Received: 15 May 2023 | Revised: 29 October 2023 | Accepted: 28 November 2023

DOI: 10.1111/ajag.13270

RESEARCH ARTICLE

Australasian Journal on Ageing WILEY

Improving hip fracture care: A five-year review of the early contributors to the Australian and New Zealand Hip Fracture Registry

Morag E. Taylor[1,2,3,4] | **Niamh Ramsay**[1] | **Rebecca Mitchell**[1,5] | **Catherine McDougall**[1,6] | **Ian A. Harris**[7] | **Jamie Hallen**[1,2] | **Nicola Ward**[1] | **Sarah Hurring**[1,8] | **Lara A. Harvey**[1,2,3] | **Elizabeth Armstrong**[1,2,3] | **Jacqueline C. T. Close**[1,2,9]

[1]Australian and New Zealand Hip Fracture Registry, Sydney, New South Wales, Australia

[2]Neuroscience Research Australia, Sydney, New South Wales, Australia

[3]Faculty of Medicine and Health, School of Population Health, UNSW Sydney, Sydney, New South Wales, Australia

[4]Ageing Futures Institute, UNSW Sydney, Sydney, New South Wales, Australia

[5]Australian Institute of Health Innovation, Macquarie University, Sydney, New South Wales, Australia

[6]Surgical Treatment and Rehabilitation Service (STARS) and The Prince Charles Hospital, Metro North Hospital and Health Service, Queensland and Faculty of Medicine, University of Queensland, St Lucia, Queensland, Australia

[7]Faculty of Medicine and Health, School of Clinical Medicine, Ingham Institute for Applied Medical Research, UNSW Sydney, Sydney, New South Wales, Australia

[8]Te Whatu Ora Waitaha Canterbury, Christchurch, New Zealand

[9]Faculty of Medicine and Health, School of Clinical Medicine, UNSW Sydney, Sydney, Australia

Correspondence
Morag E. Taylor, Neuroscience Research Australia, 139 Barker St, Randwick, Sydney, NSW, Australia.
Email: morag.taylor@unsw.edu.au

Funding information
Queensland Health; WA Health; SA Health; Victorian Agency for Health Information; NSW Agency for Clinical Innovation; New Zealand Accident Compensation Corporation; Department of Health and Aged Care, Australian Government

Abstract

Objective: The aim of this study was to examine temporal trends (2016–2020) in hip fracture care in Australian and New Zealand (ANZ) hospitals that started providing patient-level data to the ANZ Hip Fracture Registry (ANZHFR) on/before 1 January 2016 (early contributors).

Methods: Retrospective cohort study of early contributor hospitals ($n = 24$) to the ANZHFR. The study cohort included patients aged ≥50 years admitted with a low trauma hip fracture between 1 January 2016 and 31 December 2020 ($n = 26{,}937$). Annual performance against 11 quality indicators and 30- and 365-day mortality were examined.

Results: Compared to 2016/2017, year-on-year improvements were demonstrated for preoperative cognitive assessment (2020: OR 3.57, 95% confidence interval [95% CI] 3.29–3.87) and nerve block use prior to surgery (2020: OR 4.62, 95% CI 4.17–5.11). Less consistent improvements over time from 2016/2017 were demonstrated for emergency department (ED) stay of <4 h (2017; 2020), pain

assessment ≤30 min of ED presentation (2020), surgery ≤48 h (2020) and bone protection medication prescribed on discharge (2017–2020; 2020 OR 2.22, 95% CI 2.03–2.42). The odds of sustaining a hospital-acquired pressure injury increased in 2019–2020 compared to 2016. The odds of receiving an orthogeriatric model of care and being offered the opportunity to mobilise on Day 1 following surgery fluctuated. There was a reduction in 365-day mortality in 2020 compared to 2016 (OR 0.86, 95% CI 0.74–0.98), whereas 30-day mortality did not change.

Conclusions: Several quality indicators improved over time in early contributor hospitals. Indicators that did not improve may be targets for future care improvement activities, including considering incentivised hip fracture care, which has previously been shown to improve care/outcomes. COVID-19 and reporting practices may have impacted the study findings.

KEYWORDS

cognition, fracture fixation, hip fractures, mortality, nerve block, orthopedics, osteoporosis, pain

1 | INTRODUCTION

There are approximately 23,000 older adults across Australia and New Zealand presenting to hospital with a hip fracture annually.[1,2] This has an enormous impact both on the older person and the health system.[1] Although studies have demonstrated a reducing incidence of hip fracture in recent decades compared to earlier decades, the burden of hip fracture will continue to increase with population ageing.[3,4]

Clinical quality registries systematically collect health-related data to evaluate and monitor health-care quality.[5] Registries highlight variation in clinical care, deviation from care guidelines and have been demonstrated to drive improvements in care and outcomes.[6] In light of this, there has been an increase in the number of clinical registries over time. There are more than 16 hip fracture registries worldwide, the largest of which is the National Hip Fracture Database (NHFD) reporting on 63,261 patients from 163 hospitals in England and Wales in 2021.[7,8] In an external review evaluating the impact of the introduction of the NHFD in England, it was estimated that approximately 1000 lives were saved in 2011 compared to 2007 through introducing the NHFD and the associated clinical care standards, to benchmark hospital performance.[9]

In 2014, the Australian and New Zealand Guideline for Hip Fracture Care was published.[10] The guideline contains evidence-based recommendations to support high-quality hip fracture care and informed the Australian Commission on Safety and Quality in Health Care (ACSQHC) Hip Fracture Care Clinical Care Standard, published in 2016.

