

The Benefits of Streamlined Hip Fracture Management in a Regional Hospital

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Abstract

Introduction: Hip fracture is an increasingly common injury in the growing elderly population. The morbidity and mortality associated with this injury can be reduced by minimizing delays to surgical treatment. We describe the impact of a regional hospital service redesign project that utilized the principles of smart simplicity, a management strategy that lays emphasis on collaboration to achieve desired goals. **Methods:** Prior to the redesign, patients with hip fractures were taking an average of 72 hours for surgical treatment. A hip fracture working group was created to examine closely the process of hip fracture care, and a single key performance indicator (KPI) of “surgery within 48 hours” was adopted. This allowed identification of processes that could be clarified and streamlined, with the agreement of relevant stakeholders, in the creation of a new hip fracture pathway. **Results:** In the first 3 months of the pathway’s implementation, 16 of 18 patients had surgery within 48 hours of presentation. In a 6-month follow-up audit after 2 years of implementation, 36 of 39 patients were treated within 48 hours. This was significantly different to the time to surgery seen in the 12 months prior to the redesign ($P < .001$, Student *t* test). The mean time to surgery was reduced from 72 hours to 36 hours, a saving in an annual acute bed stay cost of A\$152 000. **Discussion:** Decreased time to the operating room, the cost savings inherent to this, can be achieved with the introduction of the best standard of care. A redesign that mandates collaboration in achieving a single KPI has allowed a significant culture shift in the treatment of hip fractures in our institution in the months following its institution. **Conclusion:** Collaborative, multidisciplinary collaboration has facilitated a higher standard of care and demonstrated significant cost benefit.

Keywords

fragility fractures, economics of medicine, geriatric medicine, geriatric trauma, trauma surgery

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Introduction

Fragility hip fracture is an end-of-life event associated with significant complications. The mortality rate at 30 days is around 8%¹ and can be 30% at 1 year.² Protracted hospital stays are also common, with acute hospital stay ranging from 9 to 15 days,³ often followed by rehabilitation time that is longer still.

The management of hip fractures is a complex and costly venture often without ideal outcomes.⁴⁻⁶ In those patients who survive, infective complications, including chest and urinary sepsis as well as wound infection, can reach 30%. Many patients are unable to return to their previous level of function and often have to accept a more supported living environment than before their injury. As the population ages, age-specific incidence may remain stable or even fall, but the absolute number of patients will increase at a predicted rate of 15% every 5 years until 2026.⁷ Considerations from both patient-centered

and health economic-centered perspectives are, therefore, imperative. Cost estimates for acute inpatient stays vary between institutions and between state health-care systems, approximately A\$910-A\$1147 per day.³

The standard of care for patients with hip fractures has been widely studied. The emphasis in published guidelines has been placed upon expert preparation of the patient for surgery and rapid progress to surgery, with an appreciation that a delay in

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surgery beyond 48 hours correlated with excess preventable morbidity and mortality.⁸ In large metropolitan hospitals, the volume of hip fracture patients admitted mandates an organized approach to their management and makes the arguments for resource allocation easier to sustain. The challenge for a smaller regional hospital is one of less predictable presentation of hip fracture patients, making maintenance of coordinated management processes more challenging and overall care less consistent.

Restructuring of health-care management processes will traditionally use standard techniques to examine the so-called pillars of management—hard (structure, process, systems) and soft (people, relationships)⁹ in order to facilitate the change. Newer models of restructuring, such as smart simplicity, aim to drive change by improving interplay and cooperation between groups rather than compromise.⁹ The key point of this approach is that while compromise between opposing views may allow some improvements, close cooperation and discussion between groups holding those views can allow development of an outcome that is truly the best rather than merely a midpoint between extremes. The adoption of minimal performance indicators focuses attention upon the intended outcome of a reorganization rather than upon the processes involved.

