



Developing Registries and Effective Care Models for the Management of Hip Fractures: Aligning Political, Organizational Drivers with Clinical Outcomes

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Abstract

Purpose of Review The aim of the review is to conduct a literature search on cost-effectiveness or cost savings of osteoporosis fracture liaison services.

Recent Findings We identified four types of FLS. A total of 11 cost-effectiveness studies examining 15 models of secondary fracture prevention models were identified. Nine models were found to be cost-saving, and five were found to be cost-effective.

Summary It is possible to adopt a cost-effective model for fracture liaison services and expand across geographical regions. Adopting registries can have the added benefit of monitoring quality improvement practices and treatment outcomes. Challenges exist in implementing registries where centralized data collections across different chronic conditions are politically driving agendas. In order to align political and organizational strategic plans, a core set of outcome evaluations that are both focused on patient and provider experience in addition to treatment outcomes can be a step toward achieving better health and services.

Keywords Cost-effectiveness · Cost savings · Orthogeriatric · Registry · Hip fracture · Prevention · Outcomes

Introduction

Trauma registries are recognized as providing useful information about acute care delivered to patients hospitalized with injuries. A patient registry is defined as “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 predetermined scientific, clinical, or policy purposes.” Registries are surveillance systems that capture data that can help to improve quality of services and

simultaneously allow the patient and caregiver to make informed decisions independently from the intended purpose of the registry. Indeed we have noted, in a national evaluation of a trauma registry, that mortality rates have diminished [1]. There are also implications when trauma centers vs. non trauma centers have demonstrated better results for those patients presenting with more severe injuries rather than those with less severe injuries. In these cases, prioritizing patient flow, for those with less severe injuries, and allowing these patients to receive care either at home or in the community and/or discharged from the hospital earlier can improve the quality of services throughout the patient’s care. These gaps in the continuum of care need to be addressed and carefully monitored through the development and use of registries or a data centralized system of integrated care. Considerable financial investments and political drive in addition to consistent data definitions and specialized personnel, like clinical epidemiologists, are fundamental factors in determining service efficiencies and prevention of fracture [2]. Our objective with this review of the current literature is to examine the cost-effectiveness of orthogeriatric and fracture liaison service models for patients presenting with hip fracture. We will

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present recommendations to inform the development of a hip fracture registry to reduce the incidence of hip and other fragility fractures. Our review will capture relevant outcomes, underpinning the Quadruple Aim and conceptual frameworks, including information on effectiveness and cost-effectiveness.

Aligning Political Agendas with Organizational Structures and Hospital Strategic Plans to Evaluate the Economic Impact of Hip Fractures

Cross country data comparisons for the reduction of hip fracture and mortality rates can only occur if the program design is transparent and co-designed with representatives of every stakeholder group that will be involved in the program, including patients. Programs should align with organizations' strategic planning timelines and timelines for related initiatives, such as quality improvement plans [3]. The applicability and feasibility of measurement should be considered for each organization expected to participate. Further, benchmarking may be attributed at least in part to the implementation of a registry and support networks that provide a dashboard to contributing sites. The chance to improve the management of data can assist individual hospitals to adapt to their capacity, size, and resources [4]. Understanding the impact that certain policy drivers [5] can have for buy-in from each of the individual hospitals is dependent on having a live report of risk-adjusted outcomes in a cross comparison with other similar sites.

Establishing a mix of mandatory outcomes and a selection of optional outcomes can help to balance government priorities with the needs of patients with hip fracture and those needs stipulated in organizational strategic plans. To understand the relevance of registries that are driven by governments, we can find a plethora of resources in the grey literature across different jurisdictions. Other nationally driven initiatives are learning from Sweden [6] and the UK [7] who have created a rich network of registries. Australia has 28 clinical registries, almost rivaling Sweden's 70 registries, which have established outcomes that address both population outcomes and health system processes to measure quality improvements. Missing variables and time lag, especially for outcomes linked to patient self-report, can impose significant hurdles. Patients and their caregivers must be contacted by staff personnel, and should the patients not be available questionnaire responses may not be entered into the database. We can learn valuable lessons reviewing the resources for guiding the design, implementation, and data evaluation of these registries [8]. In Australia, "Operating principles and technical standards for Australian clinical quality registries" were developed under the auspices of the Australian Commission on Safety and Quality in Health Care, and the processes are currently undergoing validation [9, 10].

