



HIP FRACTURE REGISTRY TOOLBOX

A collaboration between the APFFA Hip Fracture Registry Working Group and the FFN Hip Fracture Audit Special Interest Group

Edited by
Joon-Kiong Lee
Ding-Cheng Chan

FOREWORD

Launched in November 2018, the Asia Pacific Fragility Fracture Alliance (APFFA) is comprised of the following seven regional and global organisations:



Asian Federation of Osteoporosis Societies

Asian Federation of
Osteoporosis Societies
(AFOS)



Asia-Oceanian Society of
Physical and Rehabilitation
Medicine (AOSPRM)



Asia Pacific Geriatric
Medicine Network
(APGMN)



Asia Pacific
Orthopaedic
Association (APOA)



Fragility
Fracture Network
(FFN)



International
Osteoporosis
Foundation (IOF)



International
Society for Clinical
Densitometry
(ISCD)

The primary purpose of APFFA is to drive policy change, improve awareness and change political and professional mindsets to facilitate optimal fracture management across Asia Pacific. The “engine room” of APFFA is the three Working Groups that are focused on Hip Fracture Registries, Education and Evidence Generation.

The FFN is a global organisation, which was founded in order to create a multidisciplinary network of experts for improving treatment and secondary prevention of fragility fractures. In September 2016, FFN convened a “Presidents’ Roundtable” during the 5th FFN Global Congress, held in Rome. The purpose of the roundtable was to explore how organisations with a focus on various aspects of care of fragility fractures could collaborate. The organisations involved were FFN, European Geriatric Medicine Society (EuGMS), European Federation of National Associations of Orthopaedics and Traumatology (EFORT), International Collaboration of Orthopaedic Nursing (ICON), International Geriatric Fracture Society (IGFS) and International Osteoporosis Foundation (IOF). The product of that collaboration was the Global Call to Action on Fragility Fractures (CtA), published in 2018¹. The CtA called for urgent improvement in the acute care, rehabilitation and secondary fracture prevention for individuals who sustain fragility fractures, and for establishment of national

alliances of healthcare professional organisations and other interested stakeholders to speak with a unified voice to policymakers to catalyse change. Given that the first “clinical pillar” of the CtA is multidisciplinary co-management of the acute fracture episode - to systematically improve the care that we provide - hip fracture registries are essential.

Widespread implementation of hip fracture registries has the potential to facilitate improvements in care for the many millions of individuals who sustain hip fractures every year. We hope that this collaborative effort of APFFA and FFN will be useful to you and the communities that you serve.



Professor Jacqui Close
CO-CHAIR
APFFA Hip Fracture Registry Working Group



Dr. Emer Ahern
CO-CHAIR
FFN Hip Fracture Audit Special Interest Group



Dr. Hannah Seymour
CO-CHAIR
APFFA Hip Fracture Registry Working Group



Professor Matt Costa
CO-CHAIR
FFN Hip Fracture Audit Special Interest Group

EXECUTIVE SUMMARY

Hip fracture registries provide a mechanism for hospitals to benchmark the care that they provide against best practice clinical standards for acute care, rehabilitation, and secondary fracture prevention. In May 2021, national hip fracture registries were at varying stages of development in approximately one tenth of countries globally. The purpose of this Toolbox is to provide a distillation of learning from those existing registries to support colleagues in the rest of the world who are keen to establish a hip fracture registry in their countries. The burden imposed by hip fractures on older people and their families, healthcare systems and national economies is currently enormous and set to grow dramatically worldwide in the next 30 years, and in the highly populous Asia Pacific region in particular.

Essential components of national quality improvement programmes for hip fracture care include clinical guidelines, from which can be derived best practice clinical standards, which include quality indicators that enable quantification of performance. Clinically-led hip fracture registries offer the technological infrastructure to transform patient-level data into information that can empower hospital teams to reflect upon the care that they provide, identify challenges and solutions, and continuously improve care.





This Toolbox focuses on practical aspects of establishing a registry, including:

- The importance of clinical leadership and engagement
- How to consolidate and broaden buy-in from a diverse range of stakeholders
- How to build the case for change
- Approaches to registry planning and funding
- How to pilot a registry and increase participation
- Building an effective governance structure and adherence with ethical requirements
- Developing a minimum common data set and data dictionary

A summary of the extensive literature on the multidisciplinary care of individuals with hip fractures is also provided, in addition to detailed case studies of national hip fracture registries from Australia and New Zealand, Spain and the United Kingdom.

For the clinical champions of new national hip fracture registries, the key themes of the early meetings of National Hip Fracture Registry Steering Groups are proposed, in addition to approaches to develop national alliances of healthcare professional organisations to encourage support for the registry by national policymakers.

CONTENTS

Hip fracture registries: Why are they needed and what is their purpose?	7
The burden of hip fracture in Asia Pacific	10
Essential components: Clinical guidelines and standards, quality indicators and registries	12
Practical aspects of establishing a registry	19
Clinical leadership and engagement	20
Consolidating and broadening stakeholder buy-in	21
Building the case for change	22
Why establish a national hip fracture registry?	22
How can a national hip fracture registry be established?	22
What specific tasks need to be undertaken to establish a registry?	23
Fragility Fracture Network Policy Resources	23
Registry planning and funding	24
Registry planning	24
Registry funding	29
A registry pilot and increasing participation	29
Governance and ethics	30
Governance	30
Ethics	31
Minimum common data set and data dictionary	32
Supporting activities	32
Practical resources	33
Acknowledgements	35
Asia Pacific Fragility Fracture Alliance	35
Fragility Fracture Network	36
Review of the Hip Fracture Registry Toolbox	36
Suggested citation	37
Funding	37
Appendix 1: Multidisciplinary care of individuals who sustain hip fractures	38
The organisation of orthogeriatric co-management programs	39
Clinical effectiveness of orthogeriatric co-management programs	40
Costs and cost-effectiveness of orthogeriatric co-management programs	42

Appendix 2: Australian and New Zealand Hip Fracture Registry.....	43
Building a coalition to support registry development.....	43
Funding the registry	44
Developing guidelines and clinical standards.....	44
Increasing participation in the registry.....	46
Facilities Level Audit	46
Newsletters	47
Hip Fests and webinars	48
Registry reports and publications	49
Alignment with national policy priorities.....	51
Australia	51
New Zealand.....	51
Appendix 3: Spanish National Hip Fracture Registry	52
Building a coalition to support registry development.....	52
Funding the registry	53
Developing guidelines and clinical standards.....	53
Increasing participation in the registry.....	54
Registry reports and publications	54
Alignment with national policy priorities.....	55
Appendix 4: UK National Hip Fracture Database.....	56
Building a coalition to support registry development.....	56
Funding the registry	57
Developing guidelines and clinical standards.....	58
Increasing participation in the registry.....	59
Registry reports and publications	60
Alignment with national policy priorities.....	61
Appendix 5: Agendas for National Registry Steering Group Meetings.....	64
Appendix 6: Australian and New Zealand Intention to Collaborate	68
Introduction	68
Objectives of Collaboration	68
Appendix 7: The 2020 ANZ Hip Fracture Registry Facilities Level Audit	70
References	74

HIP FRACTURE REGISTRIES: Why are they needed and what is their purpose?

In 2020, the Agency for Healthcare Research and Quality (AHRQ) published the fourth edition of *Registries for Evaluating Patient Outcomes: A User's Guide*². This comprehensive document defined patient registries as follows:

"A patient registry is an organized system that uses observational study methods to collect uniform data (clinical and other) to evaluate specified outcomes for a population defined by a particular disease, condition, or exposure, and that serves one or more stated scientific, clinical, or policy purposes.

The patient registry database describes a file (or files) derived from the registry."

The use of registries varies by condition. A large number of registries have been developed for cardiovascular disease and cancer, while very few exist for dementia. At the time of writing this Toolbox, national hip fracture registries have been established, or are in development, in 18 countries across Asia Pacific, Europe, Latin America and North America³⁻¹⁷. These registries are at different stages of maturity and levels of participation.

Registries provide a platform to identify and explore the impact of variation in the provision of healthcare. At its most basic, a registry can provide a simple count function that serves to identify where variation exists – how many, how often, etc. More advanced registries allow for further exploration of the drivers of variation as well as the impact that variation has on outcomes such as adjusted 30-day mortality. As an example, **Figure 1a** overleaf, is derived from the 2020 Annual Report of the Australian and New Zealand Hip Fracture Registry (ANZHFR) and shows data on time to surgery for hip fracture patients¹⁸. Delay occurs for many reasons and there is considerable variation between hospitals as shown in **Figure 1b**.

Registries also offer a mechanism to benchmark care provided by individual hospitals or other healthcare facilities against best practice clinical standards. Real time reporting enables multidisciplinary teams in hospitals to know when best practice is being delivered and identify aspects of care that require attention. It is this ability to provide real time feedback that can drive a quality improvement agenda. As noted by Currie, well used continuous feedback¹⁹:

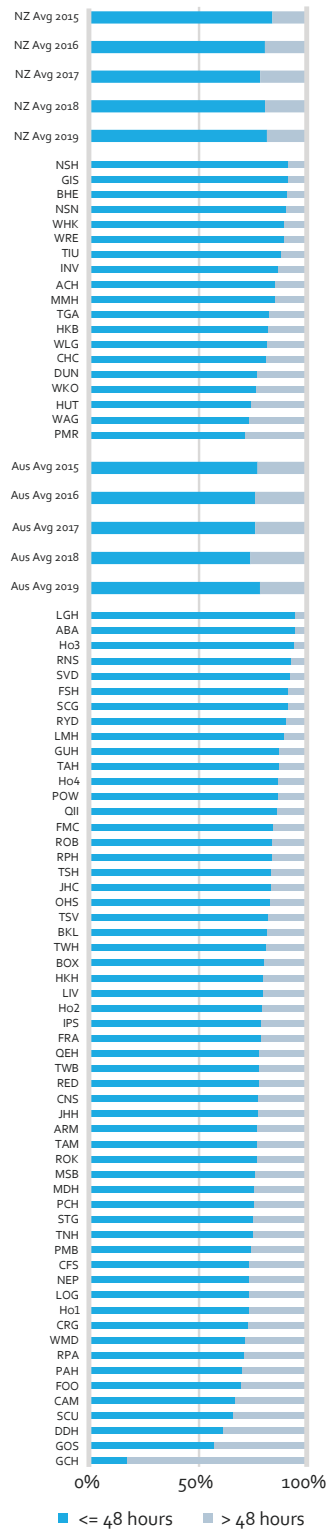
“ ... is continuously and consistently empowering and encourages a strategic approach. And units that make a regular practice of monthly audit meetings to scrutinise their own data can use it ... to identify and quantify problems and address them as they emerge, with or without management support: a prompt and flexible ‘fire-fighting’ response that only continuous audit can provide.”

The purpose of this Toolbox is to provide the reader with an overview of key lessons learned in the establishment of hip fracture registries to date and practical tools to support registry development.

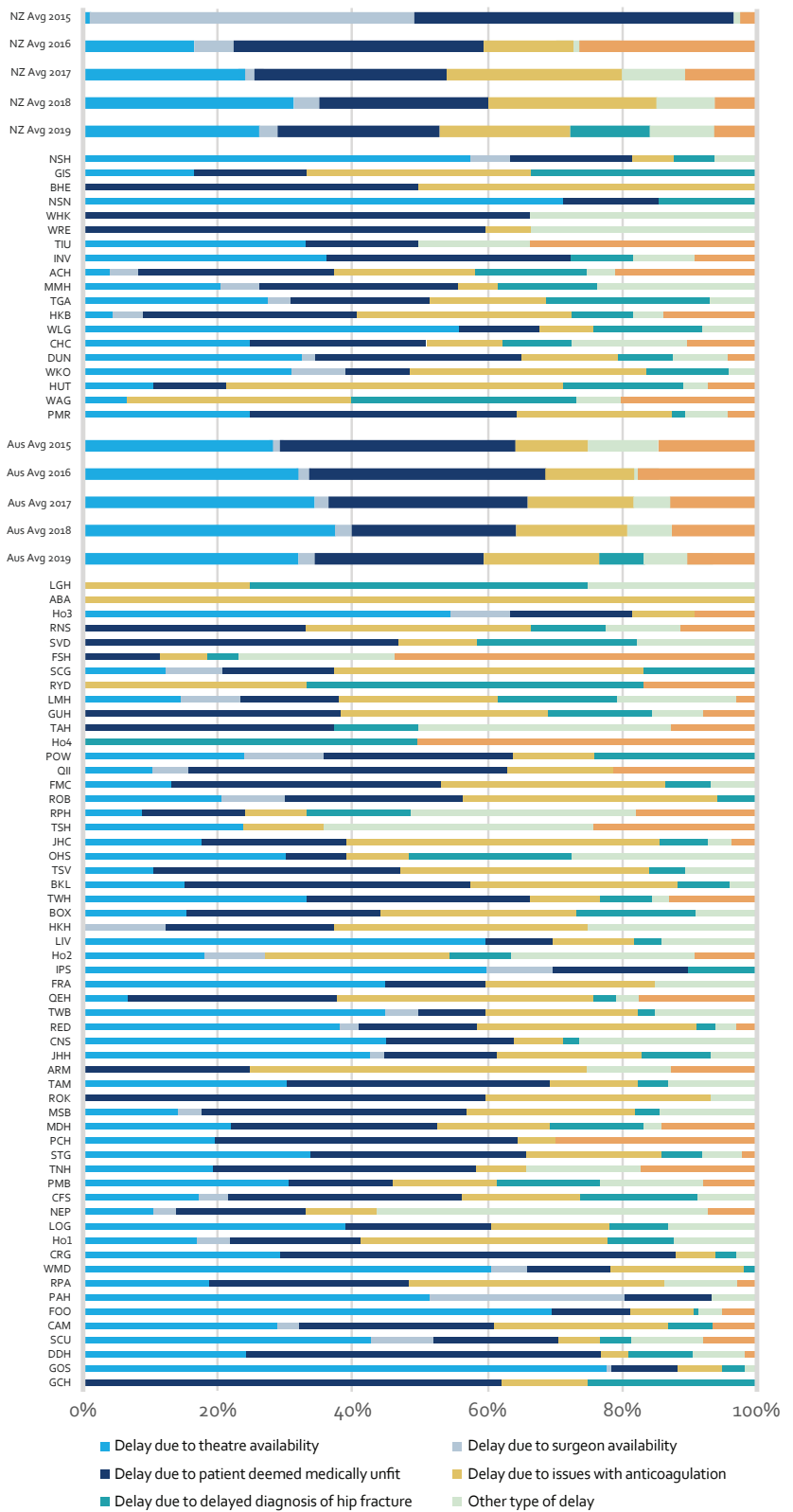


Figures 1a and 1b. Time to surgery and reasons for delay vary considerably in hospitals in Australia and New Zealand¹⁸

SURGERY WITHIN 48 HOURS



REASON FOR DELAY LONGER THAN 48HRS



Reproduced with kind permission of the Australian and New Zealand Hip Fracture Registry

THE BURDEN OF HIP FRACTURE IN ASIA PACIFIC

As illustrated in *Table 1*, the burden imposed by hip fractures in Asia Pacific is currently enormous and is set to grow substantially in the coming decades. In 2018, the Asian Federation of Osteoporosis Societies (AFOS) published an update to hip fracture projections for the following countries and regions in Asia: China, Chinese Taipei, Hong Kong SAR, India, Japan, Korea, Malaysia, Singapore and Thailand²⁰. As noted by Ebeling et al, the AFOS study estimated the total population of these countries and regions to be 3.1 billion in 2018, accounting for 70% and 42% of the Asian and global populations, respectively²¹. In 2018, more than 1.1 million hip fractures were anticipated to occur in the nine countries and regions incurring an estimated direct cost of US\$7.4 billion. By 2050, the number of hip fractures is projected to increase by 2.3-fold to more than 2.5 million cases per year, resulting in projected costs of almost US\$13 billion.



Table 1. Hip fracture incidence, mortality and costs across the Asia Pacific region

COUNTRY/ REGION	POPULATION IN 2020 (THOUSANDS)	POPULATION AGED ≥65 YEARS IN 2020 (THOUSANDS AND [%])	ANNUAL HIP FRACTURE INCIDENCE	MORTALITY	COSTS	REFERENCES
Australia	25,500	4,134 (16)	18,700 ^a	30-day: 5% 120-day: 13% 1-year: 26-28% 3-year: 45% 8-year: 72%	US\$ 740 million (AU\$ 1,010 million) ^b	18, 22-26
China	1,439,324	172,262 (12)	484,941 ^c	1-year: 14-23%	US\$1,690 million ^c	20, 22, 27, 28
Chinese Taipei	23,817	3,775 (16)	45,063 ^c	1-year: 11-17%	US\$260 million ^c	20, 22, 29, 30
Hong Kong SAR	7,497	1,364 (18)	9,590 ^c	30-day: 3% 1-year: 17%	US\$85 million ^c	20, 22, 31
India	1,380,004	90,720 (7)	331,898 ^c	3-months: 12% 6-months: 17% 12 months: 22%	US\$256 million ^c	20, 22, 32
Indonesia	273,524	17,129 (6)	n.a.	n.a.	n.a.	22
Japan	126,476	35,916 (28)	151,846 ^d	1-year: 19% 2-years: 33% 5-years: 51% 10-years: 74%	US\$4,479 million ^e	22, 33-35i
Malaysia	32,366	2,325 (7)	5,880 ^c	30-day: 7-10% 6-months: 14-22% 1-year: 26%	US\$35 million ^c	20, 22, 35ii-iv
Myanmar	54,410	3,393 (6)	n.a.	n.a.	n.a.	22
Nepal	29,137	1,698 (6)	n.a.	n.a.	n.a.	22
New Zealand	4,822	789 (16)	3,849 ^f	30-day: 6-7% 120-day: 10% 1-year: 24%	US\$117 million (NZ\$171 million) ^g	22, 25, 36-38
Philippines	109,581	6,040 (6)	n.a.	n.a.	n.a.	22
Singapore	5,850	781 (13)	3,900 ^h	3-months: 9% male and 6% female 1-year: 19% male and 13% female 3-year: 36% male and 26% female 8-year: 65% male and 57% female	US\$49 million (S\$67 million)	22, 39, 40
South Korea	51,269	8,096 (16)	32,332 ^d	1-year: 20%	US\$100 million	20, 22, 41
Sri Lanka	21,413	2,405 (11)	n.a.	1-year: 17% male and 15% female 2-year: 26% male and 20% female	n.a.	22
Thailand	69,800	9,045 (13)	42,118 ^c	1-year: 19%	US\$85 million ^c	20, 22, 42
Vietnam	97,339	7,657 (8)	n.a.	n.a.	n.a.	22

a. For 2015-16, among Australians aged ≥45 years

b. For 2017, total direct cost

c. For 2018, direct cost

d. For 2015

e. April 2012 - September 2013, Yen:USD exchange rate

f. For July 2019 - June 2020

g. For 2014

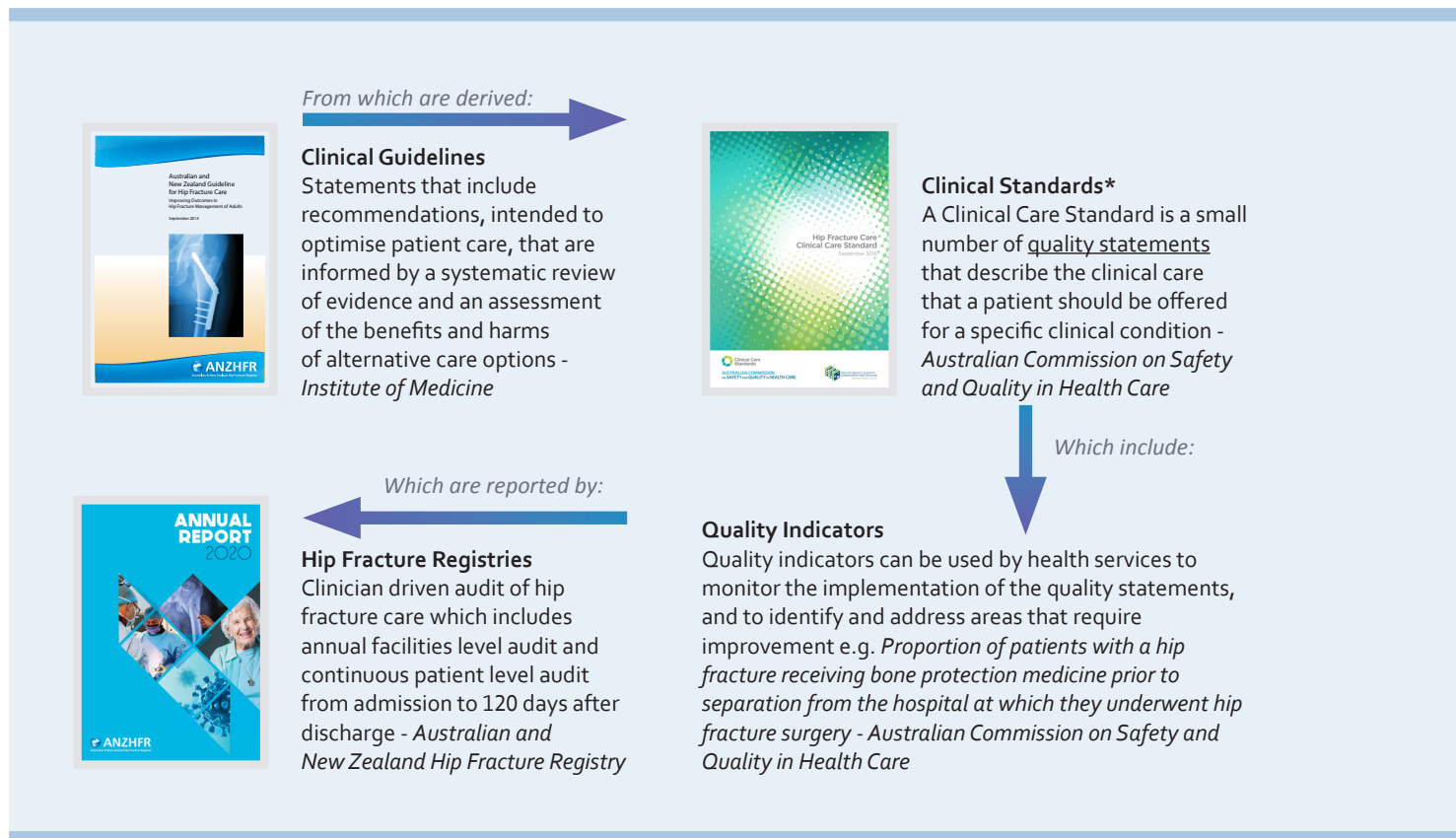
h. For 2017

n.a. = not available

ESSENTIAL COMPONENTS: Clinical guidelines and standards, quality indicators and registries

The relationship between clinical guidelines and standards, quality indicators and registries is illustrated in *Figure 2*.

Figure 2. The relationship between clinical guidelines and standards, quality indicators and registries^{18, 43-45}



Reproduced with kind permission of the Australian and New Zealand Hip Fracture Registry and the Australian Commission on Safety and Quality in Health Care

* This image 'Hip Fracture Clinical Care Standard' was developed by the Australian Commission on Safety and Quality in Health Care (ACSQHC). ACSQHC: Sydney (2016).

The terms “clinical standards” and “quality standards” are used interchangeably in the published literature and by organisations with a focus on healthcare quality. The Australian Commission on Safety and Quality in Health Care has described clinical standards and their purpose as follows:

“A Clinical Care Standard is a small number of quality statements that describe the clinical care that a patient should be offered for a specific clinical condition. It differs from a clinical practice guideline; rather than describing all the components of care for managing a clinical condition, a Clinical Care Standard addresses priority areas for quality improvement.

