Medical Practice and the Community

Proceedings of a conference convened by the Australian National University at the John Curtin School of Medical Research, Canberra, 26-30 August 1968.

Edited by R.G.Brown & H.M.Whyte.

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R. G. Brown and H. M. Whyte
Editors

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Foreword

At the time this conference was arranged it was expected that Lord Florey, Chancellor of this University and then President of the Royal Society of Great Britain, would have presided over it, and indeed he was actively involved in its planning and design. Unfortunately, his death deprived us of his wide-ranging knowledge, his wisdom and his humanity, and I was deeply conscious of my own inadequacy in the role which he would have filled with such distinction. Florey would have brought to his presidency, apart from those qualities inherent in him as a man, a profound awareness of the continuing impact which research and expanding knowledge in the biological sciences have and will continue to have on the substance of medical practice. We had to look to others in this conference, as I knew we could, to concentrate this special light on our problems.

As I look at the papers on the working of the medical profession and the relationship between it and the community it serves, I am struck by its growing institutionalisation. This is not peculiar to this profession; it is a quality of contemporary life in many if not in all its aspects. It is perhaps a function of large numbers combined with speedy communication and complex technology and therefore probably inescapable for us. Judging by other fields with which I am more familiar, institutionalisation has advantages. It enables vast quantities of work to be done; it offers the opportunity to break down the expertise required so as to employ a wider range of skills and training, thus diluting the highest qualities and rarest capacities upon which the whole is dependent. Against this, it has a rigidity in organisation, a tendency to bureaucracy in the pejorative sense and a divorce of those involved in the institution from those it is designed to serve.

Now it may not be unreasonable to ask clients of banks so to conduct their financial affairs that their transactions can be manipulated on a computer, but it is less reasonable to ask human beings to enjoy infirmities in such times and places as lend themselves to similar treatment. The raw material, therefore, of the medical profession is less malleable than that of some other social institutions, and the difficulty of reconciling the basic purposes of the profession with the pressures to institutionalise will be the greater.

Linked with the growing institutionalisation is the rapidly changing content of medical care as a result of scientific and technological change. If I may be forgiven for introducing economic considerations at this point, I would like to draw attention to an important aspect of this change from the point of view of the consumer of medical care and the community.

In our economic system scientific and technological change, combined with improved organisation, enables us to produce desired commodities more cheaply. Indeed it is this growing productivity, the production of more goods and services per unit of labour, which provides the basis for

rising standards of income, at least throughout the industrialised world. It is a peculiarity of many services, including medical care, that while the practitioners reasonably enough expect to participate in the rising levels of income, it is difficult for them to reduce the number of persons involved in its provision. In the medical profession also, the rapidly changing character of the care provided involves increasing resources of capital and manpower. Consequently, if one regards medical care as an economic commodity, it is one for which both the individual and the community, through the state, must expect to pay more.

While it is true that the individual is getting a different, and we assume a better product, this is requiring a larger share of his income. From the community point of view, it would I feel be helpful if there were some kind of calculus of benefit against which one could test the rising costs.

As a sometime economist and financier I was relieved to find an apparently growing consciousness that resources for the health industry, as it has been described, were not unlimited, and that it must compete with other claims on the community's productive capacity. I was interested in the suggestion that medicine may need to use the cost-benefit analysis technique employed to justify major claims on our resources for mighty power projects and similar enterprises. For such an analysis the cost element would be simple enough to calculate and I looked hopefully for an indication of how benefits might be assessed. If current techniques of the statistician-economist were employed we could only assess them at what individuals and the community in fact paid for them, that is, at their money cost, which, from the point of view of expansion, would leave you in the delightful situation that the costs and benefits of any proposed development of medical services would precisely balance.

For a moment I thought that the evidence which had been given for the shift in life expectancy as a result of medical development would provide us with the nucleus of a rational calculus, since it would in theory be possible to measure the added years of life resulting from particular medical developments against which costs could be set. There would, of course, remain the problem of balancing those years, and more difficult, the calculus would ignore the question of the quality of life in the added years. Most difficult was the melancholy thought that by this calculus most of our current expenditure appeared to be in directions likely to add little or nothing to the span of human life, or if I understand it correctly, to its quality either. Ecclesiastes remarked that 'ripeness is all' but the medicos have apparently decided that 'survival is all'.

In this exploration of the problems of allocation of resources I responded with warm recognition to the *cri de coeur* that whatever else went short, exciting research should be immune. As a distributor of government patronage to the Arts I have heard similar pleas from music, from theatre, from poetry and the like. Indeed, while it is true that from time to time the scientists of this world will come up with knowledge which will transform our understanding and our practices, their main justification is that like the singers, the poets, the tennis players, they are among the graces of civilisation. They represent the fun of exploration and discovery which give us all joy—at least vicariously.

It seemed universally agreed that the skill, wisdom, and understanding

of the medical practitioner were too precious to be wasted on tasks capable of being performed by lesser mortals, and that, in the language of trade unions, they should be diluted with paramedical and other ancillary skills. This led me to wonder why it has not happened, why a group of practitioners do not hire themselves the necessary properly certified bodies to perform these lesser tasks, freeing themselves for their truly professional labours. Does the B.M.A., A.M.A. or what have you, stand sword in hand between the practitioners and their Eden of lightened labours and more satisfied patients? If so, should we invoke the Restrictive Trade Practices Act?

I had the impression that there was in the beginning a kind of sad resignation towards the 'terminal fate' of the general practitioner as against the specialist, a feeling that the idea of a personal physician as an adviser responsible for the whole health and medical welfare of the patient was admirable but might be on the way out. This turned my mind to other institutions, commercial and such, universities, banks, the law, where it was my impression that the equivalent of the general practitioner, the man responsible for the whole function, while lacking many of the specialised skills to carry out the whole function, had retained the authority and status of the executive position. The legal profession might provide an interesting analogy: the family or personal solicitor represents the general practitioner of the law, advising his client on what learned advice or forensic skill he should hire from the specialist barrister, counsellor or advocate. In the legal profession the barrister may be very highly paid but there is little risk of his becoming a cuckoo in the nest of the solicitor. The solicitor remains not merely the primary source of advice but also the organiser of other legal services and above all the channel of payment: a barrister is permitted to receive fees only through the solicitor. I give this idea free of charge to those who wish to preserve the status and function of the general practitioner, not merely as the doctor of first contact but as the continuing medical adviser concerned with the whole health and welfare of his patient.

It was strongly urged that hospitals, at least teaching hospitals, should form part of complex medical centres which should, so to speak, be a microcosm of the medical world, containing within it facilities for first consultation through the range of treatments, including specialised facilities such as those for mental illness and geriatrics. I can see that this would serve many purposes, bringing the general practitioner firmly into the fully equipped team, presenting the student readily with a balanced view of the medical world that he would soon encounter professionally.

I am not clear whether this form of medical care is envisaged as the norm or only as suitable for teaching centres. It frightens me a little by its size and apparent inflexibility. I suggest that if this concept is favoured, the aid of management consultants be sought to plan administration of such a colossus in ways which would preserve some scope for individuality and enterprise and would avoid the mounting costs of large-scale bureaucracy. Furthermore, if we are able to contemplate such a centre as a necessary part of a teaching institution in Canberra, we should consult the city planning authority immediately. It would present town planning problems of great magnitude needing a substantial area, centrally placed and readily accessible to traffic of all kinds.

I am impressed even more than I expected by the relevance of the knowledge and skills of social scientists to the problems before us. We have been concerned firstly with medicine as a profession, an institution with its roots and associations deeply and widely spread in society. It is one of many social institutions, and social scientists have long made a study of institutions, their life histories, their ecologies, their pathologies. We have much to gain from extensive dialogue between these disciplines and the medical profession. It was for these reasons that there were participating social scientists, management consultants, and hospital managers, as well as biologists, teachers of medicine and practitioners.

The conference originated from a specific problem which faced this University. In the John Curtin School of Medical Research, the University is responsible for the conduct of basic research in the various sciences which can throw light on the problems of human biology. It has from time to time been proposed that the University should in due course establish a medical school for the training of practitioners, and indeed conversations on such a development have been held between the University, the Commonwealth Department of Health, and the Canberra Community Hospital.

There emerged from these discussions a conviction that merely to add to the numbers of medical schools within the Australian university complex was insufficient reason for such a development and that it could be fully justified only if it made possible a new and significant contribution to medical education in Australia, a contribution which would be derived from a fresh and unprejudiced view of the future of the profession, taking into account professional, scientific, technological, social, economic, and educational factors.

Perhaps we are happily placed to provide a home for an educational institution based on such a fresh view. We start with a bias, perhaps, towards an emphasis on the importance to medicine of biological research and a practice of biological scientists working and living among social scientists and others in the humanities. Apart from this background we are largely free from entrenched academic medical interests, clear traditional disciplines, and powerful personalities. We exist in a new but rapidly growing community with as yet only one major hospital and a community of practitioners, young and relatively uncommitted to established systems. This may offer a rare, possibly a unique opportunity, to mould a pattern of medical education more suitable to the needs of our time.

This is not of concern to us alone. The questions we are asking ourselves here are being asked in every established medical school in the progressive and no doubt agonising re-appraisals of the basis for their activities, and indeed by all those who in any capacity are concerned with the health of the community. We work, therefore, not merely for this University, but for the profession and for the community, and the impact of these discussions can be wide indeed.

We should not, I am warned, expect too much from this conference. History suggests that it is rare for revolutions to begin with conferences, although in the political field they are fertile progenitors of them, and they may mark steps along the path of acceptance of revolutionary ideas. The issues before this conference were not new. There were already working in many minds and many places examples of the little leaven of which we may

one day say it leaveneth the whole lump. If we in this work can provide an environment in which this leaven can be recognised, warmed, and helped to become pervasive, we achieve much.

H. C. Coombs

Preface

The conference was convened to attempt to determine probable trends in medical practice and the likely structure of medical services of the future, preliminary to a study of future developments in medical education.

Four general background papers were commissioned on demographic, sociological, and organisational features which might affect the direction in which medical practice would go, and these were distributed to the participants in advance. They form Part I of the proceedings.

Four sets of papers were prepared for discussion in the opening plenary sessions on topics bearing on likely changes in medical practice: changing patterns of disease, changes in educational and living standards, developments in medical science and technology, and doctors' professional requirements. Together with the chairmen's opening remarks at the plenary sessions and summaries of the discussions, these make up Parts II to V of the proceedings.

In its final phases the conference then discussed, in small groups and in plenary session, the issues which emerged. These fell into two categories: those concerned with the broad pattern of medical care, such as the role of the hospital in the organisation of medical services, and the nature of general practice, which seemed to have a significant bearing on the future structure and function of the services; and those concerned with more specific features of these services, such as the knowledge, skills, and human qualities of personnel which would enable them to work more effectively, and some desirable aspects of medical care which might be incorporated into practice, such as continuing graduate training. These discussions are summarised in Part VI of the proceedings.

R.G.B.
H.M.W.

Canberra, 1969

Acknowledgments

The Australian National University is indebted to many people for their generous and unselfish effort in contributing in so many ways to this conference.

The names of the participants in the conference are recorded elsewhere in this volume. To them, all eminent and busy people who came from many parts of Australia and from overseas, we are specially indebted.

Sir Harry Wunderly, known widely both in Australia and abroad for his work in tuberculosis, came out of retirement to act as Organising Secretary and Executive Officer for the conference and to undertake the difficult and demanding groundwork required. At cost to his time and health Sir Harry extended his inquiries and enthusiasm overseas. I record the University's gratitude to Sir Harry.

This preliminary work was ably concluded by Dr R. L. Kirk, Senior Fellow in the Human Genetics Group in the John Curtin School of Medical Research at this University. Mrs Caroline Warton was secretary to Sir Harry Wunderly and Dr Kirk over this long period of organisation and with patience and diligence attended to a multitude of tasks.

The Organising Committee, meeting frequently and patiently, gradually brought the conference to reality. Its members were largely drawn from University staff but Professor Ray Brown (Flinders University), Dr Ralph Reader (National Heart Foundation of Australia), and Sir Harry Wunderly were also members of the Committee.

Dr Ralph Reader and Professor Ray Brown, although not members of the staff of this University, were specially dedicated to the ideal of the conference. Both contributed extensively to its organisation.

Last but by no means least I wish to record the gratitude of the University and my personal thanks to Professor Ray Brown and Professor H. M. Whyte who, as co-editors of these proceedings, have made a major contribution to the effectiveness of the conference.

J. G. Crawford
Vice-Chancellor

PART I

1 W. D. Borrie

Demographic and Social Changes

The title of this paper, as given to me by the organisers of the conference, is couched in terms which are designed to terrify either a demographer or a sociologist because it implies prediction of future events. It further implies that the influence of demographic and sociological changes, as well as the events themselves, can be predicted.

At this point the task becomes truly awesome. Technically a projection of a population to some future date is relatively simple; but few projections are ever borne out by events, first because the sociological factors influencing patterns of marriage and fertility are not yet predictable—indeed, as I shall show later from Australian experience, they can change with most disconcerting rapidity. Furthermore, while sociological changes may have implications for medical practice, the reverse is also true: medical practice, both in its organisational aspects and in so far as it is applying advances in medical science, has sociological, and particularly demographic consequences. One might speculate, for example, upon the effect of a strike of gynaecologists upon the rates of infant and maternal mortality, abortion, or the sales of contraceptive pills; or upon the effect on life expectations of abolishing surgeons.

Demographic, sociological and medical factors are all interwoven in the total fabric of our social organisation and processes, each affecting that society and each interacting in a way that makes it extremely difficult to discern the discrete influence of each. The problem has been illustrated in historical explanations accounting for the assumed decline in mortality rates in the late eighteenth and nineteenth centuries. The first signs of decline were initially attributed to advances in medical science (Talbot Griffith 1926) but later research demonstrated that environmental factors such as improved water supplies, sanitation, housing and food, as well as the unexplained disappearance of plague in the seventeenth century, were the more important factors (McKeown and Brown 1955). Indeed, environmental factors associated with improving real incomes, sanitation and housing were probably more important than medical science until almost the end of the nineteenth century (McKeown and Record 1962). Similar factors continue to play their parts in the rising expectations of life in the developing countries of the world today: for example, mortality declines cannot be explained wholly by such single events as malarial control, although certainly the application of

science has been much more important in these contemporary countries than it was in nineteenth century Europe.

This brief excursion back into history is not an attempt to escape the awkward questions raised by the title of this paper, but is designed to illustrate the problem of identifying cause and effect with a precision that will permit prediction of the future demographic or sociological trends of our society. It also helps to set the current demographic and sociological situation in its proper perspective; for sociologically many aspects of the current structure and organisation of modern developed and industrial countries are unique (city size, transport, mass communication and transmission of knowledge and ideas). Demographically the whole scene of a developed or industrial society is unique, whether examined in terms of fertility, morbidity or mortality. In addition, Australia has the demographic and sociological impact of a net gain of approximately 1·7 million persons through immigration since 1945 — a flow which, with their Australian-born children, has accounted for about half the nation's total growth of approximately four million since the end of World War II.

Before entering the realm of conjecture by projecting into the future, consider some of the salient demographic and sociological features of Australia's recent past and present which will almost certainly continue to have a major influence for the remainder of this century.

Demographically the unique feature of modern developed society, including Australia, is the relative unimportance of death. If medical science succeeds in adding a few more years to the upper limit of human life, this will have virtually no effect upon reproduction or biological family size, because already approximately 94 per cent of female births live to menopause and, more importantly, even fewer die before they voluntarily cease bearing children in their early thirties, by which age the probability of surviving from birth is about 96·6 per cent.

I shall now consider five current demographic facts which seem to have an important bearing upon current and future organisation of medical practice:

The extremely low levels of infant and maternal mortality. In Australia these compare favourably with most developed countries, but as the evidence of Sweden in particular indicates, the level of infant mortality of about 18 deaths per 1,000 live births is capable of further reduction to 10 or less. Society is likely to support further endeavours in this field, but the demographic consequences of any improvement will be very slight over the nation as a whole. However, the satisfactory national level of infant mortality cloaks quite wide discrepancies in regional and social areas. For example some of the more remote areas of some States have rates 50 per cent and more above their capital city levels. The general tendency of large cities to have the lowest rates (around 17 per 1,000 live births) probably reflects the concentration within them of each State's medical skills and hospital facilities.

The virtual absence of death other than through accidents (particularly road deaths) between infancy and adulthood. The effective controls have

become the specialist paediatrician, a regular school medical service and the local hospital rather than the family doctor.

Marriage at a relatively early age and a much higher probability of marriage than in the past. This change in marriage patterns, one of the most striking sociological phenomena of the post-war period, has been apparent in a great many countries of northern and western Europe as well as in overseas countries settled by Europeans (for example the United States, Australia, New Zealand). In Australia the change has been marked by a fall in the mean age at marriage—the average age of spinsters marrying was 22·21 years in 1965 compared with 23·40 only ten years earlier—but most strikingly by changes in the proportions of men and women who married (Borrie and Spencer 1965). For several hundred years the pattern of western European society seems to have been for 12 to 15 per cent of women to remain unmarried (Hajnal 1965). By contrast the situation in Australia in 1961 was that only 7·7 per cent of women remained unmarried at age 30–34. Furthermore, over 60 per cent were married at age 20–24, compared with about one-third in pre-war times. The following table summarises the position.

TABLE 1:1

Ever married as proportion per cent of age group

	Age	1891	1933	1947	1961
Males	25–29	38·9	43·9	62·1	66·8
	30–34	59·9	67·4	78·3	80·8
	35–39	70·6	81·2	84·5	87·9
Females	20–24	34·9	31·2	48·6	60·5
	25–29	67·2	62·4	79·0	87·6
	30–34	82·2	77·5	86·3	92·3

Thus marriage and the beginnings of a family have become the most important factors bringing young adults into close contact with the medical profession: from infancy until marriage many of them have probably hardly seen a doctor. But the contact with the doctor after marriage is no longer merely for the matter of childbearing, which brings me to the fourth point of this saga.

Children and the life cycle. One feature of modern marriage is that a higher proportion of couples appear to desire at least one child than did their parents, for only 17 per cent of those marrying in 1959–60 had not borne a child after five years of marriage, compared with 27 per cent of those who married in 1937–8. Almost certainly this improvement in initial fertility is not merely due to the desire of a higher proportion of modern parents to have a child, but also reflects important developments in medical science which have reduced marital infertility in both males and females. The modern pattern, with the level of childlessness at only 17 per cent after five years and about 10 per cent after ten years of marriage, means that most couples who are physiologically capable of having a child do so with relatively little delay. In addition almost 30 per cent of all first births are illegitimate or are conceived out of wedlock—a somewhat higher figure than that of the early 1920s but roughly comparable with the situation of the 1930s (Current Affairs Bulletin 1966).

Whenever the process of childbearing begins—and the average age is around 23 years—for most women the process now takes up a comparatively short span of their reproductive years. A century ago it required, on average, about six live-births to ensure that three children would be raised to adulthood, and even half a century ago the ratio was still about five to three. Allowing for miscarriages and still-births, the number of pregnancies required to produce three adults was approximately seven and six. Allowing two years interval between marriage and first birth and an average of two years again between births, a woman married around 25 years was thus likely to be involved in the process of begetting children for the greater part of her remaining fecund years.

Now the process takes half the time—about six years after marriage for three children, and the many who have only two children, a mere four years. Just how the fertility curve has changed over the last forty-five years is apparent in the graph of age specific fertility rates of Australia (see Fig. 1:1).

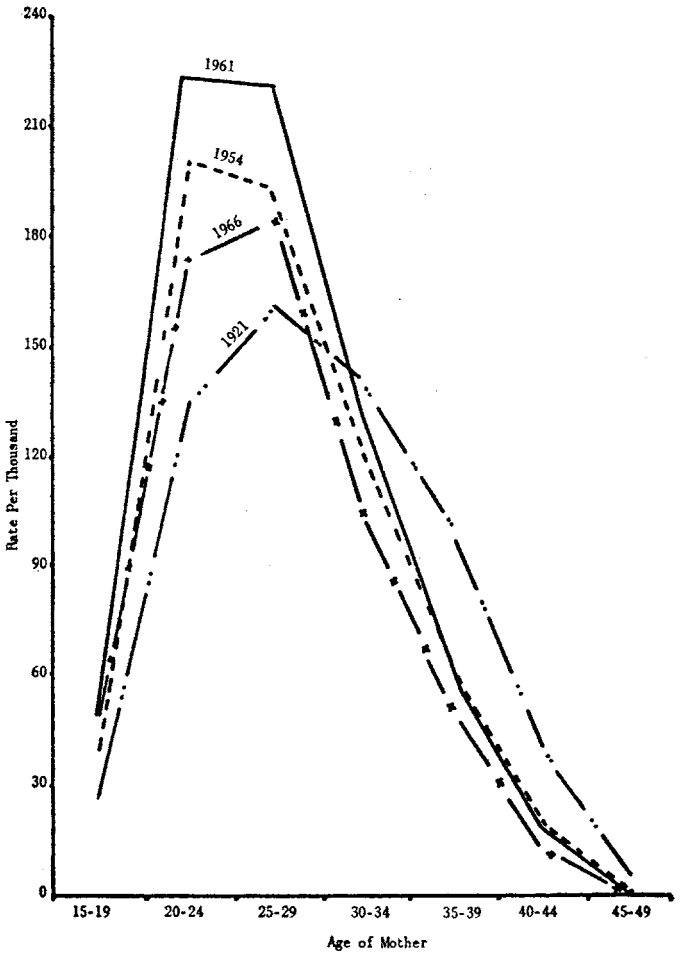

Fig. 1:1 Age specific fertility rates

The very sharp change in the graphs representing 1961 and 1966 deserves further comment, because it shows how quickly and dramatically patterns can vary in response to changing economic circumstances, social attitudes or other factors. That the downward trend since 1961 is not wholly due, or even due to a major extent, to the contraceptive pill, even although Australian women appear to have the highest per capita consumption (Current Affairs Bulletin 1967), has been cogently argued by my colleague, Dr Norma McArthur (1967).

The important point to note here is that, whether we examine the pre-pill decline in the birth rate in the 1930s (when the lowest-ever point was

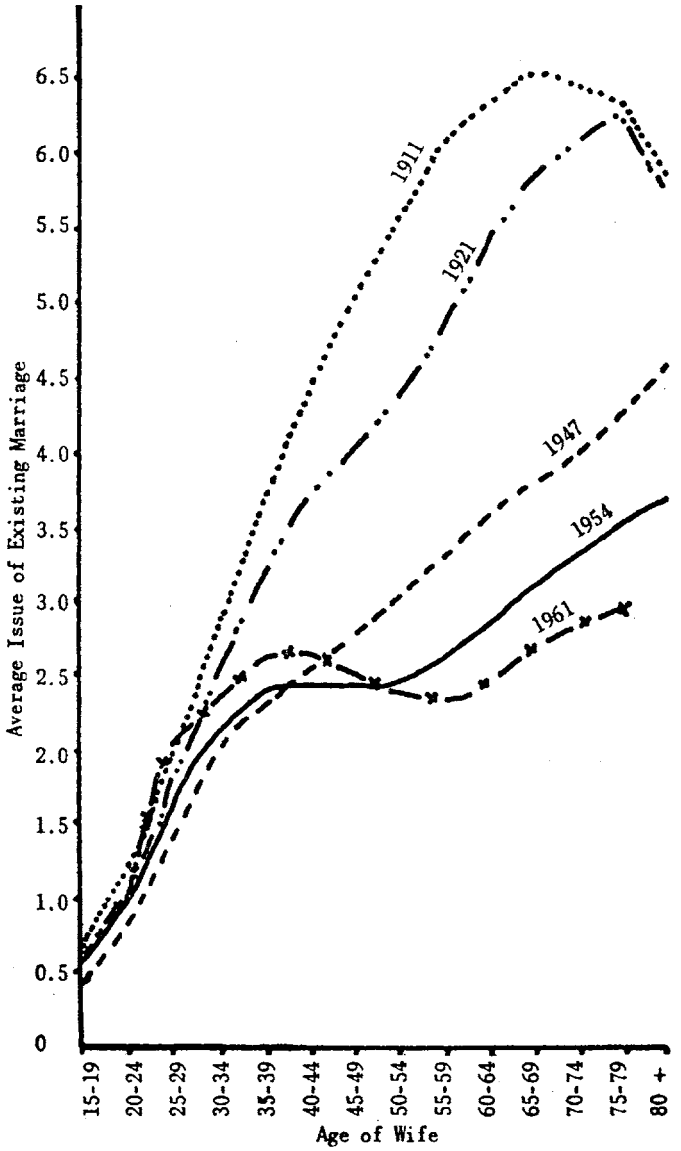

Fig. 1:2 Average issue of existing marriages, 1911-61

reached) or the sudden decline of the 1960s, how many children women have and when they have them is now a highly rational matter. Moreover there is not a shred of evidence that, in this age of virtual immortality as far as reproductive behaviour is concerned, average family size will rise above three children (see Fig. 1:2). In our sort of society the third birth is the crucial one, that is the birth which marks the dividing line between substantial population increase and slow decline. With the low levels of mortality and the high proportions marrying which have prevailed in recent decades, Australia has been able to sustain a level of natural increase around 1·2 and 1·3 per cent with a level of fertility which implies an average completed family size considerably below three children. The average issue of existing marriages enumerated at the 1961 census was 2·65 for women aged 40–44 and 2·50 for those aged 45–49. Younger women at that time showed a higher fertility, those aged 30–34 already having an average issue of 2·67, and those aged 35–39 an issue of 2·65 children, but with the trend towards earlier marriage and childbearing rather than larger families, the additional children born to these women during their remaining childbearing years will probably still result in completed families averaging less than three children.

The third child has become the significant one in terms of social policy as well as of medical practice. A social policy designed to encourage population increase in our low mortality has a better chance of producing effective results if it aims to encourage the third rather than the fifth child. The third child is also important in medical terms, as it now means for many the attainment of the 'desired' family size, often at the comparatively young age of about thirty years. Thereafter these women will be seeking very efficient contraceptives for they will still have many years of potential fecundity. The prevention of unwanted pregnancies has become a crucial factor in the minds of still young parents in regard to the proper upbringing of their 'desired' children (for example an adequate and increasingly prolonged education) and also in regard to the proper social and economic role of the wife, including her possible return to employment. In this last matter, Australia is still not one of the really advanced countries, but the extent of the change is apparent in the fact that the proportion of married women in employment between 1947 and 1961 increased from 6·0 to 17·4 per cent for those aged 30–34, and from 7·0 to 21·0 per cent for those aged 35–39. For women at least, the old adage about life beginning at forty should now read thirty—and as long as death control remains as stringent as at present in our society, the new pattern of reproductivity and post-reproductive activity referred to above is likely to remain.

For ages above about 35 years further improvements in morbidity and mortality have social and economic rather than demographic implications. In the initial decline of mortality, say when the expectation of life at birth was advancing between a century and half a century ago from around 40 years or a little below to about 50 years or a little above, the major gains were in the early years of life. This is implied in Table 1:2. Until approximately World War II, the improvements achieved sometimes favoured females and sometimes males, but over the past thirty years or so the females have advanced rapidly and in 1960–2 had a marked advantage over men at all

TABLE 1:2
Expectation of life in Australians at selected ages, 1901–10 to 1960–2

Age	1901–1910	1920–1922	1932–1934	1946–1948	1953–1955	1960–1962
			Males			
			Years			
0	55·20	59·15	63·48	66·07	67·14	67·92
10	53·53	56·01	58·02	59·04	59·53	59·93
20	44·74	46·99	48·81	49·64	50·10	50·40
30	36·52	38·44	39·90	40·40	40·90	41·12
40	28·56	30·05	31·11	31·23	31·65	31·84
50	21·16	22·20	22·83	22·67	22·92	23·13
60	14·35	15·08	15·57	15·36	15·47	15·60
70	8·67	9·26	9·60	9·55	9·59	9·77
80	4·96	5·00	5·22	5·36	5·47	5·57
			Gain in years since preceding census			
0		3·95	4·33	2·59	1·07	0·78
10		2·48	2·01	1·02	0·49	0·40
20		2·25	1·82	0·83	0·46	0·30
30		1·92	1·46	0·50	0·50	0·22
40		1·49	1·06	0·12	0·42	0·19
50		1·04	0·63	–0·16	0·25	0·21
60		0·73	0·49	–0·21	0·11	0·13
70		0·59	0·34	–0·05	0·04	0·18
80		0·04	0·22	0·14	0·11	0·10
			Females			
Age	1901–1910	1920–1922	1932–1934	1946–1948	1953–1955	1960–1962
			Years			
0	58·84	63·31	67·14	70·63	72·75	74·18
10	56·39	59·20	61·02	63·11	64·78	65·92
20	47·52	50·03	51·67	53·47	55·06	56·16
30	39·33	41·48	42·77	44·08	45·43	46·49
40	31·47	33·14	34·04	34·91	35·99	36·99
50	23·67	24·90	25·58	26·14	27·03	27·92
60	16·20	17·17	17·74	18·11	18·78	19·51
70	9·96	10·41	10·98	11·14	11·62	12·19
80	5·73	5·61	6·01	6·02	6·30	6·68
			Gain in years since preceding census			
0		4·47	3·83	3·49	2·12	1·43
10		2·61	1·82	2·09	1·67	1·14
20		2·51	1·64	1·80	1·59	1·10
30		2·15	1·29	1·31	1·35	1·06
40		1·67	0·90	0·87	1·08	1·00
50		1·21	0·68	0·56	0·89	0·89
60		0·97	0·57	0·37	0·67	0·73
70		0·45	0·57	0·16	0·48	0·57
80		–0·12	0·40	0·01	0·28	0·38

Source: Official Life Tables, Commonwealth Bureau of Census and Statistics.

ages. Here again both demographic and medical factors were involved: fewer women were exposing themselves to the risk of high parity births and medical science was greatly reducing the risk of death amongst those who

did undergo childbirth. While women were successfully getting rid of most of their gynaecological complaints, men were making only tardy progress against their major killers, such as cardiovascular diseases, cancer and respiratory disorders. The Australian life tables showed a gain in expectation of life for males from age 60 of only 1¼ years between 1901–10 and 1960–2—hardly a sufficient reason for raising the male retiring age and not an advance that has added substantially to the burden of the male aged. But the lack of male advance and the considerable female advance of 3¼ years at age 60 over the same period has considerably increased the proportion of ageing widows in society, thereby raising problems requiring new approaches for their solution, particularly in the fields of social medicine and psychiatry.

Summarising these demographic factors in terms of the modern life cycle, one may say that the expectations that are now taken for granted are a safe birth for both child and mother, the prevention of death or serious illness until at least adult life, adequate medical attention for a few years of reproduction, an assurance that medical science can prevent unwanted pregnancies during the remaining fecund years (often half the total female reproductive cycle), adequate hospital, medical and other social services to ensure a few years of retirement when the male's working life has been completed, and a fairly high expectation by women that the comfort of their final years will be without a husband's support and will depend heavily upon the provision which society is prepared to make for them. Indeed all of these expectations, from birth to old age, now assume a substantial degree of social reponsibility through national health services and heavily subsidised if not completely socialised medical services.

The attainment of these modern health and life expectations is now so costly in terms of medical, surgical and pharmaceutical services, that it can only be achieved by the lower income groups with social assistance in the form of progressive taxation and a reallocation of the revenues thus raised in terms of personal and family needs, with increasing emphasis upon institutional aspects of medical care to provide the necessary specialist services.

While the average life cycle sketched above is fairly typical of most of today's developed societies, with life expectations around 70 years, there are some aspects of Australian society which are unusual if not unique and which create particularly difficult problems in terms of efficient medical and hospital services.

The first of these arises from Australia's vast size and the distribution of its small population. Precise analysis of intercensal trends in distribution as between urban and rural areas is bedevilled by changes in boundaries and definitions of 'urban', but the overall picture is perfectly clear. It may be summarised as follows: only about one in six Australians lives in rural areas; about a similar proportion lives in relatively small country towns with populations between 1,000 and 20,000; thus approximately one-third of the population lives in rural areas or small country towns; about 9 per cent live in cities other than the capitals; about 58 per cent live in the State capitals and in Canberra.

Concentration of population is even more pronounced than these figures imply. Three great urban complexes contain just over half of Australia's population. At the 1966 census the position was this:

		Number in thousands
New South Wales	Sydney	2,445
	Newcastle	234
	Wollongong	163
		2,842
Victoria	Melbourne	2,108
	Geelong	105
		2,213
Queensland	Brisbane	719
	Toowoomba	56
	Gold Coast	53
		828
Total:	Numbers	5,883
	Per cent of Australian population	51

Add to these eight urban areas, Canberra, the three remaining State capitals of Adelaide, Perth and Hobart, and the remaining three cities with populations exceeding 50,000 (Ballarat, Townsville and Launceston) and we have accounted for some 64 per cent of the people of Australia. As Table 3 shows, most of these cities have been growing at rates which exceed 2 per cent a year, that is considerably above the national rate. In other words these are the areas which have been absorbing the greater part of immigrants from overseas and the equivalent of the whole of the natural increase of Australia's rural areas. Borrie and Spencer (1965) have estimated that 240,000 persons aged 7 and over residing in urban areas in 1961 had emigrated from rural areas during the previous seven years, and that the majority of these were young people fresh from school and in the young adult age groups. Another important emigrant stream from rural to urban areas was the age group 65 years and older.

TABLE 1:3

Population (in thousands) of the largest cities in Australia in 1961 and 1966, excluding full blood Aborigines

State	City	1961*	1966†	Annual Increase %
New South Wales	Sydney	2,197	2,445	2·2
	Newcastle	220	234	1·3
	Greater Wollongong	128	163	5·5
Victoria	Melbourne	1,858	2,108	2·7
	Geelong	88	105	3·7
	Ballarat	54	56	0·7
Queensland	Brisbane	587	719	4·5
	Townsville	51	59	3·1
	Toowoomba	50	56	2·4
	Gold Coast	35	53	10·3
South Australia	Adelaide	580	727	5·0
Western Australia	Perth	424	499	3·5
Tasmania	Hobart	110	119	1·6
	Launceston	56	60	1·4

* Adjusted 1961 census figures to comply with 1966 census criteria.

† Preliminary figures, 1966 census.

Source: Commonwealth Bureau of Census and Statistics, Census Division.

Relating these facts of urban-rural distribution to the demographic life cycle referred to earlier, they mean that both numerically and in terms of the need for medical services, the demands are being increasingly concentrated in urban areas, and particularly amongst the three great urban complexes described above and the other capital cities. In these a high proportion of the births occur, the majority of families with young children reside and the majority of the nation's aged lives. Such a pattern means that the static and even declining rural areas offer little attraction for the young doctor seeking wide general experience, and neither do the rural areas, when combined with the many small and scattered country towns, offer many more attractions for the general practitioner or the young specialist. I do not know the desirable base population size for providing the needs of a medical school or a major teaching hospital, but I suspect that it is considerably in excess of 100,000, and once the capital cities of Australia and their environs are covered, it takes a very large area indeed in most parts of Australia to encapsulate a population anywhere near the 100,000 level.

Despite considerable attention to the notion of urban decentralisation, the development of new industrial areas associated with mineral exploitation, or of towns to serve new agricultural and pastoral developments, there is no reason to believe that the basic distribution of Australia's population will change during the remainder of this century. A few more Canberras may be developed with good planning; a few places like Townsville or Darwin may continue their very rapid growth; but the fifteen major cities are likely to go on absorbing almost the same high proportion of the nation's growth as they have done in the past twenty or thirty years, and it is within these that a great deal of the energy and ideas will be applied concerning medical practice and organisation. Such application is urgent and necessary, for, if recent growth rates continue to apply, these areas will be doubling their populations by the end of the century. Populations by then of about six million served by Sydney-Wollongong-Newcastle and five million served by Melbourne-Geelong-Yallourn seem a certainty if the immigrant flow of recent years is sustained.

Nevertheless this great urban concentration should not be permitted to absorb all the nation's medical energies and expertise. Until Australia has a population many times larger than at present, there will remain the one-third living in relatively small and widely separated towns, in the frontier settlements associated with new developments, and in rural areas, and the effective organisation of these to ensure medical and health services equal to the best of the major centres of population will continue to present a major challenge. So far most has been heard of the services for essentially remote areas—the Flying Doctor—and concentration on this aspect has perhaps detracted attention from the intermediate zones where most of the small towns are to be found. Attempts in recent years to encourage immigrant doctors—some with qualifications not recognised by our State Medical Boards—to serve country town and rural areas show recognition of the problem but do little to solve it. The right approach is probably the organisation of large base hospitals, and associated closely with these, highly organised general and specialist mobile medical services which both permit fully qualified doctors to commute regularly by air over substantial regions and can quickly bring in cases needing specialist attention or hospitalisation

to well equipped centralised facilities.

Such schemes would of course add considerably to the national health bill, and in our political structure would probably again require financial assistance at the federal level, but a cursory examination of a few indices, such as infant and maternal mortality, indicate that present services still leave the small town and rural third at a considerable disadvantage compared with those who live in major conurbations. Moreover the disadvantages are probably greater than mortality statistics imply, because the dangerously ill do generally get into a base hospital or one of the large city hospitals: the disadvantage is probably greatest at the preventive stage. The notion of the family doctor is probably least appropriate in the small Australian town and rural areas, for with the specialist services now required to sustain our seventy-years-of-life system, the family doctor can only be efficient if he has ready and quick access to such services. In any case, many doctors in these areas must be continually frustrated by the continued emigration of many of their younger clients.

Another aspect of the Australian scene which provides some unusual and at times difficult aspects for the medical man, whether general practitioner or specialist, is the size and complexity of the immigration program, which, as indicated earlier, has been responsible for about half the nation's growth since 1945.

In terms of the nationality of permanent and long-term arrivals (that is those arriving to reside here for twelve months or more) the main groups between October 1945 and June 1966 have been:

British	1,334,000
Italian	300,000
Greek	152,000
Dutch	142,000
German	107,000
Polish	83,000
Other	389,000
All nationalities	2,507,000

As family settlement has been a basic element of Australia's immigration program, a high proportion of immigrants has been young parents and their children. Amongst permanent and long-term arrivals in 1945–59, about a quarter were children aged 0–14 and two-thirds were between ages 15 and 49. Thus a high proportion were of an age where medical attention for young children and for childbearing was still important. In treating these immigrants, language communication must be a considerable problem for many doctors, particularly in some of the inner metropolitan centres in which are sometimes found heavy concentrations of non-British groups, for example Italians and Greeks. Moreover, access to doctors fluent in their language must also be a problem for many non-British immigrants as the immigration of trained doctors from these countries has been negligible. Such immigration has been discouraged by the fact that the State Medical Boards do not recognise qualifications earned in those countries but require such persons to undertake up to three years further training in a medical school within Australia. The only substantial inflow of non-British doctors was amongst the displaced person immigration between 1949 and 1951.

Many of these subsequently obtained Australian qualifications, and others who did not take this course were eventually permitted limited practice in areas for which sufficient Australian-trained doctors could not be found, as in country areas and in New Guinea. Apart from this displaced person stream, the only significant inflow of doctors has been doctors from the United Kingdom, and, as their qualifications are recognised, they have been immediately available for medical service.

Generally, however, it can be said that because of their age and composition and because of the small inflow of immigrant doctors qualified to practise in Australia, immigrants have more than proportionately added to the demand for medical services. This has meant that the demand for trained medical personnel has been at a maximum when the age groups from within Australia, from which the major supply has had to come, have been at a minimum. That is, those approaching the age for medical training were until recently the deficit birth cohorts of the late 1930s. This situation is now changing rapidly as a result both of the post-war baby boom and of the substantial input of young immigrants who have been trained in Australian schools. The change is apparent in the fact that in 1966 there were 1,052,100 young persons aged 15–19, compared with only 810,300 in 1961 and 591,700 in 1954. This changing demographic factor, when combined with the expansion of training facilities through the extension of existing schools and the development of new ones in some of our new universities (for example Monash and the University of New South Wales) should ensure a very much increased outflow of Australian-trained doctors than was the case between about 1945 and 1960. Nevertheless, so long as the immigration of medically trained people with qualifications recognised in Australia remains negligible, the immigration program will continue to create an excess of demand over supply. To sustain its own supply, a target of a population gain of 100,000 through net immigration (which is slightly below the government's objective) should include about a hundred medically qualified settlers. Almost certainly nothing like this ratio has applied so far.

Finally in regard to immigration, the quality of medical services offered and their direct cost to the patient are likely to be important elements in the decisions of many immigrants whether or not to settle in Australia. Many of the immigrants come from countries with very comprehensive, socialised medical and hospital schemes. This applies to many European countries as well as to the United Kingdom. Just how the immigrant views Australia's national health and medical scheme, or what proportion of the immigrants immediately takes the steps necessary to ensure full benefits (particularly through personal contribution to a recognised hospital and medical fund) are questions about which very little is yet known. Surveys have indicated that some immigrants, particularly from the United Kingdom, feel the Australian services to be inferior to those they have left in their countries of origin, and whether true or not, the conclusion reached tends to colour their attitude towards permanent settlement. To the intending settler the most critical aspects may well be the cash payments required for hospital and medical treatment before any refund can be secured—an aspect which perhaps tends to encourage the view that our semi-private-enterprise scheme is less 'free' than wholly socialised schemes. Both the immigrant's

image of Australia's health and medical services and their real efficiency are areas in which much further research is needed before we can assess their significance in the immigration program.

The final matter to be considered in this paper is the likely future growth and structure of the Australian population and their implications for medical practice. To some extent these questions have been answered in general terms in earlier sections which discussed population distribution and immigration. Before proceeding further it is also of some interest to compare the changes that have occurred over the past in the nation's population profile. Figure 1:3 gives an overview of the change that occurred in the fifty-five years 1911–66. Here are mirrored the net results of very great cultural and social changes. The profile of 1911 is the product of the great migrations of the 1870s and 1880s and of the first great sweep downward from about 1880 of both mortality and fertility. The 1911 profile is remarkably symmetrical, with the slight surplus of males in the higher age groups reflecting rather the high masculinity of nineteenth century immigration than differential mortality between the sexes.

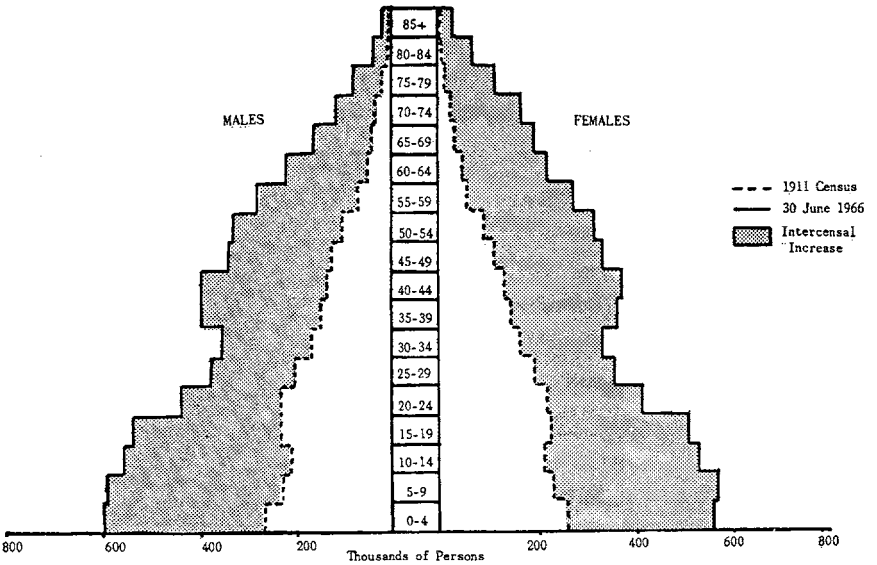

Fig. 1:3 The population of Australia in 1911 and 1966

By contrast the much larger population profile of 1966 is ragged. Troughs and peaks in immigration flows have had their effect. Mortality has also changed very greatly over the period. But the main determinant of the pattern of 1966 has been the very marked and sudden changes in the levels of births. The deficit cohorts of the low birth rates of the 1930s are embedded in the structure between ages 20 and 39—thus helping to explain the deficit until recently in medical trainees. But the base on which the profile stands is wide and ample down to age five, thus giving promise of both a good supply of medical trainees and also of young families on which they can practise. For the immediate future the growth potential looks good, but at age 0–4 the pyramid is again slightly undermined, reflecting the fall in the birth rate and in the absolute numbers of births since 1961.

To attempt to go forward now for fifty-five years would be folly. The rapid changes of the past in terms of migration and fertility to which I have referred indicate why it would be folly. Therefore all I shall do is to indicate the way ahead for twenty years from 1966 on the basis of the following assumptions that seem reasonable in the light of present circumstances.

Taking the 1966 census population as the base, the following assumptions were included in the projection: (1) a steady but slight decline in mortality. (2) A continuing slight fall in fertility to 1969 and then a slight rise. This assumption takes into account the evidence that fertility fell sharply from 1961 to 1966, but that the pattern now seems to be flattening off. The projection therefore assumed that the gross reproduction rate, which was 1·7 in 1961 and which had fallen to 1·4 in 1966, would decline to 1·2 in 1969 and thereafter rise slightly to 1·3. (3) A net immigration gain each year equal to 0·8 per cent of the population, with the age and sex experience of the past ten years and the same fertility pattern as the non-immigrant population. This assumption provided population derived from immigration 1966–86 of approximately 2·78 millions.

On the basis of these assumptions the population of Australia in 1986 would be slightly in excess of 17·1 million, compared with 11·5 million in 1966, and its shape and structure compared with 1966 will be as illustrated in Fig. 1:4. The most striking feature is the very great projected increase by 1986, compared with 1966, of the young adults between ages 20 and 39—they increase from deficit to surplus and promise well for gynaecologists and manufacturers of contraceptives, as well as for the potential supply of doctors. However the recent decline in the birth rate will again be tending towards another deficit period in trainees around 1986.

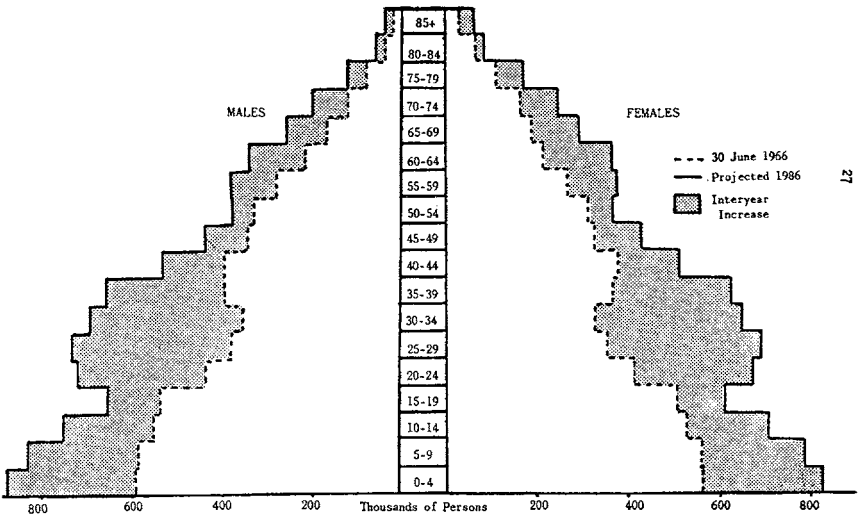

Fig. 1:4 The population of Australia in 1966 and as projected to 1986

A collapse of immigration could reduce the total population of 1986 by about 2,700,000 but its shape would not be radically altered. As such an eventuality is quite contrary both to present government policy and to principles of the Labor Party, any assumption foreshadowing such a curtail-

ment is simply not reasonable. Indeed, if present government targets are reached the immigrant flow will be greater than that assumed and could raise total population to about eighteen million by 1986, but again the shape of the profile would not be greatly altered.

In view of the public cost of medical and health services—a cost likely to increase in real per capita terms so long as we continue to press for even lower mortality rates than we have at present—an important question is whether the structure indicated in the projection is likely to increase the burden on the nation's breadwinners. The basis for such a consideration is given in Table 1:4.

TABLE 1:4

Numbers and proportions of the Australian population in age groups in 1911, 1966, and as projected for 1986

Age	1911	1966	1986	1911	1966	1986
		Numbers			%	
Males						
0–14	714,567	1,740,460	2,460,790	30·9	29·9	28·6
15–64	1,497,456	3,659,990	5,507,709	64·7	63·0	64·0
65+	101,003	409,750	638,412	4·4	7·1	7·4
Total	2,313,035	5,810,200	8,606,911	100	100	100
Females						
0–14	695,926	1,658,020	2,334,512	32·5	28·9	27·4
15–64	1,355,239	3,503,270	5,312,352	63·3	61·2	62·3
65+	90,805	569,210	879,534	4·2	9·9	10·3
Total	2,141,970	5,730,500	8,526,398	100	100	100
All persons						
0–14	1,410,502	3,398,480	4,795,302	31·7	29·4	28·0
15–64	2,852,695	7,163,260	10,820,061	64·0	62·1	63·2
65+	191,808	978,960	1,517,946	4·3	8·5	8·8
Total	4,455,005	11,540,700	17,133,309	100	100	100

Sources:
1911—Census figures
1966—At 30 June 1966
} Commonwealth Bureau of Census and Statistics;
1986—Projections made by Department of Immigration.

Examined in terms of broad age groups there seems to be no problem. Those of working age (15–64) increase slightly as a proportion of total population, and compared with 1911 the total burden of dependency does not greatly alter. In its component parts, however, the dependent burden does shift markedly, with the proportion of aged rising from 4·3 to 8·8 per cent, and the proportion of juveniles falling from 31·7 to 28·0. The 1911 pattern is certainly not likely to recur, in this age of nationally controlled fertility and longevity, but the new pattern of a higher proportion in the aged dependent group is likely to increase public expenditure for reasons mentioned earlier in this paper (high cost of specialist medical and surgical services, high proportion of widows, increasing tendency to institutional care).

The burden on the working-age group is also likely to be increased, less from higher per capita costs associated with the birth and infancy of their children than with higher educational participation rates of young people beyond compulsory school-leaving age. A more detailed analysis of the period 1966–76 allowing for increased educational participation rates has

shown that those available for employment might not increase by more than one million even though the total age group aged 15–64 might be almost 1·6 million (Borrie and Spencer 1965).

Thus sociological changes associated with education and higher costs of medical and health services for the aged will probably require increased taxes raised from the nation's workforce in the future, but assuming that there will also be advances in the productivity of labour, the added burden is not likely to be onerous. Nevertheless the illustration just used does show how dependent the social structure of a modern developed society is upon continuing, and desirably increasing, affluence. If efficient economic organisation fails all else is lost.

A safe conclusion is that the increase in demand for doctors is not likely to be proportionally less than the increase of population: in other words a population increase of 50 per cent over the next fifteen years will require an increase of at least 50 per cent in medical personnel. This could sustain our present demographic patterns of mortality and longevity; but as mankind appears to be continually striving for immortality, research which is expensive in terms of money and personnel will continue to attempt to squeeze another year of juice out of life's orange. At the other end of the scale the attempts to improve even further the already uniquely low level of mortality of infants and mothers is bound to go on. And in between, the computerisation of diagnosis, the higher costs of surgery and increasing efficiency of hospital care will require higher incomes to pay for it all. Society is likely to demand and be prepared to pay for all this. At the same time increasing mobility will hasten the trend towards patient visiting doctor rather than the reverse, with the doctor of first contact linked in group practice as part of the chain to the specialist services and ultimately, if required, to the hospital.

Such at least seems to be a universal trend in urban and high density areas. But Australia will still have to sustain and develop an approach appropriate to the environment of the small town, frontier and rural areas, which are still vital to the nation's economic growth, but which offer little attraction to medical skills in a free enterprise system. It is here perhaps that the greatest challenge lies in the immediate future in terms of management and innovation which take full advantage of recent medical and technological developments.

Conclusions

An assessment of the influence of demographic and sociological changes for future medical organisation and medical practice is very difficult, first because changes in the medical field have themselves demographic and sociological consequences. There is no clear one-way process: all three interact. Secondly, exact prediction of demographic or sociological events is virtually impossible: social science is not as exact as that.

Nevertheless there are many aspects of contemporary 'developed' societies that are unique in human experience and that are likely to have significant medical implications. Some of these unique aspects may be expressed, in terms of the life cycle, as very low mortality, controlled fertility and the current patterns of marriage and family building.

These unique demographic elements exist in 'developed' societies, such as Australia, which are also highly urbanised and highly mobile. There are additional factors of particular significance to Australia, such as the high proportion of population growth coming from international immigration and the dispersal of non-metropolitan population amongst many small towns scattered over vast areas. Bringing efficient and specialist medical services to this small town and rural third of the population presents many challenges and opportunities for innovation. There are likewise some special problems arising from the extent and diversification of the immigrant flow.

The maintenance of today's low levels of mortality—and their improvement, which social pressures will demand—is likely to require increasingly costly medical and hospital services; and therefore the nation's capacity to pay for these depends essentially upon improving productivity and real incomes. These services will also have to be provided in a future population which, although bigger, will be distributed much as at present. Thus the rights of the scattered small town and rural areas will continue to be important. At the same time the nation will have to plan to double its service capacity in metropolitan and major urban areas within the next thirty to thirty-five years, assuming that future growth patterns will be similar to those which now prevail.

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2 J. C. Lane

Non-medical Technological Changes

Any account of the effect of changing technology in transportation and communications on medical practice must take into account the remarkable distribution of population in Australia. Although this country has a relatively small population for its area and the popular self-image of the Australian is that of a lean, bronzed countryman, the truth is that Australians are an extremely urban people.

Some 39 per cent of the population lives in two cities, 59 per cent in six capitals, 61 per cent in nine cities over 100,000 and 65 per cent in fifteen cities over 50,000. At the other end of the scale there are large tracts of country which are populated at an extraordinarily low density. Though small in numbers, this low density population is of interest because in the recent past some of the more spectacular applications of communications and transportation to medical practice have been achieved in relation to it.

Small communities are liable to decay unless there is some special geographic or other feature, or deliberate government policy, ensuring their viability. Inspection of the 1966 census suggests that towns of less than 5,000 are tending to lose population. In addition, except where new areas are brought into production by technological changes, as by irrigation or addition of trace elements, the density of population in rural areas outside towns is also tending to decrease as the farming or pastoral operation comes to require less labour: for example, rural Victoria had 487,000 persons in 1961, but 463,000 in 1966. The chronic difficulties of small towns in attracting and retaining a doctor may ultimately be solved by the disappearance of some of the towns themselves. An effect of readily available road transport on a small community can be seen in the newspaper account of the establishment of a hospital in a small town midway between Ballarat (pop. 56,000) and Melbourne, seventy-five miles distant, and its closure eight months later for lack of patients (Melbourne *Herald*, 8 August 1967). Fairbairn, at the University of Melbourne, in a study of country towns, recently found that 'the motor car had lowered the importance of many small Victorian towns and set them on the path to ultimate disappearance'.

Therefore, over the existing extremes of population distribution must be superimposed a trend for the largest units of population, the cities, to grow larger and for the rural areas to become even more sparsely populated.

The recent history of communications technology

The likely effect of technological change in the near future can be approached by considering present use of communications and transportation in different medical functions and its recent history.

It is possible to list methods of transport and communications in terms of movement of persons, movement of materials and movement of information, for certain medical interfaces and functions:

Clinical Medical Service

Patient to doctor of first contact (elective and emergency)
Doctor to patient
Doctor to diagnostic facility
Doctor to consultant
Consultant to patient
Therapeutic substance or device to patient
Patient to diagnostic facility
Patient to consultant
Patient to hospital
Patient to hospital (special facilities)
Patient return from centre for diagnosis or specialised treatment

Public Health

Services
Information collection and research
Forensic pathology
Disaster relief
Public health education

Medical Education

Undergraduate training
Formal postgraduate training
Conferences and eminent visitors
Extension training of practising clinicians

Only certain aspects call for comment. The devices which have come to facilitate the conduct between patient and doctor in the recent past have been the road vehicle, in particular the private car and the road ambulance, and the telephone. The doctor is first contacted by telephone with resulting rapid communication of advice or a decision for a visit or hospital admission: no longer is it necessary to send someone to fetch the doctor. Over the past twenty years this process has been approaching completion with the penetration of most levels of the community by the private motor car and telephone.

In the more densely settled rural areas one consequence has been a greatly reduced need for personal transportation by the rural general practitioner since his patients tend to come into town to his surgery if they are ambulant and to hospital if they are not. By contrast his colleague in a large city is obliged to spend a substantial part of his time transporting himself by private car not only for house visits but to the widely separated hospitals which he is obliged to use for inpatient service.

In rural areas of very low population density, mostly under 0·25 persons per square mile, the roles of the car and telephone are played by the aircraft and radio in the service provided by the Royal Flying Doctor Service

and kindred organisations. The success of this service since its beginning some forty years ago has been thoroughly documented and needs no extensive description (Bilton 1961; Vickers 1966; Langsford 1966). In recent years the service has come to provide not only visiting medical clinics and emergency services but also a visiting dental service (Table 2:1). It is not an exaggeration to say that this service, together with ancillary uses made of the radio network, has transformed living conditions for families in these very low density areas. Personal mobility in such areas has also been increased by the rather rapid growth in the use of light planes, which have come to be used as long-range automobiles.

TABLE 2:1
Growth of Royal Flying Doctor Service activities over a six-year period

	1959–60	1965–6
Flights	1,447	2,590
Miles flown	632,000	959,166
Patients carried	1,457	2,287
Radio consultations	11,528	18,510
Telegrams	245,000	319,856
Budget ($)	546,000	910,000 (est.)

Source: Royal Flying Doctor Service Sectional Reports (does not include Northern Territory Aerial Medical Service).

The use of aircraft to bring service to the patient has been extended in the flying surgeon service in Queensland, in which a general surgeon 'consults' over an area of 336,000 square miles with an estimated population of 80,000 (Leaming 1966).

It is also convenient to mention here the use of aviation in public health services, for example, immunisation, infant welfare, and disease surveys, particularly by the Northern Territory Medical Service (Langsford 1966), and the recent innovation of a flying public health nurse in Western Australia.

Although the Flying Doctor Service includes the function of an air ambulance, it is primarily a mechanism for bringing medical care to patients by means of aviation. The use of aircraft to provide an ambulance service *per se* is fairly new, although an air ambulance service has been in successful operation for twenty-three years in the sparsely populated Cape York Peninsula.

In the recent past the transportation of stretcher patients from somewhat more populated rural areas and rural towns to larger centres for specialised diagnosis or treatment has been largely by road ambulance with some use being made of commercial air services, or occasionally specially chartered aircraft. Journeys of some hundreds of miles are by no means uncommon. Trips of this length, perhaps over poor roads, may prejudice the patient's condition and, moreover, take the ambulance out of service in its own district for one to three days. While there is a considerable literature on the effects of air travel on patients, little has been published on the effects of road transport in the conventional ambulance. Harbison (1968) has recently described the deleterious effects of even a cross-city ambulance ride on severely injured patients.

For journeys of more than about one hundred and fifty road miles, and in special circumstances less, air transport has therefore much to recommend

it. Air ambulance services of this type have recently begun to operate in New South Wales and Victoria (Davis 1966). According to Harbison the costs of this service are very competitive with those of the road ambulance. The extension of these services to other States, particularly Queensland and the southern part of Western Australia, would seem advantageous.

Very considerable use of scheduled air services is made by ambulant patients. There is, for example, a traffic in neurosurgical cases across Bass Strait. Some patients now carried by scheduled services could, with advantage, be transferred to the air ambulance as this becomes progressively established. On the other hand the recent introduction of third level or so-called commuter regular public transport, using light twin-engined aircraft, will provide air transport to ambulant patients in certain centres which formerly lacked this service.

Certain exotic investigations and surgical procedures require elaborate facilities and a highly trained team who should, as far as possible, be constantly employed in their specialty. In view of the rapid domestic air transport already available, it may be questioned whether such highly specialised units, with a restricted clientele, need to be set up in every capital city, or whether their location cannot be planned on a national rather than a State basis.

The great development of general aviation in this country over the past six years has also increased the availability of consultants to patients in rural centres, not only on an emergency or special purpose basis but also for a regular visiting clinic. No information is readily available on the number and nature of such visiting services, but ophthalmology is one speciality in which it is known these arrangements are used. Use of chartered general aviation aircraft can result in great economic savings. For example, a radiotherapeutic team (doctor, nurse, technician) regularly visits a provincial city 300 miles from the capital. By car this visit occupied three days, two days travelling and one day clinic, but with a chartered aircraft the entire operation can be carried out in one day.

The ready availability of airmail so that few remote centres are more than twenty-four hours by mail from a city or large town with diagnostic facilities, brings most pathological diagnostic services within the reach of the rural practitioner. Horsfall (1967) has pointed out that practically all biological specimens can be transported satisfactorily this way and only a few tests (white cell counts, E.S.R. and blood films) need be done on the spot. Facsimiles of X-ray films have been sent by wire (Gershon-Cohen 1966) but the loss of resolution apparently offset the extra analytical skill of the receiver. The only technique using commercial equipment for diagnosis at a distance by electronic means is that for transmitting electrocardiograms over ordinary telephone lines. No information is available as to its use in this country. In most cases in which highly skilled interpretation is needed, the time consumed by airmailing the tracing one way and receiving a telephone call in return is sufficiently short.

Air transport as well as road transport can, of course, be used for emergency delivery of therapeutic substances or devices—blood for transfusion being perhaps the best example.

A special variety of diagnostic service in which the value of air transport has been demonstrated concerns forensic pathology. It has been found

possible to obtain post-mortem examinations by qualified pathologists on victims of civil aircraft accidents by transporting the pathologist to the accident site. In this way a 98 per cent post-mortem rate has been achieved over the past five years even though the accidents sometimes occur in remote localities (Brown and Lane 1966). In the case of an air transport accident twenty-four bodies were uplifted and transported 700 nautical miles for full examination and identification in the forensic facility in the capital city (Davison 1966). If this can be achieved for aviation accidents it could be achieved for any suspected homicide. In view of the low technical standard of many forensic examinations in rural areas (Munro 1958) the aviation example might well be followed more generally.

