PERSPECTIVE

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Making the First Fracture the Last Fracture: ASBMR Task Force Report on Secondary Fracture Prevention

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ABSTRACT

Fragility fractures are common, affecting almost one in two older women and one in three older men. Every fragility fracture signals increased risk of future fractures as well as risk of premature mortality. Despite the major health care impact worldwide, currently there are few systems in place to identify and "capture" individuals after a fragility fracture to ensure appropriate assessment and treatment (according to national guidelines) to reduce future fracture risk and adverse health outcomes. The Task Force reviewed the current evidence about different systematic interventional approaches, their logical background, as well as the medical and ethical rationale. This included reviewing the evidence supporting cost-effective interventions and developing a toolkit for reducing secondary fracture incidence. This report presents this evidence for cost-effective interventions versus the human and health care costs associated with the failure to address further fractures. In particular, it summarizes the evidence for various forms of Fracture Liaison Service as the most effective intervention for secondary fracture prevention. It also summarizes the evidence that certain interventions, particularly those based on patient and/or community-focused educational approaches, are consistently, if unexpectedly, ineffective. As an international group, representing 36 countries throughout Asia-Pacific, South America, Europe, and North America, the Task Force reviewed and summarized the international data on barriers encountered in implementing risk-reduction strategies. It presents the ethical imperatives for providing quality of care in osteoporosis management. As part of an implementation strategy, it describes both the quality improvement methods best suited to transforming care and the research questions that remain outstanding. The overarching outcome of the Task Force's work has been the provision of a rational background and the scientific evidence underpinning secondary fracture prevention and stresses the utility of one form or another of a Fracture Liaison Service in achieving those quality outcomes worldwide.
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KEY WORDS: FRACTURE PREVENTION; FRACTURE LIAISON SERVICES; MODELS OF CARE; BARRIERS TO CARE; IMPLEMENTATION RESEARCH

Introduction

The purpose of this report is to provide a logical background, medical and ethical rationale, and toolkit for reducing secondary fracture incidence, particularly hip fractures, and health care costs. It presents the evidence for cost-effective interventions to prevent further fractures in those who suffer fragility fractures. In particular, it summarizes the evidence for

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effective interventions for secondary fracture prevention, and against those that have been shown to be (unexpectedly) ineffective. It also reviews the international data on barriers that have been encountered in implementing these strategies. It discusses the ethical imperatives for providing osteoporosis management, and describes both the quality improvement methods best suited to transforming care and the research questions that remain outstanding.

The First Target Is to Reduce Hip Fracture Incidence by 20% by 2020

Hip fractures have the greatest impact, carry the greatest morbidity and mortality, and are the most costly.[1] Patients who have sustained a hip fracture are the group at highest risk for further fracture and should be prioritized for assessment for initiation of treatment to prevent secondary fractures.[2–4] Contrary to common assumptions, hip fracture patients can benefit greatly from treatment.[5,6] Initiatives to prevent secondary fractures should be offered to all men and women over age 50 years with any fragility fractures, because all fragility fractures such as wrist fractures are often "sentinel" fractures[7–10] that may precede a hip fracture in the cycle in which fracture leads to fracture.[11–14] Non-hip fractures account for about 80% of the clinical fracture burden presenting to any hospital, anywhere in the world[15–17]—a burden affecting younger patients that is also typically neglected as an opportunity for assessment and treatment focused on prevention of secondary fractures.[18,19] In addition, the total morbidity burden of non-hip fractures is actually greater, because such fractures are relatively common and occur in a larger, younger population, and thus represent a greater burden of potential life-years lost.[20,21] Any and all fragility fractures should be investigated as low trauma; ie, if the fracture would not have been *expected* if the same event had happened in a healthy young person.

