AMJ Australasian Medical Journal [AMJ 2015;8(5):154–160]

Neck of femur fracture management by general surgeons at a rural hospital

Cristian Udovicich[1,2], Dean Page[1,2], Molla Huq[2,3,4], Stephen Clifforth[1]

1. Hamilton Base Hospital, Western District Health Service, Hamilton, VIC, Australia
2. St Vincent's Hospital Melbourne, Fitzroy, VIC, Australia
3. Department of Medicine, The University of Melbourne, Melbourne, VIC, Australia
4. Department of Epidemiology and Preventative Medicine, Monash University, Melbourne, VIC, Australia

AUDIT

Please cite this paper as: Udovicich C, Page D, Huq M, Clifforth S. Neck of femur fracture management by general surgeons at a rural hospital. AMJ 2015;8(5): 154–160. http://doi.org/10.21767/AMJ.2015.2347

Corresponding Author:
Dr Cristian Udovicich
Hamilton Base Hospital
Foster St, Hamilton, VIC, Australia
Email: cristian.udovicich@gmail.com

ABSTRACT

Background
Neck of femur (NOF) fractures are the most common injury among elderly patients and a significant burden on our healthcare system.

Aims
This study aimed to evaluate if an Australian rural hospital serviced by general surgeons can meet the established standards of care for the management of NOF fractures by undertaking surgery within 48 hours.

Methods
An audit of patients presenting to an Australian rural hospital with NOF fractures over a seven-year period was performed. Patients were excluded if they were transferred or suffered peri-prosthetic or multi-trauma-related fractures. Outcomes included time to surgery, length of stay, and in-hospital mortality, and were compared to three similar Australian studies from hospitals with specialist orthopaedic units. Descriptive statistics and meta-analysis were performed.

Results
Overall, 182 patients presented with NOF fractures and 114 met our inclusion criteria. Only 12 per cent of patients were transferred. Patients were mostly female (74 per cent) and elderly (mean age 84.0 years). A total of 79 per cent of patients were operated on within 48 hours; other studies reported 67–86 per cent. Mean length of stay was 11.9 days (versus 7.7–13.7), and in-hospital mortality was 4 per cent (versus 2–7 per cent).

Conclusion
This audit suggests that an Australian rural hospital serviced by general surgeons can meet the established standards of care for management of most NOF fractures. Some post-surgery outcomes are similar to those reported by larger centres with specialised orthopaedic units.

Key Words
Neck of femur, hip fractures, hip surgery, rural health, aged care, health outcome

What this study adds:

1. What is known about this subject?
General surgeons at rural Australian hospitals may have a large scope of procedural skills, including the management of neck of femur (NOF) fractures. For NOF fractures, time to surgery greater than 48 hours has an increased risk of 30-day and one-year mortality (41 per cent) as well as postoperative complications.

2. What new information is offered in this study?
Established standards of care for NOF fractures are being met at an Australian general surgeon-serviced rural hospital. Outcomes such as time to surgery, length of stay, and in-hospital mortality are similar compared to larger metropolitan and regional hospitals with dedicated orthopaedic units.

3. What are the implications for research, policy, or practice?

This is among the first Australian studies comparing neck of femur fractures managed by general surgeons at a rural hospital to those with dedicated orthopaedic units. Well-equipped rural hospitals with general surgeons and appropriate facilities can satisfactorily manage neck of femur fractures in line with worldwide-standards and performance.

Background

Neck of femur (NOF) fractures are the most common injury among elderly patients. More than 3.2 million Australians are over 65 years of age,[1] and there will be an estimated 15 per cent increase in NOF fractures every five years until at least 2026.[2] Patients with NOF fractures tend to have multiple comorbidities that not only contribute to the aetiology of the injury, but may complicate treatment and recovery. Given the complexity of these patients' conditions, multidisciplinary care is essential and therefore this patient group is increasingly larger consumers of health resources. Combining both in-hospital and subsequent care, the cost to society is currently estimated to be above AUD $750 million annually.[3]