Reference should be made to certain aspects of medical education in which modern transportation and communication have a considerable impact. The advent of the long range, piston-engined transport aircraft about twenty years ago and especially the subsonic jet eight years ago immensely shortened the journey time from North America and Europe to Australia, thus reducing the travel problem to a matter of money only. Since then, population growth, a buoyant economy and increased medical sophistication in this country have been able to support these costs: not only have short-term visits, for conferences and the like, to overseas centres become possible for an increasing number of Australian doctors and medical scientists, but Australia itself has become the venue of international medical meetings. In addition there has been a constant stream of eminent visitors from overseas for lecture tours and exchange of information. (The Melbourne Medical Postgraduate Committee lists an annual average of eighteen such visitors for the past six years.)

Daily airmail service has made it possible to make use of overseas computing facilities on a routine basis, as will be discussed under computers.

On the domestic scene the private car, scheduled airline service and chartered aircraft have made a similar process possible within this country, as evidenced by the growth in popularity of various internal conferences. This process has been supplemented by services providing recorded lectures by tape or disc and with slide illustrations. In Sydney there is, in addition, a landline service for live transmission of selected meetings.

Future developments in technology

It is assumed there will be no major innovations in rail or sea transport, or in postal communications.

Increasing use and development of the private car are not likely to make large differences in medical practice as it is now known. It has been noted that trends over the past fifteen years will be continued with the increasing penetration of the community by car ownership. Transit times may become slightly shorter for rural and inter-city journeys and will not improve or will become slightly longer in the large conurbations.

The private car (and the road vehicle in general) is of medical concern in a different sense as being the generator of medical emergencies in accidental trauma. The need for improved ambulance and hospital arrangements to respond to this need has been demonstrated by Jamieson and Tait (1966). In addition there is at present an unfilled need for

emergency communications to medical and rescue services in the case of a road accident in rural areas, particularly on important highways passing through sparsely settled country (Adams 1967; Pacy 1967). Alarms or vandal-proof emergency telephone services, similar to those found in cities for police or fire purposes, are technically feasible and require only organisation to make them a reality.

Telecommunications. The use of the telephone for first contact between patient and doctor, for emergencies, for consultation, and so on, will be extended with the further penetration of the community by the telephone. Use of the telephone for a psychiatric rescue service (suicide prevention) does not require new technology. The improvements in long distance service, for example subscriber trunk dialling, will facilitate communication with specialists, hospitals and diagnostic facilities by the rural practitioner, but the effect will be chiefly in some economies of time and effort. Automatic telephone answering is already available and automatic transfer to another number will be possible with the introduction of electronic switching.

A personal paging system accessible over the normal telephone network is feasible. In low population density areas, technical advances (particularly using radio) will improve reliability, and eliminate party-line operation. Mobile service (telephone-in-the-car) is already available and its use must be determined by cost in relation to benefit.

Data transmission, facsimile and visual data display by telephone lines will undoubtedly be available during the next decade. Such devices and sophisticated teleprinters may come to be used for communication between hospitals if some formal relationship comes to be built up between them. This topic and information retrieval is best discussed in connection with computers.

Video-phone requires a large bandwidth and is consequently very expensive. It is doubtful if Jones's proposed solution to the 'no house calls' problem is economically practical—'the provision of two-way television links between houses and medical centres . . . for do-it-yourself medical care'—though this has the same logic as the present flying doctor system of radio consultation and medical kit (Jones 1967).

Radio communication between ambulance and base is already used in most large cities and has been provided in a few rural areas where distances are short and good remote transmitter sites are available. Extension of this practice is quite possible, especially in the south-east of the continent where VHF transmitter sites (already established for aviation and other purposes) are available for common use. Advantages of tying the hospital casualty department into the ambulance communication circuit are outlined by Hall and Garden (1967). In other areas, hospitals could have advance warning of the progress of ambulance and patient by the use of mobile HF equipment. No new technology is required. Much improved radio communication for Royal Flying Doctor Service outstations is also possible. Indeed, use of single side band techniques will be obligatory by 1971, in conformance with international agreements.

Aviation. Air transportation by means of air ambulance could be substantially extended with advantage. Gradual improvement in supporting facilities, for example airfields and radio navigation aids, which are already

in progress, will make the service potentially more widely available. Apart from general improvements in economy and reliability, developments in aviation are unlikely to make qualitative differences to the flying doctor services.

An application of aviation not so far attempted concerns transport of patients, particularly in emergencies, across large metropolitan areas. In Melbourne, for example, a city which occupies about 480 square miles with a longest dimension of thirty-five miles, and with an adjoining resort area, populous in summer, extending a further twenty-five miles, all the teaching hospitals lie within a rectangle of three and a half by one mile. Consequently the journey time by road ambulance, particularly in periods of peak traffic, from outlying parts of the metropolitan area can be quite long. There would appear to be advantages in helicopter transportation of emergency cases in such large cities. Several trials or projected trials of rotary-wing aircraft for cross-city patient transport have recently been reported. It has been observed in the Vietnam war that elapsed times of about sixteen minutes from wounding to surgery are regularly achieved, but it is not easy to translate the achievements of a unified military organisation directly into the complicated and historically organised structure of a large community.

An extension of this concept concerns the use of rotary wing and STOL aircraft, making use of available clear spaces, parks, piers and warehouse loading spaces for flying in medical rescue teams in the event of some large-scale disaster which blocks surface transportation. The feasibility of such a technique has recently been demonstrated in the city of New York (Metro Air Support 1967).

Spaceflight has provided certain physiological problems of general medical interest (effects of weightlessness and bedrest) and a *tour de force* in biomedical telemetry. Consequences for medicine of air-cushion vehicles are not yet apparent.

With regard to medical education, present trends will doubtless continue. Reductions in fares are likely with the introduction of very large subsonic jets on international flights. Reduction of journey times within Australia will, however, come to an end as the subsonic jet becomes general: supersonic flight within Australia seems unlikely in the next decade. Supersonic flight on overseas services will be of negligible advantage to overseas visitors attending meetings or on lecture tours, since the circadian clock still has to be readjusted.

Television. Closed-circuit colour television, already well demonstrated, will no doubt become general for undergraduate and postgraduate teaching of certain topics. A novel use of videotape concerns the replay of history-taking by students, enabling the student to see himself in action and have his performance reviewed by his teacher (Torkelson and Romano 1967). Radio and television broadcasts have had a small experimental use for extension-type medical education. General use of these techniques would depend in part on radio and television channels being available exclusively for education, a development which at present seems unlikely.

Broadcast facilities for public health education are at present little used (indeed, it might be said television is used on balance more for anti-public health education). It may be doubted, however, whether use of mass media for this purpose is likely to be effective unless the members of the com-

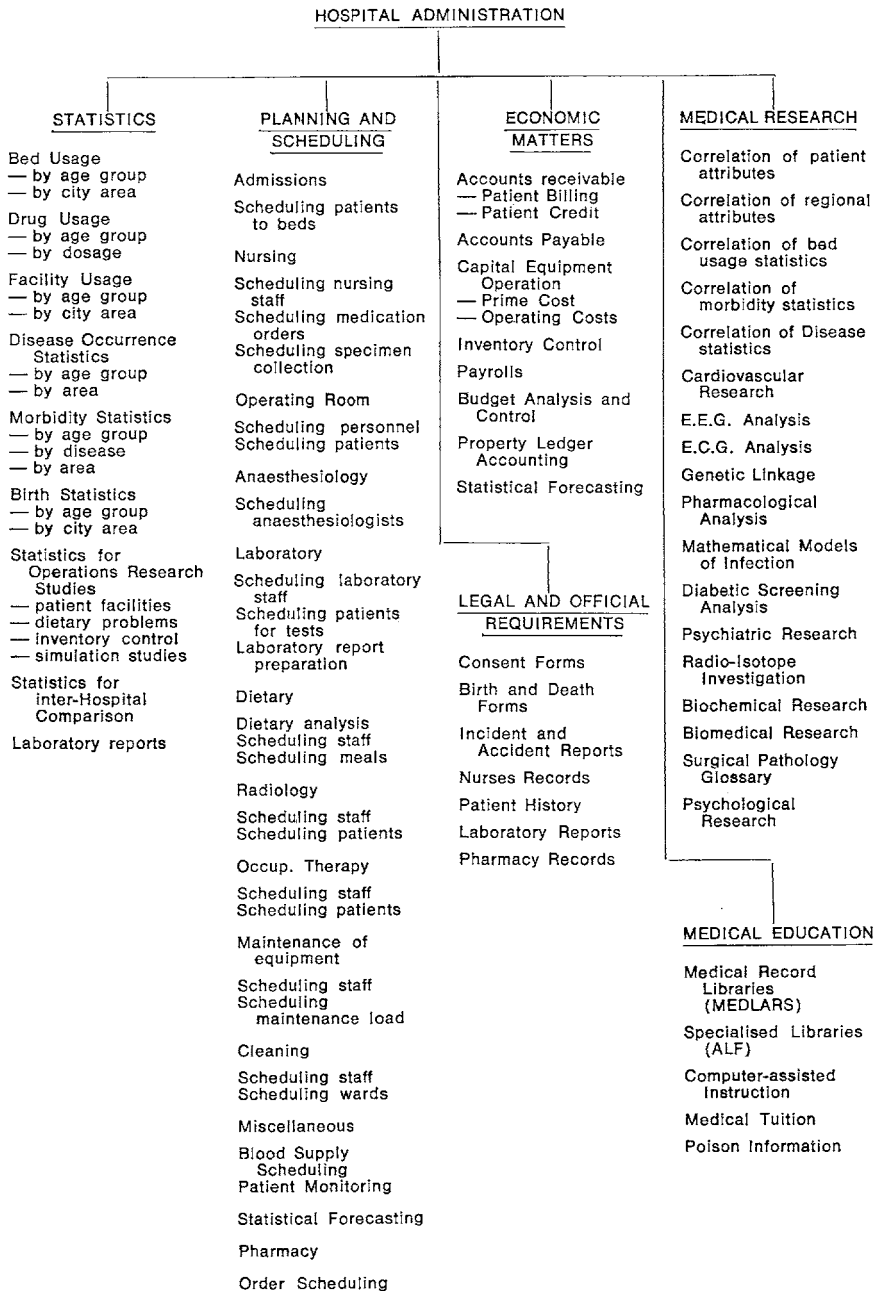

Fig. 2:1 Potential areas of use for computers (redrawn from Gross 1967). Note that a number of the functions shown would usually be carried out by a health department or hospitals authority.

munity have been previously sensitised by more direct education.

Computers

Attempting to estimate the likely effect of computers on medical practice is like shooting at a moving target. The first electronic digital computer was constructed twenty-five years ago, the first commercially produced computer was marketed fifteen years ago, solid state circuitry has been in use for about ten years, and time-sharing for about five. Applications for this evolving equipment are in such a state of ferment that the literature does not reflect the state of the art.

Recognising that the crucial advantage of the computer is in rapidly handling large quantities of information (whether data points from a single test, attributes of individuals or a population, or library references), likely uses in medicine are for business computation; hospital information processing (for current information and for hospital records); special purpose computation (including automated clinical pathology); information retrieval and correlation (of public health data and in automated libraries); and for medical diagnosis.

The following discussion refers to examples from this classification, without following it exactly, which are in regular or experimental use or seem to be feasible developments. An extended tabulation of possible computer functions in medicine is given by Gross (1967) and is shown in Figure 2:1.

Business computation. Computers are well established as processors of the myriad numerical processes of any large business. Medical institutions, typically hospitals, are already making use of established techniques for accounting purposes, of which payroll compilation is a good example. An organisation does not have to be large to make this worthwhile, since this kind of computer service can readily be hired. Computers can also be used for other accounting purposes, stock control and the like. This use may be specially advantageous for inventory control in the pharmacy and for expensive perishables, such as stored blood.

Operational management. The blood bank, indeed, needs a strategy for deployment of blood, in response to orders, rather than simple stock control, and this process is very amenable to computer management. Singman *et al.* (1965) show how computer control reduced both inventory and the percentage of outdated blood.

Sophisticated uses of the computer in hospital management might include preparation of rosters for nursing staff, scheduling of outpatient appointments and inpatient admissions. From previous hospital records the computer could assign values of expected length of stay to each patient based on the admission diagnosis. Thus the occupancy state of various services of the hospital might be predicted days or weeks ahead. Given suitable coordination of the hospitals and ambulance service of a city, assignment of accident and other emergency cases could be optimised.

Current information processing. A number of attempts have been made, not all successful, to apply electronic data processing to some hospital information functions, for example the ordering of laboratory tests and the transmission to the ward of the results. That described by Baird and

Garfunkel (1965) did not meet expectations in large part because it was a batch process, out of service at weekends and at night.

An on-line computer can play a more active role as a data transmission device in the ordering of drugs for patients, automatic transfer of results of laboratory tests and generally in providing a more rapid and more accurate communication system than the orthodox paperwork. These operations would be linked to administrative procedures, as for example in THOMIS (Total Hospital Information System), described by Johnson (1967):

> In the admitting area is an on-line terminal where data is entered directly into the computer. The information is verified back to the admitting clerk and, at the same time, the computer notifies the appropriate nursing station and the telephone switchboard. Once the patient is admitted and put to bed the doctor may write an order as he normally would. One of the ward clerks, receiving a chart with orders for medication on it, transmits the orders to the computer through the terminal at the nursing station. The order is received in the computer centre on automatic printing card punches, verified back to the nursing station and then transmitted directly to the pharmacy via computer where the terminal in the pharmacy prints out the medication order directly on a pressure-sensitive label. At the same time the computer deducts the item from inventory.
>
> Other ancillary services such as clinical laboratory tests, electroencephalograms, anything which could possibly be ordered by a doctor, are ordered directly through the computer centre.
>
> When the order is received in the computer centre, the first thing checked is the date, 'today' or future. If 'today', the order is immediately transmitted to the laboratory where it is received on an IBM 1093 programmed keyboard. So the laboratory is set up and ready when the specimen arrives. If the schedule is for a future date, the order is processed during the computer's night run, midnight to 7 a.m. During this run, various reports are created. Some are laboratory pickup lists, workload control by laboratory areas, etc.
>
> When the test is performed, results are transmitted via the 1093 directly to the computer. After verifying the information by the 1093's keyboard printer, the computer transmits the information to the appropriate nursing station where it is entered on the patient's chart.
>
> During night runs, after receiving laboratory results for every patient having laboratory work done, the computer centre creates what they call a patient clin laboratory profile. This report shows all tests ever ordered for a patient from the day of admission on, test sequence, chronological sequence, and all results. This is inserted into the patient's chart the following morning. The doctor now has one or possibly two pages listing all laboratory tests ever performed for his patient while in the hospital. He can get comparatives from one sheet. Meanwhile the charges for all these services are being stored in the computer's memory in the patient's file. This works the same for other services as well. All ordering for the patient is done through the system, including his discharge.

Special purpose computation. The computer can effortlessly carry out the computational processes, particularly those which are recurrent, in reducing the data from research. According to Warner (1966) the computer 'is a means for rapid analysis and display of experimental data to the researcher during the course of his experiment in order to optimise his chances of making significant associations and exploring new leads'. Ledley

(1965) describes many examples of biomedical systems in which the computer can be employed to solve equations or simulate dynamic models.

There are particular applications where the large volume of analyses required make computer processing particularly attractive. Automatic evaluation of electrocardiograms offers benefits in improved reliability in reading and reduction of tedium, but, though much effort has been expended on the problem, techniques completely suitable for work-a-day use do not yet seem to be available. Effort is similarly being directed towards electroencephalographic analysis. The computer has been successfully applied to cardiac output measurement by the indicator dilution technique, with savings in computational labour (Taylor *et al.* 1967). Other examples are counting and analysis of chromosomes (Jacobs 1965; Ledley and Ruddle 1965), analysis of body scanning in isotope studies and compution of radiation dosage.

With the increased use of automated procedures in clinical pathology there is prospect of eliminating clerical time (and clerical error) by inserting the output of the autoanalyser (or similar apparatus) into a computer-based data processing system of the type described above. A necessary step is to transform the analytical output, which is usually in analogue form, into digits, preferably at the laboratory input. In practice it is usual to have a small computer to control the autoanalyser (Hicks *et al.* 1966).

An important by-product of getting biochemical test results into digital form amenable to data processing is the ease of carrying out the necessary function of quality control, 'the regular surveillance of all the results reported on actual specimens from patients, with appropriate statistical analysis' (Squire 1965).

Partly as a stimulus to automation and partly a consequence, the number of laboratory tests ordered per patient has been rapidly increasing. Clinics already exist in which the patient is routinely subjected to a series of such tests, X-rays and the like before seeing a clinician. Whether this process (with its possibilities for the diagnosis of non-disease) will stand up to cost-benefit analysis has yet to be demonstrated.

Public health. Consideration of multiple routine tests on patients leads naturally to screening procedures on apparently well people. The vast capacity of the computer to store and correlate data on many individuals presents the opportunity not only to follow up these procedures but also to provide the information for cost-benefit appraisal ('Who's for screening?' 1967).

Most reviews of computers centre, naturally enough, on the hospital, but public health, concerned as it is with the health of populations, can make equal use of them. The example of health screening has been given above. Not only can the computer store and analyse the data produced by the screening process but also greatly assist in generating the letters, appointments, pursuit of absentees, later recall, and so forth from a computer file of the population under study (Hodes 1968).

Another use concerns the bringing together of all health records pertaining to an individual: this record linkage has been shown to be quite feasible (Acheson 1965). This technique virtually depends on assigning a unique serial number to each individual, which then appears on all records pertaining to that person. (In the United States, the social security number is

used for this purpose.) A similar process can infuse Registrar-General's records of deaths back into hospital files, so that the outcome of discharged cases can be more truly evaluated (Hubbard and Acheson 1967).

Chronic disease epidemiology is dependent on such large quantities of data and such long time intervals that computer techniques are virtually essential in all phases, the descriptive, the analytical, and the experimental.

A third example might be a quality control of epidemiological data to detect minor but important epidemics (Knox 1965). A technique similar to that used for libraries can update the information held in poison control centres (Nodine and Rieders 1967).

Hospital records. The foregoing developments will have the effect of making the hospital (or better, the hospital system) more efficient and may sometimes confer a money saving. However, except that laboratory reports may come to hand more expeditiously, the clinician may not find himself or feel himself directly affected by them, since the freeing of skilled staff from clerical activities by the hospital information system will affect mainly paramedical occupations. However, two computer-based advances are likely to influence the clinician.

Hospital records, that is the totality of records of past patients, present a formidable problem in automation, for two main reasons. The first concerns the sheer volume of material to be stored. Secondly, the translation of narrative case histories into computer language is particularly intractable and clinicians are notoriously reluctant to complete questionnaires and check lists.

An example from neurology of a clinical summary including symptoms and main finding is given by Korein *et al.* (1966), and another for diseases in the field of immunology is described by McPherson and Mackay (1967). Both make use of a technique known as variable field format.

However, a simple discharge summary of the case is readily handled. Such data can be used (as in the PAS/MAP plan of the Commission on Professional and Hospital Activities) to provide hospital administrators with up-to-date quantitative information about the work the hospital is performing. For a group of hospitals, these data would provide the essential market research which the statutory authority (the Hospitals Commission or equivalent in each State) must have to fulfil its planning and co-ordinating function, and which might tend to offset the political disincentives to rationalisation of hospitals. Bellamy (1966) points out 'that we have as a result of the central control of our hospitals the opportunity to consider a multi-hospital, multi-computer system with obvious advantages [for] retrieving the medical records of patients who have attended several hospitals and in distributing the emergency work load between hospitals'. It should be added that the central control is central to each State. It is to be hoped that computer systems to be developed in each State will be compatible, so that we will not be faced in five years with the computer equivalent of the break-of-gauge of the railways.

Information from the case summary can also be used to provide a quantitative feedback to the hospital medical staff, both collectively and individually, whereby the quality of medical care received by patients can be compared with standards agreed to by the staff. The participation of the clinician in setting the criteria for adequate treatment for various conditions

is likely to be an effective educative process which will materially accelerate the diffusion of new technical knowledge. The Medical Audit Program thus contains two key elements of the learning process: active participation by the learners and knowledge of results. It may be that, as MAP-like arrangements become established, they will have more effect on the continuing education of the clinician than the more formal postgraduate, educational processes referred to earlier.

Aided medical diagnosis. The computer-based process described above is already in regular operation. A quite different application, still only experimental, concerns computer-aiding of the diagnostic process itself: essentially the estimation of the probability that a given disease is present when certain independent symptoms are observed (the word 'symptom' is extended to physical signs and test results). This can be done (Hall 1967) given the incidence of the symptom in those with the disease and the incidences of the disease and of the symptom in the population. Thus quantitative probabilities can be assigned to each item in the differential diagnosis, given the presence or absence of a set of 'symptoms'. A similar logic can be used for treatment evaluation (Ledley 1967).

Development of computer-aided diagnosis evidently depends on good estimates of the three necessary incidences, over a wide range of diseases and symptoms, to be derived from morbidity and survey data most of which have yet to be collected.

Although such a computer facility, when developed, would need to be established in a large hospital or medical institution, it is envisaged that any clinician subscribing to the service would have access to it, either by a typewriter-graphical display terminal or even, as in the medical-diagnosis-aiding-computer (Mediac) of Ledley's proposal (1965), by voice and the use of the telephone dial.

According to Waxman (1966), 'while it is not clear that the computer will ever effectively substitute for a human diagnostician, it is already obvious that the machine is capable of contributing to a diagnostic decision. It also has many uses as pedagogic device'. Use of a computer for medical students' tuition has been reported (Main 1967), but perhaps more significant is a by-product of work on computer diagnosis of congenital heart disease described by Warner *et al.* (1964). During development, the performance of the computer in correct diagnosis improved but so did that of the clinical specialists with whom the computer was being compared. However, not everyone agrees that the Bayesian model of the diagnostic process is the correct one; if not, machine diagnosis may lie much further in the future.

Automated libraries. The final point at which the computer can intervene in medical practice is in the retrieval of published information, a process which has been becoming ever more difficult with the exponential growth of medical literature. Discussion will be restricted to the best known computerised library system, MEDLARS, of the United States National Library of Medicine.

This device, which has been operating since 1964, was established to set up the contents of the Index Medicus, to produce certain recurrent bibliographies and to conduct special searches on demand (Adams 1965). Provision was made for decentralisation (through duplicate tapes and a

program for conversion to other computer languages), not only in the United States but internationally. These tapes are equivalent to the Index Medicus on tape but with increased depth of indexing and more search parameters. Experience so far is that hand searches are more efficient for small jobs, but work is being pursued on more effective search strategies (a small MEDLARS search is illustrated in the *British Medical Journal* (1967) 3:430).

Conclusions

The main effects on medical practice of the car, telephone, radio and aircraft have already taken place. Present trends will continue as car ownership and telephone use increase. The largest remaining change may be further development of the air ambulance. No significant influences are to be expected from new vehicles—hovercraft, supersonic transports or spacecraft.

Improvements in the shape of better radio communications for ambulances, alerting systems for roadside rescue, rotary wing transportation for patients across large cities, and a forensic pathology flying squad require means of implementation rather than new technology. Institutions exist with an interest in three of these applications, but it is not clear what organisation would be motivated to pursue the matter of a roadside rescue alerting system. New types of telephone services are unlikely to have important effects on medical practice, though automatic transfer of phone calls will undoubtedly be a convenience.

New medical applications of radio and television broadcasting seem unlikely but closed-circuit television and videotape will probably have a larger role in medical teaching.

The computer has already become a major new tool for medical research. It has considerable potential for improving the efficiency of hospitals, both in administration and in controlling the flow of information within the hospital. Computer systems will, however, not necessarily be cheaper than the methods they replace. Moreover it is not clear that installations so far attempted or proposed have been preceded by the necessary operational research or systems analysis, aimed at identifying those links across which faster information transfer would have large payoffs.

Economies of scale are considerable in computer technology and Bellamy (1967) has made out a strong case for computerised hospital information systems being set up for groups of hospitals rather than individual institutions.

A technique for reviewing current hospital practice, by computer analysis of discharge summaries, is already in use in a few Australian hospitals. It has great potential for raising standards of patient care, through involvement of the medical staff, and for providing the numerical information needed for planning by the statutory hospital authorities.

Thus three factors, the desirability of rationalising hospital resources to take advantage of fast road and especially air transport, the data for planning thrown up by PAS-type programs and economies of scale for computer installations combine to indicate a leading role for the State hospital authorities. Ideally these authorities should collaborate for rational

location of costly facilities for special-purpose treatment.

Detailed case record-keeping by computer is an experimental rather than a usable technique at present. Automated libraries and indexing are recent developments and will be essential in coping with the growth of medical literature.

Computer-aided diagnosis is a theoretically feasible process. It is likely to be available for a few narrow disease groupings fairly soon but a general purpose device lies in the future. Exploitation of this technique may need to await a new generation of doctors who have been exposed to computers during their training.

These technical developments will tend to benefit the care of conditions which are rare or acute or which require exotic and technically interesting procedures, rather than that of chronic disease and mental illness. Because of the cost of new devices, their adoption will tend to favour large rather than small hospitals, and large groups or clinics rather than individual medical practice. On the other hand, opportunities for preventative medicine are greatly enhanced by the computer, given a suitable public health climate, especially in screening, epidemiology of chronic disease, and assembly of morbidity information.

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3 J. M. Last

Organisation of Medical Care

In an elegant essay on the evolution of medical practice, Sigerist (1933) pointed out how medicine was transformed from a private relationship between doctor and patient into a complex social institution. Since 1933 the complexity has increased until now we can legitimately speak of a health service industry rather than of the medical profession as one party to the social contract under which society receives its medical care. The pace of technological development has bewildered practising doctors and medical administrators alike. Improvisation has often been substituted for radical change and reorganisation has been discussed more often than accomplished. There is little excuse for adding yet more words to the discussion save to clarify some of the confusion.

Several major issues have dominated the thoughts of individuals and committees who have tried to take stock of the relationship between medical practice and society. How and by whom should health services be administered? What is the role of the hospital? What is the future of personal health services? Should standards of care be subject to surveillance?

Administration

Proposals for health service reorganisation range everywhere along the political spectrum from the ruggedly individualistic far right view of the president of the American Medical Association (Rouse 1967) to socialist plans for a centrally controlled salaried service in which doctors and other health personnel are state servants. Like some other British institutions, the National Health Service is a compromise between the ideology of the left—central planning and socialisation—and the right-thinking stance of the medical profession which demanded independence and autonomy. Like most compromises it has satisfied no one, and pressure for reorganisation has mounted steadily. A consensus is forming that decentralisation of administration may solve all the problems. I believe that this view is too optimistic and that while decentralisation would help, it could not by itself achieve miracles. Cohesion of presently disparate elements is more urgently needed.

Cohesion of the many specialties in modern medical practice is achieved, in theory, in a centralised, multi-disciplinary, multi-specialist complex, the

balanced hospital community (McKeown 1958). This also has the advantages of effecting economies by pooling resources, facilities and manpower; and of providing a suitable base for teaching and research. These advantages are not necessarily lost by partial decentralisation of the specialised services, provided there are efficient lines of communication and transport.

Decentralisation of administration is an underlying principle of the regional medical program proposed in the United States by the de Bakey Commission (1964). This closely resembles another proposal for regional organisation, made almost fifty years ago in the Dawson Report (1920). Dawson and his colleagues drew up an imaginative blueprint for a network of primary and secondary health centres, equipped with beds, staffed by general practitioners and nurses, and linked administratively and academically to a medical school. They even suggested a location for the first regional network, in the West Country based on the medical school at Bristol. Regrettably the plan was never implemented.

The principle is the same as that pronounced by the de Bakey Commission, but in the interim the changed pattern of disease and the rapid development of specialisation have led to some modifications. The emphasis now is on medical care by a multi-disciplinary team rather than by the individual doctor. Paramedical personnel of several kinds, such as laboratory technologists, behavioural scientists, and statisticians play a part no less important than that of their medical colleagues.

Who will lead the team? It is generally believed in the medical profession that the leader should be a doctor, albeit specially trained in the art and science of administration. In non-medical circles it is sometimes held that medical care is too important to be left to the doctors: the possession of a medical qualification matters less than the expertise of management. However, medical management does require medical knowledge, probably best acquired by doing a medical course and getting some years of clinical experience. Morrison (1965) outlined the requirements of the medical manager, and has initiated a new course of training in Edinburgh, geared specifically to fulfil these requirements: clear understanding of man's place in the world and medicine's place in the affairs of men; proficiency in measurement of community health and assessment of changes due to medical care; and training in modern management techniques, especially the use of computers. A doctor who has completed the course of training for the Diploma of Social Medicine at the University of Edinburgh should be able to direct with confidence and competence a multi-disciplinary medical team, especially if his clinical training and experience enable him to talk on equal terms to the clinicians in the team.

One of the most important tasks of the medical administrator is evaluation of the service provided by the team he administers. This is especially true if regionalised services offer scope (as they should) for diversification and local variations. Evaluation of medical care has been much discussed. I have outlined some of the principles elsewhere (Last 1965b). Ideally, we should assess end results of care, and White (1967) has suggested five: death, disease, disability, discomfort, and dissatisfaction, all of which can be measured, if perhaps with diminishing degrees of objectivity.

The medical administrator already appreciates the importance of mortality and morbidity statistics as indicators of death and disease in the population

he serves. He could (but seldom does) assess disability using sickness certificates, discomfort using prescriptions or other data on consumption of drugs for symptoms such as relief of pain; and dissatisfaction by identifying patients who break appointments or change doctors frequently. Obviously there are other effective and perhaps more meaningful measures; the above are given merely as examples. I believe an administrator is failing to fulfil his function if he does not attend to evaluation in these and similar ways. To do so he must be trained in epidemiology, and in operational research methods. The central importance of these disciplines has been recognised in postgraduate public health and administration courses in Britain and North America, as well as in the new course at Edinburgh. These aspects do not yet appear to be well developed in Australia.

The role of the hospital

What are the boundaries, if any, beyond which the hospital has no role in medical care? We should consider this question for at least three reasons. First, the change-over to progressive patient care implies that hospital-based doctors retain some responsibility for care of ambulant patients, after the acute phase of illness has passed. Their responsibility begins at the other end of the disease process, for example, when their skills are utilised in presymptomatic diagnosis. Secondly, evidence from several sources (Peterson *et al.* 1956; Jungfer and Last 1964; Butler and Bonham 1963) suggests that standards of care are lower in general practice than in hospital. One way to raise standards in general practice might be to remove the barrier between hospital-based and community-oriented practice. Thirdly, an epidemiological model of medical care ecology (White, Williams and Greenberg 1961) showed that hospitals collect only a tiny, unrepresentative fragment of community sickness experience. For research and teaching, as well as for service, their horizons should be widened.

A balanced teaching hospital could provide a continuum of care for all sections of society and all kinds of disease; if effective lines of communication develop with general practitioners in the area, standards of community care could be elevated, and the hospital should provide a range of rehabilitative and preventive services for ambulant patients or potential patients at both ends of the health-sickness continuum, so that for research, teaching and service the population seen by hospital staff will be more representative than the atypical fraction of 1 per cent in the model described by White *et al.* Plans for the balanced teaching hospital at Birmingham (McKeown *et al.* 1965) envisage such a combination as this. In Scotland, a new administrative approach may lead to the widening of hospital horizons. Health centres in future will, wherever possible, be located at hospitals, similar to the prototype which has functioned for some years at Stranraer (*British Medical Journal* 1966); and the demarcation between activities of hospital-based and community-oriented doctors which has for so long bedevilled British medicine may eventually be obliterated—by evolution rather than revolution. It is noteworthy that British doctors, who once desired their separation into hospital-based and community-oriented specialties, are coming to the view that dividing hospital from community is arbitrary and artificial, while

in some other medical care systems, pressure groups inside the medical profession sometimes try to erect barriers around hospitals, restricting privileges to doctors who possess specialist qualifications. Rejection or ejection from the hospital of doctors who lack specialist qualifications can hardly be in the interest of their patients or the community.

The future of personal health services

Discussion about personal health services has continued at a high pitch, rising at times to a crescendo throughout the whole period since the end of World War II. Basically the issue in Britain can be narrowed down to the future of general practice; in the United States, discussion has mostly been about the question of who will replace the general practitioner in his role and function as doctor of first contact.

Argument is furious, and agreement has been reached only on the need for definition of the role and function of the general practitioner, or whoever is to replace him. McKeown (1962) gave a lead with his proposal for replacement of the contemporary British general practitioner by a trio, consisting of paediatrician, obstetrician and physician-geriatrician. In this system, family care would be sacrificed to continuing personal care, compartmentalised by age and type of condition. Some evidence suggests that many people would reject this system in favour of one which provides family care (Sheps, Sloss, and Cahill 1964; Cartwright 1967). Nevertheless it would be worth a trial, and not least among the reasons for this is the evidence contained in my other paper for this conference, suggesting that many doctors who will provide health services in the future would prefer to do so in this way.

Other alternatives include some which start from the premise that continuity is an expendable ingredient of good medical care. There is some supporting evidence for this view (Lashof and Turner 1964); and group practices in which patients are evaluated by a team, using a battery of screening tests, as in the Health Plan in the San Francisco Bay area, are practical demonstrations which could be used to evaluate this method of delivering health services (Collen *et al.* 1964). Evaluation by assessing end results would be perfectly feasible in this setting, especially where the population at risk is known, as it is in prepaid health care systems. With a little modification of recording methods, this method of evaluation would also be feasible in the Australian Medical Benefits Scheme.

Another way to provide first-line medical care is to dispense with doctors at this level and to rely on medical auxiliaries such as nurses, feldshers or some other kind of paramedical personnel. These medical auxiliaries would act mostly as signposts or sorting agents, sending people on to appropriate specialists and dealing themselves only with minor and incidental symptoms or conditions. There is no good reason why they should not perform this function on domiciliary visits, as well as in the hospital or clinic. They can also assist with routine inoculations, dressings and other simple procedures. This idea is viewed with emotions akin to horror by some doctors; yet a good deal of prior selection goes on even when doctors occupy the interface between the public and the medical service. Patients

themselves select which form of care they consider appropriate, often with greater sophistication than suggested in the *New Yorker* cartoon which showed a clinic waiting room decorated by a picture of the human body with arrows indicating the parts dealt with by the doctors. Doctors who resist the suggestion that the interface be occupied by a non-medical person often employ a receptionist who makes many decisions every day about priorities for individual patients. It is all a matter of degree. Evaluation of regional variations in health status in societies with both feldshers and doctors would help to settle the issue. Some Eastern European countries have this combination and research would be timely. One thing which seems clear is that the independent solo general practitioner is obsolete. Yet there are still many in solo practice: 24 per cent in Britain and over 35 per cent in Australia (Ministry of Health 1967; Bain 1967). However, only 1 per cent of young British doctors would prefer this form of practice (see my other working paper), and at this rate the species should soon become extinct.

Because of the indecision about the future of personal health services, I would like to offer my own suggestions about the role and function of the personal doctor. First, let us examine some attributes sometimes held to be important. Continuity of care and family care can be discarded because there is no convincing evidence that they benefit the patient. In any case, general practitioners often honour these obligations in the breach, rather than the observance (Jungfer and Last 1964). A good clinician will discover the relevant facts about the family background and past medical history of his patient whether or not he treats other family members as well, and whether or not he has ever seen the patient before. I have discussed elsewhere the myths about continuity of care (Last 1967); and White and I demonstrated that continuity is not necessarily a feature of general practice, at least in the United States (Last and White 1968). Is domiciliary care an essential part of personal care? There is no doubt that seeing the patient in his everyday habitat greatly enlarges the doctor's comprehension of his problem; but frequently repeated home visits 'just to see how old Mrs So-and-So is getting on' sometimes deteriorate into a meaningless ritual, dissipating the doctor's time and energy, both of which could be better spent on more skilled clinical work in the consulting room or the hospital.

The essential ingredients of personal care are preventive, diagnostic, consultative and therapeutic tasks. First, the personal doctor safeguards the health of his patients by traditional methods of immunisation, health surveillance (as in pregnancy) and counselling. Secondly, he diagnoses, or at any rate sorts out the incidental conditions from which his patients suffer. His other two functions follow directly from this process: treatment of those conditions that are within his competence; and referral to the appropriate specalist service of those whose problems are beyond the scope of his skills or resources. In this sense the personal doctor is a consultant and I believe with Fox (1960) that he has a continuing responsibility and relationship to the patient during the latter's involvement with specialists—at the very least he can interpret the technology to the patient, and at the most he can do much more than this.

Surveillance of standards

Administrators, academics and professional leaders share feelings of disquiet about the uneven quality of medical care, especially in general practice. However, convincing evidence also exists to suggest imperfections in hospital practice (Lee, Morrison and Morris 1957; Schimmel 1964). If standards are so uneven how might they be raised in places where they are low? There are several prerequisites. The first step is a method or methods of measuring medical care. The five end result measurements, already mentioned, should be applied. Many other measurements can be carried out during the medical care process and much more should be done to implement some of these. For example, hospital activity analysis demonstrates great variation in hospital length of stay for common conditions like tonsillectomy and hernia repair (Heasman 1964). Surgeons should be aware of these differences and of their own performance in relation to that of their peers. The next step, a more demanding one for most clinicians, is whether medical and surgical audit should include end result measurements. What is the recurrence rate after hernia repair? Does it matter whether the patient is kept flat on his back for a fortnight or gets up and walks away from the operating table? We do not yet know the answers to these simple questions. It is hardly surprising therefore that we have failed in attempts to evaluate more complex aspects of medical care, especially in general practice (Lee, Weatherall and Draper 1964; Joyce, Last and Weatherall 1968). Results of these studies are very confusing. All the same, work so far done does demonstrate that measurement of medical care is feasible in general as well as in hospital practice. I have reviewed and discussed elsewhere some other ways of measuring medical care (Last 1965a, 1965b, and 1967). The second step is feedback: systematic reporting of clinical activity to all clinicians, tabulating data in such a way that individual performance can easily be compared with the average or mode. This is the basis of Patient Activity Study (Commission on Professional and Hospital Activities 1964). It is also used by Regional Medical Officers in the British National Health Service to assist their assessment of prescribing habits of general practitioners. Regrettably there is a punitive element in the activities of Regional Medical Officers and the bad relationship which has sometimes developed between them and general practitioners should be a warning to all of us—tact and diplomacy are needed in the feedback process of quality control. The postgraduate fellowships of the Australian College of General Practitioners seem to offer a more promising approach to data-collection and feedback, as the punitive element is not part of their relationship with general practitioners.

Surveillance will generally be more effective in a medical team, especially one in which morale is high. Another reason for the Regional Medical Officers' frequent failures is that they are dealing all too often with isolated, segregated, suspicious entrepreneurs who are virtually medical Poujadistes. Although the proportion of solo practitioners is still quite high in Australia, so is the proportion who belong to groups and large partnerships. If young Australian doctors resemble their British contemporaries we can look forward to the progressive replacement of solo practitioners by groups or partnerships. The problem of medical services in remote rural areas is then

likely to be solved by greater speed of transport and communication.

In at least one setting I have seen quality control successfully applied in general practice. The United Mineworkers' group practices in Western Pennsylvania have practised medical audit for some years (Falk 1963). Morale is high and so is the spirit of self-criticism among participant physicians. I believe that the combination of job-satisfaction and the sense of purpose which comes from having a clearly-defined role in the team are responsible for the high standard of care revealed by medical audit in that setting. Are job-satisfaction and definition of role too much to ask for in other systems of medical care?

Studying medical care

No matter how health services are organised and administered, their effectiveness and efficiency should be routinely and systematically evaluated. Medical need should be defined and assessed by surveillance of indicators of community health: demographic data, mortality and morbidity data, hospital admissions, records of sickness absence from school and work, and so forth. The relationship between demand for medical care, supply of health service resources, and the use of medical care, requires continuing appraisal. Some of the data for this are available and unused; some would require collection. Finally, the outcome or end results of medical care should be assessed on a continuing basis, using objective criteria as far as possible for this purpose.

Conclusions

Decentralisation of health services has been proposed by several select committees. If the proposals are implemented, administrators should evaluate the service by measuring the end results of medical care: death, disease, disability, discomfort and dissatisfaction. The administrator should probably be a physician trained in epidemiology, sociology and management.

If hospitals provide progressive patient care, their responsibility to the community can extend to include preventive services (for example, screening for early chronic disease), domiciliary after-care, and terminal home care. Greatest uncertainty surrounds the future of general practice. This could be replaced by a personal health service based on the specialties of paediatrics, obstetrics, and internal medicine-geriatrics; or augmented by ancillary health personnel who would replace the general practitioner in his conventional role of sorting agent or signpost, as well as assisting with routine procedures. Continuing surveillance of standards by end result measurement and medical audit should be a built-in feature of the health service organisation.

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4 J. M. Last

Doctors' Attitudes

The organisation of medical practice is unsatisfactory because the standard of care is uneven; is often unsatisfying to patients or doctors or both; and is economically inefficient, especially in its use of human resources. Alternatives ought therefore to be considered, and so should the likely response of the medical profession to these alternatives.

Doctors themselves usually decide the organisational framework of medical practice. In Britain the National Health Service exists in its present form because before its inception in 1948 and several times since then the medical profession insisted upon this (Stevens 1966). As Freidson (1967) has pointed out, the result resembles that in cautionary fairy tales where people are cursed by the granting of their wish: general practitioners wished to preserve their independence and were cursed with isolation; consultants desired autonomy, freedom from competition, and security of employment, and have been cursed by inflexibility in the structure of the hospital service during an era of more rapid change in medical care than ever before. Doctors who contemplate further changes in the organisation of medical practice would be wise to know themselves. Repetition of mistakes might thus be avoided.

Medical care systems which have been designed to meet the wishes of the medical profession possess certain characteristics. Senior administrative positions are occupied by doctors; and among participant members of the profession there is a distinct prestige ranking. There are clear lines of demarcation between specialties (not always without demarcation disputes like those found in industry) and certain specialties have privileges denied to others; most important of these is the right to treat patients within the hospital.

Many in the rank and file of the profession, especially those in general practice, have become disenchanted and have sought to change this system. Complaints by general practitioners focus on the inadequate reward for their efforts, on restrictions of their right to practise as they see fit or where they choose, and on what they regard as their undignified position at the bottom of the status pyramid. These complaints may be partly due to lack of insight into the real nature of their problem, which is, I believe, that a truly general practitioner cannot exist in a society of increasing specialisation. General practitioners will remain insecure until the uncertainty about their role and function has been resolved.

There is evidence of low clinical standards in general practice. Perinatal mortality rates are higher when antenatal care is supplied by general practitioners than when it is provided by hospitals or local authorities (Butler and Bonham 1963); and general practitioners sometimes use obstetric services unintelligently (Hobbs and Acheson 1966). Use of diagnostic and supportive sociomedical services is haphazard and prescribing is sometimes irrational (Lee *et al.* 1963).

Even the quality of basic clinical skills like history-taking and physical examination is variable and sometimes poor (Peterson *et al.* 1956; Clute 1963; Jungfer and Last 1964). Medical care in hospitals also has many imperfections (Lee *et al.* 1957; Riedel and Fitzpatrick 1964) and so does the private practice of specialists in internal medicine (Kroeger *et al.* 1965). Both in hospitals (Cartwright 1964) and in general practice (Cartwright 1967) doctors and other medical personnel frequently lose sight of the fact that patients are people.

Academics, administrators, and advisory committees have been dissatisfied with the organisation of medical practice, primarily because of a conviction that standards must be raised. McKeown (1962) and the Porritt Committee (1962) in Britain, and the de Bakey Commission (1964) and the Folsom Commission on Community Health Services (1966) in the United States, have been much concerned with the organisation of community health services, and have suggested alternative ways in which these services could be supplied and delivered.

Small-scale experiments with alternatives have been going on for many years, albeit often unplanned, seldom seen as experiments, and almost never adequately evaluated. Examples abound in the United States and Australia, especially since the end of World War II, of group practices, some of which embodied new ways to finance medical care as well as to supply it. In Britain, despite a rigid administrative framework and the conservative tradition of the medical profession which inhibited bold innovations, attempts by general practitioners to ease the burden of their work by forming groups and rotas, and the efforts of local authorities to combine their public health and clinical activities, led each along converging pathways, many of which met in health centres where clinical and preventive services have begun to intermingle. The next logical step is fusion (or re-integration) of community-oriented with hospital-based medicine, and in Scotland especially there are encouraging signs that this is imminent. The deep divisions between hospital-based and community-oriented medical services may soon be at least partly obliterated in Scotland by the establishment of combined hospital and health-centre complexes, which will provide inpatient, outpatient, ambulatory and domiciliary care, the objectives of which will be both curative and preventive.

Proposals for modifying medical practice organisation, whether made by administrators, academics, or practising doctors, commonly imply or assume that they will be acceptable to those who work in the reorganised service. If the traditional pattern of hospital practice is supplanted by progressive patient care, can we assume that consultants will acquiesce in the dissolution of their little empires of wards and beds? Can we assume that personal care of individual patients (in or outside the hospital) will be supplied and delivered cheerfully and willingly by a team rather than by an individual

doctor? How well do existing methods of medical education equip participating doctors for the new roles and functions that may be required of them?

Surveys of professional attitudes

Before plans for progressive patient care or for specialised personal health services are implemented, it would certainly be useful to know whether the rank and file of the profession will approve; and also whether it is effectively trained to work in the reorganised service. Results of recent surveys of British doctors will therefore make a useful contribution to a discussion about the future organisation of medical practice. While we must be cautious in generalising too widely from British experience, there is some circumstantial and anecdotal evidence to suggest that the position is similar in the United States and Australia, and perhaps in other countries too.

In 1966, I conducted two postal surveys of British doctors. In the first of these I investigated the pattern of settlement of a 10 per cent random sample of general practitioners and consultants in England and Wales (that is about 2,800 doctors) and showed that a significantly higher proportion of general practitioners than consultants had settled in the community or region where they had lived in their youth (Last 1967a). If faced with a choice between settling in a desired locality or continuing in a particular specialty, consultants put a higher priority on pursuit of career ambitions; with general practitioners the priorities were reversed. As a by-product this investigation yielded a good deal of useful information about attitudes to practice in the National Health Service. Complaints about poor communication between general practitioners and consultants were common, and suggested (though they did not prove) that more team-work would be welcomed by both parties.

In another postal survey I studied the careers since graduation and the future plans of about 1,500 young British doctors. These were a stratified random 50 per cent sample of a much larger number, about whom some information was already available because they had been surveyed five years earlier in 1961, when they were second, fourth or sixth year medical students. When re-investigated in 1966 they had therefore mostly been qualified for one, three, or five years. Their performance in the 'milestone' examinations of the undergraduate course was also known. This investigation produced much fascinating information (Last *et al.* 1967, 1968; Last 1967b, 1967c; Stanley and Last 1968; Last and Stanley 1968). Here we are concerned mainly with information about future intentions and with attitudes to medical practice and medical education.

Attitudes to community medical practice

Recent British graduates overwhelmingly rejected solo practice: almost all wanted to belong to a team, preferably within, or failing that, outside the hospital. This might reflect their professional insecurity: individualism and a desire for independent practice might be asserted when they have had more experience; but the proportion prepared to consider solo practice was little higher in the senior cohort (1·8 per cent) than in the junior (0·6 per

cent). If practice by teams rather than indivduals is to be the pattern for the future, this far at least the blue-prints are acceptable to future doctors. However, recent graduates in Britain in the 1960s seem to be reluctant to embrace any form of community practice divorced from the hospital; only 28 per cent gave their first preference to general practice, and this means that new recruits will fall short of annual requirements by almost 500 (Last 1967b). Of those (405 altogether) whose first preference was for general practice, 46 per cent would prefer to belong to a small partnership, 51 per cent to a group practice or health centre, and only 3 per cent would consider solo practice. On the other hand, two or more recent graduates will be clamouring for every opening in the mainstream hospital specialties (Table 4:1).

TABLE 4:1

Preferred specialty of young British doctors, and opportunities available in Britain

Career	Number preferring	% preferring	Adjusted annual aspirants in Britain*	Annual openings†
Anaesthetics	106	7·4	138	72
Ophthalmology/ Otolaryngology	54	3·8	68	38
Dermatology	17	1·2	22	10
Solo G.P.	15	1·0		
Small partnership G.P.	191	13·3	28·5	542	1030
Group G.P.	204	14·2		
Internal Medicine	169	11·8	225	101
Obstetrics/Gynaecology	106	7·4	137	33
Paediatrics	99	6·9	132	18
Pathology, etc.	55	3·8	76	64
Psychiatry	63	4·4	83	71
Radiology/Radiotherapy	24	1·7	32	41
Surgery, etc.	200	13·9	210	116
Others	116	8·1	170	?
	1434			

* Based on annual output of 2,000 doctors from British medical schools, and adjusted for 'definite' emigration in each specialty.

† *Source:* Medical Staffing in the National Health Service. *Lancet* (1967), 2: 668.

These facts should be related to evidence on choice of locality to practise. This survey confirmed the trend set by the investigation of established general practitioners and consultants, by showing that 59·1 per cent of potential general practitioners, but only 39·9 per cent of all others, hoped or intended to settle in the locality where they had lived in their youth. There thus appears to be a sociological distinction between doctors who are culturally tied to a particular community, who tend to choose careers in general practice, and all others, who have been called 'spiralists' (Watson 1964) because they are prepared to move around from place to place while going upward in their pursuit of specialist ambitions which cannot readily be realised if they remain in the same place. Many are prepared to emigrate in order to fulfil their career ambitions (Last 1967c). However, some who asserted that they would not accept general practice in Britain, where they

would be excluded from hospital, volunteered the information that they would welcome a combination of hospital and community practice, with perhaps only partial specialisation. I wonder how far this is removed from McKeown's concept of a specialised personal health service based on paediatricians, obstetricians, and physicians. There are signs in Britain of an impending increase in the flexibility of medical practice organisation which would augment the development of specialised team practice *à la* McKeown. This would not be a variation of the type of specialised group practice found in North America and Australia, which has never existed in Britain, but would have a more precise staffing structure (which would include ancillary health personnel); this is in some ways an improvement upon the *laissez-faire* approach to collective practice arrangements in other English-speaking countries.

Diversity of organisation must be encouraged and evaluation of each variant by study of end results of care is essential. One way to do this is by systematic medical audit: estimating case-fatality rates, disability days, and failure to keep appointments. The last-mentioned of these is quite a good indicator of patients' satisfaction or dissatisfaction with the service they receive.

Career indecision

The problem of predicting how and where recent graduates will be absorbed in health services is complicated by the fact that a high proportion evidently remain undecided about the nature of their ultimate career until some time after they have graduated. Indeed, the information already given about the distribution of recent graduates between the various branches of the profession is based partly on preferences for future careers rather than on definite intentions. Preferences (at any rate, those of students) have little predictive value when no firm decision has been made; more than two-thirds of students had changed their preference for a future career when resurveyed five years later (Last and Stanley 1968). Only one in ten students entering medicine claim to have decided what they want to do. By the time they graduate the proportion has risen to one in four, and a year after graduation it reaches one in three; but five years after graduation less than two-thirds had definitely decided which specialty they would enter (Table 4:2), although most of the remainder had narrowed the field down to a small number of possibilities. It is probably desirable for recent graduates to preserve an eclectic approach at least for a year or two in order to get a sound basic training and all-round experience which will preserve their adaptability so that they can turn their hands to other work than their chosen specialty, should this become necessary. A specialist physician or surgeon who cannot give an anaesthetic or perform a forceps delivery of an impacted occipito-posterior presenting foetus will be less adequately equipped than one who can do these things. Moreover, such a doctor can if necessary change specialties midway through his professional lifetime (as many chest physicians were obliged to do by the therapeutic revolution of the 1940s); and fragmentation of medicine into a series of loose-knit technologies is postponed or avoided.

However, once serious vocational training has begun, it is undesirable

TABLE 4:2
Seniority and firmness of career decision

	Definitely decided	Decided on field of work	Decided against some careers	Quite undecided	Total (=100%)
First year students 1961	10·3	51·1	7·7	30·4	1795
Final year students 1961	23·2	57·1	7·6	11·0	1662
Doctors, 1966					
Junior class (1 year grad.)	30·7	49·9	15·2	3·7	375
Intermediate class (3 years grad.)	53·9	36·3	7·0	2·4	532
Senior class (5 years grad.)	62·3	28·6	6·1	2·9	589

that it should be interrupted by pursuit of skills and experience which are irrelevant or inappropriate to the chosen specialty. For example, a prospective psychiatrist would hardly be wise to devote six months to ear, nose, and throat surgery, or vice versa. About one in four of those qualified five years at the time of the 1966 survey, had previously held training posts (other than pre-registration appointments) which bore no relation to their currently stated career goal. Those who had failed undergraduate examinations were more likely to have held inappropriate posts than those who had not failed. This suggests that sometimes a recent graduate might have been obliged to take a post because it was the last resort between him and the labour exchange, rather than because he really sought this kind of experience. But in many cases a history of seemingly irrelevant previous appointments probably represented only the quest for variegated experience before a final career choice was made.

Though this may be a peculiarity of British medicine, my experience of offering career advice to recent Australian graduates some years ago suggests that it was a feature also of that medical subculture (Last 1960).

The implications, both for postgraduate medical education and for effective staffing of health services, are considerable. Obviously, vocational postgraduate training cannot properly begin until the trainee knows what he wants. Health service administrators might be excused for being sanguine about eventually staffing all under-manned and unpopular specialties: many recent graduates who at first reach for the stars of glamorous over-crowded specialties will eventually grasp the treetops of humdrum general practice. Or will they? Would it not be better to capitalise on their aspirations, and plan a health service which will provide them with professional satisfaction that comes from pride in their work, and, more important, provide their patients and the community with an efficient and effective system of medical care?

Education of the young doctor

Medical education is a life-long process, but there are big differences in both opportunities for and attitudes towards continuing education. The whole future career of a doctor is determined by a combination of constitu-

tional factors and environmental influences which probably begin to operate before he completes his undergraduate course. A doctor who is well endowed with ability (measured by performance in examinations) will be rewarded by the most favourable opportunities for carefully supervised postgraduate training in teaching hospitals with a wide range of educational facilities. His colleague who has had difficulty passing undergraduate examinations (who may be less able, or merely less concerned with examination success) will more often obtain his postgraduate training in non-teaching hospitals (Table 4:3). In this type of hospital there are fewer staff in relation to the number of beds, and fewer senior staff in relation to the number of juniors. My colleagues and I have suggested (Last *et al.* 1967) that these qualitative as well as quantitative differences in staffing will contribute to the higher case fatality rates from common conditions, which have been observed in non-teaching hospitals (Lee *et al.* 1957).

TABLE 4:3
Academic record and hospital training

	Teaching hospital	Non-teaching hospital	Both types of hospital	Total (=100%)	N.R.
Honours at graduation	28	3	23	54	
	52%	6%	43%		
No failures	214	170	306	690	21
	31%	25%	44%		
One failure	64	69	98	231	18
	28%	30%	42%		
Two failures	22	61	68	151	16
	15%	41%	45%		
Three or more failures	41	124	125	290	22
	14%	43%	43%		
Total	369	427	620	1416	77
	26%	30%	44%		

$\chi^2 = 78{\cdot}64$ d.f. 8 $P < 0{\cdot}0005$

N.R. = No response to question. Not included in percentages or significance tests.

Compared to teaching hospitals, responsibility assumed by junior staff in non-teaching hospitals is often less carefully graded in relation to seniority and experience. The hospital mess is often small and larger proportions of staff may live out, thus reducing opportunities for informal 'shop talk' which plays an important part in postgraduate education. There are often fewer educational opportunities of a more formal nature: teaching ward rounds, clinico-pathological conferences and postgraduate courses, and a well-stocked library are all likely to be less readily accessible.

This system of training young doctors, which exists in Australia as well as in Britain, will exaggerate inequalities of competence existing at the time of graduation, favouring the talented and handicapping those whose ability is more limited.

Inequalities of educational opportunity will probably be aggravated by differences in attitudes towards continuing or life-long medical education. Those with a more positive approach devoted more time to medical reading, had more definite plans for further study, were more often attending post-

graduate courses at the time of the inquiry, and less often considered that their training was complete. These doctors were more likely to have done well in examinations but the correlation with career choice was closer (Table 4:4). It is not yet possible to estimate to what extent this difference is constitutional. I hope that it is mostly environmental, and therefore susceptible to modification during undergraduate medical education. The subject is being further pursued in collaborative studies with my colleague Dr Henry Walton, in the Department of Psychiatry.

TABLE 4:4

Career choice, opportunities for and attitudes towards postgraduate education

%

	Anaes. Radiol.	Basic Sci. Path.	Derm. ENT Eyes	G.P.	Med.	Obst. Gyn.	Paed. Psych.	Surg.
A. *Opportunities*								
Teaching hospital only	17	37	35	19	40	25	22	29
Non-teaching hospital only	33	19	20	34	15	33	28	22
Teaching rounds	39	38	47	26	52	35	51	39
Medical library	90	89	75	57	86	73	99	89
Case conferences	46	58	50	33	52	36	56	55
P.G. medical centre	37	27	28	25	31	31	34	32
P.G. courses	53	61	50	45	50	36	53	44
B. *Attitudes*								
Not currently attending course	58	55	59	76	62	75	65	79
Seldom or never read medical journals	6	4	7	7	2	7	4	4
Read an hour or more daily	27	34	29	3	26	15	16	31
No plan for systematic study	3	5	0	23	2	7	1	1
Consider training complete	7	9	2	30	4	6	5	3
Total (=100%)	131	89	68	406	166	107	160	188

Differences in educational opportunities and in attitudes towards continuing education become particularly important when considered in relation to career choice. The specialties do not share equally the supply of talented graduates: those who have done well in examinations are more likely to take up careers in internal medicine or the laboratory specialties, whereas those who failed undergraduate examinations are more likely to enter general practice (Table 4:5). Qualitative differences between graduates, accentuated by subsequent differences in opportunity and enthusiasm for learning, mean that standards of medical care will probably be higher in hospital than in community practice.

If standards of community care are to be raised, we will have to alter the present system of postgraduate training. I believe that the regional medical programs proposed in the United States (de Bakey Commission 1964), and

TABLE 4:5
Academic record and career choice

	Basic Sci. Path. Bact.	Internal Medicine	Paed. Psych.	Derm. ENT Eyes	Anaes. Radiol.	Surgery	Obst. Gynaec.	Other	G.P.
Graduated with honours	6 6·7%	13 7·7%	8 4·9%	2 2·8%	4 3·1%	7 3·5%	3 2·8%	7 5·1%	4 0·98%
No failures	54 60·7%	91 53·8%	85 52·5%	35 49·3%	62 48·1%	93 46·3%	45 42·4%	78 50·6%	168 41·0%
One failure	12 13·5%	26 15·4%	25 15·4%	14 19·7%	26 20·0%	38 18·9%	16 15·0%	29 18·8%	63 15·4%
Two failures	7 7·9%	11 6·5%	20 12·3%	10 14·1%	13 10·1%	16 8·0%	11 10·4%	16 10·4%	63 15·3%
Three or more failures	10 11·2%	28 16·6%	24 14·8%	10 14·1%	25 19·4%	46 23·0%	32 30·2%	24 12·5%	113 27·6%
Total (= 100%)	89	169	162	71	130	200	107	154	411

the suggestion of the Millis Commission (1966) for surveillance of post-graduate educational standards by medical schools, offer more prospect of improving the present situation than the proposals of McKeown (1962) for the future development of medical care outside the hospital. McKeown's proposals imply only tenuous links with the hospital and make no provision for surveillance of educational standards or facilities.

The question of standards in clinical practice is too far-reaching to be considered in detail here. I do not believe that it will much longer be possible for medical schools or for academic bodies within the profession to deny responsibility for continuing surveillance of standards among members of the practising profession. One advantage of the regional medical programs is that surveillance would be facilitated. This was among the recommendations of the Royal Commission on Medical Education in Britain (Todd Report 1968).

Conclusions

Present inadequacies of medical practice are a sufficient reason for proposing reorganisation, and existing systems may be economically non-viable as well as substandard. The wasteful financial structure of the Australian National Health Scheme has been criticised by economists (Downing 1964); as anomalies and inequities are removed from the Scheme its fiscal viability is further reduced. In my view, the uneconomical use of human resources is a more serious problem. The 'brain-drain' from rural and provincial regions to already bloated metropolitan medical services will continue (because it is subject to a kind of Parkinson's Law) unless new incentives can be found to keep health services personnel more equitably distributed. Regionalised services, like those proposed in the Regional Medical Programs of the United States, may offer a more powerful incentive, in the form of professional satisfaction and intellectual stimulus, than merely offering more money to country doctors and nurses.

Proposals for a reorganisation of medical practice seem likely to find greater favour with the next generation of doctors than would a continuation of the existing order, at least in Britain. More evidence to confirm this would be welcome. The medical profession of any country is a distinct subculture, with complex lines of communication, and a unique political psychology. Reactions to organisational change have never been adequately studied by social psychologists or political scientists, and research by experts in these disciplines would be timely.

It would be unwise to ignore sociological evidence such as that on 'spiralism' and specialism. Studies of British medical students both in 1961 (Martin *et al.* 1966; Todd Report 1968) indicate that medical students are recruited very unevenly from the social classes and the geographical regions. Working-class students and those from some of the regions currently short of doctors are under-represented. Data on examination performance in relation to social class (Last *et al.* 1968) suggest that some medical schools discriminate against applicants with working-class backgrounds, and possibly against those from some regions (because of their accent, perhaps?). Sociological criteria should not dominate the decisions of selection committees, who have to choose a limited number from the many appli-

cants for medical school places; but sociological evidence should certainly not be ignored altogether.