Osteoporosis can lead to secondary fractures leaving the elderly in critical conditions unless they are managed appropriately. Although wrist injuries are sentinel fractures in determining the diagnosis for osteoporosis, the incidence of hip fractures can be more costly. Alleviating the strain on hospital resources is imperative, especially as these rates are noted to rise among patients with complex comorbidities. However, gathering relevant information on hip fractures can be a challenge. Hip fracture outcomes are captured by arthroplasty registries in some European countries [11–13], while other countries have dedicated hip fracture registries: Australia [14], New Zealand [15], Canada [16], Norway [17], Sweden [18], and the United Kingdom [19]. Good quality registry data can be a challenge, whereby missing information and data sources indicate discontinued continuums of care across various geographical regions and community services to help patients presenting with hip fracture. There seems to be a growing momentum to develop hip fracture registries across integrated health care systems, like Kaiser Permanente [20]. The registry holds information on demographics, interventions, morbidity, and mortality as well as characteristics of both the surgeon and the hospital. Most of the information gathered by the registries still have room for improvement, and we suggest mapping outcomes onto conceptual frameworks and the Quadruple Aim, which includes elements related to the work environment where the providers may experience stress or burnout, in order to get a more comprehensive picture of the patient journey through care.

Using the OMERACT Conceptual Framework to Map a Core Set of Outcomes

The framework that embeds both a population and system level was developed by Outcome Measures in Rheumatology (OMERACT) in 2014 [21]. In collaboration with the AO foundation, in 2011, the expert panelists developed a core set of outcomes for the orthogeriatric co-management of hip fracture. A paper was published as a result of these discussions by Liem et al. [22], who present a core set of outcome parameters to assess best treatment practices for the management of hip fractures in an interprofessional environment, which we mapped onto the OMERACT framework (Table 1).

Outcomes need to be collected in a reliable way such that there is a better buy in from the hospitals and then incorporated into organizational strategic plans. The panelists contributing to the development of the core set determined that the collection of 12 parameters should be set upon admission, discharge, 30-day-, 90-day, and at 1 year following admission of the patient presenting with hip fracture. Three countries (US, UK, and the Netherlands) have published reports stating that 40–44% of the population in the studies recovered their pre-fracture mobility independence at 1 year [23]. Policy

Table 1 Outcomes from a consensus expert panel that were analyzed to determine a core set of parameters to assess treatment in the management of hip fracture mapped onto the 4 main core areas of the OMERACT framework

Interventions – disease	Life impact	Resource use – economic impact	Pathophysiological manifestations
Fall prevention	Activities of daily living – Barthel Index	Medication Use – Osteoporosis medication	Mobility- Timed up and go test
Complications	Quality of life	Inappropriate medication – adverse drug reaction	Parker Mobility score
Mortality		costs – % of expected national costs	Pain- verbal rating scale
		EQ-5D	
		Re-admission rates	
		Length of stay	
		Time to surgery	

makers who rely on performance indicators will need to choose outcomes that can demonstrate improvement over shorter time frames. Collecting outcomes measuring mobility in this patient population at one-year follow-up given the relatively healthy patient does not provide information about what occurred prior to the 1-year mark. If mobility does not demonstrate change at 30 days, this domain may not be important even as a political driver despite the fact that it may be relevant to the patient. Short- and long-term outcomes are necessary to get a comprehensive picture of what happens following a hip fracture. Setting appropriate time frames should be linked to clinical hospital capacity such that acute care hospitals have different needs affecting the choice of appropriate outcome measures.