Most patients sustaining NOF fractures require surgery as definitive management. Although there are varied surgical procedures, there are examples of established standards of care worldwide for NOF fractures. The British Orthopaedic Association recommends that "all patients with hip fracture who are medically fit should have surgery within 48 hours of admission, and during normal working hours".[4] Additional guidelines have also been detailed by the Swedish National Registry of Hip Fracture Patient Care.[5] These recommendations are strengthened by evidence that improved outcomes are associated with reduced time to surgery. A systemic review comprising 257,367 patients concluded that a delay of surgery greater than 48 hours increased mortality by up to 41 per cent (30-day and one-year all-cause mortality).[6] Additionally, an increased risk of postoperative complications, including pneumonia, other infections, delirium, and pressure sores are associated with delayed surgery.[7]

Recommendations on time to surgery for NOF fractures are generally based on research focused on large tertiary or regional hospitals with dedicated orthopaedic units.[8–10] In rural Australia, some smaller hospitals have the ability to surgically manage patients with NOF fractures. Certain unique challenges exist in these rural Australian centres. First, there is a growing proportion of elderly people in rural areas of Australia. As a proportion of the population for that particular area, non-major urban areas contain 13 per cent more people aged 65 years and older compared to major urban areas.[11] In Western Australia, the population of elderly people is expected to triple by 2026.[12] Second, some rural orthopaedic services are undertaken by permanently based general surgeons. In some locations, specialist orthopaedic surgeons visit regularly for elective operative lists. For these general surgeons, operating for a fractured NOF may provide additional challenges to an already broad scope of practice. However, managing patients locally has significant benefits to the patient such as decreased financial and time burden, and the availability of support from family, friends, and community.[13]

There is minimal objective evidence regarding the capability to meet worldwide standards or postoperative outcomes of rural orthopaedic services provided by general surgeons. The primary aim of this study is to evaluate if an Australian rural hospital serviced by general surgeons can meet the established standards of care for the management of NOF fractures by undertaking surgery within 48 hours, with a secondary aim to demonstrate comparable NOF post-surgery outcomes to non-rural centres in Australia.

Method

Sample frame

This was an audit of consecutive patients presenting with NOF fractures to an Australian rural hospital in Victoria between July 2006 and May 2013. This hospital was an appropriate setting for this audit as the associated town is classified as a an outer rural area.[14] The town had a population of 9,342 in 2011[15] and is within four hours of a major city.

The hospital is well equipped as a surgical service with multiple theatres as well as operative equipment and radiology that allow for surgical management of NOF fractures. Two of the full-time general surgeons that service the hospital have extensive experience in performing these procedures. There is also a dedicated surgical ward with nursing and allied health staff well versed in postoperative recovery. A limited high dependency unit is also available. Physicians were involved if postoperative complications occurred. Additionally, there is a rehabilitation unit in the hospital itself as well as extensive outpatient community care. As such, an effective multidisciplinary, collaborative approach can be provided from presentation.

The hospital is serviced by three general surgeons with specialist surgeons visiting every week. An orthopaedic surgeon operates fortnightly for a full day. While there is no formal treatment protocol for NOF fractures at the hospital, the aim is to undertake operations on the day of or the day after presentation. Patients were either added to existing in-hours surgical lists or were performed out-of-hours. The on-call surgeon roster was rotated by general surgeons experienced in managing NOF fractures.

Patients who had presented to the emergency department with NOF fractures were identified from a hospital database search. Parameters included "hip fracture" and "femur fracture". Medical records were examined to ensure patients were coded correctly and additionally validated from radiology reports. Only patients with a NOF fracture were included. Patients presenting with a NOF fracture were excluded if they were transferred or managed conservatively. Patients sustaining multi-trauma-related or peri-prosthetic fractures were also excluded. In addition, patients were excluded if surgery was performed by a visiting orthopaedic surgeon.