Is there a place for vocational guidance or career advice for young doctors? The answer is probably a qualified 'yes', but the process would have to be delicately handled. If it were undertaken by anyone associated with the health service, it would be difficult to avoid the suggestion that one objective was to encourage recruits towards under-manned specialties. A disinterested outsider, perhaps a member of a university staff or of a professional association, or even a layman, should be able to avoid this suggestion; but it would be necessary for him to be proficient in the rationale and techniques of vocational guidance. Training and experience in the behavioural sciences almost to postdoctoral level would appear to be required.

My own studies have revealed serious deficiences in the present arrangements for graduate education of young doctors, which impede their ability to play a proper part in any reorganised community health services. The highest priority is for radical reorganisation and reform of postgraduate training, so that all doctors emerge adequately equipped to play their full part in medical practice.

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PART II

5

R. Dubos

Changing Patterns of Disease (i)

During the next few decades, most people in industrialised countries will live in large urban agglomerations. In view of this fact, it is reassuring to know that life expectancy and the general state of health are now at least as good in certain very large prosperous cities as in small towns and rural areas. Most city dwellers in Sydney, New York, London, Paris or Moscow look as vigorous and live as long as farmers or fishermen anywhere in the world.

There are still many persons, however, who believe that country life is essential to the maintenance of physical and mental health, and predict on this basis that widespread urbanisation will in the end bring about the deterioration of mankind.

Biological aspects of urban industrial life

While there is no evidence at present that physical and mental health need be impaired by urbanisation and industrialisation, the urban experience of mankind is so limited that a final judgment of the issue is not yet possible. Man has lived in cities, even in crowded ones, ever since Neolithic times, but until recently the urban population was constantly being renovated by the influx of non-urban people immigrating from primitive areas and rural environments. If present trends continue, however, the whole world will be urbanised and this biological transfusion will no longer be possible.

In the very near future most children of city dwellers will be born, will develop, and have and raise their own children in urban environments. The urban way of life may not necessarily last for many generations because social structures, industrial practices and demographic patterns are likely to change. But the present forms of industrialisation and urbanisation will almost certainly last long enough to create biological and pathological problems without precedent in the history of mankind. In the future the city will be the birthplace and cradle of man; there is no way to foresee the long-range biological and social consequences of urban life continued uninterruptedly for several generations.

Urban life exists in many different forms. One extreme is found in the compact cities of continental Europe—such as Paris, Hamburg, Milan or Athens—where most people live in apartments. Another extreme is found in the sprawling agglomerations such as Los Angeles, Houston, Sydney or Melbourne, where most people live in detached houses. But granted that

living in a compact city differs in many respects from living in a sprawling agglomeration, all urban environments impose on human life certain common characteristics which are determined by technological imperatives.

Modern urban man commonly suffers from crowding or from the so-called tensions of life, but so did his ancestors. The difference however is that all aspects of modern life—whether in high-rise apartments or in detached houses—are conditioned by the impact of technological forces over which man has no control.

Judged from the physical appearance and behaviour of people in Westernised countries, it would seem that most human beings readily make a successful adjustment to the new ways of life created by urbanisation and industrialisation. Yet the demand for medical care and for hospital facilities is constantly increasing in all Western countries. One of the reasons for this increased demand is certainly that modern man has become more exacting with regard to health, and less willing than his ancestors to accept infirmities, pains and blemishes. A more important reason however is that increasing numbers of persons suffer from chronic ailments, both physical and mental, which do not necessarily destroy life but ruin it.

The degenerative ailments that constitute the largest medical problems of Western civilisation do not generally become manifest until late adulthood. As a result, the affected person has time to produce his family and to play his role in the social enterprise. Since diseases of late adulthood do not interfere with the biological success of the species, they would be of little importance if man were only an animal. Man's degenerative diseases acquire great importance however from the fact that they must be judged not only as biological problems but in terms of human values.

It goes without saying that degenerative diseases are under the control of genetic factors; it can be taken for granted also that changes in the surroundings and ways of life inevitably affect in the long run the genetic makeup of the population. But in practice, the changes in the pattern of diseases which are occurring now, and will certainly continue to occur during the forthcoming decades, cannot be of genetic origin.

More and more people escape early death from infectious diseases and nutritional diseases and therefore live long enough to become victims of degenerative and other chronic ailments. Furthermore, several factors of the modern environment and ways of life certainly play a role in increasing the frequency of vascular disorders, malignancies and allergic and mental conditions. This is proven by the fact that the patterns of disease change rapidly and differ from one social group to another.

In brief, the diseases characteristic of industrial and urban civilisations are the consequences of man's responses to the new environmental stresses. For this reason, it seems useful at this point to consider briefly some of the biological aspects of the urban technological environment.

Malnutrition used to be one of the threats of city life. There still exists among many people a romantic belief that the country man has a better chance than his city cousin to eat wholesome food, fresh and unadulterated. In practice, however, hardly anyone in industrialised nations eats only the food that he produces. The farmer's table is primarily supplied with cereals, vegetables, dairy products and meat, which came from far away and were

extensively processed before being packaged.

The city dweller may even enjoy some advantages over the farmer from the nutritional point of view, because the foodstuffs available to him are commonly more varied and fresher than those found in country stores. The city dweller can find nutritional safety in the fact that he can choose from many kinds of foodstuffs throughout the year, in much the same way as primitive man, who derived his nourishment from a large variety of wild products. The supermarket provides the nutritional equivalent of the grubs, tubers and buds which enabled primitive man to survive where white men would starve today.

Unfortunately, little is known of the kind of nutrition best suited to modern urban life. Nutritional requirements were determined two generations ago for vigorous and physically active young men. These requirements certainly do not fit automated, air-conditioned life. Much remains to be learned also concerning the needs of the mother during pregnancy and of her child during early postnatal life. Many paediatricians are beginning to wonder whether the big baby is necessarily a healthy baby. It has even been suggested that too generous a nutrition during early life may so imprint the child that his nutritional demands remain excessively large thereafter, with undesirable psychological and behavioural consequences.

Infectious processes were among the most serious threats of city life in the past. Although the dangers from this source to urban populations have been decreased by public health practices and the use of antibacterial drugs their impact is still far greater than commonly assumed, but not more so in urban agglomerations than in rural communities. In fact, public health processes—such as control over microbial contamination of water and food supplies and immunisation—have gone far towards minimising this type of danger. Furthermore, it is possible that urban man develops resistance to certain infectious agents as a result of herd immunity. Influenza, for example, may never again achieve the catastrophic severity it did during the 1917–18 epidemic, because most urban populations are highly mobile and consequently exposed at frequent intervals to the group of viruses responsible for this disease. The level of immunity acquired thereby may not be high enough to completely prevent reinfections, but sufficient nevertheless to protect against its most serious consequences.

All forms of environmental pollution, including noise and unavoidable exposure to excessive stimuli, unquestionably constitute objectional aspects of modern life, but they are manifestations of ill-managed technology rather than of urban life *per se*. Many forms of environmental pollution, including noise, are almost universal in industrialised countries and are often at their worst outside the city, for example, on highly-travelled highways or on bodies of water crowded with motor-boats. Sewage, organic chemicals and mineral fertilisers such as phosphates and nitrates pollute not only city reservoirs but also all natural waterways and lakes. Exhausts from motor cars, factories and incinerators are incorporated in smogs that are almost as intense over suburbs as over compact cities, and are progressively spreading over all the land.

No systematic studies have been made concerning the biological activities of the various kinds of air and water pollutants. Very little attention, for example, has been paid to the colloidal stuff released from automobile tyres,

or to the asbestos particles released from brake linings and from materials used for insulation by the building trade. Yet these particulate materials constitute a very large percentage of the total mass of air pollutants and are of a size that allows them to reach deep into the pulmonary tract.

Since most kinds of environmental pollutants produced by modern technology did not reach significant levels until one or two decades ago, the worst effects of pollution are yet to be recognised. They will probably loom large among the preoccupations of future physicians.

All cultures have rituals and festivities during which human beings are exposed to violent stimuli and live without regard for the natural biological cycles. But these disturbances occur only on rare occasions. In contrast, what used to be unusual and transient experiences now have become the rule in everyday life. Most important perhaps are the disturbances of biological rhythms resulting from the modern ways of life.

Every person shifted from day to night duty or vice versa is aware of the difficulties resulting from hormonal maladjustments that such shifts entail. Similarly, every traveller has experienced the physiological discomfort associated with travel by jet aircraft from one continent to another. Bright illumination late into the night and uniform temperature maintained throughout the year by airconditioning unquestionably contribute to comfort and increase efficiency. But it may turn out that these advantages will have to be paid for later in the form of pathological effects—yet to be determined because they have not been looked for. Studies have been made of the pathological effects caused in chickens exposed throughout the year to artificial light for increasing egg production, and frogs manipulated at different periods in their biological rhythms. But hardly anything is known of the effects produced on man by the unnatural stimuli to which he is now constantly exposed.

Along with environmental pollution and noise, crowding and its consequences are aspects of city life most commonly objected to. The fact is, however, that countless human beings appear to have elected to live among crowds throughout history—and even in prehistory. The Neolithic settlements in Rome during the Imperial period, the medieval fortified towns and the cities of the Industrial Revolution all exhibited population densities that have not been exceeded in our own times. Modern cities are larger but generally less crowded than those of the past. It can be assumed that more and more human beings will become progressively better adapted to crowding as they are increasingly exposed to city life during the early phases of their development.

The effects of crowding, furthermore, cannot be estimated only in terms of population density. They depend on the characteristics of the social organisation and on the nature of interrelationships between individual persons. Hong Kong and Holland are among the most crowded areas of the world, yet their populations enjoy good physical and mental health because they have slowly developed in the course of centuries patterns of human relationships that minimise social conflicts and allow persons to retain their identity and a large measure of individual freedom. This does not mean that man can indefinitely increase the density of his populations, but only that the safe limits have not been determined.

The dangers of adaptation

There is a widespread belief that health is threatened by the ways of life in urban industrial areas, by the many forms of environmental pollution, by the tensions and emotional solitude in congested cities, by the monotony and even boredom of automated work—in brief, by man's estrangement from the conditions under which his evolution took place. But in most cases it has proven impossible to trace the role of one particular type of stress in the causation of the diseases characteristic of industrial urban civilisations.

One of the difficulties in the aetiological analysis of the diseases of civilisation is that many changes in the surroundings and ways of life occur simultaneously and so rapidly that their individual pathological effects cannot be determined. Furthermore, change *per se* often acts as a pathological agent, irrespective of the nature of the conditions that are changed.

In many cases, for example, the deleterious effects of crowding result not so much from high population density as from the social disturbances associated with sudden increase in density. The appalling amount of physical and mental disease during the Industrial Revolution had several different causes but one of the most important was certainly the fact that immense numbers of people from rural areas had to live and function in the densely populated tenements and industrial settlements of the mushrooming cities before they had had time to make physiological and emotional adaptation to their new ways of life. Yet it took but a few decades to convert these rural populations into urban ones for whom high population density became almost an essential condition, if not of happiness at least of contentment. In contrast, there is some indication that rapid decrease in population density, as is occurring at present in the Great Plains of North America, may increase the incidence of mental disorders. The rapid mobility of populations from one area to another is also contributing at present to the patterns of diseases in technological societies.

In summary, it would seem that the so-called diseases of civilisation are to a large extent the consequences of maladaptive responses to the rapid changes in the ways of life: they may not be due to the urban industrial environment *per se*, but rather to the sudden changes in environment with all the difficulties of adaptation that this entails.

The history of mankind demonstrates that most human beings can make biological and social adjustments that enable them to adapt and contribute to effective function even under extremely stressful conditions. Paradoxically, however, the very fact that man is capable of achieving some form of adaptive response to many different kinds of stress accounts for many of his most serious medical problems.

While the phrase 'adaptive response' is convenient to discuss the interplay between man and his environment, the concepts of adaptation developed by biologists are not entirely suitable to the analysis of human medical problems.

The general biologist usually defines the word adaptation in Darwinian terms. For him the word implies a state of fitness to a given environment, enabling the species to multiply and to invade new territories. In this light, man is remarkably adapted to life in highly urbanised and industrialised societies, as shown by the fact that his populations continuously increase

and that he spreads urbanisation and industrialisation to more and more of the earth. It is obvious on the other hand that further population increase has become objectionable, and may soon become catastrophic. In applying the concept of adaptation to man it is therefore necessary to use criteria different from those used in general biology.

Physiologists or psychologists give to the word adaptation a meaning different from that implied in Darwinian population theory. But their interpretation also fails to take into account the peculiarities of human life.

For physiologists and psychologists, a response is adaptive when it enables the person to maintain homeostasis through metabolic, hormonal, or mental processes that tend to correct the disturbing effects that environmental forces exert on the body and the mind. Such adaptive responses contribute to the welfare of the organism at the time they occur, but unfortunately they often have secondary effects that are deleterious at a later date. When evaluated over man's whole life span, homeostatic mechanisms are less successful than commonly assumed because many, if not most, chronic disorders are the secondary and delayed consequences of adaptive responses that were useful at first but are faulty in the long run.

It has long been recognised of course that homeostatic mechanisms can lead to unhaemostatic effects, which is particularly true when the homeostatic response is excessive. In traumatic shock, for example, intense vasoconstriction is homeostatic to the extent that it preserves blood pressure, but it is unhaemostatic at the same time because it deprives organs and tissues, such as the kidney, of their vital blood flow. In the hypervolemia of heart failure the congestive state is useful up to a point in filling a weakened heart chamber, but leads ultimately to total failure by way of both excessive vascular pressures and over-dilated heart chambers. As to the inflammatory reaction, it helps in fixing or destroying the aggressive agent but it can in many ways destroy the organ while attempting to protect the body.

Most important, as already mentioned, is the fact that homeostatic mechanisms commonly have delayed and indirect consequences responsible for the pathology of many chronic disorders. The production of scar tissues is a homeostatic response because it heals wounds and helps in checking the spread of infection. But fibrosis in the liver or in the kidney means cirrhosis or glomerular nephritis; scar tissue may freeze the joints in rheumatoid arthritis or may choke the breathing process in the lung.

Many other examples readily suggest themselves, such as the various forms of hyperimmune response and the so-called compensatory reactions such as compensating polycythemia or compensating emphysema. These processes exert a protective or reparative function when they first occur but they can become destructive in the long run. All too often the wisdom of the body is a very short-sighted wisdom.

Atmospheric pollution provides striking examples both of man's ability to function in a biologically undesirable environment and of the dangers inherent in this adaptability.

Ever since the beginning of the Industrial Revolution the inhabitants of Northern Europe have been heavily exposed to many types of air pollutants produced by incomplete combustion and the fumes from chemical plants; such exposure is rendered even more objectionable by the inclemency of the Atlantic climate. Long experience with pollution and with bad weather

has resulted in the development of physiological reactions and of living habits which have adaptive value, as proved by the fact that Northern Europeans accept almost cheerfully their dismal environment. Such adaptive responses to pollution occur all over the world in the heavily industrialised areas, where people function effectively despite the almost constant presence of irritating substances in the air they breathe.

Unfortunately, the respiratory tract continuously registers the insult of the various air pollutants, even among persons who seem almost unaware of the smogs surrounding them. As a result chronic pulmonary disease now constitutes the greatest single medical problem in Northern Europe. It is increasing in prevalence at an alarming rate also in North America, and it will probably spread to all areas undergoing industrialisation. There is evidence furthermore that air pollution increases the incidence of various types of cancers as well as the number of fatalities among persons suffering from vascular diseases. But the long and indefinite span of time between cause and effect makes it difficult to establish convincingly the aetiological relationships.

The delayed effects of air pollutants constitute models for the kind of medical problems likely to arise in the future from other forms of environmental pollution. Wherever convenient, chemical pollution of air, water and food will be sufficiently controlled to prevent the kind of toxic effects that are immediately disabling and otherwise obvious. Human beings will then tolerate without complaint concentrations of environmental pollutants that do not constitute such a serious nuisance as to interfere with social and economic life. But continued exposure to low levels of toxic agents will eventually result in a great variety of delayed pathological manifestations that will not be detected at the time of exposure, and may not become evident until several decades later.

Adjustment to the various forms of malnutrition also has distant consequences of far-reaching importance. For example, persons who have been born and raised in an environment where food intake is quantitatively or qualitatively inadequate seem to achieve a physiological adaptation to the kind of malnutrition that they have experienced in youth. Such adaptation however creates a vicious circle of metabolic difficulties and mental retardation or indolence. Similarly, children fed diets that are excessively abundant and rich tend to become large eaters as adults, and thus may become more prone to vascular diseases.

As a result of the erroneous belief that microbial diseases have been conquered there is a tendency to regard the so-called minor infections as inconsequential problems. Yet these ailments erode the functional integrity of the body, progressively damaging the respiratory, digestive and urinary tracts as well as the kidneys and perhaps also the blood vessels. Like other stresses to which man becomes adjusted, minor infectious processes probably play a part in the diseases of the modern world.

Man is a gregarious animal; he generally tends to accept crowded environments and even to seek them. Constant and intimate contact with hordes of human beings has come to constitute the normal way of life. This change has certainly brought about all kinds of phenotypic adaptations to social environments that constituted biological and emotional threats in the past. But the long-range consequences of this adaptation are not known. If con-

stant and extreme crowding has pathological effects these will have an insidious course, their expressions being determined not so much by the initial effect of the stimulus on a particular target organ as by the complex secondary responses evoked from the whole organism and from the whole social group.

The responses to environmental stimuli made by the organism during the very early phases of its development, including the intra-uterine phase, deserve special emphasis because they exert profound and lasting effects on the physical, physiological, and behavioural characteristics of the adult. Often, indeed, such effects appear irreversible. Experiments have revealed that also in animals, early influences condition growth, longevity, behaviour, resistance to stress, and learning ability. The effects exerted on human life by early influences can therefore be studied through the use of experimental models, much as is being done for other types of biological problems.

The following are a few of the many observations made in laboratory animals which exemplify the remote and indirect manifestations of early influences:

A single exposure of young female mice to a single dose of radiation (25 r) does not destroy their fertility, but it shortens their reproductive life span by inactivating some of their oocytes in immature follicle stages. Since a long delayed effect on fertility can thus be traced to oocyte damage occurring twenty-four hours after irradiation, there is reason to believe that other complex late effects may also be the indirect consequences of other types of cell death occurring immediately following radiation.

A single injection into neonatal mice of particulate pollutants common in urban air was found to produce a high incidence of hepatomas much later during the adult life of the treated animals.

Subclinical infections contracted at birth and mild nutritional deficiencies during gestation or lactation have been found to depress growth rates and adult size in various animal species, even if the subsequent conditions were optimum for adult development. Many different types of stimuli that impinge on the organism during its early formative stages (even *in utero*) can likewise affect the learning ability and behavioural patterns of the adult.

Collective versus individual approach to the control of disease

The greatest improvements in health have been achieved by eliminating the most obvious agencies of disease, rather than by treating their pathological manifestations. The following changes have probably been among the most influential in this respect: sanitary measures against the spread of gastrointestinal infections; vaccination against smallpox, diphtheria and a few other infectious diseases; the social practices that brought about a spectacular fall in mortality from tuberculosis long before vaccination or any of the antituberculous drugs were available; better food, clothing, housing and working conditions; less exacting physical work and more effective protection against inclemencies of the weather.

Many of the beneficial factors mentioned above correspond to what is generally referred to as higher living standards. There is no doubt that higher living standards have rendered the population more resistant to various

infections and other stresses. But there is reason to fear that we have now reached a phase of diminishing returns in this regard. In fact, as is well known, the high level of prosperity is creating a new set of medical problems. Environmental pollution, excessive food intake, lack of physical exercise, the constant bombardment of stimuli, the estrangement of civilised life from the natural biological rhythms, are among the many consequences of urbanised and industrialised life that have direct or indirect pathological effects.

In brief, it can no longer be taken for granted that a further rise in living standards will result in health improvement. The more probable situation is that it will result in a new pattern of diseases.

Even if we succeed in identifying the factors that are responsible for the increase in chronic and degenerative diseases, it will prove extremely difficult to control them because all aspects of the urban and industrial environment are so intimately interwoven in the social fabric.

Other difficulties have their origin in individual attitudes.

Keeping streets and houses clear of refuse, filtering and chlorinating the water supplies, watching over the purity of food products, assuring a safe minimum of air in public places, constitute measures that can be applied by the collectivity in an anonymous manner, so to speak, and without interfering seriously with individual freedom. These measures do not demand personal effort from their beneficiaries and are therefore readily accepted.

In contrast, any measure that requires individual discipline and effort is likely to be neglected. Almost everybody is aware of the dangers associated with overeating, failure to engage in physical exercise, chain cigarette-smoking, constant exposure to polluted environments and to social stimuli, excessive consumption of alcohol and of other stimulants or depressants. But few of the persons are willing to make the individual efforts that would be required to avoid these dangers. Furthermore, the consequences of environmental threats are so often indirect and delayed that the public is hardly aware of them.

The mass diseases of the past were fairly directly connected with the natural environment. In contrast the chronic and degenerative diseases, as well as the mental disorders, which constitute the mass diseases of today in prosperous countries, are integrated in a much more complex manner with the ways of life and the socio-cultural environment. For this reason they are much less amenable to community-based control than are the nutritional and infectious diseases, and demand that greater emphasis be placed on the co-operation and interest of the individual person. Hence, the need to reformulate medical policies in such a manner that the conventional public health practices that emerged from nineteenth century science be supplemented by more personal relationships between physician and patient.

The physicians and medical scientists of the late nineteenth and early twentieth centuries proceeded on the assumption that most disease problems originate from poverty and filth and therefore can be solved by improving living conditions. This hypothesis placed the war against microbes and malnutrition at the centre of the medical stage. The dramatic fall in mortality rates all over the Western world leaves no doubt as to the efficacy of the attack against the infectious and nutritional diseases which dominated the medical picture after the first Industrial Revolution.

Around the turn of the century the focus of medical attention shifted from the environment to the intimate structures and mechanisms of living organisms. Studies on the spread of infection or on the quality of foodstuffs lost ground to the chemical analysis of immunological processes, of intermediary metabolism or of endocrine control. Even the Pavlovian reflexes and Freudian complexes are beginning to appear old-fashioned when compared with the detailed analysis of neural mechanisms or of memory storage and retrieval.

This change of scientific focus has had large practical consequences. Whereas the greatest contributions to health during the nineteenth century have been in the prevention of disease through manipulation of the environment, the most brilliant successes of twentieth century medicine have been in the treatment of disease through action on the intimate mechanisms of the body. The use of insulin and other hormones, the dietary control of phenylketonuria, the maintenance of normal physiological processes during surgical interventions, the operation of artificial kidneys or of cardiac pacesetters, are but a few examples of therapeutic procedures which could not have been developed without a detailed knowledge of body components and functions. There is even hope that some of the mental disorders can be managed through this approach.

The description of the organism in terms of its elementary structures and mechanisms and the doctrine of specific aetiology has led to such spectacular achievements, both theoretical and practical, that it would seem sufficient to let medicine continue along the road on which it is now travelling to create a medical utopia. Yet there are signs that a change in direction is necessary, and indeed is about to be made.

Paradoxically, the phenomenal growth of scientific medicine has been accompanied by a simultaneous increase in the popularity of what has been called fringe medicine. The various forms of faith-healing, the drugs and treatments based on folklore remedies and the perennial attempts to return to the ways of nature are but a few of the countless manifestations of fringe medicine. To a large extent its success reflects of course the credulity of the public and the pathetic longing for easy solutions to the problems of disease. But this is not the whole story. Dissatisfaction with scientific medicine as presently conceived reaches into the medical profession itself. The complaint that the doctor treats the disease but is not interested in the patient is voiced almost as loudly and frequently by physicians as it is by the general public.

The scientific basis for this concern is that the disorders of the body and of the mind are to a very large extent the consequences of inadequate responses to the environment. They involve not only a particular organ but the organism as a whole. For this reason, the practice of medicine demands of the physician a holistic attitude that goes beyond that of the experimental scientist. Ideally, the physician must apprehend as many as possible of the factors that play a role in a given situation and be able to recognise those factors that can be usefully manipulated by medical and social technologies.

Of special importance is the fact that the patient's responses are conditioned by past influences, especially the influences exerted by the factors which affected his early development. One of the greatest contributions of

the Hippocratic school, and in our own times of Freud, has been to emphasise the importance of taking a history in the examination of the patient. History-taking will certainly become an even more important aspect of medical care in the future, when more is known of the extent to which the experimental past can affect all aspects of life.

This very personal aspect of medical history will become increasingly important in view of the fact that the diseases characteristic of industrial urban civilisation involve so deeply the individual characteristics of the patient and his socio-cultural environment.

As patterns of disease change, so do the demands made on the medical profession. The crowd diseases caused by infection and malnutrition lent themselves to a collective approach that could be almost anonymous. The chronic and degenerative diseases which dominate the pathological picture in Western civilisation will require of the physician a much more searching concern for the peculiarities of his patient.

6 T. McKeown

Changing Patterns of Disease (ii)

If a biologist who had given no special thought to the problems of human health were invited to express an opinion about them, his reasoning might be along the following lines. Throughout his existence man, like other living things, has been exposed to a high risk of disease and death. In technically developed countries this risk has greatly diminished, largely as a result of medical measures, particularly those directed to the prevention and treatment of disease in the individual. In consequence the health problems of today are different from those of the past; but since medical science will continue to advance, the problems also must be expected to change. Moreover they will do so in ways which cannot be foreseen, for neither the pace nor the direction of scientific progress can be predicted for more than very short periods.

I believe this interpretation to be mistaken both in its emphasis on specific medical measures and in regarding the change in health problems as essentially a continuum. Theoretical considerations, as well as experience of the past two centuries, indicate that the main influences on health are not the prevention and treatment of disease in the individual; and although health will continue to change there is nevertheless an important distinction to be made between the problems of the past and those of the foreseeable future. Indeed the twentieth century may come to be recognised as a watershed separating the infectious diseases which have been predominant throughout man's evolution from the residual problems which remain when infections are reduced to small proportions. Changes in the residual problems are of course inevitable, but their effects will be small in comparison with those which have resulted from the decline of infectious disease.

The object of the first part of this discussion is to assess the nature of the residual problems in technically advanced countries, but in order to do so it is necessary to look back as well as forward.

Reasons for improvements in health

Health began to improve significantly in the West in the eighteenth century. The previous slow growth of population indicates that over any considerable period there was only a small excess of births over deaths, and there seems no doubt that man's evolution has been characterised by high early mortality due mainly to infectious disease. A rapid rise of population began in Britain in the eighteenth century—in other countries somewhat later—

and it is the main evidence of a profound change in health from that time.

In 1838 births, deaths and causes of death were registered in England and Wales and assessment of reasons for improvement in health rests mainly on interpretation of the behaviour of the birth rate and death rate (McKeown and Record 1962; McKeown 1965). The evidence shows that mortality declined from about 1870 and the decline is almost wholly attributable to a reduction of deaths from infectious disease. Examination of cause of deaths which declined suggests that in order of importance the main influences were a rising standard of living (which had probably begun before 1838), improvements in the external environment (from about 1870) and specific medical measures in the twentieth century. Prevention or treatment of disease in the individual made little contribution in the nineteenth century (the exception was vaccination against smallpox).

However, the rise of population in the eighteenth century shows that a significant improvement in health began at least seventy years before registration of births and deaths. It cannot be attributed to specific medical measures, which can hardly have been more effective in the eighteenth than in the nineteenth century, or to a fortuitous decline in mortality from infectious disease. If these possibilities are excluded, the initial improvement in health must have been due to a rise in the standard of living (McKeown and Brown 1955), and the striking advances in British agriculture in this period (Hutchinson 1966) provide an acceptable explanation for it.

These conclusions place the emphasis on improvements in food as the earliest and probably the most important reason for the advance in health. But their effectiveness would have been greatly reduced if the expansion of population had not been restricted by reduction of the birth rate from about 1880. Had the birth rate remained at its earlier level (approximately 35 per 1,000) the population of England and Wales would now be about 140 millions instead of 46 millions, with effects on living and health standards which can be imagined.

Residual health problems of technically advanced countries

In less than a hundred years the problems confronting medicine in technically advanced countries have been transformed. Everywhere until the nineteenth century, as in developing countries today, expectation of life was short, and infectious disease was the predominant cause of death. The modification of the medical task is attributable to the change in the age of the population which has resulted from prolongation of life and a lower birth rate, and to the new pattern of morbidity and mortality which has emerged from the decline of the infections. Before assessing the effects of these trends on the residual problems I shall consider briefly the conditions upon which human health depends.

During man's evolution, natural selection has kept at a low frequency genotypes associated with reduced fertility or early mortality. Most deaths which are genetic, in the sense that they could not be prevented by changes in the environment, occur either soon after conception, largely from accidents at fertilisation or implantation, or after the end of reproductive life when the influence of natural selection is reduced or absent.

In principle, other deaths between conception and the end of reproduc-

tion could be prevented by modifying the environmental agencies which lead to them. In practice, control of such influences may be difficult or impossible if they operate during pre-natal life; it is often feasible by skilled obstetric care if they occur just before or during birth; and it can readily be achieved after birth when the adverse influences are in the post-natal environment.

The advance in health hitherto has been due mainly to control of post-natal influences, of which the most important is insufficient food. Of man's four basic requirements—food, heat, oxygen and water—only food has been so seriously lacking as to have a profound influence on evolution. Food supplies can be increased, but not indefinitely, and to achieve a balance between food and numbers it is essential to restrict population growth. Viewed historically this restriction is probably the single most important reason for the advance in health.

Adverse influences after birth vary widely in character: they include, for example, infective organisms, accidents, and the self-imposed hazards of smoking, excessive eating, and deficient exercise. These influences have in common both the feasibility of their control and the fact that if they are not controlled the medical care of the affected is costly and often ineffective.

Appraisal of the problems presented by morbidity is more difficult than in the case of mortality. Those forms of sickness associated with reduced fertility or expectation of life—for example, tuberculosis—have been affected by natural selection and there are the same grounds for thinking they can be prevented by environmental measures. But sickness which has little influence on fertility or mortality (either because it is relatively benign, like the common cold, or because it occurs after the end of reproduction) is little affected by natural selection and is less likely to respond to environmental measures. It is significant that the decline of mortality, brought about largely by changes in the environment, has not been accompanied by a corresponding reduction of total morbidity. These issues are of outstanding importance in the field of mental illness, and it is not known whether the common cold forms continue at a high level because they are not susceptible to environmental measures, or because the right measures have not so far been applied.

Against the background of this interpretation it is possible to assess the character of the medical problems in technically advanced countries. It is convenient to consider them in three age periods.

Problems in childhood (conception to age 14). The most striking change in this period is a relative increase in the significance of pre-natal influences; most medical problems occurring between conception and age 14 are now determined by the time of birth. Many of them are potentially preventable: possibly half of all abortions (those which are induced); foetal and early post-natal deaths associated with maternal illness and difficulties of labour; and post-natal morbidity and mortality due to infections, accidents, and violence. Much more knowledge is needed to assess the possibility of prevention of the remainder of abortions, of deaths due to causes such as malformations, immaturity, and neoplasms, and of the serious mental and physical handicaps such as mental subnormality, defective sight and hearing, and malformations in surviving children. Little is known about the causes, presumably largely in the social environment, of psychological

maladjustment in children.

Problems in early adult life (age 15–44). The medical problems are much smaller in this than in the preceding or the following age periods. They include deaths, probably the majority, and sickness due to preventable causes: accidents and violence; smoking (cancer of the lung, chronic bronchitis and coronary artery disease); and atmospheric pollution (respiratory disease). The scope for prevention is much less certain in respect of other deaths from cancer and cardiovascular disease, and of sickness and disability from arthritis, rheumatism, and mental illness.

Problems in middle and late life (age 45 and over). The problems of these two age periods are discussed together because, although their frequency is different, their character is essentially the same. In both there are causes of sickness and death which are in some degree preventable, such as those due to smoking and atmospheric pollution, cancer of the lung, coronary artery disease, respiratory disease, and accidents and violence. The scope for prevention is again uncertain in respect of sickness and death from most forms of cardiovascular disease, cancer, arthritis, rheumatism, and mental illness. There must also be doubt about the common forms of disability (for example immobility, and defective sight and hearing) associated with advanced age.

This appraisal of contemporary problems suggests that with the decline of infections and reduction of disability and mortality from such preventable causes as induced abortions, accidents, smoking and atmospheric pollution, there will remain the pattern of disease characteristic of all societies at an advanced stage of technical development. Except for mental illness, most problems presenting between conception and maturity are congenital, and neither prevention nor treatment is very effective. Many patients with serious disabilities—mental retardation, congenital malformations, blindness and deafness—will require care for prolonged periods, some for the rest of their lives. The diseases of middle and late life undoubtedly offer scope for investigation and treatment, but in a relatively old population prolonged disability must be common and the care of those affected will be a conspicuous part of the medical task. Mental illness remains formidable, and it would be a mistake to anticipate a large reduction in the incidence or duration of the common forms.

This review indicates not that we should reduce efforts to understand, investigate, and treat disease, but that, in view of the character of the residual tasks, medicine must be concerned increasingly with preventive measures, and with the rehabilitation and care of the sick and disabled, particularly the congenitally handicapped, the mentally ill, and the aged sick. Increased importance of the less tractable forms of disease and disability is the inescapable legacy from the improved physical health in early life.

The organisation of medical services

Although it seems self-evident that medical services should be designed with regard for the tasks confronting them and should respond to changes in the nature of the tasks, these elementary but essential requirements have not been met. For the most part services have been improvised in response to local and often ephemeral circumstances with small concern for the

medical scene as a whole or for future trends. This lack of planning is reflected in the organisation of the major components of the contemporary services: hospitals are ill-fitted for the tasks they have to perform; the future of personal and domiciliary medical care is in doubt; and where a national commitment for comprehensive services has been accepted, traditional public health continues more or less unchanged in a profoundly altered medical environment.

It is the acceptance of a national commitment which has provided the incentive and the means to review the pattern of services inherited from two centuries of improvisation. In some countries, and for the first time, the central government has the responsibility to think constructively about medicine and its services, and to begin to shape them in accord with present and future needs. In doing so it faces not only uncertainties concerning the changing character of medical problems but the inadequacy of the traditional framework to support the services which are already required.

These issues will be discussed in relation to the three main divisions of the services: hospitals; medical practice outside hospitals; and the public health service.

Hospitals. Until now it has been possible to build a hospital in almost any place and for any purpose for which funds could be made available. Abel-Smith (1964) has described some of the early consequences in Britain, where there were eight general hospitals and twenty-six special hospitals within a mile of the Middlesex Hospital and quite inadequate provision elsewhere in London. The most important long-term result was the isolation of special hospitals, and the failure to make voluntary provision for three of the largest classes of patients: the mentally ill, the destitute sick, and the infectious.

These deficiencies led to the construction of public hospitals. But separate provision was made for each class of patients and this created four authorities—voluntary, county (for asylums), Poor Law and municipal—which were not unified until 1948.

Because of this history the hospitals inherited by the National Health Service were virtually unplanned. Voluntary authorities had accepted, and each of the public authorities had been assigned, responsibility for only a segment of the hospital population. There was neither opportunity nor incentive to relate services effectively to one another, much less to plan a service which would meet efficiently the needs of a town or area. This explains the disorganised hospitals of technically advanced countries, rapidly being reproduced in undeveloped parts of the world.

The lack of planning during the evolution of hospitals is also reflected in the use of sites. Many are badly located, too small to permit growth, and buildings have been designed without regard for the need for changes of use and replacement.

But the experience of the past two centuries has not only provided hospitals unsuited to present and future needs. It has also led to acceptance of many undesirable concepts: that mental, chronic and acute hospitals should be separate; that size of site is not crucial, and may be no more than a few acres; that a hospital should be designed as a single building; that there are advantages in separating some special hospitals, for example for paediatrics and obstetrics; that teaching hospitals should be even more specialised

than non-teaching general hospitals. Some of these assumptions are beginning to be challenged, but too slowly to change many decisions recently taken, or about to be taken, which will shape hospitals for generations.

No problems of hospital organisation are made easier by fragmentation of services, and most are made more difficult. Indeed the only justification for continued use of isolated institutions is that we cannot yet afford to replace them, and I suggested that in future hospitals should be planned with the following features (McKeown 1958):

All types of patients to be cared for at the same site in approximately the proportions in which they are found in the hospital populations.

Multiple buildings, of varied size, design, equipment, and permanence of structure, each adapted to the needs of the class of patients to be admitted.

Patients classified according to their medical, nursing and other needs and placed in the unit most suited to their care.

Medical and nursing services provided by a common staff.

But a hospital organisation commensurate with present and future demands requires not only the integration of fragmented services: it needs also a new approach to site planning. The key to site planning should be the unpredictability of future needs, and the best plan is one which makes provision for growth, change of use, and replacement of outdated facilities. These requirements influence individual buildings, but even more they affect the size and handling of the site as a whole.

Medical practice. There are large differences in the organisation of medical practice, even between countries at an advanced stage of economic and social development. Doctors serving patients are divisible broadly into general practitioners and specialists, but the work done by the two classes and the relationship between them may be quite different.

In Australia some general practitioners have independent access to hospital, where they may do a considerable amount of specialised work. In Britain the line between general and specialist practice is more clearly drawn; the general practitioner usually restricts his work to the domiciliary field and refers patients needing specialist services to consultants in hospitals. In the United States general practice has contracted, and medical services, including primary care, are largely provided by doctors designated as specialists. Since the medical problems of these countries are very similar it is at least questionable whether the different patterns of practice will all prove satisfactory, and it is clearly desirable to try to identify the type of practice likely to be consistent with future needs. The following are some questions to be considered:

Is it desirable to provide medical and nursing care for patients at home? This service undoubtedly makes extravagant use of the time of doctors and nurses; yet where it is not available people are admitted unnecessarily to hospital, including, ominously, psychiatric and geriatric patients who often cannot be discharged at the end of treatment. In a society which brings into hospital every bed patient who needs the service of a doctor or nurse it may be assumed that the care of the sick is the responsibility of the medical

services, and that little contribution should be expected from relatives.

Should the patient have a personal doctor with continuing responsibility for his care? Fox (1960) has argued persuasively that in view of the complexity of scientific medicine it is desirable for everyone to have a 'medical friend'. Yet some people question whether it is realistic to perpetuate this form of practice, when professional interest, status, remuneration, and the doctor's convenience all point in a different direction. Where choice is open, as in the United States, general practitioners have already 'voted with their feet' by changing to specialist practice based on hospitals.

Should a single general practitioner provide care for all members of a family? In Britain the family doctor is highly regarded and the concept of continuous supervision of parents and children by the same practitioner has obvious attractions. But can a single doctor be psychologically and technically equipped to deal with problems as different as an obstetric emergency, an emotionally disturbed child, an acutely ill adult and a bedfast geriatric patient needing prolonged care?

How much primary care can be given by ancillary workers, and in particular, can the nurse largely replace the doctor at the point of first contact? This would certainly remove many difficulties in the organisation of medical practice, although it would create some for the nursing profession. It is sometimes said that this kind of service would be unacceptable to patients, although a recent experiment on these lines was quite successful (Smith and Mottram 1967).

Should the work of the general practitioner (primary doctor) be specialised? If family practice is judged not to be feasible some basis must be found for specialisation. It might be achieved in more than one way. In some parts of the United States, for example, all doctors describe themselves as specialists and do not provide domiciliary and personal care.

If the general practitioner restricts his practice, what should be his relation to the other kind of specialist? This question is crucial to the future of medical practice, and the present confusion is largely due to failure to think clearly about the respective roles of the two major classes of practitioners.

Should the general practitioner work in hospital? This question arises only if medical practice continues outside hospitals. Assuming that it does, there is wide, but by no means uniform, agreement that the primary physician should have a hospital role. In its favour are continuity of care and the further education of the doctor through hospital experience. In opposition it is said that the general practitioner, even with his work restricted to an age group, would not be competent in a hospital role, and that it would be incompatible with his responsibility for domiciliary and personal care.

These questions are complex and no combination of answers is likely to be acceptable to most doctors. Nevertheless we must seek a framework in which medical practice can develop on lines more consistent with future requirements. I have suggested that the key to reorganisation lies in the relationship between consultants and general practitioners.

> Consultant practice should be restricted to services which require both referral and specialisation as conditions of expert practice, and doctors who are not consultants should provide personal medical care in patients' homes, at a health centre and in hospital. In future it will probably be desirable for all doctors to specialise and it is suggested tentatively that the best arangement would be to divide the work of the personal doctor according to the age of patients. Personal medical care would then be provided by four types of doctors (obstetrician, paediatrician, general physician and geriatrician) working in groups and strongly supported by consultants (McKeown 1965).

However, no-one can be confident about the ideal future organisation of medical practice and it is possible that different solutions will be appropriate in different circumstances, for example in urban and rural areas, and in developed and developing countries. What is needed is unrestricted evolution of the relationship between practitioner and consultant and between domiciliary and hospital practice. The indispensable basis is a role for the general practitioner in hospital, preferably one consistent with his other work, and a close working relationship between consultant and practitioner, in and out of hospital.

The public health service. Discussion of contemporary medical services would be incomplete without a brief comment on the public health service, which until recently constituted the major public commitment. It is the part of the medical scene most difficult to interpret, largely because there is no clearly-defined basis for its work. In Britain in the nineteenth century it would have been accurate to say that it was concerned with the control of infectious disease, a description which covers environmental medicine and the administration of fever hospitals. But with the introduction of personal health services the definition would have had to be enlarged to include prevention of diseases other than infections, and with acceptance of responsibility for general hospitals in 1929, the last possibility of any well-defined basis was removed. Since that time the role of local health authorities has been determined less by logic than by convenience; they have been asked to do a variety of things which were either not done, or were inadequately done, by other medical services.

Local health services have been established for so long on the public medical time scale that when new commitments are accepted there is considerable reluctance to disturb them. In Britain, for example, the National Health Service removed hospitals from local authorities, but otherwise left their responsibilities essentially as they were. This has perpetuated the anomalous distinction between different types of personal medical services. When the public commitment includes both prevention and treatment of disease in the same individuals, the opportunity should be taken to bring these services together under a common staff and a single administration.

The role of the teaching centre

If it is accepted that medical problems have 'changed, changed utterly', and that the traditional services are inadequate to deal with them, the question remains as to the role of the teaching centre. How can it give the lead that is badly needed? Can it do more than accept continuation of patterns of

practice which are manifestly deficient, hoping that ingenuity in the design of curricula will in time prepare the way for more far-reaching changes?

It should be said at once that the scope for significant advance in medical thought and practice through redesign of curricula is limited. This is not to say that improvements in the curriculum are unimportant; but it is to recognise that the work of the teaching centre is a far more potent influence on the outlook of the student and, through him, on the medical science and service of the future. It is what the teacher, and particularly the clinical teacher, does rather than what he says that is effective, and if the medical scene is to be modified it must be attacked through the pattern of service and research exhibited at the teaching centre.

It is for this reason that the restricted role of the teaching hospital is so regrettable. Mainly for historical reasons, its service has been focused on selected patients whose character has determined the scope of clinical teaching and research. Large classes of patients—particularly the mentally ill, the aged sick and the mentally subnormal—have been either excluded or admitted in numbers which bear no relation to the true dimensions of these formidable problems. Domiciliary care and the public health service have, at least until recently, been quite outside the range of interests of the teaching centre.

Because they conceal important areas of medicine from students and research workers, these deficiencies could not fail to be significant. But they have also made it impossible to mount a comprehensive attack on medical problems. In the field of mental illness, for example, it is surely desirable not only to give students an accurate grasp of the size and character of the major problems, but also to put before them a complete service in which preventive measures, domiciliary care, day care, outpatient service, assessment, short-term treatment, rehabilitation, and prolonged care all have their place. It is questionable whether such a service exists anywhere in the world and it certainly cannot be exhibited at teaching centres where the knowledge, interests and sympathies of the next generation of doctors are formed. Moreover the piecemeal approach is not limited to the depressed areas of care but is found in greater or lesser degree in all fields of medicine.

But if the need for a comprehensive approach at the teaching centre is accepted two questions arise. How can it be prepared in the face of uncertainties concerning the character of future problems? And will it not prejudice the traditional lines of service and research which require carefully selected patients?

It has already been suggested that the character of future problems is more predictable than many people suppose; broadly what is required is to reconcile increasing elaboration of methods of investigation and treatment with the need to care adequately for large numbers of patients with residual disabilities. I believe these diverse requirements will best be met under a common medical and nursing staff and on a common site.

But for a comprehensive approach it is not essential to see clearly the problems and patterns of practice in the indefinite future. What is required is a broad base for service, and imaginative planning which takes account of changing needs.

I have suggested that the best way to overcome the traditional restrictions would be for the teaching centre to accept responsibility for all medical

services of an area, preferably the one in which it is placed. In practice something less may have to be accepted, because domiciliary and public health services cannot be included. In these circumstances there should at least be responsibility for all hospital care of a defined population and a close link with other medical services.

But if this were the whole basis for the work of the teaching centre it would not provide the selected patients who are also needed, particularly for research and postgraduate teaching. Fortunately the two aims need not conflict if there is a satisfactory balance between responsibilities for all patients from a defined population and for selected patients from a much larger population.

Experience will be needed to show the best balance between the two activities and it must vary according to local circumstances. In a small town in a thinly populated area, a university hospital may have considerable difficulty in getting enough patients and may need a high ratio of comprehensive to selective work. The difficulties are increased if there are other hospitals in the same area. The circumstances are quite different in large centres of population where with thoughtful planning it should be possible to achieve the ratio which seems best in relation to the resources and commitments of the hospital. But in spite of variation, the general aim should be the same: to have enough representative patients from a defined population to give viable units and to make a substantial impact on medical service, research and education; and to have enough selected patients to enable the teaching centre to make its contribution to other lines of teaching and research.

It is sometimes asked whether, for the first of these aims, it would not be sufficient to have examples of all types of patients rather than all patients from a defined population. The distinction is important and it should be said at once that only the 'all patients' basis would achieve the objectives. A hospital receiving examples of psychiatric, geriatric and mentally subnormal patients is not able to show the size and character of these problems and the range of services required, nor to promote research for which representative patients and the related populations are needed. Where it is considered necessary to reduce the commitment for comprehensive service, it is much better to restrict the size of the defined population than to serve it selectively. Indeed to admit selectively is to continue the organisation of a teaching hospital from which it is essential to break away.

Conclusions

The twentieth century may be regarded as a watershed separating the infectious diseases which have been predominant during man's evolution from the residual problems which are now conspicuous in technically advanced countries—congenital handicaps, mental illness and disease and disability associated with ageing. In order of time and importance the main reasons for the change are (a) a rising standard of living, particularly of nutrition, (b) control of the physical environment and (c) specific preventive and therapeutic measures. But the effect of these influences would have been reduced and possibly eliminated if the growth of population had not been restricted by a declining birth rate.

Medical services have not yet responded to the changes in medical problems. The hospital task is to reconcile the inevitable increase in complexity of methods of investigation and treatment with the need to care for the large numbers of patients with residual disabilities. For this purpose hospitals should be planned as balanced centres for all classes of patients, and should serve defined populations without reliance on separate mental, chronic, or other isolated facilities. Medical practice has nowhere reached a stable or satisfactory form and a framework is needed which will allow a new pattern to evolve. The essential basis is a role for the general practitioner in hospital (but one consistent with his responsibility for personal and domiciliary care) and a close working relationship between practitioner and consultant in and out of hospital. The public health service also needs to be reshaped to eliminate the division of responsibility for prevention and treatment of disease in the same individual.

A new pattern of medical services requires reorientation of the work of teaching centres. They should put before students a balanced picture of the tasks confronting medicine and of the best means which our knowledge and resources allow for solving them. This can be done by accepting responsibility for all services required by patients from a defined population. This enlargement of responsibilities can be accepted without prejudice to traditional interests by judging carefully the size of the defined population in relation to numbers of selected patients drawn from a much wider area for other teaching and research purposes.

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7 B. P. Billington

Changing Patterns of Disease (iii)

There are no diseases, only sick people. Cohen of Birkenhead (1955), in outlining the historical development of the understanding of illness, pointed out the ancient Greek origin of the abstract concept of disease, upon which medical science is based. Medical practice is ambivalent in the use of the abstract disease concept; we speak of the treatment of disease, yet in action we treat patients for their ill health (as teaching by example would show, if it were not considered an inferior method for the educational standards of universities). Part of the community approach depends on the estimation of frequency of disease, disease now changing from an abstract concept to a measurable reality; there are many who feel that this occupation is slightly bogus, not in so far as it is desirable to increase understanding but because when used by public agencies dealing with health documentation, planning, and finance it classifies together people (through whom alone disease can be expressed) by a single group of factors they have in common, but whose other differences, which may be of importance to them, are omitted.

To write of the changing patterns of disease one might suppose that there is good documentation on what has passed and what is current, but it is a comment against both medicine and the community that only in the last twenty years such documentation, apart from death and communicable disease, has been thought worthwhile in some countries, notably excluding Australia. The comments to be made must be intuitive rather than factual.

Changes in the community

As people change, so may their patterns of behaviour and the illnesses which affect them. For example, sensory deprivation syndromes and barotrauma relating to man's changing demands in the conquest of his environment can clearly be recognised as newly developing areas of medical knowledge, just as new chemical substances and industrial methods can cause new syndromes for diagnosis by the individual practitioner and new problems in prevention for industrial and public health authorities. Demographic data have shown the rate of increase in the total population and its geographic distribution; urbanisation has brought about social changes affecting the patterns of disease which are not easy to measure or document, and has led to diversification of the activities of medical graduates.

So far the medical discipline of geriatrics has its demand from increasing

numbers of the population with a slowly increasing preponderance of women, rather than from an increasing proportion of elderly folk. Immigration, with the higher proportion of non-British migrants, has had profound effects on medical practice; not only do migrants bring diseases with them, for example tapeworms from Lebanon and hydatids from Yugoslavia and Greece, but new genes which have lasting effects independent of straight-out genetic diseases, such as favism and thalassaemia. There are other genetic changes which alter the patterns of disease over a period of time: diabetes, a genetically dependent disease, previously had the limiting force of death before reproduction which controlled its incidence; treatment has now largely abolished this force and the disease seems to be increasing in frequency in the community. The general problems of balanced polymorphism in disease and of the effects brought about by population change are the study of population geneticists. Immigration has shown the importance of cultural background, of folklore and of education in medical practice at all levels, with the difficulties of assimilating peasants from Southern Europe into a medicine geared to a sophisticated urban culture. In the larger cities groups of different nationalities have arisen which look for their medical care to practitioners derived from their own countries or who speak their language and remain outside the usual fabric of health education and health care. Luckily immigrants beget Australians, and the responsibilities of the school medical services have increased thereby. Immigrants might also bring a larger than average proportion of psychological and social misfits, who, together with those who fail in their adaptation to the new environment, have led to an alteration in psychiatric practice (Listwan 1959). Transients, for example, university students from Asia, also produce new problems of health (Davis and Bolin 1967); with rapid transport and the increase in number of transients there is not only continuing need for quarantine precautions but also a need for medical practitioners to be cognisant of the diseases previously limited to other areas of the globe. These may be introduced either in the transient population or in those Australians who have been transients elsewhere.

Mortality

Mortality data have been available in Australia since 1860, and their analysis owes much to Professor Oliver Lancaster of Sydney (Lancaster 1963). There are two aspects of importance, the first relating to survival and the second to causes of death. Mortality rates for Australia in recent years are shown in Figures 7:1 and 7:2. The community demands that attention be paid to attacking the diseases which cause most death and morbidity, the problems of living. The whole discipline of medical practice is geared to adjusting its standards and the quality of medical care towards the diseases which are the major causes of death at any given time. The evidence from the past indicates that an understanding of changes in patterns of disease has come mainly from observations outside the main streams of therapeutic medicine and disease-directed research. Himsworth (1962) pointed out that the study of phenomena, particularly of natural experiments, is still likely to be the most rewarding source of the ideas which will ultimately improve the health of the community.

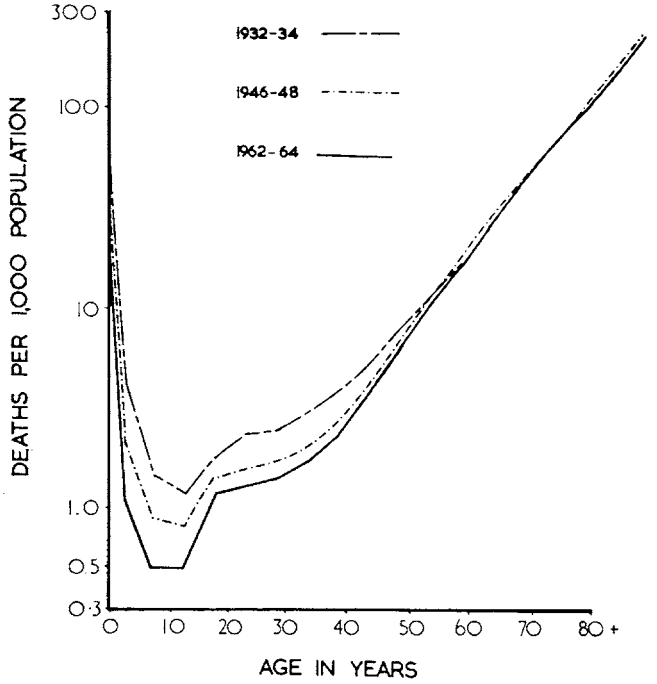

Fig. 7:1 Mean annual mortality rates for Australian males

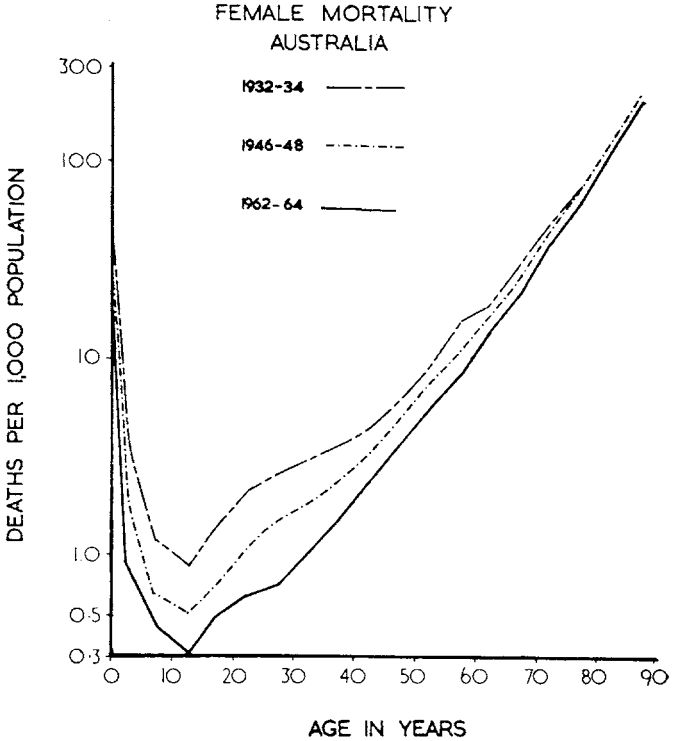

Fig. 7:2 Mean annual mortality rates for Australian females

TABLE 7:1

Percentage frequency of diseases and deaths of males in different circumstances

Diseases	England and Wales Registered Deaths 1955	England and Wales Hospital Discharges 1955	England and Wales General Practice Consultations 1955	New Zealand Hospital Discharges 1948	New Zealand Hospital Discharges 1963	Australia Registered Deaths 1934	Australia Registered Deaths 1964	Australia General Practice Consultations 1963
Infective & Parasitic Diseases	2.2	6.5	4.9	7.5	2.8	9.5	1.0	3.8
Neoplasms	17.0	8.2	0.7	4.3	6.5	11.2	14.9	0.9
Endocrine, Metabolic Diseases	0.5	1.8	0.9	1.0	1.3	1.3	1.3	0.9
Blood Diseases	0.3		0.4	0.4	0.5	0.9	0.3	0.2
Mental & Behavioural Diseases	0.2	1.1	2.8	2.1	1.9	0.1	0.5	2.9
Organic Disease of the Nervous System	11.8	3.3	1.9	1.9	3.9	6.3	10.8	1.3
Eye Diseases	<0.1	2.5	3.7	1.8	2.1	<0.1	<0.1	2.0
Ear Diseases	<0.1	1.4	5.0	1.4	1.0	0.2	<0.1	3.9
Cardio-Vascular Diseases	33.7	7.6	4.6	8.1	9.6	26.2	42.8	4.5
Diseases of Nose & Throat	<0.1	9.4	16.2	6.6	7.0	0.3	<0.1	11.2
Diseases of Lower Respiratory Tract	12.6	6.2	11.2	6.6	7.3	10.2	8.4	9.6
Diseases of Digestive System	3.1	18.2	9.4	15.4	13.8	5.7	3.0	7.7
Genito-Urinary Diseases	2.8	6.6	1.5	5.6	4.8	8.2	2.4	1.7
Diseases of Skin, etc.	0.1	2.7	10.4	5.3	3.1	0.5	0.1	9.9
Diseases of Locomotor System	0.2	4.2	6.4	5.8	4.9	0.3	0.2	4.2
Congenital Malformations	0.8	1.4	0.2	1.4	2.0	1.6	1.2	0.2
Diseases of Infancy and the Neonate	1.9	1.0	0.2	0.9	1.1	4.2	2.6	0.3
Senility, Symptoms only, etc.	1.3	5.9	7.0	1.5	5.6	4.7	0.4	4.8
Diseases of Pregnancy								
Accidents Violence Poisoning	4.5	12.8	9.8	18.8	20.7	9.5	9.4	15.8
Not sick, Advice, etc.		0.3	3.0	3.4	0.7			13.7

TABLE 7:2

Percentage frequency of diseases and deaths of females in different circumstances

Diseases	England and Wales Registered Deaths 1955	England and Wales Hospital Discharges 1955	England and Wales General Practice Consultations 1955	New Zealand Hospital Discharges 1948	New Zealand Hospital Discharges 1963	Australia Registered Deaths 1934	Australia Registered Deaths 1964	Australia General Practice Consultations 1963
Infective & Parasitic Diseases	1.3	4.1	3.7	7.1	2.4	8.6	0.6	3.5
Neoplasms	17.6	6.6	0.9	6.0	8.4	13.2	13.2	1.2
Endocrine Metabolic Diseases	1.3	3.7	2.0	2.3	2.1	3.1	2.3	1.8
Blood Diseases	0.5		1.6	0.4	0.5	1.1	0.4	0.8
Mental & Behavioural Diseases	0.3	1.2	4.6	2.7	2.3	0.2	0.3	4.2
Organic Disease of the Nervous System	18.2	2.5	2.3	1.8	3.6	7.9	18.2	1.7
Eye Diseases	<0.1	2.0	3.7	1.3	1.7	<0.1	<0.1	1.7
Ear Diseases	<0.1	0.9	3.5	1.4	1.0	0.2	<0.1	3.4
Cardio-Vascular Diseases	38.8	6.0	5.7	6.7	8.1	25.9	40.4	5.4
Diseases of Nose & Throat	<0.1	5.9	15.0	6.5	7.0	0.3	<0.1	11.5
Diseases of Lower Respiratory Tract	9.6	3.2	8.0	5.0	5.3	9.7	5.5	7.1
Diseases of Digestive System	2.9	10.9	7.3	12.4	10.1	5.5	2.9	6.6
Genito-Urinary Diseases	1.5	9.2	5.9	9.7	10.9	7.1	2.4	7.4
Diseases of Skin, etc.	0.1	1.9	8.8	3.7	2.5	0.3	0.2	8.5
Diseases of Locomotor System	0.5	3.4	6.8	3.7	4.4	0.7	0.4	4.2
Congenital Malformations	0.8	0.7	0.1	1.1	1.3	1.0	1.2	0.1
Diseases of Infancy and the Neonate	1.5	0.6	0.2	0.8	0.8	3.9	2.4	0.2
Senility Symptoms only, etc.	2.5	4.7	7.4	1.7	6.4	5.7	0.8	5.3
Diseases of Pregnancy	0.2	9.5	1.2	13.0	10.0	2.3	0.2	1.3
Accidents Violence Poisoning	3.4	5.5	6.3	7.6	10.5	3.6	5.6	6.7
Not sick Advice, etc.		0.3	4.9	5.2	1.1			17.5

Woodruff (1963) has shown in Australia how death under the age of forty years has declined in frequency—from 51·4 per cent of deaths in 1901–10 to 11·2 per cent in 1963. The pattern of causes clearly indicates, as many have shown, that death now depends more on age than on any other factor. Amongst the major causes of death are vascular diseases, atheroma, arteriosclerosis and malignant neoplastic disease; those in which ageing seems to be related to the pathological process or upon which factors dependent on time, that is upon length of life, have a dominant relationship to pathogenesis—in clinical parlance, the chronic diseases.

The patterns of the causes of death in Australia in 1934 and 1964 are shown in Tables 7:1 and 7:2. It has been suggested that the decline in mortality in the future will depend on advances in therapeutic medicine and surgery (Dorn 1959), although it seems more likely that the mortality from diseases which depend on individual behaviour, for example cancer of the lung, chronic bronchitis and emphysema, and deaths from accident, may be influenced by health education and by legislation: as in the past, by prevention.