Practice Impact

Hospitals that have been contributing patient-level data to the Australian and New Zealand Hip Fracture Registry on/before 1 January 2016 have made significant improvements in several quality care indicators. Quality indicators that have not improved should be targeted in the coming years, while considering whether incentivised care should be introduced in Australia and New Zealand in view of the demonstrated success in England.

The Standard comprises seven quality statements, each supported by measurable quality indicator/s (Table S1).[11] These include care at presentation, pain management, orthogeriatric model of care, timing of surgery, mobilisation and weight-bearing, minimising the risk of another fracture and transition from hospital care.

The Australian and New Zealand Hip Fracture Registry (ANZHFR) is a clinical quality registry with the primary objective of using data to drive change and ultimately improve health outcomes for older people after hip fracture. The ANZHFR started collecting facility-level data from 2013 and patient-level data from 2015. Both the facility- and patient-level data have been designed to dovetail with the binational clinical quality indicators and the ANZHFR publicly reports each facility's progress against each quality indicator annually. Currently, more than 80,000 patient records have been collected

from 93 hospitals, representing almost three quarters of Australian and New Zealand's public hospitals.[12] ANZHFR patient-level data are also linked to National death data in each country, enabling 30- and 365-day mortality following hip fracture to be calculated. This study aimed to examine temporal trends in the quality of hip fracture care in Australian and New Zealand hospitals contributing patient-level data to the ANZHFR on or before 1 January 2016—the early contributors.

2 | METHODS

2.1 | Study design

Retrospective cohort study involving 24 early contributor hospitals (on/before 1 January 2016) to the ANZHFR with patients admitted from 1 January 2016 to 31 December 2020.

2.2 | ANZHFR

The ANZHFR collects patient- and facility-level data for people aged ≥50 years presenting to a participating hospital with a low trauma hip fracture. A minimum common dataset is supported by a data dictionary, providing clear definitions for each of the reported variables.[13] Each participating site is responsible for its own data collection and entry. Mortality data are obtained through an annual linkage with the National Death Index in Australia and the Ministry of Health mortality data in New Zealand. Hospital participation is voluntary and over time, the number of hospitals contributing patient-level data has increased: There were 24 hospitals in 2015, 34 in 2016, 56 in 2017, 67 in 2018, 76 in 2019 and 86 in 2020.

2.3 | Ethics and consent

The ANZHFR has ethical approval from a lead HREC in each state (NSW: NSW Population & Health Services Research Ethics Committee, reference HREC/14/CIPHS/51; VIC: Monash Health HREC, reference HREC/16/MONH/65; QLD: The Prince Charles Hospital HREC, reference HREC/14/QPCH/54; WA: Sir Charles Gairdner Group HREC, reference 2014–043; SA: Central Adelaide Local Health Network HREC, reference HREC/14/RAH/115; TAS: UTAS HREC, reference H0015534 and H0017654) and New Zealand (Northern B Health and Disability Ethics Committee, ref 14/NTB/112). The ANZHFR operates on a waiver of consent (New South Wales, Queensland, South Australia) or opt-out consent (Tasmania, Western Australia, Victoria and New Zealand). Patients are provided with a project information pamphlet describing the type of data collected, how data will be used and how they can opt out/decline participation.

2.4 | Study cohort

The study cohort comprised 24 hospitals in Australia and New Zealand treating people aged ≥50 years with a hip fracture and that started contributing patient-level data to the ANZHFR on or before 1 January 2016—the early contributors.

2.5 | Quality indicators

The key quality indicators examined during the 5 years of participation (numbering identifies ACSQHC quality indicator outlined in the Hip Fracture Care Clinical Care Standard; 1 and 2 without a letter are quality indicators, but are not from the Hip Fracture Care Clinical Care Standard):

1. An emergency department (ED) stay of less than 4 h (considered best practice and is potentially an indicator for ACSQHC Quality Indicator 1a.)
1b. Documented preoperative cognitive assessment
2b. Documented pain assessment within 30 min of ED presentation
2b. Analgesia given within 30 min of ED presentation (or not needed or already provided)

2. Administration of a nerve block before attending theatre (best practice and is potentially an indicator for ACSQHC Quality Indicator 2b since it addresses timely pain management)
3a. Assessed by a geriatric medicine during acute hospital stay (orthogeriatric model of care)
4a. Undergoing surgery within 48 h of presentation to hospital
5a. Given the opportunity to mobilise the day of or the day after surgery
5b. Unrestricted weight-bearing through the affected limb
5c. Documented pressure injury of the skin (stage 2 or higher)
6a. Discharged on pharmacologic treatment for osteoporosis
8b. 30- and 365-day mortality

2.6 | Descriptive data

Age, sex, usual place of residence, preadmission walking ability, preadmission cognitive status and American Society of Anaesthesiologists (ASA) Classification (1: healthy to 5: moribund, unlikely to survive 24 h) were collected as part of the ANZHFR data and are reported to describe the cohort.

