Outcomes for Older Patients With Hip Fractures: The Impact of Orthopedic and Geriatric Medicine Cocare

A. A. Fisher, MD, FRACP, PhD,* M. W. Davis, MBBS, FRACP,*† S. E. Rubenach, MSocSc,‡
S. Sivakumaran, MBBS, MRCP(UK), FRACP,* P. N. Smith, MBBS, FRACS,†§
and M. M. Budge, B MedSc, MBBS, FRACP*†

Objectives: To assess the impact of a specifically designed model of orthopedic-geriatric cocare on hip fracture (HF) outcomes.

Setting: Tertiary teaching hospital (level I trauma center).

Design: Prospective observational study with a retrospective (historical) control. Data on 951 consecutive patients 60 years of age or older admitted to the authors' institution with a nonpathologic HF over a 7-year period (1995 to 2002) were analyzed. Between 1995 and 1997, medical problems were managed by a geriatric medicine (GM) consultation-only service (retrospective audit). In 1998, a GM registrar began overseeing daily medical care with weekly geriatrician consultant review (prospective study). Outcomes for 2 time periods were compared: a 3-year period before (no GM; 504 patients) and a 4-year period after (GM; 447 patients) the introduction of GM cocare.

Main Outcome Measurements: Postoperative medical complications, mortality, length of stay, discharge destination, use of thromboprophylaxis, and antiosteoporotic treatment.

Results: While comparing 2 periods (GM and no GM), significant reductions in postoperative medical complications and comorbid conditions (in total 49.5% vs. 71.0%, $P < 0.001$) and mortality (4.7% vs. 7.7%, $P < 0.01$) occurred and rehospitalization to medical wards within 6 months decreased (28% vs. 7.6%). However, no differences were observed in median length of hospital stay (10.8 vs. 11.0 days) or in discharge destination. Antiosteoporotic treatment (12% to 69%) and specific thromboprophylaxis (63% to 94%) increased in the GM period.

Conclusions: Orthopedic-geriatric cocare for the older patients with HF was associated with significant reductions in morbidity and mortality, and increases in optimal postoperative care. Options for further improvement of orthopedic-GM cocare need to be investigated.

Key Words: hip fracture, orthopedic-geriatric cocare, outcomes, older people

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Hip fracture (HF) is a major health problem worldwide with enormous health and socioeconomic consequences.¹ HF in older adults represents a leading cause of morbidity, mortality (10% to 28% at 6 months,^{2,3} up to 33% in the first year⁴), permanent functional disabilities (32% to 80%^{5–9}), and institutionalization (up to 35%¹⁰). HFs in older adults are associated with more death, disability, and medical costs than all other osteoporotic fractures combined.^{6,11} Notably, the number of HF will exponentially increase worldwide with continued aging of the population, especially those over 75 years.^{12,13} In Australia, by 2050, a 4-fold increase in the yearly number of HFs is expected.¹⁴

The older the patients with HF, the more likely that comorbidities exist at the time of fracture presentation. Indeed, coexisting medical problems have been reported in up to 90% of patients with HF.⁴ Surgery, postoperative rehabilitation, and discharge from hospital may be delayed if these medical problems are not appropriately managed. The epidemic of HF in older patients, their multidisciplinary needs and poor outcomes have motivated collaboration between orthopedic surgeons and geriatric medicine (GM) consultants. To improve the outcome of HF, different models of joint orthogeriatric care have been proposed (Table 1).

However, analyses of the efficacy of these models of combined orthopedic and geriatric care have yielded variable results. Some reported significant^{16–19,21–23,26–35} or at least minor^{20,36,37} improvements, whereas others failed to observe any benefit.^{4,5,8,38–43} Similarly, in a Cochrane review meta-analysis of 9 trials (a total of 1869 older patients with HF), which compared usual orthopedic care with coordinated multidisciplinary inpatient rehabilitation, combined outcome measures (eg, death or institutional care) tended to be better for the latter group, but “the results were heterogeneous and not statistically significant”.⁴⁴

The objective of our study was to assess the impact of daily GM cocare on clinical HF outcomes, within the orthopedic unit. Our hypothesis was that combined

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From the Departments of *Geriatric Medicine; §Orthopaedic Surgery; ‡The Canberra Hospital, ACT, Population Health Research Centre, ACT Health; and †The Australian National University.