The Clinical Care Standard supports:

- *people to know what care should be offered by their healthcare system, and to make informed treatment decisions in partnership with their clinician*
 - *clinicians to make decisions about appropriate care*
 - *health services to examine the performance of their organisation and make improvements in the care they provide”*
-

In 2018, Voeten et al undertook a systematic review of quality indicators for hip fracture care reported in the literature, clinical guidelines and hip fracture audits⁴⁶. The 97 unique indicators identified were classified as relating to structure (n=9), process (n=63) and outcome (n=25). A set of nine indicators which featured in at least two data sources were proposed as candidates for further research to assess their clinimetric properties:

- | | | |
|---|--|--|
| 1. Orthogeriatric management during admission | 4. Future fracture prevention assessment | 7. Prevention/assessment of pressure ulcer |
| 2. Time to surgery | 5. Systematic pain assessment | 8. Mortality rate |
| 3. Time to mobilisation after surgery | 6. Assessment of malnutrition | 9. Return to specified place of residence within a specific time frame |

Much has been written on multidisciplinary management of hip fracture patients elsewhere. A summary of recent systematic reviews and other useful publications is provided in **Appendix 1**.

SECONDARY FRACTURE PREVENTION REGISTRIES

Several other registries exist which relate specifically to secondary fracture prevention, including the UK Fracture Liaison Service (FLS) Database⁴⁷ and the American Orthopaedic Association Own the Bone® programme⁴⁸. The work of these registries is summarised in the FFN Clinical Toolkit in the section on *Clinical Pillar III: Reliable delivery of secondary fracture prevention after every fragility fracture*⁴⁹. Furthermore, one pillar of the IOF Capture the Fracture® Partnership is creation of a global Fracture Liaison Service (FLS) database comparative tool which will help hospitals to develop quality improvement plans, facilitate the management of the patient pathways, and achieve sustainable FLS⁵⁰.

Table 2 provides links to clinical guidelines and standards, quality indicators and hip fracture registries in Asia Pacific, Europe, Latin America and North America. Some registries are well-established while others currently have comparatively low levels of participation. A first step for colleagues who are keen to establish a registry in their country would be to review some of the resources and publications linked in **Table 2**. In 2016, the Australian Commission on Safety and Quality in Health Care published an economic evaluation of five clinical quality registries for prostate cancer, trauma, intensive care, dialysis and transplantation, and joint replacement⁵¹. Two of the registries operated at the state level, one was national and two were joint Australian and New Zealand registries. Economic value was based upon measurement of a range of condition-specific process and outcome measures. Extrapolation of the findings for each registry enabled estimation of the indicative potential benefit that could be achieved with full national coverage. The extrapolated benefit to cost ratios varied from 4:1 to 12:1.

Key conclusions included:

- Registries improve the value of healthcare delivery at a relatively low cost, when adequately funded and operated effectively.
- Comparatively small financial investments in registries are likely to be highly cost-effective.
- Provision of timely and reliable feedback to clinical teams, and involvement of health system managers and payers enhances impact.

To put into context the central and local costs for nationwide hip fracture registry participation, estimates from the UK National Hip Fracture Database (NHFD) are informative¹⁹:

- The NHFD Implementation Group was originally comprised of seven members (Clinical Leads for geriatric medicine and orthopaedics, three project coordinators and two information technologists).
- When NHFD supported 200 clinical teams reporting on 60,000 cases per year, the central salary cost per case was approximately £5 per case (US\$6.70).
- The local cost per case - based upon a fully trained nurse spending one hour per case documenting provision of care into the NHFD - was £32 per case (US\$42.99).
- The combined central and local costs of audit approximated to 0.5% of the cost of a hip fracture.
- As noted by Currie in 2018¹⁹:

"Audit provides information with the potential to deliver care that is both better and cheaper, which translates into a brief but effective formulation: 'If you think information's expensive, try ignorance.' In truth, for hip fracture care supported by effective audit, cost and quality are not in conflict. This is in marked contrast to a more frequent approach from clinicians to providers and government departments: 'If you want better care, we need more money.'"

THE IMPORTANCE OF RELIABLE DATA COLLECTION

The importance of identifying an individual within a hospital team with appropriate training and capacity to reliably enter data into a registry cannot be understated. Ideally, a permanent non-rotating staff member would be appointed to this position.

Table 2. Clinical guidelines, standards, indicators and registries by regions and country/countries

REGION AND COUNTRIES	CLINICAL GUIDELINES	CLINICAL STANDARDS	QUALITY INDICATORS	HIP FRACTURE REGISTRY
ASIA PACIFIC				
Australia and New Zealand	Australian and New Zealand Hip Fracture Registry Steering Group. 2014. Link . ⁴³	Australian Commission on Safety and Quality in Health Care, Health Quality & Safety Commission New Zealand. 2016. Link . ⁴⁵	Australian Commission on Safety and Quality in Health Care, Health Quality & Safety Commission New Zealand. 2016. Link . ⁴⁵	Website: Link . ³ Reports, presentations and publications: Link . ³² Participating hospitals: 94
Japan	Japanese Orthopaedic Association Clinical guideline for hip fractures 3 rd edition. 2021. In press. ⁵³	(For secondary fracture prevention) Clinical Standard for Fracture Liaison Services in Japan. 2020. Link (in English). ⁵⁴	Not currently available	Publication: Link (in English). ⁴ Participating hospitals: 20
South Korea	In 2020, the Korean Academy of Rehabilitation Medicine and Korean Academy of Geriatric Rehabilitation Medicine prepared <i>The Clinical Guideline for Rehabilitation in Patients with Hip Fracture</i> . Link (in Korean). ⁵⁵ An English language version will be published during 2021.	Not currently available	Not currently available	Clinical Research Information Service record of Nationwide Hip Fracture Registry Cohort Study KCT0002042: Link (in English). ⁵⁶ Publication: Link (in English). ⁵ Participating hospitals: 16
EUROPE				
Austria, Germany and Switzerland	Patient treatment is performed in certified departments of orthogeriatric surgery (AltersTraumaZentrum DGU®), assuring standardised interdisciplinary treatment based on specific guidelines described in a predetermined criteria catalogue established by the German Trauma Society (DGU). Link (to publication in German). ⁵⁷ Each department has to complete specific audits every three years.	Geriatric Trauma Working Party, a subgroup of the German Trauma Society. 2014. Link (to publication in English). ⁵⁸ This includes involvement of a geriatrician at least twice a week and daily physiotherapy.	Publications: <ul style="list-style-type: none"> Geriatric trauma registry (AltersTraumaRegister DGU®). Results of the pilot phase. Link (to publication in German).⁵⁹ The geriatric trauma register of the DGU-current status, methods and publication guidelines. Link (to publication in German).⁶⁰ Effect of time-to-surgery on in-house mortality during orthogeriatric treatment following hip fracture. Link (to publication in English).⁵ 	Website: Link (in German). ⁶¹ Participating hospitals: 108
Denmark	National guidelines from 1999 to 2008 published by the societies for orthopaedics, nursing and physiotherapy. Link (to publication in Danish). ⁶² These guidelines have been superseded by local guidelines for the five Danish public hospital regions.	National Standards are set by the Danish Multidisciplinary Hip Fracture Registry Steering Group. Currently, there are 17 indicators e.g. mortality, reoperations, time to ward and operation. Link (to publication in Danish). ⁶³	Danish Multidisciplinary Hip Fracture Registry Steering Group. 2004. Link (to publication in English). ²	Website: Link (in Danish). ⁶⁴ Participating hospitals: 22

REGION AND COUNTRIES	CLINICAL GUIDELINES	CLINICAL STANDARDS	QUALITY INDICATORS	HIP FRACTURE REGISTRY
England, Wales and Northern Ireland	From 2007-2011, the British Orthopaedic Association (BOA) – British Geriatrics Society (BGS) Blue Book (Link) ⁶⁵ , and thereafter the UK National Institute for Health and Care Excellence (NICE) Clinical Guideline 124 (Link). ⁶⁶	From 2007-2012, the six clinical standards advocated in the BOA-BGS Blue Book (Link) ⁶⁵ , and thereafter the UK NICE Quality Standard 16 (Link). ⁶⁷	UK NICE Quality Standard 16 (Link). ⁶⁷	Website: Link . ⁶⁸ 2020 Report: Link . ⁶⁹ Videos: 10 Year Anniversary of the NHFD Meeting (Link). ⁷⁰ Publications: There are many publications relating to the NHFD. Recent examples include: - Discharge after hip fracture surgery by mobilisation timing (Link). ⁷¹ - The findings of a surgical hip fracture trial were generalizable to the UK national hip fracture database. (Link). ⁷² Participating hospitals: 174
Finland	Working group appointed by the Finnish Medical Society Duodecim and the Finnish Orthopaedic Association. 2017. Link (in Finnish). ⁷³	Not currently available	Hip Fracture Database of the PERFECT (PERformance, Effectiveness, and Costs of Treatment episodes) project. 1999-2007. Link (to publication in English). ⁷⁴ The authors note “It would be ... interesting to extend the current monitoring system to a more comprehensive quality register containing also additional clinical data in the same way as the RIKSHÖFT ⁷⁵ quality register for hip fracture treatment in Sweden.”	Website: Link (in Finnish). ⁸ Publication: Link (in English). ⁷⁶ Participating hospitals: 32
Ireland	From 2013-2017, the British Orthopaedic Association (BOA) – British Geriatrics Society (BGS) Blue Book (Link) ⁶⁵ , and thereafter the Irish Hip Fracture Standards (Link). ⁷⁷	Irish Hip Fracture Database Governance Committee. 2018. Link . ⁷⁷	Irish Hip Fracture Database Governance Committee. 2018. Link . ⁷⁷ National Healthcare Quality Reporting System Reports Link . ⁷⁸	Website: Link . ⁷⁹ 2019 Report: Link . ⁸⁰ Participating hospitals: 16
Italy	The clinical standards were informed by clinical guidelines from the Association of Anaesthetists of Great Britain and Ireland (Link) ⁸¹ , BOA-BGS (Link) ⁶⁵ , UK NICE (Link) ⁶⁶ (and archived guidelines from Australia and Scotland).	Gruppo Italiano di OrtoGeriatría (GIOG) supported by Società Italiana di Gerontologia e Geriatria (SIGG), and Associazione Italiana Psicogeriatría (AIP). 2014. Link (to publication in English). ⁸²	GIOG supported by SIGG, AIP and Società Italiana Geriatria Ospedale e Territorio (SIGOT). 2020. Link (to publication in English). ¹⁰	Publication: Link (in English). ¹⁰ Participating hospitals: 14
Netherlands	The Dutch Surgical Association (NVVH) and Dutch Orthopaedic Association (NOV): Guideline for Proximal Femoral Fractures, last updated in 2016. Link (in Dutch). ⁸³	The Dutch Surgical Association (NVVH) and Dutch Orthopaedic Association (NOV): Guideline for Proximal Femoral Fractures, last updated in 2016. Link (in Dutch). ⁸³	Three sets of quality indicators: 1. Healthcare insight in the Netherlands: participation in registry and functional outcomes at three months. Link (in Dutch). ⁸⁴ 2. Health and Youth Care Inspectorate (IGJ) containing reoperation within 60 days, functional outcomes at 3 months. Link (in Dutch). ⁸⁵ 3. Dutch Institute for Clinical Auditing. Internal hospital feedback on time in ER, time to OR, hospital stay, geriatric involvement, osteoporosis management, complications and mortality. Link (in Dutch). ⁸⁶	Website: Link (in Dutch). ⁸⁷ 2019 Report: Link (in Dutch). ⁸⁸ Publication: Link . ¹¹ Participating hospitals: 67

REGION AND COUNTRIES	CLINICAL GUIDELINES	CLINICAL STANDARDS	QUALITY INDICATORS	HIP FRACTURE REGISTRY
Norway	Norwegian Orthopaedic Association, Norwegian Geriatric Society, Norwegian Anaesthesiological Society. 2018. Link (in Norwegian). ⁸⁹ Internationally adapted version as a publication in English. 2019. Link . ⁹⁰	The Norwegian Hip Fracture Register (NHFR) advocates the following clinical standards: Surgery within 24 hours / 48 hours after fracture Treatment of displaced femoral neck fractures with arthroplasty in patients >70 years of age Use of cemented femoral stems in patients >70 years of age Link (in Norwegian). ⁹¹	Norwegian Health Directorate: 30-day mortality, 30-day readmission, surgery within 24 and 48 hours. Link (in English). ⁹² The NHFR: 30-day mortality, 1-year reoperation rate, surgery within 24 and 48 hours, use of arthroplasty for femoral neck fractures, use of cemented femoral stems. Link (in English). ⁹³	Website: Link (in English). ⁹³ Publication: Link (in English). ⁹⁴ Participating hospitals: 43
Scotland	The Scottish Standards of Care for Hip Fracture Patients have superseded the archived SIGN 111 Guidelines.	Scottish Standards of Care for Hip Fracture Patients. 2020. Link . ⁹⁵	Scottish Standards of Care for Hip Fracture Patients. 2020. Link . ⁹⁵	Website: Link . ¹³ Publication: Link . ⁹⁶ Participating centres: 19
Spain	Spanish Society of Geriatrics and Gerontology and the Spanish Society of Orthopaedic Surgery and Traumatology (SEGG and SECOT). 2007. Link (in Spanish). ⁹⁷ Spanish Association of Osteoporotic Fractures (SEFRAOS - <i>Libro Azul de la Fractura Osteoporótica en España</i>). 2012. (in Spanish and archived). ⁹⁸	Spanish National Registry of Hip Fracture (SNHFR) quality indicators and standards. 2019. Link (in English and Spanish). ⁹⁹	SNHFR quality indicators and standards. 2019. Link (in English and Spanish). ⁹⁹	Website: Link (in Spanish). ¹⁰⁰ Reports: Link (in English, 2018) and Link (in Spanish, 2019). ^{101, 102} Publication: Link (in English). ¹⁴ Videos: Link (in Spanish). ¹⁰³ Participating hospitals: 80
Sweden	In 2003, the National Board Health and Welfare published clinical guidelines including type of surgery, pain relief, pressure ulcer prevention similar to the UK Blue Book. ⁶⁵ In 2008, agreement was reached in a RIKSHÖFT consensus meeting of orthopaedic surgeons on time to surgery. More than 80% of hip fracture patients should be operated on within 24 hours.	The 21 Swedish regions decide on clinical standards for each region, but recommendations commonly include: <ul style="list-style-type: none"> • Surgery within 24 hours • Treatment of displaced femoral neck fractures with hemi arthroplasty in patients >60-70 years • Use of cemented femoral stems • Fracture Liaison Services to prevent new fractures • Multi professional teams 	Follow up after 4 months: Return to place of origin, pain, complications, reoperations, walking ability and walking aids.	Website: Link (in Swedish) ²⁵ and Link (in English). ¹⁰⁴ Publications: Link (in Swedish) ¹⁰⁵ , Link (in English) ¹⁰⁶ and Link (in English). ¹⁰⁷ Participating hospitals: 45
LATIN AMERICA				
Mexico	Health Secretary: <ul style="list-style-type: none"> • Intracapsular fractures (in Spanish). 2009.¹⁰⁸ • Osteoporosis (in Spanish). 2009.¹⁰⁹ • Trans-trochanteric fractures. 2010. Link (in Spanish).¹¹⁰ • Displaced femoral neck fractures (in Spanish). 2012.¹¹¹ • Nursing interventions (in Spanish). 2013.¹¹² Mexican Social Security Institute IMSS: <ul style="list-style-type: none"> • Comprehensive Medical Management (in Spanish). 2014.¹¹³ 	In development. Link (to publication in English/Spanish). ¹¹⁴	In development. Link (to publication in English/Spanish). ¹¹⁴	Publication: Link (in English n.b. Vol. 6 No. 1 2020 pp1-9). ¹¹⁵ Participating hospitals: 7

REGION AND COUNTRIES	CLINICAL GUIDELINES	CLINICAL STANDARDS	QUALITY INDICATORS	HIP FRACTURE REGISTRY
NORTH AMERICA				
United States of America	American Academy of Orthopaedic Surgeons. 2014. Link.¹¹⁶	American Academy of Orthopaedic Surgeons. Appropriate Use Criteria: <ul style="list-style-type: none"> • Acute treatment. 2015. Link.¹¹⁷ • Postoperative rehabilitation. 2015. Link.¹¹⁸ 	American Academy of Orthopaedic Surgeons. Timing of Surgical Intervention. 2018. Link.¹¹⁹	Website: Link.¹²⁰ Publication: Link.¹⁷ Participating hospitals: >500



PRACTICAL ASPECTS OF ESTABLISHING A REGISTRY

This section of the Toolbox provides the reader with a distillation of the global experience to date of establishing the registries featured in *Table 2*. Key lessons learned are presented in a generic format. Detailed descriptions of the development and outcomes to date of registries in Australia and New Zealand, Spain and the United Kingdom are provided as supplementary reading in *Appendices 2-4*.

APFFA is developing a series of recorded interviews to share experience from colleagues who have established Hip Fracture Registries in their countries. These interviews provide insights on the practical aspects of establishing a registry that follow and can be accessed through the [APFFA YouTube Channel](#).



CLINICAL LEADERSHIP AND ENGAGEMENT

Clinical leadership and engagement are pre-requisites to establish a successful registry. The initial steps towards registry development often mirror the approach advocated by international organisations in the development of Orthogeriatrics Services or Fracture Liaison Services. Clinical champions with leadership skills and a willingness to make a personal commitment to lay the foundations for registry development are critical. The Fragility Fracture Network (FFN) [Hip Fracture Audit Special Interest Group](#) (HFA SIG)¹²¹ and the FFN Regionalisation Committee¹²² provide networking opportunities for National Registry Champions to share experiences and learn from each other.

A common first step for the Registry Champion(s) is to convene a meeting of well-connected colleagues who are members of the relevant national professional organisations and non-governmental organisations. This will likely include national and, in some countries, regional organisations for geriatric and/or internal medicine, orthopaedic surgery, osteoporosis and metabolic bone disease, nursing, physiotherapy and rehabilitation. Ideally, these colleagues would be appointed by their respective organisations to speak on their behalf at the initial registry scoping and planning meeting. However, that may not be realistic until a set of initial steps towards registry development has been agreed. If this is the case, it is critical that the initial meeting participants ensure that the parent mainstream organisations are fully apprised of developments from the outset. This could include briefing the President of their organisation and reporting regularly (as an invited guest) to the Board or Council. In countries which have government agencies or departments within health ministries with responsibility for quality and safety in provision of healthcare, early engagement with such agencies could prove beneficial.

Outcomes of the first meeting could include:

- Establishment of a National Hip Fracture Registry Steering Group, whereby the individuals who attended the meeting seek approval from the governing bodies of their respective organisations to be designated as an official representative on the Steering Group.
- Learning from the experience of established registries within a country is desirable:
 - Establish a sub-committee to review the clinical guidelines and standards, quality indicators and hip fracture registries linked to in *Table 2*.
 - Explore opportunities to invite a member of the Steering Group/Board of a well-established, high-performing registry to serve as a mentor and advisory member of the Steering Group (e.g. a member of the Steering Group of a National Joint Registry or National Myocardial Infarction Registry).

- A review of national clinical practice guidelines relating to the acute care, rehabilitation and secondary prevention of hip fractures, to determine:
 - Do the guidelines need to be updated? If so, in order for the updated guidelines to be endorsed by national guidelines accreditation agencies and healthcare professional organisations, must a specific methodology be adhered to?
 - Are the current or updated guidelines amenable to derivation of clinical standards and quality indicators?
- Identification and engagement with clinicians in hospitals that have undertaken intermittent or ongoing audit of their provision of hip fracture care.
- Identify suitably skilled individuals to establish working groups focused on the following issues:
 - Funding
 - Information technology platform
 - Minimum dataset
 - Ethics and governance
 - Consumer advocacy and feedback

An outline of potential agenda items for the first three registry meetings is provided in **Appendix 5**.

The section of the Toolbox on establishing a registry pilot and increasing participation considers approaches to engage multidisciplinary teams in hospitals throughout a country.

CONSOLIDATING AND BROADENING STAKEHOLDER BUY-IN

A tried and tested approach to consolidating stakeholder buy-in at the level of national professional organisations and non-governmental organisations is to draft a multi-party Memorandum of Understanding (MoU). The MoU between the British Geriatrics Society and British Orthopaedic Association laid the foundations for development of the UK NHFD. A similar approach supported development of the Australian and New Zealand Hip Fracture Registry (ANZHFR). **Appendix 6** provides the text of the *Intention to Collaborate for Improved Care of Older People with a Hip Fracture* signed by the Presidents of 13 organisations in 2017.

Key steps in the development of a MoU include:

- Ensuring that the President and Board/Council of all relevant organisations are fully apprised of the aims, objectives and operations of the National Hip Fracture Registry Steering Group from the outset.
- Highlight that well-established national registries established MoUs early in their development.
- Inform the leadership of all potential signatory organisations that a MoU will be developed and subjected to a consultation exercise to achieve consensus on wording.

- “Future proof” the MoU by including a clause which describes how additional organisations may be added to the MoU in the future.
- When the MoU has been signed, all signatory organisations to issue jointly agreed communications to highlight their commitment and support of the registry.
- Tailor communications for all potential funders, relevant government departments and national quality and safety in healthcare agencies upon signing of the MoU to encourage their support for the registry.

BUILDING THE CASE FOR CHANGE

As illustrated in *Table 1*, the burden imposed by hip fractures in Asia Pacific is currently enormous and is set to grow substantially in the coming decades. Faced with the rapidly escalating incidence and costs associated with hip fractures, hip fracture registries will serve as an essential tool for clinicians, hospital administrators, healthcare systems and governments in Asia Pacific, and the rest of the world, to underpin quality improvement initiatives.

The case for change could be articulated using the *why, how, what* approach:

Why establish a national hip fracture registry?

- Hip fracture is a high-volume activity.
- Hip fracture is a high-cost activity with costs to the person and the health system.
- There is a strong evidence base to support the benefits of high-quality care, from the perspective of patients, healthcare professionals and health systems.
- The evidence base lends itself to measurable process and outcome indicators.
- The quality of acute care, rehabilitation and secondary fracture prevention is highly variable within countries and between countries.
- A national hip fracture registry enables:
 - Hospitals to benchmark the care that they provide against quality standards and so underpin national quality improvement initiatives.
 - Payers to monitor how investment in quality improvement initiatives leads to better outcomes for patients and more effective use of healthcare resources.

How can a national hip fracture registry be established?

- Identify national clinical leaders willing and able to take people on a journey.
- Establish a National Hip Fracture Registry Steering Group with an appropriate governance structure.

- Learn from the experience of hip fracture registries established in other countries and well-established registries for other conditions within the particular country.
- Promote a simultaneous bottom-up and top-down approach to registry development and participation:
 - Bottom-up: Encourage enthusiastic clinicians to establish multidisciplinary teams in their institutions and begin to undertake local benchmarking of care (early adopters).
 - Top-down: Engage national professional organisations and non-governmental organisations to advocate to their membership and policymakers for improvement in the acute care, rehabilitation and secondary fracture prevention of individuals who sustain hip fractures.

What specific tasks need to be undertaken to establish a registry?

- Identify a potential source of funding, which could be biomedical industry partners, philanthropic foundations, research bodies and/or government agencies.
- Adopt existing clinical guidelines, clinical standards and quality indicators from a well-established registry in another country, then adapt them in due course to suit the needs of your country.
- Develop a minimum common dataset (MCD). The FFN MCD should be the starting point so as to facilitate international benchmarking over time (available from this [link](#)).
- Identify a technology platform to enable data collection.
- Consider ethics requirements.
- Establish a Hip Fracture Registry Implementation Group, which will include clinical lead(s), a webmaster, and a registry coordinator(s).

Fragility Fracture Network Policy Resources

In 2020, the Fragility Fracture Network (FFN) published a [Policy Toolkit](#)¹²³ which contains guidance, tools and case studies relating to implementation of the three “Clinical Pillars” of the Global Call to Action on Fragility Fractures⁴, namely, acute hip fracture care, rehabilitation and secondary fracture prevention, and a fourth pillar relating to formation of national alliances to persuade politicians and promote best practice among colleagues. The Policy Toolkit is recommended reading for members of a new National Hip Fracture Registry Steering Group. Case Study 2 relates to the establishment of the UK NHFD.