2.7 | Statistical analysis

All analyses were performed using SAS 8.3 Enterprise Guide (SAS Institute Inc., 2020). Presentation date was defined as the date of first presentation to the hospital (i.e., if a patient was transferred, the date of presentation to the initial hospital was used) or the date of in-hospital fracture. Descriptive characteristics of the study cohort are reported as frequency with per cent or mean ± SD. χ^2 test was used to examine between-year differences for categorical data. Logistic regression was used to assess the association (expressed as an odds ratio [OR] and 95% confidence interval [95% CI]) between each quality indicator and year with reference to the first year of data collection for that indicator. The models were unadjusted, except for mortality, which was adjusted for factors known to influence mortality including age category, sex, usual place of residence, preadmission cognitive status, preadmission walking ability and ASA classification. Admission dates in 2020 were censored (<01 June 2020) for 365-day mortality as linked death data was only available up until June 2021.

3 | RESULTS

There were 26,937 records of patients admitted with a hip fracture to 24 early contributor hospitals between 2016 and 2020 in Australia and New Zealand. There were 5231 patients in 2016, 5248 in 2017, 5265 in 2018, 5709 in 2019 and 5484 in 2020 (Table 1). The mean age of the cohort was 82.2 (SD 9.9) years and 18,370 (68%) were women.

Table 1 describes the characteristics of the cohort by year of presentation. Most patients (~73%) were admitted from private residences and 27% from Residential Aged Care Facilities (RACF; Table 1). Approximately 38% of patients had cognitive impairment or known dementia prior to admission and 81% had an ASA classification of ≥3 indicating at least severe systemic disease. The majority (98%) had surgical repair of their hip fracture (Table 1).

Performance against 11 quality indicators is reported by year (2016–2020) in Figure 1 and Table S2. The odds of quality indicator attainment in each year after the first year of data collection for that indicator are reported in Table 2. There was a significant increase in the proportion of patients having a preoperative cognitive assessment, receiving nerve blocks before theatre, and prescribed bone protection medication on discharge in later years compared to 2016/2017 (Figure 1, Table 2 and Table S2). Pain assessment within 30 min of ED presentation and surgery within 48 h significantly improved in 2020 when compared to 2016/ 2017 (Figure 1, Table 2 and Table S1). The odds of having an ED stay of less than 4 h increased in 2017 and 2020 when compared to 2016. In the early contributor hospitals, the proportion of patients receiving an orthogeriatric model of care and being offered first-day mobilisation fluctuated over the study period (Figure 1, Table 2 and Table S2). The odds of having a hospital-acquired pressure injury (stage 2 or higher) increased in 2019 and 2020 when compared to 2016 (Table 2). Thirty-day mortality has not changed over time (Figure 2A, Table 2 and Table S2). However, there has been a reduction in 365-day mortality in 2020 compared to 2016 while adjusting for covariates (Figure 2B, Table 2 and Table S2). Table 3 presents quality indicator attainment for the early contributors, and for all Australian and New Zealand participating hospitals as reported in the ANZHFR annual reports, demonstrating that overall early contributor hospitals have a higher level of attainment than the binational averages.

4 | DISCUSSION

This study shows that early contributor hospitals to the ANZHFR improved in performance against national quality indicators over a 5-year period. Relative to the first year of reporting of data, patients were more likely to have their cognitive function assessed preoperatively, were more likely to receive nerve blocks before theatre as part of their pain management and were more likely to have been prescribed bone protection medication at discharge from the hospital where the patient had surgery. Less consistent, but still improvement in some quality indicators was in pain assessment and management within 30 minutes of ED presentation, an ED stay less than 4 h, surgery within 48 h and 365-day mortality. Other indicators fluctuated over time (i.e., assessed by geriatric medicine and offered first-day mobility) and the odds of hospital-acquired pressure injury increased in 2019 and 2020. Reducing clinical variation and encouraging attainment of quality indicators that have been demonstrated to improve outcomes is key to optimising patient functional outcomes and facilitating a return to premorbid quality of life.

Whilst the early contributors to the ANZHFR in the current study demonstrated improved performance in a number of quality indicators, there was no reduction in

TABLE 1 Descriptive characteristics of patients admitted to ANZHFR early contributor hospitals, 2016–2020 ($n = 26,937$).