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Reprints: Dr Alexander Fisher, MD, FRACP, PhD, Department of Geriatric Medicine, PO Box 11, Woden, ACT, 2606, Australia (e-mail: alex.fisher@act.gov.au.).

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TABLE 1. Models of Combined Orthogeriatric Care in the Management of HF

Model	Country (City)
1. Nurse-based liaison service	UK, Newcastle upon Tyne ¹⁵
2. Multidisciplinary liaison service (weekly ward round)	UK, London ¹⁶
3. Assign a geriatrician to provide daily care in the orthopedic ward	Italy, Rome ¹⁷ UK, Surrey ⁴
4. Clinical pathway/multidisciplinary care	Australia, Melbourne ¹⁸ Australia, Melbourne ¹⁹ Australia, Sydney ²⁰
5. Interdisciplinary intervention in the hospital and community by allied health professionals	Australia, Gold Coast ²¹
6. Orthogeriatric unit (ward)	Israel, Tel Aviv ²²
7. Transfer to the geriatric ward after surgery	Finland, Kinkomaa ²³
8. Geriatric orthopedic rehabilitation unit	USA, New York City ⁸
9. Hospital at home	Australia, WA, ²⁴ Netherlands UK, Cambridge ²⁵
10. Medical management by hospitalist service in a surgical ward	USA, Rochester ²⁶

orthogeriatric management of older HF patients would decrease perioperative morbidity and mortality, improve postoperative and postacute care, and decrease rehospitalization and length of hospital stay.

MATERIALS AND METHODS

Design

This is a prospective cohort observational study with a retrospective (historical) control.

Participants

Nine hundred fifty-one consecutive patients of age 60 years or above admitted to The Canberra Hospital with a primary diagnosis of nonpathologic HF over a 7-year period (1995 to 2002).

Intervention

Between 1995 and 1997, patients with HF were managed exclusively by the orthopedic team and GM advice was limited. All medical problems were managed by a consultation-only service. In 1998, a part-time orthogeriatric GM registrar was appointed to oversee daily medical care with weekly consultant geriatrician review. A half-time orthogeriatric GM registrar worked 5 days a week and was available for consultation from 0800 to 1700. On weekends and after-hours, GM care was usually provided by 1 of 2 geriatricians on-call. These 2 specialists were the consultants who reviewed all HF patients in routine weekly and in case of need. This provided management of concurrent medical problems, postoperative complications, and advice on rehabilitation and discharge planning.

Data Collection and Main Outcome Measurements

Data regarding patient demographic characteristics, type of fracture, American Society of Anesthesia (ASA) classification, comorbid conditions, postoperative medical complications, mortality, length of stay, discharge destination, use of thromboprophylaxis, and antiosteoporotic treatment were collected prospectively by a doctor (A.A.F.) for a 4-year period after the introduction of the integrated ortho-geriatric service. Similar data for a 3-year period before the integrated ortho-geriatric service

was introduced were abstracted from medical records by another doctor (S.E.R.) blinded to the patient group. No patients were excluded from the analysis. Data were compared in 2 time periods: a 3-year period before ($n = 504$) and a 4-year period after ($n = 447$) the introduction of the integrated ortho-geriatric service.

Definitions

Adequacy of antiosteoporotic treatment (on the basis of the National Osteoporosis Foundation Guidelines, 2000) was defined as adequate if the patient was receiving triple therapy with bisphosphonate [or hormone replacement therapy (HRT)], calcium and vitamin D, and partial if the patient was receiving any antiosteoporotic drug.