REGISTRY PLANNING AND FUNDING

The AHRO's [Registries for Evaluating Patient Outcomes: A User's Guide: 4th Edition²](#) includes a comprehensive section on planning and funding a registry. See Chapter 2 (pages 27-59) which describes the following themes:

- Introduction
- Steps in Planning a Registry
- Anticipating and Preparing for Change
- Special Considerations
- Resources for Registries
- Summary
- Case Examples

Registry planning

Appendix 5 provides potential agenda items to be included in the first three meetings of a newly formed National Hip Fracture Registry Steering Group. As proposed for the second meeting of the Steering Group, a key output could be a SWOT Analysis (i.e. Strengths, Weaknesses, Opportunities, Threats) informed by feedback on the various tasks completed since the first meeting, in combination with consideration of the list of facilitators and barriers below. The SWOT analysis can inform next steps in the development of the registry.



FACILITATORS

Mentorship and previous experience

- Leaders of the registries described in *Table 2* could provide mentorship to support new registry development. These leaders can advise Steering Groups of new registries what stimulated them to invest in a registry in their respective countries. Many of these leaders be members of the [FFN Hip Fracture Audit Special Interest Group](#), a group which could also be approached to provide mentorship opportunities and advice.
- National orthopaedic associations often have experience of managing registries on account of their involvement in national joint registries.
- Experience of running national registries in disease areas other than fragility fractures is present in many countries, a common example being cardiovascular disease and cancer registries. The UK NHFD Steering Group benefitted from advice during the early years of establishment of NHFD from a colleague with great experience from the previously established Myocardial Ischaemia National Audit Project (MINAP)¹²⁴. Lessons could be learned from colleagues with similar experience elsewhere.

Government-related

- Long term government support for a registry is desirable but not always the most likely source of seed funding to get a registry started. However, being aware of government priorities and strategic plans is important when building the case for funding.
- Governments in Australia¹²⁵, New Zealand¹²⁶ and countries in other regions have funded hip fracture registries, setting a precedent for policymakers in countries without a registry to provide long-term funding.
- In Thailand, the Ministry of Public Health has mandated that all hospitals must implement a FLS for hip fracture patients¹²⁷, so a registry will be required to measure adherence with this mandate.
- Registries can play a role in government initiatives to manage a rapidly ageing population.
- Registries can support government efforts to promote equitable provision of care and access to care.
- On 14th December 2020, the United Nations General Assembly declared 2021-2030 the Decade of Healthy Ageing¹²⁸, to which a component of a government's national response could be improvement of acute hip fracture care, rehabilitation and secondary fracture prevention.
- Registries could support work streams of regional intergovernmental work groups e.g. APEC Health Working Group (Strategic Plan 2021-2025, Objective 3: Supporting healthy populations across the life-course, including the prevention and control of non-communicable diseases, including mental health, and promoting healthy aging)¹²⁹ and ASEAN Health Cluster Work Programmes (Cluster 3: Strengthening Health Systems and Access to Care)¹³⁰.

Healthcare professional-related

- The Global Call to Action on Fragility Fractures⁴ published in 2018 was endorsed by global, regional and national organisations for geriatrics, orthopaedics, osteoporosis, nursing, rehabilitation and rheumatology. This included all the regional organisations for Asia Pacific and the majority in China, India and Japan. Since publication, organisations from many countries and regions have added their endorsement, including Australia, Korea, Malaysia, Myanmar, Nepal, New Zealand, Philippines, Taiwan and Thailand.
- The Asia Pacific Fragility Fracture Alliance (APFFA) is comprised of the following seven regional and global organisations: Asian Federation of Osteoporosis Societies (AFOS), Asia-Oceania Society of Physical and Rehabilitation Medicine (AOSPRM), Asia Pacific Geriatric Medicine Network (APGMN), Asia Pacific Orthopaedic Association (APOA), Fragility Fracture Network (FFN), International Osteoporosis Foundation (IOF) and International Society for Clinical Densitometry (ISCD). This Toolbox is a collaboration between the [APFFA Hip Fracture Registry Working Group](#) and the [FFN Hip Fracture Audit Special Interest Group](#).
- National alliances of professional organisations and national FFNs have been established or will imminently be established in many countries which can advocate for registry development with one voice to policymakers.
- National, regional and global organisations hold regular conferences which provide an opportunity to show case registry development and promote universal participation in national registries.
- The research potential of registries will attract interest from academic clinicians, including the potential for international comparisons.

Data-related

- The APFFA Hip Fracture Registry Working Group recommends the FFN Minimum Common Dataset (MCD) which is available from this [link](#).
- However, where resources are very limited or non-existent, then starting small and collecting a few variables is encouraged. The selection might include a simple number count of hip fractures plus a few variables that reflect quality of care – use of nerve blocks to manage pain, time to surgery, early mobilisation and length of stay.
- Explore potential for core variables to be retrieved directly from hospital patient administration systems without double data entry.

Cost-related

- As stated in the British Orthopaedic Association – British Geriatrics Society Blue Book, “*Looking after hip fracture patients well is a lot cheaper than looking after them badly*”⁶⁵.



- The cost of operating and entering data into a national hip fracture registry is low. In the UK, the central cost per case for operating the UK NHFD is estimated to be GBP 5 per case (US\$6.70) and the cost of data entry in hospitals is GBP 32 per case (US\$42.99)¹⁹. As noted by Dr. Colin Currie in the review on hip fracture audit, *“If you think information’s expensive, try ignorance”*¹⁹.
- Better and cheaper care is attractive to payers, whether in the public or private sector.

BARRIERS

Healthcare professional-related

- There is a paucity of geriatricians in many countries.
- Consensus on the need for registries among professional organisations may be lacking in some countries.

Approval-related

- The complexity of ethics approvals will vary within and between countries.
- Opt-out approval is recommended for inclusivity and to ensure a registry is truly representative of the hip fracture population. However, some countries are likely to require an opt-in approach with informed consent.
- Attitudes to disclosure of hospital performance by administrators and governments may vary between countries, and between the public and private sectors.

Data-related

- Widely endorsed national clinical standards for hip fracture care and secondary prevention are available in a minority of countries.
- Variable standards of data entry.
- Capturing data on people who have limited access or no access to healthcare.
- Capture of acute care data is comparatively easy versus capture of long-term follow-up data.

Cost-related

- Identification of initial funds to support central registry personnel.
- Hospital administrators may be unwilling to fund their personnel to enter data into the registry.
- Making the registry sustainable in the long-term.

Others

- Scalability may be a challenge in the most populous countries.

Registry funding

Appendices 2-4 describe how the registries in Australia and New Zealand, Spain and the UK received funding from the outset. In summary:

- **Australia and New Zealand:**
 - **2012-2015:** ANZHFR Steering Group was a recipient of a Bupa Health Foundation Award¹³¹.
 - **2015:** Grants from Osteoporosis New Zealand and the New Zealand Health Quality and Safety Commission.
 - **2016-present day:** The Accident Compensation Corporation (the “Crown Entity” responsible for injury prevention in New Zealand) allocated core funding for 2016-2018 and has provided ongoing funding since.
 - **2017:** An unrestricted grant was provided by Amgen Australia.
 - **2018-2020:** Funding from the Australian Government.
 - **2021:** ANZHFR receives ongoing funding from the Australian Government Department of Health, New Zealand Accident Compensation Corporation, NSW Health Agency for Clinical Innovation, SA Health, WA Health and Queensland Health, and receives in-kind support from Neuroscience Research Australia, UNSW Sydney and the New Zealand Orthopaedic Association.
- **Spain:** Since 2016, the Spanish National Hip Fracture Registry has received funding from AMGEN SA, UCB Pharma, Abbott Laboratories and FAES Farma, as well as a research grant awarded by the Fundación Mutua Madrileña.

- **UK:**
 - **2007-2009:** Early funding by the Association of the British Pharmaceutical Industry (ABPI)¹³² and Association of British Healthcare Industries (ABHI)¹³³ - the professional bodies of the pharmaceutical and devices industries respectively - and a substantial grant from the Department of Health.
 - **2009-2012:** The Health Quality Improvement Partnership (HQIP)¹³⁴ - an independent organisation led by the Academy of Medical Royal Colleges¹³⁵, The Royal College of Nursing¹³⁶ and National Voices – funded central costs over three years.
 - **2012-present day:** Integrated into the Falls and Fragility Fracture Audit Programme¹³⁷, under the auspices of HQIP, managed by the Royal College of Physicians¹³⁸.

The take home message based on this experience is that leaders of new registries need to think creatively and seek funding from diverse sources as opportunities arise.

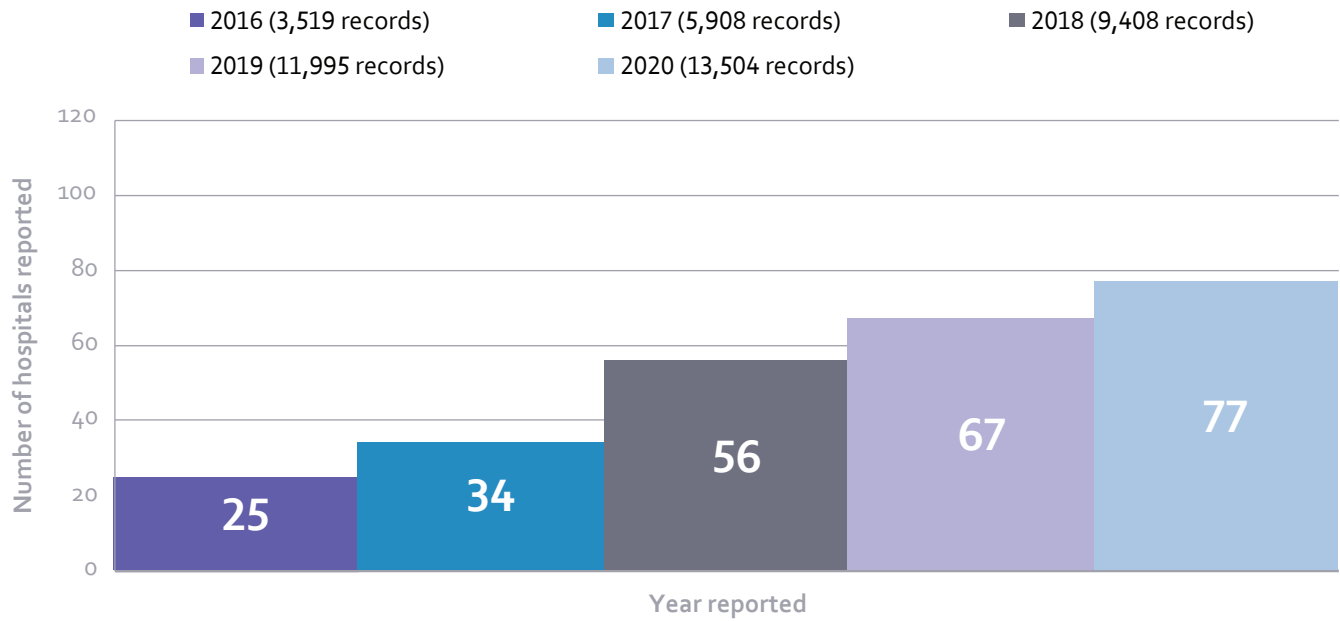
A REGISTRY PILOT AND INCREASING PARTICIPATION

A common theme in registry development is that during the early days participation is low. As illustrated in *Figure 3*, the number of hospitals participating in the ANZ Hip Fracture Registry tripled during the period 2016-2020. Indeed, the UK NHFD, which has documented the care of more than 650,000 patients from 2007-2020, was preceded by a handful of hospitals in England, Wales and Northern Ireland that had been auditing hip fracture care locally for years prior to establishment of the national registry. Accordingly, readers in countries in which no local hip fracture audit has been undertaken to date could start collecting information on hip fracture care in their institution and seek out likeminded enthusiasts through regional and national professional organisation meetings to work towards establishing a national registry pilot.

In 2020, the Fragility Fracture Network (FFN) published a [Clinical Toolkit](#)⁴⁹ which described a stepwise approach to implementation of the three so-called clinical pillars of the Global Call to Action on Fragility Fractures¹. The first pillar relates to multidisciplinary co-management of the acute fracture episode. It is suggested that a multidisciplinary hospital team identifies an existing clinical standard for hip fracture care as a benchmark for the care their unit provides (n.b. this could be any of the clinical standards linked in *Table 2*). Further, it is proposed that benchmarking be undertaken against some or all of the quality statements within the chosen clinical standard. A subsequent short-term local audit would enable prioritisation of specific aspects of care in a three to six-month pilot quality improvement project. During the pilot project, data collection could be done with a template based on the FFN MDS MS Excel spreadsheet that can be downloaded from this [link](#). The stepwise approach goes on to propose how the pilot program could be expanded and ultimately established as a sustainable long-term service.

Figure 3. Number of hospitals and cases reported in the ANZ Hip Fracture Registry 2016-2020¹³⁹

NUMBER OF HOSPITALS AND CASES



Detailed descriptions of approaches to increase registry participation are included in the case studies in *Appendices 2-4*. These include:

- Facilities Level Audits: These document what services, resources, policies, protocols and practices exist in hospitals across a city/region/country in relation to hip fracture care. The 2020 Australian and New Zealand Hip Fracture Registry Facilities Level Audit is included in *Appendix 7*.
- Website
- Newsletters
- Regional meetings

GOVERNANCE AND ETHICS

Governance

The [AHRO's Registries for Evaluating Patient Outcomes: A User's Guide: 4th Edition²](#) includes a comprehensive section on registry governance arrangements (see Chapter 9, pages 258-272).

As proposed in the sections on clinical leadership and engagement, consolidating and broadening stakeholder buy-in, and *Appendices 2-4* on the Australian and New Zealand, Spanish and UK national registries, from the outset, an objective should be to have a National Hip Fracture Registry Steering Group comprised of individuals who represent all relevant professional and non-governmental organisations. While this may not be possible in the early Steering Group meetings, achieving this objective within the first six to twelve months should be a priority.

Reflecting on the governance structure of the UK NHFD in 2010 – three years after the launch of the registry – provides insight on how the governance of a new registry may evolve¹⁴⁰:

- *"NHFD is overseen by a large and broadly-based **Steering Group** representing the core clinical specialties and other relevant professionals, and including also representation from a patient group.*
- *A smaller **Implementation Group**, based in the British Geriatrics Society headquarters, deals with project development, data monitoring and analysis, and the generation of reports. Recruitment and support of participating centres, and day-to-day organisational matters, are in the hands of a project manager and two project coordinators.*
- *A **Data-Set Subgroup** is responsible for the monitoring and development of the NHFD standard data set, and its recent adaptation for use with the Best Practice Tariff (BPT).*
- *A **Scientific and Publications Committee** oversees access to, and use of, NHFD data; and promotes audit-based studies and publications relating to hip fracture care and service development."*

Ethics

The complexity of ethics approvals will vary within and between countries. Commentary in annual reports on the nature of the ethics approval process for registries that are in the process of achieving universal participation include:

- **Australia and New Zealand:** *"The governance requirements for individual hospitals to participate are approval by a Human Research Ethics Committee (HREC) in the relevant jurisdiction and then site-specific governance approval at the level of the relevant health district. Whilst the ANZHFR provides administrative assistance to individual hospitals to gain the necessary approvals, limited resourcing and duplication of processes can lead to delays between sites identifying resources for data collection and submission, and the requisite approvals to contribute data to the ANZHFR."¹⁸*
- **Spain:** *"Before commencing data collection, and after defining the project, performing a literature review and publishing its founding principles, the following tasks were carried out:*
 - *The database proposed by the FFN was adapted.*
 - *The promoters of the FFN Registry were contacted, endorsement was requested from the Scientific Societies, the first hospitals were included.*
 - *Approval by the Clinical Research Ethics Committees/Medicines Research Ethics Committees (CRECs/mRECs) was requested, as well as classification by the Spanish Agency of Medicines and Medical Devices (Agencia Española de Medicamentos y Productos Sanitarios or AEMPS), support from the Ministry of Health (General Subdirectorate for Health Planning), and registration with the Spanish Data Protection Agency (Agencia Española de Protección de Datos).*

- *The project was integrated into a Research Institute, which acts as a coordinating centre (Instituto de Investigación Sanitaria del Hospital Universitario La Paz, IdiPAZ).*
- *From then on, the continuous collection of data in the participating hospitals and the analysis of the results began.”¹⁰¹*

The AHRQ’s [Registries for Evaluating Patient Outcomes: A User’s Guide: 4th Edition](#)² includes a comprehensive section on principles of registry ethics, data ownership and privacy (see Chapter 7, pages 160-220). The AHRQ User’s Guide notes the three fundamental principles identified in the Belmont Report for the ethical conduct of scientific research that involves human subjects¹⁴¹:

1. *Respect for persons* as autonomous agents (i.e., self-determination).
2. *Beneficence* (i.e., do good, do no harm, protect from harm).
3. *Justice* (i.e., fairness, equitable distribution of benefits and burdens, equal treatment).

These principles are aligned to the international guidelines for the ethical review of epidemiologic studies published by the Council for International Organizations of Medical Sciences¹⁴². The AHRQ User’s Guide provides a detailed analysis of ethical considerations – including the issue of consent - relating to registries.

MINIMUM COMMON DATA SET AND DATA DICTIONARY

It is recommended that new registries adopt the FFN MCD which is available from this [link](#). This is a tried and tested dataset that ultimately allows for international benchmarking. Each data variable must have a clearly articulated definition that is available in the data dictionary. For resource limited countries, keen to start data collection, it is possible just to select a few variables to get started. The selected variables should help build the case for change and for funding – volume, cost, mortality, etc.

SUPPORTING ACTIVITIES

Workforce development initiatives have played an important supporting role to promote widespread participation in national hip fracture registries. During the early years of the UK NHFD, the British Orthopaedic Association and British Geriatrics Society joined forces to run joint educational days for trainee surgeons and geriatricians. This effort contributed significantly towards creating a workforce of young consultant/attending orthogeriatricians and orthopaedic surgeons with an interest in fragility fractures. There are many publications in the literature which document local quality improvement initiatives and audit against the Blue Book clinical standards and, subsequently, attainment of the Best Practice Tariff financial incentive¹⁴³⁻¹⁴⁵.

Further, regional multidisciplinary meetings in Australia, New Zealand and the UK have been very popular, attracting several hundred clinicians, clinical leaders, service managers and audit staff⁴⁹. Recent “Hip Fests” (i.e. Hip Festivals) are described in **Appendix 2**, along with virtual activities intended to maintain momentum throughout the Covid-19 pandemic.

PRACTICAL RESOURCES

- A Generic Business Case [link](#) for a hospital to contribute to a national hip fracture registry:
 - Australian and New Zealand Hip Fracture Registry - <https://anzhfr.org/>
- Fragility Fracture Network resources:
 - Minimum Common Dataset– <https://www.fragilityfracturenetwork.org/what-we-do/special-interest-groups/hip-fracture-audit-sig/>
 - Global Call to Action on Fragility Fractures - [https://www.injuryjournal.com/article/S0020-1383\(18\)30325-5/fulltext](https://www.injuryjournal.com/article/S0020-1383(18)30325-5/fulltext)
 - Clinical Toolkit - <https://www.fragilityfracturenetwork.org/cta/>
 - Policy Toolkit - <https://www.fragilityfracturenetwork.org/cta/>
 - Orthogeriatrics Textbook 2nd Edition - <https://link.springer.com/book/10.1007%2F978-3-030-48126-1>
- International Osteoporosis Foundation resources:
 - Capture the Fracture® partnership website - <https://www.capturethefracture.org/>
 - IOF Compendium of Osteoporosis - <https://www.osteoporosis.foundation/sites/iofbonehealth/files/2020-01/IOF-Compendium-of-Osteoporosis-web-Vo2.pdf>
- National hip fracture registries resources:
 - Australia and New Zealand - <https://anzhfr.org/healthcare-professional-resources/>
 - Spain - <http://rnfc.es/publicaciones-rnfc>
 - UK - <https://www.nhfd.co.uk/20/hipfractureR.nsf/ResourceDisplay>
- Patient and carer resources:
 - **Australia and New Zealand:** ANZHFR “My Hip Fracture Guide”. Available in the following languages:



[Arabic](#)



[Dari](#)



[Greek](#)



[Chinese \(simplified\)](#)



[English](#)



[Hindi](#)



[Chinese \(traditional\)](#)



[Farsi](#)



[Italian](#)

KOR [Korean](#)

ARA [Punjabi](#)

TAG [Tagalog](#)

NEP [Nepalii](#)

ESP [Spanish](#)

VT [Vietnamese](#)

- **Canada:** Canadian Orthopaedic Foundation “Recovery from a hip fracture: Information for patients and care givers” - <https://whenithurtstomove.org/wp-content/uploads/HipFracture-EN.pdf>
- **UK:** NHFD “Your hip fracture: all about your hip fracture and what to expect on the road to recovery” - <https://www.nhfd.co.uk/20/hipfractureR.nsf/docs/Patients2020>
- **USA:** OrthoInfo (from the American Academy of Orthopaedic Surgeons) “Hip fractures” - <https://orthoinfo.aaos.org/en/diseases--conditions/hip-fractures>



ACKNOWLEDGEMENTS

The Hip Fracture Registry Toolbox was written by the [Asia Pacific Fragility Fracture Alliance Hip Fracture Registry Working Group](#) as a collaboration with the [Fragility Fracture Network Hip Fracture Audit Special Interest Group](#).

ASIA PACIFIC FRAGILITY FRACTURE ALLIANCE

The Asia Pacific Fragility Fracture Alliance (APFFA) is co-chaired by Dato' Dr. Joon-Kiong Lee (Orthopaedic Surgeon, Malaysia) and Professor Ding-Cheng (Derrick) Chan (Geriatrician, Taiwan), who are also the editors of this Toolbox. APFFA is comprised of seven regional and global organisations. APFFA wishes to thank the following representatives participating on behalf of their respective organisations in the APFFA Joint Steering Committee (JSC):



Asian Federation of Osteoporosis Societies

Asian Federation of Osteoporosis Societies (AFOS)

Professor Leilani Mercado-Asis
Adjunct Assistant Professor
Ang Seng Bin



Asia-Oceanian Society of Physical and Rehabilitation Medicine (AOSPRM)

Professor Reynaldo Rey-Matias
Professor Wen-Shiang Chen



Asia Pacific Geriatric Medicine Network (APGMN)

Professor Leon Flicker
Dr. Edward Leung



Asia Pacific Orthopaedic Association (APOA)

Professor David Choon
Dr. C Sankara Kumar
Chandrasekaran



Fragility Fracture Network (FFN)

Professor Jacqui Close
Dr. Hannah Seymour



International Osteoporosis Foundation (IOF)

Professor Cyrus Cooper
Dr. Philippe Halbout



International Society for Clinical Densitometry (ISCD)

Professor Robert Blank
Dr. Yanling Zhao

The “engine room” of APFFA is the three Working Groups which are co-chaired by the following JSC members:

- Hip Fracture Registry Working Group:
 - Professor Jacqui Close
 - Dr. Hannah Seymour

- Education Working Groups:
 - Professor Robert Blank
 - Professor Leilani Mercado-Asis
- Evidence Generation Working Group:
 - Dato’ Dr. Joon-Kiong Lee
 - Professor Ding-Cheng (Derrick) Chan

FRAGILITY FRACTURE NETWORK

The Fragility Fracture Network (FFN) is a global organisation, which was founded in order to create a multidisciplinary network of experts for improving treatment and secondary prevention of fragility fractures. The FFN President for 2019 to 2021 is Professor Jay Magaziner (Scientist, USA). In addition to the FFN Executive Committee, which is a sub-group of the FFN Board, the following four committees are the “engine room” of FFN activities:

- Scientific Committee
- Regionalisation Committee
- Education Committee
- Communications Committee

Within the umbrella of the Scientific Committee sit a range of Special Interest Groups (SIGs), which includes: Hip Fracture Audit, Hip Fracture Recovery Research, Perioperative Care, Physiotherapy, Vertebral Fragility Fracture and Secondary Fracture Prevention. The FFN Hip Fracture Audit (HFA) SIG is co-chaired by Dr. Emer Ahern (Geriatrician, Ireland) and Professor Matt Costa (Orthopaedic Surgeon, UK), and the membership of the FFN HFA SIG Advisory Group is documented [here](#).

REVIEW OF THE HIP FRACTURE REGISTRY TOOLBOX

We would like to thank the following colleagues who were invited to review previous drafts or components of the Toolbox. The advice received has improved the quality of the document.