Characteristics, *n* (%) or mean ± SD	2016, *n* = 5231	2017, *n* = 5248	2018, *n* = 5265	2019, *n* = 5709	2020, *n* = 5484	Total, *n* = 26,937	*p*-Value
Country							
Australia	4525 (87)	4268 (81)	4413 (84)	4614 (81)	4456 (81)	22,276 (83)	
New Zealand	706 (14)	980 (19)	852 (16)	1095 (19)	1028 (19)	4661 (17)	
Age, years	82.3 ± 9.6	82.3 ± 9.8	82.5 ± 9.8	82.1 ± 10.2	81.8 ± 10.1	82.2 ± 9.9	**.009**
Age categories							
50–64 years	300 (6)	301 (6)	317 (6)	390 (7)	362 (7)	1670 (6)	**<.0001**
65–74 years	767 (15)	819 (16)	715 (14)	864 (15)	887 (16)	4052 (15)	
75–84 years	1637 (31)	1599 (31)	1676 (32)	1775 (31)	1749 (32)	8436 (31)	
85–94 years	2186 (42)	2142 (41)	2174 (41)	2219 (39)	2082 (38)	10,803 (40)	
≥95 years	341 (7)	387 (7)	383 (7)	461 (8)	404 (7)	1976 (7)	
Women[a]	3606 (69)	3607 (69)	3646 (69)	3831 (67)	3680 (67)	18,370 (68)	**.03**
Usual residence[b]							
Private residence (including unit in retirement village)	3757 (73)	3777 (73)	3797 (73)	4186 (74)	3976 (73)	19,493 (73)	.75
Residential aged care facility	1425 (28)	1411 (27)	1434 (27)	1505 (27)	1484 (27)	7259 (27)	
Preadmission walking ability[c]							
Walks without walking aids	2421 (47)	2430 (47)	2304 (45)	2599 (47)	2468 (45)	12,222 (46)	**.03**
Walks with either a stick or crutch	667 (13)	671 (13)	643 (13)	679 (12)	646 (12)	3306 (13)	
Walks with two aids or frame	1870 (37)	1902 (37)	1941 (38)	2115 (38)	2105 (39)	9933 (38)	
Immobile	155 (3)	162 (3)	184 (3.6)	189 (3.4)	219 (4)	909 (4)	
Preadmission cognitive function[d]							
Normal cognition	3252 (63)	3067 (61)	3073 (61)	3464 (62)	3182 (60)	16,038 (62)	**.007**
Impaired cognition or known dementia	1878 (37)	1956 (39)	1948 (39)	2098 (38)	2114 (40)	9994 (38)	
Surgical management[e]	5075 (97)	5124 (98)	5048 (98)	5564 (98)	5364 (98)	26,175 (98)	**.002**
ASA classification[f]							
ASA classification 3 or more	3587 (78)	3687 (77)	3767 (81)	4296 (83)	4163 (83)	19,500 (81)	**<.0001**
1: healthy	149 (3)	93 (2)	59 (1)	92 (2)	68 (1)	461 (2)	**<.0001**
2: mild systemic disease	871 (19)	881 (19)	725 (16)	816 (16)	760 (15)	4053 (17)	
3: severe systemic disease	2618 (57)	2776 (60)	2762 (61)	3065 (59)	2998 (60)	14,219 (59)	
4: incapacitating systemic disease, constant threat to life	944 (21)	898 (19)	997 (22)	1207 (23)	1159 (23)	5205 (22)	
5: moribund, unlikely to survive 24 h	25 (1)	13 (0)	8 (0)	24 (1)	6 (0)	76 (0)	

Note: Bold *p*-values indicate significant results ($p < .05$).

Abbreviations: ANZHFR, Australian and New Zealand Hip Fracture Registry; ASA, American Society of Anaesthesiologists.

[a] $n = 12$ with missing data.

[b] $n = 103$ classified 'other'; $n = 82$ with missing data.

[c] $n = 567$ with missing data.

[d] $n = 905$ with missing data.

[e] $n = 186$ with missing data.

[f] $n = 2923$ with missing data, 203 of these were data entry errors.

30-day mortality. Perhaps this is due to the lack of consistent improvement in some key quality indicators. For example, there has been little improvement in median time spent in ED and the proportion of people undergoing surgery within 48 h, and although the proportion of people offered first-day mobility is high, from a new variable introduced in 2020, less than half actually walk on the day of or after surgery.[12] In the UK, there are several domains of quality care that are currently not considered within the ACSQHC Hip Fracture Care Clinical Care

FIGURE 1 Proportion of patients meeting quality indicators for hip fracture care by year (2016–2020).

Standard. For example, the Best Practice Tariff includes delirium and nutritional assessments (recently added to the minimum dataset of ANZHFR), as well as tighter timing requirements for time to surgery (36 h) and assessment by a geriatrician (72 h). Both latter factors have previously been associated with reduced mortality.[14–16] Also worth considering is that Australia and New Zealand had lower 30-day mortality rates (~7%–8%) at the inception of the ANZHFR, in contrast to the NHFD.[9] When it began in 2007, 30-day mortality for that year was 11%, followed by 10% in 2008 and 9% in 2009, 9% in 2010 and 9% in 2011.[9] Furthermore, when comparing 11 of the 38 Organisation for Economic Co-operation and Development (OECD) countries, Australia and New Zealand reported the lowest rate of hip fracture 30-day mortality.[17]

Evidence from the early years (2007–2011) of the NHFD demonstrated benefits of a clinical quality registry (audit and feedback) to improve a number of key indicators over time, including a significant reduction in mortality and improvement in time to surgery in England.[9] Further benefits were seen with the introduction of the Best Practice Tariff in 2010, whereby hospitals were financially incentivised to meet a specified set of clinical quality indicators which have been updated over time.[18] Subsequently, Metcalfe et al.[18] teased out the benefits of financial incentivisation over and above clinical care standards together with clinical quality registry audit and feedback. Mortality following hip fracture was contrasted between England (incentivised care) and Scotland (no incentivised care), and

TABLE 2 Logistic regression comparing the earliest year of data collection to subsequent years for each hip fracture care quality indicator ($n = 26{,}937$).