Results from a systematic review were recently published and showed similar core domains although no consensus methodology was reported. It is ideal to report domains in each of the core areas such as the one we adopted that highlight all aspects of measurement. Dyer et al [23]. used the International Classification of Functioning, Disability and Health [24]; however, the authors also note the importance of additional domains (such as accommodation, quality of life and mortality, and health condition) that do not sit within this framework but would fit within the OMERACT framework.

The hip fracture outcome group identified patient reported experience as an important domain to assess but did not have any identified instrument to assess this. Interestingly, we can learn from an initiative funded by the Ontario Ministry of Health and Ministry of Long-Term Care (MOHLTC) that incorporated patient experience in a pilot to link funding to quality. In 2015, the Hospital Advisory Committee (HAC) was organized as a governance structure that was part of the Health System Funding Reform (HSFR); it was designed to provide the then Ontario MOHLTC with advice and recommendations to improve and evolve HSFR in terms of efficiency, access and equity, safety, and patient-centered care. HAC identified linking quality to funding (LQ2F) as a priority area within HSFR.

In 2018, the MOHLTC in conjunction with the Ontario Hospital Association announced the launch of the LQ2F pilot. Table 2 reports the 5 indicators chosen in the domains of patient experience, safety, and effectiveness. These domains were drawn from Health Quality Ontario's 2019 report, "Quality Matters" [25].

We recommend that outcome sets need to consider whether there is alignment with government directives, whether the outcomes are feasible, i.e., can they be calculated using the existing data infrastructure, are hospitals familiar with the outcomes, and/or are the hospitals already collecting the outcomes and that the evaluation of performance and benchmarking is within the control of the hospital. Further, the outcomes selected need to be scientifically sound, such that the outcomes are valid and reliable, and the evidence behind the outcome is explicit.

Fracture Liaison Services

Ganda et al. [26•] described four models of fracture liaison services (FLS) with decreasing levels of intensity:

- **Type A:** Type A models of care represent following protocol for secondary fracture prevention, where following a minimal trauma fracture, patients are identified, assessed, and treated.
- **Type B:** Type B models of care stop short of treatment initiation, instead providing the primary care physician with recommendations based on the FLS assessment.
- **Type C:** Type C models of care are less-intensive, in that individuals identified as suffering minimal trauma fractures are provided with osteoporosis education and advice, and their primary care physician is alerted of the fracture with recommendation for further assessment to reduce the risk for additional fractures.
- **Type D:** Type D interventions include only education and advice to individuals presenting with a minimal trauma fracture. No physician contact is included in this model.

Table 2 Five indicators chosen in the domains of patient experience, safety, and effectiveness. These domains were drawn from Health Quality Ontario’s report (Health Quality Ontario)

Quality domain	Indicator	Data source	Considerations
Patient experience	Did you feel that there was good communication about your care between doctors, nurses, and other hospital staff? Before you left the hospital, did you have a clear understanding about all of your prescribed medications, including those you were taking before your hospital stay? Did you receive enough information from hospital staff about what to do if you were worried about your condition or treatment after you left the hospital?	Canadian Patient Experiences (CPES) developed by the Canadian Institute for Health Information (CIHI)	CPES survey can be associated with burden in costs to administer. Prioritizing patient experience within a set of outcomes for hip fracture can facilitate collection of data. Reviewing historical data for comparisons is time-consuming. Some large teaching hospitals may experience higher responding rates, than smaller community hospitals. This could be tied to hospital buy-in but also could be associated with more patient engagement and easier access to support for hospitals to collect the data from patients.
Safety	Medication reconciliation at discharge	Annual Quality Improvement Program	This indicator was discontinued by Health Quality Ontario. Results show disbelief in the validity of self-reported instruments, and opportunities for educational brochures could facilitate

Table 2 (continued)

Quality domain	Indicator	Data source	Considerations
Effectiveness	Readmission within 30 days for selected Health-Based Allocation Model (HBAM) In patient Group (HIG)- AMI, cardiac conditions (excluding heart attack), congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), pneumonia, diabetes, stroke, and gastrointestinal disease	Discharge Abstract Database	other indicators on medication. Readmission rates within 30 days may not be feasible for all hip fracture patients and also considerations to hospital types and capacity will play a role in making this outcome relevant.