Dr. Tanawat Amphansap (Bangkok, Thailand), Ms. Elizabeth Armstrong (Sydney, Australia), Professor Lauren Beaupre (Edmonton, Canada), Dr. Bruno Boietti (Buenos Aires, Argentina), Ms. Louise Brent (Dublin, Ireland), Dr. Ivan Chua (Singapore, Singapore), Mr. Stewart Fleming (Brisbane, Australia), Associate Professor Frede Frihagen (Oslo, Norway), Associate Professor Jan-Erik Gjertsen (Bergen, Norway), Professor Yong-Chan Ha (Seoul, South Korea), Dr. Roger Harris (Auckland, New Zealand), Professor Ami Hommel (Malmö, Sweden), Professor Christian Kammerlander (Munich, Germany), Professor Aysha Habib Khan (Karachi, Pakistan), Professor Unto Hakkinen (Helsinki, Finland), Mr.

Ravi Jain (Toronto, Canada), Professor Sarath Lekamwasam (Galle, Sri Lanka), Professor Jae-Young Lim (Seoul, South Korea), Dr. Roberto López-Cervantes (Zapopan, Mexico), Professor Keijo Mäkelä (Turku, Finland), Professor Rajesh Malhotra (New Delhi, India), Professor David Marsh (Monte Castello di Vibio, Italy), Professor Takashi Matsushita (Tokyo, Japan), Mr. Jayson Murray (Chicago, United States of America), Mr. Christopher Naso (Washington DC, United States of America), Dr. Carl Neuerburg (Munich, Germany), Dr. Cristina Ojeda-Thies (Madrid, Spain), Associate Professor Henrik Palm (Copenhagen, Denmark), Assistant Professor Dipendra Pandey (Kathmandu, Nepal), Professor Mikko Peltola (Tampere, Finland), Dr. Marinis Pirpiris (Melbourne, Australia), Professor Anette Hølen Ranhoff (Bergen, Norway), Associate Professor Cecilia Rogmark (Lund, Sweden), Professor Takeshi Sawaguchi (Toyama, Japan), Professor Irewin Tabu (Manila, Philippines), Professor Myint Thang (Yangon, Myanmar), Dr. Cae Tolman (Hong Kong), Professor Aasis Unnanuntana (Bangkok, Thailand), Dr. Juan Viveros-García (León, Mexico), Ms. Kirsty Ward (Glasgow, Scotland), Ms. Nicola Ward (Tauranga, New Zealand), Ms. Franka Würdemann (Leiden, The Netherlands), Dr. Noriaki Yamamoto (Niigata, Japan), Dr. Minghui Yang (Beijing, China).

SUGGESTED CITATION

Hip Fracture Registry Toolbox: A collaboration between the APFFA Hip Fracture Registry Working Group and the FFN Hip Fracture Audit Special Interest Group. Close J.C., Seymour H., Mitchell P.J., Ahern E., Costa M., Magaziner J., Lee J.K, Chan D.-C., Ang S.B., Mercado-Asis L.B., Flicker L., Leung E., Choon D., Kumar C.S.K., Rey-Matias R., Chen W.-S., Halbout P., Cooper C., Blank R., Zhao Y., on behalf of the Asia Pacific Fragility Fracture Alliance and the Fragility Fracture Network. Asia Pacific Fragility Fracture Alliance. Editors: Lee J.K and Chan D.-C. Publisher: Asia Pacific Orthopaedic Association. Kuala Lumpur. 2021. e ISBN 978-967-19711-0-9.

FUNDING

Development of this Toolbox was funded via an unrestricted grant from Amgen Asia to the Asia Pacific Fragility Fracture Alliance and its content was developed independently by the Asia Pacific Fragility Fracture Alliance and Fragility Fracture Network.

APPENDIX 1:

Multidisciplinary care of individuals who sustain hip fractures

During the last decade, implementation and evaluation of multidisciplinary programs for individuals who sustain hip fractures has been undertaken in many countries. These are often referred to as orthogeriatric co-management programs. The cumulative numbers of citations in Google Scholar for the keyword 'orthogeriatrics' for the periods 1960 to 2009 and 2010 to 2019 were 657 and 3,420, respectively.

Additional recommended reading for healthcare professionals with an interest in the multidisciplinary care of individuals who sustain hip fractures includes:

- The second edition of the [orthogeriatrics textbook](#) published as Open Access in August 2020¹⁴⁶:
 - Ong and Sahota's [Chapter 5](#) on establishing an orthogeriatric service notes that there is a scarcity of geriatricians in many countries and describes a set of geriatric medicine competencies that could be acquired by other physicians, such as hospital internists or general physicians, to support the care of older patients with hip fractures.
- The Fragility Fracture Network [Clinical Toolkit](#)⁴⁹

A summary of the orthogeriatric approach follows.

THE IMPORTANCE OF THE MULTIDISCIPLINARY TEAM AND PATHWAY MAPPING

An important initial step in the development of an orthogeriatric co-management program is identification of "orthogeriatric champions", who will likely become the co-leaders of a multidisciplinary project team. Given the scarcity of geriatricians in many low- and middle-income countries (LMICs) other internal medicine doctors may provide the core geriatric competencies in perioperative medical care in lieu of a geriatrician. The composition of multidisciplinary teams may vary between hospitals and countries, but often includes orthopaedic surgeons, geriatricians, anaesthetists, osteoporosis specialist physicians (e.g. endocrinologists or rheumatologists), radiologists, clinical pharmacists, fracture liaison coordinators, orthopaedic nurses, physiotherapists, occupational therapists, dieticians, and social workers. Each of these professionals serve as champions for the program to engage colleagues within their respective departments. To ensure "patient voice", representatives of people who sustain hip fractures and their carers should be invited to input to project team meetings.

One of the first tasks for the multidisciplinary team is to map the hip fracture pathway throughout the journey from pre-hospital care to the Emergency Department, the pre-operative, operative and

post-operative phases, rehabilitation and recovery, and long-term care to prevent secondary falls and fractures. In [Chapter 5](#) of the orthogeriatrics textbook, Ong and Sahota provide an example of a pathway mapping exercise across the different phases of care, in terms of principles and what care should actually be delivered⁴⁶. In the [FFN Clinical Toolkit](#), stepwise approaches are described to drive improvement in acute care, rehabilitation and secondary fracture prevention⁴⁹.

THE ORGANISATION OF ORTHOGERIATRIC CO-MANAGEMENT PROGRAMS

The 2014 Australian and New Zealand (ANZ) Guideline for Hip Fracture Care summarised the fundamental differences between traditional models of hip fracture care and the orthogeriatric approach as follows⁴³:

- **Traditional model:**
 - A person with hip fracture is admitted to an orthopaedic or surgical ward
 - The orthopaedic team take sole responsibility for care delivery
 - There is not shared ongoing responsibility between orthopaedic surgeons and geriatricians: referrals are made to specialities other than orthopaedics on a needs basis
- **Orthogeriatric model:**
 - A shared care arrangement between the specialties of orthopaedics and geriatric medicine is established
 - The geriatrician takes a lead role in pre-operative optimisation to prepare the person for surgery and post-operative medical care, and coordinates the discharge planning process
 - This includes nutrition, hydration, pressure care, bowel and bladder management and monitoring of cognition

Rehabilitation in the inpatient setting is usually overseen by a geriatrician or a rehabilitation physician in a mixed rehabilitation unit, however, some people are transferred to a subacute facility. Several funding streams in both countries support the option for rehabilitation in the home environment.

The ANZ Guideline recommended that from admission to hospital, persons with hip fracture be offered a formal, acute orthogeriatric service that includes all of the following:

- Regular orthogeriatrician assessment
- Rapid optimisation of fitness for surgery
- Early identification of individual goals for multidisciplinary rehabilitation to recover mobility and independence, and to facilitate return to pre-fracture residence and long-term wellbeing
- Early identification of most appropriate service to deliver rehabilitation

- Continued, coordinated, orthogeriatric and multidisciplinary review and discharge planning liaison or integration with related services, including falls prevention, secondary fracture prevention, mental health, cultural services, primary care, community support services and carer support services

CLINICAL EFFECTIVENESS OF ORTHOGERIATRIC CO-MANAGEMENT PROGRAMS

As noted above, the literature on the orthogeriatric approach has expanded substantially during the last decade. Summaries of recent systematic reviews and single centre studies follow.

In 2019, Moyet et al undertook a systematic review and meta-analysis to determine the optimal model of orthogeriatric care to reduce mortality after hip fracture¹⁴⁷. Studies were classified as programs which had an orthogeriatric ward, provided geriatric advice on an orthopaedic ward or had shared care delivered by orthopaedic surgeons and geriatricians. While reduced mortality was evident for any sort of orthogeriatric model compared to usual care (odds ratio [OR] 0.85; 95% CI 0.74–0.97), the benefit was most pronounced for the studies which referred to an “orthogeriatric ward” (OR 0.62; 95% CI 0.48–0.80).

In 2020, Yoon et al undertook a systematic review to compare outcomes of orthopaedic-led care models compared to coordinated orthogeriatric care models or geriatrics-led care models¹⁴⁸. Differences between the results for the types of model were assessed using chi-squared tests, with a p-value <0.05 considered statistically significant. Individuals admitted under a coordinated orthogeriatric model or a geriatrics-led model had significant decreases in time to surgery (p=0.045), length of stay (p=0.0036) and postoperative mortality rates (p=0.0034).

In 2020, Blanco et al described outcomes for three different models of hip fracture care consecutively implemented at the University Hospital of Salamanca, Spain from 2003 to 2014¹⁴⁹:

- **Traditional Model:** Since the 1970s, the traumatology team led delivery of care and requested input from other specialists as deemed necessary
- **Geriatric Consultant Model:** From 2008 to 2013, a geriatrician was incorporated into the model and would intervene when requested by the traumatology team
- **Orthogeriatric Unit Model:** In 2013, upon unification of the two orthopaedic and trauma services within the hospital, an orthogeriatric shared care model was established

The orthogeriatric model resulted in a higher proportion of individuals undergoing surgery within 24 hours (24.8%) compared to the traditional (5.1%) or geriatric consultant models (6.7%). The orthogeriatric model was also associated with a statistically significant shorter length of stay than the other two models. While a trend towards lower in-hospital mortality was evident with transition from one model to the next, the differences were not statistically significant.

The orthogeriatric model has been successfully implemented in the Asia Pacific region. In 2019, investigators from Beijing Jishuitan Hospital¹⁵⁰ benchmarked the care provided by their multidisciplinary co-management program against the six clinical standards proposed in the British Orthopaedic Association – British Geriatrics Society Blue Book on the care of patients with fragility fractures⁶⁵. A pre-intervention, post-intervention methodology was used. Key findings included:

- 50% of the intervention group received surgery within 48 hours compared to 6.4% of the pre-intervention group (OR, 14.9; $p < 0.0001$).
- 76.4% of the intervention group received osteoporosis assessment compared to 19.2% of the pre-intervention group (OR, 13.9; $p < 0.0001$).
- 100% of the intervention group received geriatrician assessment compared to 0.3% of the pre-intervention group (OR, 664.9; $p < 0.0001$).

In 2019, Sood et al described outcomes of a geriatric hip fracture program at a military hospital in Kanpur, India¹⁵¹. A dedicated trauma coordinator was responsible for fast-tracking surgery and served as a liaison between the radiology department, an orthopaedic surgeon, a physician, an anaesthetist, an operating room matron, physiotherapists, and porting services. The mean time from injury to hospital admission was 1.7 days and from admission to surgery was 1.8 days. Surgery was done within 48 to 72 hours of injury in 88% of cases. At one year after surgery, 90% follow-up was achieved, which revealed a mortality rate of 7.7%. Ambulatory aids were required by 59% of survivors. Notably, only 5% of individuals were dependent for their activities of daily living.

In 2019, Chiu et al evaluated the impact of orthogeriatric care, comorbidity and complications on 1-year mortality after hip fracture in Taiwan¹⁵². Comparisons were made between an integrated care group, who were managed by a specialised hip fracture surgeon who acted like an orthogeriatrician with routine consultation from medical specialists, and a non-integrated care group managed by other orthopaedic surgeons in a traditional fashion. The overall 1-year mortality was 10.9% and a survival benefit was evident for the integrated care group (hazard ratio, 0.33; 95% confidence interval [CI], 0.12-0.88; $p = 0.027$).

In 2020, Lawless et al evaluated the impact of transfer between hospitals on time to surgery and subsequent mortality after hip fracture¹⁵³. Fiona Stanley Hospital (FSH) in Perth, Western Australia serves a catchment area of 870,000 km². Consequently, individuals who initially present to a regional referring hospital, where the appropriate orthopaedic or anaesthetic services are not available, are transferred to FSH for surgery. Among those who underwent surgery ($n = 506$) at FSH from November 2017 to October 2018 more than a quarter (28.6%) had initially presented to a peripheral hospital. Mortality at 30-days and 1-year were statistically significantly lower for individuals who presented directly to FSH (5.3% and 23.8%, respectively) compared to peripheral presentations (10.5% and 31.5%, respectively). Furthermore, being transferred was an independent risk factor for mortality, regardless of time to surgery.

In 2020, Laurent et al undertook a systematic review and meta-analysis to explore the association of orthogeriatric care models with the evaluation and treatment of osteoporosis¹⁵⁴. Orthogeriatric care was associated with higher odds of:

- Diagnosis of osteoporosis (OR 11.4; 95% CI, 7.26-17.77).
- Initiation of calcium and vitamin D supplements (OR 41.44; 95% CI, 7.07-242.91).
- Discharge on anti-osteoporosis medication (OR 7.06; 95% CI, 2.87-17.34).

However, there was substantial heterogeneity in these findings and a paucity of data relating to falls prevention and secondary fracture rates.

COSTS AND COST-EFFECTIVENESS OF ORTHOGERIATRIC CO-MANAGEMENT PROGRAMS

In 2017, Tan et al from Tan Tock Seng Hospital in Singapore evaluated the cost-effectiveness of their orthogeriatric model of care¹⁵⁵. The study population included individuals with hip fracture who were treated surgically (n=187) and non-surgically (n= 57). Key findings included:

- The mean cost of hospitalisation was higher for those treated surgically (S\$14,816 vs. S\$9,011; p<0.01)
- The length of stay was shorter for those treated surgically (16 [range 4-56] days vs. 19 [range 2-84] days)
- When surgery was delayed beyond 48 hours after admission, every additional day of delay increased costs by S\$576

In 2020, the investigators from Beijing Jishuitan Hospital undertook a cost-effectiveness analysis of their program¹⁵⁶. The average lifetime costs of conventional management and the multidisciplinary co-management program were US\$11,975 and US\$13,309, respectively. Modelling estimated that 1-year mortality for individuals receiving co-management was 1.7% less than conventional management (16.1% vs. 17.8%). Accordingly, the incremental cost-effectiveness ratio (ICER) was US\$78,412 for each death averted during the first year after fracture. When quality-adjusted life years were used as a measure of effectiveness, co-management conferred a benefit of 0.07 QALYs compared to conventional management (2.45 vs. 2.38 QALYs), which translates to an ICER of US\$19,437 per QALY gained. Based on a willingness to pay (WTP) threshold of US\$26,481 per QALY gained, there is a 78% likelihood that the co-management program will be cost-effective in the Chinese context.

APPENDIX 2: Australian and New Zealand Hip Fracture Registry

BUILDING A COALITION TO SUPPORT REGISTRY DEVELOPMENT

Pursuant to initial discussions at the Australian and New Zealand Society for Geriatric Medicine Annual Scientific Meeting in Auckland, New Zealand in May 2011, a preliminary meeting of representatives of stakeholder organisations from the healthcare professions and patient societies was held in Sydney, Australia in October 2011. The purpose of this meeting was to share emerging experience in Australia and New Zealand (ANZ) and learn from the UK experience of development of the UK NHFD⁶⁸. Representation and support came from:

- Australian Commission for Quality and Safety in Health Care
- Australian and New Zealand Bone and Mineral Society
- Australian and New Zealand College of Anaesthetists
- Australian and New Zealand Society for Geriatric Medicine
- Australian Orthopaedic Association
- New South Wales Agency for Clinical Innovation
- New South Wales Clinical Excellence Commission
- New Zealand Health Quality and Safety Commission
- New Zealand Ministry of Health
- Osteoporosis Australia
- Osteoporosis New Zealand

Agreed goals following on from the meeting included:

1. Establishment of a National Steering Group with endorsement from key professional organisations
2. The need to develop and endorse Australian and New Zealand Guidelines for the care of a hip fracture patient
3. The development and endorsement of nationally agreed quality standards for hip fracture care to allow for benchmarking nationally (i.e. within Australia and New Zealand) and internationally

4. The development of a minimum dataset and consistent data dictionary for interstate comparison of performance
5. The establishment of a consumer advocacy group to drive the need for a registry from a consumer perspective
6. Undertake a baseline audit of services across Australia and New Zealand
7. Pilot a minimum dataset

FUNDING THE REGISTRY

In December 2011, a funding application was made to the Bupa Health Foundation, one of the leading charitable foundations dedicated to health in Australia⁴³. In May 2012, the ANZHFR Steering Group was a recipient of a Bupa Health Foundation Award which enabled:

- Production of hip fracture clinical guidelines
- Establishing quality indicators of care
- Developing a “consumer manifesto” whereby consumers articulate their own views as to what constitutes high quality care
- Piloting patient level data collection in all States/Territories in Australia

During 2015, the initial development of the New Zealand arm of the ANZHFR was supported by grants from Osteoporosis New Zealand and the New Zealand Health Quality and Safety Commission. In the same year, the Accident Compensation Corporation (the “Crown Entity” responsible for injury prevention in New Zealand) allocated core funding to support implementation and development of the New Zealand arm of ANZHFR from 2016 to 2018. In 2017, Amgen Australia provided an unrestricted grant to support ongoing development of the registry. In 2018, the Australian Government allocated funds to build capacity of the Australian arm of the ANZHFR from 2018 to 2020. In 2021, ANZHFR receives ongoing funding from Australian Government Department of Health, New Zealand Accident Compensation Corporation, NSW Health Agency for Clinical Innovation, SA Health, WA Health and Queensland Health, and receives in-kind support from Neuroscience Research Australia, UNSW Sydney and the New Zealand Orthopaedic Association.

DEVELOPING GUIDELINES AND CLINICAL STANDARDS

The first meeting of the ANZ Hip Fracture Guideline Adaptation and Working Group was held in December 2012. Membership largely came from the existing ANZHFR Steering Group with the addition of a number of experts in a range of fields and with many members specifically representing a key professional organisation or society. The *Australian and New Zealand Guideline for Hip Fracture Care: Improving Outcomes in Hip Fracture Management of Adults* was published in September 2014, with the endorsement of the Australian National Health and Medical Research Council⁴³.

Recommendations made originated from the 2011 UK National Institute for Health and Care Excellence (NICE) clinical guideline¹⁵⁷. Using the internationally agreed ADAPTE process¹⁵⁸, the NICE guideline was modified to reflect the Australian and New Zealand context.

In 2016, the Hip Fracture Care Clinical Care Standard was launched⁴⁵, having been developed by the Australian Commission on Safety and Quality in Health Care in partnership with the New Zealand Health Quality and Safety Commission. The following quality statements were included:

1. A patient presenting to hospital with a suspected hip fracture receives care guided by timely assessment and management of medical conditions, including diagnostic imaging, pain assessment and cognitive assessment
2. A patient with a hip fracture is assessed for pain at the time of presentation and regularly throughout their hospital stay, and receives pain management including the use of multimodal analgesia, if clinically appropriate
3. A patient with a hip fracture is offered treatment based on an orthogeriatric model of care as defined in the *Australian and New Zealand Guideline for Hip Fracture Care*⁴³
4. A patient presenting to hospital with a hip fracture, or sustaining a hip fracture while in hospital, receives surgery within 48 hours, if no clinical contraindication exists and the patient prefers surgery
5. A patient with a hip fracture is offered mobilisation without restrictions on weight-bearing the day after surgery and at least once a day thereafter, depending on the patient's clinical condition and agreed goals of care
6. Before a patient with a hip fracture leaves hospital, they are offered a falls and bone health assessment, and a management plan based on this assessment, to reduce the risk of another fracture
7. Before a patient leaves hospital, the patient and their carer are involved in the development of an individualised care plan that describes the patient's ongoing care and goals of care after they leave hospital. The plan is developed collaboratively with the patient's general practitioner. The plan identifies any changes in medicines, any new medicines, and equipment and contact details for rehabilitation services they may require. It also describes mobilisation activities, wound care and function post-injury. This plan is provided to the patient before discharge and to their general practitioner and other ongoing clinical providers within 48 hours of discharge.

INCREASING PARTICIPATION IN THE REGISTRY

The cumulative number of hospitals contributing to the ANZHFR and the number of cases recorded are shown in **Figure 3**. The approaches that underpinned the observed increase in participation included Facilities Level Audits, regular newsletters, “Hip Fests” and webinars.

Facilities Level Audit

The first Facilities Level Audit was undertaken during 2012 and published in 2013¹⁵⁹. The aim of the audit was to assess and document what services, resources, policies, protocols and practices existed at the time across Australia and New Zealand in relation to hip fracture care. The 2020 ANZHFR Facilities Level Audit is provided as **Appendix 7**. A list of all public hospitals in Australia (n=94) and New Zealand (n=22) operating on hip fracture patients was created. Information was requested from these hospitals and telephone contact was then made with each site to establish a key contact person and to explain the purpose of the audit. The audit form was emailed or faxed to each site for completion.

The completed forms were returned to research personnel and weekly emails were sent to all sites to update people on progress and encourage completion of the form. The data was entered into a central database for the purposes of analysis. The audit was completed in November 2012. Key findings are shown in **Table 3**. The most common barrier to proposed hip fracture service redesign was funding, followed by staff shortages and operating theatre availability.