Hip fracture care quality indicator[a]	*n*	2016	2017, *n* = 5248, OR (95% CI)	*p*-Value	2018, *n* = 5265, OR (95% CI)	*p*-Value	2019, *n* = 5709, OR (95% CI)	*p*-Value	2020, *n* = 5484, OR (95% CI)	*p*-Value
ED stay <4 h[b]	24,822	Ref	1.16 (1.05, 1.27)	**.002**	1.02 (0.93, 1.13)	.62	1.04 (0.95, 1.14)	.4125	1.20 (1.09, 1.31)	**.0002**
Had preoperative cognitive assessment (1b)[c]	20,678		Ref	–	1.47 (1.35, 1.59)	**<.0001**	1.91 (1.77, 2.06)	**<.0001**	3.57 (3.29, 3.87)	**<.0001**
Had pain Ax ≤30 min of ED presentation (2b)[c,d]	15,984		Ref	–	1.04 (0.94, 1.15)	.44	0.95 (0.86, 1.05)	.31	1.24 (1.12, 1.37)	**<.0001**
Analgesia given ≤30 min of ED presentation or not needed or already provided (2b)[c]	18,982		Ref	–	1.14 (1.03, 1.27)	**.009**	1.06 (0.96, 1.17)	.23	1.07 (0.97, 1.18)	.20
Nerve block received before theatre	25,705	Ref	1.29 (1.18, 1.41)	**<.0001**	2.64 (2.40, 2.91)	**<.0001**	3.28 (2.98, 3.61)	**<.0001**	4.62 (4.17, 5.11)	**<.0001**
Assessed by Geriatric Medicine/Orthogeriatric model of care (3a)	26,397	Ref	0.85 (0.73, 1.00)	**.049**	1.73 (1.43, 2.10)	**<.0001**	1.27 (1.07, 1.50)	**.007**	1.16 (0.98, 1.37)	.08
Surgery ≤48 h (4a)[e]	25,887	Ref	1.02 (0.93, 1.12)	.70	1.00 (0.91, 1.10)	.97	1.09 (0.99, 1.20)	.07	1.12 (1.02, 1.24)	**.02**
Offered first-day mobilisation (5a)[f]	24,931	Ref	1.21 (1.04, 1.42)	**.01**	1.02 (0.88, 1.19)	.76	0.85 (0.74, 0.98)	**.02**	1.13 (0.97, 1.31)	.11
Unrestricted weight-bearing (5b)	26,047	Ref	1.11 (0.90, 1.38)	.34	1.07 (0.87, 1.33)	.52	1.38 (1.10, 1.72)	**.005**	1.09 (0.89, 1.35)	.41
New hospital-acquired pressure injury (≥grade 2) (5c)	26,131	Ref	0.85 (0.66, 1.10)	.21	0.94 (0.73, 1.22)	.65	1.59 (1.27, 1.98)	**<.0001**	1.40 (1.12, 1.76)	**.004**
Bone protection medication on discharge (prescription) (6a)	25,845	Ref	1.42 (1.29, 1.56)	**<.0001**	1.15 (1.04, 1.27)	**.005**	1.80 (1.65, 1.97)	**<.0001**	2.22 (2.03, 2.42)	**<.0001**
30-day mortality (8b)[g]	23,055	Ref	1.03 (0.86, 1.23)	.72	0.92 (0.77, 1.10)	.34	1.02 (0.86, 1.22)	.78	0.88 (0.73, 1.05)	.14
365-day mortality[g]	20,299	Ref	0.97 (0.87, 1.08)	.58	0.92 (0.83, 1.03)	.14	0.97 (0.87, 1.07)	.52	0.86 (0.74, 0.98)	**.029**

Note: Bold text denotes significant finding ($p < .05$).

Abbreviations: Ax, assessment; CI, confidence interval; ED, emergency department; OR, odds ratio; Ref, reference year for comparison.

[a]Numbering after quality indicators identifies those outlined in the Australian Commission on Safety and Quality in Health Care Hip Fracture Care Clinical Care Standard.[11]

[b]In hospital fractures excluded from analysis.

[c]Variable introduced 2017.

[d]Known timing of pain assessment used for analyses, that is, Had pain Ax ≤30 min of ED presentation vs. >30 min; patients who were classified 'pain assessment not documented' were classified as missing; one hospital with missing data in 2017 excluded.