The daunting burden of fragility fractures expressed in excess morbidity, mortality, and costs is not inevitable. The challenge is to identify the individuals at high risk and apply the demonstrated effective interventions for the purpose of reducing their risk of future fractures, especially hip fractures. We describe the positive impacts of Fracture Liaison Services (FLS)[15,22–26] in local and regional health systems and discourage reliance on other approaches, notably educational strategies, that have been reproducibly ineffective. In particular, high-functioning FLS that aggressively identify and manage patients after a fracture have been successful in raising the unacceptably low current postfracture assessment/treatment rate of 20%[9,18] into the acceptable 80% to 90% range. These have been evaluated and shown to be effective in various jurisdictions.[15,22–29]

This report adds to the growing international calls for improvements in care using coordinator-based systems[24] but adds the international dimension, in addition to European and North American perspectives. This has been achieved through 65 key opinion leaders from 36 countries, in almost all major international jurisdictions, providing their wide range of views and experience on the barriers to implementation. This is particularly important, given that the majority of the global burden of disease during the next four decades is projected to arise in Asia and South America. The contributions of Task Force members from Asia and Latin America support the generalizability and adaptability of the system-based approach on a truly global scale. This new and extensive set of information has not been documented before and, distinct from the International Osteoporosis Foundation's advocacy,[24] provides the "toolkit" resource to support implementation of change. A serious barrier to establishment of an effective FLS is not knowing how to make a business case to secure its funding. The full document (including Supporting Appendix A) provides support to clinical champions throughout the world to make this case successfully. The full-length toolkit provides much detail needed to draft successful business plans at the same time as providing the background information that underpins recognizing and categorizing the specific challenges in individual jurisdictions. This is truly a tool for clinical translation and improved health care implementation.

Ethical Dimensions of Secondary Fracture Prevention

Patients deserve optimal management of their health care, but the fragmentation of many health care services inevitably impedes the ideal. In the case of secondary fracture prevention, the older patient typically presents with the first fracture to an emergency department or an orthopedic surgeon. Those care providers have the skill set to provide acute medical management and repair broken bones. However, there is an additional dimension: the knowledge that a fracture has occurred in someone at risk for low bone mass identifies this person to be at increased risk for future fracture. There is the highest level of evidence that osteoporosis can be medically managed to decrease the probability of future fractures.[30] The data clearly demonstrate that:

- a high proportion of secondary fractures can be prevented by appropriate management[5,31–37];
- an initial fracture in an at-risk person is sufficient grounds to require a full evaluation, including bone mineral density (BMD) measurement and fracture risk assessment, and, unless contraindicated, initiation of treatment for any underlying bone fragility.[7–14]

Long-term management of this chronic illness is ill-suited to the immediate care skill sets of most emergency physicians and orthopedists. The underlying bone fragility and multifactorial increased fracture risk may be managed subsequently by endocrinologists, rheumatologists, geriatricians, internists and other primary care practitioners, physiatrists (rehabilitation physicians), and physical and occupational therapists, usually in collaboration. These providers have the training and together have the opportunity and the patient contact necessary to provide chronic care for a problem that is inadequately addressed by any acute care provider in isolation. The systems-level problem is that too often the acute care providers have neither formal linkages nor established referral patterns to

the patients' osteoporosis and chronic, long-term care providers.[38]

The data are sufficiently compelling to characterize an appropriate referral as an obligation to do the right thing, providing a pathway to the best outcome. This referral must encompass a full evaluation and formal decision for appropriate therapy unless the clinical situation requires otherwise. To do any less certainly falls short of acceptable clinical and ethical standards. The argument of "first do no harm" has been misused in this context to justify allowing this known risk to go without intervention, assessment, or adequate follow-up to reduce the likelihood of further complications or adverse outcomes. It might be argued that, in many cases, neither the orthopedist nor the emergency physician is the ideal person to initiate such investigation and treatment, but that does not absolve them of the responsibility to ensure that the patient or family are fully aware of the risk and to effectively arrange appropriate evaluation and follow-up. Given the two sets of data above, all three categories of care providers—the acute care clinicians managing the index fracture, the care providers evaluating and managing osteoporosis, and the health care system that ought to assure excellence in patient record management and systems of referral—should accept their medical and ethical obligations in this important and treatable condition. We have the evidence, the professionals have the knowledge, but neither the individual clinicians nor the systems are doing enough of what needs to be done to protect at-risk people from further risk. Although responsibility for this harm by omission is vague, it is nonetheless real. Considering the impact of secondary fractures on the quality of life for the older woman or man compels us to ponder the dual obligations to do the right things and to do things right.

