

# The effectiveness of geriatrician-led comprehensive hip fracture collaborative care in a new acute hip unit based in a general hospital setting in the UK

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## ABSTRACT

**Background:** We introduced a new model of care for patients with hip fractures involving a multidisciplinary approach. We then assessed the impact of this geriatrician-led comprehensive and collaborative hip fracture care on hip fracture outcomes.

**Methods:** The traditional model of care comprised of patients being managed on an orthopaedic ward under the care of one of ten orthopaedic surgeons, with a weekly orthogeriatric liaison. In this study model, hip fracture patients were directly admitted from the emergency department to a new, acute, dedicated hip unit that provided joint patient care by orthopaedic surgeons and an orthogeriatrics team. Intervention measures included fast track admission, a preoperative geriatric assessment, daily geriatrician-led clinical care on weekdays and general medical support on weekends. Standard protocols were implemented. Weekly geriatrician-led multidisciplinary meetings were held with an emphasis on early mobilisation and early discharge planning.

**Results:** There was a significant reduction in the time to surgery performed within 48 hours (86% vs 77%  $p=0.013$ ) and in the hospital length of stay (34 vs 19.6 days  $p<0.001$ ).

**Conclusions:** The main reasons for the improved outcomes in the study could include the multidisciplinary teamworking with geriatrician-led pre and post-operative care, and working closely with orthopaedic surgeons. Additionally, implementation of systematic protocols could have contributed to positive results.

**KEYWORDS** Hip fracture, orthogeriatrician, acute hip unit

**DECLARATION OF INTERESTS** No conflicts of interest declared.

## INTRODUCTION

Hip fractures in older adults are common and a major health problem worldwide, with many health and socioeconomic consequences.<sup>1</sup>

### Basic epidemiology

With an ageing population, the incidence of hip fractures is increasing; the annual number is expected to double by 2040.<sup>2</sup> Almost half of the patients with hip fractures fail to regain their pre-fracture mobility; up to 30% die within one year of surgery and a quarter of those living independently require long-term nursing care.<sup>3,4</sup>

### The need for geriatrician involvement

Hip fractures have traditionally been managed by surgeons. But patients with a hip fracture are usually elderly. The prevalence of co-morbidities including frailty is high among patients hospitalised following a

fracture. Surgery, post-operative rehabilitation and discharge can potentially be delayed if coexisting medical problems are not appropriately managed. These patients are at a high risk of complications such as delirium, infection and iatrogenic problems.<sup>5</sup> This can lead to functional decline, long-term care needs and ultimately death. Geriatricians are experts in caring for patients with medically complex needs and may be able to identify and reduce such risks, thereby improving outcomes following surgical hip repair.

### Evolving models of orthogeriatric care

The epidemic of hip fractures in elderly patients, their complex needs, which are best served using a multidisciplinary approach, and poor outcomes have led to the development of several interdisciplinary orthogeriatric models of care since the 1960s. Results have been mixed.<sup>6</sup> Collaborative orthogeriatrics care has

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led to a reduction in the length of hospital stay, fewer post-operative complications and lower rates of institutionalisation, with resulting decreased overall cost.<sup>6</sup> The original orthogeriatric units focussed their attention on the rehabilitation phase following surgery. In earlier studies, the orthopaedic surgeon was primarily responsible for care and there was a variable degree of geriatrician involvement. The focus was often on post-operative interventions rather than pre and post-operative care in an acute hospital setting.<sup>7-9</sup> When an orthogeriatrician acts as a consultant specialist with only weekly visits, more medical conditions are recognised but a study showed no effect on mortality, length of stay or discharge placement.<sup>10</sup> Increased benefits have been demonstrated in more intensive interventions in which a geriatrician has increased responsibility for care.<sup>11-13</sup> A daily geriatric collaborative model has shown a 21% reduction in medical complications, a 3% reduction in mortality and a 20% reduction in readmissions at six months.<sup>14</sup> Another study demonstrated a reduction in complications and length of stay.<sup>15</sup> More recently, a model with joint care by orthopaedic surgeons and geriatricians showed earlier surgery and a reduction in acute hospital stay by 33%.<sup>16</sup> In recent years, hospitals have started setting up units where orthopaedic surgeons and geriatricians share clinical responsibility for patients from the time of admission.