[e]This variable is calculated using date-time variables, please note that the ANZHFR annual report uses a categorical variable.

[f]Analysis was conducted on patients who were not classified as immobile (wheelchair or bed bound) preadmission.

[g]While adjusting for age category, sex, usual place of residence, preadmission walking ability, preadmission cognitive status and ASA classification; death data only available until June 2021; therefore, for 2020, 365-day mortality analyses completed on cohort admitted between 1 January 2020 to 31 May 2020.

with the introduction of the Best Practice Tariff, from (2010 to 2016) mortality was reduced in England compared to Scotland with more than 7600 fewer deaths within 30-days over the same time period.[18] Similar to Scotland, these improvements in mortality have not been demonstrated in Australia and New Zealand, and currently, there are no financial incentives for providing high-quality care in Australia and New Zealand. In fact, Australia has introduced a series of financial penalties for a number of hospital-acquired complications including some relevant to hip fracture care, for example, infection and delirium. It is unclear at this point in time whether the use of financial penalties is driving quality improvement activities and achieving the aim of reducing hospital-acquired complications. In Western Australia, incentivised care for hospitals meeting quality indicators for hip fracture care was trialled from 2014 to 2016.[19] The proportion of patients with hip fracture having surgery within 36 h increased and acute

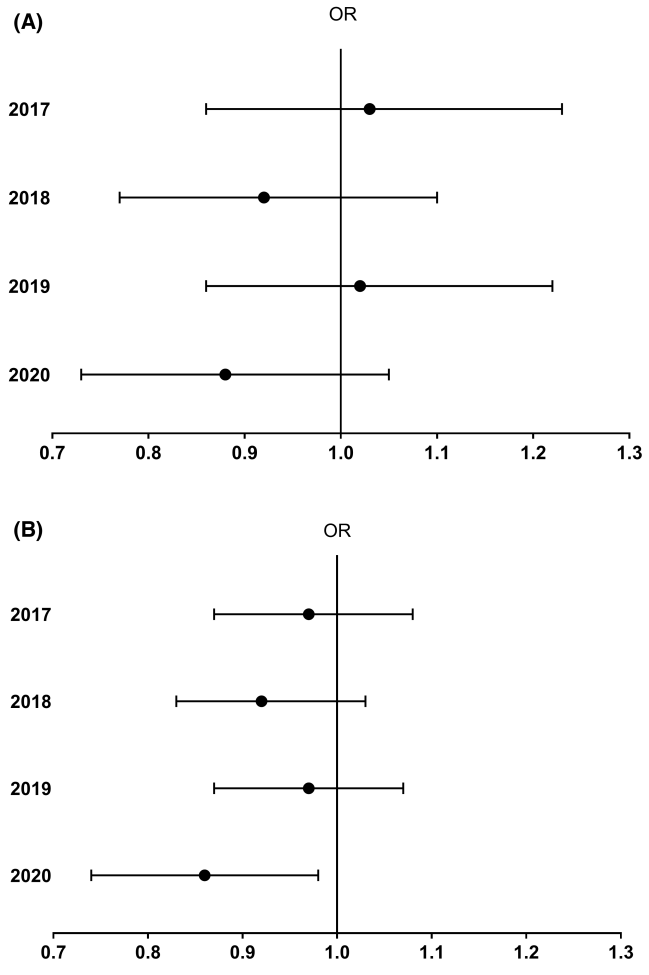

FIGURE 2 Mortality by year with 2016 as the reference year: (A) 30-day mortality and (B) 365-day mortality (while adjusting for age category, usual place of residence, preadmission walking ability, preadmission cogntiive status and ASA classification).

hospital length of stay decreased from 2014 to 2016, providing further support for incentivised care.[19] A common theme both in England and Western Australia is the need to meet all quality indicators to achieve financial reward, and it is possible that this bundled approach rather than just being good at one or two measures is key in driving the observed improvement in performance and outcomes.

For this study, we intentionally explored temporal trends in quality indicator attainment for hospitals that were early contributors to the ANZHFR to determine the impact of care standards and registry participation in hospitals that were proactive and engaged from an early stage in the ANZHFR. When comparing quality indicator performance in the early contributors to all hospitals that have joined the ANZHFR over time (Table 3), we can see several quality indicators where the early contributors have achieved greater success in achieving standards than those joining at a later date. Specifically, the early contributors had a higher proportion of quality indicator attainment than all ANZHFR hospitals for: use of nerve block for pain management, orthogeriatric model of care, time to surgery, early mobilisation, unrestricted weight-bearing and bone protection medication on discharge.