At a systems level, when a patient presents with a fracture to the emergency room or to an orthopedist, there should be a care pathway in place to ensure that clinicians evaluate for osteoporosis, future fracture risk, and for the need for treatment for prevention of secondary fractures. In different settings this pathway may be affected by primary or secondary care clinicians. It is distinct from the management of cognitive, affective, and physical functional deficits to optimize recovery. Similarly, if and whenever the patient presents to a primary care physician with a history of fracture, the same appropriate evaluation should automatically be triggered.

Major Barriers to Optimal Fracture Prevention in Fracture Patients

Secondary fracture prevention management is assigned a low priority by primary care physicians, specialists, health administrators, policy makers, and the general public as a result of a lack of awareness of the gravity of this condition and thus a lack of interest. Osteoporosis is still dismissed as a problem linked to aging, rather than an opportunity for treatment to diminish the incidence of future fractures. This translates currently to inadequate commitment to and financing of necessary investigations and treatments. Despite comparable heath impacts to osteoporosis, other noncommunicable diseases, such as diabetes and cardiovascular disease, enjoy higher priority in governmental programs. Prevention campaigns at the national level and effective treatment for all people with a high risk of fractures have lagged behind other conditions.

Better management is severely limited by lack of funding for dedicated FLS personnel to identify patients and follow-up on treatment. In our commonly fragmented systems there is no salary support for such initiatives, causing patients to be discharged without follow-up. In many jurisdictions internationally, there is also limited funding for risk assessment and, more importantly, for long-term pharmaceutical management. Doctors are occupied with, and preoccupied by, primary fracture treatment, and do not dependably make these arrangements. Supporting Appendix B summarizes the barriers identified in a poll of the international members of the Task Force.

Reducing Duplication of Improvement Efforts

There are several initiatives sponsored by the U.S. National Osteoporosis Foundation,[39] the International Osteoporosis Foundation,[40] and national osteoporosis patient societies,[41–44] including the "Capture the Fracture" campaign, the U.S. National Bone Health Alliance,[39] American Society for Bone and Mineral Research,[45] Arbeitsgemeinschaft für Osteosynthesefragen (AO) Foundation,[46] International Society for Fracture Repair,[47] World Health Organization,[48] American Academy of Orthopedic Surgeons,[49] American Orthopedic Association,[50] European Federation of National Associations of Orthopaedics and Traumatology (EFORT), the Bone and Joint Decade,[51] Fragility Fracture Network,[52] and other groups related to osteoporosis prevention, treatment of fragility fractures, secondary prevention, and relevant research and education. Our Task Force suggests that a cooperative approach, and even national central clearinghouses for secondary fracture prevention initiatives, could align and streamline these efforts to prevent waste and duplication, enhance progress, and create solutions.