## PURPOSE OF THIS STUDY

The purpose of this study was to compare the process of care as well as the outcomes before and after the introduction of medical-orthopaedic collaborative management at a new, acute hip unit (AHU) at Glangwili Hospital, Carmarthen, UK.

## METHODS

**Setting:** This study was carried out at a district general hospital (DGH) with approximately 300 admissions with a hip fracture per year.

**Design:** This was a prospective, cohort observational study with a retrospective (historical) control. Two cohorts of patients with hip fractures aged over 50 years admitted to the DGH at Carmarthen in Wales: the first cohort was from a historical control group and the second from an intervention group. Patients over the age of 50 years were included as it was a 'needs-based service' as opposed to 'age-defined orthogeriatric care'.

Patients with a periprosthetic fracture and high trauma were excluded. Time to surgery was defined as the time taken between the patient's admission and arrival to the operating theatre. Length of stay was defined as the number of days a patient stayed in an acute hospital bed prior to discharge.

**Pre-intervention:** Prior to July 2011, patients with hip fractures were admitted under the care of one of ten orthopaedic consultants. They were primarily managed by the orthopaedics team. The traditional pathway of these patients was admission from the emergency department (ED) to the orthopaedics ward, followed by surgical treatment and post-operative rehabilitation under orthopaedics care. Advice from a geriatrician was limited to a weekly consultation service. Medical problems were addressed by the medical registrar on call. There was a lack of doctors in the multidisciplinary team meetings. Patients were discharged to peripheral rehabilitation hospitals if they were unable to go home. There was lack of standardised approach to fluid administration, pain management, thromboprophylaxis, falls and osteoporosis management.

**Intervention:** A joint programme was developed between the orthopaedic surgeons and the orthogeriatrician using existing resources and facilities. In July 2011, a new 15-bed dedicated AHU was established in the medical block of the same hospital. The nursing staff, therapists and junior doctors were existing staff members. The care of all patients aged over 50 with a hip fracture was co-led by an orthogeriatrician and one out of the ten orthopaedic consultants from the time of the patients' admission to the AHU. The decisions regarding the surgical method of hip repair still remained with the orthopaedics surgical team.

### Key intervention measures in orthogeriatric management

- A key feature of the AHU is the central role of one orthogeriatrician as the physician responsible for all patients admitted with a hip fracture. The geriatrician decides the pre and post-operative medical management for all of these patients on weekdays. The geriatrics team is now more closely and directly involved in the day-to-day management and in discharge planning (on weekdays).
- The orthogeriatrician developed an operational policy, with agreement from key stakeholders involved in hip fracture care.
- After arrival in the ED, patients with a hip fracture are offered a fast track management pathway which includes earlier assessment, pain control, and appropriate use of fluids. Investigations are carried out earlier, such as blood tests, electrocardiogram and X-ray are performed on the way to the dedicated AHU.
- A clerking proforma has been developed to enable more complete and standardised information collection on admission. Patients are assessed in the AHU by the junior orthopaedic doctor.