Statistical Analysis

Group results were expressed as median and/or mean values ($\pm$ SD). We compared the groups using Student t tests. Categorical measures were expressed as counts (%) and analyzed by the χ^2 test. The level of significance for P values (2-sided) was set at 0.05. Statistical package for social sciences (SPSS 11.5 for Windows, SPSS Inc, Chicago, IL, 2002) was used.

RESULTS

Operating Model for Combined Orthogeriatric Management and Description of the Participants

Figure 1 provides an overview of the care pathway for HF for older adults in The Canberra Hospital. The GM service evaluates the patient with HF as soon as possible, often while the patient is still in the emergency department. However, all HF patients were admitted under the care of an orthopedic surgeon and treated in the orthopedic ward (when stable). A protocol regarding orthogeriatric comanagement of HF patients was implemented. The orthopedic surgeon selected the type of operation, whereas risk factors, readiness for surgery were assessed by the geriatrician and anesthesiologist and were then discussed with the surgeon to avoid any surgical delay. After surgery, all patients (if stable) were transferred to the orthopedic ward and received daily

FIGURE 1. An operating model for combined orthogeriatric management of older adults with HF.

care by the orthopedic and GM team. Table 2 summarizes the main areas of GM input.

The demographic characteristics of the 2 groups of older patients with HF treated in a 3-year period before and a 4-year period after the introduction of geriatric care are shown in Table 3. There were no significant differences in age and sex distribution between the groups. However, in the second period, the proportion of trochanteric fractures significantly increased (61.7% vs. 42.9%, $P < 0.001$), whereas the proportion of cervical fractures decreased (32.0% vs. 52.8%, $P < 0.001$). In the second period, there were also more HF patients with ASA classification scores (determined by anesthesiologists blinded to the study) of 3 and 4 (68.5% vs. 62%, $P \leq 0.001$) and with coronary artery disease (27.1% vs. 19.5%, $P = 0.008$). Other admission characteristics, including a wide range of comorbid diseases, residential, and ambulatory status did not significantly differ between the 2 groups. There was no difference in the proportion of types of surgical procedures (for each fracture site) performed in the 2 groups.

Main Outcomes

Because combined orthogeriatric care was introduced, in-hospital mortality of older HF patients significantly decreased (4.7% vs. 7.7%, $P < 0.01$). Joint orthogeriatric care also resulted in a significant reduction in postoperative medical complications including sepsis, pneumonia, urinary tract infection, delirium, venous thromboembolism [deep vein thrombosis (DVT) and pulmonary embolism (PE)], pressure sores, acute coronary, and cerebrovascular syndromes (Table 4). The number of patients receiving specific pharmacological thromboprophylaxis with low-molecular-weight heparin or unfractionated heparin increased from 63% to 94% ($P < 0.001$). Moreover, the rate of rehospitalization to medical wards within 6 months after hospital discharge for HF decreased from 28% to 7.6% ($P < 0.001$). However, no differences were observed in mean and median lengths of hospital stay, although the number of patients with hospital stays of more than 30 days slightly decreased (Table 5). In the 2 study periods, there was no difference in the percentage of

TABLE 2. Main Areas of GM Input into Assessment and Care

1. Peri-operative
Investigation and management of multiple comorbidities
Risk assessment
Modification of correctable medical conditions ("prepare for surgery")
Analgesia and anesthesia
Reversal of antithrombotic therapy and anticoagulation
Prophylactic antibiotics
Prevention of pressure ulcers
Maintenance of adequate hydration and nutrition
Blood transfusion where appropriate
2. Postoperative
Prevention and treatment of postoperative complications
• Infections
• Delirium
• Thromboembolic complications
• Cardio-pulmonary complications
• Cardiovascular complications
• Urinary retention
• Renal failure
Further investigation and management of multiple pathology (including causes of falls)
Rationalization of medications
Secondary antiosteoporotic treatment
Coordination of functionally orientated nursing and paramedical care
Early goal setting and discharge planning

patients returned home or discharged to residential care institutions.