Table 3. Services available in 2012 for hospitals for Australian States and Territories and New Zealand¹⁵⁹

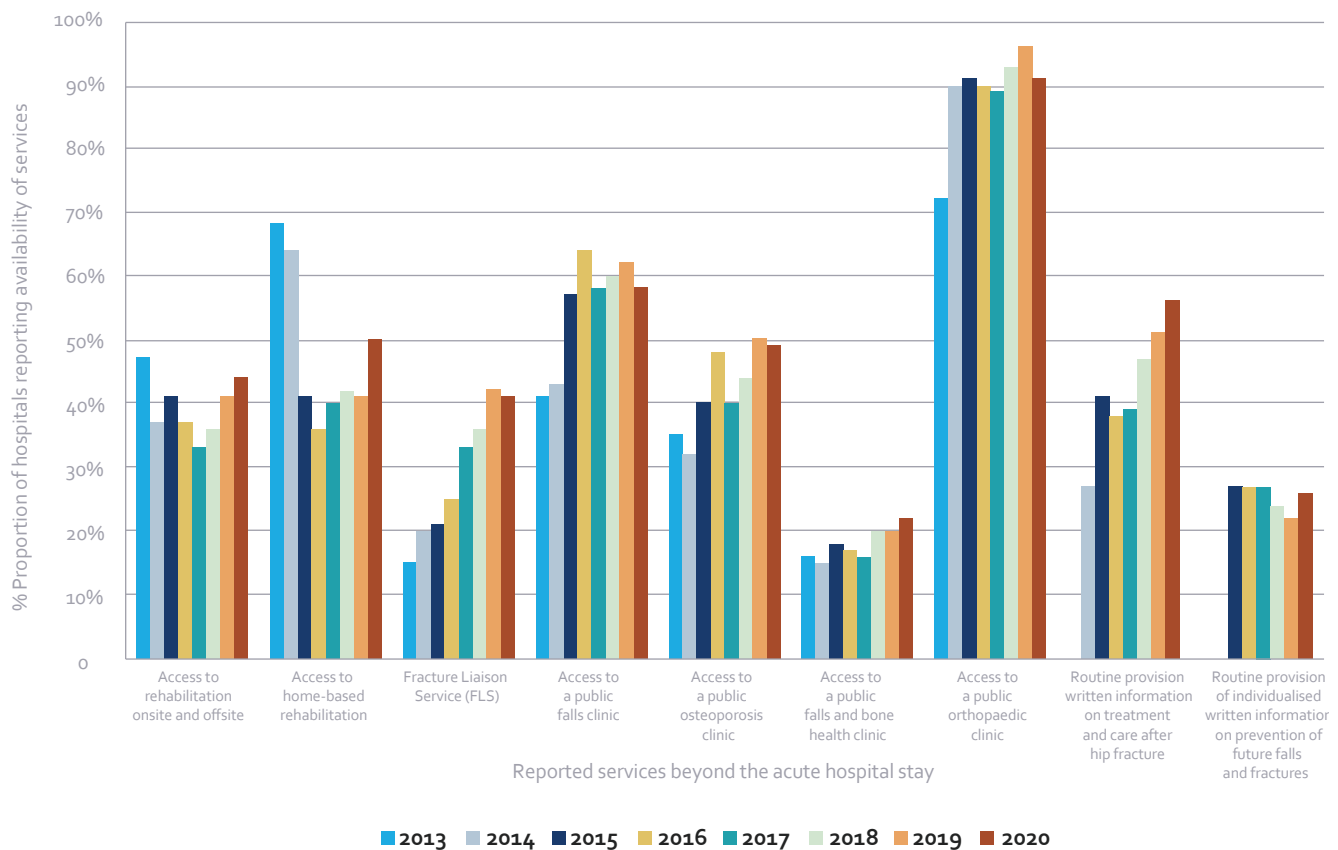
	NSW	VIC	NT	QLD	ACT	WA	TAS	SA	NZ	OVER-ALL TOTAL
Number of hospitals performing hip fracture surgery	37	24	2	13	1	6	3	8	22	116
Hospitals with dedicated orthopaedic beds available	68% (range 14-45)	75% (range 5-44)	50% (32 beds)	85% (range 18-48)	100% (34 beds)	83% (range 16-45)	33% (18 beds)	50% (range 15-60)	82% (range 10-90)	83/116 (72%)
Hospitals with Geriatrics service available	62%	46%	50%	54%	100%	67%	33%	38%	55%	63/116 (54%)
Hospitals which have a Fracture Liaison Service	22%	17%	0%	15%	0%	17%	0%	25%	0%	17/116 (15%)
Hospitals that collect local hip fracture data	38%	67%	50%	69%	100%	83%	0%	38%	64%	63/116 (54%)
Barriers to proposed hip fracture service redesign	59%	58%	50%	62%	100%	50%	67%	75%	64%	72/116 (62%)

Reproduced with permission of the Australian and New Zealand Hip Fracture Registry

Facilities Level Audits were subsequently published in 2014¹⁶⁰ and 2015¹⁶¹ to provide ongoing comparisons and track changes over time. From 2016, these audits were combined with Patient Level Audits as ANZHFR Annual Reports^{18, 25, 162-164}. As shown in **Figure 4**, the 2020 Annual report documented the proportion of hospitals in both countries reporting specific services beyond the acute stay for the period 2013 to 2020¹⁸. Notable increases were evident for access to Fracture Liaison Services, public falls clinics and routine provision of written information on treatment and care after hip fracture. However, 59%, 42% and 44% of hospitals, respectively, were still not providing these services, so there remain significant opportunities for improvement.

Figure 4. Proportion of Australian and New Zealand Hospitals reporting specific services beyond the acute stay from 2013 to 2020¹⁸

PROPORTION OF NEW ZEALAND AND AUSTRALIAN HOSPITALS REPORTING SPECIFIC SERVICES BEYOND THE ACUTE HOSPITAL STAY



Reproduced with permission of the Australian and New Zealand Hip Fracture Registry

Newsletters

ANZHFR produces regular newsletters to promote the work of the registry in both countries. The newsletters include updates on the number of participating hospitals and cases recorded. The mid-2020 newsletter provides an illustration of the types of content that is likely to be of interest to colleagues involved in caring for individuals who sustain hip fractures and stimulate interest in the registry¹⁶⁵:

- ANZHFR Lecture Series 2020: For more details on this see the next section.
- Translations of a Hip Fracture Care Guide for people who sustain hip fractures, their families and carers¹⁶⁶
- International Multicentre Project Auditing COVID-19 in Orthopaedics and Trauma (IMPACT)
- The FERMAT study (FRacture pathway MAppingTools) coordinated by the University of Oxford, UK
- The launch of [Bone Health New Zealand](#)
- A Year in the Life of the NZHFR National Coordinator
- Introducing the New NZHFR Clinical Lead
- Publications of the Month

Hip Fests and webinars

In 2018, ANZHFR initiated a series of State-based festivals in Australia – “Hip Fests” - to provide opportunities for sharing experience in improving hip fracture care between hospital teams in New South Wales and Western Australia. In 2019, Hip Fests were held for teams from Queensland, South Australia and Tasmania, in addition to the North and South Islands of New Zealand. Recordings of the presentations delivered are available from the ANZHFR website at <https://anzhfr.org/reports/>. In 2020, on account of the Covid-19 pandemic, ANZHFR produced a series of lectures in lieu of planned State-based Hip Fests which can be viewed on the [ANZHFR Training and Education channel](#) on YouTube. These include lectures on the following topics:

1. [Team work](#)
2. [High intensity physiotherapy for hip fractures](#)
3. [Total hip replacement versus hemiarthroplasty in the management of hip fractures](#)
4. [Direct oral anticoagulants and emergency surgery](#)
5. [eHIP- A hip fracture journey](#)
6. [Role of transthoracic echo in hip fracture](#)
7. [An introduction to the Fragility Fracture Network](#)
8. [When not to operate and when to palliate: A shared care approach](#)
9. [Ethics and Governance](#)
10. [Data Quality](#)
11. [Bone Protection Medication Upon Discharge](#)
12. [Malnutrition and Hip Fracture](#)
13. [Bone Health After Hip Fracture](#)
14. [HIPFIT and Beyond](#)

REGISTRY REPORTS AND PUBLICATIONS

As noted in the section on Facilities Level Audits, the ANZHFR 2016 Annual Report included the fourth Facilities Level Audit and the first Patient Level Audit¹⁶². The report included data from 25 of 121 public hospitals with 3,519 individual patient records entered into the registry during calendar year 2015 (2,925 from Australia and 594 from New Zealand). In all of the figures and tables no hospital was individually identified. In the Patient Level Audit, hospitals were assigned a unique identifying number which was only known to the team within the particular hospital. The same approach was taken in 2017¹⁶³. The 2018 Annual Report was the first to identify delivery of the various reported aspects of care on a named hospital basis¹⁶⁴. This approach balances the need for teams to be able to compare the care they provided against other hospitals and national clinical standards, while allowing sufficient time for hospitals administrators to have confidence in the accuracy of the data being presented for their hospital.

The ANZHFR 2020 Annual Report included the eighth Facilities Level Audit and fifth Patient Level Audit¹⁸. The report included data from 77 hospitals across both countries with 13,504 patient records entered into the registry during calendar year 2019 (10,225 from Australia and 3,279 from New Zealand). In New Zealand, ascertainment increased from 20% in the 2017 report to 86% in 2020. Jurisdictional differences render ascertainment difficult to assess in Australia, although similar trends are likely to be observed. Resource efficient ways are being investigated to provide this information in future reports.

While the number of hospitals participating in the ANZHFR has grown each year, during the five years of patient-level reporting, the following aspects of care have shown improvement:

- Preoperative cognitive assessment
- Assessment of pain in the emergency department
- The use of nerve blocks for pain management
- The participation of a consultant surgeon in the operation
- The assessment of delirium

However, little change has been observed in the following areas:

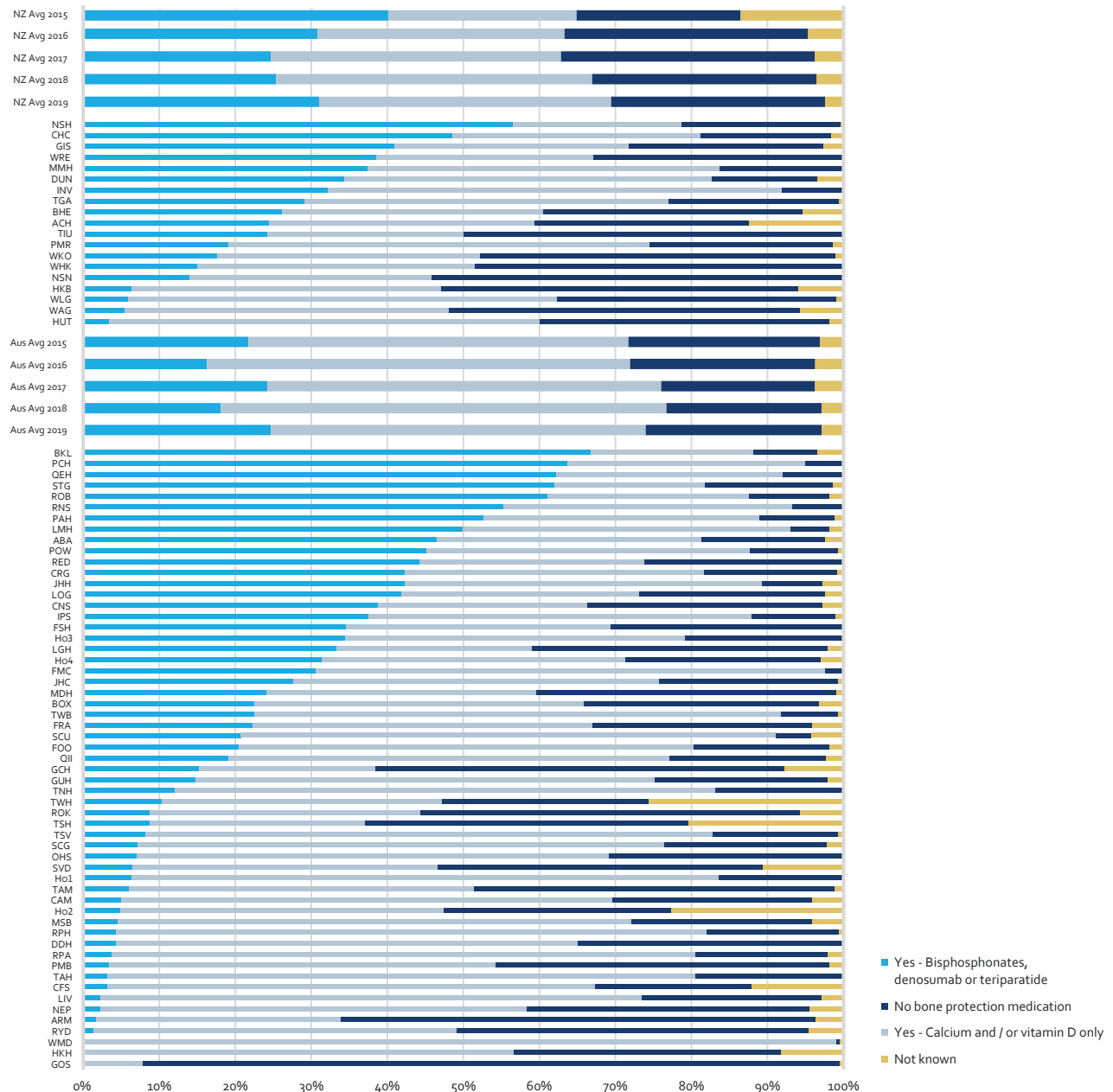
- Preoperative medical assessment
- Reasons for delay to surgery
- Weight bearing after surgery
- First day mobilisation
- Hospital acquired pressure injuries
- Active treatment for bone health at discharge

While the majority of individuals undergo a falls assessment during their hospital stay (72% in Australia and 76% in New Zealand), initiation of bone protection medication during the acute stay occurs for the

minority, as illustrated in *Figure 5* (31% in New Zealand and 25% in Australia). However, the variation between hospitals is self-evident. In New Zealand, follow up at 120 days is available for more than 80% of cases and indicates that 45% are receiving bone protection medication. In Australia, follow up rates are low and 38% report receiving medication to reduce the risk of another fracture at 120 days.

Figure 5. Bone protection medication on discharge in Australian and New Zealand hospitals¹⁸

BONE PROTECTION MEDICATION ON DISCHARGE



Reproduced with permission of the Australian and New Zealand Hip Fracture Registry

The ANZHFR has been described in recent review articles¹⁶⁷⁻¹⁶⁹ and book chapters^{170, 171}. In 2019, Tan et al published a data quality audit on records in the ANZHFR¹⁷².

ALIGNMENT WITH NATIONAL POLICY PRIORITIES

Australia

In 2020, the Australian Government published a national strategy to maximise the value of clinical quality outcomes data, which identified priority actions aligned to the following six pillars¹⁷³:

- Patient Outcomes:
 - Patient-centred health care
 - Improved clinical practice care and health outcomes
- Standardisation and Efficiency:
 - Quality, efficiency and cost effectiveness
 - Financial sustainability
- Innovation and Impact:
 - Transparency and access
 - Data linkage, integration and interoperability

The ANZHFR is highlighted in this strategy document.

New Zealand

In 2015, as previously noted in the section on funding the registry, the Accident Compensation Corporation (ACC) allocated core funding to support the New Zealand arm of ANZHFR from 2016 to 2018. In 2016, a multidisciplinary, multisector effort during the previous four years culminated in ACC investing NZ\$30.5 million (US\$20.4 million) to support nationwide implementation of the following initiatives:

- A Fracture Liaison Service in every District Health Board
- In-home and community-based strength and balance programmes
- Assessment and management of visual acuity and environmental hazards in the home
- Medication review for people taking multiple medicines
- Vitamin D prescribing in Aged Residential Care
- Integrated services across primary and secondary care (including supported hospital discharge) to provide seamless pathways in the falls and fracture system

In 2017, the multisector effort was formalised under the *Live Stronger for Longer* initiative, which is comprised of all relevant government agencies, non-governmental organisations and the health sector¹⁷⁴. A Falls and Fractures Outcomes Framework was developed to assess the impact of the activities described above³⁶. The Outcomes Framework describes five domains which are populated with a range of measures pertaining to falls and fracture care, including quarterly data obtained from the ANZHFR.

The [FFN Policy Toolkit](#)¹²³ is also recommended reading in relation to achieving policy changes.

APPENDIX 3:

Spanish National Hip Fracture Registry

BUILDING A COALITION TO SUPPORT REGISTRY DEVELOPMENT

In 2018, Sáez-López et al described in detail the objectives, methodology and implementation of the Spanish National Hip Fracture Registry (SNHFR)³⁷⁵. During 2016 and 2017 requests were made to scientific societies operating at the national and regional level in Spain to endorse the establishment of the registry. The following 22 societies offered their endorsement and appointed delegates to the SNHFR (Spanish acronyms in parentheses):

- **International societies:** Fragility Fracture Network
- **National societies:**
 - Hispanic Foundation of Osteoporosis and Bone Metabolism Disorders (FHOEMO)
 - Spanish Society of Orthopaedic Surgery and Traumatology (SECOT)
 - Spanish Society of Osteoporotic Fractures (SEFRAOS)
 - Spanish Society of Geriatrics and Gerontology (SEGG)
 - Spanish Society of Bone and Mineral Metabolism Research (SEIOMM)
 - Spanish Society of Geriatric Medicine (SEMEG)
 - Spanish Society of Internal Medicine (SEMI)
- **Regional societies:**
 - **Geriatrics and Gerontology:** Society of Aragon of Geriatrics and Gerontology (SAGGARAGON), Society of Castille and Leon of Geriatrics and Gerontology (SGGCYL), Society of Catalonia of Geriatrics and Gerontology (SCGIG), Society of Madrid of Geriatrics and Gerontology (SMGG), Society of Valencia of Geriatrics and Gerontology, (SVGG), Society of Extremadura of Geriatrics and Gerontology (SOGGEX), Society of Castille-La Mancha of Geriatrics and Gerontology (SCMGG), (Society of the Principality of Asturias of Geriatrics and Gerontology (SGGPA) and Society of Murcia of Geriatrics and Gerontology (SMGG).
 - **Orthopaedics and Traumatology:** Society of Castille, Leon, Cantabria and Rioja of Traumatology (SCLECARTO), Society of Madrid of Orthopaedic Surgery and Traumatology (SOMACOT), Society of Galicia of Orthopaedic Surgery and Traumatology (SOGA-COT), Society of Aragon of Orthopaedic Surgery and Traumatology (SARCOT) and Society of Andalusia of Orthopaedic Surgery and Traumatology (SATO).

FUNDING THE REGISTRY

Since 2016, the SNHFR has received funding from AMGEN SA, UCB Pharma, Abbott Laboratories and FAES Farma, as well as a research grant awarded by the Fundación Mutua Madrileña (grant number AP169672018).

DEVELOPING GUIDELINES AND CLINICAL STANDARDS

In 2007, the *Clinical Practice Guidelines in Geriatrics for the Elderly Affected by Hip Fracture* were published as a collaboration between the Spanish Society of Geriatrics and Gerontology and the Spanish Society of Orthopaedic Surgery and Traumatology (SEGG and SECOT)⁹⁷. In 2012, a “Blue Book” (Libro Azul) was published by the Spanish Association of Osteoporotic Fractures (SEFRAOS)⁹⁸. Prior to establishment of the SNHFR, there was no mechanism in place to establish adherence with either of these guidelines. From launch, the SNHFR used a Spanish version of the Fragility Fracture Network minimum common dataset (FFN MCD)¹⁷⁶.

In 2019, the following proposed set of quality indicators and standards were published⁹⁹:

1. Proportion of patients operated on in less than 48 hours:
 - Current mean is 44%, standard is 63%
2. Proportion of patients mobilized out of bed by the day after surgery:
 - Current mean is 56%, standard is 86%
3. Proportion of patients prescribed anti-osteoporotic medication at discharge:
 - Current mean is 32%, standard is 61%
4. Proportion of patients prescribed calcium supplements at discharge:
 - Current mean is 46%, standard is 77%
5. Proportion of patients prescribed vitamin D supplements at discharge:
 - Current mean is 67%, standard is 92%
6. Proportion of patients developing pressure sores during hospitalization:
 - Current mean is 7.2%, standard is 2.1%
7. Proportion of patients with independent mobility at 30 days:
 - Current mean is 58%, standard is 70%

A justification is provided, and a set of recommendations made to achieve the standard for each indicator. It was planned to evaluate the results six months after implementation of the recommendations.

INCREASING PARTICIPATION IN THE REGISTRY

During the first year of operations in 2016 to 2017, a Technical Secretary and Data Manager were employed and a pilot study was undertaken at 15 hospitals¹⁷⁵. By October 2017, the number of participating hospitals had increased to 54 and 7,028 patient records had been entered¹⁴. The 2018 publication describing the registry and its aims included a call to potential participants¹⁷⁵:

"This publication serves to communicate the NHFR's desire to include the greatest possible number of cases of patients with fragility hip fractures throughout the entire Spanish territory. Physicians caring for patients with these characteristics can contact the Technical Secretariat at [the Secretariat email address was provided] or their possible inclusion in the Registry."

REGISTRY REPORTS AND PUBLICATIONS

In 2019, Ojeda-Thies et al published findings of the first SNHFR annual report and made comparisons with other registries¹⁴. At 75 years, the age threshold for inclusion in the SNHFR is higher than most other registries, which either include individuals aged 50 years or over, or all hip fracture regardless of age. Key findings included:

- **Time to surgery:** The mean surgical delay in Spain was 75.7 hours, which was almost double that for all other countries analysed, with the exception of Italy.
- **Mobilization:** At 58.5%, the proportion of Spanish patients mobilized on the first postoperative day was the lowest of all countries studied (69-89%).
- **Geriatrician/other physician input:** Spain had the highest proportion of geriatrician or other clinician involvement during acute hospitalization (94%) of any of the registries studied (50-91%).

The second SNHFR annual report was published in 2019 - in both Spanish and English - and described the care of 11,431 patients from 72 hospitals in 15 Autonomous Communities during 2018¹⁰¹. The foreword of the report was authored by the Minister of Health, Consumer Affairs and Social Welfare and concluded:

"This project is an example of good practice and of great usefulness for the quality of care and efficiency of health services. It will be necessary to assess the sustainability and impact of this and other National Networks to achieve integration into the global health system and thereby reduce clinical variability by improving the quality and equity of the Spanish National Health System."

Key findings from the 2018 report included:

- **Time to surgery:** The mean surgical delay was 66.1 hours, which was 9.6 hours less than in 2017.
- **Mobilization:** 64% of patients were mobilized on the first postoperative day, which was 8% more than in 2017.
- **Geriatrician/other physician input:** At 94% remained the same as 2017.
- **Osteoporosis treatment:** 48% of patients received osteoporosis treatment within one month, which was 12% more than 2017.
- **Cognitive impairment:** The proportion of patients with cognitive impairment in 2018 (36.9%) was essentially the same as 2017 (36.4%).
- **Length of stay:** The hospital length of stay in 2018 of 10 days was one day shorter than in 2017.

The report concluded with a description of the future work plan for 2019 to 2020, which included:

- Ongoing audit of adherence with the quality indicators and standards.
- Presentation of the registry to the Ministry of Health and the Regional Ministries of Health of the different Autonomous Communities, for their information, and a request for collaboration in decisions to improve care.
- Preparation of an observational survey on the type of care and human and material resources dedicated to treating hip fracture patients in each hospital.

In February 2021, the 2019 Annual Report¹⁰² was published in Spanish with a translation into English to follow later in the year. A repository of videos on demand are also available online¹⁰³.

ALIGNMENT WITH NATIONAL POLICY PRIORITIES

During the year prior to the launch of the SNHFR, engagement with government agencies resulted in the following achievements:

- The registry has the initial support of the General Sub-Directorate of Health Promotion and Epidemiology of the Ministry of Health, Social Services and Equality.
- It has been classified by the Spanish Agency of Medicines and Medical Devices (AEMPS) as Non-PAS (a Non-Post-Authorization Study), and therefore the administrative procedure that governs it only includes the approval or ratification of the respective Institutional Review Boards (IRBs) of each site.
- It has been registered at the Spanish Agency for Data Protection.

APPENDIX 4: UK National Hip Fracture Database

BUILDING A COALITION TO SUPPORT REGISTRY DEVELOPMENT

In 2003, the British Orthopaedic Association (BOA) published the first edition of the “Blue Book” on the care of patients with fragility fracture, which stated⁴⁷:

“Since osteoporotic fractures occur in elderly people, comorbidities are the rule rather than the exception. We therefore need strong support from physicians specialising in care of the elderly. The days of entrusting complex medical management to inexperienced and over-burdened orthopaedic Senior House Officers (*i.e. junior doctors*) must be ended. Orthogeriatric leadership of pre- and post-operative acute medical management, rehabilitation and secondary prevention is at least as important as high-quality surgery in minimising the impact of osteoporotic fractures on patients’ lives.”

Despite advancing a clear and practical framework for improving the management of individuals who sustain fragility fractures, combined with a major dissemination effort which included placement of an advertisement feature in the *British Medical Journal*, insufficient progress to improve standards of care stimulated drafting of a second edition of the Blue Book which was published in 2007⁶⁵. A key distinction between the first and second editions of the Blue Book was that the latter was conceived from the outset as a joint enterprise between the BOA and the British Geriatrics Society (BGS), the most numerous surgical and medical specialist disciplines in the UK at the time. In addition to orthopaedic surgeons and geriatricians, the multidisciplinary authorship group included specialists in anaesthesiology, metabolic bone disease, specialist nursing (both orthopaedic and osteoporosis) and primary care physicians. This collaboration forged the nucleus of a coalition which expanded in subsequent years to include all specialities that play a role in the management of fragility fractures.

The second crucial distinction between the first and second Blue Books was that publication of the second edition intentionally coincided with the launch of the UK NHFD. The second edition proposed the following six clinical standards:

1. All patients with hip fracture should be admitted to an acute orthopaedic ward within 4 hours of presentation
2. All patients with hip fracture who are medically fit should have surgery within 48 hours of admission, and during normal working hours
3. All patients with hip fracture should be assessed and cared for with a view to minimising their risk of developing a pressure ulcer
4. All patients presenting with a fragility fracture should be managed on an orthopaedic ward with routine access to acute orthogeriatric medical support from the time of admission

5. All patients presenting with fragility fracture should be assessed to determine their need for antiresorptive therapy to prevent future osteoporotic fractures
6. All patients presenting with a fragility fracture following a fall should be offered multidisciplinary assessment and intervention to prevent future falls.

The rationale for the need for consensus clinical standards in combination with a mechanism to benchmark against those standards was described as follows:

“These standards reflect good practice at key stages of hip fracture care. Widespread compliance with them would improve the quality and outcomes of care and also reduce its costs. The rationale for them is set out in the Blue Book, and compliance – and progress towards compliance – can be continuously monitored by participation in NHFD.”