The decline in mortality from tuberculosis was based on the knowledge of social factors related to the conditions of spread long before satisfactory means of therapy were available. Other diseases have waited to be controlled by a combination of specific therapy and the application of knowledge about aetiology in the social sense. The decline in mortality from syphilis has been due more to the introduction of specific therapy than any application of the principles of prevention based upon knowledge of aetiology. The lesson may be that the limit of improvement in mortality to be hoped for by understanding social and environmental factors in aetiology is the limit to which education will affect individual behaviour or to which the individual and community sense of liberty will negate proposed legislation despite appropriate scientific evidence; fluoridation of water in the prevention of dental caries is a good example. Each move to alter the environment might be criticised as experimental, but should be comparable to the experiment involved each time a physician treats a patient.

Study of the changing mortality from a disease by the cohort method sometimes has advantages. Figure 7:3, for example, shows the rise in mortality from arteriosclerotic and coronary heart disease among males in Australia from 1950–4 to 1960–4. A much smaller increase occurred among females over the same period. Figure 7:4, on the other hand, shows a decline in mortality due to hypertension, and Figure 7:5 shows a decline in the death rate from cerebrovascular accidents, especially in females.

The overwhelming trend of mortality to affect older age groups obscures mortality at other ages where medical problems still exist. In infancy there remains the mortality peak which is not reached again until the sixth decade; although the rate has fallen from 43·6 deaths per 1,000 live births in 1934, to 16·7 deaths in 1964, further progress is likely to be achieved with extreme difficulty, as death occurs mainly in the first forty-eight hours of post-natal life, with immaturity and neo-natal conditions, such as birth injury and respiratory disturbances, both seen more prominently in the immature neonate, leading congenital malformations as the most important causes. It is difficult to judge how much there is community

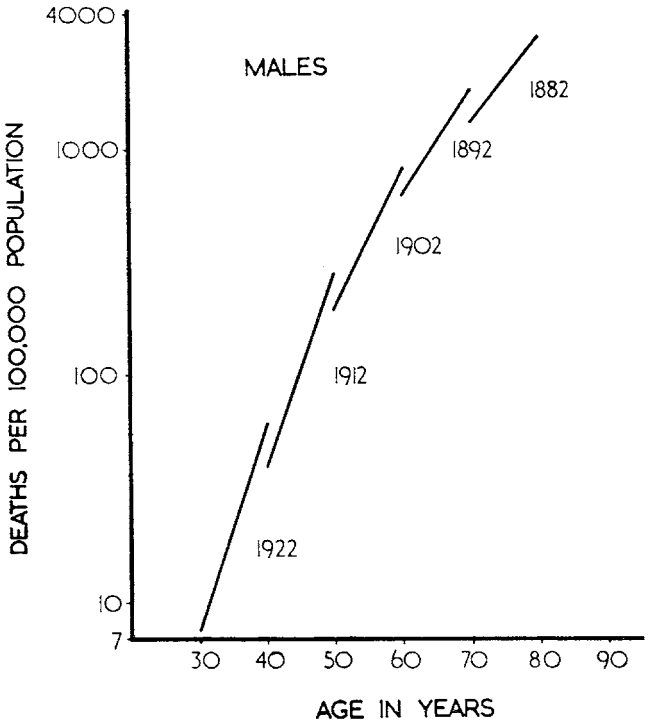

Fig. 7:3 Mean annual mortality in Australian males from arteriosclerotic and coronary heart disease, 1950–4 and 1960–4, arranged as a series of cohorts whose years of birth are shown on the figure

demand for specialised neo-natal care, but leadership is coming from the profession, with neo-natal paediatrics based entirely on hospitals and extensions into ante-natal care increasing in importance as a clinical and investigative discipline. While many of the social factors related to prematurity are known, there has been little practical advance in prevention, but the care of the premature and the prevention of death are areas which need specialised diagnostic and therapeutic skills. One suspects that the community at the moment accepts prematurity as a cause of death but expects the hospitals to provide first-class medical care of full-term neonates, having, apart from circumcision, little notion of what neo-natal paediatrics involves.

This attitude emphasises the hospital as the focal point; not the obstetrician or the general practitioner—clearly a change from thirty years ago.

Pre-natal diagnosis, for the conduct of labour from the mother's side, is extending to pre-natal prevention, diagnosis and treatment on the foetal side, a subject given impetus by the observations of natural experiments, for example, rubella-induced congenital deformities and the thalidomide disaster. The development of specialised neo-natal surgery in the treatment of congenital deformities, and of neo-natal paediatric cardiology with its aim of pre-natal diagnosis and treatment, again emphasises the hospital and medical leadership. It will be interesting to observe whether there will be a reciprocal community response from women wishing to be con-

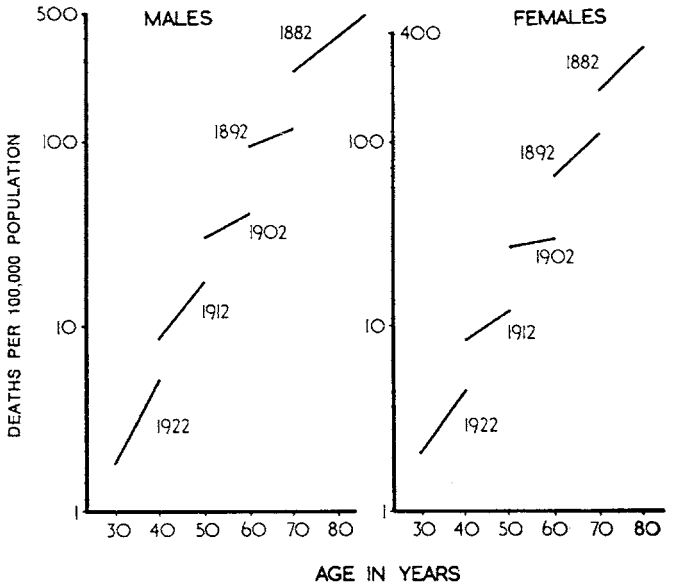

Fig. 7:4 Mean annual mortality in Australia for males and females from hypertension, 1950–4 and 1960–4, aranged in cohorts

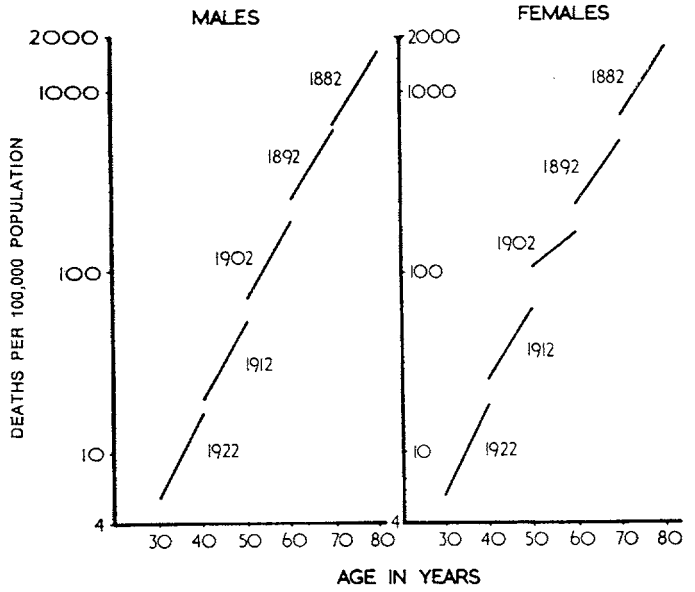

Fig. 7:5 Mean annual mortality in Australia for males and females from cerebro-vascular accidents, 1950–4 and 1960–4 arranged in cohorts

fined only where there are first-class specialised facilities for intensive neonatal care, including surgery; or even a demand for as many pre-natal diagnostic aids as are available, possibly by a pre-natal paediatrician, to ensure the best conditions for their offspring.

In childhood, 39 per cent of deaths result from accidents (on the road and by drowning), while 31 per cent of deaths result from various forms of pneumonia, congenital deformities and miscellaneous neoplastic diseases. The latter have fostered the special study of paediatric oncology, with palpable temporary gains in life span for a great deal of effort. In young adult life up to thirty years of age, 65 per cent of deaths now follow accidents; the most important group (53 per cent) are related to motor vehicles, where accidents involving speed, running off the road and collisions tend to imply recklessness, immaturity of judgment and inexperience, the natural attributes of youth. Between thirty and forty years of age accidental death has fallen to 38·6 per cent, neoplasms rate 17·5 per cent (carcinoma of the breast in women being the largest individual group). Next in line, coronary heart disease, heralds the patterns of the causes of death from age-dependent diseases.

Morbidity

Apart from a sideways look at the paradox that while death is natural, its causes are pathological, medical practice is concerned with illnesses of

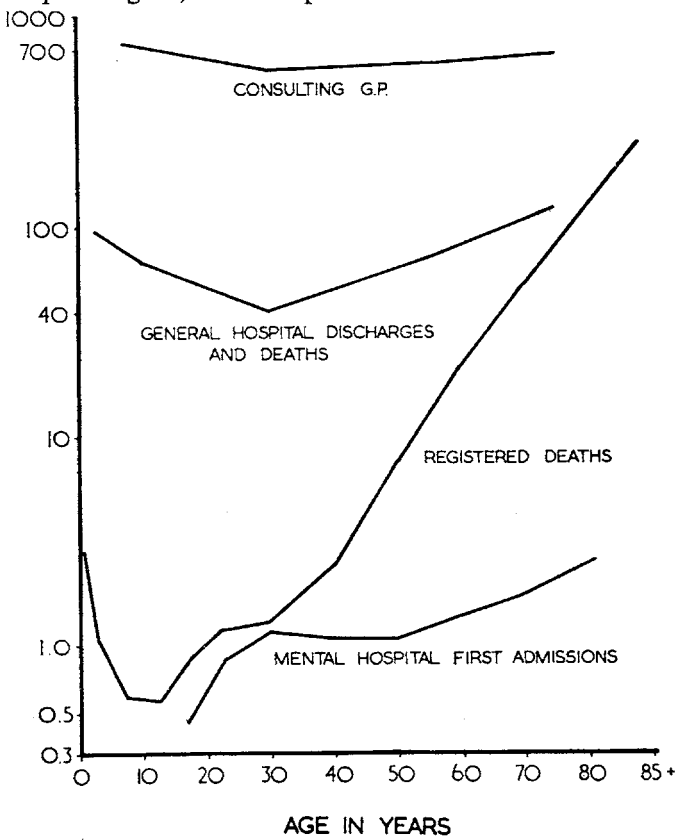

Fig. 7:6 Annual rates per thousand males in 1955 in England and Wales of (i) deaths, (ii) hospital deaths and discharges (extrapolated from a sample), (iii) episodes of illness necessitating general practitioner attention (extrapolated from a sample), and (iv) first admissions to mental hospitals

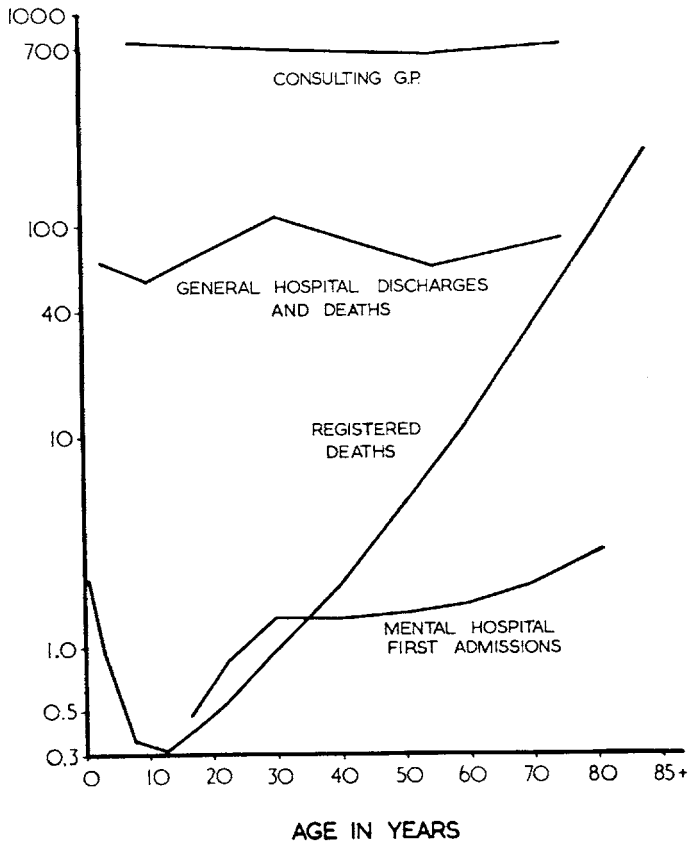

Fig. 7:7 Annual rates per thousand females in 1955 in England and Wales of (i) deaths, (ii) hospital deaths and discharges (extrapolated from a sample, (iii) episodes of illness necessitating general practitioner attention (extrapolated from a sample), and (iv) first admissions to mental hospitals

the living, recognising that prevention of death is an important aim. There are no satisfactory methods of estimation of morbidity in the community. Some studies in the United States and Britain used a questionnaire method, requesting a sample of the population to remember and record episodes of illness; one such study, with its aim to include illness which does not receive medical attention, indicated that there was about 20 per cent more illness in women than in men (McKeown and Lowe 1966). The most readily accessible information comes from medical sources. In England and Wales in 1955 information is available not only from registered deaths but of illness receiving attention in samples of hospitals and general practices. The age and sex distribution of patients is shown in Figures 7:6 and 7:7 and the distribution of diseases in each category, independent of age, using the International Classification of Disease, is shown in Tables 7:1 and 7:2. The original data and the means of obtaining it need not concern us (Registrar-General 1956, 1959; Logan and Cushion 1958) except that neither the hospital inpatient figures nor the general practice figures include normal labour, and inpatient figures omit those conditions admitted to special

mental hospitals, for which other information is available (Brooke 1963) and is included in Figures 7:6 and 7:7. The hospital inpatient inquiry has been enlarged; the most recent figures relate to 1962 (Ministry of Health and Registrar-General 1966). Alderson and Meade (1967) in the Oxford area have shown how errors in documentation, quite apart from medical errors, limit any interpretation placed on the hospital inpatient figures. Data for a longer period are available from New Zealand hospitals, representing approximately 80 per cent of all non-obstetric hospital admissions in that country. These are included for the years 1948 and 1963 for general comparison (Tables 7:1 and 7:2). Figures 7:8 and 7:9 show also the degree of change in the use of hospital beds in New Zealand in the same period (New Zealand Department of Health 1951, 1952, 1953, 1964, 1965, 1966).

In Australia the only available figures relate to the patterns of disease based on death certificates and a single morbidity survey in general practice in 1962–3, which also used the International Classification of Disease. The percentage of the diagnoses of episodes of illness in the surveyed population is shown in Tables 7:1 and 7:2. Although the surveyed sick population constituted approximately 1·6 per cent of the total Australian population, it has not been possible to calculate with any accuracy what proportion of the population consulted a general practitioner during the year of the survey, which limits its usefulness as a measure to be referred to in any subsequent survey.

There is some crude information about the use of Australian hospitals as shown in Table 7:3. Since 1946 in public hospitals there has been an increased turnover of patients of 39 per cent with only 1 per cent additional beds. The size of public hospitals has increased since 1934. Mental

Fig. 7:8 Age specific rates in males of death and discharge (spells) from New Zealand hospitals in 1948 and 1963 expressed as a percentage of the whole population

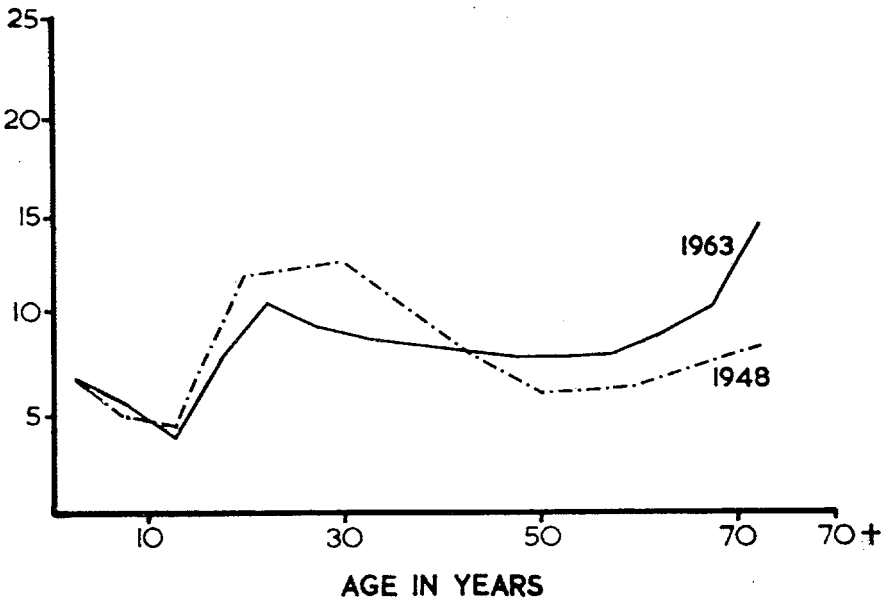

Fig. 7:9 Age specific rates in females of death and discharge (spells) from New Zealand hospitals in 1948 and 1963 expresssed as a percentage of the whole population

hospitals have had to provide fewer beds to accommodate a greatly increased number of admissions. The most striking change in the last decade since the introduction of Commonwealth medical and hospital benefit arrangements has been the increasing number of private hospitals, with an increase of 55 per cent in private hospital beds over a period of eight years. Some of the recent statistics related to private nursing homes have been provided by Powell (1967).

TABLE 7:3

Changing use of hospitals in Australia, 1934–64

		1934	1946	1956	1964
Public hospitals	Number of hospitals	530	586	709	748
	Beds per million population	4598	5578	5557	5637
	Annual admissions per 1,000 population	61	84	106	117
	Outpatient cases per 100,000 population	n.a.	1·7	2·8	3·0
Mental hospitals	Beds per million population	3684	3497	3111	2880
	Annual admissions per 1,000 population	0·5	0·5	0·6	1·4
Private hospitals	Number of hospitals	n.a.	n.a.	855	1242
	Beds per million population	n.a.	n.a.	1742	2699

n.a. = information not available.

Patterns of disease

The patterns of disease relating to doctor-patient contact as shown in Figures 7:6 and 7:7 and Tables 7:1 and 7:2 give information which is estimated only on their relationship to general practice and hospital illness. In the Australian general practice study it was noted that the morbidity rate as judged by doctor-patient contact was almost twice as high in the first year of life as at any other age. The pattern of hospital discharges in New Zealand between 1948 and 1963 shows a general similarity in rates to that in England and Wales between 1955 and 1962. Both countries have seen an increase in the number of admissions of both sexes over the age of fifty years. Hospital admissions depend on patterns of medical practice and on social conditions, as well as on the incidence of disease and its changing patterns. The larger proportion of 'non-sick' in general practice in Australia as compared to England and Wales is not satisfactorily explained. In Australia 70 per cent of the people in this category attend general practitioners for prophylactic injections and for conduct of normal pregnancy. It seems probable that practitioners close to the family units will continue to provide these services and that these categories will continue to form the largest single measurable group of patients in their practices.

Changes in the payment for medical care in Australia in the last twenty years have brought about important but poorly-documented changes in the patterns of medical care and disease at different levels of practice. Studies such as those of Forsyth and Logan (1960) in Barrow-in-Furness, in assessing communities' needs for medical services, will need considerable adaptation to fit the more complicated Australian pattern. For example, with respect to domiciliary nursing, the Commonwealth government provides no financial rebate, but the health insurance organisations may pay to their insured customers a small rebate for this service; only the wealthy can afford domiciliary care for chronic disabling illness, with the result that there is a heavy hospital demand for care of the chronically sick and disabled and for the elderly and infirm, particularly as hospital care does attract a satisfactory financial rebate from both the Commonwealth government and voluntary health organisations. A considerable change in the pattern of practice related to patient care could occur if it were decided that there would be a reasonable financial rebate for private domiciliary nursing, or if the various States of the Commonwealth provided a State-directed service for this purpose. In this connection it is necessary to accept that the provision of health services for the community is the responsibility of the individual States, although the finances for this come from both State and Commonwealth sources. The public hospital system also affects the patterns of disease which are seen in them. They remain based on the old English charity system, and only those in the low income bracket and age and other pensioners can apply or be referred to the public hospitals for diagnosis and treatment, except in an emergency, utilising the charity service of specialists and general practitioners in private practice.

There is a tradition in the community that those patients who wish to pay for special attention do not apply to enter public hospitals but go to small private hospitals with inferior diagnostic and therapeutic facilities for major illness. The situation led William Mayo to say in 1924 of the

teaching hospitals: 'All the wonderful facilities of these splendid institutions are reserved for poor men and tramps and the rest of the community is taxed to pay for them' (Barrett 1967). Although hospitals built in recent years have larger private sections than the older hospitals, their organisation is still mainly geared to the anachronistic charity system.

In metropolitan areas and in large country towns, because of the number of pathologists and radiologists in private practice it is feasible for quite serious disease to be diagnosed and treated at home or in small private hospitals; the limits are in the capacity of the insured patient to pay and the limitations of the services provided by the pathologists and radiologists of the district. The advantage of this system is that it has advanced considerably the facilities available to a large section of the community. There are some disadvantages; an upper limit to the rebates payable (for example for pathological tests) in any one year, dependent upon the finances of the insurance organisations, may leave the patient considerably out of pocket for serious illnesses which offer moderate challenge to diagnosis or require several measurements in treatment. This indirectly restricts the practitioner who is conscious of the patient's pocket as to how he can diagnose and treat ('quality versus price'). The system has relegated the largest and best-equipped public hospitals to care for an extraordinarily high proportion of age pensioners and social derelicts; it raises difficulties in teaching, particularly general surgery and obstetrics; and it affects the private practices of some specialist groups previously dependent on their charity hospital associations. The system, particularly as rebates are geared to procedures (if the responsible lay press is to be believed), has increased the risk of unnecessary surgery and, if some academics are to be believed, has led to diagnosis without real weighing of the evidence, reliance being placed on the reports of radiologists and pathologists. Naturally there is no documented evidence for these opinions.

The patterns of disease seen both in general and in hospital practice have been partly determined by alterations in the arrangement of medical practice. They can be modified further by decisions of the bodies which control the finances of practice (namely the Commonwealth Treasury and the profit-and-loss accounts of the voluntary health organisations), possibly to a greater extent than by any medical demands of the community, medical requirements for advance from the profession, or even by improvements thought desirable in the public interest by responsible elected bodies and their servants. This is an important obverse of the general title; the changing implications of medical practice can alter the patterns of distribution and treatment of disease.

The diseases

Infectious diseases. Infectious diseases have long ceased to be an important cause of death; the advent of anti-bacterial antibiotics appears to have reduced mortality, but the major effect appears to have been a decrease in the number of hospital admissions for infectious diseases. This fact is seen particularly in the figures for New Zealand hospitals. Pulmonary tuberculosis in the middle-aged and elderly is still numerically the largest killer; it caused 50 per cent of the total deaths in this category in 1964 in

Australia. Notifications of tuberculosis have not fallen quite as dramatically as mortality. The notification rate per 100,000 population in Australia was 53 in 1933, 46 in 1945 and 25 in 1965. Venereal diseases still remain a public health and social problem, although much less of a strictly medical problem and, with satisfactory treatment of syphilis, are rarely fatal. Adams (1967) has shown in a survey that the actual incidence rates of new cases in 1965 for venereal disease in Sydney were syphilis 33, and gonorrhea 448 per 100,000 population. The reporting rates of 9·2 per cent for syphilis and 7·1 per cent for gonorrhea have important implications. Despite the law and their community responsibility, individual practitioners limit their action only to what they think is necessary for the care of their patients. The emergence of penicillin-resistant strains of gonococci highlights, in this area as in that of other bacterial diseases, the ecological struggle between man and his organismal parasites. Both show phenomena of adaptation. Man's superior intellectual capacity is challenged by each man's individuality, his impediment to social organisation, as seen also in the special factors related to the continued presence of wound infection in hospital populations.

Prophylactic immunisation against both bacterial and viral diseases will continue, supported by a continued public education program; the lessons of small outbreaks of diphtheria in recent years emphasise that vigilance must be maintained in prophylaxis as well as in other methods related to public health and hygiene in the prevention of this and other infectious diseases.

Although prophylaxis against viral infections has achieved resounding success there is no satisfactory anti-viral antibiotic or other agent for treatment. The natural history of epidemics of virus disease depending on low community resistance, as shown by the behaviour of the worldwide epidemic of Asian influenza a decade ago, leaves no cause for complacency; should a sufficiently virulent new virus occur by mutation, disease of viral origin of unspecified clinical type could suddenly become a major health problem in this or in other countries.

Cardiovascular diseases. Mention has already been made that cardiovascular disease and cerebrovascular accidents now account for slightly more than 50 per cent of all deaths in Australia. Arteriosclerotic and coronary heart disease, numerically the most important group of vascular diseases, have increased considerably as a cause of death in Australia even in the last decade, despite the efforts of medical practice to outline the causes and to introduce efficient treatment (Figure 7:3). The incapacity to predict how much further the rise in mortality might go continues to alert all sections of medicine. A quick look at the history of anticoagulant treatment for myocardial infarction over the last twenty years demonstrates the expenditure in terms of effort to pay a small clinical reward. How much for one life prolonged? This is a question which only the informed community and its representatives, not the profession, can answer. Advance occurs slowly by an evolutionary process which itself is a natural experiment.

Deaths attributed to hypertension and hypertensive heart disease have fallen remarkably (Figure 7:4); this has also been reflected in hospital admissions. It seems likely that the change has been brought about with

more effective treatment outside hospitals as the result of pharmacological advances.

Cerebrovascular disease producing organic neurological consequences is of interest here. The changes in Australian mortality in recent years are shown in Figure 7:5, with a remarkable fall under the age of seventy-five years. It is a curious phenomenon that coronary artery disease and cerebrovascular disease in the main have the same basic type of anatomical lesion, yet the two diseases tend to behave differently epidemiologically. There is a suggestion from clinical experience and from the figures cited in this paper that treatment of hypertensive heart disease has resulted in individual patients surviving longer, to die later of coronary heart disease or cerebrovascular disease. There is a rising number of hospital admissions from strokes in New Zealand and in England and Wales, which, together with a decline in mortality, suggests that there has been an improvement in treatment and a consequent increased demand for rehabilitation. Mortality figures suggest that a proportion of patients recovering from strokes now live to die of other causes, including arteriosclerotic and coronary heart disease. From a hospital point of view, patients with strokes constitute half of the patients admitted with organic diseases of the nervous system, and their long hospitalisation renders the need for beds for this group of illnesses greater than any other.

Amongst other vascular diseases it is noted that the incidence of acute rheumatic fever has declined considerably. Although chronic valvular disease of the heart as a cause of death has declined, its apparent incidence in hospital patients has not yet appreciably altered.

Classified with diseases of the circulatory system are varicose veins of the lower extremity. They represent a group of conditions such as haemorrhoids and abdominal hernia for which treatment is surgical and for the most part elective, and will always be represented highly in hospital series. In New Zealand hospitals in 1964, an estimate of between 12 per cent and 17 per cent of all hospital admissions were for elective surgical treatment. Variations in number will depend on several factors other than the incidence of the conditions. Improvement in techniques for treatment will lead to increased numbers of patients selected for treatment, and economic, educational, and other social factors in the community will alter fashions in the demand for elective treatment. Generally, and this applies to a wider variety of conditions, once there is an effective treatment there is some point in specific diagnosis, and the apparent incidence of the condition increases. Much has been written over the years about fashion in medicine; it is easier to think about fashion in medicine than to document it.

Neoplastic diseases. Neoplastic diseases now rank second as a cause of death in Australia (15·4 per cent), but there has been little change in the age-specific mortality rates from this class of disease in the last thirty years, except that in Australia, as elsewhere, an increasing proportion of the total has come from primary cancer of the lung. The importance of neoplastic disease in hospital practice as compared with general practice is shown in Tables 7:1 and 7:2. In addition to the age factor in the development of malignant neoplastic disease, environmental factors are also of importance in influencing the unknown biological processes at fault, for example the higher incidence of skin cancer and melanoma in Australia and in patients

in sub-tropical zones in comparison with temperate zones. Some malignant diseases seem biologically determined to be incurable before diagnosis, but not others—for example, carcinoma of the breast, carcinoma of the colon and carcinoma of the cervix. Regular routine cytological examination supported by special laboratory facilities has been offered as a special cancer-detection method for cancer of the cervix. This has emerged at the behest of hospitals and public bodies whose function in the community is to attempt to reduce mortality from malignant disease. The task of general practitioners is not often appreciated; in 1962–3, in the general practitioner survey in Australia, the average number of cancers of the colon and rectum (important neoplasms for early diagnosis and treatment) was one case diagnosed per practitioner per year. Some advances have been made in the last thirty years, notably with the arrest of carcinoma of the prostate with oestrogens, although management of other endocrine-dependent malignancies has not been quite so successful.

A change in community attitudes to malignant disease seems to have occurred in the last twenty years. There seems to be much less emotional horror on the part of the relatives, less secrecy and more objective resignation. Despite the enormous sums of money being poured into cancer research, one suspects, as in the past, that real advances will come from the development of observations of the curious in other spheres of endeavour. In the interim it is hoped that epidemiological study will reveal more specific carcinogens and that legislation and public health education can do the rest. In the latter connection there are many who feel that the profession's rigid rules of anonymity, relating to the methods by which persons who are in private medical practice can communicate with the public, are seriously restricting the value of the profession in the important matter of health education, particularly in non-metropolitan areas. Doctors who cannot communicate with the public are unlikely to lead the public, as once was their traditional role.

Mental disorders. There has been increasing enlightenment in both medical and community spheres regarding illnesses in this category, particularly in the last twenty years. Mental ill health, and the provision of services for it, was traditionally a matter for 'the authorities', with certification, legal requirements and a state-organised system of mental hospitals. Health statistics for most countries consequently treat mental ill health in a separate category from general ill health and information is more difficult to obtain. The attitude of separateness from the general body of ill health is rapidly declining and probably represents, at both community and practice levels, the most significant change in pattern that can be documented.

In the last decade the increasing number of specialist psychiatrists entering private practice and the increased number of small private psychiatric hospitals are quite striking; psychiatric ill health is becoming independent of the state-operated mental hospitals whose role has also altered from that of detention to one of active treatment and rehabilitation, except for elderly demented folk, the mentally defective and a small group of seriously disturbed persons for whom the accent has changed from detention to care. It is not clear how much mental ill health bypasses the general practitioner and goes directly to mental hospitals for medical care. The figures in Table 7:3 show the changing use of psychiatric hospital beds and the increasing

number of patients who utilise them, with the most rapid change occurring in the years between 1956 and 1964. Whether the doubling of general hospital admissions in England and Wales between 1955 and 1962 for the disorder of neurotic depressive reaction represents a real increase or a change in the fashion of diagnosis is uncertain (Balint 1964). There are some points of similarity between the studies of general practice in England and Wales in 1955 and in Australia in 1962–3. The incidence of diseases in this general class of mental disorders is approximately the same, with a higher incidence in women (Tables 7:1 and 7:2). In Australia, childhood behaviour disorders were seen slightly more frequently than the total number of psychotic disorders, and alcoholism about twice as frequently. In England and Wales childhood behaviour disorders occurred with only about half the frequency of the total number of psychotic disorders, and alcoholism only about one-fifth as frequently. The social problems of juvenile delinquency have focused attention on the medical aspects of behavioural disorders of childhood; childhood psychiatry is growing in stature as well as in use in both private and state hospital spheres. It is probable that the school medical services will need to complement increasingly in the psychiatric field the important case-finding and health-detection examinations that this service has been doing for so long in the organic field.

The advent of effective pharmaco-therapy and rehabilitative manoeuvres for many psychotic and neurotic disorders has improved the public outlook on mental sickness. The warped public image of the psychiatrist as a doctor apart, an eccentric, will fade, and with the availability under the Australian medical benefits system of private psychiatric hospital care and the development of psychiatric units and day hospitals in general hospitals, the social stigma about mental ill health will decline. There is a long way to go before preventive mental health is likely to become a vital affair. It seems likely that the trend for state mental hospitals will be to continue to care for patients with mental deficiency and for patients with senile dementia, with an important excess of female patients.

Diseases of the skin, eye, ear, nose and throat and locomotor system. In general practice in Australia approximately 20 per cent of the disorders seen fall into these categories. In hospital practice, in relation to diseases of the eye, the treatment of squint and cataract lead the field by a long way, followed by glaucoma (which might just be increasing in incidence), keratitis and iridocyclitis, whereas in general practice in Australia over 70 per cent of eye conditions fall into the category of conjunctivitis. With respect to diseases of the ear, both general practice and hospital practice show otitis media to be the most common condition treated, but the evidence from hospitals in New Zealand, England, and also Wales, is that there has been considerable decline in the number of patients admitted to hospital with otitis media and mastoiditis in the last ten years. In general practice 94 per cent of the conditions of the nose and throat relate to acute and chronic nasopharyngitis and chronic sinusitis, whilst hospital admissions relate mainly to tonsillectomy, and to a lesser extent correction of a deformed nasal septum or nasal polyps. As far as diseases of the skin are concerned there seems to be no obvious difference between the conditions seen in hospital as opposed to general practice.

A certain amount of stability has appeared in disorders in these categories and it seems likely that no major alteration will occur in the foreseeable future. This applies also to disorders of the locomotor system.

Diseases of the lower respiratory tract. In this section the patterns of disease seem to have stability, except that in several countries including Australia there has been an increase in mortality from bronchitis, particularly chronic bronchitis in middle and later life. There is also a suggestion (Gandevia 1958) that in Australia there has been a recent increase in mortality from asthma. Pneumonia and bronchitis in the middle-aged and elderly are the chief causes of hospital admission and death, with asthma a long way behind. In general practice influenza and bronchitis, with an accent on the 5–14 year age group, lead asthma and pneumonia as the most common illnesses seen.

Diseases of the digestive system. The pattern in this section is also relatively stable. There has been a satisfactory decline in mortality from appendicitis, hernia (both neo-natal and adult), cholelithiasis and cholecystitis—diseases in which elective and emergency surgical treatment are prominent. There is a suggestion of an increase in mortality from cirrhosis of the liver and pancreatitis. There is a constant decline in mortality from chronic peptic ulcer, despite a possible increase in the incidence of chronic gastric ulcer limited to certain areas (Billington 1965). The pattern of disease for which hospital admission is desired has not altered between 1948 and 1963 in New Zealand, nor between 1955 and 1962 in England and Wales. Figures from Australian general practice show that 45 per cent of the cases seen in this category were recorded as having simple gastroenteritis or functional disorders; conditions which, with the exception of gastroenteritis under the age of five years, form only 5·3 per cent of hospital admissions for digestive diseases in New Zealand.

Diseases of the genito-urinary system. Diseases of the kidney are fraught with difficulties of classification. It seems that there has been a moderate degree of decline in mortality in the last decade from non-infective acute inflammatory renal diseases in Australia; there seems to have been an increase of about the same degree in mortality from infections of the renal tract. These together make up about three-quarters of the total mortality in this general group. There seems to be a decline in mortality from prostatic hyperplasia. In hospitals the patterns of disease of the male and female genital organs have not significantly altered in recent years. The proportion of hospital discharges of women for some benign genital conditions, usually treated surgically is about twice as high in New Zealand as in England and Wales. This could reflect a different incidence of disease between the countries, or be caused by a higher proportion of gynaecological beds to be filled, or in New Zealand by a greater desire to have gynaecological surgery.

Pregnancy and childbirth. In Australia it is normal practice for labour to be conducted in hospital. It is not clear, however, what proportion of women privately engage general practitioners or obstetricians to conduct their ante-natal care and delivery, and what proportion seek attention directly from public hospitals, particularly in an urban environment. There is no documented evidence to suggest any change of pattern in recent years. The low and declining level of maternal mortality (from 0·75 deaths per

1,000 live births in 1932–4 to 0·33 in 1962–4) is encouraging, and documentation has now come to the stage of case-finding and analysis, a responsibility of the Director-General of Health in each State of the Commonwealth. From demographic and community points of view the abortion rate is important, but difficult to document. The stillbirth rate seems to be declining slowly, and figures from England and Wales (Registrar-General 1966) suggest that improvements result mainly from maternal rather than foetal factors or problems of labour.

Accidents, poisoning and violence. This group of illnesses is important both as a cause of death and for inpatient and general practice. Lancaster (1963) pointed out that there has been a decline in mortality in Australia in the last century but there is clear evidence that the mortality has not declined in recent years. In Australia in the last thirty years accidental death from traffic accidents has increased from 23 per cent to 48 per cent of all deaths in this category in men, and from 19 per cent to 31 per cent in women.

In hospital practice in New Zealand and in England and Wales there are increased rates of admission for all fractures, those of the skull and facial bones arising more than others. There is a parallel increased admission rate for concussion and other head injuries. Fractures of the femur, particularly in elderly women consequent upon falls, are also increasing. In Australia the number of deaths from traffic accidents in the rural areas, with the high proportion of head injuries and fractures and other major injuries to the trunk, have suggested that traumatic services should be developed intensively in such areas. Because of the devastating nature of the injuries it seems unlikely that the provision of neurosurgical teams in rural areas to treat such cases on the spot would lead to a significant improvement in mortality. Apart from traffic accidents the greatest number of fatal accidents and poisonings occur in the home, although in England and Wales in 1962 there are figures to suggest that 40 per cent of fatal accidents and poisonings in males are related to employment. In 1963 in New Zealand, a much less industrialised country, only 33 per cent of the total male hospital admissions due to accident and poisoning were related to employment. In Australia accidental death from poisoning constitutes 4 per cent of the total accidental and violent deaths, of which 64 per cent result from drugs used in medication, an increasing proportion, although only 12 per cent of the poisonings recorded in general practice were due to drugs used in medication.

Suicide is an increasingly important cause of death. While the rate for males has increased by about 20 per cent since 1934 the rate for females has almost doubled, although it is still less than the male rate. The methods adopted have not changed greatly among men but there has been a remarkable change among women; whereas suicide by domestic gas was the commonest method in the 1930s and the 1940s, in 1964, 63 per cent of women committed suicide by the use of analgesic and soporific drugs, particularly barbiturates. The number of cases of accidental poisoning from barbiturates admitted to hospital doubled in England and Wales between 1955 and 1962, and trebled in New Zealand between 1948 and 1963.

Increase in suicide has both social and psychiatric causes, but the rising incidence of barbiturates as a method and of non-fatal barbiturate over-

dosage in the community have important medical implications.

The morbidity from medical care

It is common knowledge that major and minor illness may be produced during treatment of primary illness as the result of medical treatment. Satisfactory figures are not available, mainly because classifications both in hospital and general practice relate to the primary illness. Although the problems of iatrogenic illness are usually considered in terms of toxic drug reactions (which are increasing in number and variety with the increasing number of agents becoming available) there are other problems such as incompatible blood transfusion, cardiac arrest during anaesthesia, the morbidity produced after elective surgery (the literature on gastric surgery is a case in point) and the occasional reaction after prophylactic injections. There are several natural checks, in addition to the ethics of medical practice, such as the coroner's court and legal action for damages.

In relation to the community, changes in the patterns of treatment have produced an important increase in the national drug bill. Advances in treatment have become not only more complex but also more effective; there is profit to be made by private manufacturers and pharmaceutical distributors. Modern medicine is increasingly indebted to the research in pharmacology and the mass production of first-class therapeutic agents by private firms, but these firms exist for profit, and competitive promotion of their products has an effect on all levels of medical practice as older products are replaced by newer agents of proven efficiency. The price is related not only to the legitimate research costs of the preparation itself but to its promotion and to covering losses otherwise incurred. As with individual pharmacological agents the general effect is eminently desirable, but there is a morbidity, in this instance to the national pocket.

Changing attitudes to disease

The first matter for discussion relates to standards of medical care from a medical point of view. There have been two parallel advances in the last twenty years; the first relates to complexities of treatment and the second to accuracy of diagnosis. The progress of medical science and practice has depended on both the use of technological advances and on the skill of some practitioners in those areas which require development, intricacy and precision. The reasons for the growth of specialisation in medicine, as in many other practical disciplines, is really beyond the scope of this contribution, except that the medical requirements of both the community and the profession are heavily involved. While some advances in therapeutic medicine, for example antibiotics, can be applied in all areas of practice, others, particularly surgical, not only require hospital facilities but the development and use of purely scientific and technological disciplines not in the main stream of practice, for example heart-lung machines, tissue typing laboratories, and cardiac pacemakers. Many of the specialist diagnostic and therapeutic activities can only be conducted in hospitals, implying that specialist practice will become more dependent on hospitals than in the past. But there is a limit to the public need for some therapeutic manoeuvres which involve expensive apparatus and a team of highly skilled

specialists and technologists. It is increasingly obvious that some of the more recent developments, for example renal transplantation and open heart surgery, are to be limited (both for financial reasons and for reasons relating to medical efficiency) to one or two major hospitals in a metropolis. There are some important implications. Medical undergraduates and their teachers in those hospitals which are not selected to develop a particular specialised area are at a disadvantage. They will have increasing difficulty in integrating the new knowledge and experience of a particular diagnostic or therapeutic advance into their learning, practice, and teaching. In turn the patients seen by even the new graduates are less likely to be considered for one of the advanced techniques than if they had attended a practitioner who had trained in a hospital where such an advance was already in progress. Restriction of a method limits its applicability in the broadest sense to the whole community; the smaller communities which cannot afford the method will suffer most.

There will be an increasing tendency, as has occurred over the last decade, for patients to be obliged to move out of their natural geographic *milieu* if they are to take advantage of the new methods. There is considerable community resistance to such movement; it is not only the patient who has to be moved but also the relatives, and there are financial sacrifices to be made. At the present time this is an important area for health education activity in the community. There seems little doubt that specialisation and the modern advances in diagnosis and treatment will need an increasingly adaptable public to use them to the best degree. Individual members of the community who are not prepared to be readily adaptable will not be reached by the new methods. This seems to be a social interpretation of Darwin's 'survival of the fittest'. The requirement of adaptability of members of the public already extends to their hospital sojourn. Complicated diagnostic and therapeutic manoeuvres require patient co-operation; the paradox that patients must be pretty fit nowadays to have their diseases diagnosed and treated in hospitals is not without point. There is increasing use of team activity in hospitals, which by its very nature tends to evoke confusion and hence fear and resentment on the part of the patient.

There also seems to be developing an inverse relationship between the quality of personal care and the quality of technical skill provided by the hospitals of Australia. While the complexities of the doctor-patient relationship may be negated in this sort of environment both the doctors and the patients lose their individuality, a concept which seems hard for some medical groups not associated with large hospitals to comprehend. Questions no doubt will be asked whether full-time paid medical personnel, who restrict their activities to being important members of a team directed in one area only, really justify full medical courses and medical degrees. The questions must be answered by the profession, bearing in mind that advances in medicine may make such super-specialists suddenly redundant —put the correct way, the medically-qualified themselves will ensure the limit of super-specialisation and the avoidance of mere technology.

Another important area relating to the standards of medical care from a medical point of view concerns standards of diagnosis. In the last twenty years, at all levels of practice, there has been an increasing tendency not only to suggest a diagnosis but where possible to prove it beyond doubt.

The public interest in medical and surgical audits in the larger hospitals indicates that the community is also cognisant of this important change in outlook. Specificity of diagnosis is now feasible at all levels of practice, but the remarks made previously about the adaptability necessary for both patients and their physicians to benefit maximally from the facilities provided are apt in this situation. The development of accuracy in medical diagnosis has entailed extraordinary growth in laboratory and technical services, but there will always be a limit to the services which practitioners in private practice can afford to make available. In all States except Queensland there is the additional factor that the charity background of hospitals and the correct application of the means test limits the applicability of some first-class diagnostic manoeuvres available in the advanced public hospitals mostly to the poor.

It is a problem of communication that there remains a large section of the community who have no concept of aids to diagnosis beyond one X-ray, one blood test and perhaps one electrocardiogram, and who resent, or appear to resent, the concept of being tested. There are other sections of the community who nowadays demand complete parsing and analysis for every move. Both of these sections of the community find some practitioners easier to deal with than others and vice versa. Just as authority in medical science and teaching has declined (Topley 1940), so it is declining in medical practice with the increase in sophistication in certain sections of the community. The importance of the doctor-patient relationship will never vary, for in chronic disease the doctor himself is now recognised to be the most important therapeutic agent; psychiatrists and professors of medicine are just as likely to be placebo reactors as the medically unsophisticated; it is the level at which the doctor-patient relationship is conducted that varies. One detects an increasing tendency for the community to equate medical practice with medical science, an attitude all too common amongst the academic teachers of medicine. While it seems clear that the advances in medical care call for greater adaptability on the part of the patient, and personal action in disease prevention, the comment by Bridges-Webb (1968) is of interest, that more people regard the doctors and not themselves as responsible for their health. Taken at the community level this might imply that sections of the community look to medical organisations rather than their own public institutions as being responsible for health services.

With the knowledge that treatment of some diseases is facilitated by early diagnosis, there is an increasing demand for regular physical examinations supported by other laboratory examinations. In general terms, for the method to have value there must be a known remedy for an illness, or for slowing its rate of development, at the stage when the disease is diagnosed (Hutchinson 1960). Very few evaluations have been made. Schor and others (1964), reviewed the records of 360 patients subject to routine health assessments (using a wide battery of tests) who had died. Only 51 per cent of diseases causing death had been diagnosed at the last health examination. In the age group 50–59 years, when the majority of recorded deaths occurred, 60 per cent of those who died had been seen within one year of death and 75 per cent within two years of death. The only consolation was that the incidence of diagnosed diseases was much

higher in the group who died than in an age-matched but otherwise random sample of those who were still alive. Mass-survey techniques have their value in case-finding, for example for tuberculosis, and are being increasingly developed, as with diabetes. It is still too early to determine whether the application of cone biopsy of the uterine cervix in cases of cancer *in situ* diagnosed by routine cytology will alter the mortality rate from frank cancer of this type.

Health surveys of general practice show not only the frequency of minor illness but also of non-organic ill health. There are no figures to indicate whether there is a real or apparent increase in the number of patients consulting with ill health determined in this way. The determinants of non-organic ill health have only been analysed in recent decades, presumably because this form of illness has been revealed by the decline of serious acute disease.

The advances in more recent years still have to receive wide acceptance from the profession. These relate to understanding the motivation for requesting medical attention. While no practitioner can have failed to experience at times a disparity between the presenting symptoms and the real illness, which becomes apparent only after a satisfactory doctor-patient relationshhip is established, the actual incidence and the patterns and determinants of this type of psychodrama remain unexplored. What are the medical and social factors which determine whether the patient will present to the doctor, and what sort of doctor and where? (Mechanic and Newton 1965a). The psychological study of transactions has drawn attention to the problems of understanding how, why and when some persons adopt the sick role as an adaptive mechanism whether organic disease is present or not; the same question can be asked about situations where structural abnormality is capitalised upon. How can one separate the groups in morbidity data as well as in practice? (Mechanic and Newton 1965b). Most follow-up studies of hospital clientele show that there are more social and adaptive determinants of results than there are strictly medical determinants (Querido 1959); they show the need for considering the patient beyond the limits of merely physical symptomatology.

There is strong evidence that episodes of purely physical illness often occur in clusters and that in the life story of an individual patient these relate for the most part to disturbances in, and maladaptations to, life's experiences and environmental, particularly social, influences (Hinkle and Wolff 1958). It remains to be seen whether these aspects of behavioural medicine will necessitate a psychiatrist in the team of first-care doctors in addition to those proposed by McKeown and Lowe (1966) in order to take a full life and social history, or whether the natural development of medical knowledge, in particular the general 'fall-out' to all classes of practice from advances in any special discipline, will be sufficient to mark progress in this area. Hinkle (1964) expressed the view that the practitioner's job in the future really lies in analysis of man and his environment; how their interaction can be altered to the benefit of the health of the individual, implying a greater knowledge and understanding of human society, the determinants of human behaviour, and the action and reaction between individuals and those responsible for their medical care.

The interaction between medicine and the social sciences is not only

increasingly determining the character of practice and the attitudes of both the public and the profession to disease, its aetiology and management, but is revealing new concepts of disease. Although alcoholism is common in Australia (Derrick 1967) the profession has been slow to recognise it as a disease. As a disturbance of society, alcoholism has long been recognised both by those who have been chroniclers of social activities, for example Hogarth and Dickens, and by the formal students of social science. Alcoholism has not fitted the usual concept of disease as cellular pathology or its extensions into disturbances of function, including molecular and biochemical function. The concept of alcoholism as 'dis-ease', as a disorder of behaviour or a disorder of social adaptation, is only just gaining acceptance in limited medical circles as a nosological entity to be considered in aetiological and therapeutic terms, that is, in medical terms. The growth in this country, as elsewhere, of specialised centres for the treatment of alcoholism independent of the ordinary hospital and mental hospital services has largely been the result of public and not medical action. The community has taken the lead and the profession is now slowly following. Alcoholism is probably the first of a group of adaptive disorders of behaviour to be clearly recognised by medicine as a result of social pathology.

It seems that the traditional concepts of disease will be increasingly widened to include behavioural ill health consequent upon other disorders of social adaptation. The patterns of drug-addiction without orthodox psychiatric disease are beginning to follow; interest is being expressed in social pathology related to the alarming rate of traffic accidents, and soon must come medical interest in the social pathology of barbiturate and other non-narcotic drug habituation. In these areas, the public cannot act without therapeutic help being available; this involves the profession. Many argue that social offenders need not punishment, as in the past, but treatment. This clearly involves both medicine and the community, new diseases and new aetiologies.

Conclusions

There are limitations to the consideration of diseases as actual entities; there are no diseases, only sick people. The patterns of illness vary according to people, the patterns of their life, and according to the methods of observation. Mortality data have revealed age-dependent chronic diseases as the most important causes of death, the control of which will probably, as in the past, depend on the development of observations of natural experiments by those who work in disciplines apart from disease—directed research, health education and legislation. The patterns of disease as seen in hospital practice and in general practice differ; and experience in Australia indicates that the patterns of practice and the diseases presenting for treatment can be radically altered by financial decisions of the Federal Treasury and the voluntary health insurance organisations. Within the patterns of disease and their relationship to medical practice, adaptations between the medical profession and the community are continuously occurring; sometimes the lead is taken by the profession and at other times by the community. The paradox exists that the growth of specialisation, increasingly dependent on

the community's hospitals, has made therapeutic advances more difficult to acquire; individual members of the community must increasingly depend on their own resources and become increasingly adaptable in order to obtain the best medical care available. The continuously spreading contact between medical practice and sociology is revealing new concepts of disease: disorders of human behaviour to be studied, treated, and prevented. The diversification of medical practice increases the number of different avenues for the first doctor-patient relationship to be established for different classes of ill health.

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Discussion

CHAIRMAN'S REMARKS—D. N. F. DUNBAR

The three papers by Dubos, McKeown and Billington deal with different facets of this general problem. While there is a fairly clear agreement that the importance of infectious disease is now reduced to an insignificant level by comparison with other causes of death or serious illness, there is ample room for differences of opinion on where the major effort of the medical profession should be directed in order to meet community needs. Clearly there are many different situations requiring attention but the basic changes in incidence of disease call for a critical examination of current medical training and medical practice—in its widest sense.

One of our difficulties is to define what we mean by disease. What information is available about the incidence of such disabilities except through the medical profession at large? To what extent are our statistics affected by the willingness of a patient to seek treatment or advice, especially, for example, in mental illnesses? Once an effective treatment becomes available the apparent incidence of the condition increases. Yet we must attempt to analyse the variety of medical needs in the community and the means whereby they may be met.

Malnutrition and infectious diseases have been largely overcome by adequate provision of food and the elimination of many of the agencies of disease—not by treatment of the disease itself. Nevertheless there are still secondary effects of importance in both these areas. For example we have yet to cure the common cold.

While infectious diseases are no longer 'killers' they still take up a large fraction of the time of a general practitioner. Similarly childbirth, injections and routine examinations occupy another large slice of his time. This means that while there may be a need to modify the approach to some of the problems of disease, there are substantial continuing services to be provided in these very necessary fields, services which are frequently dismissed too lightly.

Are we training doctors today in a manner which will fit them to cope with the demands of the future? Attention must be given during the training period to the problems of caring for the aged and the mentally ill. Is too much importance being attached to scientific medicine? Are we, as a community, being blinded to more general and more pressing needs by the glamour of modern surgical miracles?

The increasing incidence of degenerative ailments and mental illnesses

—both of which require prolonged periods of treatment and care—not only draws attention to the adequacy of medical training but also calls for a close examination of the hospital systems of today and their success or failure in meeting this need. What alternatives are available and how effective are they? Should we seek a large comprehensive medical centre? Or would a series of smaller specialist groups be superior? Or again should the hospital service be taken to the patient?

Man is today less willing than ever before to accept pain, infirmity, or blemish. He now seeks to have corrected conditions which once would have been accepted or tolerated. This has arisen from improvements in diagnosis and better understanding of the underlying scientific principles. Nevertheless there is a strong tendency to reject the detailed testing and treatment which is often involved. Even if the patient is wealthy enough to meet the costs of complex therapy, what treatment is economically justified? Many of the most expensive techniques are available only to the poorest patients. Should any man be refused treatment on economic grounds?

To what extent is the concept of medical practice influenced by the economic position of the patient? In other words how extensively is the pattern of disease, as seen by the general practitioner or the hospital, influenced by the costs to the patient?

Today's higher standard of living, however, has brought with it a new set of medical problems and it is no longer obvious that further improvement in living standards will result in improvement in community health. Individual attitudes are vitally involved. While we are all aware of the hazards of chain-smoking and excessive consumption of alcohol, the dangers seem so indirect and far removed that few of us make the effort to avoid them.

Preventable disabilities seem to fall into two major categories: those which can be prevented by community or anonymous action; those which depend on the individual exercising self-discipline, and in which community action would be unacceptable because of an infringement of individual liberty.

These problems of preventable disabilities are likely to arise with increasing frequency in our modern urban environment. Indeed it is only now coming to our notice how important are the effects of pollution, of crowding, or rapid change in environment, and of tensions—all characteristics of urbanisation. There is ample scope for inquiry and action in this emerging phenomenon of modern city life. It is necessary to recognise the importance of the interaction of man with his environment because so many effects are observable only after a long period. This situation raises interesting problems of health education and the part to be played by doctors. Can the members of the medical profession continue to remain silent and anonymous on the many important issues facing the community today?

In the nineteenth century, manipulation of the environment produced the greatest improvements in health; in the twentieth century the concentration has been on the structure and mechanisms of the living organism and consequently on scientific medicine; perhaps the time is now ripe to re-examine the effects of our new environment.

SUMMARY

In considering changing patterns of disease and their implications for medical practice, the discussion focused attention on three groups of diseases: chronic and degenerative conditions, and what were called the diseases of civilisation and the diseases of technological societies. There was general agreement about the need to organise medical services and medical care so that they would not only reflect the likely increasing incidence of these, but also would emphasise the possibilities for their prevention. There was less agreement about how this could be achieved, particularly as it affected the future of the general practitioner, or the doctor in the community, and his training. Attention was again directed to a lack of information, both social and biological, which, it was suggested, was necessary for the organisation of services and the training of doctors.

Of the chronic and degenerative conditions, such as congenital disabilities, mental illness and diseases of ageing, it was noted that already in many Western societies they account for a high proportion of occupied hospital beds, that they are relatively intractable, and that their significance quantitatively was unlikely to decrease. The need for the organisation of medical care and particularly of the hospitals to adjust to the character of this problem was emphasised. It was said that the solution would in turn provide the starting point, and determine the priorities for the solution of other problems of medical care, such as the balance between scientific and technological medicine and community care, or the relation between the practitioner in the community and the specialist in the hospital. What this solution might be was less clear.

Discussion of the diseases of civilisation and of technological societies centred upon the possibilities of their prevention, the role of the medical profession in educating the community in this, and its implications for the training and the practice of the doctor in the community. The two groups of diseases were compared in their dependence on faulty patterns of human conduct, and contrasted in the former's relation to individual behaviour and the latter's relation to social behaviour—the comparison and contrast, for example, between cardiac and respiratory disease associated with overeating, cigarette-smoking and lack of exercise and that associated with air pollution such as from asbestos particles from car brake-linings. Technological society, it was said, is creating a new biological environment, with new needs and new problems, which will modify the disease patterns of the future; but we know little about these changes.

In considering the relevance of changing patterns of disease to the organisation of medical services and the training of doctors there was more agreement that these should reflect the changing patterns and be flexible enough to respond to them than there was about how this might be achieved. As examples, it was suggested that teaching centres and teaching hospitals could accept responsibility for providing medical services for a defined community as a basis for teaching the practice of medicine in the community, including the principles of preventive medicine. And it was suggested that doctors should be taught practice under conditions more like those which would be appropriate for the patterns of disease of the future. Training for teamwork in chronic care, and the role of the general practitioner in relation to the whole person, and his concern with the task

of primary prevention, were examples given. But apart from a discussion of the feasibility of the 'balanced hospital community' as a basis for organisation of medical services, no specific proposals were considered. A lack of adequate information on which to base proposals was again noted.

PART III

8 G. T. Harrell

Changes in Educational and Living Standards (i)

The last century has seen a world-wide shift from a rural, agrarian toward an industrial, urban society. This shift has resulted in a concentration of people and resources more and more in cities with less and less dispersion throughout the countryside. Simultaneously with the concentration, a rapid evolution of new social institutions and attitudes has occurred. There is also a rapid rate of growth and wider distribution of wealth and income.

Compulsory education for all people has been instituted in the developed countries and has resulted in greater numbers of people seeking higher education and a greater spread of educational opportunities among all classes.

The dramatic improvement in health, with a lengthening of the life span, has led to a change in attitude from a desire for cure of disease to a demand for maintenance of health. This change largely is a result of higher incomes and improved living standards. The expectations for medical care are for better quality, wider distribution, and greater availability of care than formerly. The greater use of medical care generates demand for even more health services of all types. The patterns of practice and systems for delivery of medical care face the challenge of change. Can the traditional, individual doctor-patient, highly confidential, interpersonal relationship continue to serve public demands and needs? Must an integrated system with many highly specialised professional and technically trained personnel be developed? Will any new system of medical practice inevitably follow industrial trends and become more impersonal and mechanised?

These questions are particularly pertinent in the development of a program for the establishment of a new medical school. They are equally as important in the adaptation of the existing educational and patient care programs to present needs.

Changes in educational standards

In the past, education of most people was in the simple skills of reading, writing and calculating. A much smaller proportion of the population continued into secondary school than at present and only a few pursued higher educational programs in the university. Education was oriented from the classical point of view in the liberal arts and the humanities. Little science was taught in the classical educational programs or those pointed toward the professions. The practice of the traditional non-medical professions

required some general knowledge of the principles of medical care. For example, a military commander would have to supervise measures in his army unit or ship for control of disease in peace-time and provide for the care of the wounded in war-time. In isolated rural areas without a physician, the churchman, as the most highly educated person in the community, often would give advice or render simple medical care.

Professional knowledge in all fields was transmitted chiefly by the apprenticeship method, and most professions took a guild approach so that information and techniques were not made available to the public. Though universities have had faculties of medicine since the Middle Ages, little education beyond the classics was possible. With the growth of the natural sciences, true educational programs for the scientific base of medicine became possible. Science has engendered great interest on the part of the public. Scientific advances, including those in the field of medicine, are now news in which the general public is interested and feels it has a right to the knowledge. Now, many reports appear in the lay press as soon as research findings are announced to the scientific world. Many technological advances in the natural sciences as well as in the applied sciences have economic implications. That these implications are recognised by the public is seen by the support given to societies for research and graduate education. As the application of research findings has improved the health of the people, the scientific base for medical practice has attracted even greater public interest and support.

Better education of the general public in science and wider availability of knowledge in the general field of medicine is possible as proportionately more people continue beyond the elementary educational programs. A better understanding of physiological processes, such as normal growth, development and behaviour, the principles of reproduction as applied to family spacing, nutrition, and the control of simple infections is possible in the context of the sociological unit—the family. The dramatic reduction in the incidence of enteric infections through governmental supervision or control of water supplies, sewage disposal and food processing plants has led the public to expect more and more improvement in health from all types of public health measures. The alteration of endemic arthropod-borne diseases has such striking economic implications that the public accepts and expects control through public health measures. The dramatic reduction in the incidence of malaria in many parts of the world is an example. A better understanding of the basic principles behind control of these important diseases can be taught during the general education of the public.

An understanding of the principles and application of them in the family and community offers the opportunity for a change in the role of the physician in the delivery of medical care in the future. As the public accepts more responsibility for organising and financing new methods or systems of medical care, the educational program for the physician can be adapted to them and better planned to serve them.

In the past, the apprenticeship approach to the training of the physician emphasised the art of medical practice and the development of manipulative skills. The basic education was more general and not directed toward the profession of medicine itself. As the natural sciences evolved, a basis for practice on a scientific floor was established. Training in the manipulative

skills both for diagnosis and treatment continues in the clinical years of the current curricula, using patients as in the past. True professional education is now possible, utilising the scientific method as an intellectual approach to problem solving. Research can now be used as a teaching tool. The application of research techniques to the educational process was developed first in the natural sciences, but has now been extended to the applied sciences. In medicine this trend began in the last century. Now, with the rapid rate of accumulation of factual knowledge through research, divergent trends are appearing. An increasing number of physicians trained through the M.D. degree route are needed to care for the public. In universities, research in the basic medical sciences has led to the recognition of the need for training some students through an approach leading to a research degree—the Ph.D. As a result, increasing numbers of faculty in these medical school departments are broadly university-oriented and have the Ph.D. rather than the M.D. as in the past. Increasing numbers of people trained in the allied health professions are taking this educational route to supervisory and teaching positions.