Key Elements for Success/Initiatives That Work

A number of key elements shared by the growing number of successful and sustained initiatives, that have been published, are:

- Integrated systems with cost-saving incentives to pursue secondary prevention of fragility fractures.
- Reimbursement for "doing the right thing" to prevent second fractures, along with penalties for not doing so.
- Increased awareness of professionals and patients, particularly through respected patient organizations that are independent of industry and can address some of the issues of primary prevention.
- Commitment of the orthopedic community to improved medical care for fragility fracture patients through a multidisciplinary advisory board and educational materials.
- Implementation of an FLS for the medical management of low-trauma fractures carried out by a nurse coordinator or other dedicated personnel working in fracture clinics and on

orthopedic/trauma wards. Their task is to take responsibility for identifying fragility fracture patients, educate them, perform risk assessments, determine indications for treatment according to national guidelines, communicate with the treating physicians to ensure appropriate therapy, facilitate communication between the specialists and the primary care physician, follow up with patients to ensure persistence on care, and gather data to follow the success of the program.
- Recognition of the consequences of hip fracture; ie, medical complications, loss of capacity in activities of daily living, and osteoporosis treatment, by small groups in private hospitals or clinics, sometimes geriatrics clinics, with some participation from orthopedists who are beginning to refer hip fracture patients to geriatricians.
- Improved government awareness and influence, including the lobbying of decision makers by local champions. More active involvement in this lobbying activity by national osteoporosis societies is important and effective. Lobbying by the International Osteoporosis Foundation is also helpful.
- Initiatives on a state/national/political level connect to administrative and political key stakeholders.
- Formulating nationwide guidelines endorsed by key medical specialties and patient organizations.
- Country-specific comprehensive program guides (''Blue Books'') on fragility fractures as an awareness tool for health authorities and health professionals.
- Implementation registry; eg, national hip fracture registries.
- Wide availability of management algorithms, nurse coordination of care, and task management disease registry software.

It is important to consider what has been shown to work reliably in a number of environments. The consistently successful approach is an FLS. These have reduced subsequent fractures in several countries by integrating fracture care with secondary fracture prevention through management of low bone mass and fracture risk. This approach has been adopted recently as national policy in the UK National Health Service.[53] It has been adopted in some integrated Health Maintenance Organizations in the United States,[54,55] in a government-funded province-wide project in Ontario, Canada,[56] and in some centers in Australia[27] with similar reach and effectiveness. The successful FLS programs described in this document and in peer-reviewed publications by those who championed them have shown that reducing fracture events is achievable, and that it depends primarily on redesigning delivery of care to coordinate management across the inpatient-outpatient interface and across provider specialties and over time.

The FLS requires the participation and cooperation of both the orthopedic service that treats the fracture and the clinical services (eg, primary care, gerontology, endocrinology or rheumatology, physiotherapy, rehabilitation) that then actively manage the postfracture patient to reduce the risk of a next fracture. The FLS coordinator is often but not necessarily a nurse who engages with the patient shortly after the fracture occurs and ensures that secondary causes for fracture are assessed, BMD testing is performed as appropriate, and fracture risk assessment performed utilizing a validated tool. Critically, the FLS coordinator ensures that antifracture medication is prescribed (where indicated), together with calcium and vitamin D supplementation (as needed), and provides follow-up to maximize treatment adherence. This individual may provide some or all of this medical care, or may primarily be the connection to the medical practitioner noted above who reviews the laboratory and BMD testing results and prescribes pharmacologic therapy. A major barrier to creation of an effective FLS in most environments is obtaining long-term and stable funding for the services of the FLS coordinator.

The deployment of FLS programs has a dual benefit. They reduce the numbers of subsequent fractures, including the more expensive hip fractures, and reduce health care costs.[23,27,28] There is growing evidence that effective therapy also translates to reductions in premature mortality.[6,57] There is sufficient evidence that broad deployment of FLS strategies would reduce the incidence of hip fractures by 20% or more over several years.

Reaching Consensus to Create an FLS

As noted above, too often health care providers and system administrators operate within local health systems that are failing to provide the necessary care for prevention of secondary fractures in fracture patients. Fragmented, highly variable care, and missed preventive opportunities are the rule. Health financing systems and government health policies commonly also fail to support the development of FLS programs. In particular, a major barrier to creation of an effective FLS in several environments is the will to ''find'' and allocate funding for the services of the FLS coordinator. As a result, the numbers and costs of avoidable fractures escalate, as the aging population grows larger.