In our regional hospital, we undertook a service design assessment and redesign process that attempted to address the issues causing slow progress from admission to surgery of hip fracture patients, using time to surgery as the sole key performance indicator (KPI). We used a model of smart simplicity to drive progress toward the common goal by cooperative process restructuring, allowing staff involved in the processes to explore jointly the approaches that were best supported by evidence. We subsequently reviewed the efficacy of this process immediately after introduction and then at 1 year after its establishment. We measured acute stay bed costs to assess the economic benefit of the restructuring process.

Methods

The initial stage of the redesign project was to establish a hip fracture working group (HFWG), with a dedicated facilitator (J.L.) who reported to the hospital executive management team. Key representatives on working group were director of orthopedic services, director of anesthetic services, emergency department (ED) nurse unit manager, hospital access manager, ward unit managers, and allied health unit manager. Input was also sought from geriatrician, physician representative, chief radiographer, dietitian, junior medical, and surgical staff.

The single KPI of “time to theatre” (taken from arrival at the hospital ED) was set as the goal of the redesign process. Over a 17-month period, May 2012 to October 2013, the group met and clarified many of the issues responsible for the delay to theatre. A “walkthrough” process aimed to identify as many as possible of the steps involved in moving a patient with hip fracture from ED presentation to theatre for definitive surgery.

These steps were then assessed for the presence and implementation of appropriate processes. These were coded according to a traffic light system—green for satisfactory, amber if the process was not fully implemented but did exist, and red if processes were absent or inappropriate. The majority of the walkthrough chart was red. This allowed a robust discussion leading to the development of a new streamlined pathway toward rapid surgical treatment of hip fracture patients.

As an initial step, it was agreed that once a firm, radiographically proven diagnosis of hip fracture was reached, the access manager would confirm the admission of the patient, allowing the proposed hip fracture pathway to be initiated (Figure 1)

Specific bottlenecks and solutions within the fracture pathway were identified. The below strategies were implemented with the introduction of the streamlined hip fracture pathway.

Radiography

- Hip fractures were prioritized as urgent cases, with recognition that radiological evidence of fracture is vital both to diagnosis confirmation and for surgical planning
- Restructure of the radiographers’ on-call rosters, to allow for patients presenting out of hours, was introduced.

Orthopedic Registrar

- Streamlined admissions process to commence prior to orthopedic review.
- Review of patients within 2 hours by the orthopedic registrar.
- Key role in ensuring the initiated pathway was progressed and all steps occurred sequentially.
- All orthopedic staff allowed timely review of patients without the need for changes to orthopedic staffing.

Medical Registrar/Physician

- Medical review within 2 hours of arrival, followed by consultant physician review.
- All patients were assessed, no inclusion or exclusion criteria for review were utilized.
- Optimized correctable medical comorbidities, evaluated noncorrectable comorbidities to streamline medical optimization to minimize delay to surgery.
- Direct involvement with fast-track rehabilitative services postoperatively.

Allied Health

- Early referral to allied health staff—physiotherapy, occupational therapy, dietitian, speech pathologist as appropriate
- Individualized referral based on orthopedic teams’ anticipated requirements, as well as assessments deemed necessary by other units and allied health teams involved in patient care.