While comparing the second to the first period, the length of hospital stay of patients who were living preoperatively in a residential care institution and post-HF repair returned to the same residential facility was significantly shorter (17.5 ± 17.8 vs. 22.4 ± 28.7 days, $P < 0.001$); in this group, however, fatal outcomes post-HF occurred earlier (9.1 ± 7.9 vs. 16.4 ± 11.0 days, $P < 0.001$).

Use of Antiosteoporotic Treatment

The proportion of patients receiving antiosteoporotic treatment before presentation with an HF was 11.8% in 1995 to 1997 and 14% in 1998 to 2001, and in all cases it was only partial (inadequate). In other words, antiosteoporotic therapy for primary HF prevention was very low during both time periods. Because, establishing the orthogeriatric service antiosteoporotic treatment of secondary fracture prevention has progressively increased. In the last year, it reached 68.9% and was defined as adequate in 43.7% of discharged patients.

DISCUSSION

The concept of combined orthogeriatric care in management of older persons with HF has been reported because the late 1950s^{45,46} and different models have been proposed (Table 1). Although such an approach has become increasingly accepted, the effectiveness of shared care still remains controversial. Even when HF patients were treated in a dedicated orthogeriatric unit,

TABLE 3. Demographic Characteristics of Older Patients With HF Treated Before (1995 to 1997) and After (1998 to 2001) Introduction of the Orthogeriatric Cocare Model

Characteristics	Time Periods	
	1995–1997	1998–2001
No. patients	504	447
Age (years)		
Range	60–99	60–99
Mean $\pm$ SD	81.3 ± 8.2	81.9 ± 8.0
≥ 75 years (F)	311 (81.0%)	292 (87.7%)
≥ 75 years (M)	91 (75.8%)	83 (72.8%)
≥ 75 years (total)	402 (79.7%)	375 (83.9%)
Sex		
Women	384 (76.2%)	333 (74.5%)
Men	120 (23.8%)	114 (25.5%)
Site of fracture		
Cervical	266 (52.8%)	143 (32.0%)***
Intertrochanteric	216 (42.9%)	276 (61.7%)***
Subtrochanteric	22 (4.4%)	28 (6.2%)
ASA classification†		
1–2	157 (38%)	122 (31.3%)***
≥ 3	256 (62%)	267 (68.6%)***
Comorbidity		
Coronary artery disease	99 (19.5%)	121 (27.1%)**
Congestive heart failure	107 (21.1%)	103 (23.0%)
Cerebrovascular accident	54 (10.7%)	59 (13.2%)
Transient ischemic attack	40 (7.9%)	27 (6.0%)
History of myocardial infarction	32 (6.3%)	34 (7.6%)
Chronic obstructive pulmonary disease	49 (9.7%)	95 (10.1%)
Dementia	168 (33.1%)	142 (31.8%)
Parkinson disease	32 (6.3%)	21 (4.7%)
Hypertension	207 (41.1%)	194 (43.4%)
Residence at admission		
Home	331 (65.7%)	286 (64.0%)
Institution	173 (34.3%)	161 (36.0%)
Ambulatory status		
Independent	284 (56.0%)	237 (53.0%)
Use a walking device	197 (38.9%)	182 (40.7%)
Nonambulatory	26 (5.1%)	28 (6.3%)

*** $P < 0.001$.

** $P < 0.01$.

†Data were available for 413 (82%) patients in the first period, and for 389 (87%) patients in the second period.

prospective randomized studies provided conflicting results.^{4,21,28,36,39} Similarly, the role of rehabilitation therapy and care is uncertain.^{5,8,23,39–41,44} However, in Australia and New Zealand, various schemes including accelerated domiciliary and in-hospital rehabilitation,^{21,29–31,37} use of critical pathways,^{18–20} or geriatrician review on a twice weekly basis³² lead to improved outcomes.^{20,37} In the United States, hospitalists are increasingly collaborating with surgeons to provide perioperative care. The utility of such comanagement in orthopedic patients has been evaluated in only a few studies.^{26,47} Hospitalist-orthopedic comanagement of high-risk patients undergoing elective-hip and total-knee replacement reduced only minor postoperative complication rates but did not affect length of stay or costs.⁴⁷ A similar model in older HF patients resulted in a decreased length of stay (8.4 vs. 10.6) "without adversely affecting inpatient deaths or 30-day readmission rates".²⁶ It is