The practice of medicine, however, remains an art. The immutable law of biological variability cannot be altered by any amount of research. Because of the inherent variability between individuals in any living system, in order to meet scientific criteria, groups of individuals must be studied. In this fashion individual variations are smoothed out and a statistical approach to interpretation of data permits the drawing of scientifically valid conclusions. When data collected on an individual are interpreted in the light of conclusions drawn from study of a group, scientific criteria are not met. The application of data, regardless of how accurately and scientifically collected, when applied to the care of the individual patient is in the realm of art and not science. The approach to the educational program of practitioners in the healing arts must take these interpretations into account.

The change in the character of illness in the past three decades has resulted in an alteration in the chief causes of death and of morbidity. With the change, more emphasis should now be placed in the educational program on behaviour as a basic biological phenomenon which must be considered by all clinical disciplines. The functional overlay to organic illness is becoming more prominent and requires better understanding by the physician so that he can institute measures for its alleviation or control. More and more, the mimicking of illness by symptoms produced through the stresses of living in a highly competitive society has led to the recognition of the group of psychosomatic problems. Most of the stresses producing these symptoms arise either in the home or on the job. As society becomes more and more complex, education in the social and behavioural sciences, as part of the training of the physician, becomes imperative.

The professional program should not neglect the traditional classical education, particularly in the humanities. Although this education can begin in the pre-professional years, this period alone cannot be depended on to give the student an adequate background for practice throughout his professional lifetime. The relevance to the problems of patient care cannot be easily seen during the college years and the greatest motivation for study is therefore lacking. Education in the humanities should continue into the professional years of the curriculum. This need is particu-

larly important in a period of rapid social change and evolution of society. The better general education of the public, including some general understanding of biological principles as applied to medicine, will have implications for professional education. The public expects to be informed about the implications of disease. Increasingly, the public has accepted the use of all patients, regardless of economic status, for the teaching of medical students and house officers. Society also is beginning to accept the use of all patients in clinical research programs since it can see the results applied in the improved practice of all physicians in the community.

Changes in living standards

In the past, the chief industry was agriculture. The economic units were the family and the amount of land which could be tilled by it using manual skills and hand tools. Most diseases were bacterial, viral or parasitic in nature and were confined to the family unit. One member of a family would reinfect another so that the cycle was rarely broken, and diseases such as tuberculosis were passed from one generation to another. Injuries were largely fractures resulting from falls or accidents which often involved domestic animals. The economic resources of the family limited the purchase of such medical care as was available.

As society became industrialised, the emphasis shifted from cottage or family industries to mass production in factories. The faster production of almost unlimited quantities of standardised items became possible. As the volume of production increased, a lower unit price became possible so that the benefits of production were more widely available. Technological advances which continuously improved the product could be seen by the lay public and could be appreciated through the use of such products. By sharing in the fruits of production, the standards of living of large numbers of workers and their families in industry have risen. It is not as easy or simple to apply these same principles to agriculture. The introduction of mobile sources of power with the resultant increase in mechanisation has tended to consolidate the small family farms into large corporate units tilled by machines. These trends have resulted in the requirement for fewer workers who may have higher incomes and have more money to spend for medical care, but this trend has displaced large numbers of workers with minimal skills and has cut off their traditional economic support. These people usually are the workers with the least education.

These principles can be extrapolated to some of the service industries where a greater use of machines also replaces manual labour, but to a lesser extent. The principles, however, cannot be applied to professional services, including medicine. Exercise of professional judgment and the use of manipulative skills require essentially the same number of hours now in the care of the individual patient as in the past.

The urbanisation of society has resulted in the centralisation of supporting public services. Water supply, sewage disposal, electrical power and transportation are examples of services society has demanded be increasingly available and often supplied by government. Centralisation permits the development of measures for quality control by the same or an independent agency. This principle is being extended not only to public utilities and to

private enterprises such as food suppliers, but to hospitals, laboratories and other agencies for the delivery of medical care. The demands of the public for higher standards and the maintenance of these standards imply acceptance by the purveyors of more measures for control.

Rising living standards have helped improve the health of the people. Control of the epidemics of arthropod-borne diseases, such as typhus and plague, largely came about without the imposition of specific medical or public health measures. The improvement of general sanitation and of housing has tended to control rats, which are the vectors for these scourges. The role of pure water supplies in protecting the public against enteric infections was appreciated by the Romans. Later the recognition of the role played by the contamination of wells by sewage led to a reduction in the incidence of typhoid fever and dysentery. Central water purification plants and sewage treatment and disposal plants have proved to be very effective in rural or developing areas. Improved living standards began to change the character of tuberculosis and leprosy long before specific chemotherapeutic drugs were developed for treatment of these diseases. Improvement in housing and general nutrition were factors which increased resistance to a number of infections. The availability of canning plants or home techniques for the preservation and processing of food prevented the transmission of enteric infections or gastrointestinal disturbances from toxins produced by bacteria.

The development of effective chemotherapeutic drugs, particularly the sulfonamides and penicillin, has permitted the effective treatment of bacterial respiratory infections, especially pneumococcal pneumonia. The development of immunisation procedures and vaccines has reduced the number of deaths from acute infections which formerly affected many people, especially children. Diphtheria, pertussis, tetanus, and smallpox, to name a few, all now can be controlled. Although the vaccines against poliomyelitis have not prevented the proportionately large number of deaths as have other immunisations, their impact has been much more dramatic. As a result of all these measures, the chief causes of death have changed from acute, self-limited, infectious diseases to other types of illness. The episodic infections meant that successive visits to the physician were usually for different diseases. The physician often could do little more than offer comfort to the patient and family and wait for the natural history of the disease to run its course. Now most of these potentially fatal diseases are curable or preventable.

The chief causes of death now are heart disease, stroke, other vascular problems, and cancer. These illnesses are chronic and the natural history of the disease extends through months and years, if indeed it is not lifelong and genetically determined. These illnesses at present are not curable. Successive visits to the physician are for a steadily progressive process for which we lack the basic biological information on the mechanisms of causation to devise means for cure. Higher standards of living and greater incomes have resulted in increased use of animal sources of protein with the associated high content of saturated fats. The increased intake of these foods may have a bearing on the production of vascular problems. Similarly, greater affluence is reflected in greater use of alcohol and tobacco. Cigarette smoking, in particular, appears to have some connection with the increased

incidence of heart disease and of cancer of the lung. Higher standards of living have led to vastly increased use of the internal combustion engine as a source of power. The automobile apparently is the chief offender in air pollution of cities. Incomplete combustion of fossil fuels in electric generating plants and factories pollutes the atmosphere. The result of chronic inhalation or ingestion of pollutants from air, water, or the residual of chemical pesticides and preservatives in food in the production of prolonged intoxication and damage is not yet known. Automobile accidents are the chief causes of death now in the most productive years of young adulthood. The driving habits of people which lead to accidents are a reflection of behaviour as well as of training. The maiming accidents in industry often reflect behaviour, and we are learning more about the accident-prone individual. What the role of behaviour is in the incidence of home accidents is not clear.

The role of stress in the production of illness in a competitive society becomes increasingly important as the pace increases to obtain and retain jobs. The changing role of the woman in society, as more single and married women work to increase the family income, is altering the diseases seen in women. The greater number and availability of over-the-counter drugs is increasing the number of reactions from self-medication, and is a chief causative factor in the poisoning of children, particularly in the home. The fact that fewer illnesses are occurring, such as pneumococcal pneumonia which requires long periods of hospitalisation for treatment of the disease and its complications, means that more types of diseases can be treated in the hospital than formerly and for shorter periods of time. More attention can be given by all physicians to mental illness and to the functional overlay in other types of organic disease. The development of mood-altering drugs has shortened the average hospital stay for mental illness but has not decreased appreciably the number of beds continuously occupied by patients with these problems.

The changes in work habits and the development of industry-supported programs to share the cost of illness have introduced third parties into programs for support of medical care. These costs formerly were borne by the patient and the family. The increasing investment in equipment for diagnosis and treatment of illness is forcing groups of physicians to share the equipment. The urbanisation of society and its affluence is providing the money to build and equip institutions for health care. Formerly, people were born and died in their homes. Now, increasingly, they are being born and die in hospitals. These changes in the pattern and delivery of care and the reduction in the number of home visits by the physician are possible through improved means of transportation, chiefly the automobile. Greater accessibility and centralisation have resulted in increased demands for both the type and quantity of medical care provided. More reparative surgery is done and more efforts are made at rehabilitation after illnesses of all kinds. These efforts, along with the prevention of disease, require an increased use of the allied health professions and paramedical personnel. Increasingly, technically-trained workers with less education than the physician are being used to perform diagnostic and simple therapeutic measures. Society apparently must bear the cost for construction and maintenance of facilities to train these health workers and to provide a place for them to work. The

hospital is emerging as the focal point in the community for delivery of medical care by all levels of workers in the health fields. This trend has encouraged the tendency to support the health workers financially through salaries paid by the institution, with the cost passed on to the public through increased charges for technical services, rather than through professional fees. This principle can be seen in the fact that nurses now are employees of the hospital and rarely work for the family in the home. The professional supervision and technical performance of laboratory tests is done by salaried hospital employees.

Rising standards of living in the general population are reflected also in increased demands by the physician's family for a personal social life which more approximates that of others in the community. The physician himself, therefore, is less willing to be continuously on call seven days a week, twenty-four hours a day, without opportunities for personal recreation or intellectual stimulation.

Implications for practice

Effect of education of the public. In the past, the patient went to his family physician only when he was ill. He hoped for a cure of disease or repair of an injury. Increasingly, he now expects advice on a multitude of problems often related to the prevention of illness, the maintenance of health or the solution to personal problems. The public reads about scientific advances and sees dramatic results in themselves or members of their family from the use of 'miracle drugs' for treatment of acute infections, or of exotic surgical procedures such as open-heart operations. The public expects similar results in all diseases and is disappointed when the physician cannot meet their expectations. Formerly, the family physician decided when the patient required specialised care. Now, with increasing public knowledge, patients are referring themselves to a specialist they have selected on the basis of their own evaluation of the medical problem and of the physician's competence. The wisdom of this process can be seriously questioned, but it is the result of public decision and demand. The profession has responded by increasing the specialisation of practice. A group of highly specialised medical practitioners can meet patient care needs in an urban setting. This organisation usually is not possible in a rural or sparsely settled area, though some such clinics are effective in the western United States. The alternatives to increasingly fragmented specialisation are professional insistence on the patient having a family physician who would do the initial visit and decide on referral; substitution of a group of specialists or clinic for the solo family physician as the first point of contact; or the development of a different person, perhaps a new type of family physician or someone else with less training and less responsibility, who will screen the complaints and serve as a triage officer for the disposition of the problem.

Effect of living standards. When a member of the public experiences for the first time a complete health evaluation at university medical school standards, he recognises the difference from his past experience. Unfortunately the patient often is impressed more by the complex equipment used and the number and diversity of laboratory tests done than by the quality of the professional evaluation. He recognises the possibility of early

detection of a disease process, or of his susceptibility to factors which may lead to serious illness. The public has indicated its willingness to pay for studies of this kind. The actual laboratory tests can be done by technically trained personnel. Automation of the techniques leads to a lower unit cost per test and permits a battery of screening tests to be performed on a patient with no more human effort on the part of the technician and little more cost to the patient than a single test would require. Automated techniques require large capital investment for the equipment, and their dependable use must have a program of quality control.

These factors lead to centralisation of equipment and personnel. With some tests the sample can be sent some distance for analysis. In the case of blood, it usually will require some local processing, such as separation of plasma to obtain an accurate reading, as in a potassium determination. Electrocardiograms can be sent by wire, recorded and read centrally. The interpretation can be made by a physician or initially screened by a computer. Electroencephalograms cannot be similarly transmitted because of electronic noise, but the tracings could be made locally and the sheets mailed for interpretation. Other tests, such as some X-ray fluoroscopic procedures, require the simultaneous presence of the patient and the professional man. Image intensification techniques for gastrointestinal series can be used and the image displayed on a television monitor elsewhere. Cine radiographic films can be made locally by a technician and sent some distance for interpretation. The presence of the radiologist, however, is necessary for early detection of many types of abnormalities through manoeuvres which he personally performs that can be done by the professionally trained person, but could not be expected from a technician running a routine test. These measures make it logical to place the sophisticated laboratory diagnostic functions in a regional hospital or clinic. Whether a full-time completely professionally-trained physician is in residence, or comes periodically to a series of regional medical centres, as did the old-fashioned circuit rider, will depend on the volume of work and the availability of the physicians required. In cities, particularly in a university teaching hospital, the availability of equipment and personnel poses no great problem. The solutions to these problems are largely economic. The overall cost to the public is comparable, whether the financial responsibility is that of the patient himself, a third-party plan for pre-payment or insurance, or is assumed by government.

The supervision and control of the public health services are currently accepted as a government responsibility. Should the supervision in rural areas at the level of the individual family be the responsibility of the government, or of the local physician working with sanitarians and other paramedical personnel who may be based in a government agency? The training of the physician would have to be different if he were to accept this responsibility. From a more didactic point of view such training would be better done in an area where the specific problems exist than in a distant spot. These problems vary with each country. As more paramedical personnel are used in the delivery of medical care, it can be anticipated that those who are trained together at all levels will work better together. The various people will understand more fully their roles in practice in the community. An inevitable tendency exists, if paramedical personnel are placed in a community alone or are permitted to work independently, for them to try to

become separate professions. Should this separation occur, medical care would be further fragmented.

Effect on the physician. The physician is most efficient in terms of his time if he works in an office or clinic setting and the patients come to him. The technique of air evacuation by helicopter developed in war-time makes it less important that the physician be at the site of injury, accident or serious illness. Trained personnel, such as a military medical corpsman can do the first-aid and transport the patient. The cost is great, but the saving in professional time and better final results may easily justify the expenditure. If a physician's base is in or adjacent to a regional hospital he can use the diagnostic services of various laboratories and can use treatment facilities, such as an emergency room or minor operating room, for biopsies he might not wish to attempt in his own office. These central facilities can be shared by a number of physicians and their use is made more efficient. A computer to analyse statistically the most likely diagnostic possibilities should be located in a central place. A computer is an efficient device for the storage of large volumes of data and for rapid recall. Remote terminals can be placed in the individual physician's office, but the volume of work done there and the present high cost will probably make this use prohibitive for some years to come. In addition, there is a danger in the use of an increasingly mechanised approach to what is essentially a humanistic problem—the care of a patient. Mechanisation may alter the attitude of a professional man, particularly during the formative student years, and certainly has caused unfavourable reactions on the part of some patients. No substitute has been devised for the physician seeing and talking to the patient, regardless of the amount of equipment and the personnel used to help him.The physician can delegate some follow-up visits in the home to a less well-trained person than himself. A 'family health advisor' could educate the patient and the family in the meaning of disease and train them in techniques to be followed in the home for long-term care.

Increasingly, medical care of all types is being given to ambulant patients. The ambulant patient can come to a regional clinic or hospital. If the hospital is not within commuting distance he can be housed in an ambulatory unit in the hospital for minimal self-care until it is safe for him to go home. Diagnostic studies can be done less expensively in such a unit than on the traditional hospital nursing floor. An ambulatory inpatient unit can be used for convalescence or for extended care after the patient has been discharged from the acute nursing unit of the hospital. However, acute and intensive levels of care must be done in a hospital. These types of care increasingly are utilising monitoring techniques which can be fed into a computer. Limits can be established which, if exceeded, will sound a warning and alert medical personnel. Physicians must understand the principles behind such devices in order to evaluate the data displayed, and to detect errors in mechanical performance. These techniques require a trained electronic technician or an engineer for maintenance, and are expensive to install and operate. They do reduce continuous bedside observation by professionally-trained personnel.

The public is demanding that the physician keep up with most recent advances in care. When he begins medical school, the physician is committed to continuing self-education for the rest of his professional life.

Continuing education can be done best if it is related to patients under the physician's care. It is easiest in terms of effort and achieves the highest motivation of the physician if continuing or refresher education is done in a hospital where the physician works. This location does have the distraction of the demands of day-to-day practice, however. If the physician goes to a university teaching hospital away from his home base, a locum tenens is usually required if he is in solo practice. If the locum tenens is a post-graduate student such as a house officer who is still in training and is two to three years post-M.D., the experience can be beneficial to him in his own education. If the physician is practising in a group clinic setting the locum tenens may not be needed, but if he is, he can be watched and helped by experienced senior physicians. The older physicians will also get the benefit of teaching a less experienced one, which is one of the best ways for them to learn at the same time.

Conclusions

Improved standards of public education have raised people's expectations concerning the quality, type, extent, and availability of medical care.

Greater incomes and wider distribution of wealth have increased the demands of the public for health services of all types. These demands cannot be met by the number of individual physicians currently being produced if they practise alone in the traditional fashion.

Increased knowledge of basic mechanisms of disease attained through research has been applied to medical practice, and has resulted in a change in the pattern of disease, with alteration in the causes of death and lengthening of the life span.

Research has developed sophisticated, often automated instruments and techniques for diagnosis and treatment of disease. The cost of these techniques and the need for quality control have resulted in a trend towards the centralisation of these resources, facilities, and personnel in institutions.

The world-wide urbanisation of society also has furthered the trend towards the development of the community hospital or health centre as the focal point for the delivery of medical care. These trends also have promoted the organisation of group practices composed of specialists based in an institution or clinic.

Improved transportation through better roads and wider distribution of automobiles permits the patient to come to the physician in a setting where he is more effective and efficient. An office in or near a medical institution provides access to diagnostic and treatment facilities and to technically-trained personnel who can perform tasks formerly done by the physician himself when he practised alone.

The public has recognised the improvement of health care in recent decades and has demonstrated its willingness to support larger, better-equipped hospitals and clinics. People have accepted greater government participation and control through public health measures in the provision of essential services such as water supplies and supervision of food processing.

These trends pose a challenge to universities to develop programs of professional education which retain the best of the traditional, personalised, humanistic doctor-patient relationship in a system of delivery of care that is becoming larger, more impersonal and mechanistic.

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D. C. Wallace

Changes in Educational and Living Standards (ii)

Demographers are as a rule cautious in predicting the state of things to come, and with good reason. The only certain thing they can do is to state that if certain trends continue or are altered in such and such a way, then in a given period the situation will be so and so. Depending on the likelihood of their assumptions being true, their predictions can have a strong or slight chance of coming about.

One can make informed guesses about the future educational and living standards half a century from now, but one has only to retreat thirty years and see that statisticians as eminent as Fisher (1930) were seriously concerned about declining national population to realise just how much in error such attempts can be. Birth and death rates can alter rapidly and the former rate is almost in these days a whim of fashion, as variable as the height of the feminine hemline.

Despite this there is one aspect of future humanity that one can be certain about. Biologically the human race will not have altered in the period of time under discussion. People will still be people, subject to the same basic strengths and weaknesses as they are today, with the same level of basic intelligence as they now have and, though education may alter their expression, with the same basic drives as now influence them.

Emotions and the means by which our various emotional states are set will not have altered, and this does give us a sure footing from which to attempt to foresee the future. One can reasonably assume that educational levels and living standards will be higher at the turn of the century than they are now. The school leaving age is rising, university enrolment is snowballing and both national and individual productivity is increasing. From this one may assume not only that people will desire better and more expert medical care, for we want this now, but that they will be better able to afford the type of medical care they desire.

What medical care do we desire? The most satisfactory episodes of medical care, not only for the patient but for the doctor as well, are those infrequent consultations in the homes of wealthy patients, when one makes a leisurely journey, spends sufficient time with the patient and his or her medical advisor, meets and discusses the case with relatives, attends to the matters of medical care, is suitably regaled and returns home. The doctor is pleased for he has received the flattering compliment that his opinion is desired not only by his patient, but, more important, by his colleague. The

patient is content for he escapes the inconvenience and the irrational fear of the hospital or doctor's consulting room and at the same time is comforted to know that an expert has given due consideration to his illness, and no detail will be omitted that might help speed his recovery.

No matter how rapid nor how revolutionary changes in the technological aspects of medicine become, there will still be a place for this type of medicine, and because it is the type of service we as highly-educated and relatively well-off members of the Australian community want today, it will be the type of service desired and therefore obtainable by a larger proportion of the better-educated and better-off community of tomorrow. Planners of medical services must keep this in mind, for it is the most humane and most humanly satisfying form of medical practice.

Unfortunately, all medical service cannot become as idyllic as this. There can never be enough medical graduates to provide such a service to everyone for every illness. It is wasteful of time and medical skills, and these are both in short supply now and will become more so in future. It would be instructive to examine alterations in the ratio of doctor to population which have occurred in the past. But in considering this one would also be advised to remember that these medical graduates are distributed in different ways as regards their tasks, so that it is not simply a matter of accepting that as there might be somewhat fewer patients per doctor, there must be more time for a doctor to spend on each patient. The reverse is so. Whereas in 1935, 75 per cent of medical graduates were engaged in general practice, in 1965 only 35 per cent were still so engaged (Llewellyn-Jones 1969). Medical graduates are doubling up on certain types of illness, for instance intensive coronary care, and leaving less and less time available for the care of cases with minor illness, much to the irritation of the increasingly well-informed and prosperous sufferer from a small ailment.

Where is the balance to be struck? To what degree should the patient get what he wants—kindly, competent and adequate care out of hospital or clinic? And to what extent should he get what can be given—technologically complicated and intensive team care which is only possible within the confines of a large institution? Before attempting to postulate answers to these problems certain additional considerations should be taken into account.

Teachers' attitudes and student recruitment. The type of training given to the medical undergraduate will of course greatly influence the type of medical practice he will enter following graduation, but much more than this will he be influenced by attitudes within the profession, and particularly among his teachers. In my own generation of students, a lost one as far as general practice is concerned, we received a competent all-round training directed at producing general practitioners, but the attitude of our teachers was that the general practitioner was a failed specialist, and accordingly few of us remained any length of time in this field. Prospects of financial reward have an effect on the new graduate but this is not really a very important consideration in his choice of career.

A disturbing development in recent times has been the falling off in proportion of school leavers who take up scientific subjects at the university (Thornton 1968). Amongst several possible explanations for this, the most probable is that non-scientific careers are seen as more profitable in terms

of material prospects and more likely to result in elevation to the top echelons of management in a managerial society. The consequences of this for medicine could be disastrous, for medicine depends for its continued progress on attracting its share of the most intellectually gifted of the community. For our culture at large, the results could be as bad. The most highly intelligent should always attack the hard disciplines; the soft should be the province of the less well-endowed, and this will not remain so if the science graduate finds himself continually subordinate either physically or financially to the graduate in arts.

Leisure and its implications. In assuming that future society will have a higher living standard and better education, it is implicit that there will be more leisure available to the individual. The major effect of such a change on medical practice will be to accentuate the pressure already raised in the profession for increased leisure. The present situation in this regard is poor and has been deteriorating. In part this is a consequence of the fee-for-service system of remuneration whereby the harder a doctor works the more he earns. But probably more important has been the relative lowering of cost for individual services, so that a doctor has to work considerably harder to earn the same living standard as he had thirty years ago. Total medicine costs have risen and are rising astronomically, as by more refined investigation and more intensive treatment we squeeze a few more per cent of certainty into the probability of correct diagnosis and a few more months on to expectation of life. At the same time the leisure available to the medical graduate has been diminishing, and his standard of living with it. In due course this must inevitably make medicine a less attractive career to the matriculating student, and a very vicious circle will commence.

Postgraduate education. A corollary of this is the steadily growing need for postgraduate instruction. In our present system it is a considerable financial hardship to undertake any useful form of postgraduate instruction, and the harder a doctor works the more difficult it becomes for him to find the time for such work.

In the undergraduate milieu, and possibly to a lesser extent in the early postgraduate years, the most academically successful students are encouraged to enter the various fields of clinical research which lie open. In planning medical education the consequences of draining off the cream of the young graduates into such fields must be carefully considered. My most recent acquaintance with medical undergraduates was in Scotland during 1967 and I was impressed that the activity most highly regarded by them was clinical research, and that the less it had to do with the bother of considering the patient and his illness the better. There seemed a very definite running away from the troubles of treating disease to the calmer and more academic pursuits of clinical science. The pendulum may have swung too far. What is needed, as in the balance between science and the arts already mentioned, is a balance between medical research and the treatment of illness.

In regard to living standards, the way seems clearly mapped out already. The public ward patient, short of the geriatric group, has virtually disappeared in many areas (Saint 1960). The honorary system, with all its evils of charity medicine and its consequences, both as regards loss of income to the physician for work diligently performed, and loss of dignity to

the patient, is an anachronism that should have disappeared twenty years ago. It is reasonable to expect that it will have gone in the near future, to be replaced by some form of sessional salaried service. It is reasonable also to expect that as national wealth grows the medical service to pensioners and the geriatric group generally will rise towards the level of the general population.

The problem of uneven and inadequate medical care in an affluent society is receiving attention at the moment (Battistella and Southby 1968). Though there will always be a segment of the population who will be unable on their own account to afford good medical care, it is reasonable to expect that their contract with the physician will be underwritten in a financial sense by government money. It is in this sense that I feel the public patient will disappear; the indigent patient will remain, but he will be treated for all practical purposes as one who can pay his way. Much thought must go into deciding how this is to be done, but now that the community is alerted to the problem a solution must be found.

The educated patient. The consequence of better educational standards in the population as regards the actual conduct of medical treatment is likely to be relatively minor. The days when the consultant could stand lecturing at the bedside of a public ward patient, confident in the knowledge that the uneducated person in the bed would not have any understanding of the long words he used, are long gone. Already patients demand, and should receive a reasonable explanation of their medical problem and its treatment. In this regard further general education is unlikely to make the patient more cognisant of the intricacies of medical diagnosis and treatment. In fact medicine is now so intricate that we ourselves are almost in the position of laymen when attacked by an ailment which lies beyond the sphere of our own immediate interest and experience.

It is well to remember that one cannot equate education with intelligence. The irrational fear of the hospital and the almost superstitious distaste for illness which one finds in the layman has little to do with raising either his educational or his living standard beyond a certain level already reached by most members of our society. This will still remain and will need to be dealt with. Greater appreciation of the impact of social environment on the patient and his illness may lead to better employment of our knowledge of the social sciences in the service of medicine.

Lastly, the resistance of society to radical change must be appreciated. We speak of a rapidly changing environment but this very phrase has overtones of conservatism. Human beings and human society both resent change; a little variety is allowable certainly, but any real alteration in our way of life is opposed with great vehemence. This is much more so in our social relationships than in material things. We will reluctantly agree that electric light is better than gas, but most people would still vastly prefer the comforting availability of the family doctor in a sudden nocturnal illness to the arrival of an unfamiliar team from the nearest medical centre.

Implications for medical practice

The purpose of this conference is to answer the question of how these and many other factors will affect the medical services of the future. To this

question there is at once no answer and there are many answers. One cannot say what is the best form of medical practice, nor can one be sure what medical practice will be like in future. Yet one can plan medical practice in fair detail and keep to the plan, or one can merely improve what is desirable and eliminate that which is undesirable from present methods. An infinity of options is available.

Firstly let us consider the question of a salaried national health service. Most non-medical people, educated or uneducated, wealthy or poor, probably in their heart of hearts think this is a desirable thing. Yet experience in Britain demonstrates that the higher the educational level and the higher the income of the individual, the more likely he is to seek private treatment for himself when he needs medical advice. As we are postulating a rising standard of both of these, and as our living standards are at the moment somewhat higher than in Britain, it should follow that more and more of the population would seek to avoid making use of such a service even when available. I do not think we need expect to see a salaried national health service introduced in Australia, nor need we plan for one. More government money will enter the medical service but the private contract between the doctor and patient which has existed since Aesculapius (Toole 1968) will remain the basis of most medical treatment.

One might with some success uphold the thesis that despite any elevation in educational and living standards medical practice will not alter basically in the immediate future, and this is the view to which I incline. However, it has altered considerably since early in the century and will be expected to do at least as rapidly in the next half-century. At the risk of being proved grievously in error, I shall now make some definite predictions. The most important is that I expect to see the extinction of public hospital practice as it is now understood. It is already more than half gone; most patients are charged for hospital services, be they public or private patients. The standards of service available to the two categories blur into one another more and more. I make use of my resident staff to help me with my private patients; it makes my life easier and gives the patient better service. I have no qualms about using private patients for teaching purposes and they enjoy the opportunity. I hope to see the honorary system go very shortly, to be replaced by one or another system of payment.

I expect to see a continued existence of the general practitioner in some form. We can all imagine forms of service in which he is abolished, replaced by any of a number of alternatives, and most of these systems would work quite satisfactorily. However, they are revolutionary in nature and are certainly not desired by the community. The doctor of first contact working privately in the community is certain to remain. If the general practitioner's status is lowered by declining social level, impossible load of work, diminishing real income and sheer exasperation from inability to practise interesting medicine, so that no-one can be recruited for this work, then a new group of specialists will fill his place. I cannot see that any form of tertiary education will be set up to produce something equivalent to the medicine boy of New Guinea or the feldsher of Eastern Europe. Such people could do the minor jobs of the general practitioner and perform his sorting activities very well, but they are alien to the desires of our community, lay and medical, and will not be produced.

I hope to see, and would encourage by all means, the growth of ever larger group practices. Incidentally, I condemn as retrograde the current official campaign against their designation as area clinics. The Goulburn Medical Clinic is an area clinic and it is foolish that we cannot call ourselves by this name. Group practice is not the subject of this paper but I would suggest that it is a form of first contact service which is evolving at present to meet the requirements of the increase in complexity of medicine and the need for doctors to partake of the improvements in living standards of the community (Wallace 1964). A method of encouraging the group practice ideal is to put some further thought into the integration of hospital and general practitioner services. In many ways unco-ordinated efforts have been made in various parts of this country. One might mention the domiciliary services of the Royal Newcastle Hospital (Gibson 1965) and the physical incorporation of medical consulting rooms with hospitals seen in so many teaching hospitals today, also set up so many years ago for the general practitioner services in Colac, Victoria. So I expect to see more and bigger and better hospital-oriented group practices. Do not forget that a group practice is economically a more profitable method of practising medicine than any other.

Much has been said about the value of having a family doctor and of the desire of an individual to have one doctor to whom he may turn for medical advice and who has a detailed knowledge of his social and medical background. Little has been said of the reverse side of the relationship. Familiarity too often dulls suspicion. How often do we all have cause to reproach ourselves for failing to see a new illness occur in an old patient because we had become too used to him and his old ailments. All patients should see a new doctor once in a while and group practice provides this freshness of approach while preserving the family doctor's knowledge.

This leads to a further prediction. It is that as the educational level of the population rises the stigma attached to the mental hospital will drop, and present moves towards integration of this service with other medical services will in time prove wholly successful. The stigma of mental disease will take long to erase. It is deeply ingrained in our own thinking as medical graduates—one has only to look at the obvious motivation behind the articles ascribing George III's undoubted madness to porphyria (MacAlpine and Hunter 1966): 'He wasn't mad, poor fellow, he had an inborn disorder of metabolism'. It should not matter in our emotional approach to his mental disorder, and in due course we and the community will really accept that mental and physical illness are different aspects of the same thing.

This brings me to the end of my predictions. I think they can be summed up very simply. I expect to see a continuance of the present fee-for-service type of medical practice. I do not expect there to be development of a lesser-trained level of medical personnel to act as a first contact between patient and medical services. I expect to see a survival of general practice in some form, with a closer integration of services—hospital, group and general practice, mental health and, though it has not been mentioned so far, public health and preventive medicine.

Certain aspects of a future community which we hope will be better-off and better-educated should be mentioned for their negative value. Human ignorance and credulity will remain. The Rasputins of the future may alter

their patter, but fringe medicine will still be present. In my opinion it is all bad and should be frowned upon, but in my experience, little harm is done as a rule to the patient who submits to it. I cannot recollect a patient who suffered from the ministrations of a 'quack' and have seen far too many who have died needlessly owing to the failure of their medical advisor to consider their symptoms serious enough for careful consideration.

Besides this matter of credulity, which one hopes concerns only the minority of unintelligent and emotionally unstable people, there is a more serious and subtle process going on which has its effect on the intelligent and thinking members of the lay public as well. This is the news value of certain aspects of medicine. In the past we have had experience of the positive evil produced by the publication in popular periodicals of potted items on medical topics, which have had the effect of misinforming the general public on vital issues which they have not the background knowledge to evaluate. The debate on smoking and cancer is a classical example. More recently the impact on the public of many television documentaries on medical subjects has been horrifying. It is to be hoped that some control will be exercised by responsible medical administrators on these matters.

One of the more serious consequences of such a lopsided presentation of medicine to the public is a demand for unnecessary investigation. We have all had experience of the patient who has no need for detailed investigation but who has been most unhappy when his medical adviser has not gone through the expensive motions of ordering the X-rays and haematological investigations the patient thinks he needs.

Geriatrics. This matter is not particularly germane to the subject of this essay, but it is so important that some mention should be made of it. The elderly form one large group whose living standards may not rise in the future and whose medical care may in consequence be second-rate, at a time when they can be expected to make up an increasing bulk of the total numbers needing medical attention. No-one can claim that their treatment at present in this country is on a level commensurate with other sections of the community. In part this is a simple question of economics, but also in part it is a consequence of medical training. Teachers are naturally interested in acute medicine and resent the 'vegetable patch' of chronic illness that clogs up the beds in their wards, and this attitude communicates itself very effectively to their students. Chronicity and multiplicity of small defects are the hallmarks of disease in old age, and so this becomes less attractive as a field in which to work and is relegated to second-rate, time-serving practitioners.

Geriatrics is not, and should not become, a discipline separate from the rest of medicine, and the tendency to split it off from general medicine in the same way as institutional psychiatry should be resisted in the interests of society as a whole. It should be realised that a much greater part of the medical care of the world of tomorrow will of necessity be devoted to conditions we now describe as chronic degenerative disease, and students should not only receive an adequate grounding in the care and management of such disorders but an attempt should be made to orient them towards regarding these disorders as a challenge more worthy of their attack than many of the acute conditions under investigation today. The value of this was demonstrated when the Postgraduate School at Hammersmith Hospital

was commenced. It took over an old local government hospital filled with chronic 'uninteresting' cases. The medical team attacked one of the problems they found there and completely altered the understanding and management of chronic respiratory disorders. It became a live and interesting field in which to work.

Rural practice. Despite the growth of metropolitan areas in Australia there will always remain a sparsely-populated hinterland comprising perhaps one-third of the total population of the community. The people living in these areas will demand, and should be given, if possible, a medical service as good as that obtainable in the cities. In the large country centres with populations of 25,000 and upwards this should present no problem. They are large enough to support a medical and paramedical community which can cope with the basic medical needs of the area. In smaller centres this becomes an increasing problem, and as educational and living standards rise it is becoming ever more obvious that people living in these areas find the absence of reasonable medical care more and more annoying. Dr Baden Cooke who has a much longer experience than I have of rural practice has recently spoken on this subject (Cooke 1968). His solution is to provide an expanded bush nursing service and a decreased number of medical practices in rural areas. I do not feel that this is adequate. Admittedly it is bad for both doctor and community to put a doctor in a solo practice in an isolated area for years on end, where he stagnates and his standards drop. But there is really no proper substitute for a medical graduate, as any man living in a rural area will tell you, and it is a great hardship if that graduate is more than thirty miles distant. Better transport helps but it will get little better than it is today until far into the distant future. A solution is the Norwegian one of requiring the young graduate to spend a year in isolated areas. It is good for him and good for the community he serves. Rising living standards mean greater mobility of population. This can refer to the doctor as well as to the man in the street, and a year or so spent as a young man in a rural area should be acceptable to any medical man, no matter what his ultimate career is to be.

Hospital practice. Hospital practice, it must be accepted, will have changed out of all recognition within twenty years. Look at what we have seen in the past two decades—the disappearance of tuberculosis sanitoria, the rise of the intensive care wards, the fall of the open general ward, the rise of geriatrics and so on. Will alterations in educational and living standards have any great bearing on trends in medical treatment within the hospital? It is questionable, except in so far as the extinction of the public patient is concerned. People may demand more intensive investigation, be more insistent about receiving the best therapy, be less easily hoodwinked by facile explanations than at present; but in general hospital medicine will proceed despite such changes, for it depends on the alterations caused by disease in a biologically unchanging human organism. Hospital practice will alter in accordance with changes in medical knowledge and patterns of disease, not in accordance with the living standards and general knowledge of hospital patients.

What is medicine?

Finally, there are the questions of what comprises medicine; and of what does lie within the province of the practitioner. As educational standards rise, so one finds more and more fields being regarded as coming within the doctor's province. Medical genetics is a field of rapidly growing importance which is virtually new. Alcoholism, juvenile delinquency, marital unhappiness, and the social problems of geriatric care are all recent additions to the medical sphere, and along with these runs the growing realisation of the important part sociological concepts have to play in the provision of medical care. We who were trained in physical medicine remain uneasy when confronted with these sociological problems. The medical student of tomorrow must have an adequate training in the social sciences and be taught to work much more closely in association with experts in these fields. With this broadening of the scope of medicine and with the limit to the number of doctors that one can expect the community to provide, it becomes obvious that there can never be enough medical graduates to provide a complete service. As medicine enters more fields, so it must rationalise and relinquish some previously regarded as its sole province. Ancillary disciplines such as nursing must take over more of the routine management of illness. A small instance of what I mean can be mentioned here. When I was a student, a nurse never recorded a blood pressure or took a blood sample. This was doctors' work. Now we regard it as reasonable for a probationer to be trained in these techniques, while trained nursing staff are expected to know how to observe a cardiac monitor and to apply a defibrillating shock. How much more work can reasonably be delegated to leave the medical graduate time to cope with his more varied tasks?

As a thought on the question of the impact of rising living and educational standards on medical practice, and a very sobering one too, one could easily imagine a situation arising in an egalitarian society where illness prior to old age had been virtually abolished, in which medicine would have very little attraction as a low status occupation concerned with the messy business of birth and lingering death, requiring long hours of work and long years of difficult study to master. Recruitment of good students into such a profession might be a very difficult problem then. If this conference decides on nothing else, it should resolve that the status of medicine as a profession and as a branch of the biological sciences must be continuously maintained at the highest possible level.

Conclusions

As this is a very personal paper, I should like to conclude by making some observations on an individual note. Like Canute, I feel that one cannot order the tide to retreat. There are certain trends in medicine which one must accept as rolling on inevitably like the incoming sea. These one cannot oppose. Luckily, most that I observe seem to point towards a better medical service. However, one can direct these trends to a greater or lesser extent, and I can see certain directions in which I should like to see medicine be encouraged to evolve.

I should like to see the steady disappearance of the private surgeries

dotted at random throughout our towns and cities, and their replacement by larger integrated clinics where doctors may work in proximity to readily available hospital services, and where much more use could be made of ancillary services—social workers, nursing services, physical medicine, special investigations and so on—than is the case today. By this means the medical graduate could reserve his time and interest for the performance of tasks for which his skills fit him, and in consequence his talents would not be wasted. His contact with his fellows would not only maintain his interest in medicine, but their observation of his work would compel him to produce his best. Not only this, but such concentration of services would reduce waste and would be sounder economically.

Although the financing of medical care must still depend basically on a private contract between patient and physician, government could well take steps to support, at least in part, the ancillary services. These can never become a commercially profitable proposition, and however desirable they might be they are unlikely to be provided by the unaided commercial enterprise of the private practitioner of medicine.

In essence, a better-educated and better-off future community should be willing and able to provide itself with a co-ordinated, humane, and efficient medical service, satisfying to doctors and their patients alike.

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Discussion

CHAIRMAN'S REMARKS—W. D. BORRIE

There are a number of common elements in the two papers by Dr Harrell and Dr Wallace:

The expectation of rising real incomes *per capita,* affluent though we are already.

Continued concentration in urban areas (although, as Dr Wallace emphasises, there will continue to be a widespread third of Australia's population over rural and small town areas).

The increasing importance of public health services and medical and chemical science in controlling infectious diseases and sustaining an environment in which life expectations may be expected to continue at seventy or more years.

Universal compulsory education taking the young people through at least three years of secondary schooling and an increasing proportion to the end of the school curricula and on to tertiary education.

Hence the increasing capacity of the consumers of medical skills to be aware of the basic requirements of maintaining reasonable health without recourse to medical advice, and even to make some self-diagnosis and treatment of common ailments.

The increasing mobility of people which increasingly enables them to go to a doctor, medical centre or hospital, thus reducing their dependence upon domiciliary services by a doctor.

The papers then consider a number of matters which may be classified under two headings:

The impact of these changes upon the consumers of medical skills;
Their impact upon medical services and medical science.

Impact on consumers. Here the points that might be emphasised for discussion are:

The services required in childbirth, now almost wholly institutionalised in hospitals.

The comparatively little need (historically speaking) for medical attention in the home for children of school and university age.

The increasing tendency for medical checks and medical welfare of these

age groups to be the responsibility of institutions (schools, universities, industry, and other major employers).

Medical requirements of young married couples associated with pregnancy and birth, and, from an increasingly early age, with effective contraception to avoid unwanted pregnancies until menopause.

The increasing range of self-administered drugs purchased without medical advice.

The relatively small amount of medical attention required from adulthood to advanced middle age in a population with our life expectations, other than for the matters indicated above.

The increasing importance of psychosomatic complaints and problems.

The increasing importance of geriatric care and the treatment of degenerative diseases.

Impact on medical services. The increasing importance of medical and biological research which can check and prevent infectious diseases.

The limited role of the general practitioner as a family doctor and his developing role as the first contact and point of referral to specialist or hospital services.

The increasing importance of the association of the doctor of first contact with a group practice, thus giving easy access to specialist services.

The importance of developing links between such practice and the hospital system (especially in relation to computer control, data-bank storage, computer retrieval of information, and in some instances, computer-assisted diagnosis).

The emphasis upon ambulatory patients and the increasing capacity of patients, even in rural areas, to go to the medical centre, rather than the doctor going to the patient, although the demand for the latter may be continued for some time by the more wealthy section of society (a point emphasised by Dr Wallace).

The increasing significance of the hospital as an essential part of a community, although on the one hand there is still considerable consumer resistance to hospitalisation, while on the other hand there is probably no longer much resistance to the group practice or medical centre as a place of treatment.

The increasing obsolescence of the honorary system within hospitals as these trends develop and as increasing affluence and efficient medical health schemes (socialised or by private insurance) enable increasing proportions of the population to expect and pay for the same expert treatment.

The impact of advances in medical science upon the training of the doctor, increasing the emphasis upon advanced postgraduate training and specialisation.

The increasing necessity for doctors with sociological and psychological training to serve the growing needs of social deviance, mental disorders, and problems of old age and degeneration. (The Report of the United Kingdom Royal Commission on Medical Education anticipates the changes required for fitting the doctors both to the advances in medical knowledge and to the modern community by emphasising that all doctors—general practitioners as well as consultants—will be specialists in particular aspects of medicine, and that every doctor who wishes to exercise a substantial measure of independent clinical judgment will be required to have a substantial post-

graduate professional training—'the aim of the undergraduate course should be to produce not a finished doctor but a broadly educated man who can become a doctor by further training'.)

The increasing use of paramedical persons for many minor domiciliary services (for example nurses and social workers), and also in diagnostic and other health services associated with medical centres or hospitals (for example X-ray, computer diagnosis, blood tests, and minor pathological tests).

But while advances in education may be greatly increasing people's perception of health problems and increasing their capacity to sustain reasonable health by self-help, the whole system of health control must be backed by increasingly extensive medical and biological research, diagnostic services and high quality medical services within hospitals. This prompts the question as to whether these costs are tending to outrun the increases in real incomes and so require increasingly social investments and income redistribution if a 'new poor' is not to develop within the affluent society, in terms of equality of medical treatment.

This tendency is exacerbated by the fact that the main drive for the improvement of human life appears still to be how to extend its duration rather than its quality within existing life spans. The search for eternal life always receives society's sanction, but in so far as this means conquering the degenerative diseases it is expensive; and even at existing life spans it is the ageing who most need society's help, for they tend to be the ones least able to meet the cost of proper medical care. Both the extension of life and the proper treatment of medical and psychological problems within existing life spans and associated with the complex patterns of life of modern urbanised and mass society have become extremely expensive, and both Dr Harrell and Dr Wallace seem to me to assume that their efficient provision will mean a greater degree of social control—and by implication income transference in favour of the less wealthy and older members of society—than exists at present either in the United States or in Australia.

One is tempted to ask if the search for affluence and immortality is not after all leading to medical socialism.

SUMMARY

The discussion on the whole was marked by some tentativeness. This was due not merely to it being the first and therefore a 'settling-in' session, but also to the demonstrated lack of survey material of the adequacy required to justify firm conclusions about the relation of advances in incomes and educational standards to medical practice.

In the broadest terms it was evident that rising average incomes did not necessarily produce better quality or more widespread adequacy of medical service. Likewise while changes in educational standards had certain obvious impact, such as rising expectations of doctors and of the medical services, it was not altogether clear that these had produced an easier or more fruitful doctor-patient relationship, or that medical 'awareness' (much of it obtained from mass media) on the part of the consumer made for a better and more constructive understanding of the doctor and his problems on the part of the patient.

Rising affluence and medical research had together certainly brought about some changes including a wider effectiveness in controlling infectious diseases; but it was evident that affluence and educational changes had not yet produced answers to the problems of urban and rural poor. Medical costs tended to rise as fast, if not faster, than average incomes, leaving the less-than-average income earners in even greater need of organised social effort to meet their requirements. Again it was evident to laymen and medical practitioners alike that despite scientific advances in medicine many everyday problems such as the problems of an ageing population were not satisfactorily catered for in terms either of medical or social organisation. Yet again it was evident that some of the concomitants of rising affluence in practice were urbanisation and complexity of living which in turn produced new and pressing problems and tensions in life. Medicine may still be an art but the practitioner has to embrace a wider understanding of the social factors than had once been thought necessary.

The discussion left the *rapporteur* with the strong impression that opinion present recognised that higher levels of education and incomes pointed to medical problems and possibilities of future organisation to meet them, but gave no definite lead. The need to provide the patient with individual counselling in the midst of, or, more especially, because of increasing centralisation of the more expensive and increasingly improved elements in medical service, was strongly stressed. Not so firmly stressed but none the less evident was a realisation that rising educational standards, average incomes and rising costs did point, as the two prepared papers suggested, to more group practice, more rational development of hospitals as medical centres concerned with all aspects of medical care in the community they served, and not least to more medico-sociological research on the issues traversed in the papers and in the debates. It was more than clear that the day of *laissez-faire* in medical practice was gone. This fact must influence the structure of medical education, even if the precise mixture of public and private action and initiative in medical practice was not yet easily predictable.

PART IV

10 H. A. F. Dudley

Developments in Medical Science and Technology (i)

The authors of papers for this conference are at the outset faced with problems of definition. They may operate only in the beam of their particular searchlight of understanding (Popper 1959; Davies 1965) which in turn is narrow or broad according to their training and bias. This paper will adhere tenuously to the following definitions:

Medical science. In the first half of this paper we shall use the word science in the somewhat superficial and orthodox sense of organised observation and the deductive argument therefrom which leads to systematised knowledge. Implicit in such usage is the idea that by sufficient observation and its collation, knowledge will always be revealed and logical action can therefore follow.

In the second half of the paper where, rather than recounting what has gone before, we will be endeavouring to predict what might be the future influence of science and technology on medical practice, the definition will differ, approximating to that developed in a number of publications by Popper (for example Popper 1963). In his view the scientific attitude or approach consists in constructing hypotheses about natural phenomena and putting these ideas to the test by appropriately designed experiments. The results may support (confirm is too strong a word), reject, or modify the hypothesis. A corollary of this view is that the construction of hypotheses can be applied to the methods of experiment; definitions, language, and techniques become a subject of hypothesis and inquiry in a manner that simpler axiomatic science tends to neglect.

The difference between the two definitions is of considerable importance in the context of this paper. The past influence of science on medicine has been largely in the first sense—the provision of factual framework for the rationalisation of medical phenomena. We speak somewhat glibly of scientific medicine but while this is a partially acceptable term it needs more careful dissection. In so far as much of the basis of our knowledge of disease origin and process is now based upon observation carried out in accord with scientific canon, medicine is at least partially scientific. There exist many gaps in the scientific framework, and whole areas of human activity and behaviour have as yet hardly come into the ambit of the scientist interested in medicine, or the doctor interested in scientific observation. But there are good reasons to hope that many of these gaps will be filled, reasons which are reinforced by a growing emphasis on social and behavi-

oural problems. However, in so far as the appellation 'scientific' refers to the methodology of clinical medicine—the way we practise in relation to the patient—we are as yet hardly entitled to use the word. Mostly, we are still using an intuitive and random guesswork approach to our patients and have scarcely begun to submit the bedside attitude to scientific study. In particular, we have, in the second sense of 'scientific', had little occasion to erect or test hypotheses about clinical methods. It will be one task of this paper to show in some detail that this omission is of importance to the future direction of medicine and of considerable significance in education.

Technology. This may be defined as the necessary organisation and development required to translate ideas, hypotheses, and facts into effective action. Inevitably and obviously there is much intermingling of science, social goals, and economic feasibility which determine or should determine the attainment of the technical end. In the exploitation of medical scientific achievements there is increasingly a conflict between feasibility and desirability in a social sense. (In passing it might be mentioned that the word 'achievement' is ill-chosen but has been hallowed by common usage. As with 'fight' (against cancer, stroke, and so on), 'breakthrough', and 'struggle', it has connotations of the doctor locked in a deadly struggle with the forces of evil (disease), imparting to him a Galahad-like role in which he can do no wrong.)

Medical practice. This is defined predominantly, but not exclusively, as clinical practice of organised groups of doctors and their associates and colleagues on a common site or sites—the hospital, medical centre or other area where professional groups collaborate.

Influence of medical science and technology in the last hundred years

Little formal study has so far been made of the influence of biological science and technology on human affairs. We are all vaguely aware that such influence has probably been considerable; we can cite instances where both science and technology have greatly altered the doctor's approach—asepsis, penicillin, and vaccination are among the usual examples. But it is often difficult to disentangle biological and medical matters from the general meshwork of scientific and social thought and action. Thus, statements on past influences are bound to be largely subjective interpretations rather than hypotheses tested by experiments or even facts garnered in a scientific manner. One may derive some reassurance in that this is a common situation in all historical fields; history is by definition interpretative and it is uncommon to have the opportunity to test the hypotheses which are put forward. Even the reporter-like activities of the professional historian represent his view of the way matters come about. Indeed, G. M. Young (1936) defined history as 'the way Herodotus and Fra Paolo and Tocqueville and Maitland and all these people say things happen'. We might add 'and how Young, Trevelyan, Macaulay and all these people interpreted what others saw and wrote'. Consequently in endeavouring to define the influence of science and technology on medical practice, firstly we are to a considerable extent dependent upon the opinions of others as set down in the history of our subject particularly during the past century; secondly, we are necessarily biased by our own attitudes towards what we know of facts that have

already been brought to light or which we have discovered ourselves.

This digression on history may appear so trite as to be unnecessary but it is of significance in understanding where we are in the relation between science, technology, and medical practice today. There is a tendency amongst doctors (one which is reinforced by certain aspects of their training and professional lives) to accept their present position as inevitable and to believe that their attitudes towards the conduct of medical practice are inevitably right and historically inescapable. It occurs to few to question the belief that they are flotsam in the flood waters of progress. Indeed, passivity and objectivity become mixed in their minds. Leach (1967), speaking in a general scientific context, has recently well stated this need to escape from our historical chains:

> Why do so many of us talk as if the advancing sweep of technology were a natural catastrophe beyond all human control? If you ask a professional scientist that question he will probably simply reinforce your alarm insisting that genuine human control is impossible . . . that being so the wise man must avoid all involvement in practical affairs . . . all true science must aim at objective truth and that means that the human observer must never allow himself to get emotionally mixed up with his subject matter. Detachment is obligatory.

Returning specifically to medicine over the past one hundred years or so, we may take as our thesis that the advancing sweep to which Leach refers has placed in the hands of doctors and their co-workers enough knowledge to permit deep advances in understanding and quite remarkable technical feats. It is scarcely surprising therefore, that faced with a rich vein of scientific gold the doctor should concentrate on methods of winning and refining it, neglecting perhaps the influence of his product on the market. The profession has adopted the line of least resistance by following what has appeared to be the most acceptable pathway of scientific exploitation; it has been further encouraged to do so by the classic stance of objectivity in which the influence of the observer on the phenomena studied is held to a minimum, and the observer or manipulator is not held responsible for the outcome (in the human as distinct from the mechanistic sense). The monument in Western medicine to this concentration on discovery and mechanistic analysis is the modern hospital, particularly the teaching hospital where the dissection and management of process has dominated medical practice. Modern hospital medicine is process-orientated and technique-exploiting—not, of course, without very considerable success. But to achieve this success it has been necessary to narrow the approach to admit only the study of these things that fall clearly within the ambit of the conventional scientific approach. Not all investigation and experiment is subject to the obliterative wrath of Fisher (1966), but particularly in the last two decades there has been an increasing feeling that what cannot be precisely measured or manipulated without influence by the observer is not worthy of attention. An idea is only respectable if it is followed by a carefully designed, controlled experiment (which often establishes, let it be said, the obvious). Speculations which involve the observer, concepts which do not render themselves open to immediate precise testing, have come, as a consequence of this unnecessarily narrow scientific approach, to be regarded as second-rate. Scientific respectability is a state of mind engendered by

having tidy papers published in reputable journals whose format is stereotyped (Medawar 1964); proliferation of such activity leads to increased research grants allotted to your peers so as to enable you to pursue the same line. Scientific medicine in this sense has chosen to investigate only one small facet of human disease, to make its study important, and through the creation of the hospital to dominate the technical and therapeutic arena. Balint and Balint (1961) have well expressed this fear:

> In scientific medicine, especially since the establishment of pathological anatomy as the highest court of appeal for any medical problem, practically all attention has been concentrated on the study of the iatrogenous illness, while the autogenous illness which often has no anatomical basis has been more and more considered as a largely irrelevant nuisance.

Their definitions of the terms iatrogenous and autogenous are roughly equivalent, on the one hand, to what the doctor chooses to abstract, using his scientific bias towards controlled and verifiable observation, and on the other hand, to the patient's total disordered reaction to this environment.

It may be rightly objected that there is little virtue in asking questions for which we believe (either intuitively or from the state of our knowledge and technology) that there are at the moment no meaningful answers (Dent 1967; Platt 1967 a and b; Medawar 1967). However, it is also true that the growth of fact and technology and a receptive environment for the exploitation of both tends to close the mind to speculation.

Another factor which has contributed to a narrow view of medical science is the action-orientated nature of the average doctor. It must be presumed that men and women become doctors because they want to do something in relation to their fellow man; action rather than contemplation is their mainspring. Thus, faced with a press of problems which, because of associated human suffering, always appear urgent, medical people tend to act first and to postpone until later or indefinitely consideration of philosophical conundrums or social implications. Nowhere is this better seen than in the surgeon whose stereotype is the driving, courageous, decision-maker ready to operate on anything at any time and to bask in the warmth of the patient's gratitude. As with all stereotypes this is a caricature, but nevertheless short-term thinking tends to crowd out the long-term and it is rare indeed to find a philosophical surgeon (except in the stoic sense of the word). However, physicians should not regard themselves as immune; although they tend to allot to internal medicine the philosophic touch, the last quarter of a century in particular has seen the growth of a technically well-endowed group of non-surgeons whose intuition has been increasingly modified by their knowledge of process and their mastery of procedure. The gold-headed cane has given way to the cardiac catheter as much as the dirty frock-coat has been supplanted by gown and autoclave.

A final influence upon the course of development of medical technology has been the self-generative effect of scientific medicine; those who are satisfied with the yield of an analytic approach based upon facts or axioms are inclined to look scornfully at those they regard as less rational. By contrast, those whose guidance in medicine is admittedly intuitive and emotional often adopt a slightly derogatory attitude towards their deductive colleagues. Each tend to regard their own philosophy as sufficient and inviolate. We have here the basis for a two cultures situation (Snow 1964)

and, although the phrase has lost its impact in the general debate between science and the humanities, it has still a place in defining a split such as this in the narrower field of medical practice. Over the last fifty years or so the scientists have assumed such ascendancy as to drive those less formally equipped into a corner where they stand at bay, spitting out repetitive philosophical arguments in a language that many scientists do not understand. The schism is of importance in that technical growth based upon a narrow interpretation of science has caused considerable friction between groups, and has interfered notably with attempts to change the direction of the advancing front of medicine or to relate it to community need. Where there are internal faction fights unanimity on policy is unlikely; repeatedly papers appear, on the one hand pleading for a greater emphasis on scientific medicine, on the other hand urging the retention of the art of medicine. The latter term is not defined except by exclusion, nor usually is any attempt made to extend the former to include anything but the analysis of process in biochemical or biophysical language. The position taken up by the two groups is not commonly associated with any attempt to bridge the gap, and if anything, is more calculated to maintain division than to create synthesis.

The teaching hospital. We have outlined briefly, and to a degree by exaggeration, the present dominance of scientific medicine and technology. This dominance has in turn led to a marked growth in Western society of therapeutic powerhouses—the hospitals—in which the analysis and manipulation of process has often come to outweigh the importance of people. It hardly requires stressing that if these powerhouses are employed as major educational tools it is very likely that they will produce good engineers. Technical performance has a considerable attraction (perhaps in part because of its imitative and repetitive features) and in consequence the student or young graduate is easily swept up into acquiring little but skills based upon sound factual knowledge and pragmatism, but associated with process rather than persons. He may also be conditioned to regard matters which are inexplicable within the terms of his scientific vocabulary as unnecessary or irrelevant.

Three other matters assist in directing the student towards the performance aspects of his subject. First, by taking refuge in action rather than initial thought, he can acquire a mask, can cut himself off from the considerable emotional impact that the problems of the sick may make upon him. As Berger and Mohr (1967) say: 'It is generally assumed that doctors take a professional view of suffering . . . yet the suffering which certain doctors witness may be more of a strain than is generally admitted'. It is this strain which contributes to the acquisition of a professional approach in which action rather than contemplation can afford the escape route from the impact of emotional involvement. Keniston (1967) expresses this well when he writes: 'The coldly "scientific" approach may receive powerful assistance from the student's drive for omnicompetence as a means of self-protection against stress'. Again in an imitative manner the student or young doctor sees this professional attitude in his superiors and will regard it as worth acquiring for this if no other reason. It must not be forgotten, however, that for many the acquisition of a persona of indifference in the face of suffering may be a traumatic or difficult process. Some at least of the loss of motivation that seems to characterise the early clinical years of study

may represent a struggle to acquire a measure of detachment from the whirlpool of suffering.

Secondly, in our catalogue of factors which direct the hospital-educated student towards the goal of technical competence alone, we live in a scientifically and technically orientated world in which there is not only a genuine interest in science (supplemented and sustained by the free communication channels of the mass media), but also increasingly a concern by scientists to acquaint the public with the results of scientific work in order that research and development funds should be continually available. Consequently, an overlay of 'rightness' and of technical glamour exists in a scientifically orientated career within medicine. The orthodox scientist or technician holds the stage and has often every intention of remaining before the footlights for as long as possible. Medical spectaculars such as the transplantation of organs or the breakthroughs in cancer research that take place every month or so must have considerable influence on the attitudes of a student or a doctor, especially when they are backed by the arguments of persuasive (sometimes even plausible) men. The general view he will adopt could be that as long as we work long enough and hard enough at the analysis of processes we shall achieve everything for the best. The problem is not, of course, confined to medicine. Expenditure on big science and big technology is the order of the day. Both can generate big if not overpowering arguments for their continued support and can even sometimes create an air of injured rectitude (based upon varying premises such as national prestige, 'spin off', and pigheadedness) which it is difficult to counter without appearing in the guise of a spoilsport. Perhaps this is but a specific instance of the general ability of corporations and institutions to manipulate public demand (in the guise of need) to suit their ends (see Galbraith 1967).

Thirdly, our technically educated public finds it easy to identify service when it is clearly associated with a concrete result or purpose. The layman of today can see the analogy between an herniorrhaphy and a new front suspension more clearly than he can between the teacher's role in establishing attitudes in his child and the doctor's possible role in advising the same child or counselling him when in difficulties. In certain societies, of which Australia is one, he is thus more prepared to pay for technical service. Technically orientated society, therefore, can pressure the doctor to a certain extent into a particular role, one which for other reasons he is often prepared to accept.

Medical practice today

We may summarise at this point by saying that medical practice in Western society today, is conditioned and narrowed by the growth of science and technology acting on a largely passive and convinced profession who, in common with other areas, are certain of the rectitude and adequacy of their approach. Other factors peculiar to medicine have favoured a situation where action-orientation based upon technology provides a satisfactory outlet and a shield for the doctor. It remains briefly to examine the further and secondary influence these matters have had upon the overall practice of medicine within and without the hospital.

We have already emphasised that by acting as the scientific powerhouse, the hospital has become the centre of acceptable technological development. In doing so it has achieved three things, all interrelated but conveniently dealt with separately. Firstly, it has created for itself a self-sustaining group of pressures and taboos, which work to reinforce its own position (Revans 1964; Cartwright 1964). Some of these patterns of behaviour may be the desirable infrastructure for any human group but others, such as the concentration on process which we have already discussed, are antagonistic to new thinking. The hospital and its staff regard themselves as an ingroup, by definition requiring that there exists as well an outgroup which in the eyes of the former is likely to be less privileged and even less well-endowed intellectually (that is, less prepared to use methods of thought and action acceptable to the hospital ingroup). Secondly, and at least in part as a consequence, there has developed from hospital dominance a view that there are two classes of doctors. McKeown (1962) expresses this felicitously when he writes:

> . . . it is sometimes suggested that doctors fall naturally into two classes: those who like to give personal service and are less interested in work which is intellectually or technically more exacting; and those who like to give specialised care to referred patients . . . to the extent that it exists, this bimodality is due less to a law of Nature than to the tradition of medical education and practice.