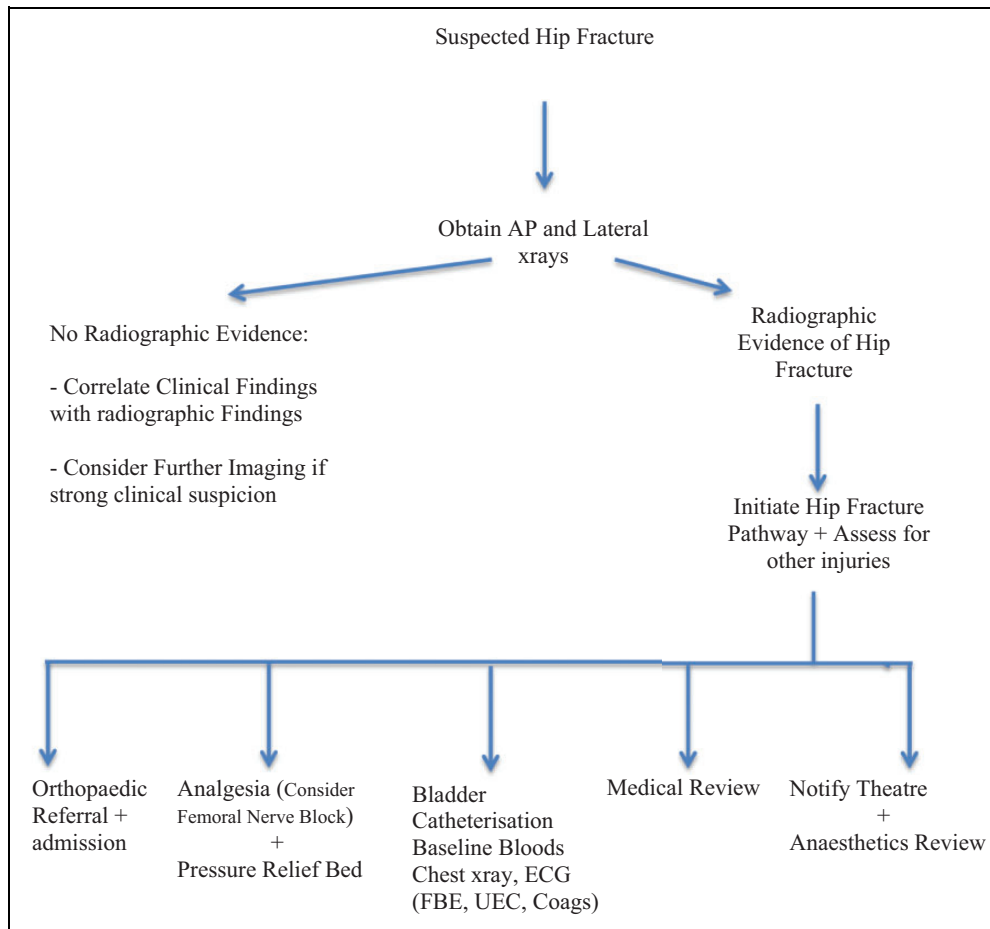


Figure 1. Proposed hip fracture pathway, developed by hip fracture working group.

Theatre Team

- Standard streamlined booking processes were introduced—Direct booking with nurse in charge of theatre and on-call anaesthetist.
- Twilight emergency theatre sessions commenced to improve access to theatre—Discussion with theatre managers facilitated easier access to theatre out of hours, with regular list arranged to accommodate inpatient trauma.
- Structured weekend trauma lists were also used to ensure timely theatre access.

Anaesthetists

- Specialist anaesthetist reviewed patients early to assess and reduce anaesthetic risk associated with hip fracture.
- Pathway procedures were implemented in consultation with the anaesthetic department aiming to reduce or eliminate additional steps from the ED admission to theatre.

In order for these changes to be implemented, a substantial cultural shift needed to occur to change preconceived attitudes regarding patients sustaining hip fractures, patients who had often been afforded little priority. Table 1 demonstrates the

Table 1. The Cultural Issues Causing Delay to Hip Fracture Patient Progress Through the Pathway.

Role	Direct/Paraphrased Quotes From Staff
Radiographer	“I have never considered hip fractures to be emergencies”
Orthopedic registrar	“I’m in theatre, I’ll come to emergency department at the end of the list and see referrals, including that hip fracture”
Medical registrar	“I’m busy. I don’t need to come and see that hip fracture patient, it’s a surgical problem”
Consultant physician	“That’s a surgical case, not a medical problem”
Allied health (multiple disciplines)	“Refer the hip fracture patient after the operation”
Theatre nurse	“We don’t do hip fractures at the weekend, or out of hours”
Anaesthetist 1	“I don’t do hip fractures at the weekend, in case something urgent comes in”
Anaesthetist 2	(After a second on-call system was suggested): “I’m not sitting around waiting for the occasional call just to suit you”
Orthopedic surgeon	(Monday morning): “I’ll be available to do that hip fracture on Friday”

attitudes that were identified during the development of the hip fracture pathway, revealing the cultural issues displayed by all parties involved in the treatment of hip fracture patients.