Wu et al. [27•] report that cost-effectiveness studies of secondary fracture prevention interventions were conducted in Canada, Australia, US, UK, Japan, Taiwan, and Sweden. In comparisons with usual care or no treatment, FLS of all intensity models were consistently cost-effective across countries (cost per quality and duration of life following medical or surgical treatment, as measured in QALY, ranges from USD \$3023–28,800 [CAD \$3779–36,000] in Japan to USD \$14,513–112,877 [CAD \$18,141–141,096] in the US, with several studies documented cost savings.

Methods

A search of the literature was conducted through PubMed and Google Scholar using the Medical Subject Heading (MeSH) terms “accidental falls,” “cost-benefit analysis,” “hip fractures,” “osteoporosis,” and “osteoporotic fractures” in combination with the following keywords to identify relevant articles and documents: “cost,” “cost-effectiveness,” “fall prevention,” “FLS,” “fracture liaison service,” “intervention,” and “orthogeriatrics.”

Results

A total of 11 cost-effectiveness studies examining 15 models of secondary fracture prevention models (types A, B, and C, as well as an orthogeriatric model) were identified in the literature. Overall, nine models were found to be cost saving, and five were found to be cost-effective. While all three types of FLS were found to be cost-saving in some studies and cost-effective in others, cost savings tended to be smaller in the less intensive Type C FLS studies, and cost-effectiveness lower (i.e., higher cost per quality and duration of life following medical or surgical treatment), compared to the more intensive Type A FLS. Table 3 provides a list of study characteristics and models.

Discussion

Establishing a Rationale for a New Hip Fracture Registry

The UK's model of a National Hip Fracture Database (NHFD, <https://www.nhfd.co.uk> last accessed January 1, 2020) is a leader in national efforts to establish a similar database in other countries, like Canada, that has existing parallels with the UK's health care system. The NHFD data shows that the average length of acute stay decreased from 19.7 days in 2009 to 15.6 days in 2017 [42, 43]. An economic simulation using similar methodology for the province of Ontario in Canada suggests that province could save over 43,000 acute inpatient bed days per year across the province within the first few years of operation.

We would advise caution when interpreting these results should the rationale attribute all the UK's decrease in average length of acute stay to the NHFD initiative since the NHFD reports do not substantiate a causal relationship. We could imagine several other factors (e.g., changes in general population health, increased overall health system efficiency, etc.) that can cause the decline in length of acute stay between 2009 and 2017 apart from the NHFD initiative, which was established in 2007. Furthermore, comparing two data points is not very convincing. Ideally, we would evaluate the UK data before the NHFD initiative began and data from a control group jurisdiction that never implemented a hip fracture database. According to the NHFD reports [42, 43], patient mortality was lower by about 7% in 2017, but it is not clear what the comparative time period is here; it may refer to a 7% decrease in the mortality rate from 2009 to 2017, as 2009 was the first year the NHFD report was published. Here again, causation cannot be inferred from the correlation – the fact that the mortality rate decreased by 7% over the course of the NHFD's existence does not mean that the NHFD caused that decrease. Data on the trend in mortality rate from before the establishment of the NHFD could be helpful here.