- Emergency medical management opinion is sought from a medical registrar if needed out of hours and at weekends.
- Ward rounds are carried out by the orthogeriatrician on weekdays. The geriatrician carries out a pre-operative evaluation on weekdays that includes a comprehensive geriatric assessment (CGA), and enables the necessary preparation and optimisation of care with an anticipated operation within 48 hours.
- A consistent, coordinated medical team approach is offered from admission to discharge from the AHU.
- Evidence-based practice is implemented for thromboprophylaxis, intravenous fluids, pressure sore prevention, bowel/bladder care regimes and prophylactic antibiotic regimes as per protocols agreed with the microbiology team.
- All patients have a nutritional assessment and oral supplements are provided as required.
- Rehabilitation is started on the first post-operative day. A rehabilitation programme is offered to all patients including those with cognitive impairment. A multidisciplinary team approach is practiced. Regular weekly multidisciplinary meetings are held, supervised by the orthogeriatrician. Emphasis is on goal setting and early discharge planning.
- Written leaflets are provided to patients and relatives. These include information on the surgery, osteoporosis and 'staying steady.'
- All patients have standardised falls and osteoporosis assessments. Dual energy X-ray absorptiometry scans are offered to patients aged under 75 years and pharmacotherapy is initiated as per National Institute for Health and Care Excellence (NICE) guidelines.<sup>17</sup>

## DATA ANALYSIS

Collected data were entered into an excel spreadsheet. Results are presented as percentages. Comparison between pre- and post-intervention data was carried out using Chi-squared analysis. Group results were expressed as median or mean values (+/- SD). The p value significance was set at <0.05.

## RESULTS

- Data for 494 patients were analysed: 235 in the pre-intervention and 259 in the post-intervention groups from the national hip fracture database report. An independent audit was also undertaken to assess outcomes in the two groups.

**TABLE 1** Baseline characteristics of hip fracture patients

	<b>Orthopaedic ward-based care n=235</b>	<b>Acute hip fracture unit n=259</b>
Age	40–98 mean 82 median 84	41–103 mean 81 median 83
Female (number and percent)	169 (72%)	194 (75%)
Admitted from own home (number and percent)	190 (81%)	212 (82%)
Preoperative abbreviated mental test average score	9/10	8/10
American Society of Anesthesiologists (ASA) Physical Status classification (number and percent)	Grade 1–9 (4%) Grade 2–115 (49%) Grade 3–80 (34%) Grade 4–21 (9%) Grade 5–5 (2%) Unknown 5 (2%)	Grade 1–8 (3%) Grade 2–75 (29%) Grade 3–124 (48%) Grade 4–44 (17%) Grade 5–3 (1%) Unknown 5 (2%)

- Baseline characteristics of both groups is shown in Table 1. The patients are very elderly, with median age 83.5 years, and 75% were female. No significant differences were detected in the two groups.
- Table 2 shows the process of care. It demonstrates significant improvement in time to surgery within 48 hours, preoperative geriatrician assessment and falls assessment. However, no difference was seen in the bone health assessments in the two groups.
- Table 3 shows the outcomes with a significant reduction in the length of hospital stay in the new AHU.

## DISCUSSION

This study describes the experience of managing patients in a new orthogeriatrician-led AHU and the outcomes are compared with patients managed with previous orthopaedic ward-based care under an orthopaedic surgeon. Both groups of patients had similar baseline characteristics and access to similar hospital resources.

### Positive outcomes

Results included improved preoperative orthogeriatric intervention, earlier surgery within 48 hours, reduction in the length of hospital stay, improved falls assessment, standardised thromboprophylaxis and osteoporosis management, with an overall improved quality of care. The reasons for improved care in our study can be

**TABLE 2** Process of hip fracture care in the two groups

	Orthopaedic ward-based care	Acute hip unit care	p value
Number of patients	235	259	
Average time from emergency department to ward (hours)	10.2	3.28	p<0.001 highly significant
Surgery within 36 hours (number and %)	145 (61.7%)	177 (68.4%)	p=0.122 not significant
Surgery within 48 hours (number and %)	152 (64.6%)	200 (77.2%)	p=0.013 significant
Preoperative geriatrician assessment (number and %)	10 (4.2%)	197 (76.1%)	p<0.001 highly significant
Bone health assessment (number and %)	229 (97.6%)	246 (95%)	p=0.155 not significant
Falls assessment (number and %)	12 (5.1%)	191 (73.9%)	p<0.001 highly significant