TABLE 4. Incidences (%) of Main Postoperative Medical Complications in Older Patients With Hip Fracture

	Time Periods		<i>P</i>
	1995–1997 (n = 504)	1998–2001 (n = 447)	
Sepsis	12.4	6.7	0.040
Delirium	11.7	5.9	0.020
Venous thromboembolism	4.6	1.3	0.007
Pneumonia	3.8	0.5	< 0.001
Urinary tract infection	8.9	6.7	0.040
Pressure sores and blisters	4.7	1.8	0.010
Anemia	35.4	30.2	0.890
Gastrointestinal bleeding	2.3	0.9	0.090
Acute cerebrovascular syndromes	2.3	0.5	0.017
Acute coronary syndromes	2.4	1.3	0.049
Total	71.0	49.5	< 0.001

worth noting that in these studies, heterogeneous populations were tested (from the community, from nursing homes, with differing levels of cognitive dysfunction, etc.), and different approaches were used. Therefore, direct comparison is difficult.

In our model, which is simple and inexpensive, older patients with HF admitted to the hospital received daily care by GM service, although they remained in the orthopedic ward. Our study demonstrated several important points: (1) combined orthogeriatric care resulted in a significant decrease in mortality and a reduction in the total number of postoperative medical complications and comorbid conditions; (2) no significant differences were observed neither in median and mean lengths of hospital stay nor in the proportion of patients discharged to residential care; and (3) venous thromboembolism prophylaxis and use of antiosteoporotic therapy for secondary fracture prevention markedly increased.

Mortality and Morbidity

Among studies published since 1990, mortality rates in HF patients were 7% to 11% in hospital, 3% to 13% at 30 days, and 17% to 43% at 1 year after surgery.⁴⁸ Although in-hospital mortality rates at The Canberra Hospital in 1995 to 1997 period (before integrated

combined care) were at the low end of these ranges; in the 4-year period of combined orthogeriatric care, there was a further significant decline in mortality rate (from 7.7% to 4.7%).

It is not surprising that older patients with HF demonstrated multiple complications and comorbid conditions. Our data are consistent with other reports,⁴⁸ although the rates of these comorbidities vary widely. Importantly, combined orthogeriatric care resulted in a significant decrease in incidence of sepsis, pneumonia, symptomatic thromboembolic complications, urinary tract infection, pressure sores, gastrointestinal bleeding, acute coronary, and cerebrovascular events. Furthermore, within 6 months after hospital discharge for HF, the number of patients requiring medical readmission also decreased significantly (from 28% to 7.6%). It has been shown recently that hospital readmissions after HF repair are largely because of nonsurgical illness and are associated with increased mortality and morbidity.⁴⁹

Notably, these improvements in clinical outcomes happened despite an increased proportion of patients with higher ASA scores (≥ 3), coronary artery disease, and trochanteric fractures. A similar trend in redistribution of HF types has been observed in other countries,⁵⁰ with trochanteric fractures known to be associated with more severe comorbidity and poorer outcomes than cervical fractures.^{51–54} This suggests that HF patients with multiple concomitant medical problems benefit from regular involvement of geriatricians in their management.

Venous Thromboembolism Prophylaxis

Older patients with HF are known to be at very high risk of venous thromboembolism. Without preventive treatment, the incidence of total and proximal DVT is 50% and 25%, respectively, and rates of total and fatal PE are 4.3% to 24% and 3.6% to 12.9%, respectively.^{55,56} Our study and others^{57,58} suggest that despite these data, the use of thromboprophylaxis is still suboptimal. In our hospital, implementation of orthopedic and GM cocare resulted in a critical consideration of benefit/risk ratio, type, and length of thromboprophylaxis in each patient. The use of pharmacological prophylaxis in the study periods increased from 63% to 94%, and the number of symptomatic thromboembolic complications (DVT and PE) decreased from 4.6% to 1.3%.