Building a Rationale for Extending a Program Across the Province

Our findings are similar to those reported by Yong et al. [39] (2016), who found that the standard version of the Fracture Screening and Secondary Prevention Program (FSPP), a type C FLS, had an incremental cost-effectiveness ratio (ICER) of roughly CAD\$20,000 per QALY compared with the more intensive Fast Track model (Type A), which had an ICER of CAD\$5720 per QALY. Yong et al. [40] argue that extending the fracture screening and prevention program would be cost-effective, but it may emphasize that it is better to extend such a program across the province using the less intensive model. Additionally, Yong et al. were careful to note that the study of the Fast Track model was a secondary analysis because the sample size was much smaller (roughly $n = 200$) than the sample size in the main analysis. The Fast Track model has only been implemented at a large teaching hospital in Toronto, whereas the standard model is what has been implemented in 33 clinics across the province.

As a minor note, Yong et al. [39] also state that the *Fast Track* program was much more cost-effective in non-hip fracture patients than in hip fracture patients (\$3213 vs. \$51,377 per QALY gained). Yong et al. [39] report that their findings are “not generalizable to settings with low volume of fragility fracture patients (less than 300 per year), where a centralized model may be more appropriate.” Finally, the study has some methodological flaws: (1) the cost effectiveness results are very sensitive to parameter alterations, (2) the authors rely on many assumptions and simplifications, and (3) there may be substantial selection bias if eligible patients are not mandated to use the FSPP.

In the literature, we found cost savings findings specifically for hip fractures and warrants further investigation:

- National joint registries for England and Wales include cost savings for specific interventions, i.e., the financial implications of uncemented versus cemented total hip replacements on a national scale [44].
- Total hip arthroplasty is a cost-effective surgical procedure to alleviate pain so that the hip recovered functionality. These findings were verified using registries and noting the importance of implant survivorship was urged [45].
- A strategic approach with economic impact based on raising the bar on current practices can come from registry data [46].

Selecting Outcomes for a Hip Fracture Registry

While orthogeriatric care protocols and liaison services remain simple in theory, the patient and their caregiver