**TABLE 3** Outcomes in the two groups

	Orthopaedic ward-based care n=235	Acute hip unit care n=259	p value
Average length of stay (days)	19.3	15.1	p=0.013 significant
Total acute and post-acute stay (days)	34	19.6	p<0.001 Highly significant

attributed to good quality care led by the orthogeriatrician soon after admission and at the same time ensuring orthopaedic surgeon involvement and expertise. Fast track of admissions from ED facilitated early management of common geriatric syndromes. Our study showed that early geriatric involvement during the acute phase of hip fracture is useful in reducing the time to surgery. Hip fractures can be treated as an urgent condition with geriatrician leadership of the programme. Standard protocols and a common standard approach were introduced, leading to better clinical management of complications and of common geriatric syndromes associated with hip fracture patients. Geriatric assessment is important in the early identification and management of delirium, pain, incontinence, nutrition, anaemia, oxygen requirements, fluid balance and other medical issues seen in elderly patients. Attention was focused on early discontinuation of the catheter, review of medications, discontinuation of any that might affect functional status and minimising cognitive side-effects of pain medications. The introduction of a single responsible geriatrician enabled a consistent clinical approach, helping the patient to achieve their highest level of health and functional abilities. Early identification of high-risk patients and orthogeriatrician-led medical care on weekdays could explain the reduced length of stay. A team approach was implemented, facilitating planning of early surgery, early ambulation and early discharge. The multidisciplinary orthogeriatric approach identified the

complex medical and social issues affecting the elderly hip fracture patients. Weekly orthogeriatrician-led multidisciplinary meetings helped to achieve the patient's goals and enabled effective discharge planning. There was also an emphasis on continued staff training. The high visibility of the geriatrician in the dedicated AHU facilitated collaboration and communication between the orthopaedic surgeon and the multidisciplinary teams. The specialisation of the ward may also be an important factor. The preliminary nature of the study makes it impossible to distinguish which elements, i.e. standard care protocols or dedicated orthogeriatrician, provided the critical effect on quality and outcomes.

#### Neutral outcomes

Our data do not show much difference in secondary osteoporosis prevention before and after the establishment of the AHU. One possible explanation is that the weekly ward round and ongoing education of junior orthopaedic doctors by the same orthogeriatrician and the specialist trauma nurse for osteoporosis treatments was done in the previous cohort.

#### Limitations

There was no statistically significant difference in the time to surgery within 36 hours but there was a significant difference in earlier surgery within 48 hours in the new unit. Time to surgery is also dependent on other factors such as theatre availability; further analysis

of data including a larger sample size could provide the answers. Due to the inclusion of a retrospective cohort sample it was not possible to compare complication rates (both medical and surgical) and infection rates during the period of hospitalisation. It is likely that there were fewer complications although this variable was not measured directly because the focus was on clinical processes directly related to outcomes. However, the effects of improved treatment of medical problems in a geriatrician-led AHU is to be expected. Some other determinants of hospital outcomes after hip fracture such as effects of co-morbidities, cognitive impairment and prefracture mobility status were not analysed. Formal standardised tools to assess functioning were not used. The data are limited to the acute hospital setting and further studies should consider following the patients in rehabilitation and home settings. We did not determine the amount and timing of therapy or nutrition aspects but these are unlikely to be different in the two groups. The study focused on short-term outcomes of care, i.e. the length of stay, and we did not compare mortality data. Long-term outcomes such as residence at 12 months should be studied.

Despite the non-randomised design and other limitations, the findings from the study are important. Any weakness of our before and after study is limited by the fact that both groups were from the same hospital, under the care of similar surgeons and nursing staff, and received common therapy; junior orthopaedic doctor staff were involved and no changes occurred in the community services and surrounding rehabilitation centres. Data collection was done by the hospital audit department and a specialist nurse for both groups, independent of the geriatrician or orthopaedic surgeon, thereby minimising the potential bias in findings. Further studies are needed to evaluate the components that are critical to the unit's success.