Data collection

Time to surgery was defined by the period between emergency department presentation and time of surgery. This was ascertained from the emergency department and theatre notes in the medical records. X-rays were reviewed by the authors (blinded to the original radiology report) to determine the type of fracture. If there were differences in diagnosis between the authors' review and the original radiology reports, there was further discussion between the authors and a radiologist to confirm diagnosis. In regard to secondary outcomes, length of stay was defined as the number of days admitted on the acute surgical ward and hospital mortality was death on the acute ward. The American Society of Anaesthesiologists (ASA) status was used as a surrogate marker of systemic comorbidities to address the patient's preoperative state that could influence surgical outcome.

Data analysis

Data were entered into Microsoft Excel 2013 (Microsoft Corporation, WA) and analysed using STATA 12 (StataCorp, TX). Cross-tabulation, descriptive statistics and meta-analysis was performed for this study.

Results

A total of 182 patients presented to the hospital with a NOF fracture over the relevant time period. Sixty-eight patients did not meet the inclusion criteria resulting in 114 patients eligible for analysis. Transferred patients comprised only 21 of those excluded.

Patients were elderly (mean age 84.0 years) with a female predominance (74 per cent) and mostly came from home (65 per cent) (Table 1).

Table 1: Demographics (n=114)

Age (mean, 95% CI)	84.0 (82.5–85.4)
Female, % (n)	74% (84)
Residential Status on Admission, % (n)	
Home	65% (74)
Supported Accommodation	35% (40)
ASA Grade, % (n)	
1	1% (1)
2	27% (31)
3	55% (63)
4	15% (17)
Missing	2% (2)

Trochanteric NOF fractures were the most common (41 per cent) with both the dynamic hip screw and Moore's hemiarthroplasty procedures split evenly (Table 2).

Table 2: Fracture and surgery type (n=114)

Type of Fracture, % (n)	
Undisplaced intracapsular (Garden 1 & 2)	14% (16)
Displaced Intracapsular (Garden 3 & 4)	35% (40)
Basocervical	8% (9)
Trochanteric	41% (47)
Type of Surgery, % (n)	
Moore's Hemiarthroplasty	47% (54)
Dynamic Hip Screw	50% (57)
Open Reduction Internal Fixation	3% (3)

Surgery was performed under 48 hours from presentation in 79 per cent of patients with a median time to surgery of 23.9 hours. Patients stayed on the acute surgical ward for a median of 8.5 days with an in-hospital mortality of 4 per cent. The majority of patients (60 per cent) were discharged to a rehabilitation unit after acute ward discharge (Table 3).

Table 3: Outcomes (n=114)

Time to surgery, hours (median, IQR)	23.9 (15.6–41.2)
Time to surgery>48h, % (n)	21% (24)
Acute Surgical length of stay, days (median, IQR)	8.5 (6–13)
Discharge Destination from Acute Ward, % (n)	
Home	11% (12)
Supported Accommodation	24% (27)
Rehabilitation Unit	60% (68)
Acute Hospital	3% (3)
In-Hospital Mortality	4% (4)

Discussion

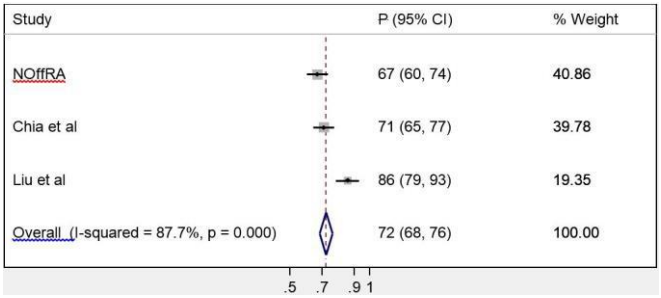
The results of this audit illustrate that the established standards regarding timeliness of care for patients with NOF fractures are generally met in a rural hospital serviced by general surgeons. The median length of time to surgery was 23.9 hours and 79 per cent of patients underwent surgery within 48 hours.

Comparable outcomes

Our results are comparable to other studies on NOF fractures involving dedicated orthopaedic units in non-rural Australian centres. Three studies were used for comparison. The NOffRA study (Neck of Femur Fracture Registry of Australia pilot project)[16] included patients from a metropolitan public, a metropolitan private, and regional public hospital. Studies by Chia et al.[17] and Liu et al.[18] were from an outer metropolitan and regional setting, respectively. It is important to emphasise that these studies present data on outcomes from dedicated orthopaedic units in non-rural areas.