Table 3 Results from a jurisdictional scan, study characteristics and models

Study/jurisdiction	Type	Intervention description	Results	Cost-effectiveness (saving) ^a
Sander et al., 2008 [28] (Toronto, Ontario)	Type A	“Osteoporosis Exemplary Care Program,” a coordinator-facilitated program in which patients with fragility fractures received appropriate identification, education, assessment, referral, and treatment for suspected underlying osteoporosis.	<ul style="list-style-type: none"> • In year one, three hip fractures prevented among 500 patients managed annually (reduced from 34 to 31)^b 	<ul style="list-style-type: none"> • CAD \$48,950 net hospital cost saving per 500 patients managed annually in year one • Cost savings could also be achieved if as few as 350 patients were managed annually by a single coordinator • Cost savings expected to rise in subsequent years, and when additional costs such as rehabilitation and dependency are considered
Majumdar et al., 2009 [29] and Morrish et al., 2009 [30] (Alberta, Canada)	Type A	Osteoporosis case manager assigned to patients after sustaining a hip fracture, who arranged for testing and prescription of an appropriate treatment if the patient had low bone mass.	<ul style="list-style-type: none"> • 60 fractures (40 hip) prevented per 1000 patients • 40 QALYs gained per 1000 patients 	<ul style="list-style-type: none"> • CAD \$2576 life-time cost-saving per patient • The break-even threshold, where costs for the intervention would equal costs for usual care, was estimated to be reached after 2 years
	Type B	Facilitated BMD testing. The case manager arranged for testing, with results being sent to the primary care physician for further management.	<ul style="list-style-type: none"> • Facilitated BMD patients did not incur statistically significantly more fractures (hip or any) compared to patients receiving a case manager intervention 	<ul style="list-style-type: none"> • Facilitated BMD testing cost CAD \$24 per patient, compared with CAD \$56 per patient for the case manager intervention
Majumdar et al. [31], 2013 (Alberta, Canada)	Partial type C (without patient education component)	Opinion-leader-endorsed evidence summaries, and treatment guidelines and patient-specific reminders were delivered to primary care physicians of patients who had incidentally detected vertebral fractures reported on routine chest radiographs	<ul style="list-style-type: none"> • Four fractures (two hip) avoided per 1000 patients • Eight QALYs gained per 1000 patients 	<ul style="list-style-type: none"> • CAD \$282 life-time cost saving per patient
	Type C	The “enhanced” intervention included a patient activation strategy (written educational materials and telephone-based counseling by a nurse practitioner) in addition to the physician intervention.	<ul style="list-style-type: none"> • Six fractures (three hip) avoided per 1000 patients compared to the physician intervention • Six QALYs gained per 1000 patients compared to the physician intervention 	<ul style="list-style-type: none"> • CAD \$339 life-time cost saving per patient compared to the physician intervention (CAD \$621 in total)
Majmudar et al. [32], 2017 (Alberta, Canada)	Type C	“Catch a Break Fracture Liaison Service (FLS)”. Outpatients with non-traumatic non-hip fractures were identified and contacted by phone to carry out a standardized osteoporosis screening risk assessment. “High risk” participants were asked to follow up with their family physician for testing and received osteoporosis educational materials. Notification was also sent to the family physician.	<ul style="list-style-type: none"> • 14 fractures (4 hip) prevented per 10,000 patients • 12 QALYs gained per 10,000 patients 	<ul style="list-style-type: none"> • CAD \$9167 per QALY
Cooper et al. [33, 34], 2012 (Australia)	Type A	“Concord Minimal Trauma FLS”	<ul style="list-style-type: none"> • 89 QALYs gained per 1000 patients 	<ul style="list-style-type: none"> • AUD \$17,291 (CAD \$13,919) per QALY (for a cost of AUD \$1486 [CAD \$1196] per patient compared to standard care over a 10-year period)
UK Department of Health 2009 [35] (UK)	Type A	Nurse led FLS. The specialist nurse investigated primary fracture cases and initiated treatment where applicable, and supported the monitoring and maintenance of medication adherence in collaboration with primary care.	<ul style="list-style-type: none"> • 33 fractures (18 hip) prevented over 5 years based on management of 797 cases per year in an overall population of 320,000 	<ul style="list-style-type: none"> • GBP £56,527 (CAD \$95,531) over 5 years (for a cost of GBP £234,181 [CAD \$395,766]) • Additional reduced social care costs for people who fund their own care were not considered
McLellan et al. [26, 36, 37], 2011 (Glasgow, UK)	Type B	FLS	<ul style="list-style-type: none"> • 18 fractures (11 hip) prevented per 1000 patients • 22 QALYs gained per 1000 patients • 266 hospital bed-days saved 	<ul style="list-style-type: none"> • GBP £21,000 (CAD \$36,876) overall saving per 1000 patients (for a cost of approximately GBP £290,000 [CAD \$509,240]) • Setup costs for widespread adoption across the UK were estimated at GBP £9.7 million (CAD \$17.0 million)

Table 3 (continued)