FUNDING THE REGISTRY

As noted in the 2010 NHFD National Report¹⁴⁰:

“Early development of NHFD depended on generous funding from the Association of the British Pharmaceutical Industry (ABPI)¹³² and Association of British Healthcare Industries (ABHI)¹³³, the professional bodies of the pharmaceutical and devices industries respectively; and on a substantial development grant from the Department of Health¹⁷⁸ that supported regional meetings, publications, and statistical consultancy inputs to case-mix adjusted outcome reporting.

From April 2009, and for a period of three years, the central costs of the NHFD are being met by funding from the Health Quality Improvement Partnership (HQIP)¹³⁴ totalling approximately £1.4 million (US\$1.8 million). This covers staffing costs, contracts with the Information Centre¹⁷⁹ and with Quantics¹⁸⁰, office rental and services, communications, meetings and publications, and sundries.”

HQIP was established in 2008 to promote quality in healthcare, and in particular to increase the impact that clinical audit has on healthcare quality improvement. HQIP is an independent organisation led by the Academy of Medical Royal Colleges¹³⁵, The Royal College of Nursing¹³⁶ and National Voices. HQIP’s funders include NHS England¹⁸¹, the Welsh Government¹⁸² as well as, for certain projects, the Health Department of the Scottish Government¹⁸³, Department of Health, Social Services and Public Safety Northern Ireland¹⁸⁴ and the Channel Islands.

From 2012 to 2015, the NHFD continued its work as part of a new Falls and Fragility Fracture Audit Programme¹³⁷, again under the auspices of HQIP, which was managed by the Royal College of Physicians¹³⁸. This commissioning and funding arrangement continues to the time of publication of this Toolbox.

DEVELOPING GUIDELINES AND CLINICAL STANDARDS

Pursuant to the first and second editions of the Blue Book described previously, in 2011, NICE published clinical guidelines on hip fracture care¹⁵⁷ and, in 2012, a quality standard¹⁸⁵ derived from these guidelines which included 12 quality statements:

Statement 1.

People with hip fracture are offered a formal Hip Fracture Programme from admission.

Statement 2.

The Hip Fracture Programme team retains a comprehensive and continuing clinical and service governance lead for all stages of the pathway of care, including the policies and criteria for both intermediate care and early supported discharge.

Statement 3.

People with hip fracture have their cognitive status assessed, measured and recorded from admission.

Statement 4.

People with hip fracture receive prompt and effective pain management, in a manner that takes into account the hierarchy of pain management drugs, throughout their hospital stay.

Statement 5.

People with hip fracture have surgery on the day of, or the day after, admission.

Statement 6.

People with hip fracture have their surgery scheduled on a planned trauma list, with consultant or senior staff supervision.

Statement 7.

People with displaced intracapsular fracture receive cemented arthroplasty, with the offer of total hip replacement if clinically eligible.

Statement 8.

People with trochanteric fractures above and including the lesser trochanter (AO classification types A1 and A2) receive extramedullary implants such as a sliding hip screw in preference to an intramedullary nail.

Statement 9.

People with hip fracture are offered a physiotherapist assessment the day after surgery and mobilisation at least once a day unless contraindicated.

Statement 10.

People with hip fracture are offered early supported discharge (if they are eligible), led by the Hip Fracture Programme team.

Statement 11.

People with hip fracture are offered a multifactorial risk assessment to identify and address future falls risk, and are offered individualised intervention if appropriate.

Statement 12.

People with hip fracture are offered a bone health assessment to identify future fracture risk and offered pharmacological intervention as needed before discharge from hospital.

In 2016, the quality standard was reviewed and statements prioritised in 2012 were updated or replaced in accordance with prevailing national priorities, and Statement 3 was updated again in 2017⁶⁷.

INCREASING PARTICIPATION IN THE REGISTRY

In 2018, Currie's review on the evolution of hip fracture audit included a detailed description of how nationwide participation in the NHFD was achieved during the period 2007 to 2011¹⁹. This included:

- **Website:** This provided useful documentation including job descriptions, business cases, protocols donated by participating hospitals and a literature registry which provided monthly updates on relevant publications. During the last decade the website has become increasingly sophisticated and currently includes hospital dashboards, describing progress and ratings, and charts relating to best practice, surgery and performance.
- **Newsletters:** Informative NHFD newsletters were produced from 2007 to 2013. Thereafter, NHFD news was incorporated into the newsletters of the Falls and Fragility Fracture Audit Programme managed by the Royal College of Physicians¹³⁷.
- **Regional Meetings:** These included regional data quality workshops which brought together audit staff from hospital and regional multidisciplinary meetings which routinely attracted several hundred clinicians, clinical leaders, audit staff and service managers. The latter served as the inspiration for the Hip Fests run by the ANZHFR.

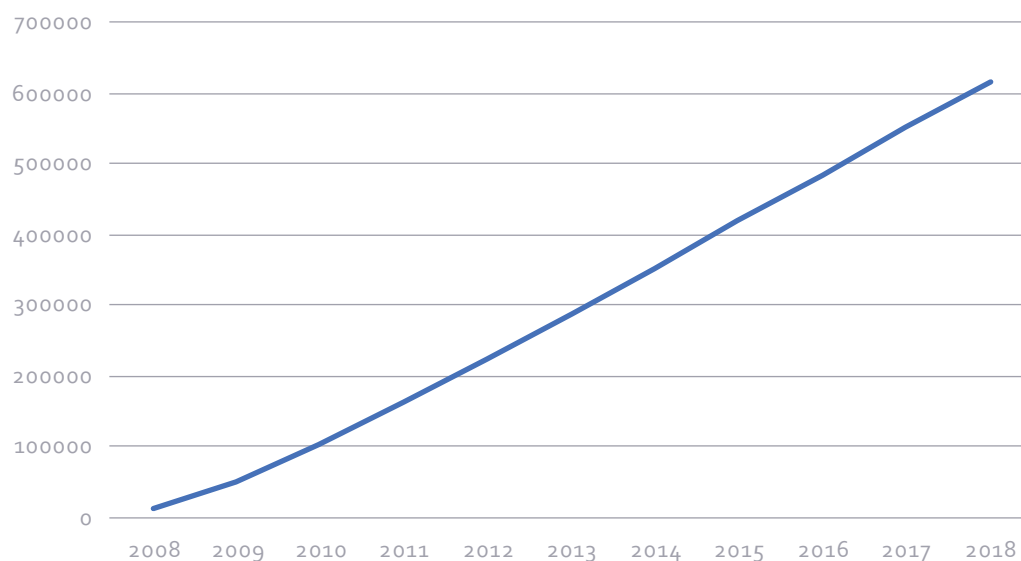
By October 2010, 99% of hospitals were registered on the NHFD, 95% were regularly entering data and the number of recorded cases since launch in 2007 surpassed the 100,000 mark. As of October 2020, the number of recorded cases exceeded 650,000, making the NHFD the largest continuous audit of acute hip fracture care and secondary prevention in the world.

In March 2017, NHFD held a 10th anniversary event which included 10 presentations which reflected on the decade of experience gained. These include a presentation from Professor David Marsh on "How to start a world class audit from scratch: history of the NHFD". This and the other videos can be downloaded from this [link](#).

REGISTRY REPORTS AND PUBLICATIONS

The first NHFD Preliminary National Report was published in 2009 and detailed case-mix, care and outcomes on 12,983 cases of hip fracture from 64 hospitals that submitted more than 60 cases over the year 1st October 2007 to 30th September 2008¹⁸⁶. Annual reports have been published since with all eligible hospitals in England, Wales and Northern Ireland regularly uploading data since 2013¹⁸⁷. The cumulative number of cases recorded is shown in *Figure 6*.

Figure 6. Cumulative number of case records on the UK National Hip Fracture Database^{140,186-195}



In 2015, Neuberger et al. undertook an evaluation of the impact of the NHFD initiative, consisting of the Blue Book clinical standards, data collection and feedback through the NHFD, and NHFD-led educational and workforce development activities to support regional and national sharing of best practice¹⁹⁶. Key findings included the following:

- Participation in the NHFD increased from 11 hospitals in 2007 to 175 hospitals in 2011.
- From 2007 to 2011, the rate of early surgery (on day of admission, or day after) increased from 54.5% to 71.3%, whereas the rate had remained stable during the period 2003– 2007 (the NHFD was launched in September 2007).
- From 2007–2011, 30-day mortality reduced from 10.9% to 8.5%, compared to a fall from 11.5% to 10.9% from 2003– 2007. The annual relative reduction in adjusted 30-day mortality was 1.8% per year in the period prior to launch of the NHFD, compared with 7.6% per year after the launch ($p < 0.001$ for the difference).

In 2019, a set of key performance indicators (KPIs) was developed to support collaborative improvement efforts¹⁹⁷:

KPI 1 – Prompt orthogeriatric assessment: Percentage of hip fracture patients assessed by a senior orthogeriatrician within 72 hours. NHFD overall 90%, performance range (2018) 1-100%.

KPI 2 – Prompt surgery: Percentage of patients receiving hip fracture surgery by the day following admission. NHFD overall 69%, performance range (2018) 13-94%.

KPI 3 – NICE compliant surgery: Percentage of patients who received a NICE compliant surgical approach to their hip fracture surgery. NHFD overall 72%, performance range (2018) 38-88%.

KPI 4 – Prompt mobilisation after surgery: Percentage of patients mobilised by the day following hip fracture surgery. NHFD overall 80%, performance range (2018) 36-100%.

KPI 5 – Not delirious when tested after surgery: Percentage of patients who were assessed and found not to be delirious after their surgery. NHFD overall 69%, performance range (2018) 0-92%.

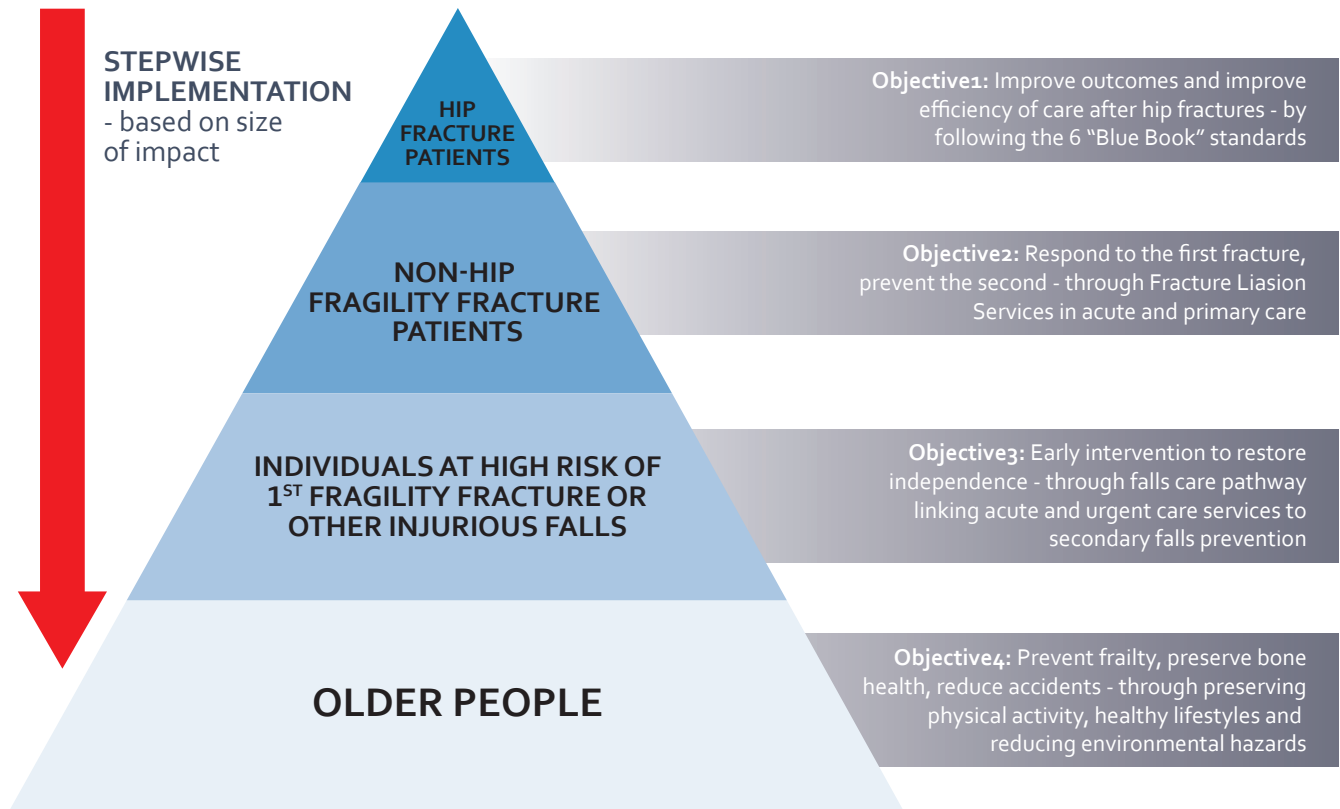
KPI 6 – Return to original residence by 120 days: Percentage of patients known to have returned to their original residence by 120 days after their hip fracture. NHFD overall 69%, performance range (2018) 37-91%.

A platform has been created to enable sharing of case studies relating to specific indicators as well as mortality.

ALIGNMENT WITH NATIONAL POLICY PRIORITIES

In 2008, the UK National Osteoporosis Society and healthcare professional organisations jointly made the case to the Secretary of State for Health that specific guidance was required for commissioners of services in the National Health Service to address care gaps revealed by national clinical audits relating to falls and fragility fractures. In response, the Secretary of State commissioned the National Clinical Director for Older People to establish a Department of Health working group on falls and fractures to draft the policy¹⁹⁸. This led to publication of a component of the Department of Health's *Prevention Package for Older People* focused on falls and fragility fractures in 2009¹⁹⁹. This policy document provides a roadmap for a systematic approach to falls and fracture prevention that incorporates the four key objectives illustrated in *Figure 7*, with improvement in outcomes of hip fracture care as the first objective.

Figure 7. Department of Health for England falls and fracture priorities in 2009¹⁹⁹



In 2010, the Department of Health for England introduced the Best Practice Tariff for hip fracture (BPT)²⁰⁰, a financial incentive scheme that linked the level of reimbursement to the hospital, at the level of an individual patient, to delivery of key performance indicators based on the Blue Book standards. This was made possible by near universal participation in the NHFD at the time. The payment differential for delivering best practice was initially set at GBP £445 (US \$570) for 2010–2011, which was subsequently increased to GBP £890 (US\$1,139) for 2011–2012 and GBP £1,335 (US \$1,709) for 2012–2013 and thereafter. In order to receive the BPT uplift, all of the following criteria needed to be met during 2010–2012:

- Time to surgery within 36 hours from arrival in an emergency department, or time of diagnosis if an inpatient, to the start of anaesthesia
- Involvement of an (ortho-) geriatrician:
 - Admitted under the joint care of a consultant geriatrician and a consultant orthopaedic surgeon
 - Admitted using an assessment protocol agreed by geriatric medicine, orthopaedic surgery and anaesthesia

- Assessed by a geriatrician (as defined by a consultant, non-consultant career grade, or specialist trainee) in the perioperative period (defined as within 72 hours of admission)
- Postoperative geriatrician-directed:
 - Multi-professional rehabilitation team
 - Fracture prevention assessments (falls and bone health).

From April 2012, an additional BPT criterion was added which required pre- and post-operative cognitive assessments to be completed. During the period 2012–2020, further refinements were made to the BPT criteria, with the most recent being extension of the scheme to include fractures of the femoral shaft and distal femur.

In 2019, Metcalfe et al evaluated the impact of the BPT on outcomes for hip fracture patients in England by using Scotland, which did not participate in the scheme, as a control group²⁰¹. Patients were included in the analysis if they were treated for a hip fracture in England (n=1,037,860) or Scotland (n=116,594) with inpatient admission dates between January 2000 and December 2016, and had complete follow-up information for one year following admission. The BPT was implemented in England from April 2010. Between 2010 and 2016, 7,600 fewer deaths could be attributed to interventions driven by the BPT. Despite an observed steady increase in re-admissions to hospital during the pre-implementation phase, this was reversed on implementation of the BPT. Time to surgery and length of stay were also significantly reduced.

The 2019 NHFD Annual Report noted that KPI 1 (prompt orthogeriatric review) was achieved for 93% of patients in England in 2018, in contrast to 58% in Wales and 87% in Northern Ireland. Given that the BPT is only in place in England, the difference may reflect the influence of the BPT.

APPENDIX 5:

Agendas for National Hip Fracture Registry Steering Group Meetings

Agenda items for First Meeting of National Hip Fracture Registry Steering Group for Country X

- Establish the Country X National Hip Fracture Registry Steering Group:
 - Appoint Founding Chair or Co-Chairs for a specified period (e.g. three years to provide organisational continuity and momentum)
 - Identify current gaps in representation from core disciplines and a plan to recruit additional members from relevant professions
 - Liaise with consumer organisations to recruit a consumer representative to join the Steering Group
 - All Steering Group members to commit to provide ongoing updates on registry development to the President and Board or Council of their professional organisations, with a view to be designated as their organisation's official representative on the Steering Group
 - Explore opportunities to invite a member of the Steering Group or Board of a well-established, high-performing registry in Country X to serve as a mentor and advisory member of the Steering Group (e.g. a member of the Steering Group of a National Joint Registry or National Myocardial Infarction Registry)
 - Assign several members to develop Terms of Reference for the Steering Group
 - Agree frequency of Steering Group meetings in first year (probably 4 to 6 meetings in total)
- Development of clinical practice guidelines, clinical standards and quality indicators:
 - Establish a sub-committee to:
 - Review existing national clinical practice guidelines for Country X relating to the acute care, rehabilitation and secondary prevention of hip fractures
 - Review the clinical practice guidelines and standards, quality indicators and hip fracture registries from other countries linked to in **Table 2** of this Toolbox
 - Determine if existing national clinical practice guidelines for Country X need to be updated OR if national clinical practice guidelines from other countries could be adopted or adapted for Country X, with a view to derive clinical standards from the updated/adopted/adapted guidelines and define associated quality indicators

- Establish Working Groups focused on the following topics:
 - Identification of potential sources of funding for the registry (e.g. pharmaceutical industry, medical devices industry, philanthropic foundations, research grants, government agencies)
 - Identification and engagement with clinicians in hospitals in Country X that have undertaken intermittent or ongoing audit of their provision of hip fracture care
 - Identification of an appropriate information technology platform for the registry which is widely accessible in Country X, a Minimum Common Dataset and a Data Dictionary (consider [FFN MCD](#))
 - Definition of what feedback will be provided to which individuals in participating hospitals and at what frequency
 - Collaboration with national consumer organisations to integrate the work of the national hip fracture registry into consumer advocacy strategies

Agenda items for Second Meeting of National Hip Fracture Registry Steering Group for Country X

- Feedback of activities undertaken since first meeting:
 - Steering Group Chair or Co-Chairs:
 - Representation from any core disciplines not represented at first meeting
 - Identification of a mentor from another well-established registry in Country X
 - Update on Steering Group Terms of Reference
 - Steering Group Members to update on their professional organisation’s willingness for them to be designated the official representative of the organisation on the Steering Group
 - Clinical Guidelines/Standards/Indicators sub-committee summary of analysis of relevant national clinical practice guidelines for Country X and potential for adoption/adaptation of Clinical Guidelines/Standards/Indicators in *Table 2* of this Toolbox
 - Working Groups to provide feedback on potential sources of funding, identification/engagement with clinicians who have conducted local hip fracture audits, IT platform, Minimum Common Dataset and Data Dictionary, feedback and consumer advocacy
- Informed by the feedback presented – in combination with consideration of the facilitators and barriers proposed in the Registry Planning section of this Toolbox – the Steering Group to undertake a SWOT analysis to inform next steps in the development of the registry as indicated in *Figure 8*.

Figure 8. A SWOT analysis with its four elements in a 2x2 matrix

	Helpful to achieving the objective	Harmful to achieving the objective
Internal origin (attributes of the registry)	Strengths	Weaknesses
External origin (attributes of the environment)	Opportunities	Threats

Agenda items for Third Meeting of National Hip Fracture Registry Steering Group for Country X

On the assumption that Steering Group Meetings are held every two to three months during the first year of registry development, the third meeting would occur four to six months after the first meeting. Accordingly, agenda items are likely to include:

- Guidelines/Standards/Indicators sub-committee update:
 - A costed project plan should be formulated to adopt or adapt existing guidelines from another country or draft new guidelines for Country X
 - The sub-committee leading this work should consider how broad endorsement of the Guidelines/Standards/Indicators can be achieved
 - The project plan should include a communications and dissemination strategy

- Updates from Working Groups:
 - Outcome of approaches to potential funders, development of a budget for annual operations and consideration of recruitment of a National Registry Coordinator
 - The IT platform Working Group should make a recommendation to the Steering Group on which IT platform will be the most effective, practical and affordable option
 - The Minimum Common Dataset and data Dictionary should be signed-off at this meeting
 - Pilot sites should be agreed and be consulted on the proposed feedback that the registry will provide to participating hospitals
 - Draft a process to secure ethics approval for pilot site participation
 - Consumer Advocacy Working Group to lead development of a 3-5 year Strategic Plan for the registry
- Memorandum of Understanding:
 - Representatives of the organisations represented on the Steering Group to commence drafting of a multi-party Memorandum of Understanding (MoU) to consolidate the engagement of all relevant national organisations
 - All Steering Group members to invite the Board or Council of their respective organisations to review the draft MoU and propose amendments as required.

APPENDIX 6: Australian and New Zealand Intention to Collaborate

INTRODUCTION

Hip fracture is the most serious and costly fall-related injury suffered by older people, with people aged 50 years and over accounting for more than 95% of the admitted patient cohort in Australia. In Australia in 2016, there were approximately 22,000 hip fractures, with an estimated combined direct and indirect cost of \$908 million. That number is set to rise to more than 30,000 by 2022, with a projected cost of \$1.126 billion. In New Zealand, it is predicted there will be more than 5,300 hip fractures by 2020 with an estimated hospital cost of more than \$119 million.

Mortality and morbidity as a result of a hip fracture is high: 5% will die in hospital; over 10% will be newly discharged to an aged care facility; more than 50% will still experience a mobility-related disability 12 months after injury and another 15-20% will have died.

OBJECTIVES OF COLLABORATION

Each of our societies and organisations has agreed in principle to collaborate on initiatives to improve the care provided to people who have suffered a minimal trauma hip fracture. We agree to promote excellence in hip fracture care for patients at their presentation to hospital, in the provision of their care whilst in hospital, in their rehabilitation after treatment, and in the minimisation of future falls and fragility fractures.

We agree to collaborate to establish and share mechanisms for improving care and optimising outcomes for older people who have fractured their hip. We will do this by supporting the development and implementation of a bi-national hip fracture registry, the Australian and New Zealand Hip Fracture Registry (ANZHFR). The ANZHFR will collect, analyse and disseminate information to drive sustained improvements in hip fracture care across the Australian and New Zealand health care systems. The ANZHFR will be directed by a multidisciplinary Steering Group, co-chaired by a representative of the Australian and New Zealand Society for Geriatric Medicine and the Australian Orthopaedic Association or New Zealand Orthopaedic Association. The ANZHFR will be hosted both in Australia (AHFR) and New Zealand (NZHFR).

Each of our societies and organisations will jointly participate in a review of the Australian and New Zealand Guideline for Hip Fracture Care with other invited experts, and will promote its use by our members. We will seek opportunities to promote education and clinical knowledge for the improvement of hip fracture care, in line with accepted guidelines and standards.

In the pursuit of improved hip fracture care, each of our societies and organisations recognise they will need to engage and collaborate with other professional societies, health care providers, state and national government health authorities, and other consumer organisations.