While it is possible that such a basic difference really does exist, we have at the moment only a very third-rate clinical impression to support it. The difference as it is expressed in modern medical practice is one which has become established by scientific and technical impact and training during the last century and no more (McKeown 1962).

Thirdly, there has arisen from the apparent emphasis on the technical expertise of the hospital and from the intellectual and emotional appeal that it engenders, a view that one method of solving some of the ills of the practice of medicine is to make it possible for all doctors to use the hospital. However, this is but a conventional response to the medical education and technical pressures that we have described; educated by a hospital, imbued with its narrow but safe precepts and conscious of the untidy world outside its walls, the graduate feels that he could better practise as he was taught if he has direct access to hospital machinery. In communities where such access exists (in Australia, for example), the predominantly 'extra-hospital' practitioner or first contact doctor seems to have more job satisfaction—but this is tautological for, if he is trained in hospital medicine, it is inevitable he will find satisfaction in being able so to practise.

It must be mentioned in passing, however, that the criticism of the doctor-hospital relationship contained in the previous paragraphs cannot be viewed in isolation. For better or worse society has created, in response to various medical and lay pressures, a hospital system. For the doctor who graduates today the system is there, and much as we may wish to alter either his relationship to it or his tasks without it (the latter may be preferable, as Fox (1962) has emphasised), we must recognise that this can be done only against the background of existing institutions. This is particularly the case when society's investment, economic and emotional, is considerable; such is certainly the case with hospitals.

Constructive influences of new technology

What has been written here so far about science, technology and the hospital has been critical if not derogatory. It should not be forgotten that the growth of knowledge has placed in our hands two powerful weapons. On the one hand a greater ability in many fields to alleviate personal suffering; on the other hand to undertake self-analysis in a manner previously thought impossible or unnecessary. We should pause here to consider the two levels of analysis that are possible: first, the continued reasoned criticism of what is being done within the established framework; secondly, the testing of the framework and the consequent formation of alterations and extensions to it.

At the first level the medical profession has already come a long way by providing detailed analysis of performance—predominantly it must be admitted of how patients (usually groups rather than individuals) should respond to treatment by living, dying, sustaining complications, or conforming to a certain criterion after the lapse of a certain time. We have still far to go to establish yardsticks of how doctors should respond to given situations—how, for example, a general practice should be run (Jungfer and Last 1964); what governs the decision-making of hospital doctors, or what is the doctors' managerial role. But there exists a methodology for developing such studies given that the medical profession can except them without totally undermining its self-confidence and self-esteem.

An increasing awareness within society of what can be technically achieved will enforce critical analysis of performance upon the doctor. In this sphere the technically orientated society serves in medicine as in many other fields to sharpen the doctor's performance. The techniques of operational research, although not to be regarded in the way their prophets would wish, as total panaceas, are powerful tools in an attempt to understand the complex workings of a hospital or group of doctors and patients. It is perhaps an indication of the orientation of much medical education that whereas operational research and its mathematical structure has found wide acceptance in engineering technology and business, it is having a hard fight for a respectable position in medicine.

However, it is to the second level—that of formulating extensions to our present logical and investigative framework—that the writer looks for the most hopeful future impact of science and technology on the practice of medicine, and it is to this that the remainder of this paper will be devoted.

Two cultures in clinical medicine

If we return momentarily to the two cultures situation outlined earlier we may say with brevity and at the expense of but a little accuracy that its existence is based upon failure of communication, in turn the consequence of lack of a common language. If we change the definition of science from passive observation and deduction to experimental testing of hypotheses—however inadequate both may be—and if we become increasingly concerned with the application of our tests to situations which involve ourselves, this language barrier should disappear. In simple terms, if we recognise that all human phenomena may be studied, if not explained, by common techniques then we shall have gone a long way towards providing a synthesis suited to

our times. The techniques involved will be an agglomeration of those used by conventional science—observation, analysis, breakdown into components—and of those more associated with practice—intuition, hypothesis, and conjecture. Medical science can then give place to a science of medicine in which the techniques used will be not only the controlled trial and the carefully limited experiment but also methods designed to give broader answers to general hypotheses, to test, for example, intuitive sequences and heuristic behaviour. What is fundamental is that the two groups should agree that their methodology has common attributes: for example, the doctor testing a diagnosis by pattern recognition, goal-seeking or the calculation of probabilities is acting much in the same way as a scientist who designs an experiment to explore a hypothesis based partly on previous acquired knowledge and partly upon new ideas or relations that have sprung into his own mind. That doyen of philosophers, Popper (1959), uses words which would gladden the heart of those frightened by conventional science: 'Looking at the matter from the psychological angle, I am inclined to think that scientific discovery is impossible without faith in ideas which are of a purely speculative kind and sometimes even quite hazy'.

What we might call the agglomerative approach to natural phenomena will rest on a more tolerant behaviour towards each other by both cultures, a pattern of interaction which in turn will be the consequence of their day-to-day contact. Towards this end new physical structures for medical care—medical centres, health centres, group practices—are possible sources of better understanding between disciplines and thus of less divergent development. It is a tenable hypothesis that this in turn would then lead to a better service by medicine to the community. However, creation of the desire for interaction on the basis of satisfactory organisational and architectural environments is of itself no guarantee that fruitful exchange will take place. In fact, the physical organisations carry with them the aspirations of men and so tend to create a self-congratulatory atmosphere in which the aims must be regarded as achieved. Effective criticism of large new medical organisations from within or without tends usually to be met by a closing of ranks. Anyone who has taken part in the design of new hospitals or the growth of new medical schools, or both, can support this conclusion.

It is much more likely that currently separate philosophies of medicine will come together to form a common science through the medium of more critical analysis of educational roles and goals. As at this time medical graduates reflect our own attitudes, biases and stereotypes, so for the future we may achieve most by a redefinition, on our student's behalf, of science, technology and practice.

Influences on the medical curriculum

In designing new curricula we must look both to the past influence of science and technology and to the hopeful synthesis between formal scientific method and the intuitive techniques of the clinician which could take place in the future. Within the compass of this paper we shall make only three recommendations. First, that we undertake a much more detailed analysis of the methods used by clinicians in day-to-day practice and the pressures exerted upon them and that we use this analysis as the basis of our clinical

teaching, having introduced the student to the doubts and uncertainties which pervade scientific knowledge. Although argument by analogy is dangerous, we can liken our current situation in education for the practice of medicine to that of conventional mathematical teaching in the schools. For many years we have said to children 'do this, do that, learn this, learn that, multiply here, divide there' without much, if any, consideration of our or the child's understanding. Now, as Heritage (1966) says, we endeavour to show that mathematics 'is not a set of acrobatics with symbols done to rule but an intelligible and logical procedure of thought'. Similarly in learning for clinical medicine we have instructed the student to acquire a rather limited range of repetitive skills, a clinical multiplication table from which, almost without other endeavour (apart from some vague mental process in which art and experience are blended in a feat of mental legerdemain), he can be expected to solve complex real-life human problems. What is now required is an approach to a calculus of medicine—the phrase is Card's (1966) but its use here has a somewhat wider meaning—which seeks to give the student an understanding of concepts such as disease, diagnosis, and problem solving; also of the interaction between the doctor in his various roles and the patient in his; of the heterogeneity and variability of biological data; of the logical basis of decision-making. These are matters of continuous concern to the doctor in his day-to-day contact with patients. Until now we have had little incentive to undertake such analysis but the advent of potential mimics for the clinician (mainly but not entirely computer-based) has prompted a finer dissection of what he is and does. This in turn opens the way to a better clinical education and requires others responsible for medical education to fall in line.

In retrospect it is tempting to argue, as I have done elsewhere (Dudley 1967) that an additional factor in disturbing motivation in the late years of the clinical course is the mental confusion sustained by the student when, fresh from the factual, deductive and limited world of the laboratory, he is confronted with the clinician who, however much lip service may be paid to scientific information, uses much more complicated and seemingly illogical methods to reach diagnostic and therapeutic goals. American students are often said to show less loss of motivation than those in the British Commonwealth and, as with a host of other differences, this is usually ascribed without evidence to their greater maturity. However, it may also be the consequence of less clinical ritual and mumbo-jumbo in American clinical education: appeals to intuition are less common than those to the diagnostic laboratory. Clinical medicine is more intelligible in the terms that they have already learnt, is more black and white and therefore easier to assimilate. It may be narrow into the bargain.

The conventional logic of the laboratory is 'act only from or in accord with known facts'. The medical situation, as Ramalingaswami (1967) has said, is one where willy-nilly the doctor '. . . must act. He must make decisions with inadequate data with too many variables . . . he must make tentative clinical diagnosis based upon intelligent guess-work. Problem solving, decision-making and judgment are the attributes that must figure predominantly in the educational process'. In education for business and for war, some attention is now being paid to these difficult but studiable and teachable areas. But the application of the same ideas to medicine has

scarcely begun, nor can we hope to attain to satisfactory clinical education and proper exploration of science and technology until we have analysed this aspect of medical science.

By way of summary, we may say that the development of medicine in the last hundred years has been by the accretion of scientific and technical knowledge to an established and empirical method of practice. Scientific medicine has rationalised some of the empiricism but has not influenced the philosophy. The very phrase implies that there is also a non-scientific medicine. We should now re-examine the outdated system which insists that both scientific and non-scientific medicine co-exist, taking as our basic premise that all natural phenomena are susceptible to hypothesis and experiment, although some areas are meantime so complex and multifactorial that the hypotheses or tests may be difficult, impossible to formulate, or quite untidy and incomplete. Only so can we teach better for the future and escape from a rigid system which posterity will regard as similar to what we now look upon as the persistence of Galenical thinking.

It is very probable that as we search for a better science of medicine some sacred cows will have to be led to the slaughter: for example, that the most satisfactory approach is always through an exhaustive history and physical examination; that the observations of good clinicians are not subject to error; that laboratory diagnosis is always an adjunct and placed later in time than clinical diagnosis; that for some situations the patient really needs a doctor as distinct from a first-class technician; that research in the laboratory sense is the life-blood of medical education. These and many others have remained largely unchallenged throughout the past century.

In making an attempt to create a science of medicine (a science of medical practice might be preferable) so that science and technology may broadly rather than narrowly influence the contribution medicine makes to the community, it is easy, as the past few paragraphs have done, to build educational castles in the upper firmament or to wander unchecked through a garden of bright images. As with engineering and education, medicine must practise while it preaches and radical changes must be worked by substitution or addition into an existing framework. Particularly is this true for the socio-economic basis of medical practice. The pressures mentioned earlier create a certain type of medical practice; to fashion men and women in a different educational mould and then expect them to meet and change the whole pattern of society's expectations of them is an idle and even dangerous concept. As we stand today, medicine largely follows social patterns (including political ones) rather than creates them.

It may be argued that if society really wants and needs doctors better based in the science of medicine it must free them from the tyranny of the social marketplace. It cannot be guaranteed that this will lead to a liberalisation of teaching and practice such as I believe necessary, but it may be an essential pre-requisite. And in reflecting on the history of the British National Health Service we may recognise how true this is. Separation of service from payment gave an opportunity to refashion the practice of medicine in a quite revolutionary way. But it came at the wrong time; scientific medicine and process technology were rampant, so that the consequence was the emergence of a powerful hospital system and a group of missionless doctors outside it. The educational opportunity was not so

much missed as not yet established. The widespread unrest within the profession represents the dinosaurial educational synaptic delay in groping towards new definitions. To my mind, as appears from the body of this paper, we have still much to do before we have a definitive basis for the medical education of the next generation. However, medico-political criticism of the British National Health Service ignores the fact that some of the opportunities missed in 1948 need not be lost in 1968 or 1978.

So that the reader may, if possible, be left in less doubt on the possible content of what should be an introduction to the science of medicine, the Appendix gives an outline of headings. Some of these are already being explored at Monash University and in many other centres. The Appendix does not necessarily constitute a course; in fact, this is probably a poor way of influencing student attitudes. Rather does it consist of a group of subjects and attitudes which should be contained in and permeate all formal teaching. As is clear, some will be more appropriate to selected disciplines than to others, but none is unique.

It is of importance to re-emphasise that it should be a canon of belief for those teaching in a medical school that this aspect of medicine is susceptible to analysis and study. The physiologist speculating on a feed-back loop in cardiovascular dynamics, the immunologist pondering a hypothesis in tissue rejection, the surgeon contemplating an acute abdomen, the psychiatrist thinking about a mental illness, all can and should use the same methods. As teachers they must make it clear to their students that there is a challenge in understanding the science of medicine, but to do so they themselves must have a deep appreciation of the philosophy involved. The divisive influences between the relatively pure scientist in the laboratory, the scientific clinician in the clinical laboratory, and the intuitive clinician in the wards can be submerged if all will agree to adopt the attitude that medicine should be taught and practised as a science in the modern sense. A better-equipped generation of doctors, whatever their ultimate technical role, should emerge.

The last point that I should like to make in this paper is to repeat the opening statement. We look at these matters from our own viewpoint and my suggestions on a science of medicine are only a reflection of new thinking in clinical medicine. Far broader concepts in the discipline of human biology may be required to remould the influence of science on medicine within which a science of medical practice can take its place (see for example Burnet's recent Stawell oration).

Conclusions

In the last fifty years medicine has taken the line of logical least resistance in pursuing technical goals firmly based in the scientific factual achievements of the day. With the emergence of clearer understanding of the methods of clinical practice and with the threat to balanced community service posed by the continued proliferation of big science, there is now an opportunity to redirect medical education to give a more rational view of how doctors interact with their patients and what may be their developing role. In system making for the 1970s we should aim to produce a doctor who is not the blind handmaiden of science and technological facts, but a skilled interpreter of those facts and of his own ability to employ them during his day-to-day activity in the interests of his patient.

Appendix

The content of attitudes and teaching for an approach to a Science of Medicine for the student.

The collection of human and biological data and its errors with special reference to history and physical examination.

Human interpersonal relations. Biases, attitudes, stereotypes.

Human behaviour and its influence on the derivation of data from human situations.

Analysis of data in real-life situations—probability, heuristic thinking, games, judgment and decision-making.

The concept and definition of disease and diagnosis.

Analysis of performance.

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Developments in Medical Science and Technology (ii)

A popular misapprehension in the United States today is that the only alternatives for the future of medical practice are continuation of a free enterprise system or socialisation. Much heated argument, stemming mostly from organised medicine, revolves around the forecast, and in the heat of battle the real problem seems to have been forgotten. The significant issue is not how medicine is to be paid for but how it will adapt to a new form of institutionalisation forced upon it by rapid advances in science and technology. This problem exists regardless of whether medical care is paid for privately or publicly. The fundanmental importance of the personal relationship between the doctor and his patient is not in question, but the organisation and distribution of his services are profoundly affected by the increasing complexity of medicine. The physician can no longer function adequately without help; he is more and more dependent upon a variety of other people and institutions.

By-products of science and technology

Only a small part of the unprecedented increase in biological knowledge during the past three decades has been applied to medicine. Yet medicine itself has changed dramatically and will be subjected to even greater change in the future. It is pointless to recite the specific advances in medicine, for all of you are as familiar with them as I am, but I would like to cite some examples of how the advent of new knowledge has changed the practice of medicine.

It is often said that the introduction of potent antimicrobial agents eliminated infectious disease as a major medical problem. In one sense this is true. There are today potent and specific drugs with which to treat a variety of infections. What is often lost sight of, however, is the need to know what infection one is treating, if treatment is to be effective. Let me give a specific example. When I was a medical student there was little more than academic interest in the identification of the organism causing meningitis. The only antimicrobial agents available were the sulphonamides, and the only infectious meningitis which could be treated effectively was meningococcal meningitis. To be sure we always tried to make a specific diagnosis, but we knew that if the patient had tuberculous meningitis or pneumococcal meningitis the outcome would be fatal no matter what treatment was used. Today of course it is mandatory to make the correct diagnosis

because it is possible to treat specifically a variety of meningeal infections. In other words, the fact that specific therapy is available makes the treatment of infectious diseases more rather than less complicated. To be sure, the empirical treatment of infection often works, but in any general hospital one sees the exception to this rule, and too frequently one sees the misuse of antimicrobial agents. One of the busiest consulting services at the Massachusetts General Hospital is the infectious disease service, and some of the most formidable diagnostic and therapeutic problems in the hospital are infectious in nature. The use of steroids and antimetabolites has further complicated the problem of infection. Too often potent drugs have dangerous side-effects, and increased susceptibility to infection is one of these.

I have dwelt at some length with the problem of infection in order to make a point. The more specific and the more potent the therapeutic agent available to the physician, the greater the danger if it is misused and the greater the need for specialised knowledge on the part of the physician.

The same point can be made using a variety of other examples. The technology available to the modern radiologist requires the development of specialised skills within the field of radiology. Neuro radiology and cardiac radiology are two examples of fields in which new and potentially dangerous techniques are available and which can be enormously helpful when appropriately used.

Specialisation. The inevitable consequence of the increasing complexity of medicine is the need for specialised skill and knowledge. The accusation is often made in the United States that more and more physicians wish to become specialists and fewer and fewer wish to enter general practice. The career plans of medical school graduates in the United States tend to bear this out. Fewer than 5 per cent plan to become general practitioners, according to Coggeshall (1965). The accusation implies, however, that physicians seek specialty training because it limits responsibility and is more lucrative. I believe these are false accusations. Students do not decide to specialise for these reasons but because they recognise the impossibility of knowing enough about all of medicine to practise it well, and because there are no very good models in the university hospital for a new type of general physician.

Centralisation. A second major consequence of the increase in technology and scientific knowledge relating to medicine is the need for centralised facilities. Not too many years ago the difference between a large hospital and a small hospital was reflected more in the size of the nursing and housekeeping staff than in the function of the hospital. This has changed significantly, for now only the large institution can afford the expense of the complex machinery of modern medicine and can mobilise the skilled personnel required. Renal dialysis and kidney transplantation represent one example. Not too many years ago uraemia as the terminal event in irreversible kidney disease could be treated in any hospital—and the treatment was unsatisfactory. Today, in appropriately equipped centres it is possible to maintain life for significant periods by the use of renal dialysis and in selected cases to effectively transplant a normal kidney.

Consider for the moment what is necessary to accomplish these therapeutic ends. First it is essential to have the services of a physician expert in the problems of renal disease and he must have available a team know-

ledgeable in the techniques of renal dialysis. There must be an adequately equipped and operated chemistry laboratory. A radiology department capable of doing the most sophisticated visualisation of the genito-urinary tract is needed. A surgical team capable of doing renal transplantation is necessary and it must be assisted by someone expert in the use of immunosuppressive drugs. Because of the danger of infection a well-equipped bacteriology laboratory is necessary, together with experts in the field of infectious diseases. This is an incomplete listing of the variety of experts and facilities needed, but sufficient to make the point. For certain kinds of diagnosis and therapy, one must have centralised facilities.

The need for specialised knowledge and centralised facilities already exists, and it is likely that the need will increase rather than diminish in view of the inevitable additions to medical knowledge and the increasing complexity of the technology of medicine.

Integration of functions. The physician performs many functions, but two in particular require his special skills. These are problem-solving and therapy. Diagnosis is a complex procedure which entails the accurate recording of historical data, the examination of the patient, decisions about other critical diagnostic procedures, and finally the ability to discriminate between important and trivial information. Therapy is equally complex for it involves both physical and emotional components, and the decision for or against a particular therapeutic measure is a matter of great skill and judgment. The immediate benefit of a particular therapeutic manoeuvre must be weighed against the possible complications and the long-term effects.

The introduction of new technology into medicine and the additions to medical knowledge have not altered these basic functions in a qualitative manner, but have already greatly extended the ability of the physician to solve problems and to treat the patient effectively. The autoanalyser can provide rapidly and accurately a battery of blood chemistries as cheaply as it was possible to do one or two determinations a few years back. The radiologist can visualise organs and organ systems with a precision previously impossible. The haematologist can accurately identify the particular clotting factor deficient in a patient with unexplained bleeding, and the physician has available a variety of specific and potent therapeutic agents from which to choose once he has made a diagnosis. But all of this is at a price, for the individual physician must sacrifice some of his independence if he is to benefit from the advance in science and technology. He can no longer 'go it alone' if he is to provide the most effective medical care.

Often physicians are reluctant to admit the degree of interdependence which in fact exists today. This is not unnatural and stems in part from the relationship between the physician and his patient. Nevertheless it is vital that this fact be recognised for it is central to the planning of medical care in the future. It is equally important for the physician to acknowledge that certain functions which he performs can be done as well or better by less highly-trained people, and that if he is to perform well those functions which he can do best, he must delegate other functions. Let me use the example of the doctor who sees fifty patients in the course of eight hours. He spends roughly five to ten minutes with each and clearly has no time

to examine in detail any of his patients. He is literally 'seeing' his patients, for he does not have time to exercise more than the most superficial judgment. The argument can be made that two nurses, or a nurse and the equivalent of a medical corpsman could do an equally good job of screening for illness, particularly if certain signs and symptoms were defined as signals for more extensive examination. The physician could then use his talents for more precise diagnosis and therapy. The point is that the physician must be prepared to work with professionals of lesser skill than his, as well as with his peers, and this integration of professional activity must be planned.

A systematised approach to the distribution of medical services. The ultimate goal of any health service system should be the provision of total preventive and therapeutic services to the entire population of a country. An individual or a family should have medical care not only for relatively minor illness but should have easy access to the most complex care. It is too much to hope that this can be accomplished by a haphazard system of referrals. Systems need to be devised which guarantee every individual the availability of whatever is needed for diagnosis and therapy. Nowhere has this become more apparent than in the United States. In many medical centres all of the methodology and skill of modern medicine is available, and yet within a stone's throw of the hospital are families receiving virtually no medical care. Infant and maternal mortality rates in the United States bear mute witness to the fact that advances in medicine do not solve the problems of medical care unless a conscious effort is made to provide for the appropriate distribution of medical services.

The maldistribution of medical services in the United States is in part a reflection of the maldistribution of physicians. Fewer physicians practise in rural areas and in the central city than a few decades ago, and more are found in the suburbs. But this is only a part of the problem. It is evident from what has been said that medical services must be provided in those areas which lack them, and this requires the creation of a more complex organisation than a new office building for doctors.

Anticipation of change. Two characteristics of modern technological society are obsolescence and change, and modern medicine shares these characteristics. Industrial society is often accused of planned obsolescence and it is undoubtedly true that automobiles, television sets, and modern clothes are manufactured to last only a short time so that demand will be maintained. But this is only part of the story. It is also true that industrial society is constantly developing new technology to improve the quality of the product. In the same way the technology of the modern hospital can be expected to become obsolete in twenty years, not because it is worn out but because better technology will be available. This demands a radically different approach to the building of hospitals and medical centres than has been characteristic in the past. They should not be planned as permanent institutions but should be built to adapt to change.

Similarly the knowledge and skill required by the physician will change, and he must be prepared. It is already evident that the physician who concluded his medical education twenty-five years ago cannot practise good medicine today on the basis of the knowledge he acquired during medical

school. Any system of practice which does not recognise the need for continuing education of the practising physician will fail, and any system of medical education which is predicated on a static fund of knowledge for the physician will be inadequate.

Less apparent than the obsolescence of knowledge and machines is obsolescence which overtakes organisations. Industry has long been aware of the need to modernise continuously the distribution and organisation of goods and services. In recent years the development of systems analysis gives promise of revolutionising the approach to these problems. Certainly, the aerospace industry has demonstrated the importance of this method in the solution of highly complex technical problems, and it is likely that some modification of this approach can be used to examine the distribution and delivery of health care. In any case it is predictable that no static organisation will serve society indefinitely any more than a static knowledge of medicine will continue to serve the modern physician.

In summary it can be said that modern science and technology create certain requirements which must be fulfilled by whatever system or systems of medical care are developed. These are as follows:

Specialisation is the inevitable by-product of scientific and technological advance. It will not disappear because some believe it awkward to deal with or because it seems to fragment medicine. It is a fact and must be dealt with as a condition of practice in the future.

Some aspects of medicine require such complex technology and highly specialised skill that men and equipment must be concentrated in some central location.

Physicians can no longer work alone. They must recognise their interdependence with other physicians and other health professionals.

The complexity of modern medicine requires an organisation which aims toward the distribution of complete health services to all of the citizens of a nation.

The practice of medicine in the future must adjust to a life of continuing change; change in medical knowledge, change in technology, and change in organisation.

Problems of planning

If these are the imperatives of modern science and technology in medicine, certain problems of planning become evident.

Manpower. While it may be theoretically possible that the advances in medical knowledge may ultimately decrease the demand for health services, this seems unlikely to occur in the predictable future. To be sure, the elimination of a crippling disease such as poliomyelitis reduces the demand for certain medical and surgical services, but more often than not the success of preventive measures is counterbalanced by the introduction of new and complex therapeutic procedures which increase rather than decrease the need for health manpower. A single radiological examination may take hours to perform, and certain therapeutic measures take teams of skilled personnel. While it is quite likely that certain aspects of medicine can be

automated it is unlikely that this will decrease overall manpower needs, although it may change the nature of the skills needed.

I had the privilege of serving as a member of the President's National Advisory Commission on Health Manpower which reported to President Johnson in the fall of 1967. Soon after the Commission started its work it became apparent that there was no satisfactory way of predicting numbers of physicians or other health professionals who would be needed in the United States without having some indication of how they were to be used. In other words, the problem of manpower is so intimately linked with the problem of organisation of medical services that it appeared impossible to solve the first without some insight into the second.

There are a variety of ways in which systems of care can be organised, and probably no ideal system exists; but whatever system is developed will influence the planning for health manpower. Let me use two hypothetical examples. It would be possible to develop a system in which all physician manpower would be concentrated in medical centres and all would be trained in the various specialties of medicine. Routine illness might be cared for by specially-trained nurses or by a new group of physician-assistants, and definite limits would be put on the procedures delegated to them by the physician. In any instance of more complicated illness the patient would be brought to the medical centre. Such a system presupposes easy transport of the patient and medical centres strategically located so that one or another is sufficiently close by to provide directly for more complicated illness and to supervise indirectly care in the community. It further assumes that physicians would work as a group and agree upon the delegation of duties to assistants. It also assumes that the population would accept such care.

A totally different kind of system might be developed with greater decentralisation of care and with primary services provided by the physician. Such a system would presuppose an orderly system of referral from physician to physician with the use of the medical centre reserved for only the most complicated procedures.

It is not my intent to editorialise about the relative merits of one system compared to the other, but rather to use them as models in order to project manpower requirements. The second system would clearly require more physicians, trained for two different kinds of care. One group would have as their primary responsibility general medical care, most of it on an ambulatory basis. The second group would be highly specialised and would restrict their work to the medical centre. The first system would require fewer physicians and only specialists, since much of the general care would be delegated to non-physicians. In this system however, a new group of physician-assistants would have to be trained. The point is that the manner in which medical manpower is used will dictate the educational requirements.

Regional planning. It is evident that whatever system or systems of care develop there must be some method of planning on a regional basis. In the United States the first painful step is being taken towards regional planning with Public Law No. 89, the so-called Regional Medical Program. To date this has been without notable success. Other nations have done much more, but the point which I would like to make is that some on-going mechanism

must be available for planning on a regional basis and for continuous planning. The first question that needs to be asked is what is the definition of a region, for political subdivisions do not necessarily coincide with the distribution of medical talent.

Adaptability of existing institutions to change. The problems of manpower and the creation of mechanisms for regional planning are difficult but soluble, at least in theory. Far more difficult is how to adapt existing institutions to change, for the flexibility of these institutions will dictate the solutions to the first two problems. Let me examine three different kinds of institutions: hospitals, professional organisations, and medical schools, which like other institutions tend to become more conservative as they grow older.

I will speak only of the hospitals in the United States since what can be said about the nature of the hospitals of one nation may be untrue for another, with the possible exception of a common underlying resistance to change. The American hospital has evolved from a primarily eleemosynary institution into one which is largely supported by public and private insurance payments. Payment is for the most part on a cost-plus basis so that there is no particular incentive to save. The hospital is dominated by its professional staff which bears no fiscal responsibility and which feels free to ask the hospital to provide any services which it feels it needs. The result is a system of service which reflects the competence of the staff more than the needs of the community, as well as an endless duplication of services, uneconomical irradiation units providing mediocre care, and facilities for complex surgical procedures, for example, cardiac surgery, in areas where there is little need for such services.

It is evident that some organisational change is needed if the hospital system in the United States is to respond to the demands of a changing world. Quite possibly a change in the method of payment to hospitals would encourage such change.

There is little need to editorialise about the conservative nature of professional organisations, and organised medicine in particular. But if the practice of medicine is to respond to the potential of modern science and technology, there must be a change in the attitudes of the medical guild. Fortunately there are signs that this is happening. Even the American Medical Association, long an organisation resistant to any change, now seems to be ready to address itself to the pressing problems of today under the enlightened leadership of its new president, Dr Dwight Wilbur.

In the past, medical schools have shown little more inclination to change than has the medical profession, but again there is evidence that schools of medicine recognise the need to respond to the changing world of medicine. Many have altered their curricula and most have admitted the impossibility of teaching all of medicine in detail. There is realisation that the ability to solve problems is more important than the accumulation of factual information and the trend is to decrease, not increase, the body of knowledge required of every medical student. There is even a beginning concern about the way in which medical care is delivered.

Patient satisfaction. It might be possible to devise a perfectly satisfactory system of medical care which would embody all of the potential preventive and therapeutic capabilities of medicine and which would fulfil all the

medical needs of a community, and yet would fail because it did not pay attention to those factors which dictate patient satisfaction. Modern medicine in the large medical centre even now is stigmatised as cold and impersonal. Clearly, the patient wishes to be treated as an individual by people who truly care for him. The inherent danger of technological medicine is that it will become machine-like, yet this need not be so. If the system is appropriately organised the physician should have more, not less, time with the patient who needs his services, and those who substitute for the physician can learn the necessity of warmth and understanding in dealing with the ill, or those who fear illness.

Physician satisfaction. It would be equally mistaken to devise a system of care which removes those satisfactions which are important to the physician. Part of the satisfaction of the physician derives from caring for 'his' patient, and it would be foolish to deny this basic need. It should in fact be possible to analyse those aspects of medical practice which provide the greatest satisfaction to the physician, and to exploit this knowledge in creating new approaches to the delivery of health services.

Cost. Finally, cost will dictate to a significant degree the solution to many of the problems of medical care. The Manpower Commission predicted that by 1975 the United States will be spending $100 billion on health. If the bill rises as high as that, with little improvement in the delivery of health services in the United States, the public—via the press and Congress—will certainly wish to ask some questions of those responsible.

The implementation of change

The potential of modern industrial society. In the modern industrial world, research and development have been the catalysts of progress and the most successful new industries have been those willing to innovate in the laboratory and in the pilot plant. Research and development have gone hand in hand and it can be said that modern industry is adjusted to the dynamics of change. In contrast, medicine has invested very large amounts of money (largely public) in research but relatively little in development. This is not surprising since no adequate organisation has existed for medical development. Industry developed certain types of laboratory machinery for medicine whenever this was profitable, but much of medical development is non-profitable and it has therefore proceeded in a haphazard fashion.

Let me use two different examples of what I mean by development. It is possible that much more rapid progress could be made in the development of artificial organs if one were to put together a team of engineers expert in problems of flow, chemists expert in synthetic material and surfaces, investigators concerned with problems of clotting, surgeons interested in the design of artificial organs and so on. This is difficult to do today because biological research is not funded in this way; it is not profitable enough for private industry and it is difficult to assemble a highly-skilled team without providing some degree of security.

A second example relates to the development of a fully integrated model system of care for a defined community. Here again there is no adequate mechanism for such a pilot project.

The mobilisation of talent for change. Some more rational approach to medical development must evolve, however, if the public is to receive the full benefit of what modern medical science and technology have to offer. Certainly there is great interest on the part of many who might help. Many engineers in the United States are eager to devote their special skills. This is partly because some of the problems of medicine are so obvious, and partly because of a revulsion against the amount of time and ingenuity and money spent on the development of instruments of destruction. Similarly the economist and the political scientist see in medicine a growing economic and political problem, and they too have special knowledge and special skills to offer.

Who can mobilise this talent? I suspect that in the United States today it can be most readily mobilised by the university, but to do so some different sources of funding will be needed. Certainly Harvard has come to feel that some sort of multi-disciplinary attack on the problem of medical care delivery is needed and has created a Centre for Community Health and Medical Care, jointly sponsored by the Medical School and the School of Public Health. The interest and support of the Department of Economics and the Kennedy School of Public Administration have been obtained, and it is planned to involve other faculties at Harvard when appropriate. Harvard is also exploring with the Massachusetts Institute of Technology how the resources of the two universities may be directed to some of the problems of research and development in medical science and in the delivery of health service.

At least a start can be made by the universities, but it may be that a development corporation, partly public and partly private, may provide a more suitable vehicle for development. Whatever the mechanism it is apparent that the appropriate talents must be mobilised if medical practice is to respond to the changing world of science and technology.

The ultimate goal of medicine is to prevent disease; its more immediate purpose is to treat disease and to alleviate suffering in the individual patient. This rather obvious observation is made as a prelude to a cautionary statement. Modern technological society is so powerful and so all-pervasive that it tends to dominate everything with which it becomes involved. It must be remembered that the purpose of medicine is to help and not to manipulate the individual, to serve and not to dominate the patient. Perhaps the greatest challenge today is to harness totally modern technology for the benefit of the individual, and medicine might serve as the vehicle.

Conclusions

The significant issue facing American medicine today is how to adapt to a new form of institutionalisation forced on it by rapid advances in science and technology. As medicine has become more complex, patterns of practice have changed and new requirements, not yet satisfied, have developed. These include a rise in specialty practice with a corresponding decline in general practice; growing centralisation of the specialised skills and complicated equipment necessary for effective diagnosis and treatment; interdependence of the physician with others having essential technical skills different from or less highly developed than his own, so that the

physician today is no longer able to practise alone; inequities in the distribution of medical services, which deprive certain parts of the population of comprehensive health care; a need to recognise change as a fundamental fact of life and to be prepared to accept it.

With these imperatives of modern science and technology in mind, certain problems of planning become evident.

There is no satisfactory way of predicting the numbers of health professionals needed and their educational requirements without knowing also how manpower is to be used. For example, a system in which all physicians are specialists and concentrated in medical centres would require fewer physicians, and more nurses and physician-assistants who would care for routine illnesses in the community. A system in which primary care is given by physicians, and medical centres reserved for only the most complicated procedures, would demand more physicians and a different kind of training.

Some on-going mechanism must be devised for planning on a regional basis. This has begun in the United States.

More difficult is how to adapt existing institutions to change. The hospital as it exists in the United States today has grown up around the needs of the staff rather than the community, with consequent duplication, inefficiency, and costliness. Organisational change is needed from the viewpoint both of efficiency and economy. Professional medical organisations, traditionally conservative, must be more open to new ideas of organisation and delivery than they have been. Medical schools, slow to change, are beginning to recognise that they cannot teach students all there is to know, and are making changes in curricula to emphasise the ability to solve problems rather than to accumulate factual information which will soon be obsolete.

Changes must preserve personal relationship between physician and patient.

By 1975, the United States may be spending $100 billion on health. If so, public reaction may dictate solutions to many medical care problems.

To implement change successfully medicine should emulate industry, which has long known the value of investing in development as well as research, while medicine has spent large sums on research and very little on development. The talents of experts in many fields, engineering, economics, and political science, are available for mobilisation to improve medical care. The best place to do this initially is the university, where experts are concentrated.

Whatever the mechanism, it must be remembered that the purpose of medicine is to help and not to manipulate the individual; to serve and not to dominate the patient. Perhaps the greatest challenge is to harness modern technology for the benefit of the individual. Medicine might serve as the vehicle.

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Developments in Medical Science and Technology (iii)

A survey of the influence on medical practice of advances in medical science and technology requires consideration of firstly the more important technological changes that are occurring, and secondly the influences which these could have on medical practice. There are many different areas of medical practice, but the two important areas are hospital practice (the medical activities in major metropolitan hospitals and university teaching hospitals), and community practice (the medical activities of private practitioners, clinics, and community hospitals).

Changes in hospital practice

The changes that have occurred over twenty years in the costs and activities of major hospitals will be exemplified by figures relating to the Royal Melbourne Hospital; the year 1945 has been taken as the baseline year for which the figures have been given the value of one. Figure 12:1 shows that the annual running cost of the Royal Melbourne Hospital has increased steadily over the succeeding twenty years, now being over 12 times greater in actual figures and 4·3 times greater when allowance is made for the changed value of money (as assessed from changes in retail price indexes): the current cost is over seven million dollars per annum. The contribution from governmental sources has increased nearly sixteen-fold, or 5·5 times with allowance for the changed value of money, and now accounts for nearly 80 per cent of the hospital's support. In 1945 charitable donations of $42,664 accounted for 9·4 per cent of the hospital's support, whereas in 1967 such donations had in fact fallen to $41,005 and accounted for only 0·6 per cent of the hospital's support.

With increasing costs there has not been an equal increase in the various indices of activity at the Royal Melbourne Hospital. The mean number of beds occupied daily has increased only by a factor of 1·3, the annual number of inpatients treated only by 1·9 and the annual number of outpatients treated only by 1·1. The annual number of surgical operations has increased by 1·5, but now the surgery and anaesthesia would be of much greater complexity than in 1945. The annual number of prescriptions has increased by 1·8, but now medications have become specifically curative rather than merely palliative. The number of resident doctors has trebled and the number of nurses has doubled. However, the number of laboratory tests has increased eight-fold.

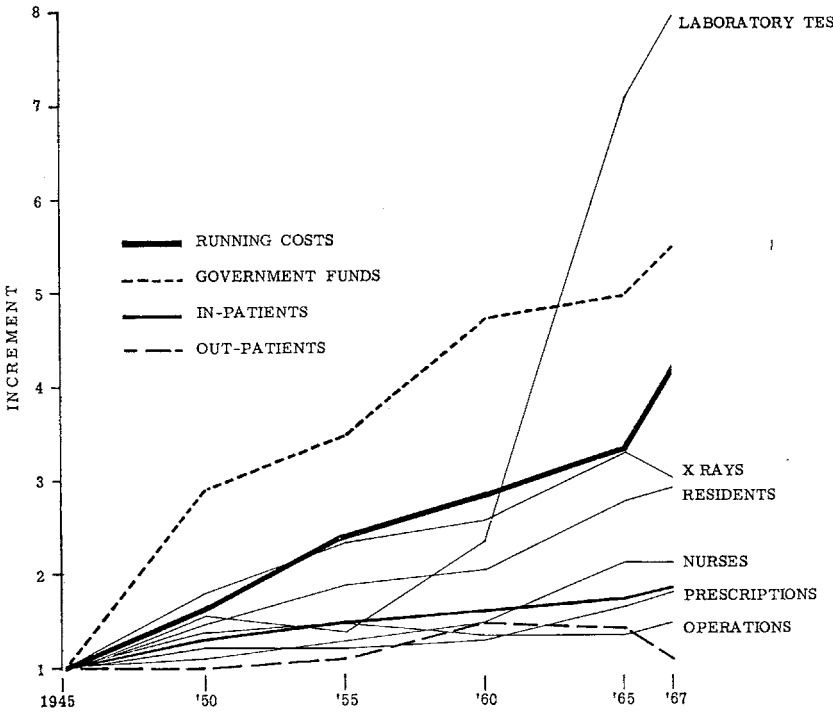

Fig. 12:1 Relative changes in costs, activities, and staffing of the Royal Melbourne Hospital from 1945 (with an arbitrary base line of one) to 1967

The implication is that now, as compared with 1945, hospital costs per patient are nearly trebled, and this change is attributable to the influence of technology on diagnosis and treatment in medicine.

As specific examples of the technological advances in the past twenty years, I would cite electronic monitoring of vital functions; automated diagnostic procedures in biochemical laboratories; angiographic procedures in radiology and the scanning of internal organs by means of radioisotopes; the processing of clinical data by computers; the application of immunological knowledge to human diseases including autoimmune disease and organ transplantation, and the development of artificial organs.

Monitoring of vital functions. Myocardial infarction, resulting from occlusion of a coronary artery, ranks high as a cause of death in the middle years of life; myocardial infarction is frequent, and the mortality in the acute phase is 30–40 per cent. Lown *et al.* (1967) state that of all deaths from myocardial infarction 85 per cent occur during the first week and 40 per cent are due to abnormal cardiac rhythms. The application of technology has facilitated continuous electrocardiographic surveillance of the heart beat by means of the cathode ray oscilloscope; modern cardiac monitor units also include a cardiotachometer and a rate-activated alarm so that immediate corrective action can be taken whenever an abnormal rhythm occurs.

The pooled data from a number of studies (Sloman 1968) have shown that early treatment of the arrhythmias recognised by continuous monitor-

ing of the heart beat has reduced the mortality from myocardial infarction from 30 per cent to 20 per cent, which is indeed significant—in other words, patients with acute myocardial infarction have a 33 per cent better chance of survival if treated for the first week in a coronary care unit with oscilloscopic surveillance. It seems that this major advance in treatment should become generally available, but its adoption has in fact been slow. This is partly because of the expensiveness of equipment and trained personnel—in mid-1968 in Melbourne there were only seven coronary care beds for a city of two million people, and these were in public hospitals which are maintained for the indigent section of the community. A second reason why coronary care units have developed slowly may relate to shifting and divided control between the patient's personal doctor and the specialised but impersonal unit which provides unique skills and facilities.

Technology in biochemistry. Technology has greatly influenced work in diagnostic laboratories in the last fifty years. Significant milestones included the introduction of colorimetric methods in biochemistry in the 1920s, the use of flame photometry for electrolyte determinations in the 1940s, the measurement of enzymes in blood in the 1950s, and automation in the 1960s (Gaddie 1967). Here automation means the use of automatic pipettes, burettes and diluters, and more particularly the continuous-flow autoanalyser. The autoanalyser, which is being used for an ever-increasing number of biochemical procedures, automatically analyses various body fluids at the rate of forty to sixty specimens per hour. Automation was introduced into the Biochemistry Department of the Royal Melbourne Hospital in 1962 and is a major factor in the Department's ability to handle the increasing number of laboratory procedures—92,000 to 290,000 annually over the past ten years—and at present 80 per cent of the work of the Department is automated.

Biochemical techniques of a more specialised type have had profound effects on medicine, one being the development of the new specialty of endocrinology. The ability of biochemists to measure precisely the amounts of circulating hormones in the blood by procedures such as chromatography and radioimmunoassay has given new understanding of the endocrine control of metabolism in health and disease.

Technology in radiology. In 1946–7 at the Royal Melbourne Hospital the patients X-rayed were 22,611 and the X-ray films numbered 58,043, whereas in 1965–6, the patients X-rayed were 40,284 and the X-ray films numbered 145,175. The proportionally greater number of X-ray films used per patient is a reflection of the increasing complexity of radiological procedures. Methods have been developed for the visualisation by contrast angiography and radioisotope scanning of internal organs, such as the brain, liver, kidneys, and heart. In the eight-year period from 1959 at the Royal Melbourne Hospital, the annual number of renal arteriograms performed has risen from 24 to 135, cerebral arteriograms from 345 to 628, and angiocardiac studies from 24 to 292. The latest technological advance is angiographic visualisation of the coronary arteries, which is becoming a routine procedure and may pave the way for the development of surgical procedures for the removal of atheromatous occlusions from the coronary arteries.

Radioisotope scanning of internal organs complements arteriography as

a technological aid in diagnosis. A particular isotope or isotopically-labelled metabolite is selectively taken up by various organs, for example, iodine by the thyroid gland, radioactive colloidal gold by the liver, and selenium by the pancreas; the gamma ray emissions from the isotope allow the mapping of the contours of the organ and the recognition of space-occupying lesions.

Computers in medicine. A most far-reaching application of technology is coming with the introduction of electronic computers into medicine. Clinicians are well aware that many of their decisions are based on inadequate information about the natural history of certain diseases and the exact effects on the natural history of treatment by drugs or surgery. This could be partly remedied if the vast amount of data on patients that is now accumulated year by year in hospitals were not buried in medical record libraries. Such data at present become accessible for analysis only by laborious retrospective review of case histories by interested doctors, but soon could become immediately available by the use of computers. Nor will the storage and retrieval of data be the only use for computers in medicine.

Computers will be used 'on line' in hospitals to provide new means of communication between ward stations and different departments—biochemistry, radiology, diet kitchen, and operating theatre. Physicians will use computers for actual patient care, as in the continuous monitoring and automatic control of vital functions. For example, anaesthesia could become wholly controlled by an appropriately programmed computer (Mackay 1968); thus the anaesthetist of the future would be located in the computer control room, supervising the automated control over the vital functions of several anaesthetised patients.

There is some ill-founded opposition to the introduction of computers into medicine: the fears that computers will become automated diagnostic machines and so replace the clinician are reminiscent of the attitudes of artisans at the beginning of the Industrial Revolution. The computer is no more than another tool at the disposal of the modern clinician—a giant memory store and labour-saving device. No physician could remember all of the many patterns of disease which he encounters, and hence, when faced with a new problem, his progress towards the right diagnosis may not be in a series of logical operations: false trails are taken and needless investigations requested, resulting in loss of time and money. The computer with its vast memory would eliminate much of this. Moreover, as new diagnostic and therapeutic procedures are being introduced into medicine these must be kept under continual review by frequent surveys and analyses of numerous clinical records. This is almost impossible with present systems of record-keeping.

The use of data processing procedures for analysis of medical records will mean major revisions in techniques of clinical documentation. The record will need to be far more structured and formalised, and devoid of ambiguities. Those parts of the record where free narrative might be retained, for example the patient's history and consultants' opinions, could still be processed, although programming difficulties would be greater than with structured data. The initial plan in the Clinical Research Unit of the Royal Melbourne Hospital has been to get as much as possible of the

clinical data (history, examination, and laboratory results) into a fixed or structured format from which it is transferred to punch cards and then to storage on magnetic tape (McPherson and Mackay 1967). The next phase will be the development of an 'on line' system in which stored data are made available on request by means of 'display inquiry consoles' connected to a large central computer. An inquiry about a particular patient can be made through the keyboard of any one of a number of consoles (Fig. 12:2), and the answer will be displayed on a cathode ray screen or appear as conventional 'print-out' from the console.

The ultimate development would be for information from all hospitals in a city, state, or the entire country to be fed into a central computer. Thus in Australia each year there would be stored some 200,000 medical records, each prepared in a similar format and hence susceptible to overall analysis to assess changing patterns of illness, racial and environmental factors in disease, effectiveness of different forms of treatment and so on. This scheme is neither unrealistic nor far-fetched because the instruments and programming techniques are already available; what is lacking is only an appropriate organistion of the data.

Immunology. New knowledge is accumulating rapidly in many branches of medicine and new technologies develop hand in hand with new knowledge. Modern immunology exemplifies this, particularly in relation to new developments in autoimmune diseases and organ transplantation. In 1950, autoimmune disease was virtually an unknown term, and now, less than twenty years later, it occupies a major part of medical diagnosis and may explain many hitherto obscure diseases including rheumatoid arthritis, ulcerative colitis, and cirrhosis of the liver (Mackay and Burnet 1963). New techniques, initially developed as research procedures in serological laboratories, have become adapted for use in routine laboratories. In one such technique, known as immunofluorescence, the capacity of autoantibody in serum to react with the target antigen can be recognised by means of a specific antiserum labelled with fluorescin and fluorescence microscopy. This technique has facilitated greatly the clinical diagnosis of autoimmune disease.

Organ transplantation appears to be ushering in a new golden age for surgery. Transplantation of kidneys, no longer the miracle it once seemed, is tending to become a routine procedure in many major hospitals; at the Royal Melbourne Hospital forty-seven kidneys from cadavers have been transplanted into forthy-three patients and 70 per cent of these kidneys have survived at least one year. Transplantation of the human liver has been done with some success in the United States, and one patient in South Africa with a transplanted heart has left hospital.

Technology has solved or is solving the problems of transplanting organs. 'Life' must be sustained in the potential donor, a victim of an obviously irrecoverable accident, by maintenance of the heart beat and the oxygenation of the tissues for some hours by means of artificial respiration. The organ to be transplanted—kidney, liver, or heart—must be immediately perfused and cooled before transfer to the recipient. With heart transplants, the recipient's circulation is maintained by an artificial heart during the transfer. The leucocytes of the donor and recipient should be tested for compatibility by the use of large panels of test sera. The recipient

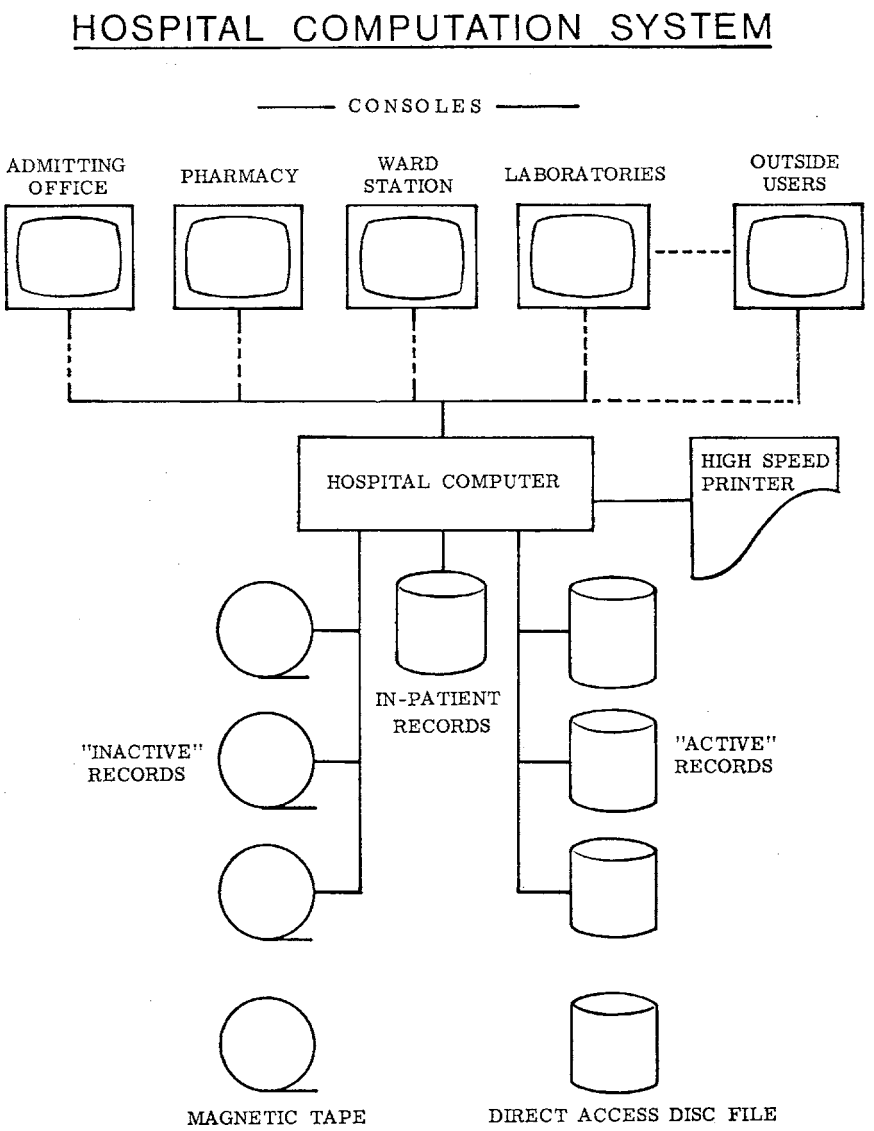

Fig. 12:2 A diagram representing an 'on-line' data processing system for hospitals based on the strategic location of 'display-inquiry' consoles all connected to a central hospital computer. Questions are 'asked' through a keyboard and the answer is promptly displayed on the cathode ray screen. The computer would have direct access to 'inpatient' records and 'active' records, while 'inactive' records would be stored separately on magnetic tape.

must be treated after the transplant with newly-developed drugs which modify the capacity of the immune system to reject grafted organs, and regular tests must be made for deleterious effects of these immunosuppressive drugs on the normal defences of the body. Organ transplantation certainly represents a remarkable example of the application of technology to medicine.

Artificial organs. The development of 'artificial organs' has advanced with organ transplantation. Artificial organs in routine use today include the haemodialysis apparatus for patients with renal failure, artificial respirators for patients with acute or chronic respiratory failure, and artificial pacemakers for patients with abnormal cardiac rhythms. An artificial heart is available temporarily to maintain the circulation during cardiac surgery. Home units for long-term haemodialysis are so well developed that they may challenge the grafting of kidneys as a treatment for chronic renal failure: cost is now the major limiting factor.

Medical technology and community practice

Advances in medical technology have had much less impact on community practice than hospital practice, although most practitioners have reasonable access to modern biochemical and radiological diagnostic services. However, in terms of 'the greatest good to the greatest number' the development of new drugs must receive first place; these are available for hospital practice and community practice alike. General practitioners are familiar with the use of most of the great therapeutic advances of the past twenty years—the antibiotics, psychoactive drugs, hormonal agents, including corticosteroids and oral contraceptives, vitamin B12, hypotensives, oral diuretics, and immunosuppressive drugs. These illustrate how the profit motive acts as a stimulus to technological development, because many of these modern wonder drugs have been developed essentially in the research departments of commercially-orientated pharmaceutical houses rather than in the laboratories of medical schools or research institutes.

Medical practitioners take full advantage of the many advances in therapeutics and are familiar with the use of immunising vaccines, which have given the community the means of preventing such dread diseases as poliomyelitis, tetanus, and smallpox at a cost of less than a dollar per person. Can modern science and technology be exploited further for the benefit of communal health, particularly in regard to certain other problems for which no group of doctors feels particularly responsible? Such problems include those associated with our contemporary way of life, in particular addictions to tobacco, alcohol, and drugs, the pollution of our air and water supplies, morbidity from the increasing density of traffic, and suicide.

No practitioner dealing with physical illness can ignore the contribution to diagnosis and treatment of psychology and psychiatry, but here science and medical technology have yet to make their major impact. A disturbed 'life situation' appears to contribute to a greater or lesser degree to many somatic symptoms in determining the pattern of illness, and in precipitating the visit by the patient to the doctor. Can any contribution be made from community practice towards understanding the interrelationships between 'life situations' and patterns of illness, and the problems related to contemporary living? It is a hopeful sign that organised surveys of disease patterns in the community are being sponsored by dedicated organisations such as the Australian College of General Practitioners. When can medical science and technology illuminate these darker areas of medicine?

Problems with advances in medical technology

The problems associated with the technological advances in medicine would include the increasing cost of medical care; increasing trends towards specialisation in medicine and the eclipse of the family doctor; an ever-widening gulf between those physicians who are, and those who are not, conversant with modern medical technology; and an uncertain role for our major metropolitan hospitals.

Increasing cost of medical care. The cost of technological advances can be illustrated by figures for regular haemodialysis for chronic renal failure. If in Britain regular haemodialysis were to be arranged for all uraemic patients aged 15–54 years, the cost in the first year would be £6·3 million, by the fifth year, £17·4 million, and by the twentieth year, £33·6 million (Kerr 1967). These apparently prohibitive costs mean that medicine is now faced for the first time with the need to discriminate between who shall receive a life-saving treatment and who shall not—between who shall live and who shall die. Never before have doctors had to face the issue that cost alone can determine whether or not a treatment is given. Prolongation of life by haemodialysis is just one extreme example of the fact that much of our modern medical technology is having palliative rather than curative effects—it is increasing the duration or tolerability of life of persons with chronic or irremediable illnesses who may be unable ever to resume a gainful occupation. The economic implications of this will need to be firmly grasped by medical authorities and by our political leaders.

Specialisation in medicine. One of the most striking effects of increasing medical knowledge and technology has been the trend towards specialisation in medicine. Most younger doctors now appear to desire this—others accept it from necessity. Increasing urbanisation and population aggregation must increase this trend. As practising doctors limit their interests to specific areas of medicine, it becomes necessary for groups of doctors to cover what used to be covered by the old-style general practitioner. Although the eclipse of the solo family doctor seems inevitable, it is hoped that there will remain within groups or clinics one person whom patients can regard as their personal doctor.

Can the doctor keep abreast? The tempo of modern advances makes it increasingly difficult for individual doctors to keep abreast of all branches of medical science and technology. The less conscientious sooner or later give up the struggle. The more conscientious have the continual anxiety that everything possible may not have been done for the well-being of their patients. The overly-conscientious or poorly-informed will squander resources by the excessive use of costly diagnostic procedures which they may not fully understand. The injudicious use of medical technology is particularly exemplified in certain hospitals where the signature of relatively inexperienced resident doctors governs to a large degree the level of activity of expensive diagnostic laboratories.

Will increasing medical technology create and maintain a gulf, perhaps an ever-widening one, between two classes of doctors, depending on their familiarity with medical technology? This in fact has already been initiated at the postgraduate level by the requirement in some States for registrable qualifications for specialty practice, and may come about at the under-

graduate level, with one class of doctor being trained for hospital or specialty practice and one being trained for general medical welfare.

The role of the major hospitals. For the major metropolitan hospitals, advances in medical technology are creating thorny problems which today present three different façades. One façade is that of the charity hospital, devoted to the treatment of the indigent sick, with entrée being restricted to the less affluent by a means test, and medically staffed by the time-honoured system of honorary service. The second façade is that of the teaching hospital, providing an all-round undergraduate education of medical students, and postgraduate education for doctors from this country and abroad. Are those two façades entirely compatible with the third façade, which is that representing modern medical science and technology, and exemplified by advanced cerebral, cardiac and pulmonary surgery, organ transplantation, oscilloscopic monitoring, and complex biochemical and radiological diagnostic procedures? Claims have been made that the charity hospital facade is already outmoded and that the teaching of undergraduate medical students in major hospitals today is unbalanced in being inadequately related to the requirements of community practice.

Problems such as the above will continue to tax the minds of our medical educators and hospital administrators. Such problems however do not engender pessimism when weighed against the benefits to the people which accrue from the influence on medical practice of advances in medical science and technology.

Conclusions

This analysis of the influence of technology on medicine is concerned with the two important areas of medical practice—hospital practice and community practice.

Since 1945 the annual costs of a major hospital, the Royal Melbourne Hospital, have risen out of proportion to all activities of the hospital except laboratory tests.

Examples of striking advances in medical technology include oscilloscopic monitoring of the heart after myocardial infarction, automation in biochemistry, angiographic visualisation of internal organs, computers in medicine, immunology in relation to autoimmunity, and organ transplantation and the use of artificial organs.

The major benefit of medical technology for community practice is the availability of many highly effective therapeutic agents. Medical science and technology have yet to make their full impact in the fields of behavioural disorders and social unrest.

The problems associated with advancing medical technology include increasing costs of medical care, the need for specialisation, the problem of doctors keeping abreast of advancing knowledge, and the uncertain role of the major metropolitan hospital. Can the major hospitals reconcile their roles as 'charity' hospitals, teaching hospitals and centres for advancing medical technology? These problems do not engender pessimism when weighed against the benefits to the people which accrue from the influence on medical practice of advances in medical science and medical technology.

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Discussion

CHAIRMAN'S REMARKS—R. J. GLASER

Participants in the conference have recognised the inseparability and the interdependence of the several topics which make up the conference program. This fact renders extremely difficult the task of discussing in a very precise and focused way a specific topic such as that assigned to this portion of the program. Problems of medical care vary even among comparable societies or indeed within a given one. For example, in the United States the problems of medical care in New York's Harlem differ significantly, at least in particular, if not generally, from the problems of medical care in rural Mississippi. Similarly, the needs of the populace in Sydney or Melbourne present challenges different from those in the vast areas of Western Australia.

There are some general considerations which may be appropriate at this point. Although the purpose of the conference is directed primarily to the prospective role of the medical school in Canberra—one that will produce physicians chiefly for Australia—the findings that derive from these discussions will have some bearing on other Western countries that are euphemistically described as highly developed—at least technologically. I am just in the process of completing a trip around the world which presented me with an opportunity to see something of medical care problems and approaches in western Europe, in Africa, and in India. It is superfluous to say that the problems in educating health care personnel in order to meet health care needs in Ethiopia bear little resemblance to those in Australia or the United States. Seventy per cent of the current health problems in Ethiopia could be wiped out merely by the application of methods we take completely for granted: immunisation, safe water, and proper sewage disposal. But despite the tremendous disparities that exist between countries in some parts of the world and those in others, there are certain conclusions that seem to me to be valid:

No country is apt to be able to produce enough physicians to meet its medical care needs in conventional ways.

There thus must be significant revision of the system of health care. In developing countries emphasis will have to be placed on the use of dressers, health officers, medical aides and so forth. In Western countries the application of sophisticated technology and the training of skilled medical person-

nel must go forward. Alteration in the conventional doctor-patient relationship must be expected.

All countries will have to make hard decisions as to how to allocate resources. The application of the cost-benefit ratio, widely used in industry, is in order. Within medicine this will involve decisions as to how funds are distributed between research, teaching, and care. On the national level, allocation of funds to defence, urban renewal, social security and so forth, will have to be made.

Comprehensive planning is mandatory. This is far more difficult to achieve when it has to be engrafted on existing structures; nonetheless, avoidance of redundant, highly expensive installations for open-heart surgery, cardiac transplant and so on is necessary.

At least in the United States, medical students in the past several years have stimulated medical faculties to review emphases being placed in medical school programs. More and more students are critical of the effort going into pure science, and the lack of effort being devoted to the definition of meaningful programs in community health. Although in some instances the students' interest in the health care of the poor, admirable though it be, has led them to disregard their basic educational objectives, nevertheless they are exerting on the whole an influence for good.

In the medicine of the future, physicians' time will have to be used much more efficiently than is presently the case. A recent study at the University of Washington showed that 50 per cent of the paediatricians' time was directed towards tasks that could have been done as well or better by less highly educated personnel. The health team concept will have to be applied meaningfully in a way that has up to now not been the case, and it may be that the most important member of the health team will be the computer.