In comparing the study population across the four studies, there was little variation in mean age, gender, and ASA classification. No demographic data were available from Liu et al. The proportion of fracture types in our study was similar to those in the NOffRA study. Regarding the primary outcome, 79 per cent of our cohort were operated on within 48 hours compared to an overall weighted percentage of 72 per cent of the three other studies (67–86 per cent), as found from the meta-analysis (Figure 1).

Figure 1: Comparison to other studies of time to surgery <48 hours (%)



In addition, there was similarity concerning secondary outcomes (Table 4). Mean length of stay for this study was 11.9 days versus 13.7 days (NOffRA) and 7.7 days (Chia et al.). There was a 4 per cent in-hospital mortality versus 2–7 per cent. Regarding discharge from the acute setting, there was no large disparity between destinations. Patients discharged to home (4–11 per cent), a rehabilitation unit (50–68 per cent), and supported accommodation (17–24 per cent) were all similar.

Benefits of local management

In addition to comparable outcomes of time to surgery, length of stay, and in-hospital mortality, there are other benefits in locally managing rural patients presenting with

Table 4: Comparison of hospital data on NOF fracture surgery to other Australian studies

	Hospital (n=114)	NOffRA (n=190)	Chia et al. (n=185)	Liu et al. (n=90)
Setting	Rural	Metropolitan and Regional	Outer Metropolitan	Regional
Time to surgery, <48 hours	79%	67%	71%	86%
Length of stay (days)				
Median	8.5 (IQR 6-13)	10	-	-
Mean (SD)	11.9 (10.1)	13.7 (12.3)	7.7 (7.2)	-
In-hospital mortality	4%	7%	4%	2%
Discharge destination from acute ward	11%	4%	8%	-
Home	60%	50%	68%	-
Rehabilitation Unit	24%	22%	17%	-
Supported Accommodation				

NOF fractures. Due to the relative isolation, rural patients have reduced access to health care. In the case of some patients, rural hospitals are not suited to the management of perioperative requirements and transfer to larger centres for complex medical or surgical issues is a necessity. If patients with NOF fractures were transferred from our centre, the majority travelled 100–200km. However, there were some patients transferred 500km away. With the relatively small size of Victoria compared to other states, this distance may be significantly more in other states with some locations requiring transfers of more than 1,000 kilometres. Consequently, the coordination of transfer and time to surgery may be affected.

With transfer away from one's local community, there are several issues that arise. First, there is undoubtedly an adverse psychological impact on patients who are away from social supports and are in an unfamiliar environment,[19] and communication with family members regarding ongoing management and discharge planning may be made more difficult.

Second, a thorough understanding of the NOF fracture patient is a necessity as patients are generally elderly with considerable comorbidities as well as requiring extensive multidisciplinary management. Due to the time-pressured nature of transfers, these details may be limited or not fully appreciated upon arrival at the transfer destination. This may be in contrast to local management where rural hospitals have strong links with local general practitioners and may even receive input from these doctors in regard to acute care and discharge planning.[20] Regardless of where definitive surgical management is undertaken, patients are generally discharged locally. Patients with NOF fractures generally require a period in a rehabilitation unit support for return to premorbid status, alteration in living arrangements, outpatient allied health visits, as well as postoperative appointments. A clearer understanding and familiarity of the services and supports available in the local community is much more easily achieved and facilitated when management occurs locally.[21] The importance of these factors can be quite substantial and should be taken into consideration in NOF fracture cases.

Last, the impact of transfer must be considered from a financial and resource perspective. The cost to the hospital or individual for an inter-hospital transfer is quite significant.[22] It may also result in an acute ambulance not available for a period of time that may consequently impact on other patients as well. The costs associated with potential disorganisation of post-acute management from a non-local hospital and future travel for follow-up appointments also need to be considered.

These multiple benefits of local management are not to be underestimated and can lead to a more rapid return to pre-morbid condition and prevention of relapse.