Length of Hospital Stay

In Australia, average length of hospital stay of patients with HF varied greatly, from 6.6 to 32.5 days,¹⁹ indicating significant variations in local factors. In the United States, the mean length of hospital stay decreased from 21.9 to 12.6 days between 1981 and 1986¹⁰ and reached 5.8 days in 2001.⁵⁹ However, efforts to shorten the length of stay of patients with HF in acute care hospitals were associated with worse long-term outcomes, increase in institutionalization and higher overall care costs.^{10,40,60} Interestingly, some studies on effectiveness of care pathways for management of HF showed some reduction in length of stay, without effect on complication

TABLE 5. Length of Stay of Patients With HF in the Orthopedic Ward and Their Discharge Destination

	Time Period	
	1995–1997	1998–2001
Length of stay (days)		
Range	1–209	1–96
Median	11.0	10.8
Mean $\pm$ SD	16.4 $\pm$ 17.6	15.9 $\pm$ 14.9
≤ 10 days	235 (46.6%)	218 (48.8%)
≥ 30 days	77 (15.5%)	58 (12.9%)
Discharge destination		
Returned home	38.8%	39.8%
Residential care facility	25.7%	25.1%
Other hospital	27.8%	30.3%

rate,¹⁹ mortality and residential status;²⁰ others observed a significant improvement in clinical outcomes but was associated with longer (mean increase by 6.5 days) hospital admissions.⁶¹ Our observations and these data emphasize the importance of a coordinated approach to the length of hospital stay, avoiding premature discharge ("quicker but sicker"), which often results in negative longer-term outcomes and shifts the burden of care to other hospitals and/or nonhospital sectors. In the 4-year period of combined orthogeriatric care in our hospital, the length of hospital stay significantly decreased in the patients discharged to residential care facilities, presumably reflecting both the decreased levels of morbidity during admission and optimized liaison with care facilities.

Use of Antiosteoporotic Treatment

HF in older patients occurs in the setting of osteoporosis or osteopenia. Furthermore, osteoporotic HF is a major risk factor for a future fragility fracture. In the year after an HF, loss of bone mineral density is about 5 times higher than in the nonfractures population.⁶² Our data showed that primary and secondary fracture prevention was virtually ignored before orthogeriatric care started. These observations are in line with other recent reports regarding primary and secondary prevention.^{63,64} By the final year of this study period, the number of HF patients treated at discharge increased to 69% and about half of discharged patients received adequate triple antiosteoporotic therapy. Although this trend is encouraging, there is still a long way to go. These data raise serious concerns regarding the adequacy of diagnosis and treatment of osteoporosis, indicating the need for more effective education of health professionals and the community.

Limitations

The primary limitation of this study is the use of an historical rather than a concurrent control group. Consequently, the effects of improved treatment of medical problems in HF patients (beyond geriatric involvement) is impossible to exclude; although our data do not support that, such a trend existed before daily geriatric care was introduced. It is also impossible from the available data to determine whether changes in surgical treatment contributed to the observed reduction in mortality and morbidity. However, the weakness of our "before and after" study is lessened by the fact that both groups were from the same institution and treated similarly, except for the every-day geriatric care. Some important determinants of hospital outcomes after HF, such as severity of cognitive impairment, prefracture mobility status were not analyzed. Also, our findings reflect a single institution in a single community, and their generalisability to populations and hospitals with characteristics different from those in the Canberra region is unknown.