Dr Ebert has described effectively the planning of model systems that are being directed under his effective leadership at Harvard. I am sure he can summarise these studies in the discussion more effectively than I can. I only want to emphasise their importance in relating a great university and its resources to the present needs of urban society. Dr Mackay has summarised the impact of technology on medical practice, especially in the hospital and I think he has defined extremely well the important contribution that can come to medicine by the wise application of computer technology. Professor Dudley has raised some questions about the contribution of the computer to medicine and suggested a redefinition of the role of experimentation in clinical practice.

In his opening remarks the Chancellor pointed out that in industry it is common for productivity to increase at a more rapid rate than the cost of goods. He pointed out, however, that this trend does not usually hold for services, and in medical care, and particularly in hospital care, we face a vexing situation. The advances in medical science have led to more complex and more expensive forms of treatment. At the same time, in the United States at least, 75 per cent of hospital budgets are directed towards labour costs, and with higher wage scales there has been such an excessive increase in medical care costs that they are now almost prohibitive.

It is incumbent on us to try to design new kinds of health centres with

emphasis on ambulatory care. With proper grading of inpatient facilities, the cost of hospital care could be favourably affected, while the quality of care could be maintained or indeed even improved.

The development of model systems, utilising appropriate technology, will afford young physicians-in-training an opportunity to learn how to use the techniques which will be available to them in the three or four decades of their practice. The computer will obviously not replace the physician, but it bids well to greatly add to the physician's ability to serve his patients effectively. There is much to be learned about how the computer can enhance medical care but those who believe that the computer is a passing fad are badly mistaken. Studies such as those being pursued by Collen of the Kaiser organisation make it clear that computer applications to medicine will be important.

Finally, we must make certain that we educate the public, so that the public understands how new systems of medical care can benefit them. In general, public education has not been effective. Emphasis has been on the sensational, and much remains to be done in this important area.

SUMMARY

In considering the influence on medical practice of developments in medical science and technology, the discussion began from the assumption that future problems of medical care could not be met mainly through increasing the number of physicians, and that better ways of using them, increasing their 'productivity', would have to be devised. Application of technology was recognised as only one way in which improvements could be made in the use of scarce medical resources: better use of paramedical personnel and improved organisation of medical services and of medical care were also mentioned. The discussion focused on the effects of these developments on the practising physician. Reference was made to the dual responsibility facing the medical profession of solving general problems of medical care, which it was agreed had much in common with other scientific problem-solving processes, and of meeting the particular needs of individual patients, on which there was less agreement as to the essential characteristics. Reference was made to recent developments in some teaching centres, for example in the United States, where models of medical care had been set up for experimental study, and it was suggested that Canberra might be an appropriate centre for this kind of study.

In accepting that no forseeable increase in the output of medical practitioners could have an appreciable effect in solving future problems of medical care, the conference noted that in Western societies a high proportion of the current costs of medical care were labour costs, and discussion focused on the means by which these might be proportionately reduced. It was accepted that the rising cost of the 'health industry' would place it increasingly under public scrutiny. Reference was made to the need for applying management techniques, such as studies of cost-effectiveness, to rationalise services and to justify their development in the face of competing demands for the community's resources.

The computer dominated the discussion of applications of technology. It was agreed that its use as a time and labour saver had not been fully

exploited, but reservations were expressed about the possibility of large gains from this within a decade. It was suggested that sophisticated medical technology need not be incompatible with a personal relation between doctor and patient: indeed by permitting better use of the doctor's time, it should improve the quality of that relationship. Reference was made to the use of the computer in integrating services, and it was suggested that substantial improvements in the effectiveness of medicine might be achieved through attention to the problems of organisation of medical services and medical care. Not only should this provide a more rational distribution of services, for example as between rural and urban areas, and between income groups, but it should provide a more rational use of resources such as paramedical personnel, and it should ensure that the patient did not use medical resources and medical facilities more costly or more sophisticated than was justified by his needs.

Little progress was made in considering the effects of these developments on the practising physician and his relations with his patient. It was suggested that the physician of the future would be more likely to be part of an organisation or team, because this would permit him to make more use of medical technology and of other health service personnel.

PART V

13 M. O. Kent-Hughes

Doctors' Professional Requirements (i)

The title poses a most baffling question: not only are the personal needs of doctors difficult to define and vary from person to person, but the professional requirements change according to the system of practice, the training of the doctor, and the demands of the community. There are therefore a number of interacting factors which affect the answers given and most of these factors change with each decade.

To narrow the field of discussion, I shall concentrate on the practising physician; others will cover the remainder of the medical and health personnel. I use the term practising physician to cover any doctor giving primary, comprehensive, and continuing care, and this includes the general practitioner, family physician, general physician, and other doctors such as paediatricians and internists in the United States who render this type of care and presumably are trained for it. The term physician is used in its broadest sense and does not mean a doctor who restricts his practice to internal medicine.

A review of the relevant literature raised the question as to which part of it, if any, should be used. To collect and sort this information would be a mammoth task because not only have doctors had so much written about them but they have themselves been prolific authors. Biographies and stories have some value as they add to our knowledge of character traits, but this at best is subjective information. Such historical surveys as *The Doctor, the Individual and Society,* written by Gilder, make fascinating reading and are valuable documents with which to temper our own impressions. Objective data derived from surveys, questionnaires and interviews are disappointing if factual information is sought from a study of the published charts, because the interplay of multiple factors acting on participants produces answers which reflect opinions, and not facts. The preparation of a questionnaire that annuls the answers which do not represent the real opinion of the person is indeed a complex task. Such answers must be discarded, or the validity of the result is left in doubt. The conclusions of the leaders of surveys, on the other hand, are valuable opinions.

A decision had to be made on whether to attempt a scientific treatise by analysing the most useful of the objective data or whether to rely on personal impressions acquired during a lifetime of practice and multiple associations with colleagues. Objective data have the disadvantage of being local in character and many of them are not relevant to the future Australian

doctor. All data on this subject up to the present time have doubtful validity when applied to the future, so the decision was reached to base this paper on subjective data and impressions.

Surveys of general practice

The surveys of Peterson *et al.* (1956) in North Carolina in the United States, Clute (1963) in Ontario and Nova Scotia in Canada, and Jungfer (1964) in Australia, have provided us with some objective data about the doctor himself, his views, his hobbies and his thoughts. They make interesting reading but the overall impressions of the authors were more important than the statistics in the charts.

Clute found a very great divergence in those general qualities which constitute personality and character. His charts revealed habits and behaviour patterns which I presume would apply to other professional groups in that Province, and the patterns differed in the two Canadian Provinces.

Jungfer published the results of a questionnaire asking doctors to list the advantages and disadvantages which they considered might encourage or deter young graduates from entering their practices, and in so doing he gained some insight into what they considered were essential requirements. Jungfer's subjective opinions which he expressed during and after completing his survey gave very useful information which was acted upon by the Australian College of General Practitioners and has subsequently proved correct.

The following is a summary of the answers given by 114 doctors in general practice in response to a questionnaire prepared by C. C. Jungfer.

The advantages were: opportunity to engage in a wide field (33); excellent hospital facilities (29); good type of community (20); close doctor-patient relationships (19); advantages of group practice (16); freedom from control (13); harmony of doctors (6); surgical opportunities (6); and good educational facilities (2).

The disadvantages were: continuous duty without relief (26); poor postgraduate facilities (15); inadequate hospital facilities (15); lack of educational facilities (11); partnership problems (10); serious shortage of practitioners in area (9); unsuitable climate (9); poor social amenities (8); and lack of ancillary services (6).

Over the past four years I have administered a rotating internship scheme for the Melbourne Medical Postgraduate Committee. During this time I have had many interviews with new graduates, receiving regular progress reports from them and have conducted questionnaires relating to their educational requirements. They have, in addition to answering the questions, attached commentaries on their undergraduate and residency training. Summaries of their commentaries are available in a mimeographed publication and they make interesting reading; a mass of statistics could be compiled from them, but again the studies are simply opinions and reactions, and their value lies in the overall impressions gained.

The affective domain

There is general agreement that affective characteristics are most difficult to

test, as the methods which have been used objectively to measure attitudes and character traits of the practising physician have not been satisfactory. Some medical educators in the United States have, however, persisted in their efforts to achieve a valid result, and are reporting results which are promising.

Two studies which could claim predictive value are those of Geertsma and Chapman (1967), on the evaluation of medical students at the University of Kansas, and of Beiser (1967), on a follow-up study of personality factors influencing medical school achievement.

One of the reasons for failure has been the absence of an acceptable terminology and classification to permit satisfactory comparative measurements.

Over the past few years educationalists have been working on this very problem and one group appears to have come a long way in providing such a classification. This group, headed by Benjamin S. Bloom of Chicago, has divided educational goals into three domains:

> Cognitive: Objectives which emphasise remembering or reproducing something which has presumably been learned, as well as objectives which involve the solving of some intellective task for which the individual has to determine the essential problem and then reorder given material or combine it with ideas, methods, or procedures previously learned.
>
> Affective: Objectives which emphasise a feeling tone, as emotion, or a degree of acceptance or rejection. Affective objectives vary from simply attention to selected phenomena to complex but internally consistent qualities of character and conscience. We found a large number of such objectives in the literature expressed as interests, attitudes, appreciations, values and emotional sets of biases.
>
> Psychomotor: Objectives which emphasise some muscular or motor skill, some manipulation of material and objectives, or some act which requires a neuro muscular co-ordination.

If this were studied by those who are attempting measurement of attitudes and character, I believe it would not be long before we have very useful information which we could call objective and relatively factual.

It is interesting that the examining body of the Australian College of General Practitioners is using this taxonomy in the preparation of its examination, as it allows the examiners to have a more accurate appreciation of what values they are testing. It is too early to give any more information because it is a most complex problem and more experience is needed before publication.

The point of interest germane to this paper is that an attempt is being made by one body in Australia to measure objectively attitudinal patterns of the practising physician.

Motivation

Doctors are being drawn by random selection from all sections of the community according to their ability to satisfy a preselection test, which at the present time is dominated by an ability in mathematics. It is fair to say they are as diverse a group as any other in the community with similar educational standards.

A doctor is credited with being a dedicated person and all dedicated people are highly motivated, so we come to the question: what makes anyone select medicine as a vocation, with its long years of study and exacting life? It is difficult to find any Australian studies on this subject worth reporting. Studies need to be of recent date because sociological changes do alter the reasons for motivation. Parker and Tuxill (1967) were able to illustrate how physicians changed their attitudes toward small community practice.

In order to determine what really motivates the intending medical student it is necessary to search more deeply than has been done, and little can be expected from short interviews or reliance on questionnaire answers. The impression is gained that the medical family atmosphere still exerts a considerable influence, though sometimes in the reverse direction, and medical publicity is having an increasing effect through films, television, novels and magazines. The financial security which a doctor enjoys is also widely publicised and this is an undoubted attraction. Once a candidate has been selected and committed to medicine, a proper study of the motivation of each student should be carried out, and from such a study during the medical course a considerable amount of valuable knowledge of the future doctor as a person would be obtained.

I believe a physician's primary motive must be dedication to helping mankind or attraction to the challenge of science or preferably both. He must consider that his responsibility is to assist in raising the quality and the standard of living in his society and the world.

I do not believe that economic gain or social status can be allowed to go unchallenged as a primary motive, because if either controls a physician's behaviour in medicine there is a danger to the community. Economic gain is quite naturally a strong motive in any society and it can be a healthy motive if applied in correct relation to others. It is only safe when it is a secondary or lesser aim, and it is most unhealthy when it becomes personal greed.

Doctors are a favoured group in our society; they are not usually tempted by want and they should have no trouble maintaining a correct motive for their profession. A considerable number of our colleagues make great financial sacrifices for their profession, and my experience is that only a very few refuse to respond if the request for sacrifice is sound. The vast majority of doctors would in my opinion place status within their profession above financial gain. No such conflict occurs, however, where the practising physician's primary motive is to heal and to help and to maintain health, or in other words where it embraces the old French proverb 'To cure sometimes, to relieve often and to support always'. Nor is there any conflict if the motive is to advance science.

Correct motivation is most important in medical group practice. If a group's main objective is financial gain for its members instead of greater opportunities for rendering better medical service by its members, then it will not be long before trouble starts. If anyone disagrees with this statement a little research into the reasons why groups break up would convince him. A great deal more should be done to promote correct motives, as this would help to solve many of the problems seen in practice today and prevent others developing in the future. Correct motivation aids self-discipline and strong self-discipline is the key to success of any system. A

knowledge of the underlying motivating factors of a doctor would give the key to many of his personal and his professional requirements.

Personal requirements

Personal requirements stem from the instinctive drives shared by all human beings: these drives become tempered by cultural influences and later by professional influences.

The needs which are relevant to this discourse are those which contribute to contentment and to general education. As normal members of society, doctors want the comfort and companionship of a home, basic security for living, and good opportunities for education for themselves and their families. They want the time and the facilities to enjoy recreation, both intellectual and physical.

Doctors have undergone a long period of training, and are usually called upon to work long and irregular hours and to accept very heavy responsibilities. These responsibilities involve making decisions of life and death, and at times doctors are the sole arbiters. Quite reasonably, they look to receive more than the average in the way of comforts and the material things of life, and so the opportunity to earn a fair and reasonable income is undoubtedly a need.

Members who have received and achieved a relatively high standard of education seek and require opportunities for continued learning and interpersonal relationships with others of like interests. It is true that in these days of advanced methods of communication no man of learning need isolate himself, but can easily and speedily correspond by letter or tape, and physical closeness is not necessary. But in reality, doctors practising in isolation do need the company of their colleagues periodically, and the breaking down of isolation is a basic personal need.

A further personal need is the opportunity to develop and to give expression to one's 'characterisation', a powerful and important need in all well-educated persons. The term 'characterisation' is used in Bloom's taxonomy to mean the peak of the internalisation or developmental process of the affective domain, and it relates to one's code of behaviour and philosophy of life. This strong desire to express oneself, to be heard, to be seen, and to participate is very evident in the educational programs, when the opportunity to take an active part in proceedings is given. As our knowledge of group dynamics and our ability to apply it improves, so we see an intense satisfaction in participating in group-learning. Important to the full development of an individual's characterisation is the need to stimulate the striving-achieving reaction by appreciation and recognition. I believe no better example of failure to develop this need can be given than the way organised medicine nearly destroyed the general practitioner by isolation, exclusion, and depreciation. Recognition of the importance of characterisation development, and recognition and appreciation of a person by the Colleges of General Practice has produced outstanding results. Recognition is a very important personal need of doctors, and although they have little difficulty in receiving this from their patients, this does not appear to be sufficient, and either community or professional recognition is sought.

Professional requirements

The essential professional needs are most diverse and depend on motivation, training, type of practice, location of practice, patterns of illness, and community demands. There are a number of requirements that are common to all. The most important of these needs is the opportunity to use medical knowledge gained and to be able to apply it; it is also important to be able to select a branch of medicine which suits one's motivation. I believe most doctors have a double motivation and enjoy people and science, but there are a few who for some reason or another fear people or fear the laboratory. To be taught the right things for one's work is an elementary statement, yet for a great number of years now those who have been entering general practice have not been well-prepared for what they need to know. This is in part due to our own neglect and lack of understanding of what is required, but the rest has been due to a lack of knowledge of how to handle many of our patients' illnesses and problems. Slowly the work of Michael and Enid Balint is receiving recognition and the Colleges of General Practice are organising the vocational training of the future general practitioner or family physician. Unfortunately both illness patterns and community demands change quite rapidly, and medical schools find it hard to keep abreast. There is no easy solution to this problem, but the fact remains that if you want a good and contented medical service it is important to see that the training fits the task ahead. It is appropriate to recall the comment I heard in Montreal in 1964: the paediatricians were complaining that the children of Montreal were suffering from the wrong diseases.

The second professional requirement is the opportunity to have to accept responsibility. A growing tendency is being noted in some practices to off-load a patient as soon as the patient is at all sick or the situation requires the use of intellectual ability. There are definite reasons for referring patients and for sharing patients, but simply to off-load responsibility should not be one of them. Medical practice of this nature does not require a fully-trained doctor and if it does, then that doctor will soon deteriorate professionally.

The third requirement is that one should be able to obtain recognition within the profession for the standard of work attained in any section of medicine. Postgraduate diplomas have for a number of years been regarded as sectional recognition for having reached a required standard of knowledge. General practice unfortunately did not, until recently, develop its own diploma and relied on others, or did not appreciate the need for any. This failure to develop a diploma is cited by new graduates as one of the main reasons for not selecting general practice or family medicine as a vocation, as they considered it was important for their future status in the profession that they achieve a postgraduate diploma relative to their work. The extent of the interest in the new general practice diploma bears witness to this, and teaches a basic lesson: if you have a classification structure in a service it is important not to leave any section without an acceptable classification, especially when this section has an extremely difficult and important role to play.

Physical facilities should be adequate for the work required. Ambulant patients need physical comfort when they attend a doctor and they need

privacy. Doctors need the advantages of medical centres from which to work, and the concept of a hospital being a general medical workshop for an area is one which needs developing. I hold a view that not only do all doctors need hospital facilities but they also need to work in hospitals. I know there are many who hold a contrary view on this subject, but there are too many advantages in its favour to persuade me otherwise. Tools of trade are increasing in number and quality, and an increasing range of diagnostic instruments is necessary and should be available. Unfortunately, through lack of adequate training, they are not nearly as much in general use as they should be.

One of the most puzzling aspects of medical practice is the failure to use adequately other personnel who are available to assist the doctor. The majority of doctors still have the attitude of the one-man business, and this attitude is encouraged by the items covered in our health insurance plan, which is limited to doctor services only. The doctor's secretarial staff is often meagre, nursing staff is usually absent and social workers and other paramedical personnel are rarely available. They are all essential requirements, if only they were recognised as such. The failure to benefit from the assistance of others is partly financial and partly due to lack of training, because medical educators themselves are not really quite aware of what others can do for them.

When a better knowledge has been gained of how to use paramedical and ancillary personnel to their best advantage, when a system of payment has been worked out and the public have been educated to pay for their services, we can then look forward to the development of health teams, either as medical group practices or in association with them and with solo practitioners. The administrative side of medical practice is becoming more complex and all doctors need adequate trained assistance. As employers they should have proper training in business and practice management before commencing practice.

A last but essential item of professional need is continuing education, and along with this goes the latent desire in most doctors to teach. Continuing education is as much a part of practice as interviewing patients, because without it a doctor must deteriorate. It is true that many claim they learn all they need to know from books and patients, but medicine is not so straightforward, and the stimulus and the balance which we receive by interacting with others, hearing their viewpoint and expressing our own, are all important. The problem has been what to impart and how to do this, and too many of our educational programs in the past have not been tailored for the recipient. This is not the place to discuss details of education, so suffice it to say that the practising physician needs a special brand of continuing education suited to his practice problems or future needs, and that it must be supplied locally and regularly throughout the year. The physician must participate actively in the learning and know how to apply it, or there will be no benefit. Many may question the statement that most doctors have a desire to teach, and many more will probably deny that they can be taught to teach. The experience of those who have been promoting teaching seminars is that the interest in teaching is very great, and that the demand for teaching seminars outstrips our ability to supply them at the present time.

To summarise the professional needs, one could say that they are the requirements to apply and continuously develop the knowledge, the intellectual and psychomotor skills and abilities, the affective characteristics developed throughout training, and the ability to solve new problems as they arise in their practice situation. The skills wither without use and they need to be suited to the tasks which the doctor will face.

Individualism

Before leaving requirements, to study influence, there is one character trait which needs discussing and this trait is individualism.

Individualism is a common trait in doctors, and is probably enhanced through the close doctor-patient relationship experienced in practice. It is a term and a trait which is open to abuse and which is used by some as an excuse to avoid team involvement. It means 'the quality of being individual', which is quite compatible with group work; but it also means 'an excessive regard for one's personal interest', and in this second meaning it is closely allied to egoism, meaning an excessive love of self. The quality of being individual is one we all hope we possess, and the doctor who selects solo practice should have this trait well developed. In its second meaning, individualism is a trait that has no place in medicine. A paragraph extracted from a study by Beiser (1967) is of interest:

> The Individualist is more difficult to deal with. He does not seem to be overly anxious and, in fact, can be irritating in his open determination to do things in his own way. Because he is not eager to impress people, he may exhibit an uneven pattern of achievement based on interest rather than ability and in many cases may give evidence of a very high ability which has been only partially tapped. He seems to be the kind of student (high MCAT scores but low grades) that admissions committees hope will 'catch fire' in medical school.

This question of individualism is only one of the factors that makes one doctor wish to practise on his own and another in a team. The solo man has no desire to be left in isolation and many solo practitioners take in partners when the practice warrants it. I have sought reasons during interviews as to why a doctor should choose a particular type of practice, but whilst those who choose partnerships or groups state their case clearly, those who choose solo practice do not easily express themselves. Jungfer reports thus:

> While the difference in outlook between country and city practitioners is recognised, it is not sufficiently appreciated that men who select practices in which they can work alone tend to be a particular type, as are those who prefer groups. Such preferences are an important factor in the selection of a practice, whether it be in the country or in a city. A considerable proportion of single-unit practitioners emphasised that they had chosen their practices because they were single-units.

A study of solo practitioners as persons and as doctors would be of great value to our country, because no matter what changes may take place in our medical service in this vast continent we will still need a considerable number of rugged, capable, and enterprising individuals who are able to practise on their own in sparsely-populated areas. Our duty to these solo doctors will

be to see that they do not have to work in isolation but are linked by modern methods of communication.

The recent questionnaire survey by Parker and Tuxill (1967), to which I have already referred gives an interesting review of the problem of manning with doctors the small community practices in western New York State.

The medical school influence

The medical schools undoubtedly influence the doctors' requirements through their curricula content and their methods of training. Competitive failure rate and didactic lecturing both militate against group learning. If medical schools could adopt the small-group method of learning then their influence to achieve change and to enhance motivation would be greatly increased. Small groups once formed can work well and are ideal media for conditioning and achieving lasting influence, not only for the acquisition of knowledge but also to influence character and personal requirements. Curriculum content with a deficiency in behavioural science teaching makes the physician's task more difficult because he is apt neither to recognise many of his patient's problems nor be able to deal with them, and as a result he may not recognise the need for assistance nor know how to use that assistance. It is of basic importance that the new graduate should be trained in such a way that he can recognise his problems in practice, have an appreciation of his needs and know how to use them. The medical school influence lasts for many years, and it is not good enough for schools to say that this sort of information comes into the graduate training period. The details may be best presented at this later stage, but the foundations of appreciation, understanding, and group training are medical school responsibilities.

The Colleges' influence

The Colleges exert considerable influence during both the graduate training period and the training for postgraduate diplomas. It will not be long before all graduates are undergoing specific training before practice, now that the Colleges and Academies of General Practice have followed other Colleges with a structured training program followed by an examination and a registrable diploma. This period is a period of inservice training and is no more a prolongation of the medical course than is continuing education.

The longer training presents the opportunity to enhance 'the service' motivating factor, promote higher standards of medical care, teach principles of efficiency, method-study, work measurement, performance rate, and handling of staff. It will increase the demand for continued education and better communication with colleagues and develop an appreciation of the need for a review of the financial return in our fee or salary structure. This review is required so that skills of intellect receive a more realistic consideration and that time, skill, and fee bear some relation to one another. The better-trained doctor will not be satisfied with poor working facilities and will require good office quarters, trained assistance and hospital facilities, wherever he is practising. He will want to do the work for which he has been trained, so it becomes important that predictions of community requirements in terms of types of doctors should be currently available to

ensure some relation between training and demand. The Colleges must remain sensitive to the changing patterns of illness and the changing demands of society, as both of these will influence professional requirements.

The community's influence

In dealing with the requirements of doctors it is necessary to discuss briefly some of the changes which are taking place in medicine and the community, and relate what effect these changes will have on future medical practice and on the doctor of tomorrow. Will new graduates in ten years' time be relieved of some of the problems and tensions that face us today? Will we have found the answers to some of these problems?

Can we within the next decade find the ideal relationship between the state and the individual in medicine? Some see no tension between the interests of the individual patient and the individual doctor, and those of the social group, whilst others are increasingly afraid that this is destroying the personal relationship. Does personal relationship depend on the behaviour of the individual, or the system under which he works, or both?

Individualism and collectivism should not be at war but should live together in reasonable harmony, because as Confucius said: 'Any process pushed to its conclusion changes to its opposite'. Society should not forget the individual and the individual should not rebel against society if society's regime is reasonable and necessary.

The respective merits of technical medicine and humane medicine have been argued for years, but there is evidence that understanding is being reached and the importance of humane medicine is being recognised. The Colleges of General Practice have been the most vocal in endeavouring to respect, develop, and foster humane medicine, and claim that their specialty is the care of the total patient. They must revive it, practise it, and teach it to each other and to other disciplines. They must answer the patient who said to Armand Vincent: 'We are prevented from dying; we are not helped to live'. They must answer the patient who said: 'I want someone who will specialise in me'. How often do we hear it debated whether a doctor can be both humanist and scientist? When a doctor regards a person as a case rather than a person, is this not merely a matter of individual behaviour wrongly developed in training? Should science or the teachers be blamed?

Another development which is causing concern within our profession and which is becoming a major issue in time, money and attention is the escalation and multiplicity of testing under the guise of scientific medicine. Undoubtedly there are many tests which are most valuable and necessary aids to diagnosis and treatment, but the very high cost of investigations in Australia together with the excessive use of tests could be a definite threat to the community's economy, and overtax the money available for other health requirements. Is that laboratory test necessary is a question which many doctors should be asking themselves today, and by asking such a question they will increase efficiency and economy in management. Will our medical schools seek some way of simplifying our use of diagnostic methods to save doctor-time and community expense? Will the future doctor be taught discrimination and be aided by simplifying the testing

methods so that he has the time to deal with the many other major problems that harass the patient? New fields of action, new fields of training mean that the new graduate must more than ever regard his student days as just an interlude in training, and that he must realise continued learning and training will be necessary throughout his life as a practising physician.

There is at the present time such a confusion of thought and indecision on so many moral and medical issues that a doctor of medicine is finding it necessary to weigh fully the problems of each case, whereas in earlier years he has sheltered behind a general rule or direction where the decision has already been made for him. The community and the individual are asking the doctor to assist in finding solutions to these problems, but is he being well equipped by his training to do this? The ever present moral issues of sexual relations and their aberrations, the conflicts of religion, the conflicting issues of human experimentation and the difficult issue of the ambulant patient who can be a danger to others, are just some of the problems. Furthermore, as we control infection, we see the rise in accidents, in suicide, in alcoholism, and in addiction. The doctor of tomorrow needs special attributes and a broad education, if he is to shoulder the responsibility the community expects him to carry. It becomes obvious that he needs a sizeable team to help him.

It is reasonable to assume that medical practice will become highly organised, that we will work in teams of various types and that we will work very closely with other professions and services. We will have to be highly efficient, discriminating, and at the same time intensely personal, if the community is to have what it needs in the way of medical services. I have introduced the above problems to indicate that we should think of the doctor of tomorrow in a somewhat different light from ourselves, so that we relate his needs not only to our own experience in the past but also to our judgment for the future.

Influence on medical practice

If the desirable personal requirements have been fostered and developed and if the professional requirements have been geared to the needs of society and the abilities of the doctor, then a complete new look at medical practice is essential to meet these requirements.

The hierarchical structure of medicine will need to be modified to conform to a team structure, because this is the way in which medicine is developing and this is what the new graduate will seek.

Medical students need to be taught group work from their first year in medical school. This should be continued in the same manner all through medical school and hospital training. The new students will be seeking this method of teaching.

Isolation in medicine must cease, and this applies to the hospital, the community, the individual, and the medical school. All belong to one society. A co-operative regional organisation will be required where the major hospital complements and aids the smaller, where the urban aids the rural, and each in turn gives and receives, that is an organisation of smaller teams within larger teams. By this means the most isolated practice in the country

can be brought into communication with others and must receive particular attention. Grouping is possible for practice and continuing education. Modern technical developments give many alternative lines of communication.

A responsible body is required to break down this isolation. The regional educational group plan of the Australian College of General Practitioners, which seeks to bring all in general practice together in local groups for educational purposes, would be a good mechanism with which to destroy this isolation. This plan includes the most isolated doctors in the country, connecting them through tape recordings which would be used for transmitting information and permitting comments and discussions.

All professional men need the challenging test of evaluation of their work to maintain high standards. The idea of a periodic review course and test is neither new nor impractical and needs consideration.

Most professional men desire to teach. Learning and teaching go together, and as medicine is a lifelong study so teaching is a lifelong task. Our profession has failed in the past to provide the wide opportunities for teaching and has failed to avail itself of the knowledge and skills of the teaching profession.

To satisfy the enquiring mind in practice and to harness this ability to aid medical progress, operational and statistical research must enter every type and branch of medical practice. Meaningful and accurate medical recording will be essential in all types of medical practice in the future.

Physicians in the future will have to foresee illness far in advance of symptoms, and where illness has occurred they will have to see that their patients are rehabilitated as well as recovered from their presenting illness. To satisfy this professional requirement the curriculum content and teaching methods in community medicine will need to be drastically changed to permit close integration of the basic sciences, the social and behavioural sciences, and the clinical disciplines.

The special branches of medicine need to be brought under constant review, and realignment made where indicated. The haphazard development of fragmented medicine without any real plan or reason fits neither the personal and the professional requirements of the doctor, nor the needs of society. Special study has been confused with specialty development and if followed to the ultimate would put every disease, every age group and every portion of the body into a separate compartment. One cannot conceive that such a development would satisfy the personal and professional requirements of doctors or the needs of society.

The whole of medical practice can be divided into a number of types of specialty development. The division should be flexible and variable, and fit the needs of patients and society and the training of the doctor. The broad discipline of family medicine with its common basic and variable additional content is one of the specialties.

It is time for a new look into medical practice.

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14 J. D. Llewellyn-Jones

Doctors' Professional Requirements (ii)

This has been a century of explosions. The scientific explosion and the therapeutic explosion have permitted man to control death without a corresponding control of birth, so that the population explosion has occurred; and behind all our thoughts is the possibility of the destruction of all the advances we have made by multiple nuclear explosions. The term explosion may in all the instances given except the last be journalistic and inaccurate, but it is graphic, and forcibly indicates the problem faced by man in the remaining years of the century: for despite, or perhaps because of, the constantly increasing knowledge available, man still handles his problems with nineteenth century attitudes.

In the microcosm of medicine this is all too evident; we have today the advantages of late twentieth century medical knowledge, but we continue to practise our profession in nineteenth century plant and with early twentieth century attitudes.

The physician at midcentury

It is difficult to determine what induces a young man, or woman, to read medicine. His background is likely to be upper middle class, his family reasonably affluent. He will have begun to specialise early in school, and to have concentrated on scientific subjects to the exclusion of the humanities. Increasingly, he will be drawn from the highest quarter of scholastic ability, at least as measured by the performance in Matriculation examinations. With this academic ability, and relative affluence, it is not clear why he chooses medicine rather than pure science. Some choose medicine because their fathers are doctors, some because of the status it offers (and in Australia, according to Donald Horne, the doctor ranks highest); some because of a desire to help humanity; some because medicine offers a satisfying and financially profitable career. The reasons are varied and difficult to analyse, but once within the medical school, the student is influenced increasingly by his teachers. And his teachers are of an older generation, often rigid in their attitudes, dogmatic in their approach, remote in their contacts. Formal didactic teaching tends to predominate, and although anatomy is losing ground, biochemistry is rapidly filling in the gap. Even when the student reaches the clinical years it would appear that all is not well, for Lord Platt (1967) has questioned whether medical science as taught in academic clinical departments really develops prepared minds. At this

time, too, the student is influenced by the honorary medical officers of the teaching hospitals. They are busy men, who conduct busy private practices, who give their time without payment to the indigent, and who involve themselves in student teaching. Admirable as they are, they have often not been taught to teach, and in their appointment to the hospital staff, their ability to teach is not always sufficiently considered. Their influence upon the student is considerable, and their standing within the hospital and the community is one which many a student would like to emulate. Yet the honorary medical officer is an anachronism today, redolent of gaslight, charity medicine, trams, bottles of physic, and the other incunabula of the Victorian era. In this atmosphere the student learns that the peaks of the profession are occupied by city consultants, the troughs by country general practitioners. So much so that the proportion of graduates engaged in general practice has fallen from over 55 per cent fifteen years ago to under 35 per cent today. Whilst part of this decrease is due to the diminished status of the family doctor, part is due to his professional isolation and to the long hours he works.

Yet the old fashioned family doctor had one significant advantage over many of today's practitioners—he knew his patients. He may have attempted too much; he may have been dangerous in some ways; he may have neglected to continue his education; but despite his many deficiencies, he had the trust of his patients and an intimate knowledge of their backgrounds, their foibles, their financial and social conditions. He may have killed sometimes, relieved often, but he consoled always. Today he has largely gone; time and the increasing volume of medical knowledge is transforming him and his patients.

The patient at midcentury

Thirty-five years ago the doctor was omniscient, omnipresent, infallible—or so the patient thought. Today, in the opinion of the patient, he no longer has these God-like attributes, although his status remains high. The change has been wrought by the mass media, whose owners have realised that people are enormously interested in health and will pay to read about it. In the past few years, pioneered by Reader's Digest and the many women's magazines, not a day passes but information about health and disease is purveyed to a fascinated reading public. This process has perhaps reached its nadir in the afternoon radio programs, in which the 'patient' can telephone in her (usually her) complaint and she and every other listener receive advice from 'Doctor John' or 'Doctor Denise'; and in the immense publicity which the first heart transplants were accorded early this year.

With this constant impact the average patient can no longer be considered a dumb recipient of medical care, but must increasingly be involved in the process of his, or her, own recovery. He now has some medical knowledge, and the physician should seek to build on this to correct misconceptions and to bring about a positive attitude to health in the mind of the patient.

The physician of the future

Faced with the immensity of comprehending the scientific and therapeutic explosions, and with the cultural changes which have occurred since the

development of radio, and particularly television, the doctor is confused. The psychological reaction to confusional states is introspection and withdrawal into a rigid pattern of behaviour. To some extent this is what doctors have done, they have retreated to the position that all of what was taught in the past is good: moreover it is familiar, and therefore there is no need to change this well-established, conventional training. During his undergraduate years, the student has little contact with man except as a disordered machine or as a corpse: his training emphasises physical disability—'dis-ease'—and tends to ignore the positive aim of medicine, which is to restore and maintain health; his training concentrates on the diseased part or organ, and ignores the possessor of that organ. And in his confusion the doctor retreats to these postulates: disease is due to pathological processes in organs; man is a superior machine composed of organs which are liable to break down, but which can be treated by repairing, or removing, the broken part.

Unless these attitudes can be changed the outlook for patient and doctor is bleak. But any attempt to alter conditions and to improve the quality and humanity of medical practitioners demands the recognition of five factors: the behavioural sciences are as important as the physical sciences in the training of a physician; medicine is not a pure science, but an applied science; the cost of health care is rising; modern medicine demands team work; and the co-operation of the patient in promoting his recovery must be obtained.

The importance of the behavioural sciences

The scientific basis of medicine was stressed in the middle years of this century as the explosion of physiological and therapeutic knowledge threatened to overwhelm the physician. No longer was an apprenticeship sufficient, no longer was an empirical approach adequate. Threatened to be swamped in the turbulent sea of knowledge, or pulled this way and that by the currents of fact, the doctor needed a rock beneath his feet; a rock on which he could stand and survey the turbulence, and comprehend the direction of the currents. That rock is the scientific basis of medicine. With a grounding in the basic sciences, it was argued correctly, the physician would be able the better to follow and to comprehend the many advances occurring in medicine. But this stress on the physical sciences of physics, chemistry, and biochemistry ignored the great importance of the behavioural sciences; and in some ways the emphasis on the physical sciences has gone too far. Too much stress has been placed on the mathematical sciences of physics, chemistry and biochemistry, and this has often led to a stress on measurement for its own sake, as more complex and expensive machines are developed by the technologists. More serious, it has led to a comparative neglect of the behavioural sciences in the training of medical students.

Yet doctors will deal after graduation with people, and people are not machines, however much we would like them to be. Because of this, and the increasing realisation that at least half of human suffering is mental in nature, it is now becoming accepted that the biosocial causes of disease are as important as the pathological causes, and that the doctor who has not received training in the behavioural sciences is an inefficient doctor. The emphasis in training and in practice must change from a stress on disease

to a stress on health, and to the reunion of preventive and curative medicine. In this respect the community laboratory is as important as the basic science laboratory or the research laboratory in the training of physicians. As the Citizens' Commission on Graduate Medical Education (The Millis Report) stated, 'What is needed is a body of information and general principles concerning man as a whole, and man in society, that will provide an intellectual framework into which the lessons of practical experience can be fitted. This background will be partly biological, but partly it will be social and humanistic for it will deal with man as a total, complex, integrated, social being'.

The truth of this concept is becoming increasingly clear, and as an alteration in the medical curriculum today can only be assessed ten years or more hence, it is urgent that at least some medical schools revise the undergraduate medical curriculum drastically.

Medicine as an application of science

If one accepts the view of the Citizens' Commission on Graduate Medical Education of the United States, it follows clearly and decisively that medicine is not a pure science but an applied science. It depends for its success on the careful application of scientific, and particularly of biological, knowledge, and it requires that the biosocial and socio-economic aspects of man be incorporated into it both during training and during practice of the art.

Lord Platt (1967) has argued convincingly that whilst the aim of the true scientist is discovery, the aim of the doctor is to 'plan the method of action judged to be of best value to the individual'. If the aims happen to coincide, so much the better; but if they happen to diverge, the scientific aim must be redirected, for medicine is an application of science. Fortunately, the aims usually do coincide, but always the doctor as a physician must be paramount to the doctor as a pure scientist. Science must be the servant, not the master. A valued servant indeed, on whom the physician can call as often as needed, but still a servant. This is particularly so as knowledge will continue to increase and the scientific and therapeutic explosions will continue to gain velocity. If doctors are to keep up with the changes, to sift the valuable advances from the dross of publication, to analyse critically the mounds of material issued by the pharmaceutical concerns, it is essential that every doctor continue his education throughout his professional life, and that he allocate time for reading, for reflection and for refresher courses. Time in this regard is important, and the overworked doctor is often a bad doctor. It is essential that the doctor be enabled financially and socially to devote time to reading; and to reading more deeply than a superficial survey of the brightly coloured, beautifully designed, well produced pamphlets, papers and blotting pads issued by the various pharmaceutical houses. Reading critically and reflecting deeply will be increasingly important to the physician who practises in the remaining years of this century. It is also essential that well-organised, informative refresher courses, in which the physician participates actively, be organised and made available to all physicians who choose to attend. Indeed, there is some argument for compulsion. But to benefit fully from this time spent, the student and the practising physician must have enquiring minds, and must follow William

Harvey in his view that 'Doctrine once sown strikes deep its root, and respect for authority influences all men. Still the die is cast and my trust is in the love of truth and the candour of cultivated minds'.

Costs of health care

The physician of today works in nineteenth century plant and has early twentieth century attitudes to his work. His attitude is basically that of the corner shopkeeper, the independent entrepreneur. Medicine in fact is economically a complex, unco-ordinated, socially wasteful industry, with inadequate plant and inflexible managers who operate under partial public control, but with a robber baron mentality.

This attitude is perilous as the costs of medical and health care escalate, for medicine is costly, is becoming more costly, and will become most costly. Who is to pay? Keyserling (1966), the Chairman of President Kennedy's Council of Economic Advisors, has posed the question, 'What portion of our total annual product should be devoted to the ultimate purposes of serving pressing social needs, lest wealth accumulate and men decay?' He answers this by pointing out that in the United States today 40 per cent of the population are denied adequate medical care despite Medicare and Blue Cross, and declares forcibly that it is a spurious argument to say that his nation—or any nation—cannot afford to alter the state of affairs. It requires a redirection of available resources 'from the wasteful, the gimmicky, to areas where help is needed'.

This situation exists in Australia today; the resources devoted to health care are inadequate; such money as is spent is spent wastefully because of the social structure of medicine. Waste occurs when suppliers, through monopoly, can charge excessively for their goods or services. It occurs when expensive plant and facilities, such as departments and laboratories, are duplicated or triplicated for prestige reasons. It occurs when patients are kept in costly facilities for convenience when equal but less costly facilities are available. It occurs when procedures which could be performed by sub-professional personnel under supervision are performed by expensively-trained professionals. Because of the social pressures which are developing for a system of comprehensive health care to encompass the whole community, because of the wasteful nature of the present system, because the funds for health care increasingly derive from Commonwealth and State governments, the suppliers, the doctors, must anticipate increasing control, and should reorganise their practices before reorganisation is forced upon them.

Medicine demands team work

Group practices. In all Western countries the proportion of physicians engaged in general practice is decreasing. In New South Wales the figure fell from 75 per cent in 1935 to 35 per cent in 1965, and this trend is likely to continue for the remainder of the century. Why is this happening?

The status of the general practitioner and his conditions of work *vis-à-vis* his specialist colleagues are deteriorating. Students are taught by specialists, and the best student academically usually seeks to engage in a specialty.

At present the specialist looks down on the general practitioner, partly because the individual general practitioner considers himself able to practise all branches of medicine; partly because the specialist tends to exaggerate the importance of scientific medicine and minimise the importance of the biosocial aspects of health care; partly because many general practitioners are 'bad doctors'.

No individual doctor can be competent in all branches of medicine, nor can he reasonably be expected, in a time of shortened working hours, to be constantly on duty when the rest of the population are obtaining increased leisure. The overworked, tired doctor cannot give his best attention to his patients. Finally, if a doctor has no time for reading, he cannot possibly monitor the voluminous literature of his subject.

Faced with these problems, the average student avoids general practice as a first choice of career and only enters it if he fails to obtain the hospital appointments required for specialisation.

Yet the personal, or primary physician (a term which should replace that of general practitioner) is essential if any system of comprehensive health care for a given community is envisaged. He will remain the keystone of the system, and his value and status must not be underestimated. But the isolated individual practitioner is an anachronism.

The only way in which the personal physician can overcome his present professional isolation and small shopkeeper attitude is by joining with a number of his colleagues to form groups. At present there is a good deal of discussion regarding the value of group practice in Australia, but little action to form the integrated groups which are essential. A group practice has obvious advantages. It permits a better service to be given. It permits the economic employment of auxillary staff, and thus increases the number of doctor-patient contacts possible: for example, in the United States a group of three doctors with nine non-medical assistants were able to care for 30,000 doctor-patient contacts a year, where previously the individual practitioners had in total only been able to effect 17,000 doctor-patient contacts. It permits the economic use of equipment. It permits the increased domiciliary care of chronic illness and mental illness. It permits the personal physician to develop special interests within the group. It prevents the inclination of the physician to hold on to his patient, and encourages consultation within the group and from hospital-based specialists. It encourages the further integration of preventive and curative medicine into comprehensive health care. It enhances the status of the personal physician and makes it equal to that of the specialist.

Hospital-based specialists. Simultaneously with the development of group practices, there will be an increasing concentration of specialists who are actually, or geographically, full-time in hospital. The present honorary system is wasteful in resources, in dignity and in effectiveness, for it depends on charity medicine and charity medicine is the antithesis of comprehensive health care. It is an insult to the recipient and a charge to the donor physician. It omits the one great need of the patient—that of respect. In most countries, whether communist, socialist, or capitalist, charity medicine has been replaced by some other form more suitable to the times. I believe that this change will occur in Australia, and with it the recognition that time is the most valuable item a physician can give. This will lead to the increas-

ing establishment of hospital-based specialists, who work in well-equipped co-ordinated teams but who treat sick individuals as people and not as containers for diseased organs. But the specialist must not consider himself superior to the personal physician merely because he is a specialist. There must be an increasing exchange between each group. It is as important for the hospital-based specialists to visit and discuss problems with the personal physicians in the area as it is for the personal physicians to be involved in patient care in the ambulatory and inpatient departments of the hospital. Only in this way can medicine develop to its full, exciting extent in the last years of this century.

The involvement of the patient in his own recovery

Today the average patient has an increasing knowledge of medical matters. Medicine is news, and persistently the newspapers, the magazines, the radio, and the television stations purvey to the public an increasing quantity of medical information. And most of it is well presented and of a high standard. Because of this changed cultural attitude, the authoritarian doctor of the past will be replaced increasingly by the doctor of today, who is prepared to talk to his patients not as if they were idiot children, but as rational sensible citizens, who want to know what is wrong, and who will be able to involve themselves in their own recovery. It is no longer sufficient to say it is so, the patient demands today to know why it is so. Unfortunately the terms used in medicine, the jargon, may not be correctly interpreted by the patient nor communicated clearly by the physician, for all too often the physician has never learnt to communicate. This will be of great importance to the doctor in the last years of this century, and as the Millis Committee has stated, 'There could be some fruitful collaboration between medicine and English'. A lack of communication is as critical a hazard in the field of health as it is in the field of politics, for in a way medicine is politics. In a recent address in which he discussed communication, Sir Robert Menzies (1967) said 'You may be a most distinguished scientist, but unless you can convey the results of your work and your research to other people, your usefulness in that field is limited. The art of communication is of tremendous importance. I believe that a general education embracing the humanities is something that ought to precede specialisation in any of the sciences if we are to produce the best results in the community'.

I believe that since medicine is an applied science dealing with *Homo sapiens*, the development of the art of communication by the physician is essential for the proper care of the patient, and this art must be fostered from the earliest undergraduate years.

Conclusions

The three final decades of this century will be a time of increasing knowledge in medicine, and a time when the physician, whether a personal physician or a specialist, will have an increasing capacity to help his fellow citizens to realise their full measure of health, and to maintain that health until old age. Achievement of this objective will require a change in attitudes by physicians, but the satisfaction from accepting the challenge will be even greater

than that obtained in the first half of the century, and the challenge will continue to attract some of our best minds and those whose deepest interest is in humanity.

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15 E. G. Saint

Doctors' Professional Requirements (iii)

I find myself confronted by the most difficult of subjects. Whereas my colleagues seem to find it easy to extrapolate technological and administrative trends to produce a convincing picture of what the practice of medicine in hospitals might be like in the remainder of this century, rather as you will recall Miss Nightingale did in the last century in her *Notes on Hospitals* (1863), I have the harder task of trying to analyse the intellectual qualities and motives of people, insofar as these may influence personal choice of career and the evolution of medical practice outside hospitals. Further, I have to ask what effect education in medical schools has upon the evolution of the medical personality: does a man's motivation and ideology emerge unscathed from experience with clinic and laboratory? That is to say, does our young doctor remain a pure existential hero, or is he corrupted by the strong and possibly perverting influences of a kind of medical admass? My difficulties are, of course, related to the want of information on the subject. One leans heavily on Dr Last's studies on medical students in Britain, realising however that the social dynamics of Britain, and particularly the kind of Health Service which students know they will enter, are very different from Australian conditions. Funkenstein's American studies, too, are relevant; but then he is dealing with a tertiary educational system profoundly different from our own, and with Harvard medical students, who bear as much resemblance to an Australian student as does a Viennese to a Hottentot. My second difficulty is that when one does delve into the socio-psychiatric literature of motivation in regard to career choice, one is quite frankly baffled by the jargon employed. I recall vividly meeting a member of Merton's Columbia group ten years ago, who was undertaking an assessment on the 'value' of teaching in a comprehensive clinic. Amongst the many indices used in the study of personality and depth of interest in a subject was a 'likeability index'. A cheerful, outgoing student I had lunched with had been given a score of 0·6: what did one have to do, I thought, to achieve a score of 0·99? Ever since then I have had reservations about this kind of psycho-social hocus-pocus.

The two greatest intuitive sociologists have been Durkheim and Weber. The former anticipated the anomic quality of twentieth century urban life, the very existence of which prompts us to ask such urgent questions as what kind of medicine and doctors are needed for twentieth century conurbations. Weber interested himself, amongst other things, in the organisation of

political institutions—the religious and capitalist machines, for example. As a broad generalisation he taught us that there exists a direct and mutual interrelation between the organisation of a social and economic institution and the kind of person needed to operate it. I suppose that he had in mind the thin-lipped Cardinals of the Curia with reputations for devious thought, and cheroot-puffing capitalists; certainly he anticipated the emergence of the tough, aggressive, endomorphic and coronary-prone managerial class. Medicine, too, is a socio-economic enterprise or institution. In an age when the enterprise is becoming almost wholly dominated by science and technology, will a narrow stereotype of a doctor emerge; and if so, is this desirable? And if the concensus of public opinion is that the exclusive emergence of the scientist-doctor is not desirable, how then do we ensure that other qualities in doctors may be permitted to flourish? Indeed, what are the desirable other qualities? I have construed these to be among the questions that you wish should be posed at your conference.

Since facts are at a premium it might be profitable to elaborate the theme by making use of biographical anecdote. The late Sir James Spence was born into an upper middle-class family with strong liberal-radical traditions in north-east England. His pre-university education followed a verbal-literary course rather than a physical science direction. An interest in people, epidemiology and the need for research stemmed from his experience in Mesopotamia in World War I. As a registrar in the 1920s he was one of the earliest to be inspired to undertake research in what was then called clinical chemistry. In middle life he practised as a conventional and highly successful provincial physician with a paediatric bent. His epidemiological interest was epitomised in his studies on the course of primary infection with tuberculosis in childhood, and on the prevalence of malnutrition in infancy on Tyneside. His humanity, doubtless stemming from his acquaintance with the philosophic tradition of Hobbes, Locke and the Benthamites, led him to cajole and persuade local health authorities to improve the quality of the care of babies in hospitals and children in homes and schools. The establishment of a Nuffield Department of Child Health in a provincial university enabled him, in the last decade of his life, to vitalise and refashion the scope of paediatrics, till then regarded as a minor sub-specialty of internal medicine. In short, here was a very great man, an innovator, who profoundly altered the direction of medical practice and whose ideas on child care are now integrally incorporated into our heritage and tradition. He was no potential Nobel prizewinner, but the possessor of a mind as broad in its compass and comprehension as two men he admired greatly, Voltaire and Goethe.

How, one speculates, would this estimable man have fared in the 1960s? He would have had to submit himself for selection into medical school with four A-level passes in the physical and biological sciences. But we know that the early, and late, cast of his mind was literary and he is likely to have opted at fifteen, when you are forced to opt, for specialisation in social and literary rather than science subjects. Medicine's loss would have been the gain of a university arts faculty or the Civil Service.

Professor A. was a pupil and a registrar of Sir James Spence. His origins were of the middle middle class: his father developed a small garage in a small country town in the early days of motoring in the 1920s into a quite

substantial and moderately profitable agency for a popular brand of car. Early in his undergraduate career he evinced an interest in the new biochemistry, and in the war he was permitted to indulge his talent in nutritional research for one of the services. Since his elevation to his Chair, his department has been strongly orientated towards metabolic problems. But perhaps his personal and private experience of life in small towns, contact with the mechanics in the family workshops, and the mesmeric tutelage of his mentor, have influenced him deeply, for it is noteworthy that his department makes a clear distinction between its graduate activities and the undergraduate teaching program. In regard to the latter, it claims no brief of omniscience; decisions on policy, teaching methods and the content of the clinical curriculum are taken in committee, along with other departments and with consultant teaching colleagues, and it is conceded that clinical competence is compatible with a rather pedestrian understanding of the pentose pathways of carbohydrate metabolism.

B. knows and has been influenced by A., although he exercises his professorial responsibility in another place. The background differs: an upper middle-class home replete with portraits of and visits from distinguished professional persons has stimulated perhaps a burning desire to achieve academic fame, also, as it happens, in the sphere of metabolic medicine. But disciplinary power and preoccupation with the abstractions of medical science are exercised with less discretion because they are unleavened by social comprehension, and undergraduates are expected to follow the course of metabolic interrelations as far as time and brainpower will permit. Social problems of medicine? that is the job for other departments—give the chaps some lectures, but not of course at our expense.

The power wielded by all these three men is immense. Among undergraduates there exists widespread respect for them, and therefore a desire to emulate them for their intelligence, integrity and achievement; and their high status in the professorial hierarchy carries with it influential roles in a series of related committees, where policy decisions affecting medical administration are made. Power is executed indeed at two levels, moulding undergraduate lives and moulding postgraduate lives by virtue of decisions made at research fund-granting committees and by appointment commitees. The James Spences of medicine, the last survivors of a humanist tradition, are disappearing, and we are left now with the As, whose ambition and scholarship is tempered happily with social comprehension, and the Bs, whose ambition and scholarship is, less happily, of a quality tending to be exclusive, not to say compulsive.

The range of talents embraced by the degree of M.B., B.S., is truly remarkable. Dr C., dear old Charlie, went to medical school in the early 1930s. His father was a modestly successful and rather staid solicitor, and his son scrambled into the medical course from a minor private school where rugger and precocious beer-drinking were more acceptable pursuits than scholarship. After ten years and many hundreds of kegs, Charlie qualified. In despair, examiners, few of whom could find it in their hearts to dislike this grinning, chubby, urbane rake, would eventually concede passes, handing on responsibility to the next of their colleagues in the assembly line. Charlie had a good and roistering war and settled down to solo practice in a working-class area, near enough to a general hospital to refer anybody

or anything that baffled him. All the registrars know Charlie's illegible two-line scrawl — 'Mrs Smith, ?, please see'. But Charlie is immensely popular and busy—women like his open smile; to men, he's a man's man; and children know that he keeps lollies in the top drawer of his desk. He has never hurt anyone; he has helped many; he does not make clever diagnoses himself but sees that others do. His energy and good spirits are infectious and one day his merits will be rewarded—he'll be Chairman of the Rotary Club, the Lodge, the Golf Club and all. He is, of course, an anachronism. It is doubtful if he would now get into a medical school and it is certain that his examination failures would be looked on with forbidding disfavour. Do we spare a thought for the Charlies of this world, who don't know the difference between albumin and globulin and whose medical reading is confined to the backs of trade blotting paper? I am heretical enough to think that we should—at least for the kind of men they are, genuinely interested in people and in helping them, and by their energy and example in an unselfconscious manner doing not a little to preserve the cohesion of families in the jungles of industrial suburbia.

Tom D., in a class of 1952, now has a smart wife, two children, and, like everyone else, two cars. He dropped physiology in third year and had a supplementary examination in surgery at his final, despite the fact that he was a hard worker with few outside interests—did he not read his lecture notes and text books through and through; isn't the commonest cause of pain in the right upper abdominal quadrant gall-bladder disease and therefore shouldn't the bag come out; and isn't prednisone good for rheumatoid arthritis? In three years' residence in non-teaching hospitals he accumulated a sizeable amount of surgical experience, and when he joined a group practice in a growing, new, lower to middle-class suburb both he and his partners felt that this experience could and should be put to good and (dare we say?) profitable use. So now he has weekends off, gets a little impatient when patients intrude upon his privacy, is rather perfunctory in his manner of speaking, and takes pride in his skill at excising gall-bladders, tonsils and occasional uteruses in the neat little hospital the constituents persuaded the Member to persuade the Minister to persuade Cabinet to build. He is happy, for his upbringing had been strict, and getting through the medical course demanded the utmost concentration, and now a rewarding practice permits him indulgences, which satisfy his material nature.

The generalisation is that until the last war we took into medical schools men and women of a quite remarkable range of intelligence and cast of mind; the one common denominator was a wish, articulated with varying degrees of strength, to be useful to ill people. About half an entering class had a good background in the physical and biological sciences, but the remainder were able to enter with a strong interest in the humanities or languages—a year's swot course in chemistry and physics was sufficient to prepare a student for the kind of physiology and biochemistry taught in the 1920s and 1930s. There was merit in this system, at which we now look askance, for the diversity of qualities in students and medical graduates fitted neatly the demands that society then made on the profession. Expenditure on research by governments and universities was limited indeed, and only a very few academically brilliant students found their way into basic science or paraclinical university departments. Clever students specialised in the

broader categories of medicine and surgery, to achieve fame as consultants. Their surplus energies and intellectual gifts, which in a subsequent era have been channelled into academic research and the administration of university departments, were then directed towards organisational and sociological innovations, as well as the advancement of specialised knowledge. It was, we recall, the social vision of Dawson and Horder in the 1920s that created a climate in which Bevan's Act of 1947 seemed thinkable and even desirable. As for the 60 or 70 per cent of honest plodders, willingly and cheerfully they accepted the burden of general practice: the more able reaching quasi-consultant status, the brilliant, like Pickles of Yorkshire, able to make epidemiological observations of great scientific importance, and the less academically gifted filling in the socially necessary role of running bleak practices in ugly places inhabited by economically deprived people. In pre-war days the principal determinants of choice were therefore socio-economic considerations and intelligence; chiefly the former. Without good social contacts and without a supplementary source of income, entrée into lower consulting ranks of hospitals of high status was difficult; the distribution curve of intelligence and qualities of mind in consulting practice and general practice was not so very different.

There have been two major changes in the organisation of medical training which have profoundly altered patterns of practice, and in each instance it is hard to differentiate between the extraneous social forces which engendered the internal professional change of gear, and the internal forces which changed conditions in society. As from 1858, all doctors were trained in universities, a major advance on previous apprenticeship methods. At the same time the need for better medical care, with rapidly industrialising urban centres, had become both obvious and critical. The long-term consequence of the 1858 Medical Act was, of course, the emergence of the competent general practitioner who has served society well for a hundred years. As for the recent revolution, we can give no fixed date other than the decade which followed publication of the Goodenough report. The characteristics of the revolution can be briefly summarised: an amazing growth of knowledge, imposing among other things a heavy burden on undergraduates and necessitating the employment of increased numbers of academic teachers, themselves committed to the growing areas of information; and a phenomenal increase in expenditure on research, both from public and private sources. *Post hoc* or *propter hoc*—it is hard to distinguish—a society, more affluent and better educated, now demands better and more costly medical attention. Out of this social revolution has been spawned the specialist, primarily a problem-solver, a man with personal characteristics very different from those of his consultant predecessor. And whereas in the first Empire there emerged tolerance and respect between consultant and general practitioner, in this second Empire, questions of status and prestige bedevil relationships within the profession.

It is now necessary to select for entrance into the medical course. Lord Moran, you remember, used to select good athletes into Mary's, but we now assume that the only people who can cope with modern undergraduate physiology and biochemistry are those who have specialised since the age of fifteen in the physical sciences, save for the few who transfer from the science-orientated faculties. Now the psychologists tell us that these young

people have logical and abstract rather than verbal skills and prefer solving problems to establishing human relations. The spectrum of choice has thus been very stringently narrowed. If account is also taken of the fact that it is predominantly from the middle to upper middle-class sections of society that medical students are recruited—with the range of value judgments this includes—the narrowness of choice is quite remarkable: from the 10 per cent of eighteen-year-olds capable of benefiting from university education, we are forced to narrow choice to a further 10 to 15 per cent. Further, during the course we lose another 20 per cent—non-problem solvers, verbalisers and those with weak motivation, who cannot cope with biochemistry, physiology and anatomy as it is at present taught.

The implications of this mode of selection, apparently imposed upon us by the demands of the curriculum, are to be seen in the answers given by students to questionnaires. In response to the question, 'Why did you choose medicine?' one finds that 50 per cent are now saying, 'Because of an interest in biological science', and less, 'Because I want to help people'. An honest answer, to be sure, and an excellent reason for becoming a doctor, but indicative of the fact that it is as much or more the abstract problem which is the centre of interest rather than the predicament of human illness. 'Which subjects do find most interesting?'—'Biochemistry and physiology, internal medicine.' 'Which the least interesting?'—'Anatomy, psychiatry, social medicine'. 'What do you want to do when you qualify?' Up to 80 per cent wish to specialise; here the motives are mixed—intellectual qualities and strivings jostle with an understandable wish to achieve security, high status, and good income. Moreover, the answer to this question changes with the passage of time: in the earlier years a higher proportion will opt for general practice, but contact with attractive and dominating clinical chiefs and the influence and excitement of the hospital environment reduce this proportion substantially in time.

The later picture, the postgraduate profile, has been drawn by Last in Britain. Academically bright chaps become super-specialists and specialists: sound chaps also become specialists of the less-distinguished kind; chaps who had difficulties in their course become general practitioners and, we are all surprised to read, surgeons. One is reminded of Hutchinson's comment to his students after the birth of his son: 'If he is brilliant I shall make him a physician . . . if he shows deficiency in intelligence doubtless he will become an E.N.T. surgeon'. The pre-war pattern of intellectual egalitarianism has been replaced by a kind of professional meritocratic structure. There is in Last's study the rather disturbing implication that general practice is now being recruited from failed specialists or less superior minds, who have rather poorly synthesised the hotchpotch of knowledge which has been pumped into them in an exhausting medical course.

If these trends were to be extrapolated, what might be the consequences? Selection procedures might become tougher and even more restrictive so that nothing but medical scientists would emerge. This I have interpreted to be the University of Nottingham's acknowledged objective. No one then would wish to enter general practice, or if they did general practice would become very superior group practice in which were emulated all the procedures and attitudes practised in the university medical centres—the American situation. And if the public were still to insist that it wanted

someone to give simple advice on common ailments without doing a gastro-intestinal series and a battery of twenty blood tests, then a demand would arise, as has already been mooted in the United States, for medical assistants—after a hiatus of time the Charlies of the world would come into their own again as feldshers.