Each individual unit or team identified within Table 1 had the attitudes presented directly addressed at both an individual level, as well as at a unit/team level as part of the pathway redesign. The structural redesign meant that each contributing unit could be identified if targets were not met. Thus allowing easier assessment and direct feedback about rate-limiting steps, providing greater incentive for unit participation.

The single KPI, time to surgery was utilized to assess the efficacy of the new protocol. Data were collected from the orthopedic audit system to assess times of admission, time to reach theatre, and durations of acute inpatient orthopedic admission. Cohorts from which data were collected included hip fracture patients admitted prior to the establishment of a new acute pathway, in the immediate aftermath of the protocol's introduction, and then a reassessment of this pathway 2 years after introduction. Average acute stay bed costs were used to assess the economic benefit of improvements in time to surgery.

The pathway was introduced utilizing the smart simplicity business model as a foundation to its design; the smart simplicity principles are as follows.⁹

- Improve understanding of what coworkers do
- Reinforce the people who are integrators
- Expand the amount of power available
- Increase the need for reciprocity
- Make employees feel the shadow of the future
- Put the blame on the uncooperative.

The role of smart simplicity is to reduce the complexity and addition of extra levels of complexity by better understanding the roles of individuals within a process structure.

The differences in time to surgery between the period before the redesign and after completion of the redesign were compared using Student *t* test, with significance set at $P < .05$, using SPSS (v22; IBM, Chicago, Illinois).

Results

South West Healthcare (SWH) in Warrnambool serves a population of approximately 100 000 people for orthopedic trauma and treats 60 to 80 hip fracture patients each year. The average time from admission to surgery for patients treated in the 12 months leading up to the formation of the HFWG was 72 hours (range: 14-126), with 22 (32%) of 68 patients treated within 48 hours.

During the last 3 months of the working group's existence (July-September 2013), 18 hip fractures were treated under the newly introduced hip fracture pathway. Of these, 16 were treated within 48 hours and 8 within 24 hours of arrival at the ED. Two patients failed to reach theatre within 48 hours of admission due to complex medical issues that required optimization. During the 6 months following the full introduction of

the hip fracture pathway (October 2013 to March 2014), 31 hip fractures were treated. Thirty of the 31 hip fracture patients were treated within 48 hours, 20 of these within 24 hours, and the mean time to surgery was 37 hours.

South West Healthcare also treats hip fracture patients from Portland Health. This is a separate hospital 100 km away by road that has no resident orthopedic surgeon. Over the 12 months (October 2013 to October 2014), 11 such patients were transferred to SWH Warrnambool for treatment. The mean time from presentation *in Portland* to surgery at SWH was 28 hours. Of these 11 patients, 10 patients were treated within 48 hours from the time of presentation in Portland.

Two years after its introduction, reassessment of the efficacy of a formalized hip fracture pathway was undertaken. Over a 6-month period between May 2015 and November 2015, 39 patients with hip fractures were treated at SWH. Twelve of the 39 proceeded to theatre on the day of admission (<12 hours), 15 within 24 hours, with only 3 exceeded the 48-hour KPI. These 3 who fell outside the 48-hour target required significant medical optimization before proceeding to theatre, and mean time to surgery was 32 hours. This was significantly different from the time to surgery seen in the 12 months prior to the redesign ($P < .001$, Student *t* test).

Those that exceed 48 hours did so due to significant medical issues. These included significant cardiorespiratory dysfunction that could be improved acutely (such as fluid overload in heart failure), sepsis, and issues with anticoagulation. The decision to delay to surgery for medical optimization was a joint decision between the anesthetic department and physicians. Medical conditions that delayed surgery were those that were felt to have a reversible component that was likely to reduce the risk of surgery.