Providers and administrators within local health systems need to address five fundamental questions to forge the consensus required to create an FLS:

1. What do we need to do? Provide the care that is published in all clinical practice guidelines for all fragility fracture patients.
2. How should we do it? Build an FLS program using the approaches described by the champions as described in this document and in their original publications.
3. Who should do what? Bring all the local stakeholders together—at least orthopedic surgeons, primary physicians, and osteoporosis consultants—within an integrated system of care and reach agreement on what roles each will fulfill to improve care as a team and not individually. The answers will vary based on provider resources, patterns of care, and the financial environment. Those dedicated to improvement must persist and prevail when predictable objections arise.
4. How should we measure performance and recognize success? A fracture population must be defined, registered, and tracked to provide, document, and continuously improve care. The incidence of new fractures must be monitored in both this registered population and for all new fragility fractures at the system level. A retrospective assessment of secondary fracture prevention care provided to the prior year's fracture population would serve as a

baseline and as a motivating comparator, a "wake-up call" for change.

5. What are the costs of care, how should they be paid, and by whom? These answers will vary from one local system and its financial arrangements to the next, but a key starting point is to ask and answer: "Who will pay for the care coordinators that are essential for educating patients and integrating care across the system?"

Framework and Toolkit

Changing health systems to provide more effective care for secondary fracture prevention in fracture patients is neither easy nor straightforward, but improvement is possible, and the need is compelling. Each FLS has had champions who actively monitor the program's performance and actively determine what is working and what is not working to achieve their process and outcome goals. The goal of this Task Force is to actively assist FLS programs already implemented or about to be implemented to achieve their process and outcomes measures. This can be facilitated by an international network of FLS care managers and champions who will freely share best practices, FLS toolkits, and their experience in problem solving issues that inevitably arise with any FLS during either the implementation or the optimization phases. The Kaiser Healthy Bones Team has already greatly benefited from the free sharing of ideas and toolkits from other FLS care managers and champions. We need to expand on this FLS Network so we all benefit from each other's expertise.

The goal of this Task Force report is to provide a logical framework, rationale, and tool kit to reduce fracture incidence and health care costs, with the first target to reduce hip fracture incidence by 20% by 2020. These items are presented in the online part of this document, which contains sections on the following:

I. Current evidence on the health, social and financial impact of osteoporotic fractures and the failure to capture individuals postfracture for evaluation for intervention:
   - The fragility fracture cycle;
   - Fracture epidemiology and health care costs;
   - Failure to reliably deliver secondary fracture prevention is a costly missed opportunity for patients, payers and politicians.

II. The international osteoporosis community's experience of systems approaches in different health care delivery systems and identification of the common denominators and barriers for successful programs are reviewed:
   - Outcome assessment and the need for standards of reporting.
   - Risk assessment tools.
   - Targets for pharmacological treatment thresholds and focusing pharmacological interventions on those at high risk.
   - International variation in pathways of care.
   - Barriers to secondary fracture prevention—how does one develop systems in countries lacking primary care infrastructure?
   - Reviews of the literature on secondary fracture prevention interventions—descriptive categories of interventions, and characteristics of effective programs that take an "active" and systematic approach to assessment and initiation of treatment as required.
   - The role of education—these "passive" approaches have perhaps surprisingly but consistently not translated to improvements in care worldwide.