Rural surgeons

Aside from the benefits to the patient as mentioned above, local management of presentations such as NOF fractures can reduce the strain on larger centres allowing them to take more complicated patients and undertake more complex procedures. This study has shown that experienced general surgeons at well-equipped rural services can achieve comparable outcomes to dedicated orthopaedic units. As with any surgeon, continuing professional development through education and training as well as caseload is necessary. The Royal Australasian College of Surgeons has maintained a Provincial Surgeon's Society to foster relationships amongst similar-minded surgeons. There are also initiatives such as grants and mentoring for surgical trainees with an interest in rural practice.

Limitations

Our study reflects a single-centre population group and therefore may not be representative of every rural area. Furthermore, the facilities at this hospital may not be representative of other rural centres that may not be able to offer such services.

An important limitation is the number of patients that did not meet our inclusion criteria (68) with 21 of these being transferred to other centres. These patients would most likely not have been managed surgically at our centre due to difficult fractures and significant comorbidities, creating a selection bias. This ultimately makes our study outcomes more difficult to compare. However, institutions with a dedicated orthopaedic unit would be expected to be more proficient in managing NOF fractures with an increased frequency of presentations and more experienced surgical, nursing, and allied health staff. Nevertheless, as previously highlighted, the data from these dedicated orthopaedic units are only comparable, not superior, to our rural centre.

Although we present data on in-hospital mortality and discharge destination, we do not present data on operative complications or extended mortality (30-day or 1-year). This is particularly important given the high incidence of both of these measures in patients with NOF fractures.[6,7] Additionally, our study does not include postoperative functional outcomes. Discharge destination may act as a

surrogate for quality of life, but this measure is likely an inadequate reflection of surgical outcome. This is of particular importance given patients in our cohort underwent either an Austin-Moore prosthesis (unipolar monoblock) or Sliding Hip Screw procedure, with no patient receiving modern modular hemiarthroplasties or total arthroplasties. The newer custom-sized head and stem components of modular arthroplasties allow for improved leg length muscle tension balances with overall better function and reduced dislocation rate.[23]

The Australian Orthopaedic Association National Joint Registry has data on 65,891 primary hip arthroplasty procedures for NOF fractures.[24] While the use of unipolar monoblock partial hip replacements has decreased from 52 per cent in 2003, it is still the second most used as of 2012. The Austin Moore type accounted for 52 per cent of unipolar monoblock procedures. Compared to unipolar modular hemiarthroplasties, unipolar monoblock has a lower 10-year revision rate, 7.9 per cent versus 8.5 per cent. The report also comments that unipolar monoblock procedures are preferred in older patients who are more likely to have comorbidities. With 90 per cent older than 75 years old, the use of the procedure in our elderly population is appropriate.

Given the limitations to study data, further multicentre studies of matched population types focusing on functional outcomes, postoperative complications, and extended mortality would be worthwhile.

Conclusion

This audit illustrates that an Australian rural hospital serviced by general surgeons can meet the established standards of care for management of most NOF fractures. When compared to larger centres with specialised orthopaedic units, our centre was able to demonstrate similar outcomes regarding time to surgery, length of stay, and in-hospital mortality. These findings may encourage other rural centres to continue or develop their capacity to manage NOF fractures.