Study/jurisdiction	Type	Intervention description	Results	Cost-effectiveness (saving) ^a
Leal et al. [38], 2017 (UK)	Type B	Nurse-led FLS, responsible for case finding, assessment, treatment recommendations, and the follow-up plan, as well as for additional support for management of bone health in hospital.	• 0.09 QALYs gained (per female patient); 0.10 (per male patient)	• GBP £12,837 (CAD \$23,222) per QALY (for females, compared to usual care) • GBP £12,458 (CAD \$22,537) per QALY (for males, compared to usual care)
	Orthogeriatric	Orthogeriatric post-hip fracture care, responsible for case finding, preoperative assessment, patient assessment, and treatment initiation, and involved in postoperative care.	• 0.12 QALYs gained (per female patient); 0.13 (per male patient)	• GBP £22,709 (CAD \$41,081) per QALY (for females, compared to FLS) • GBP £23,407 (CAD \$42,343) per QALY (for males, compared to FLS)
Yong et al., 2016 [39, 40] (Toronto, Ontario), as reported in Walters et al., 2017	Type A	“Bone Mineral Density Fast Track Program”	• N/A	• CAD \$5720 per QALY
	Type C	“Ontario Fracture Clinic Screening Program”	• 4.3 QALYs gained per 1000 patients	• CAD \$19,132 per QALY
Newman et al., 2003 [41] (US)	Type C	“Geisinger Health System Osteoporosis Disease Management Program”. The program included Osteoporosis Clinical Practice Guidelines, physician and allied health care provider education, community education, and a bone density testing program.	• The age-adjusted incidence of hip fractures fell significantly in the entire group of women over 55, as well as in several age strata (65–74, 75–84 and 85 + years)	• USD \$7.8 million (CAD \$9.6 million) in estimated overall reduction in health care costs to Geisinger Health System over 5 years
Solomon et al., 2014 [39] (Boston, US), as reported in Walters et al., 2017	Type A FLS	FLS	<ul style="list-style-type: none"> • 153 fractures (109 hip) prevented per 10,000 patients managed • Quality-adjusted life expectancy increase: 37.4 years per 10,000 patients 	• USD \$66,879 (CAD \$82,261) overall cost-saving per 10,000 patients managed

^a Bolded numbers indicated a negative overall cost, i.e. cost-saving. All CAD amounts were calculated using PPPs as published by the OECD for the year of publication of the study and the jurisdiction indicated (OECD, 2019).

^b Non-hip fractures were not considered for this study.16

remain at the forefront of the decision-making. Patient-centered care is still empowering, and outcomes that address not only treatment outcomes but also patient experience should be incorporated into registries in order to set value to an otherwise mechanistic and labor/resource-intensive dialogue about gathering hip fracture data. In the 2017 annual report issued by the Swedish Registry Programme, the authors noted that there was the patient reported outcome measures (PROM) program in place to capture patient information for those intending on receiving elective surgery for hip arthroplasties [11]. Reminders are issued such that there is a lag in time to have the registrar updated with complete questionnaires.

Conclusions

Registries can be developed in design to align political, organizational drivers with clinical outcome results. For policy makers, Type C models of care that are less intensive seem

most appropriate to expand. These current secondary fracture prevention strategies are easier to scale up in times of fiscal restraint. Type C models tend to showcase smaller cost savings and lower cost-effectiveness compared to the more intensive type A fracture liaison services. The use of patient outcomes based on specific interventions can enhance the dialogue generated from hip fracture or hip device registries. Current gaps exist in collecting the right data to capture patient and provider experience. Acute care hospitals are working to refine the process and identifying the right questions to ask patients about their care, while there is still no evidence around what questions need to be asked to understand provider experience, e.g., how well do providers access all necessary information from the patients digital health record or are there enough staff/resources on hand so they can discharge the patient in a timely manner. Developing registries is warranted, for both clinicians and policy makers, when its value outweighs the cost of collecting high quality data and the benefits, like decision-making, can be drawn from either the items or services in the registries.

Future Directions

Global challenges exist for countries to integrate protocols for hip fracture management into health care services, and governments struggle with finding the right combination of incentivized systems for patients to access the right care at the right time. Evidence from cost-effectiveness studies suggests that implementing fracture liaison services benefits patients as well as systems. Mandating screening and falls prevention remain a simple solution for ministries that seek short term results; however, funding digital health initiatives within primary, long-term, and community care can facilitate overcoming barriers in its uptake. On one hand, Ontario is presently battling dozens of electronic medical records vendors, which makes integrating health information difficult such that it is accessible across chronic conditions and hospital treatment centers. Additionally, the development of registries will challenge current provincial technology budgets and legislation dealing with linked personal health information, but the advantage of these monitoring systems can make poor hospital performers surface and serve as an incentive to treat and manage patients presenting with hip fracture according to standards [47].

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