In summary, our study indicates that joint orthogeriatric care for older patients with HF offers significant

advantages. A comprehensive geriatric evaluation and daily care may markedly improve the management of this population, resulting in a significant reduction in medical complications and mortality, and an increase of anti-osteoporotic treatment of secondary HF prevention, but does not decrease automatically the length of hospital stay or rate of discharge to institutional care. Future research should focus prospectively on identification of the optimal model(s) of orthogeriatric care, and aim for further improvement of the short-term and long-term outcomes post HF. A comprehensive coordinated multidisciplinary strategy, including falls prevention post-HF and a continuum of care through the acute hospital phase and after discharge is urgently needed, as the incidence of HF escalates in the coming decades.

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*Editorial Comment on: "Outcomes for Older Patients With Hip Fractures:
The Impact of Orthopedic and Geriatric Medicine Cocare"*

Invited Commentary

Kenneth Koval, MD

This is a very important and controversial topic. There is continued need in medicine to improve the outcomes of patients who have sustained a fracture of the proximal femur. There have been multiple studies evaluating the efficacy of interdisciplinary models for the treatment of hip fracture patients, some of which have reported improved outcomes and others no benefits of these combined care approaches. The present article by Dr. Fisher and colleagues reports a positive effect of the use of orthopedic-geriatric cocare to reduce the rate of postoperative medical complications, in-hospital mortality, and need for rehospitalization.

The major limitation with this paper is that it compares the historical outcome of hip fracture management with a more recent cohort, using the multidisciplinary approach. However, it is not fair to compare these outcomes to a historical control; medical and surgical advances may have substantially impacted these outcomes regardless of the multidisciplinary care team. Furthermore, the authors did not control for patient mix (living situation, ambulatory status), which would have affected mortality and outcome.

A very interesting and important finding of this paper is that the use of geriatric cocare resulted in an improvement in osteoporosis treatment from 12% to 69%. Identification and treatment of patients with osteoporosis has become an important issue in today's healthcare climate and is a major focus of the AOA's initiative for "own the bone." Perhaps, increased involvement of geriatricians in the care of these frail and osteoporotic patients would help to further prevent fragility fractures in this vulnerable population. I congratulate the authors for an important study.

Kenneth Koval, MD

Dartmouth Hitchcock Medical Center
Lebanon, NH

In Response:

We thank Dr. Koval for emphasizing the importance of, and controversy surrounding, posthip fracture care in older adults.

We agree and fully recognize that the primary limitation of our analyses is the use of a historical control group. Ideally, assessment of the effectiveness of orthogeriatric comanagement should be primarily based on the results of randomized double-blind controlled trials. However, such studies are difficult to perform. Both blinding of the presence of the geriatrician in the care team and matching different units' orthopedic treatment, anesthesia, nursing skill sets, facilities, and physical therapy is difficult to achieve. Not surprisingly, in many recent studies the method of evaluation of the effectiveness of different management approaches has been a "before and after" comparison.¹⁻³ A similar methodology has been used in 12 of 15 studies regarding effectiveness of stroke units and in-hospital care pathways.⁴ After all, even the results of randomized trials may have limited application to "real world" conditions, given their inclusion and exclusion criteria. Therefore, credible clinical decision pathways can and should be informed by the results of available, complementary sources.⁵

Dr. Koval states that the “authors did not control for patient mix (living situation, ambulatory status)”. We reported (Table 2) no significant differences in age, sex mix, residential, and ambulatory status and main preexisting comorbid conditions between the patients in the 2 study periods.

With regard to the effect of a geriatric cocare model on under-treatment with appropriate antiosteoporotic drug therapy after hip fracture, we would like to add that, in 2004 to 2005, the percentage of our patients receiving adequate therapy at discharge has increased to 93%.

Although likely to be multidisciplinary, the optimal and most cost-effective model for posthip fracture care in older adults may differ between countries and even among hospitals. We are thus pleased that Dr. Koval shares our view that ortho-geriatric cocare models are worthy of further exploration to provide comprehensive care to an increasingly old, frail, and medically complex group.

Alexander Fisher MD, PhD, FRACP
Michael Davis MBBS, FRACP
Marc Budge, B MedSc, MBBS, FRACP
Department of Geriatric Medicine
The Canberra Hospital, and the
Australian National University

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