References

1. Australian Institute of Health and Welfare. Australia's Welfare 2013; 2013.
2. Department of Medicine; Western Health; The University of Melbourne. The Burden of Brittle Bones: Epidemiology, Costs & Burden of Osteoporosis in Australia; 2007.
3. Sanders K, Nicholson G, Ugoni A, Pasco J, Seeman E, Kotowicz M. Health burden of hip and other fractures in Australia beyond 2000. Med J Aust. 1999;170(10):467–70. Available from: https://www.mja.com.au/journal/1999/170/10/health-burden-hip-and-other-fractures-australia-beyond-2000.
4. British Orthopaedic Association. The Care of Patients with Fragility Fracture; 2007.
5. RIKSHÖFT–Swedish National Registry of Hip Fracture Patient Care. Årsrapport; 2013.
6. Shiga T, Wajima Z, Ohe Y. Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression. Can J Anesth. 2008;55(3):146–55. [Accessed 2014 Nov 23]. Available from: http://link.springer.com/article/10.1007/BF03016088
7. Merchant RA, Lui KL, Ismail NH, Wong HP, Sitoh YY. The relationship between postoperative complications and outcomes after hip fracture surgery. Ann Acad Med Singapore. 2005;34(2):163–8.
8. Siegmeth AW, Gurusamy K, Parker MJ. Delay to surgery prolongs hospital stay in patients with fractures of the proximal femur. J Bone Jt Surg. 2005;87(8):1123–6. doi:10.1302/0301-620X.87B8.16357
9. Moran CG, Wenn RT, Sikand M, Taylor AM. Early mortality after hip fracture: is delay before surgery important? J Bone Joint Surg Am. 2005;87(3):483–9. doi:10.2106/JBJS.D.01796.
10. Parker M, Pryor G. The timing of surgery for proximal femoral fractures. J Bone Jt Surg. 1992;74(2):203–5. [Accessed 2014 Dec 21]. Available from: http://www.bjj.boneandjoint.org.uk/content/74-B/2/203.short
11. Australian Bureau of Statistics. Where and How Do Australia's Older People Live?; 2011.
12. Australian Department of Health and Ageing. Audit of Health Workforce in Rural and Regional Australia; 2008.
13. Humphreys J, Wakerman J. Primary Health Care in Rural and Remote Australia: Achieving Equity of Access and Outcomes through National Reform; 2008.
14. Australian Institute of Health and Welfare. A Guide to Rural, Regional and Remote Health; 2004.
15. Australian Bureau of Statistics. Australian Census 2011.
16. Wells V, Graves S, Ryan P, Griffith E, McDermott B, Harrison J, et al. A Pilot Project: Testing the Feasibility of Implementing a Neck of Femur Fracture Registry of Australia (NOffRA). J Bone Jt Surgery, Br Vol. 2012;94-B(SUPP XXIII):191. Available from: http://www.bjjprocs.boneandjoint.org.uk/content/94-B/SUPP_XXIII/191.abstract
17. Chia P, Gualano L, Seevanayagam S, Weinberg L. Outcomes following fractured neck of femur in an Australian metropolitan teaching hospital. Bone Jt Res.

2013;2(8):162–8. [Accessed 2014 Dec 21]. Available from: http://www.bjr.boneandjoint.org.uk/content/2/8/162.short.
18. Liu Y, Fletcher S, Li L. Elderly patients with hip fracture are treated promptly in a Tasmanian rural hospital. Aust J Rural Health. 2013;21(2):130–1. doi:10.1111/ajr.12022.
19. Samera L. Rural patients travel for health care. Med J Aust. 2014;201(10):566.
20. Booth G, Loretan K. The Healthy Lifestyle Program: implications for preventative intervention in the rural setting. In: 6th National Rural Health Conference; 2001.
21. National Rural Health Alliance. Achieving the Best Possible Outcomes for People with Acquired Brain Injury Who Live in Rural and Remote Communities; 2012.
22. Borlase B, Baxter J, Kenney P, Forse R, Benotti P, Blackburn GL. Elective intrahospital admissions versus acute interhospital transfers to a surgical intensive care unit: cost and outcome prediction. J Trauma. 1991;31(7):915–8.
23. Raaymakers E, Schipper I, Simmermacher R, Van der Werken C. AO Surgery Reference: Proximal Femur. [Accessed 2014 Dec 21]. Available from: https://www2.aofoundation.org/wps/portal/surgery
24. Australian Orthopaedic Association. Australian Orthopaedic Association National Joint Registry Annual Report 2013; 2013.

PEER REVIEW

Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

FUNDING

The primary author received financial support from Western District Health Service to aid in attending the Royal Australasian College of Surgeons 2014 Annual Scientific Congress.

ETHICS COMMITTEE APPROVAL

Western District Health Service and the South West Healthcare Ethics Committee (HREC 01/2015)