Of note is the observed increase in risk of acquiring a new pressure injury (stage 2 or higher) during hospitalisation in 2019 and 2020 when compared to 2016. This pattern is similar in the early contributors and the whole ANZHFR sample (Table 3).[12,20] It is unclear whether this relates to a 'real' increase in incidence or reflects better reporting by hospitals. In Australian and New Zealand hospitals, a recent meta-analysis suggests that the prevalence of hospital-acquired pressure injuries is 8%, with significant heterogeneity, and not specific to hip fracture patients.[21] In New South Wales, the point prevalence of hospital-acquired inpatient pressure injury has been reported to be 6% in 2015, 5% in 2016 and 4% in 2017 and 2018.[22] Whilst this is not specific to hip fracture patients and includes all pressure injuries, data suggest a trend for reducing prevalence.[22] Postoperative pressure injury prevalence in hip fracture patients using the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database has previously been reported to be 5% (includes stage 1),[23] and in the UK, prevalence ranged from 2% to 3% (stage 2 or above) from 2016 to 2020.[24] Early and frequent mobility, position changes, use of pressure relieving devices and nutrition are key to preventing pressure injury. In the UK, the best practice tariff includes several factors which may impact pressure injury development, including surgery within 36 h, assessment by a geriatrician within 72 h of surgery, a nutritional assessment and assessment by a physiotherapist on the day

TABLE 3 Hip fracture care quality indicators by year (2016–2020) from the ANZHFR annual reports[a] and for the 24 early contributor hospitals.

Hip fracture care quality indicator[b], % unless indicated otherwise	2016	2017	2018	2019	2020
Hospitals contributing to the registry, *n*	34	56	67	76	86
ED stay <4 h					
Australia	Not reported[c]	Not reported[c]	Not reported[c]	Not reported[c]	Not reported[c]
New Zealand	Not reported[c]	Not reported[c]	Not reported[c]	Not reported[c]	Not reported[c]
Early contributors, <4 h	23%	26%	24%	24%	26%
ED stay, h					
Australia, median	6	6	5.8	6.4	5.9
New Zealand, median	4.5	5	4.3	4.5	4.6
Early contributors, median [IQR]	5.7 [4.2, 8.4]	5.6 [4.0, 8.4]	5.8 [4.1, 8.6]	6.0 [4.1, 9.0]	5.6 [3.9, 8.2]
Had preoperative cognitive assessment (1b)[d]					
Australia		36%	50%	60%	72%
New Zealand		20%	35%	59%	51%
Early contributors[e]		38%	48%	55%	67%
Pain assessment ≤30 min of ED presentation (2b)[d]					
Australia		54%	64%	61%	66%
New Zealand		50%	54%	58%	62%
Early contributors[e]		45%	51%	52%	61%
Analgesia given ≤30 min of ED presentation or in transit by paramedics (2b)[d]					
Australia		63%	69%	71%	70%
New Zealand		48%	58%	58%	61%
Early contributors[e]		57%	67%	67%	69%
Had a nerve block before theatre					
Australia	59%	66%	73%	79% 76%[f]	81% 79%[f]
New Zealand	26%	36%	57%	67%	72%
Early contributors[e]	57%	60%	74%	78%	83%
Orthogeriatric model of care during stay (3a)					
Australia	95%	92%	92%	91%	87%
New Zealand	80%	80%	83%	83%	82%
Early contributors[e]	93%	92%	96%	94%	95%
Surgery <48 h (4a)					
Australia[f]	77%	77%	76%	80%	80%
New Zealand[f]	82%	80%	82%	84%	83%
Early contributors[e,g]	82%	81%	81%	82%	82%
Offered first-day mobilisation (5a)					
Australia	89%	89%	91%	91%	90%
New Zealand	90%	87%	86%	85%	89%
Early contributors[e]	91%	91%	91%	89%	92%
Unrestricted weight-bearing (5b)					
Australia	>95%[d]	96%	95%	95%	94%
New Zealand		93%	91%	94%	94%
Early contributors[e]	96%	96%	96%	97%	96%

(Continues)

TABLE 3 (Continued)

Hip fracture care quality indicator[b], % unless indicated otherwise	2016	2017	2018	2019	2020
New hospital-acquired pressure injury (5c)					
Australia	<3%	<3%	3%	4%	4%
New Zealand			3%	4%	4%
Early contributors[e]	2.5%	2.1%	2.3%	3.8%	3.5%
Bone protection medication on discharge (6a)					
Australia	16%	24%	18%	25%	26%
New Zealand	31%	25%	26%	31%	29%
Early contributors[e]	19%	25%	22%	30%	35%
30-day mortality (8b)					
Australia(adjusted)	7.7%	7.9%	7.7%	7.7%	7.6%
New Zealand (adjusted)	Not reported	7.2%	7.6%	7.2%	8.2%
Early contributors (unadjusted)	7.3%	7.7%	7.1%	7.7%	7.7%
365-day mortality					
Australia (adjusted)	25.3%	25.0%	25.5%	24.8%	Not available
New Zealand (adjusted)	Not reported	27.0%	26.5%	25.9%	Not available
Early contributors (unadjusted)	25.4%	25.1%	25.1%	26.3%	24.0%[h]

Abbreviations: ANZHFR, Australian and New Zealand Hip Fracture Registry; ED, emergency department; IQR, interquartile range.

[a]Data extracted from ANZHFR Annual reports.[20]

[b]Numbering after quality indicators identifies those outlined in the Australian Commission on Safety and Quality in Health Care Hip Fracture Care Clinical Care Standard.[11]

[c]Average and median time in ED reported.