I cannot believe that in the foreseeable future the demand for competent personal practitioners will lessen; the parents of infants and children, anxious and depressed people in middle life, and those suffering the degeneration and disappointments of old age, merit a quality of care and advice which cannot ever be given by the brilliant problem-solvers working in the new computer and electronically orientated regional hospitals. That sound counselling, the wise use of epidemiological data in the prevention of disease, the assumption of a leading role in the co-ordination of community services, the recognition of serious disease and the wise care of common ailments should ever have come to be regarded as a second-rate job, undemanding intellectually and worthy only of depreciated status, is a sad reflection on the perverse influence of the current moguls of medical education. Good general practice demands qualities of mind which would appear to be actively discouraged both by our selection procedures and by the experiences to which students are exposed in hospitals. These qualities of mind include the ability, not a common one, to establish good rapport with people of all kinds, a high degree of verbal ability, interest in historical processes and social dynamics and, above all, compassion. If the medical course is not to divaricate completely into an A and O stream, the problem will be to reconsider our selection devices with a view to broadening the range of talents, and to indicate that community work is and can be as intellectually stimulating and demanding as transplantation medicine and surgery.

My principal motive has been to analyse sociological trends and I can only comment very briefly on how these trends may be modified. For, whilst they serve good long-term ends they may have harmful consequences.

We are all agreed, and Dainton has articulated this problem very clearly for us, that too early specialisation in schools is harmful. Therefore it seems to me that we are obliged to review the system of prerequisites on which our selection procedures are based. Intellectual quality is what we are searching for, but under this heading should we not be encouraging the admission into medical schools of a higher proportion of students with verbal and human-relating skills? Is it really not possible for universities in the first year to bring students with only O level general science to a level of proficiency in chemistry and physics, in a three or four semester course, sufficient for them to comprehend molecular biology later?

Second, and related to the previous problem, do we pay sufficient attention to the quality and status of the teacher in universities, in contrast to his research interests? The trouble with our present system, excellent though it may be, is that there is an inevitable tendency for departments to look upon their students, however brief the contact, as embryo biochemists, microbiologists, research physicians and what you will. The quality of detachment and the recognition of the holism of medical training is rarely found in medical faculties, and seems to have been achieved only in those medical schools where departments have surrendered their autonomy to

curriculum sub-committees.

If we agree that the principal themes in the modern curriculum should be the development of human biological concepts, awareness of the human psycho-social condition and the development of clinical competence, it is surely becoming increasingly clear that it is not necessary, and certainly not desirable, that all medical students should tread exactly the same path: the evidence is that an over-rigid, conforming stereotype is the product of the standard modern course. Now standardisation is, of course, administratively convenient, but we who are in the teaching business would be scandalously at fault if administrative tidiness was our principal concern. Medical students could well and with little administrative difficulty be offered choice at two stages in the course—in the late pre-clinical phase and in six months of the final qualifying year. We should find, I imagine, that the problem-solvers in the early years will opt for biophysical or physiological studies in moderate depth, while the verbalisers will choose behavioural or social studies; and in the later years the latter should be encouraged to undertake community projects—and I do not mean general practice attachments: we are asking a new generation to criticise an existing institution and to perfect a new kind of community practice—while the problem-solvers will gravitate to the specialist clinics and laboratories.

To end on the biographical note and to reveal one's personal value-judgments: it would be disastrous if the James Spences of the world were to be discouraged from entering the profession. As between Professors A. and B., the mixture of scholarship and social awareness is to be commended; dear old Charlie, he doesn't stand an earthly in the day of the genetic code, but we certainly need humorous and relaxed human-relaters: and something has gone wrong with the system when Dr D. completely misinterprets his role in general practice.

Discussion

CHAIRMAN'S REMARKS—G. H. CARSTAIRS

We have had before us papers by Dr Kent-Hughes, Professor Llewellyn-Jones, and Professor Saint. By way of a bonus, we also have had the papers by Dr Last, the 'Organisation of Medical Care' and 'Doctors' Attitudes' (Part I, pp. 36 and 44).

Dr Kent-Hughes, as befits the President-designate of the Australian College of General Practitioners, has chosen to concentrate on the practising physician, by which he means 'any doctor giving primary, comprehensive and continuing care'. His approach to the literature of studies of general practice is frankly atavistic: he believes in ignoring the data and trusting the subjective opinions of the research worker. When the work has been in the hands of researchers of the quality of Drs Jungfer and Last, we can at least be assured that their generalisations have been influenced by their systematic investigations; but Dr Kent-Hughes' own observations are explicitly based on his 'overall impressions' gained while administering a rotating internship scheme in Melbourne. As such, they are an amalgam of his students' observations, and his own firmly-held opinions. He tells us that 'doctors are being drawn by random selection from all sections of the community according to their ability to satisfy a preselection test, which at the present time is dominated by an ability in mathematics'.

Is this really the case? If so, Australian experience is doubly at variance with that of Britain today: a survey carried out by the Association for the Study of Medical Education in 1966 showed that in the United Kingdom the proportion of medical students drawn from the higher social classes is increasing, as is the percentage of medical students with one or more parents in the profession (Todd Report 1968, Appendix 19). British medical schools also almost unanimously deplore the weak mathematical foundation of their entrants.

One cannot help being reminded here of the rude conflicts which can easily arise, in the course of educational planning, between expectation and reality. Only ten years ago, under the stimulus of the Russian sputnik and the promise of nuclear power, great efforts were made in Britain and the United States to expand the training of pure scientists: yet during the last two years, British students have been voting with their feet, repudiating the promise of good jobs and career advancement in applied science and scientific research. To our surprise, pure science departments in British universities have been

unable to fill their places, while the social sciences have been over-subscribed. Apparently, in the present post-war generation, a concern to understand human behaviour, even at the sacrifice of an assured, financially more rewarding career, means a great deal to a great many young people.

Dr Kent-Hughes very reasonably calls for a more detailed study than has yet been done into the motivation of contemporary medical students. In the absence of any such study, he offers us his own views, which are that young doctors want, among other things: a good standard of living and good opportunities for education for themselves and their families; opportunity to develop their personal 'characterisation', and to receive due recognition from their professional peers both as individuals and as professional workers; opportunity to deploy their learning and skills to the best advantage, whether in the advancement of knowledge, or in dealing with such people, or both; opportunity to continue learning, and to take part in teaching.

Dr Kent-Hughes notes that by no means all doctors are aware of the need to work as members of a team, making the fullest possible use of the contributions of non-medical members of that team; and yet he sees that it is going to be essential to cultivate this aspiration among doctors of the next generations. Finally, he poses an interesting antithesis between this need for teamwork and the 'rugged individualism' which used to be a valuable asset of pioneer doctors in isolated districts, but which may prove to be a positive drawback to team practice in the future.

Professor Llewellyn-Jones reminds us of the diversity of motivations which bring young men into medicine today; but stresses that both doctors and patients are profoundly different now from what they were a generation ago. Both have been influenced by the great increase and widespread dissemination of medical knowledge. Many doctors, he points out—and this applies to teachers as well as students—have been so impressed by the achievements of scientifically-based therapeutic innovations that they approach their task as though they were the mechanics of a very complex machine, whose parts are liable to break down. This gives rise to an inability to recognise dys-function in the personality as a whole, a situation which can only be remedied by the recognition of five key points: the behavioural sciences are as important as the physical sciences in the training for, and the practice of, medicine; medicine is not a pure, but an applied science; the cost of health care is rising, and will continue to rise; the single-handed omniscient physician is obsolete; patients will demand a fuller discussion of their problems by educated physicians.

Professor Llewellyn-Jones indicates ways to meet each of these points, and few of us will quarrel with his plea that doctors should so plan their lives that they have time, not only to read, but also to stop and think. He makes an eloquent plea for a refusal, on all our parts, to accept authority without question, advocating instead what William Harvey called 'the candour of cultivated minds'. Finally, he both stresses, and in his own writing exemplifies, the importance of cultivating the ability to communicate clearly and effectively with our fellow men.

Professor Saint draws attention to the influence which the prestige of 'laboratory medicine' has had upon young men's career preferences in recent years, and his observations are reinforced by the data of Dr Last's recent study of this question, with contemporary and recently-graduated

British medical students. The most striking features of Dr Last's data are the virtual abandonment of solo general practice as a choice of career, and the surprising finding that not only do a majority of graduates change their initial career preference, but that even five years after graduation more than one-third of the doctors had not yet definitely decided upon their ultimate medical role.

Professor Saint gave us entertaining, and recognisable, vignettes of types of doctor we have known in the past: not all of whom can find a place in the medicine of the future. He recognises, and deplores, the fact that careers in medical research seem to attract the brighter students, while patient care seems to be the consolation of the less gifted ones; and sees one way out of this dilemma through a widening of the admission criteria (so as to attract some of the humanistically-inclined students who are presently opting for the social sciences) and through a diversification of the basic medical course.

In both of these points, he echoes certain of the recommendations of the Todd Report. During the long period of gestation of this report, Lord Todd was wont to ask the deans of medical schools which he visited: 'Suppose I were to get good A level passes in chemistry, political science and Chinese, and then decided I wanted to be a doctor—would you admit me?'

The Commission recognised, as everyone intimately concerned with medical education must do, that there is room in medicine for men with a wide diversity of talents: hence the opportunity for entry must be such as to attract them without imposing too long a delay to make good the gaps in their preparation; and the subsequent course of study must also be flexible enough to give scope, even before graduation, for the cultivation of special interests.

The title of the theme for this session's discussion reminds us that there is an inevitable tug-of-war between what is socially and technically desirable, and what is attractive—or even acceptable—to the doctors who have to deliver medical care. Twenty years ago, the majority of British doctors clung to individual practice as their inalienable right: to-day, they are clamouring for efficient health centres from which they can practise in groups.

To-day, medical planners can see very clearly that doctors could work much more effectively if they learned how to delegate many of their tasks—including, perhaps, the time-consuming tasks of taking a full personal and social history, and helping the patient to unravel his emotional difficulties—to appropriately trained members of the allied professions, especially to nurses, social workers and laboratory technicians. However, until (somehow, somewhere) we create models of new types of medical practice, it is unrealistic to expect young doctors to include them in their own career aspirations.

Perhaps the best hope for the future lies in the very diversity of our student body. Some years ago Parnell somatotyped a whole generation of Oxford students. He found that medical students, as a group, were markedly different from philosophers and students of higher mathematics: the latter tended to be ectomorphic and introverted, whereas we doctors were mesomorphic and athletic—and distinctly extroverted. These were group findings, but there were quite a number of atypical individuals on the periphery of his scattergram. More recent work in Edinburgh (Walton 1968a) has shown that only our men medical students display this extrovert

tendency; the 25 per cent of women students were not only significantly more successful in their exam results, but also showed a clear bias towards introversion. In other studies, Walton (1967, 1968b) has shown that personality attributes are correlated with, for example, a preference for laboratory research, for treating organic ailments only, or for dealing with patients' emotional as well as their physical distress.

Walton and Last have questioned to what extent these biases are innate or the result of indoctrination and hence subject to modification. It is essential, however, to recognise that they exist, and that they must be taken into account in the implementation of any radical changes in the pattern of medical care.

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SUMMARY

The discussion did not progress far, mainly because of a lack of information on which it might be based, and some uncertainty about how to interpret what was available, particularly in the local context. It was accepted, for example, that there probably were some general features of professional callings which attracted students to medicine much as to any other profession, such as status, income, security, the conditions of and facilities for work, and its intellectual and emotional challenge. But the relative importance of these general features to the choice of medicine as a career seemed uncertain. And even more uncertain was the weight which might be attached to the specific features which made medicine attractive.

Reference was made to changes which might have occurred in the group offering for selection for medical courses, and in the procedures used for their selection. While it was accepted on the one hand that the number and quality of good students coming forward to study medicine can change quickly, for reasons which might not be hard to identify, and on the other that the organisation of professional practice considered desirable by doctors does undergo quite significant changes, caution was expressed about placing too much reliance on the notions of students or of practitioners, and about drawing too fine conclusions from the information available. Attention was directed to such features in the composition of the group coming forward as the higher proportion of students with good backgrounds in the natural sciences. But there was no agreement about the reasons for this. There was doubt about whether the features influencing this change were external to the medical course; about whether, for example, better students are being attracted to or encouraged into science courses in schools, or whether they are attracted to medicine by the emerging importance of science and technology in medicine; about what significance should be attached to this in the selection of students for the diversity of practice which a medical career

offers; and about the extent to which the motives and interests of students entering medical courses had been determined much earlier and were not significantly influenced by their experience in the medical course.

Some uncertainty was expressed about how medical students might be selected; about the dangers in too facile an approach to assessment of their motives and interests; and about what emphasis should be given to the information available. It was agreed that more information was needed about selection procedures and their operation. The doubt was strongly expressed that medical schools might not be selecting students with a sufficiently varied social and intellectual background to meet the needs of the community for medical scientists, for specialist practitioners, and for general practitioners. It was suggested that there was a need for two types of medical graduate: the one disposed to scientific problem solving, the other to exercising social attributes and skills directly in medical service. It was agreed that as well as a lack of knowledge about the motives and interests of students, and about the personal and professional requirements of doctors, there was considerable ignorance about what was probably more fundamental and at least as hard to determine, that is, the requirements of the community and how these might be taken into account in the selection of students and in the determination of the experience offered to them in the medical course. In this context it was suggested that students may be as much influenced by the organisation, the environment and the tempo of the teaching centre as by the classroom program.

This led to some questioning of the importance which might be attached to the study of the interests and motives of students and of the personal and professional requirements of doctors, not only with regard to the methods available for their study, but also more fundamentally with respect to the value of determining them. What was more important, it was suggested, was the influence on the student and the practitioner not only of the training centre but also of the system within which he practises. If this were so, it was suggested, more attention should be given to the organisation of medical services because of the effects this has on the nature of medical care, on what the practitioner can achieve, and in turn on the attractiveness or otherwise of the different avenues for medical practice.

PART VI

16 The Organisation of Medical Care

In this phase the conference, in discussion groups and in plenary session, was concerned with the larger issues, with an attempt to determine the broad pattern of medical care which might emerge. This question was approached in two ways: from a consideration of the issues which had been raised about the future of medical care; and from a consideration of the effect of the changing organisation of the health services, and particularly of the hospitals, on the nature of medical care.

There was a large measure of agreement about most of the outstanding issues concerning the organisation of domiciliary care: the need for a personal doctor; for home services of carefully considered type and scale; for reconsideration of the relation of the doctor to other professionals, particularly the nurse; for group practice from a well-planned medical centre or health centre; for some specialisation in medical practice; and for a role for the personal doctor in the hospital. Issues on which there was not agreement were: the possibility of a role for the nurse in primary care; the type of specialisation in general practice, and particularly its significance in relation to family care; and the nature of the work to be done by the general practitioner in hospital. There was general agreement about the role of the specialist, but rather less about his relation to the hospital, and less about the role of the hospital in relation to other health services. It was accepted that, whatever the final form of the health services, there would be greater private and public investment in health, and the resulting problems of resource allocation would affect the future shape of medical care. On this, as on many other issues before the conference, there was strong agreement that more research was needed, and that the scope for collaboration of sociologists, economists, and medicos in this was considerable.

Personal medical care

Experience in economically developed countries indicates that public demand for personal medical care (that is, for the services of a doctor who accepts continuous responsibility for his patient) is high and unlikely to diminish. It was readily agreed that although there are problems in providing personal medical care with the growth of institutionalised medi-

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cine, and although the way in which personal care is provided may change, it should be regarded as an essential feature of any service. Institutional problems and structural changes of a developing medical care system may impair the effectiveness of future medical practice in this sense, but may offer compensations in the more efficient handling of various types of medical problems.

Among the matters discussed was the need for a personal physician to be the doctor of first contact and probably also of continuing care, primarily concerned with the medical needs of the individual and the family in the community, and acting mostly on the initiative of the patient as the doctor of first contact. This first contact can be in general (counselling, diagnostic, and treatment) terms, and could include the provision of normal obstetric and paediatric services.

Some difficulty was seen in expanding his role to include preventive services and health education services, particularly in view of the deficiency of doctors and the difficulty of financing these services under the existing system. But it was more generally agreed that his role should be expanded to include rehabilitation and the prevention of disability from illness, and the investigation and management of chronic disease, which would become increasingly exacting in its demands on the practitioners' skills. Proposals to increase the effectiveness of the personal physician included the possibilities for an increased role for the nurse in primary care, the development of group practice particularly in health centres, and the use of health teams involving other professions.

The roles of doctor and nurse and the health-care team

With the deficiency of doctors, it is tempting to consider the possibility of relieving the general practitioner of some part of his responsibility for primary care by using the nurse. So far there have been few experiments of this type and there was in the discussion some uncertainty in assessing the promise of developments on these lines. It was noted that nurses, too, are in short supply, and certainly any such extension in their role would have large implications for nurse training. It was also recognised that the nurse-doctor relationship has probably not reached a final or stable form, and further experiments and experience are needed to show the direction it should take.

It was suggested that the general practitioner's effectiveness in providing continuing domiciliary care might be enhanced if he had better access to other community-based professionals who were able to utilise a wider range of resources from welfare and related fields which might not be readily available to the doctor. How these services should be organised—for example, what relation they would bear to hospital-based services—was not developed; but it was accepted that they would probably be employed by State or local governments or by subsidised non-governmental organisations. It was generally agreed that they would not be directly linked with general practices; and one suggestion was for the development of a multi-purpose worker, basically trained as a nurse, who could co-ordinate the work of the professionals in the home, and who could develop services with preventive possibilities such as health education.

The introduction of an assistant medical officer (of the type used in some developing countries) was examined. It was concluded that the present trend is to use the existing professions and to change their roles as necessary, rather than to create new ones.

Domiciliary services

It was agreed that a strong case can be made for the provision of some home services, particularly in psychiatric and geriatric illness where the contribution of relatives to the care of sick patients is a valuable feature of medical care. But if the hospital is to be relieved, at least partially, in such work, it is essential to support the home with a range of facilities—house nursing, home aids, meals-on-wheels and the like. It is also desirable to restrict demand for home services in those cases where the patient can safely come to a medical centre, and by doing so can economise in the use of medical resources.

Group practice

With some reluctance on the part of some of the participants, it was accepted that the disappearance of the one-to-one patient-physician relationship was inevitable, and that full-time, twenty-four hour per day, all-inclusive medical care, rendered by a single physician, was passing. The substitution of some form of practice in which several physicians might see the patient, but in which one member of the group assumes primary responsibility for him, seemed a reasonable alternative. Experience in Australia indicates that small groups of three to four general practitioners are forming. Their practice and organisation have presented problems, not yet solved. It was suggested that this form of practice could be adapted to both urban and rural areas and there was general agreement about the desirability and continuation of this trend as a basis for practice. No close attention was given to the very large questions concerning group organisation, but clearly there will be considerable variation within as well as between countries. Whatever the form the groups take (and there was much discussion about this), whatever their size, they seemed to offer a rational approach to the retention of personal relations, and to the proper use of organised facilities particularly where the group has adequate access to the supporting services of a medical centre or comprehensive hospital.

The specialist

Specialisation has increased in most economically developed countries. It was generally agreed that the trend towards specialisation would continue, but that the honorary system would go. How the work of the specialist would be organised, particularly in relation to the scientific and technological developments which seemed to be increasingly important in at least some areas of specialisation, was less clear. It was suggested that specialist teams might replace the traditional general practitioner as the point of first contact. In a group system, it was said, a specialist could develop a personal relationship with his patient, particularly if he had the counselling skills which are now more and more the mark of the good generalist.

Whatever the view of the specialist as a generalist, and the discussion was inconclusive, there seemed to be clearer agreement on the view that abnormality in obstetric and paediatric work, and all major surgery should provide a basis for specialisation, along with such more traditional areas as psychiatry and neurology. Indeed a broad basis of specialisation was thought to exist in the classifying of medical problems according to age groups, and in the specialisation which could occur within a group practice, or in relation to a medical centre. This should not prevent the general practitioner being a generalist in matters like obstetrics, paediatrics, and perhaps geriatrics.

Specialisation by the general practitioner

The report of the Royal Commission on Medical Education in the United Kingdom (the Todd Report) recognised the likelihood of some specialisation among general practitioners, but made no comment on the form of specialisation. In the United States extensive training programs for general practice have been disappointing, and there is no likely resurgence on traditional lines. However a new form of practice is fairly widely developed; one based essentially on the use of the internist, paediatrician, and obstetrician as personal doctors. In Britain any departure from the concept of family practice has been frowned on until recently, but there are now indications, particularly among recent medical graduates, of a preference for a form of practice involving specialisation. The trend in Australia is similar: most general practitioners, while accepting the desirability of specialisation in certain circumstances, would not concede that it is desirable to depart from the family basis of practice.

No precise specification of the general practitioner as a specialist within general practice emerged. It seemed too early to forecast what might develop in this respect. Attention focused more on a concern that general practice may become a residuum, rather than the primary objective of good students. It was suggested that if standards of appropriate training and of postgraduate and continuing education could be lifted with respect to practice in the community, and if specialised services in paediatrics, obstetrics, geriatrics, and surgery existed as a matter of course, then the role of the general practitioner might be more readily defined.

The relation of the general practitioner to the hospital

The history of this relationship differs in the United States, Australia, and the United Kingdom. In the United States and Australia general practitioners have access to hospital, whereas in Britain most do not. It is true that some British practitioners (about a third) have clinical assistantships, but these reflect hospital staffing difficulties rather than a carefully considered development in the shape of medical practice. In the United States the traditional access of the general practitioner to hospital has provided a ready basis for the hospital work of the obstetrician, paediatrician, and internist, who commonly provide personal medical care. In general, however, with the exception of the obstetrician, they are excluded from surgery, although there are no restrictions on their work in internal medicine.

These developments are insufficiently co-ordinated and do not as yet add up to a satisfactory pattern of total care.

How general practitioners might have better access to hospitals in Australia, particularly in rural areas, did not emerge from the discussion. Some participants saw value in basing group practice directly on hospitals; others doubted this and even seemed afraid of it, preferring independence plus access to hospitals. It was agreed that there was ample scope for variety and experiment in this area, and that the developing structure need not sacrifice the value of a general physician as primary point of contact. How continuing the contact need or will be seemed much less certain. Much would depend on the final outcome of the development of relations with the hospital system.

Hospital organisation

It was evident from the discussion that trends in the future use of hospitals, their range of service (other than in teaching), their link with personal care, with means of evaluating the quality of medical service and other matters, were less than certain. Until there is more certainty about the trend, the future role of the personal doctor is also blurred. There was general agreement that the acute general hospital would serve all social classes; that it would offer increasingly costly, complex services; and that fewer larger, rather than more small hospitals, seemed to be indicated. There was much less agreement about how hospital services would be organised.

Discussion centred on the applicability of the balanced hospital concept to the Australian urban setting. In its advocacy, it was said that to change medical practice, hospitals—especially new hospitals—are the logical place to begin, since this is where change can be most speedily and effectively made. In a large urban area, it was argued, there could be developed large comprehensive hospitals serving a community of perhaps 250,000 people. This sort of hospital could carry the necessary range of staff and equipment while keeping overheads at an economic level. It also overcomes the problem of isolation between the branches of medicine. Every branch of medicine needed to work in close association with other branches, for example obstetrics with paediatrics, and paediatrics with psychiatry; and in psychiatry, geriatrics and mental subnormality, isolation problems were acute, resulting in staffing difficulties.

A large comprehensive hospital also offered the opportunity for change in traditional teaching patterns. Mainly for historical reasons, the role of the teaching hospital has been restricted to a service focused on selected patients whose health problems determined the scope of clinical teaching and research. Large classes of patients—particularly the mentally ill, the aged sick, and the mentally subnormal—have been either excluded or admitted in numbers which bear no relation to the true dimensions of these formidable problems. Domiciliary care and the public health service have, until recently, been largely outside the range of interest of the teaching centre.

What was proposed, according to the concept of the balanced hospital community, was a teaching hospital which took responsibility for all medi-

cal services of an area, preferably the one in which it is placed, so that students could gain experience of a wide range of medical care within the hospital. By arrangement with medical resources outside the hospital, such as public health services, it could be made possible for students to study in these areas too.

In the discussion, experiments in hospital planning in three centres in Australia (Sydney, Melbourne, and Perth) were outlined briefly and comments were made from experience elsewhere. The emphasis in replanning the Sydney hospital had been on a study of existing and future function in the light of demographic trends and the limitations of an inner city site. The aim had been to create an institution which was part of the city, and provision had been made for services, such as a health centre, which it was hoped would do this. In Perth, a large site was available within a half mile of the University. The intention was to provide a wide range of services, including those for psychiatric and chronic illness, observing the principles of progressive patient care. The aim was to keep people out of hospital as far as possible, by large outpatient and day hospital provision. The hospital would be open to all; teaching was envisaged on both public and private patients, and both would be asked whether they were agreeable to be used for teaching. Payment would be made to physicians and surgeons. In Melbourne, at the Monash Medical Centre, the points of departure had been the Nuffield experience within the hospital, and the McKeown concept outside the hospital. Three problems had emerged: the limited availability of sites; the necessity to convince professional workers of the value of the balanced hospital concept; and the difficulty of maintaining flexible bed assignment to provide for changing needs. In the course of the discussion, attention was drawn to the trend in a number of cities in the United States for hospitals to move from the centre to the periphery, with sites of up to 250 acres. Experiments were being made in these hospitals to permit flexibility of bed assignment and also to reduce admissions where medical care could safely be offered outside the hospital. Reference was also made to developments in psychiatric care in Australia and elsewhere. In large cities, the demand for psychiatric services was big enough to permit the implementation of the balanced hospital concept. In Victoria, for example, planning was proceeding on the basis of units of 150,000 population. The first step was mobilisation and co-ordination of existing medical and voluntary services; second came the provision of outpatient services; and finally the development of the day hospital with an early treatment unit. The service was therefore community-based rather than hospital-based.

Although the importance of the hospital and of hospital-related services to the future organisation of medical care was accepted, the discussion was inconclusive about what form it would take. It was acknowledged that there was a growing demand in economically developed countries for a more comprehensive medical service for all, and that countries such as Australia cannot escape the questions which are posed by their uncertainties about trends and about what is desirable in the relations between hospitals, doctors, and patients. The need to base decisions upon adequate knowledge was recognised.

The cost of medical services

In a situation in which many see a need for greater public and private investment in health, it was agreed that the final shape of resource investment must be carefully considered, especially so in a federal system. Thus, if we have doctors willing to serve but wanting reasonable lives, great problems of urbanisation and also rural areas of low population density, special problems associated on the one hand with trauma and on the other with ageing and chronic illness and disability, the inescapable extra demand for all services as population numbers grow, a significant degree of relative poverty, and, not least, the rising complexity and cost of medical services in many areas of need, then we have the probability of an inevitable increase in public (that is, government) intervention. It was accepted that resources going into medical service will probably increase faster than the Gross National Product and that much of the allocation will be through the public sector.

This may well mean, it was suggested, that the mixture of private and public investment and recurrent expenditure in medical practice will change more in the direction of government expenditures, with the patient paying more or less through taxation. If medical people are worried about future trends in their practice and want to provide a full service based on personal contact in at least the first instance, they will need to take the examination well into the realm of public and private finance before they can determine what structural trends are likely to survive, even if desirable. Thus it was agreed that there are economic issues which will also affect the future shape of medical education.

Research

The conference took as the starting point for its discussion of this topic a statement from a report to the World Health Organisation entitled 'An International Study of Health Expenditure', which said:

> In countries faced with acute shortages of money, educated man-power and technical skills, it is particularly important that resources be used to the maximum social and economic advantage. Decisions must be made on the share of the resources to be devoted to health services and to particular areas within these services. Such decisions can be made more wisely if certain basic information is available.

Annual increments in expenditure on health services in countries such as Australia can be expected to be large. This fact alone makes it desirable to look closely at their operations and results. The aim of the services and all connected with them should be the achieving of better value for money. To achieve this, there needs to be, within the services, machinery for the monitoring and continuing appraisal of their activities, their costs (human and financial) and their results. There must also be feedback to which cost-consciousness and effective education directed thereto are the key. Such studies must take full account of the humanitarian quality of health services, and should not be instruments for depreciating that quality.

It was agreed that although health cannot be easily defined and there is no precise indication of the need for health services, and although there are

difficulties in the measurement of benefits from the health services, these are not necessarily serious barriers to an expansion of knowledge of costs and benefits over a wide section of the services. Major problems of operational and epidemiological research may have to be solved; meanwhile much might be done with existing techniques of enquiry and measurement; and more use could be made of existing data. In Australia, it was said, the scale of this work both inside and outside government institutions is small, compared with that in other developed countries.

On this and on nearly every topic discussed it was admitted that there were insufficient facts. Some of the areas in which it was suggested that research is required are:

The definition of health, including operational indicators of health and of departures from it.

The allocation of resources to the various segments of the health services, including operational indicators of results as in cost-benefit analysis.

The interrelationships of the services, including relationships between the different sectors, between the different governmental auspices, and between governmental and non-governmental auspices.

Attitudes and requirements of the consumers of health services.

Needs and aspirations of the staff at all levels in the health services, and the relations between them.

Organisational requirements and the training of staff at all levels.

The provision of the data necessary to make sound planning and management decisions in the health services.

It was agreed that research in the health services required the co-operation of the biological and the social sciences. Emphasis was placed on the need to relate this kind of research closely to the point of decision, so that considered answers, realistically related to the operation under review, are given.

In summing up, the final remarks made by the Vice-Chancellor of the Australian National University, in his capacity as Chairman of the plenary discussion were:

> We appear to know so little about patient and practitioner alike, about what moves a patient to co-operate or not, about what happens to patients after treatment, about what makes a student choose this or that direction for his work, what the costs of this or that structure would be, whether there are manpower problems inherent in the trends we think we see, whether future costs of medicine are frightening or bearable, and so forth and so on. The scope for collaboration of sociologist, economist, and medico is enormous and urgent. Whatever the Australian National University decides about formal medical education, it could usefully supplement the sporadic efforts now being made in Australia to develop medical sociology and medical economics.

17 Elements in Medical Practice

Having attempted to determine in the course of its deliberations what in broad terms would be probable trends in medical practice and the likely structure of medical services of the future, the conference was then expected, in this next phase of group discussions and plenary sessions, to examine in more detail some features of the future structure and function of the services. It was hoped that it would be possible to establish what knowledge, skills, and human qualities would be required of personnel, particularly the doctor of first contact and the specialist, to enable them to fulfil the roles that had been determined for them in earlier discussions. And it was intended to specify, so far as this was possible, the conditions under which some desirable features of medical care, such as provision for continued graduate training, might be incorporated into medical practice.

Not unexpectedly a full and detailed blueprint was not achieved, largely because it proved difficult in the earlier discussions to reach agreement on some fundamental features of organisation and practice, notably the role of the hospital and the nature of general practice, particularly with respect to specialisation in general practice. Despite these limitations reasonable measure of agreement was reached on a number of issues.

The conference did not decide where the doctor will make his first contact with the patient, but agreed that he should certainly have a widely based professional training of some years' duration. Thereafter, the role he casts for himself will largely indicate the parts of his background training and experience which he will keep fresh and refreshed. He should of course, be competent in resuscitation and in immediate surgical treatment; he should have a knowledge of epidemiology. But it would be consistent with the tendency to work in a team if he were to specialise—most probably in medicine in the sense normally ascribed to a physician, or in obstetrics, paediatrics or geriatrics. Whether he practises alone or with others, the doctor of first contact must know himself sufficiently and be capable of a deep understanding of emotions and personality.

The education of the clinical specialist, on the other hand, should largely conform with the proposals of Lord Todd's Committee: the customary first degree course and residency period, then a period perhaps of three

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years vocational training which, while not committing him irrevocably to a chosen speciality, would contain appropriate core material. The organisation of a number of institutions of diverse but related interests into a consortium to provide this kind of experience co-operatively was mentioned, together with the importance of travel and access to research opportunities. Special reference was made to three areas neglected in training: management, teaching, and group teamwork.

With respect to paramedical workers and others associated with clinical services, it was agreed that the physician of the future must look to these in associated disciplines and skills to collaborate with him in the management of illness and of health. If the trend of practice be towards the group, the means of organising medical associates should be readily at hand. Probably, the nurse would have a unique place within such a team. The range of other occupational roles is very wide, and the requirements of practice would vary greatly according to the needs of the community served. A proposal to involve some of the students of these associated disciplines in common training and experience within the medical school prompted expressions of caution, but it should be noted for further consideration, in the careful terms put forward by the sponsors. It was certainly clear that the greater use of associated health professions imposes the requirement of a satisfactory training for them.

Central to the discussion of the conditions under which medical care should be provided in the future was an expressed concern for its recipients. There were disagreements about the best way to guarantee adequate and humane care for all patients, but there was unanimity of opinion as to goals. Much of the discussion revolved about the question of how the public could be assured that it is receiving the most effective and competent care. And the answer was thought to lie in continuing education, in ways in which to guarantee the competence of practitioners, and in the examination of the need for a collaborative effort on the part of doctors and other health professionals.

During the discussion much emphasis was given to the need for a personal physician, a medical friend, a community-based doctor, as the physician of first contact was variously called. It was agreed that if this man is to provide adequate care for the sick as well as wise counsel for the well, it is mandatory that he continue his education throughout his active life as a practitioner. The discussion emphasised the need for a structural relationship between the unit of practice of first contact and the teaching hospital, and the need for the teaching hospital to move its sphere of influence outside its own walls. It was suggested that an effective system of continuing education required active collaboration between teaching hospitals and community-based groups, and was probably incompatible with solo practice.

It was noted that the qualified doctor can continue to practise indefinitely after registration and never again needs to demonstrate his competence. The suggestion was made that, at the very least, there should be certified evidence that the young physician has adequately completed his required hospital training, and that specialists be certified on the basis of their training. This was not recommended as a means of limiting practice, but rather as a way of defining competence for the benefit of the public. It

was further suggested that hospitals receive accreditation both for patient care and for teaching.

As medicine becomes more highly structured and institutionalised, it tends to become impersonal and dehumanised. Consideration was given to the question of responsibility for the humanitarian side of care, and care for the patient as a person. Much of the discussion dealt with the teaching hospital and the need to interpret for the patient the nature of this alien world. Communication with the patient is often neglected, and at various levels of care little thought is given to the delegation of responsibility for telling the patient what he has, what his prognosis is, and what will happen to him. Too often hospitals seem to do things to patients rather than for patients. Since the medical student learns attitudes as well as factual knowledge in the teaching hospital, considerable emphasis was given to the need for creation of an environment which is humane as well as efficient.

General practitioners

The knowledge, skills, and qualities required by 'medical graduates providing first contact and continuing care' will depend on the circumstances of the work. If the practitioner is isolated in the Outback, and has to do everything by himself, he will need to be very well versed in clinical medicine. But if he lives near a hospital, and can send it all his problems, he can get by with very little clinical ability. As the present situation in Australia is that a large part of medical work is done outside hospital, and a good deal in patients' homes, it was decided that the doctor of first contact, with which this conference is concerned, must be a good clinician.

As for the knowledge required by a general practitioner, the recommendations of the Royal Commission on Medical Education are that he should be a first-rate clinician in the field of internal medicine—(some members thought this too narrow a term)—with a good knowledge of preventive medicine and with special knowledge of the problems of family doctoring and of acting as doctor of first contact.

The Royal Commission suggested that future general practitioners, like future specialists, should have three years' general professional training, beginning after registration. There would be some choice of the posts held, but one in obstetrics would be highly desirable. The next most important subjects to be included are general medicine, paediatrics, and psychiatry. Others for which training appointments should be arranged where possible are anaesthetics, dermatology, geriatrics, ophthalmology, otorhinolaryngology, and physical medicine. 'A sound and up-to-date knowledge of therapeutics is essential for all general practitioners'.

There was no quarrel with this as a statement of the kinds of knowledge the doctor should possess, but the opinion was expressed that the practitioner must be able to cope with traumatic surgery, providing immediate surgical care, and he must be a first-class resuscitator.

'Should the practitioner *do* everything? No, he should understand everything,' which drew the reply—'To understand everything is to do nothing'. It was stated that at present the general practitioner is expected to do everything—though assisted by a back line of people who could do better.

If it were possible to limit the knowledge he is expected to have, he would be more efficient.

This idea that the practitioner will find it harder and harder to be clinically efficient, trying to cover an ever-widening front, was the origin of Professor McKeown's tentative proposal to replace today's practitioner by a group of specialists. He pointed out that, more and more, doctors want to specialise, and the public likes to go direct to specialists. His proposal, therefore, is that domiciliary care should be based on four types of doctors—obstetrician, paediatrician, adult physician, and geriatric physician—working in groups whose composition would be decided largely by the age of the related population. There was some support for this scheme, but some fear also that second-rate specialists might be substituted for first-rate general practitioners. The argument that the public still wants an old-fashioned family doctor was not accepted by all. One suggestion was that what people want is a doctor who will see them through an episode of illness—not through life—and that there were advantages in making expertise available at an early stage of care.

On the other hand it was suggested that many of the problems of general practice cannot be broken down by specialties: an example being the case of an asthmatic child whose mother is mentally ill and also pregnant. Reference was made to the way in which diseases sometimes appear in clusters; and that it would be a pity if doctors of first contact became so specialised that, of several linked conditions, the doctor saw only one. It was also pointed out that in an ordinary group, the members could have special interests, without being specialists to the McKeown extent; and it was claimed that it is easier for a general practitioner to specialise than for a specialist to work as a general practitioner. As he grew more experienced in practice, a doctor often found that more and more problems turned out to be family problems. It was suggested that, where the practitioner needed more knowledge, it was chiefly in social dynamics and family dynamics.

On the matter of skills, the list given to the Commission by the Royal College of General Practitioners was adopted with only minor modifications. For early diagnosis, mention was made of the need for skill in listening, and in spotting what is really significant. Much serious disease goes unrecognised, and many a patient suffers until his cry for help fits a pattern of disease that the doctor has been taught to recognise. Now that rest has become so often impossible in hospitals, more acute illnesses may be treated at home and so, too, may many chronic diseases and disabilities. The practitioner will need to master the skills to cope with these. He must also become particularly adept at appreciating the meaning of anxiety, depression, and the many physical expressions of emotional disorder; the reaction of different types of people to disease, and his own reactions to different types of people; and the inter-relationship of disease in families. Other skills should include the management of behaviour disorders (e.g. alcoholism, delinquency); the management of bereavement and of dying; and health education.

The kind of personality required of general practitioners was not defined. Obviously the doctor must inspire trust, but he may do this in various ways; and different doctors appeal to different people—which makes free choice

of doctor important. Clearly the doctor must be a good person. But the personality of a student can be profoundly modified by his teachers, which makes it a pity that, although students have consultants to model themselves on, they seldom have doctors of first contact.

A plea was made for more research on the characteristics of students as they pass through the teaching hospital and on the effects of gently propelling some of them in chosen directions, as is already being done in some places.

On the question of whether the doctor must be good at team work, it was recognised that medical practice consists more and more of group work, but it was felt that practitioners have to sort themselves out to a large extent, some preferring to work in teams, others being better on their own. Similarly, no clear statement emerged about capacity to delegate. A doctor may be willing to delegate duties if—but only if—he knows that he retains full responsibility.

Should the doctor be the kind of man who waits for people to come to him—dealing only with the illnesses or problems people choose to present? Or should he be, as Maurice Backett has suggested, a kind of medical sheepdog, forever barking at the heels of his flock, seeing that they are fully immunised, living in healthy homes, and not getting too stout? A possible advantage was seen in some formal relationship by which a doctor coped with the preventive needs of a defined community, but some did not think he should have a captive group. His preventive work, they said, should be part of the normal transactions of practice, though a strong plea was expressed for rescinding the rules which at present so often prevent doctors from lecturing publicly on health subjects. It was asked whether doctors are sufficiently trained for health education—whether they are told how to communicate and what to communicate: to which the answer was felt to be 'No'. One practical suggestion was that doctors wishing to improve the health of their community should associate themselves with one of the small groups which in so many towns try to promote welfare.

A relevant forecast by Stewart Wolf, writing of the physician of tomorrow, was quoted:

> He probably will not even be called a general practitioner. He will see the patient first and be the diagnostician, evaluator and analyst of the data, and the counsellor of the patient. He will rely heavily on his technologists of medicine, the passers of catheters, the readers of bone-marrows, the measurers of compliance and tidal volume, and the virtuosi of the milliequivalent. The technologists, or second-class physicians, will be located in centres at least 30 miles apart, surrounded by costly and impressive equipment plugged into digital computers. The man in the field, my new kind of general practitioner, will be the really first-class physician. He will be using his head, which contains the only computer that can be mass-produced by unskilled labor.

The conference also received with enjoyment a statement by Sir Theodore Fox which it asked should be put into print.

The Personal Doctor

By Sir Theodore Fox

In the future, who is really to be responsible for the patient? Is it to be an independent practitioner, assisted when necessary by the hospital? Or

is it to be the local hospital, some of whose staff are deputed to provide home care?

Both in Australia and in Britain the medical services have been based on the independent general practitioner; and in both countries probably most planners would like to retain him as some sort of personal doctor. But I doubt whether this can be done if (as is so often and attractively proposed) practitioners are formed into groups closely integrated with hospitals and even working from hospital premises.

As Iago Galdston of New York points out, hospitals excel where a disease can be vanquished without regard to the person who has it. But in many of the illnesses of today nothing can be done unless the patient co-operates in modifying his environment or his habits. Several of the papers for this conference have urged that medicine must concern itself increasingly with these disorders of function, of environment and behaviour. And the kind of persuasion so often necessary is usually better given by a doctor who knows him at home, a doctor oriented towards the community rather than the hospital.

Community medicine differs from hospital medicine in being primarily concerned with people in relation to their families and homes, their work and their play. To do his job, the personal doctor must be a skilful clinician, and he must have easy contacts with the hospital. Nevertheless it seems to me a mistake to base his practice on the hospital, from which he should be, both geographically and psychologically, a little detached. Professor McKeown made this point when he wrote: 'There is little doubt that a personal domiciliary medical service is more secure when based on a facility outside hospital. The temptation to accept the hospital's habit of efficient impersonal service is very great and can more easily be resisted at a distance.'

The growth of specialism increases the need for everybody to have a personal doctor who, knowing how he lives, can see his problems in proportion. But to perform this function well, the doctor must feel personally responsible for his patient; he can't perform it properly if he sees himself as merely a medical officer, a functionary of the hospital, the instrument of a group. He needs to be someone chosen by the patient but not someone chosen by the community.

In many countries, probably, most medical care will soon be provided by and from the hospital. But believing this to be a second-best arrangement, I can't help hoping that Australia and Britain, with their long traditions of independent general practice, will pursue alternative solutions in which the concept of medical care primarily by an independent personal doctor is preserved, though modified to fit the new times.

Modification is necessary because personal medical care, in its ideal form, is nowadays seldom practicable. The doctor's burden is becoming too heavy unless it is shared with colleagues and ancillaries, if this sharing is bound to reduce the personal element in the care he gives. For most of the transactions of practice this does not really matter. But we should, I think, stick to the principle that everybody has a doctor who has accepted medical charge of him and to whom he can go for help.

'Someone individual', says David Rutstein, 'must direct and be responsible for the complex personal service called medical care. The confused,

perplexed patient must know to whom he can turn for guidance and support.'

Specialists

Everyone providing clinical services is a specialist, not least the new breed of general practitioner. The debate on 'Medical graduates providing specialist clinical services' was limited to those doctors who had so narrowed their technical activities as no longer to have a major role, and usually no role at all, in the first contact sense.

The principles upon which the relevant sections of the Todd Report for the United Kingdom were based were found to be acceptable, though it was realised there would be differences of detail for Australia. These principles were: that the medical undergraduate instruction period should be undifferentiated; that subsequent to an intern year of emerging clinical responsibility the graduate should enter a period of vocational training which, while not irrevocably or inflexibly committing him to a chosen specialty, would contain core material relevant to his stated choice at this moment; and finally, that a period of about three years in this mode might then permit a more directed subsequent practice and training in a given specialty. It was noted, in passing, that such a general period of semi-differentiated training would require for its national organisation a consortium based on interested institutions of diverse but related kinds.

Within this period and that subsequently spent in formal specialty training, three broad areas were considered—research, travel, and some currently neglected aspects of training for specialist practice.

In regard to research it was recognised that not all temperaments are suited to the prosecution of highly organised project-orientated research, which is usually, although not exclusively, undertaken in the laboratory. There is scope for a wide variety of talents in research activities which can range from laboratory research to clinical investigation and to the orderly collection of data in which all specialists should share during training. Furthermore, as with the Todd recommendations, formal credit should be given to a man who integrates research into his training program.

Travel as a part of training was a subject that aroused much interest. The current habit of looking upon the teaching hospital not only as the womb for conception and initial development but also as a subsequently re-enterable marsupial pouch was deplored. The cause of these existing atavistic tendencies was ascribed in part to the rigidity of senior appointments within the honorary system. The desirability of interstate travel during training as a means of acquiring different skills and attitudes was emphasised and at least two reasons were recognised for encouraging travel to other countries. First, although as a developed country we could no longer be frankly parasitic on other Western communities for basic training, there is still a need, because of our relatively limited resources and small population, to send men overseas to acquire specific skills, as well as to satisfy the inbuilt wanderlust of the average Australian. Secondly, because we are a developed country on the fringe of Oceania it is a duty for our specialists to seek and to acquire skills useful to those countries developing in our area, and travel for this purpose should be encouraged

so that emerging clinical specialists might be able adequately to teach in the wider and specialised world of South-east Asia.

Three neglected areas of training were mentioned briefly. First, managerial skills are especially important, in that specialists are particularly engaged in the deployment of expensive and limited human and physical resources. Secondly, educational skills are required and are too often assumed to be innate. Doubt was expressed by some as to our ability to teach the potential teachers, but this was disputed. Thirdly, there is a need for skill in handling the group situation, for as we have been constantly reminded, the specialist is now no longer the master of his empire: occasionally he is the leader of a group but perhaps increasingly he must become its willing servant. The growth of diversional systems in hospitals of the future will make this an even more important matter.

There was reluctance to define the human qualities expected in good specialists. Although specialists have been stereotyped as possessing or lacking certain qualities, there seemed general agreement that there was a sufficiently wide range of need within any speciality to render unnecessary pre-selection of individuals for it. There was further faith in the concept of modifiable human behaviour and the belief that attitude and example during the training period could lead to the display by the specialist of appropriate behaviour patterns. This should include many of those patterns which, to a degree by default, have come to be regarded as the exclusive province of the personal physician.

It was realised that discussion had been confined to the attributes needed to provide a springboard into specialist practice. Beyond this there is the need for the continual indentification of new skills and new knowledge, particularly for the isolated specialist, whether in town or country, and constant attention must be given to this aspect of continuing education.

Throughout the discussion it was obvious that the honorary system, although tried and tested in this community in the past, was now unable to meet the demands of this new type of specialised training.

Paramedical services

There was a clear indication from the earlier discussions that medical care in the future will be given increasingly by medical teams whose members will be drawn from a variety of medical and ancillary disciplines. This concept will apply not only to hospital-based activities, but also to those emanating from group practices, health centres, and from community-based personal physicians. One reason for the development is the realisation that the physician's time is of vital importance to the quality of the medical care he is able to give: another is the recognition that the needs of patients require a greater range of skills and knowledge than any one person can master.

There was reluctance to accept the terms 'paramedical' or 'ancillary' as a description of those members of the team who are not physicians, as these terms imply an inferior role. The name 'greater medical profession' was rejected as giving a suggestion of empire-building. 'Professional associates' seemed to be the most acceptable name, though some thought it did not go far enough towards recognising equality of status.

The composition of the team could be expected to vary in numbers and types of participants. It was assumed that the physician would lead the team and, in general, direct its activities. It was emphasised, however, that he must have or develop the personal qualities for leadership which will ensure that all workers in the team will feel themselves to be full members of the team. Some saw the organisation of the team as a pyramidal or wedding-cake structure: others rejected this in favour of a wheel analogy, which emphasised the team concept and avoided the impression of a hierarchical grading of status and worth. All were agreed, however, that the nurse stood in a unique relationship with the doctor in the team and that their colleagues, whether in echelons, layers or spokes, included physiotherapists, occupational therapists, speech therapists, social workers, psychologists, educationists, vocational and marriage guidance counsellors, laboratory technicians, radiographers, biochemists, microbiologists, and so on. Even medical physicists, electronic engineers, and computer technicians might be incorporated to some extent.

The nurse was seen as a generalist in a world of specialists, someone who would provide a sympathetic personal service to the patient, an observer, communicator, and interpreter between patient and physician: a medical friend to the patient, perhaps to an even greater extent than the doctor. Her role would be to support and to understand the patient, and to do for him those things which he would, if he could, do for himself, as well as to do things for him which the doctor would do if he could and had time. Her training would include the basic sciences and preventive medicine, communication skills, observation and accurate reporting, orthodox nursing subjects, and those psychological and sociological disciplines which relate to understanding the place of the individual in society. Her specific abilities, desires and personality might direct her to the field of hospital nursing or to some avenue of nursing in the community. In the latter instance she might work with a single physician or with a group, and she might be employed either full-time or part-time. There is a large untapped pool of married women who could contribute their skills to community health in this way.

The other professional associates were seen as playing a more variable role in teams. For instance, the demand for their services would depend on the nature of the practice and whether it was located at a hospital or in the community. It was thought that services should be provided by statutory authority, voluntary organisations, or private agencies as circumstances in the geographical area and as the political and social climate dictated, but in any case their importance was such that financial considerations by patient or physician should not limit their proper employment. No adequate reasons were advanced for this country not being able to afford such improvements in its health services. There was a real need for more efficient organisation of the existing services, and for specific attention to be directed towards bridging the gap between the providers of these services in hospitals and in the domiciliary area, to ensure continuous care of patients when transferred from hospital to home.

No attempt was made to specify in detail the knowledge and skills demanded of each professional person. However, the conference made it clear that the various members of teams must be fully qualified profes-

sionals making responsible decisions in their own fields, that they must be prepared to accept many of the responsibilities borne at present by the doctor, and that the learning of communication skills is of paramount importance. Effective communication is essential both for patient-professional relationships and for inter-personal relationships within the team. There was agreement that such skills and the knowledge of the behavioural sciences on which they may be built, are an urgent and common need of all the health professions including medicine itself.

There was discussion of a 'Greater Medical School' which could provide training in one institution, on one site, for a wide variety of health-orientated professions. A firm conviction emerged that there is indeed a need to involve students of many of these professions in common training and experience, at least for a time. No attempt was made to define the term or curriculum of this common training but there was agreement that work in the behavioural sciences, in communications, in human biology, and in community health care must form its core. Value could be seen in providing university-level training for some members of nearly all of the health professions, certainly including nursing. It was stressed that common student experience was especially fruitful in fostering equal-status communication and relationships, and it was suggested that there was ample justification for a bold experiment in this at the Australian National University. It was recognised, of course, that considerations of time, if nothing else, could severely limit the amount of common training that could be devised which would allow appropriate election for training in depth, while preserving common membership of some classes and of a student body.

In summary, it was emphasised that the concept of medical practice emerging from this conference demands not only increasing use of paramedical health professions, but also better training for them, and indicates a need for some at least in each profession to have university training.

Continuing education

Discussion on 'a medical service which incorporates continuing graduate training' ranged mainly round three questions: what facilities are required for continuing education as part of the pattern of medical practice; how can medical practice encourage or ensure motivation for continuing education; and what would the implications of these measures be for different forms of medical practice.

It was abundantly clear that the key to the problem was an effective intercourse between the doctor in the field and a competent repository of knowledge and skill. The latter was primarily the teaching hospital, but other institutions playing an important role were the professional associations and colleges, postgraduate committees, and so on. The need for a co-ordinating body for these organisations with functions of forum and advice was generally agreed, and reference was made to the Australian Post-Graduate Federation in Medicine.

The system operating at one medical school was described. General practitioners there were given the opportunity of serving in the wards. It had been found that a period of three months was necessary to allow

someone who had been graduated for ten to fifteen years to settle down again to effective learning. In this case, places were provided for some thirty to forty graduates a year, but in general such a scheme must obviously be geared to the size and nature of the hospital, and particularly its resident staff structure. Shorter courses of hospital service and even one or two day courses were considered, and while it was generally agreed that they were less effective, there was difference of opinion as to how effective they were.

Reference was made to the practice at Monash University of placing resident medical officers in outlying hospitals and having members of the teaching faculty visit these, thus providing on-site teaching for the practitioners using the hospital. Methods implemented by the Australian College of General Practitioners were also described whereby visiting Fellows organise general practitioners into learning groups and provide these groups with journals and teaching aids. Other established techniques were referred to, such as recordings, 'land-line' conferences, closed television programs, visiting lecturers, and so on. Reference was also made to the role of drug house advertising in this respect, and the disadvantages and some advantages of this were noted.

It was considered that all these methods, and others, offered ample scope for the development of an effective, continuing education program. However, they would require that time to utilise them would have to be made available in working hours and without prejudice to patient care, and that there should be structured relationship between the practitioner or his group and the teaching hospital, and thus that the latter must extend its sphere of influence beyond its own walls.

It was recognised that in most medical communities only about one in five do actively continue their education. This could be overcome to some extent by providing more time for it, but even so there was no guarantee that the free time would be so used. Basic to the problem is the development of appropriate attitudes at both the undergraduate and immediate postgraduate levels. It was considered that this was not happening to a sufficient degree at present in teaching hospitals and universities in Australia.

To generate motivation through promotion or salary seemed a likely approach, and the Merit Award System in Britain was referred to as effective, but only applicable in a form of salaried service. The delicate, but very real subject of status was considered. The activities of professional colleges and the inducement to achieve status by qualifying for membership through study requirements and examination were accepted as powerful motivating forces, and it was hoped that their influence would increase. The derivation of status from undertaking investigations, writing papers, giving lectures, participating in seminars, and so on, was likely to have an important influence and should be encouraged.

Relevant to both the above topics is in-service training. By its very nature it effectively provides facilities, and bypasses, at least to some extent, the problem of motivation, as the learning process is part of the job and the learning is done in working time. It was generally agreed that a system of medical practice which incorporates this type of education was highly desirable.

The specific requirements for training hospital resident medical officers, specialists, and research workers were not considered. It was emphasised, however, that in planning any medical organisation it was important to make provision for teaching in all the main vocational segments of the service, and to have the immediate postgraduate training flexible enough to allow 'spiralling' of doctors from one type of practice to another.

For any system of continuing education to be effective it seemed essential that it should make time available for study without prejudice to patient care; that it should not involve financial demands on the doctor; and that it should incorporate in-service training. Without interpreting these requirements too precisely in relation to the patterns of medical care described in the preceding chapter, it did seem that they were not consistent with solo practice, and that they did require some type of structured relationship between the unit of practice and the teaching hospital.

Standards of competence

Consideration was given to 'a medical service which provides a continuing survey of competence of practitioners'.

Traditionally the qualified doctor has the right to continue to practise his profession indefinitely unless he commits a serious misdemeanour, but his patient or his employer has the right to expect that he perform his task competently. The community, which through public funds increasingly supports medical care, has a similar right. The best ways of achieving reasonable standards of competence would seem to be through education, registration and, less easily, some form of assessment of performance.

It was agreed that the best method of ensuring competence was by stressing the need for education, including continuing education, and that steps should be taken to set up educational programs which encouraged the full collaboration of all sections of the medical profession.

Registration boards were seen to be necessary to ensure that the person is fit for registration, not only on the basis of his university degree, but also on the basis of adequately certified evidence that he has competently completed his required hospital training. To ensure competence in all fields it was felt that registration of specialists was also desirable, provided this was done on the basis of definitions of specialists approved by the whole profession. This should include the general practitioner where he too has reached the standard of practice in his field which gives him an acceptable diploma in general practice.

It is relatively easy to survey the competence of practitioners in hospitals, especially in more complex types of hospitals. A system of accreditation of hospitals for medical care and education is strongly to be encouraged. A national accrediting body for this purpose would involve the Australian Medical Association and the Colleges, and thus involve them in ensuring high standards of professional competence. Such a scheme of accreditation should be voluntary but would be a great stimulus to the hospitals to maintain high standards. Proper residency training and graduate training programs would be implicit in such a scheme, including regular unit rounds, clinico-pathological conferences and other means of graduate training. Surveys of competence of practice in hospitals should be regularly carried

out — reviews of deaths, operations, tissues, bed-stay periods, and all the other things which a full audit can achieve. Adequate medical records are essential. Classification of staff would apply eventually in all but small district hospitals.

The group found greatest difficulty in the question of surveys of competence among practitioners in their work outside the hospital. It was agreed that these are necessary, but the mechanisms by which they should be done were far from clear. There was no great enthusiasm for regional surveys by health authorities of such things as prescribing habits. The assessment of death rates, disease rates, disability rates, and dissatisfaction is possible, and is probably necessary, but it is subject to misinterpretation and emphasises negative rather than positive features, such as health and well-being. For community-type practices, the group felt that at least as important as the above were efforts to encourage practitioners to participate in group discussions. This can only be done on a voluntary basis but the aim should be to stimulate all doctors in the area to participate. Discussions would provide an educational experience and also, in passing, a form of survey of competence. The preliminary work of the College of General Practitioners in this field was noted.

Humanitarianism

Discussion about 'institutional and specialist services which ensure that there is responsibility for the humanitarian side of care, or care for the patient as a person' was concerned mainly with the situation in the existing framework of medical services, and with the possibility of making it more effective. Inevitably attention focused on the teaching hospital, and discussion dealt initially with some of those abstract, but none the less fundamental, elements in the relationship between doctor and patient which require some effort to bear in mind in a busy, crowded, sometimes noisy, hospital world.

Firstly, there should always be an awareness that the patient is in an alien world and some attempt should be made to re-create in the doctor's and the student's mind the world to which he really belongs. Some thought should be given to the environment in which the interview takes place, and this embraces a sense of the dignity of the individual patient, his right to privacy at least on one occasion, and the illusion of timelessness which goes with the faculty of listening to the patient. These smack either of Utopia or of a private consultation for a privileged person in a consultant's rooms or office. Yet is it not desirable that everyone should have a right to just this service, even in the counterpart of the outpatient clinic? If this is set as a goal in the physician's or specialist's clinic, perhaps in the final analysis countless subsequent visits might prove unnecessary.

Why do patients continue to haunt outpatients clinics? Not infrequently this occurs because the hospital-based doctor, either in ignorance or from an unfortunate experience, does not believe that general practitioners can cope. Hence the maintenance care of patients is often controlled in hypertensive, diabetic, thyroid, and other clinics, while the general practitioner atrophies from disuse. Inherent in this may be a lack of awareness of the

patient as a person. A more valid reason is the desire, even the necessity, of the young specialist based in a teaching hospital to build up a practice in his outpatient department. Herein lies a conflict in which the general practitioner finds himself deprived from even sharing in the challenging and interesting facets of the medicine of the day.

Many aspects of the humanitarian care of patients within institutions were discussed. One point was whether the teaching interview was not better done on the second visit rather than on the first. Another was the value of letting the student know his limitations by tape recording and videotape recording his interview with the patient, and these would then be played back to the group. The importance of progressive patient care and of continuing responsibility was stressed. There is a need to form a relationship with the patient so that he is recognised as a person in the social scheme, as well as being a patient. Emphasis was placed on the difficulties of maintaining a continuing relationship with patients in hospitals and on how the type of counselling may need to change in various stages of an illness. Unremitting thought must be given to permeating the hospital with these aspects of patient care, and this enters into the training of nurses, students, and housemen, as well as of social workers. The role of social aides, auxiliaries, hospital visitors, and hospital chaplains was discussed.

Another important factor is the general climate of opinion in the community regarding its responsibility to accept without disparagement the presence of the halt, the maimed, and the blind and to provide the means that make the life of their community accessible to them. It was emphasised that patients with chronic and disabling illnesses were dependent not only on doctors but on physiotherapists, occupational therapists and many others. The value was mentioned of having patients in groups so that they could express themselves, and reference was made to the problem of the size of wards for chronic patients and the need for a pleasant atmosphere not devoid of features of interest.

Are the qualities and the basis of what is desirable in the humanitarian aspects of medical care attainable to an adequate degree in the teaching hospital? For the inpatient, and for certain special outpatient services, it was agreed that the answer is definitely in the affirmative. However, more thought must be given to what is fundamental to human dignity and worth, and there must be clearer recognition of the limitations of outpatient services, especially where they compete with general practice.

Within the existing framework then, it was felt that the teaching hospital is too little aware of its responsibilities to the world outside its gates; too little aware of the fact that many patients are better on their own ground; and too little aware of its responsibilities for the training of the general practitioner and for making full use of his potentialities.

In concluding these discussions, the plenary chairman said: 'By the opening addresses and by the discussions I have been irresistibly reminded of a nice piece of exaggeration by Medawar:

> The more general question is this: What is medicine tending to; what are the ultimate goals of medicine in terms of human welfare generally, not just narrowly in terms of health; and what will be the ultimate effects

on society of medical practice and medically inspired legislation? I suppose that two extreme views are held in answer to these questions, and though they are mutually contradictory, they are, in fact, sometimes held by the same people, though admittedly, not at the same time.

First there is the view that medicine is abolishing—indeed has already abolished—the main causes of ill health; that the goal of medical research is to put its own practitioners out of business; that this goal will be achieved and the major task of medicine will one day be accomplished so that eventually medicine will wither away, as Lenin said the state would wither away. But some people who say this can also, in different moods, be heard to say (without any apparent awareness of inconsistency) that medicine by its very success in preserving the weak and defective and the medically dependent is imposing a huge and growing burden on society and in particular, on the medical services of society; that medicine far from withering away, will, as George Orwell said the state would, become ever more pervasive and intrusive and demanding until one day all the world will become a hospital and even the best of us will only be ambulatory patients in it.

I think it can be said that this conference has leaned away from scientific faith and the withering away of things medical and has come down heavily on the side of a human approach to human need. The conference has pointed some ways in which an Orwellian State of Medicine can be avoided and the growth demand upon resources checked. Not the least of these is the suggested development of medical sociology and medical economics and management techniques: to inform the whole medical scene and give the opportunity for better assessment of cost and benefit, of efficiency and competence.

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