#### **Education and training value**

The AHU has provided a unique training opportunity for junior doctors at foundation, core and higher training levels in both the medicine and orthopaedic departments. Junior doctors on a medical rotation have an extra opportunity for learning pre and post-operative care and orthopaedic junior doctors have an opportunity to learn directly from the geriatric team about the complex medical issues affecting frail elderly patients. This AHU offers a training curriculum for registrars and general practitioner trainees and addresses geriatric issues and management principles for patients with hip fractures. There is a growing need for co-management of hospitalised surgical patients by physicians worldwide. In order to meet this need, it has been suggested that training in internal medicine should include medical management of surgical patients.<sup>18</sup>

#### **Comparison with the existing literature**

Similar to our observations, previous studies have reported a reduction in hospital stay in an orthogeriatric unit compared to historical controls<sup>19-21</sup> and patients from different hospitals<sup>15</sup> or randomised intervention design.<sup>16</sup> Our data confirm these findings. A study of shared care in New Zealand has shown a reduction in mortality but an increased length of stay.<sup>22</sup> Continuous orthogeriatric care in an orthopaedic ward in Italy has shown reduced mortality and a reduced length of stay.<sup>11</sup> A recent study reported lower crude and adjusted 30-day, 90-day and one-year mortality rates and also improved functional outcomes in a geriatric hip fracture unit as compared with standard care in an orthopaedic ward.<sup>23</sup> An organised, co-managed (orthopaedic surgeons and a geriatrician) daily hip fracture programme in New York (Rochester model) showed reduced length of stay, mortality, complication rates, re-admission rates and costs were 66.7% of the expected costs nationally.<sup>24</sup> A study in the Netherlands showed that a geriatrician-led multidisciplinary approach was a key feature in reducing complications and 30-day readmission rates.<sup>25</sup>

#### **Can this model be replicated**

Hip fracture patients are among the most frail to be admitted to hospital and their outcomes could depend on how effectively their care is managed. Avoidable delay, incomplete assessment and lack of attention to issues such as co-morbidities, fluid balance and nutritional status, falls, and a lack of osteoporosis management can lead to poorer outcomes. Current models of care in several hospitals fall short of the ideal of providing optimal care for these patients. For this reason the traditional model where patients with hip fractures are managed primarily by the orthopaedic surgeon should be replaced by coordinated multidisciplinary care, with the involvement of an orthogeriatrician.

It is possible to replicate this approach and provide similar care at other hospitals in the UK and elsewhere. Our unit was designed by relocating 15 existing orthopaedic beds to the medical block with no extra beds, no extra nursing, medical or therapy staff, no extra therapy times and similar access to hospital and intermediate care facilities during both periods. The economic burden of fractures combined with limited financial resources for rehabilitation programmes supports the reorganisation and implementation of collaborative units such as ours. Replication of this model of care is likely to improve outcomes for older adults with hip fractures. Our hospital is the first hospital in Wales to adopt a multidisciplinary geriatrician-led approach to managing hip fracture patients from admission until discharge from the acute dedicated hip unit.

In several parts of the UK, orthopaedic wards are being restructured and various liaison models between orthopaedic and geriatric staff have been emerging. A

**TABLE 4** A comparison of length of stay between Carmarthen Hospital and national hospital average (national hip fracture database)

	<b>Carmarthen Hospital orthopaedic ward-based care</b>	<b>UK National average before establishment of acute hip unit at Carmarthen Hospital</b>	<b>Carmarthen Hospital after acute hip unit care</b>	<b>UK National average after establishment of acute hip unit at Carmarthen Hospital</b>
Acute length of stay (days)	19.3	17.7	15.1	15.7
Total stay (days)	34	23.4	19.6	20.2