Average length of acute orthopedic admission for all patients in this reassessment cohort was 6.3 days. Analysis of length of stay decreases from streamlined time to theatre was undertaken. After the introduction of the streamlined pathway, average time to theatre was 36 hours (1.5 acute inpatient days). Prior to its introduction, the average was 72 hours (3 acute inpatient days).

Discussion

We have shown that a service redesign in a regional hospital setting that aims to implement the best standard of care can achieve significant savings and potential patient care benefits. The HFWG used a model of smart simplicity to achieve significant institution-wide cultural change and to overcome the prejudices held against prioritizing elderly patients with fragility hip fractures. We encouraged staff groups to discuss the best available evidence on hip fracture management to arrive at changes that reflected that evidence rather than being a compromise between divergent views. Treatment within 48 hours is a well-established measure of optimal treatment and the recommended practice within the literature.^{8,10} Other studies have demonstrated that surgery within 12 hours of presentation conveys a further increase in the 30-day survival rate.¹¹

The delays that were seen within our smaller rural institution were commonly exceeding 72 hours, with this occurring as a result of a multifactorial delay and lack of a streamlined team approach to management seen in larger institutions. It is also evident from the comments listed in Table 1 that a culture of apathy toward hip fractures had developed within all disciplines associated with their care. With the implementation of a smart simplicity approach where the focus was cooperative interplay of services rather than compromise,⁹ a structured and streamlined approach to management was achieved.

The change in attitudes toward hip fractures that was seen across all involved units and allied health services was achieved through orthopedic lead education as well as a focused working party. This was most evident in the changed attitudes seen in the medical and anesthetic units who were made to feel as an inclusive part of the management process rather than a consult service. The patient ownership that was encouraged and led by the orthopedic unit was the catalyst for the changing attitudes seen.

What was found was that through the streamlining of the required services, with particular focus on rate-limiting steps, a significant reduction in the time to theatre was achieved. Thirty-six of the 39 patients presenting within the last 6 months were treated within the 48-hour window, with 12 treated within 12 hours and a further 15 within 24 hours of admission. The ability to improve the time to theatre dramatically indicates how effective the utilization of the smart simplicity model of redesign can be. By decreasing time to theatre, we were on average saving 36 hours of acute inpatient bedtime, an estimated saving of A\$152 000 annually.

The result is a cost benefit of approximately A\$1900 per hip fracture treated, based only on time spent awaiting theatre. This number is based on average cost per acute bed day data of A\$910 to A\$1147 per day.³ In a small institution that treats 60 to 80 hip fractures annually, this represents an estimated A\$152 000 saved annually. Further savings associated with reduced morbidity and mortality would be expected.

This saving can make a big difference to a small regional hospital, and further saving may well accrue due to the overall better outcomes achieved with early surgery, although making these calculations is more complex. The key elements that resulted in this pathways success are a direct reflection of the type of process utilized as well as the inclusive nature of the pathway. Each unit involved had a clearly defined role and set of objectives to meet. This clarity as well as addressing the ingrained institution-wide views regarding the significance and importance of streamlined hip fracture management was the key to the pathways success.

The average length of acute orthopedic inpatient stay was 6.3 days, lower than the national average (9-14 days), which may be reflective of the relatively low numbers reviewed or ready availability of rehabilitation beds. The total in-patient cost from acute admission to discharge from rehabilitation is considerably more complex to assess, and the comparison of small regional hospitals with metropolitan centers can be difficult.

Conclusion

We found that the development of a streamlined approach to the management of patients with hip fracture allows a significant reduction in the time to theatre. This correlates with a significant cost saving within a rural health-care setting, despite the relatively low numbers treated. Smart simplicity provides a collaborative model that can achieve significant benefits within rural settings that may not have a large, formalized management structure.

Declaration of Conflicting Interests

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