The intention to collaborate was signed by the Presidents/Board Chairs of the following 13 organisations:

- Australian and New Zealand Society for Geriatric Medicine
- Australian Orthopaedic Association
- Australian and New Zealand College of Anaesthetists
- New Zealand Orthopaedic Association
- Australian and New Zealand Orthopaedic Nurses Association
- Australasian College of Emergency Medicine
- Australasian Faculty of Rehabilitation Medicine
- Australian and New Zealand Bone and Mineral Society
- Osteoporosis Australia
- Osteoporosis New Zealand
- Royal Australasian College of Physicians
- Royal Australasian College of Surgeons
- Australian Physiotherapy Association



APPENDIX 7:

The 2020 ANZ Hip Fracture Registry Facilities Level Audit

Thank you for taking time to complete the Australian and New Zealand Hip Fracture Facility Level Audit

Please answer the survey for your hospital for the [2019 calendar year](#).

The audit is best completed by the multidisciplinary team at a team meeting.

- To complete the survey online, copy and paste the link to your internet search engine: [Link](#)
- To complete the survey on paper, simply edit this Word document and email to: [insert email address](#)
- Alternatively, print this form, complete all sections, and scan and email to: [insert email address](#)

AUSTRALIAN AND NEW ZEALAND HOSPITALS HIP FRACTURE FACILITY LEVEL AUDIT	OPTIONS
GENERAL INFORMATION	
Does your hospital give permission to be identified in the reporting of the Facility Level Audit results?	Yes / No
Name of person completing the audit	
Role of person completing the audit:	Orthopaedic surgeon Geriatrician Nurse Allied Health Other
State (Aus) / DHB (NZ)	
Acute hospital name	
Is your hospital a designated major trauma Centre?	Yes / No
<u>Estimated</u> number of hip fractures in 2019 (1 January 2019 to 31 December 2019 inclusive)	0-50 51-100 101-150 151-200 201-300 301-400 401+
MODEL OF CARE	

*Orthogeriatric care involves a shared care arrangement of hip fracture patients between the specialties of orthopaedics and geriatric medicine. The geriatrician is involved in the pre-operative optimisation of the patient in preparation for surgery and then takes a lead in the post-operative medical care and coordinates the discharge planning process. Implicit in this role are many of the aspects of basic care including nutrition, hydration, pressure care, bowel and bladder management, and monitoring of cognition (ANZHRF Guideline 2014, p.68).

Was there a formal orthogeriatric* service in place in **2019**?

Yes / No

Select the model of care that best describes the service provided for care of older hip fracture patients in your hospital.

A shared care arrangement where there is joint responsibility for the patient from admission between orthopaedics and geriatric medicine for all older hip fracture patients.

An orthogeriatric liaison service where geriatric medicine provides regular review of all older hip fracture patients (daily during working week)

A medical liaison service where a general physician or GP provides regular review of all older hip fracture patients (daily during working week)

An orthogeriatric liaison service where geriatric medicine provides intermittent review of all older hip fracture patients (2-3 times weekly)

A medical liaison service where a general physician or GP provides intermittent review of hip fracture patients (2-3 times weekly)

A geriatric service where a consult system determines which patients are reviewed i.e. referral on a needs basis

A medical service where a consult system determines which patients are reviewed i.e. referral on a needs basis

No formal service exists

Other – describe

PROTOCOLS AND PROCESSES

For a suspected hip fracture, does your hospital have a protocol or pathway for access to CT / MRI for inconclusive plain imaging?

Yes / No

Do you have an agreed hip fracture pathway?

Yes – ED only
Yes – whole acute journey
No

Does your hospital have a VTE protocol?

Yes / No

Does your hospital have a protocol or pathway for pain in hip fracture patients?

Yes – ED only
Yes – whole acute journey
No

Does your hospital have a planned list / planned trauma list for hip fracture patients?

Yes / No

Are hip fracture patients routinely offered a choice of anaesthesia?

Always
Frequently
Rarely
Never

AUSTRALIAN AND NEW ZEALAND HOSPITALS HIP FRACTURE FACILITY LEVEL AUDIT	OPTIONS
Are hip fracture patients offered local nerve blocks as part of pain management prior to surgery?	Always Frequently Rarely Never
Are local nerve blocks used at the time of surgery to help with postoperative pain?	Always Frequently Rarely Never
Does your hospital offer hip fracture patients routine access to therapy services at weekends?	Yes – Physiotherapy only Yes – other No
Does your hospital routinely provide patients and/or family and carers with written information about treatment and care for a hip fracture?	Yes / No
What tool is used to assess delirium in hip fracture patients?	Delirium not collected Confusion Assessment Method (CAM) 35, 36 Confusion Assessment Method (CAM- ICU) 37 3D-CAM 4AT Other Not known
Which tool does your hospital use to assess the frailty status of individual hip fracture patients?	Frailty not collected Clinical Frailty Scale Frailty Index Hospital Frailty Risk Index Other Not known
BEYOND THE ACUTE HOSPITAL STAY	
Access to in-patient rehabilitation	Onsite <input type="checkbox"/> Offsite <input type="checkbox"/> Tick appropriate box Both <input type="checkbox"/>
Does your hospital have access to an early supported home-based rehabilitation service (not the same as the Commonwealth funded transitional aged care program or community services)?	Yes / No
Does your service provide individualised <u>written</u> information to patients on discharge that includes recommendations for future falls and fracture prevention? (not the same as a copy of a discharge summary)	Yes / No
Does your service have access to a Falls Clinic (Public)	Yes / No
Does your service have access to an Osteoporosis Clinic (Public)	Yes / No
Does your service have access to a combined Falls and Bone Health Clinic (Public)	Yes / No
Does your service have access to an Orthopaedic Clinic (Public)	Yes / No

AUSTRALIAN AND NEW ZEALAND HOSPITALS HIP FRACTURE FACILITY LEVEL AUDIT	OPTIONS	
Do you have a Fracture Liaison Service, whereby there is systematic identification of fracture patients by a fracture liaison nurse/coordinator, with a view to onward referrals and management of osteoporosis?	Yes – hip fracture patients only Yes – all fracture patients (including hip) No	
OTHER		
Does your hospital routinely collect hip fracture data?	Yes – ANZ Hip Fracture Registry Yes – local system No	
If yes, who currently collects the data?	Orthopaedic surgeon Geriatrician Nurse Allied Health Other	
Do you have any plans to alter any of your service provision for hip fracture patients over the next 12 months – if so please give details?	Yes / No	If yes, give details
Are there identified barriers to any proposed service redesign?	Yes / No	If yes, give details

Thank you for completing the ANZHFR Facility Audit

REFERENCES

- 1) Dreinhofer KE, Mitchell PJ, Begue T, Cooper C, Costa ML, Falaschi P, Hertz K, Marsh D, Maggi S, Nana A, Palm H, Speerin R, Magaziner J, on behalf of: the Fragility Fracture N, European Geriatric Medicine S, European Federation of National Associations of O, Traumatology, International Collaboration of Orthopaedic N, International Geriatric Fracture S and International Osteoporosis F: A global call to action to improve the care of people with fragility fractures. *Injury*, 2018; 49:1393-1397
- 2) Agency for Healthcare Research and Quality: Registries for Evaluating Patient Outcomes: A User's Guide. 2020;
- 3) Australian and New Zealand Hip Fracture Registry: Australian and New Zealand Hip Fracture Registry website; <https://anzhfr.org/> 2021
- 4) Yamamoto N, Takhashi HE and Endo N: The challenge of secondary prevention of hip fracture in Japan. In: *Secondary Fracture Prevention: An International Perspective*, ed by Seibel MJ and Mitchell PJ, pp109-115, Elsevier, San Diego, 2019
- 5) Kim JW, Shon HC, Song SH, Lee YK, Koo KH and Ha YC: Reoperation rate, mortality and ambulatory ability after internal fixation versus hemiarthroplasty for unstable intertrochanteric fractures in elderly patients: a study on Korean Hip Fracture Registry. *Arch Orthop Trauma Surg*, 2020;
- 6) Schoeneberg C, Aigner R, Pass B, Volland R, Eschbach D, Peiris SE, Ruchholtz S and Lendemans S: Effect of time-to-surgery on in-house mortality during orthogeriatric treatment following hip fracture: A retrospective analysis of prospectively collected data from 16,236 patients of the AltersTraumaRegister DGU®. *Injury*, 2020;
- 7) Kristensen PK, Rock ND, Christensen HC and Pedersen AB: The Danish Multidisciplinary Hip Fracture Registry 13-Year Results from a Population-Based Cohort of Hip Fracture Patients. *Clin Epidemiol*, 2020; 12:9-21
- 8) Finnish Institute for Health and Welfare: PERFECT Hip Fracture Database website. 2021; <https://thl.fi/fi/tutkimus-ja-kehittaminen/tutkimukset-ja-hankkeet/perfect/osahankkeet/lonkkamurtuma/perusraportit>
- 9) Walsh ME, Ferris H, Coughlan T, Hurson C, Ahern E, Sorensen J and Brent L: Trends in hip fracture care in the Republic of Ireland from 2013 to 2018: results from the Irish Hip Fracture Database. *Osteoporos Int*, 2020;
- 10) Ferrara MC, Andreano A, Tassistro E, Rapazzini P, Zurlo A, Volpato S, Mussi C, Corsi M, Lunardelli ML, Martini E, Castoldi G, De Filippi F, Pizzonia M, Monacelli F, Barone A, Pilotto A, March A, Ungar A, Capelli R, Galmarini V, Franzoni S, Terragnoli F, Bianchetti A, Cazzulani I, Gandossi C, Valsecchi MG, Bellelli G and group Gs: Three-year National report from the Gruppo Italiano di Ortogeriatrics (GIOG) in the management of hip-fractured patients. *Aging Clin Exp Res*, 2020;
- 11) van Voorden TAJ, den Hartog D, Soesman NMR, Jakma TSC, Waleboer M, Staarink M, Bruijninx MMM, Nijman F, Knops SP, Lieshout E and Schep NWL: Effect of the Dutch Hip Fracture Audit implementation on mortality, length of hospital stay and time until surgery in elderly hip fracture patients; a multi-center cohort study. *Injury*, 2020; 51:1038-1044
- 12) Kristoffersen MH, Dybvik E, Steihaug OM, Kristensen TB, Engesaeter LB, Ranhoff AH and Gjertsen JE: Cognitive impairment influences the risk of reoperation after hip fracture surgery: results of 87,573 operations reported to the Norwegian Hip Fracture Register. *Acta Orthop*, 2020; 1-6
- 13) NHS National Services Scotland: The Scottish Hip Fracture Audit website. 2021; <https://www.shfa.scot.nhs.uk/>
- 14) Ojeda-Thies C, Saez-Lopez P, Currie CT, Tarazona-Santalbina FJ, Alarcon T, Munoz-Pascual A, Pareja T, Gomez-Campelo P, Montero-Fernandez N, Mora-Fernandez J, Larrainzar-Garjito R, Gil-Garay E, Etxebarria-Foronda I, Caeiro JR, Diez-Perez A, Prieto-Alhambra D, Navarro-Castellanos L, Otero-Puime A, Gonzalez-Montalvo JI and participants in the R: Spanish National Hip Fracture Registry (RNFC): analysis of its first annual report and international comparison with other established registries. *Osteoporos Int*, 2019; 30:1243-1254
- 15) Meyer AC, Hedström M and Modig K: The Swedish Hip Fracture and National Patient Register were valuable for research on hip fractures: Comparison of two registers. *Journal of Clinical Epidemiology*, 2020;
- 16) Viveros-García JC, Robles-Almaguer E, Albrecht-Junghanns RE, López-Cervantes RE, López-Paz C, Olascoaga-Gómez de León A, Ramírez-Izquierdo G, Sánchez-Trocino B, Torres-Naranjo F and Zúñiga-Gil CH: Mexican Hip Fracture Audit (ReMexFC): objectives and methodology *MOJ Orthop Rheumatol*, 2019; 11:115-118

- 17) Arshi A, Rezzadeh K, Stavrakis AI, Bukata SV and Zeegen EN: Standardized Hospital-Based Care Programs Improve Geriatric Hip Fracture Outcomes: An Analysis of the ACS NSQIP Targeted Hip Fracture Series. *J Orthop Trauma*, 2019; 33:e223-e228
- 18) Australian and New Zealand Hip Fracture Registry: Annual Report 2020. 2020;
- 19) Currie C: Hip fracture audit: Creating a 'critical mass of expertise and enthusiasm for hip fracture care'? *Injury*, 2018; 49:1418-1423
- 20) Cheung CL, Ang SB, Chadha M, Chow ES, Chung YS, Hew FL, Jaisamrarn U, Ng H, Takeuchi Y, Wu CH, Xia W, Yu J and Fujiwara S: An updated hip fracture projection in Asia: The Asian Federation of Osteoporosis Societies study. *Osteoporos Sarcopenia*, 2018; 4:16-21
- 21) Ebeling P, Chan D, Lee JK, Songpatanasilp T, Wong SH, Hew FL and Williams M: Asia-Pacific Bone Academy Fracture Liaison Service Educational Initiative. IOF Regional – 7th Asia-Pacific Osteoporosis Conference, 2018;
- 22) United Nations Department of Economic and Social Affairs Population Division: World Population Prospects: Volume II: Demographic Profiles 2019 Revision. 2019;
- 23) Australian Institute of Health and Welfare: Hip fracture incidence and hospitalisations in Australia 2015–16. 2018;
- 24) Harvey L, Toson B, Mitchell R, Brodaty H, Draper B and Close J: Incidence, timing and impact of comorbidity on second hip fracture: a population-based study. *ANZ J Surg*, 2018; 88:577-581
- 25) Australian and New Zealand Hip Fracture Registry: Annual Report 2019. 2019;
- 26) Giummarra MJ, Ekegren CL, Gong J, Simpson P, Cameron PA, Edwards E and Gabbe BJ: Twelve month mortality rates and independent living in people aged 65 years or older after isolated hip fracture: A prospective registry-based study. *Injury*, 2020; 51:420-428
- 27) Li S, Sun T and Liu Z: Excess mortality of 1 year in elderly hip fracture patients compared with the general population in Beijing, China. *Arch Osteoporos*, 2016; 11:35
- 28) Cui Z, Feng H, Meng X, Zhuang S, Liu Z, Ye K, Sun C, Xing Y, Zhou F and Tian Y: Age-specific 1-year mortality rates after hip fracture based on the populations in mainland China between the years 2000 and 2018: a systematic analysis. *Arch Osteoporos*, 2019; 14:55
- 29) Hsu IL, Chang CM, Yang DC, Chang YH, Li CC, Hu SC and Li CY: Socioeconomic Inequality in One-Year Mortality of Elderly People with Hip Fracture in Taiwan. *Int J Environ Res Public Health*, 2018; 15:
- 30) Lee TC, Ho PS, Lin HT, Ho ML, Huang HT and Chang JK: One-Year Readmission Risk and Mortality after Hip Fracture Surgery: A National Population-Based Study in Taiwan. *Aging Dis*, 2017; 8:402-409
- 31) Liu SK, Ho AW and Wong SH: Early surgery for Hong Kong Chinese elderly patients with hip fracture reduces short-term and long-term mortality. *Hong Kong Med J*, 2017; 23:374-380
- 32) Dhibar DP, Gogate Y, Aggarwal S, Garg S, Bhansali A and Bhadada SK: Predictors and Outcome of Fragility Hip Fracture: A Prospective Study from North India. *Indian J Endocrinol Metab*, 2019; 23:282-288
- 33) Tamaki J, Fujimori K, Ikehara S, Kamiya K, Nakatoh S, Okimoto N, Ogawa S, Ishii S, Iki M and Working Group of Japan Osteoporosis F: Estimates of hip fracture incidence in Japan using the National Health Insurance Claim Database in 2012-2015. *Osteoporos Int*, 2019; 30:975-983
- 34) Mori T, Tamiya N, Jin X, Jeon B, Yoshie S, Iijima K and Ishizaki T: Estimated expenditures for hip fractures using merged healthcare insurance data for individuals aged ≥ 75 years and long-term care insurance claims data in Japan. *Arch Osteoporos*, 2018; 13:37
- 35i) Tsuboi M, Hasegawa Y, Suzuki S, Wingstrand H and Thorngren KG: Mortality and mobility after hip fracture in Japan: a ten-year follow-up. *J Bone Joint Surg Br*, 2007; 89:461-466
- 35ii) Pang GHM, Chong ECM, Razali RM, Lee FS and Yau WK: 61 HIP Fracture Management of Older Adults in a Public Tertiary Hospital in Kuala Lumpur: Analysis and Comparison with the Standard of Care in UK. *Age and Ageing*, 2019; 48:
- 35iii) Khor HM, Teh HX, Tan FC, Shanmugam T, Kumar SC, Tan KM, Singh S, Saedon NI, Chin AV, Kamaruzzaman SB and Tan MP: 66 Short Term Outcomes Following Fragility HIP Fracture in Malaysia. *Age and Ageing*, 2019; 48:iv13-iv17
- 35iv) Penafort R, Hussein AM, Sengupta S and Poi P: One year outcome of hip fractures in the elderly. *Med J Malaysia*, 2002; 57:39-47

- 36) Accident Compensation Corporation, Ministry of Health and Health Quality & Safety Commission New Zealand: Falls & fractures outcomes framework: Supporting quality improvement across the health system to reduce harm from falls. 2020;
- 37) Kirk RJ, Lawes CM, Farrington W, Misur P, Walker ML, Kluger M, Seow MY and Andrew P: Post-operative mortality rates for neck of femur fracture at Waitemata District Health Board. *N Z Med J*, 2019; 132:17-25
- 38) Jones S, Blake S, Hamblin R, Petagna C, Shuker C and Merry AF: Reducing harm from falls. *N Z Med J*, 2016; 129:89-103
- 39) Chandran M, Lau TC, Gagnon-Arpin I, Dobrescu A, Li W, Leung MYM, Patil N and Zhao Z: The health and economic burden of osteoporotic fractures in Singapore and the potential impact of increasing treatment rates through more pharmacological options. *Arch Osteoporos*, 2019; 14:114
- 40) Yong EL, Ganesan G, Kramer MS, Howe TS, Koh JSB, Thu WP, Logan S, Cauley JA and Tan KB: Risk Factors and Trends Associated With Mortality Among Adults With Hip Fracture in Singapore. *JAMA Netw Open*, 2020; 3:e1919706
- 41) Hong S and Han K: The incidence of hip fracture and mortality rate after hip fracture in Korea: A nationwide population-based cohort study. *Osteoporos Sarcopenia*, 2019; 5:38-43
- 42) Daraphongsataporn N, Saloa S, Sriruanthong K, Philawuth N, Waiwattana K, Chonyuen P, Pimolbutr K and Sucharitpongpan W: One-year mortality rate after fragility hip fractures and associated risk in Nan, Thailand. *Osteoporos Sarcopenia*, 2020; 6:65-70
- 43) Australian and New Zealand Hip Fracture Registry (ANZHFR) Steering Group: Australian and New Zealand Guideline for Hip Fracture Care: Improving Outcomes in Hip Fracture Management of Adults. 2014;
- 44) Institute of Medicine: Clinical Practice Guidelines We Can Trust. 2011;
- 45) Australian Commission on Safety and Quality in Health Care and Health Quality & Safety Commission New Zealand: Hip Fracture Care Clinical Care Standard. 2016;
- 46) Voeten SC, Krijnen P, Voeten DM, Hegeman JH, Wouters M and Schipper IB: Quality indicators for hip fracture care, a systematic review. *Osteoporos Int*, 2018; 29:1963-1985
- 47) Royal College of Physicians: Fracture Liaison Service Database (FLS-DB) website. 2021; <https://www.rcplondon.ac.uk/projects/fracture-liaison-service-database-fls-db>
- 48) American Orthopaedic Association: Own the Bone® website. 2021; <https://www.ownthebone.org/>
- 49) Mitchell PJ, Magaziner J, Costa M, Seymour H, Marsh D, Falaschi P, Beaupre L, Tabu I, Eleuteri S, Close J, Agnusdei D, Speerin R, Kristensen MT, Lord S, Rizkallah M, Caeiro JR and Yang M: FFN Clinical Toolkit. 2020;
- 50) International Osteoporosis Foundation: PFC Tools web page. 2021; <https://beta.capturethefracture.org/pfc-digital-tools>
- 51) The Australian Commission on Safety and Quality in Health Care: Economic evaluation of clinical quality registries: Final report. 2016;
- 52) Australian and New Zealand Hip Fracture Registry: Australian and New Zealand Hip Fracture Registry website: Reports, Publications and Presentations. 2020; <https://anzhfr.org/reports/>
- 53) Japanese Orthopaedic Association: Japanese Orthopaedic Association Clinical guideline for hip fractures 3rd edition. 2021; In press:
- 54) Arai H, Ikeda S, Okuro M, Kurokawa M, Sakai A, Sawaguchi T, Suzuki A, Soen S, Nakatoh S, Hagino H, T. M and Yamamoto M: Clinical Standards for Fracture Liaison Services (FLS) in Japan. 2019;
- 55) Korean Academy of Rehabilitation Medicine and Korean Academy of Geriatric Rehabilitation Medicine: Clinical Practice Guideline for Rehabilitation in Patients with Hip Fracture (in Korean). 2021;
- 56) Clinical Research Information Service: KCT0002042: Nationwide Hip Fracture Registry Cohort 2016;
- 57) AltersTraumaZentrum DGU®: Kriterienkatalog. 2020;
- 58) Krause U and Jung K: Geriatric Fracture Centre (German Trauma Society): guidelines and certification to improve geriatric trauma care. *Innov Surg Sci*, 2016; 1:79-85

- 59) Bücking B, Hartwig E, Nienaber U, Krause U, Friess T, Liener U, Hevia M, Bliemel C and Knobe M: [Results of the pilot phase of the Age Trauma Registry DGU®]. *Unfallchirurg*, 2017; 120:619-624
- 60) [The geriatric trauma register of the DGU-current status, methods and publication guidelines]. *Unfallchirurg*, 2019; 122:820-822
- 61) AUC-Office Registries and Research Coordination: AltersTraumaRegister DGU® website (In German). 2021; <https://www.alterstraumaregister-dgu.de/>
- 62) Danish Nurses Council, Danish Physiotherapists and Danish Orthopedic Society: [Reference Program for Patients with Hip Fractures] in Danish. 2008;
- 63) Danish Multidisciplinary Hip Fracture Registry Steering Group: [Indicators and standards for Danish Interdisciplinary Register for Hip Fractures] in Danish. 2017;
- 64) Regionernes Kliniske Kvalitesudviklingsprogram. Danish Hip Fracture Register website (in Danish). 2021; <https://www.rkkp.dk/kvalitetsdatabaser/databaser/dansk-tvaerfagligt-register-for-hoftenaere-laarbensbrud/>
- 65) British Orthopaedic Association and British Geriatrics Society: The care of patients with fragility fracture. 2007;
- 66) National Institute for Health and Care Excellence: Hip fracture: management: Clinical guideline [CG124]. 2017;
- 67) National Institute for Health and Care Excellence: Quality standard for hip fracture care. NICE Quality Standard 16 (update). 2017;
- 68) Royal College of Physicians: The National Hip Fracture Database website. 2021; <https://www.nhfd.co.uk/>
- 69) Royal College of Physicians: The challenge of the next decade: are hip fracture services ready? A review of data from the National Hip Fracture Database (January–December 2019). 2020;
- 70) Royal College of Physicians: 10th Anniversary video presentations. 2017; <https://www.nhfd.co.uk/20/hipfractureR.nsf/docs/10AnniversaryVideo>
- 71) Sheehan KJ, Goubar A, Almilaji O, Martin FC, Potter C, Jones GD, Sackley C and Ayis S: Discharge after hip fracture surgery by mobilisation timing: secondary analysis of the UK National Hip Fracture Database. *Age Ageing*, 2020;
- 72) Lee H, Cook JA, Lamb SE, Parsons N, Keene DJ, Sims AL, Costa ML and Griffin XL: The findings of a surgical hip fracture trial were generalizable to the UK national hip fracture database. *J Clin Epidemiol*, 2020; 131:141-151
- 73) Finnish Medical Society Duodecim and Finnish Orthopaedic Association: Lonkkamurtuma (Hip fracture) website. 2017; <https://thl.fi/fi/tutkimus-ja-kehittaminen/tutkimukset-ja-hankkeet/perfect/osahankkeet/lonkkamurtuma/perusraportit>
- 74) Sund R, Juntunen M, Lühje P, Huusko T and Häkkinen U: Monitoring the performance of hip fracture treatment in Finland. *Ann Med*, 2011; 43 Suppl 1:S39-46
- 75) RIKSHÖFT: RIKSHÖFT website (in Swedish). 2021; <https://www.rikshöft.se/>
- 76) Häkkinen U and Sund R: What works? The association of organisational structure, reforms and interventions on efficiency in treating hip fractures. *Social Science & Medicine*, 2021; 274:113611
- 77) National Office of Clinical Audit: IHFD What we measure. 2020;
- 78) Government of Ireland: National Healthcare Quality Reporting System Reports. 2021;
- 79) National Office of Clinical Audit: Irish Hip Fracture Database (IHFD) website. 2021; <https://www.noca.ie/audits/irish-hip-fracture-database>
- 80) National Office of Clinical Audit and Irish Hip Fracture Database: Irish Hip Fracture Database National Report 2019: Stay safe and active at home. 2019;
- 81) Membership of the Working P, Griffiths R, Alper J, Beckingsale A, Goldhill D, Heyburn G, Holloway J, Leaper E, Parker M, Ridgway S, White S, Wiese M and Wilson I: Management of proximal femoral fractures 2011. *Anaesthesia*, 2012; 67:85-98
- 82) Pioli G, Barone A, Mussi C, Tafaro L, Bellelli G, Falaschi P, Trabucchi M and Paolisso G: The management of hip fracture in the older population. Joint position statement by Gruppo Italiano Ortogeriatrics (GIOG). *Aging Clin Exp Res*, 2014; 26:547-553
- 83) Federation of Medical Specialists: Proximal femoral fractures. 2016;