new collaboration between the British Orthopaedic Association (BOA) and the British Geriatrics Society (BGS) has led to major initiatives such as the BOA/BGS blue book on care of patients with fragility fractures<sup>26</sup> and the national hip fracture database (NHFD).<sup>27</sup> The blue book provides evidence-based clinical guidelines, especially in orthogeriatric care as it is one of the six key standards on best management of hip fractures. The database is a web-based audit system, collecting information about clinical care and service organisation, together with benchmarking and comparing care across all UK hospitals. The National Institute for Health and Care Excellence (NICE) has issued guidance for hip fracture care with recommendations for an orthogeriatric hip fracture programme for all hip fracture patients.<sup>17</sup> Hip fracture is part of best practice tariff in England (though not in Wales) with financial rewards available for hospitals providing quality care; it includes orthogeriatric involvement as a key component.<sup>28</sup> The overall length of stay for hip fractures across 180 hospitals in the UK ranges from 12.4 to 44.5 days, more than three times the rate than suggested in the NHFD report (2012).<sup>27</sup> Our length of stay figures are now comparable with average stays in UK hospitals (Table 4) and our hospital has the lowest total hospital stay rate (19.6 days) of the ten hospitals in Wales listed in the report.

#### **The acute hip unit as a new model of care**

The majority of previous studies have demonstrated positive outcomes using a joint orthopaedic-geriatric co-care model, with patients remaining under the care of an orthopaedic surgeon in the orthopaedic ward. Our model differs from previous models; we have a single orthogeriatrician in a geographically defined unit providing a structured method and uniform care approach to hip fracture patients. Our AHU is therefore comparable to acute coronary care unit and acute stroke unit models of care.<sup>29</sup> Our unit provides the advantages of managing all pre and post-operative care and early rehabilitation care in one setting. It seems appropriate that a patient receiving multidisciplinary care in the acute phase should continue with early multidisciplinary rehabilitation with the same physician and in the same setting. This continuity of care is more likely to be acceptable to both patients and professionals. Our AHU emphasises total quality

management and control. It offers collaborative working between orthopaedic and medical teams and improves training and specialisation opportunities. This type of unit should be considered as a radical alternative to traditional orthopaedic ward-based care for this vulnerable population.

#### **Cost-effectiveness**

Hospital stay is the most costly component of acute hip fracture care. Patients with hip fractures occupy 20–25% of beds<sup>19</sup> and account for one-half of all hospital days for all fractures. By managing patients in the AHU, the total bed occupancy can be reduced. The cost of treatment during initial hospitalisation for hip fracture ranges between €5,000 and €9,000, most of which is for the time on the hospital ward;<sup>25,30</sup> costs can therefore be decreased by reducing this time. Cutting it by 13–31% could reduce total costs by 16–18%.<sup>31</sup> A recent Spanish study reported that an orthogeriatric unit saved up to €3,741 per patient.<sup>32</sup> Other published literature indicates that an integrated geriatrician-led hip fracture programme can lead to not only improvement in the quality of care but also a gain of \$1,047 per patient, from a deficit of \$908 per patient.<sup>21</sup>

An acute orthogeriatric hip unit is a new model of care for patients with hip fractures which can provide evidence-based quality care, thereby potentially reducing mortality and also improving hospitalisation times and enabling significant savings of hospital resources. This model offers significant advantages and should be considered as a means of achieving more efficient use of hospital resources. In an era when the National Health Service is under financial pressures, this model should be seriously considered in hip fracture care in acute hospitals across the UK.

#### **CONCLUSION**

Hip fractures in the elderly pose one of the greatest challenges to health and social services. We have shown that focussed systematic hip fracture care can be provided in a more effective way for the medically complex elderly inpatient group. The most important characteristic of a successful unit is a dedicated area, a single orthogeriatrician-led service, uniform consensus

on protocols, formal daily (on weekdays) communication with the professionals and the geriatrician accepting clinical responsibility for all cases from the first day of admission. Our model is feasible in an acute hospital and can meet the needs of elderly patients with hip fractures using existing resources.

Further studies should focus on larger randomised controlled trials to examine the effects of geriatrician-led hip fracture care on quality of care, outcomes and economic effectiveness for health systems across the UK and the rest of the world.

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