III. A successful systems-based approach to secondary fracture prevention:
   - Key steps in the pathway—identification, investigation, and intervention.
   - Determining the scope of service provision.
   - Identification of patients with fractures.
   - Postfracture investigation, including risk assessment with dual-energy X-ray absorptiometry (DXA), vertebral fracture risk assessment, and investigations for secondary causes of low bone mass.
   - Interventions—pharmaceutical treatment, calcium and vitamin D supplementation, education, falls prevention.
   - Successful models of systems-based approaches to postfracture secondary prevention: Glasgow Fracture Liaison Service; Toronto St. Michael's Hospital Osteoporosis Exemplary Care Program; Ontario Osteoporosis Strategy Fracture Clinic Screening Program; and Kaiser Permanente Healthy Bones Project.
   - The FLS—what it can achieve, proven cost-effectiveness and cost savings, and quality of care.
   - FLS design and implementation—identification of stakeholders, the principles of a SIMPLE (Simple in design; Inexpensive to start; Measurable outcomes; Pays for itself; Lasts over time; Evolves with time) delivery system methodology, and active use of the Plan-Do-Study-Act (PDSA) model to aggressively improve their process goals.
   - Factors that contribute to successful outcomes from the FLS.

IV. Development of a unified approach to osteoporosis health care delivery that will have positive impact on secondary fracture preventive care for fragility fracture patients. This approach considers all perspectives, including the "5 Ps": Patients, Physicians, Politicians, Pharmaceutical companies, and third-party Payers. To achieve general buy-in and support of local champions, the following are considered:
   - Prioritization of activity;
   - Development of national consensus;
   - Examples of unified approaches in the United Kingdom, Canada, United States, and Australia;
   - Key steps in the development and implementation of a national consensus on systematic approaches to secondary fracture prevention.

Conclusion

Fragility fractures, including hip fractures, are a major health care problem worldwide. They affect men as well as women. Their

clinical impact is predominantly in those over the age of 50 years and is not confined to the geriatric population in their 80s and beyond. In the current clinical environment of care for the fracture events, providers often neglect the patient's risk for future fractures, and they need to address this risk. Amelioration of this situation will require a concerted worldwide effort, locally, nationally and internationally.

Recommendation for osteoporosis evaluation provided by an orthopedic surgeon after their management of a fracture, and the patient's awareness that fractures lead to further fractures and that treatments are available that can prevent this from happening, would help but are not sufficient. The occurrence of a fragility fracture needs to be linked automatically with provision of postfracture assessment for osteoporosis, future fracture risk, and need for treatment to prevent secondary fractures. However, successful secondary prevention measures depend not only on investigation and initiation of treatment, but on maintenance of treatment—adherence and compliance, which pose additional challenges.

In every environment reported, an FLS is the most effective, perhaps the only effective, tool for such change. This approach creates a continuum of care that overcomes the gaps in postfracture investigation and intervention and the unnecessarily high incidence of subsequent fractures. Implementing such services is required at the site of fracture treatment to link the incident fracture with management of secondary fracture prevention, and to enhance patients' adherence to treatment over time. An international survey has found similar barriers around the world (Supporting Appendix B), and that FLS strategies are effective wherever they have been tried.

A variety of implementation challenges and research issues lie ahead. These begin with health systems adopting continuous improvement methods, eg, PDSA, to monitor and transform delivery in different environments, and sharing their experiences. Longer-term cost-effectiveness studies are also needed to quantify the ''real world'' cost savings achievable through more efficient preventive strategies in those populations demonstrated to be at highest risk.

The continuing thrust of this Task Force is to provide the rational background information and science as well as the tools that will facilitate implementation of effective FLSs worldwide.

Disclosures

See Supporting Appendix C.

The American Society for Bone and Mineral Research (ASBMR) is well served by the fact that many of those responsible for policy development and implementation have diverse interests and are involved in a variety of activities outside the society. The ASBMR protects itself and its reputation by ensuring impartial decision making. Accordingly, the ASBMR requires that all ASBMR officers, councilors, committee chairs, editors-in-chief, associate editors, and certain other appointed representatives disclose any real or apparent conflicts of interest (including investments or positions in companies involved in the bone and mineral metabolism field), as well as any duality of interests (including affiliations, organizational interests, and/or positions held in entities relevant to the bone and mineral metabolism field and/or the American Society for Bone and Mineral Research).

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