- 84) [Healthcare insight in the Netherlands]: [A set of indicators that provide quality information about the treatment of hip fracture]. 2017;
- 85) Health and Youth Care Inspectorate: [Basic set of medical specialist care quality indicators 2021]. 2020;
- 86) Dutch Institute for Clinical Auditing: Dutch Institute for Clinical Auditing website. 2021; <https://dica.nl/>
- 87) Dutch Institute for Clinical Auditing: Dutch Hip Fracture Audit website. 2021; <https://dica.nl/dhfa/home>
- 88) Dutch Institute for Clinical Auditing: Impact Report 2019: Make Care Count. 2019;
- 89) Norwegian Orthopaedic Association, Norwegian Geriatric Society and Society NA: Norske retningslinjer for tverrfaglig behandling av hoftebrudd [Norwegian guidelines for interdisciplinary treatment of hip fracture]. 2018;
- 90) Ranhoff AH, Saltvedt I, Frihagen F, Raeder J, Maini S and Sletvold O: Interdisciplinary care of hip fractures.: Orthogeriatric models, alternative models, interdisciplinary teamwork. *Best Practice & Research Clinical Rheumatology*, 2019; 33:205-226
- 91) National Service for Medical Quality Registers: National Hip Fracture Register webpage. 2021; <https://www.kvalitetsregistre.no/registers/525/resultater>
- 92) Norwegian Health Directorate: Norwegian Health Directorate website (in English). 2021; <https://www.helsedirektoratet.no/english>
- 93) Haukeland University Hospital: Norwegian National Advisory Unit on Arthroplasty and Hip Fractures website. 2021; <http://nrlweb.ihelse.net/eng/default.htm>
- 94) Kjærvik C, Stensland E, Byhring HS, Gjertsen JE, Dybvik E and Søreide O: Hip fracture treatment in Norway: deviation from evidence-based treatment guidelines: data from the Norwegian Hip Fracture Register, 2014 to 2018. *Bone Jt Open*, 2020; 1:644-653
- 95) Scottish Government: Scottish Standards of Care for Hip Fracture Patients 2020. 2020;
- 96) Public Health Scotland: Scottish Hip Fracture Audit: Hip Fracture Care Pathway Report 2020. 2020;
- 97) Areosa Sastre A, Avellana Zaragoza JA, Buitrago Alonson M, Conejo Alba A, De La Torre Lanza MA, Isaac Comallonga M, Ferrandez Portal L, Lopez Alvarez E, Miralles Basseda R, Orts Garcia EJ, Pallardo Rodil B, Plaza Garcia S, Ribes Iborra J, Rodriguez Altonaga JR, Rodriguez Alvarez J, Sanchez Jurado PM, Serra Rexach JA and Valles Noguero JA: Guía de buena práctica clínica en Geriatría: Anciano afecto de fractura decadera. 2007;
- 98) Abizanda González M, Alonso Bouzón C, Carbonell Abella C, Carpintero Benítez P, Cassinello Ogea C, Cuxart Fina A, Del Pino Montes J, Díaz Curiel M, Díez Pérez A, Formiga Pérez F, García Erce JA, Gomar Sancho F, González Macías J, Hernández Vaquero D, Herrera Rodríguez A, Moreno Casbas T, Olmos Martínez JM, Otero Fernández R, Pagès Bolívar E, Pérez Cano R and Peris Bernal P: Libro Azul de la Fractura Osteoporótica en España. 2012;
- 99) Condorhuaman-Alvarado PY, Pareja-Sierra T, Munoz-Pascual A, Saez-Lopez P, Ojeda-Thies C, Alarcon-Alarcon T, Cassinello-Ogea MC, Perez-Castrillon JL, Gomez-Campelo P, Navarro-Castellanos L, Otero-Puime A and Gonzalez-Montalvo JI: First proposal of quality indicators and standards and recommendations to improve the healthcare in the Spanish National Registry of Hip Fracture. *Rev Esp Geriatr Gerontol*, 2019; 54:257-264
- 100) Spanish National Hip Fracture Registry: Spanish National Hip Fracture Registry website. 2021; <http://rnfc.es/>
- 101) Sáez López P, González Montalvo JI, Ojeda Thies C, Gómez Campelo P, Hormigo Sánchez AI, Muñoz Pascual A and Pareja Sierra T: RNFC Annual Report 2018. 2019;
- 102) Sáez López P, González Montalvo JI, Ojeda Thies C, Gómez Campelo JI, Pareja Sierra T, Navarro Castellanos L, Montero Fernández N, Aguado Hernández HJ, Castellón Bernal P, Condorhuamán Alvarado PY, Ríos-Germán P, Mora Fernández J, Sanz Reig J, Otero Puime A, Mesa Lampre P, Alarcón Alarcón T, González de Villaumbrosia C, Cedeño Veloz BA and Bermejo Boixareu C: [RNFC Informe Anual 2019] in Spanish. 2021;
- 103) Registro Nacional de Fractura de Cadera: [RNFC Videos on Demand]. 2021;
- 104) National Quality Registers: National Quality Registry for Hip Fracture Patients and Treatment (RIKSHÖFT - in English). 2021; <https://sfr.registercentrum.se/in-english/the-swedish-fracture-register/p/HyEtC7VJ4>
- 105) RIKSHÖFT: Publications with data from RIKSHÖFT web page (in Swedish). 2021; <https://www.rikshöft.se/publikationer>

- 106) Turesson E, Ivarsson K, Thorngren KG and Hommel A: Hip fractures - Treatment and functional outcome. The development over 25 years. *Injury*, 2018; 49:2209-2215
- 107) Turesson E, Ivarsson K, Thorngren KG and Hommel A: The impact of care process development and comorbidity on time to surgery, mortality rate and functional outcome for hip fracture patients: a retrospective analysis over 19 years with data from the Swedish National Registry for hip fracture patients, RIKSHOFT. *BMC Musculoskeletal Disord*, 2019; 20:616
- 108) Secretaria de Salud: Guia de Practica Clinica: Diagnostico y Traitamiento de Fracturas Intracapsulares del Extremo Proximal del Femur. 2009;
- 109) Secretaria de Salud: Guia de Practica Clinica: Diagnostico y Traitamiento de Osteoporosis en el Adulto. 2009;
- 110) Secretaria de Salud: Diagnostico y Traitamiento de las Fracturas Transtrocantericas de Femur en Pacientes Mayores de 65 Anos. 2010;
- 111) Secretaria de Salud: Guia de Referencia Rapida: Traitamiento de fractura desplazada de cuello femoral con artoplastia en adultos mayores de 65 anos. 2012;
- 112) Secretaria de Salud: Intervenciones de Enfermeria en la Atencion del Adulto Mayor con Fractura de Cadera. 2013;
- 113) Instituto Mexicano del Seguro Social: Manejo Medico Integral de Fractura de Cadera En el Adulto Mayor. 2014;
- 114) Lopez CRE, Viveros JC, Quintero HS, Gomez AJM and Marsh D: Tratamiento de la fractura de cadera en Mexico: el papel del manejo multidisciplinario y la Fragility Fracture Network. *Ortho-tips*, 2019; 15:96-104
- 115) Viveros-García JC, Robles-Almaguer E, Aréchiga-Muñoz E, López-Cervantes RE, Torres-Naranjo JF and Baldenebro-Lugo LS: Mexican Hip Fracture Audit (ReMexFC): Pilot phase report. *The Journal of Latin American Geriatric Medicine*, 2020; 6:1-9
- 116) American Academy of Orthopaedic Surgeons: Management of hip fractures in the elderly - Evidence-based clinical practice guideline. 2014;
- 117) American Academy of Orthopaedic Surgeons: Acute Treatment of Hip Fractures in the Elderly: Appropriate Use Criteria. 2015;
- 118) American Academy of Orthopaedic Surgeons: Postoperative Rehabilitation of Low Energy Hip Fractures in the Elderly: Appropriate Use Criteria. 2015;
- 119) American Academy of Orthopaedic Surgeons: Management of Hip Fractures in the Elderly: Timing of Surgical Intervention Performance Measure – Technical Report. 2018;
- 120) American College of Surgeons: ACS National Surgical Quality Improvement Program. 2021;
- 121) Fragility Fracture Network: FFN Hip Fracture Audit SIG website. 2020; <https://www.fragilityfracturenetwork.org/what-we-do/special-interest-groups/hip-fracture-audit-sig/>
- 122) Fragility Fracture Network: Our Regionalisation Strategy. 2020; <https://www.fragilityfracturenetwork.org/regionalisation/>
- 123) Tate J, Harding E, Krishnaswamy P, Rizkallah M, Caeiro JR and Yang M: FFN Policy Toolkit. 2020;
- 124) University College London (UCL): MINAP: Myocardial Ischaemia National Audit Project. 2019;
- 125) Australian Government Department of Health: Better Ageing – improving hip fracture care. 2018;
- 126) New Zealand Government: ACC invests \$30m to reduce falls and fractures for older New Zealanders. 2016; <https://www.beehive.govt.nz/release/acc-invests-30m-reduce-falls-and-fractures-older-new-zealanders>
- 127) Thailand Press Release News: Department of Medical Services, Ministry of Public Health by Lerdsin Hospital and Amgen (Thailand) Limited signed MOU on the project of Refracture Prevention Program. 2018;
- 128) World Health Organization: The Decade of Healthy Ageing: a new UN-wide initiative. 2020; <https://www.who.int/news/item/14-12-2020-decade-of-healthy-ageing-a-new-un-wide-initiative>
- 129) Asia-Pacific Economic Cooperation Health Working Group: Health Working Group Strategic Plan 2021-2025. 2020;
- 130) ASEAN: Association of South East Asian Nations: Working Together to Address Complex health Challenges. 2019;
- 131) Bupa Health Foundation: Bupa Health Foundation: About us. 2020; <https://www.bupa.com.au/about-us/bupa-health-foundation>

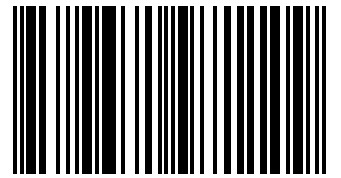
- 132) Association of the British Pharmaceutical Industry: Association of the British Pharmaceutical Industry website, 2020; <https://www.abpi.org.uk/>
- 133) Association of British HealthTech Industries: Association of British HealthTech Industries website. 2020; <https://www.abhi.org.uk/>
- 134) Healthcare Quality Improvement Partnership: HQIP: Enabling those who commission, deliver and receive healthcare to measure and improve healthcare services. 2020;
- 135) Academy of Medical Royal Colleges: Academy of Medical Royal Colleges website. <https://www.aomrc.org.uk/>
- 136) The Royal College of Nursing: The Royal College of Nursing website, 2020; <https://www.rcn.org.uk/>
- 137) Royal College of Physicians: Falls and Fragility Fracture Audit Programme (FFAP) website. 2020; <https://www.rcplondon.ac.uk/projects/falls-and-fragility-fracture-audit-programme-fffap>
- 138) Royal College of Physicians: Royal College of Physicians website. 2020; <https://www.rcplondon.ac.uk/>
- 139) Armstrong E: Number of hospitals and cases reported in the ANZ Hip Fracture Registry 2016-2020. 2020;
- 140) British Orthopaedic Association, British Geriatrics Society and Healthcare Quality Improvement Partnership: The National Hip Fracture Database: National Report 2010. 2010;
- 141) Office of the Secretary: Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of Research, Report of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. 1979;
- 142) Council for International Organizations of Medical Sciences: International Guidelines for Ethical Review of Epidemiological Studies. 1991;
- 143) Oakley B, Nightingale J, Moran CG and Moppett IK: Does achieving the best practice tariff improve outcomes in hip fracture patients? An observational cohort study. *BMJ Open*, 2017; 7:e014190
- 144) Patel NK, Sarraf KM, Joseph S, Lee C and Middleton FR: Implementing the National Hip Fracture Database: An audit of care. *Injury*, 2013; 44:1934-1939
- 145) Whitaker SR, Nisar S, Scally AJ and Radcliffe GS: Does achieving the 'Best Practice Tariff' criteria for fractured neck of femur patients improve one year outcomes? *Injury*, 2019; 50:1358-1363
- 146) Orthogeriatrics: The Management of Older Patients with Fragility Fractures, Springer International Publishing, Cham, 2020
- 147) Moyet J, Deschasse G, Marquant B, Mertl P and Bloch F: Which is the optimal orthogeriatric care model to prevent mortality of elderly subjects post hip fractures? A systematic review and meta-analysis based on current clinical practice. *International Orthopaedics*, 2019; 43:1449-1454
- 148) Patel JN, Klein DS, Sreekumar S, Liporace FA and Yoon RS: Outcomes in Multidisciplinary Team-based Approach in Geriatric Hip Fracture Care: A Systematic Review. *JAAOS - Journal of the American Academy of Orthopaedic Surgeons*, 2020; 28:128-133
- 149) Pablos-Hernandez C, Gonzalez-Ramirez A, da Casa C, Luis MM, Garcia-Iglesias MA, Julian-Enriquez JM, Rodriguez-Sanchez E and Blanco JF: Time to Surgery Reduction in Hip Fracture Patients on an Integrated Orthogeriatric Unit: A Comparative Study of Three Healthcare Models. *Orthop Surg*, 2020; 12:457-462
- 150) Wu X, Tian M, Zhang J, Yang M, Gong X, Liu Y, Li X, Lindley RI, Anderson M, Peng K, Jagnoor J, Ji J, Wang M, Ivers R and Tian W: The effect of a multidisciplinary co-management program for the older hip fracture patients in Beijing: a "pre- and post-" retrospective study. *Arch Osteoporos*, 2019; 14:43
- 151) Kulshrestha V, Sood M, Kumar S, Sharma P and Yadav YK: Outcomes of Fast-Track Multidisciplinary Care of Hip Fractures in Veterans: A Geriatric Hip Fracture Program Report. *Clin Orthop Surg*, 2019; 11:388-395
- 152) Chen CH, Huang PJ, Huang HT, Lin SY, Wang HY, Fang TJ, Lin YC, Ho CJ, Lee TC, Lu YM and Chiu HC: Impact of orthogeriatric care, comorbidity, and complication on 1-year mortality in surgical hip fracture patients: An observational study. *Medicine (Baltimore)*, 2019; 98:e17912
- 153) Lawless AM, Narula S, D'Alessandro P, Jones CW, Seymour H and Yates PJ: Time to surgery and transfer-associated mortality for hip fractures in Western Australia. *ANZ J Surg*, 2020;

- 154) Van Camp L, Dejaeger M, Tournoy J, Gielen E and Laurent MR: Association of orthogeriatric care models with evaluation and treatment of osteoporosis: a systematic review and meta-analysis. *Osteoporos Int*, 2020;
- 155) Tan LT, Wong SJ and Kwek EB: Inpatient cost for hip fracture patients managed with an orthogeriatric care model in Singapore. *Singapore Med J*, 2017; 58:139-144
- 156) Peng K, Yang M, Tian M, Chen M, Zhang J, Wu X, Ivers R and Si L: Cost-effectiveness of a multidisciplinary co-management program for the older hip fracture patients in Beijing. *Osteoporos Int*, 2020;
- 157) National Institute for Health and Clinical Excellence: Hip fracture: The management of hip fracture in adults. NICE Clinical Guideline 124. 2011;
- 158) The ADAPTE Collaboration: The ADAPTE Process: Resource Toolkit for Guideline Adaptation Version 2.0. 2009;
- 159) Australian and New Zealand Hip Fracture Registry: Facility level audit of hospitals in Australia and New Zealand performing surgery for hip fracture 2013. 2013;
- 160) Australian and New Zealand Hip Fracture Registry: Australian and New Zealand Facility Level Audit of Hospitals Performing Surgery for Hip Fracture 2014. 2014;
- 161) Australian and New Zealand Hip Fracture Registry: Australian and New Zealand Facility Level Audit of Hospitals Performing Surgery for Hip Fracture November 2015. 2015;
- 162) Australian and New Zealand Hip Fracture Registry: Annual Report 2016. 2016;
- 163) Australian and New Zealand Hip Fracture Registry: Annual Report 2017. 2017;
- 164) Australian and New Zealand Hip Fracture Registry: Annual Report 2018. 2018;
- 165) Australian and New Zealand Hip Fracture Registry: ANZ Hip Fracture Registry newsletter June 2020. 2020;
- 166) Australian and New Zealand Hip Fracture Registry, NeuRA and Ingham Institute: My Hip Fracture: Information and Individual Care Plan (in 14 languages). 2020;
- 167) Johansen A, Golding D, Brent L, Close J, Gjertsen JE, Holt G, Hommel A, Pedersen AB, Rock ND and Thorngren KG: Using national hip fracture registries and audit databases to develop an international perspective. *Injury*, 2017; 48:2174-2179
- 168) Tarrant SM, Ajgaonkar A, Babhulkar S, Cui Z, Harris IA, Kulkarni S, Minehara H, Miyamoto T, Oppy A, Shigemoto K, Tian Y and Balogh ZJ: Hip fracture care and national systems: Australia and Asia. *OTA International*, 2020; 3:
- 169) Ebeling PR, Chan DC, Lau TC, Lee JK, Songpatanasilp T, Wong SH, Hew FL, Sethi R and Williams M: Secondary prevention of fragility fractures in Asia Pacific: an educational initiative. *Osteoporos Int*, 2020; 31:805-826
- 170) Close JCT: Fracture Liaison Services: An Australasian Perspective. In: *Secondary Fracture Prevention: An International Perspective*, ed by Seibel MJ and Mitchell PJ, pp63-74, Elsevier, San Diego, 2019
- 171) Ojeda-Thies C, Brent L, Currie CT and Costa M: Fragility Fracture Audit. In: *Orthogeriatrics: The Management of Older Patients with Fragility Fractures*, ed by Falaschi P and Marsh D, pp331-357, Springer International Publishing, Cham, 2020
- 172) Tan AC, Armstrong E, Close J and Harris IA: Data quality audit of a clinical quality registry: a generic framework and case study of the Australian and New Zealand Hip Fracture Registry. *BMJ Open Qual*, 2019; 8:e000490
- 173) Australian Government: Maximising the Value of Australia's Clinical Quality Outcomes Data: A National Strategy for Clinical Quality Registries and Virtual Registries 2020-2030. 2020;
- 174) Accident Compensation Corporation, Ministry of Health, Health Quality & Safety Commission New Zealand and New Zealand Government: Live Stronger for Longer: Prevent falls and fractures. 2020; <https://www.livestronger.org.nz/>
- 175) Saez-Lopez P, Gonzalez-Montalvo JI, Ojeda-Thies C, Mora-Fernandez J, Munoz-Pascual A, Cancio JM, Tarazona FJ, Pareja T, Gomez-Campelo P, Montero-Fernandez N, Alarcon T, Mesa-Lampre P, Larrainzar-Gar R, Duaso E, Gil-Garay E, Diez-Perez A, Prieto-Alhambra D, Queipo-Matas R, Otero-Puime A and participants in the R: Spanish National Hip Fracture Registry (SNHFR): a description of its objectives, methodology and implementation. *Rev Esp Geriatr Gerontol*, 2018; 53:188-195
- 176) Fragility Fracture Network: The FFN Minimum Common Dataset. 2019; <https://www.fragilityfracturenetwork.org/what-we-do/hip-fracture-audit-database/>

- 177) British Orthopaedic Association: The care of patients with fragility fracture. 2003;
- 178) UK Government: Department of Health & Social Care website. 2020; <https://www.gov.uk/government/organisations/department-of-health-and-social-care>
- 179) UK Government: Health and Social Care Information Centre (is now called NHS Digital). 2020; <https://digital.nhs.uk/>
- 180) Quantics Biostatistics: Quantics Biostatistics website. 2020; <https://www.quantics.co.uk/>
- 181) NHS: NHS England website. 2020; <https://www.england.nhs.uk/>
- 182) Llywodraeth Cymru Welsh Government: Llywodraeth Cymru Welsh Government website. 2020; <https://gov.wales/>
- 183) Scottish Government Riaghaltas na h-Alba: Health and Social Care website. 2020; <https://www.gov.scot/health-and-social-care/>
- 184) Department of Health (Northern Ireland) An Roinn Slàinte: Department of Health website. 2020; <https://www.health-ni.gov.uk/>
- 185) National Institute for Health and Care Excellence: Quality standard for hip fracture care. NICE Quality Standard 16. 2012;
- 186) British Orthopaedic Association, British Geriatrics Society and The Information Centre for Health and Social Care: The National Hip Fracture Database Preliminary National Report 2009. 2009;
- 187) British Orthopaedic Association, British Geriatrics Society, Royal College of Physicians and Healthcare Quality Improvement Partnership: The National Hip Fracture Database: National Report 2013. 2013;
- 188) British Orthopaedic Association, British Geriatrics Society, Royal College of Physicians and Healthcare Quality Improvement Partnership: The National Hip Fracture Database: National Report 2011. 2011;
- 189) British Orthopaedic Association, British Geriatrics Society and Healthcare Quality Improvement Partnership: The National Hip Fracture Database: National Report 2012. 2012;
- 190) Royal College of Physicians: National Hip Fracture Database (NHFD) annual report 2014. 2014;
- 191) Royal College of Physicians: National Hip Fracture Database (NHFD) annual report 2015. 2015;
- 192) Royal College of Physicians: National Hip Fracture Database (NHFD) annual report 2016. 2016;
- 193) Royal College of Physicians: National Hip Fracture Database (NHFD) annual report 2017. 2017;
- 194) Royal College of Physicians: National Hip Fracture Database (NHFD) annual report 2018. 2018;
- 195) Royal College of Physicians: National Hip Fracture Database (NHFD) annual report 2019. 2019;
- 196) Neuburger J, Currie C, Wakeman R, Tsang C, Plant F, De Stavola B, Cromwell DA and van der Meulen J: The impact of a national clinician-led audit initiative on care and mortality after hip fracture in England: an external evaluation using time trends in non-audit data. *Med Care*, 2015; 53:686-691
- 197) Royal College of Physicians: National Hip Fracture Database (NHFD) Improvement Repository. 2020; <https://www.rcplondon.ac.uk/>
- 198) Department of Health in England: Speech by the Rt Hon Alan Johnson MP, Secretary of State for Health, 21 May 2008: Prevention Speech: Old Age is the New Middle Age. 2008;
- 199) Department of Health: Falls and fractures: Effective interventions in health and social care. 2009;
- 200) Gershlick B: Best Practice Tariffs: Country Background Note: United Kingdom (England). 2016;
- 201) Metcalfe D, Zogg CK, Judge A, Perry DC, Gabbe B, Willett K and Costa ML: Pay for performance and hip fracture outcomes: an interrupted time series and difference-in-differences analysis in England and Scotland. *Bone Joint J*, 2019; 101-B:1015-1023



e ISBN 978-967-19711-0-9



9 789671 971109