[d]Variable introduced in 2017.

[e]Data in the annual reports includes the category 'not known' which was excluded in Table S2, and therefore, the percentages presented differ slightly because of this.

[f]Combined Australia/NZ total.

[g]This is based on the categorical variable in the ANZHFR (i.e., it is not calculated using the date-time data).

[h]Death data only available until June 2021; therefore, for 2020, analyses completed on cohort admitted between 1 January to 31 May 2020.

of or after surgery. Additional data have been added to the ANZHFR minimum common dataset to capture information that is not part of the current clinical care standard, including nutrition assessment (added 2019), first-day walking (added 2020; whether the patient actually walked early after surgery) and clinical frailty scale (added 2021), which may assist in further understanding pressure injury risk and management for hip fracture patients in Australia and New Zealand.

The strengths of the study include the population-based design with a binational cohort, which reduces selection bias. The limitations include the retrospective nature of the data and thus the influence of changing factors over time that may not be attributed to the ANZHFR. In 2020, the global COVID-19 pandemic may have impacted care (e.g., time to surgery) and outcomes (e.g., mortality), and this has not been taken into account in this study. Also, the ANZHFR offers other education and dissemination activities that could have an immeasurable impact on the quality of care, for example, national conference (HipFest), podcasts (HipCast) and newsletters. The ANZHFR is a clinical quality registry; data are entered predominantly by clinical staff and entry is inevitably subject to human error.[25] However, there are data entry validation rules and guidance that have evolved over time and the process used is not dissimilar to administrative data. Additionally, with the reliance on predominantly clinical staff for data entry, on occasion hospitals do not collect patient-level data due to staffing issues as was the case for one early contributor hospital in 2017. Finally, death data were not available for a full year after 2020 admissions. Therefore, these data were censored to approximately 3 weeks before the final death date.

5 | CONCLUSIONS

The early contributors to the ANZHFR have made improvements in attainment of quality care indicators that were informed by the binational ACSQHC Hip Fracture

Care Clinical Care Standard. There were improvements in preadmission cognitive assessment, pain management and bone protection medication. Other indicators did not consistently improve over time and are potential areas to target. Further consideration is needed on the potential benefits of introducing a best practice tariff to reward high-quality care, similar to the NHFD model, as this has been shown to further drive improvement in hip fracture care.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the participating sites of the Australian and New Zealand Hip Fracture Registry and Mr Stewart Fleming for his role in database management. Open access publishing facilitated by University of New South Wales, as part of the Wiley - University of New South Wales agreement via the Council of Australian University Librarians.

FUNDING INFORMATION

The ANZHFR receives funding from the Australian Government Department of Health and Aged Care, New Zealand Accident Compensation Corporation, NSW Agency for Clinical Innovation, Victorian Agency for Health Information, SA Health, WA Health and Queensland Health. The Registry receives in-kind support from Neuroscience Research Australia, UNSW Sydney and the New Zealand Orthopaedic Association.

CONFLICT OF INTEREST STATEMENT

Professor Jacqueline Close and A/Professor Catherine McDougall are the current co-chairs of the Australian and New Zealand Hip Fracture Registry (ANZHFR). Professor Ian Harris is a past and inaugural co-chair of the ANZHFR. Dr Morag Taylor (part-time data analyst) and Jamie Hallen (Australian Registry Manager) are employed by Neuroscience Research Australia (NeuRA) on behalf of the ANZHFR. Nicola Ward is the National Coordinator of the New Zealand Hip Fracture Registry. Dr Sarah Hurring is the National Clinical Lead of the New Zealand Hip Fracture Registry. Dr Niamh Ramsay was previously employed by NeuRA on behalf of the ANZHFR. Dr Lara Harvey is a member of the ANZHFR research sub-committee. Ms Elizabeth Armstrong was the inaugural Australian Registry Manager of the ANZHFR. Associate Professor Rebecca Mitchell is a member of the ANZHFR Steering Group and Chairs the ANZHFR data sub-committee and is a member of the ANZHFR research sub-committee. Dr Morag Taylor was an editorial team member of the Australasian Journal on Ageing (May 2020–October 2023) and is an author of this manuscript. They were excluded from editorial decision-making related to the acceptance of this article for publication in the journal.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from Australian and New Zealand Hip Fracture Registry. Access to data collected and collated by the Australian and New Zealand Hip Fracture Registry (ANZHFR) is guided by a publicly available Data Access Policy https://anzhfr.org/data-access/.

ORCID

Morag E. Taylor https://orcid.org/0000-0002-4436-862X
Niamh Ramsay https://orcid.org/0000-0002-1721-8933
Rebecca Mitchell https://orcid.org/0000-0003-1939-1761
Lara A. Harvey https://orcid.org/0000-0001-6260-8001

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Taylor ME, Ramsay N, Mitchell R, et al. Improving hip fracture care: A five-year review of the early contributors to the Australian and New Zealand Hip Fracture Registry. *Australas J Ageing*. 2024;43:31-42. doi:10.1111/ajag.13270