Curr Geri Rep (2017) 6:15–19
DOI 10.1007/s13670-017-0197-x

GERIATRIC ORTHOPEDICS (E MEINBERG, SECTION EDITOR)

Geriatric Orthopaedics: a New Paradigm for Management of Older Patients

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Published online: 13 February 2017
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Abstract
Purpose of Review Fragility fractures have become a worldwide epidemic that has necessitated a paradigm shift in how we approach the care for elderly orthopaedic patients. There is a great need for subspecialty trained orthopaedic surgeons to help bridge the gap and help with transition of care in geriatric orthopaedic patients.
Recent Findings Not only are the surgical needs of elderly patients different than younger patients but often the complexity of co-morbidities and bio-psychosocial needs are important considerations for patient care and outcomes.
Summary Geriatric orthopaedic fellowship training is a crucial paradigm shift to provide the most efficient, safe, supportive, and cost-effective musculoskeletal healthcare for elderly patients.

Keywords Geriatric orthopaedics · Fragility fracture · Orthopaedic fellowship training · Bone health · Osteoporosis

Background on Need of Subspecialty Training of Orthopaedic Surgeons

Fractures in the elderly population can lead to profound morbidity, mortality, and social and financial consequences for patients. While orthopaedics has a large subspecialty base including hand, spine, sports medicine, trauma, musculoskeletal oncology, foot and ankle, pediatrics, and shoulder and elbow, the current approach to geriatric orthopaedics is relatively generalized. In 2003, over 51% of orthopaedic surgery work was in people 65 years of age or older [1]. Population demographics are shifting in the USA, with 43 million people age 65 or older in the USA projected to nearly double to 84 million by 2050 [2, 3]. The total number of orthopaedic cases in the elderly has increased dramatically over the past decade, which dictates the need for a paradigm shift in our approach to orthopaedic care for elderly patients.

In response to the growing elderly population and concomitant increase in fragility fractures, the American Orthopaedic Association created the "Own the Bone" program to encourage hospitals and medical centers to identify, evaluate, and treat fragility fracture patients over the age of 50 years for osteoporosis. The "Own the Bone" program's goal to change physician and patient behavior to reduce incidence of future fractures and the impact of osteoporosis is one important step in addressing the unique musculoskeletal needs in older patients [4]. However, the time sequential deterioration in strength, mobility, and agility with increased susceptibility to disease and injury associated with aging is an important concept to acknowledge in the medical treatment of patients. In particular, older individuals have a decreased ability to respond to physiologic stress and often multiple morbidities that make treatment and recovery from illness or injury more challenging than in the younger patient. Coincident with the biological aging process, the bio-psychosocial needs of the older patients are often different than younger patients and the outcome expectations following injury and disease may often have to be tempered from thoughts of "cure" to thoughts of disease management, maintaining quality of life, and meeting goals of care [5].

This article is part of the Topical Collection on *Geriatric Orthopedics*

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Despite improvements in surgical techniques and medical management of co-morbidities such as osteoporosis through concepts like "Own the Bone," up to 50% of fragility fracture patients show substantial decline in activities of daily living compared to pre-injury status, and have a 15–30% risk of mortality within 1 year after fracture. It is paramount that our orthopaedic specialty leads the way in determining how to provide the most efficient, effective, safe, and supportive musculoskeletal healthcare possible for older patients, while continuing to focus on minimizing healthcare system costs. This calls for a paradigm shift in the current practice of orthopaedic medicine in older patients [6•]. As awareness of the complex musculoskeletal needs of the aging patient continues to grow, it is time that the field of orthopaedics follows in the footsteps of other specialties such as internal medicine, neurology, psychiatry, nephrology, oncology, dermatology, and emergency medicine, to create a subspecialty of geriatric orthopaedics designed to address the unique needs of the aging population. This report will outline the motivation and an innovative approach to creating fellowship training for orthopaedic surgeons in order to create, promote, and evolve the field of Geriatric Orthopaedics.

Geriatric Orthopaedics

The field of orthopaedics aims to promote health by preventing and treating diseases and disabilities associated with the musculoskeletal system. Within this framework, the impairments that orthopaedic surgeons often address are related to mobility and function. Musculoskeletal changes associated with aging include decreased muscle mass and strength, decreased bone density, loss of skeletal height, joint pain and stiffness, increased fracture risk, and alterations in gait, balance, and posture [5]. Combined with sensory losses in visual acuity, depth perception, hearing acuity, and proprioception, the aging population is at high risk for falls and subsequent injury with high morbidity and mortality [7•]. Approach to an elderly patient often necessitates special attention to these impairments and it is imperative that we develop a more elder-oriented orthopaedic approach for best practices in the geriatric population.

Geriatric Fellowship Goals

Orthopaedic specialty training that enriches and promotes the understanding of palliative care, multi-morbidity, frailty, and general geriatric competencies helps to ensure optimized care for older patients. Orthopaedic residencies prepare surgeons to perform fracture care in a variety of settings. However, it is challenging to incorporate extensive training in bone health and wellness into the current model of training. Instead, focused apprenticeship that allows for a deep dive into the health, wellness, and medical competencies necessary to provide optimal care of older patients could potentially positively impact the morbidity and mortality of geriatric orthopaedic patients.

Goals of specialty training in geriatric orthopaedics include exposure to and participation in the evidence-based clinical care of elder fracture and trauma patients. It emphasizes comprehensive care of elderly orthopaedic patients in the hospital, clinic, and nursing facilities. In particular, fellows should develop an understanding of the entire course of care for the elderly patient from pre-hospital care, hospitalization, and post-hospitalization care. Both prevention and intervention are key components for fracture care in the elderly patient. At the completion of fellowship, it is expected that the fellow has mastery of key concepts and principles in the basic sciences and clinical disciplines in areas of geriatric trauma and elder fracture care. In addition, the fellow is expected to master surgical skills necessary for the management of complex fractures in the elderly, periprosthetic fractures and arthroplasty in the geriatric fracture population. Key components of geriatric orthopaedic fellowship training are to obtain the necessary knowledge base to create and manage a comprehensive geriatric fracture program with focused care concepts in bone metabolism, perioperative care, rheumatology, and palliative care and provide community medical education related to best practices in geriatric orthopaedic care and fracture prevention methods.

Interdisciplinary Team Exposure

Important considerations while treating older orthopaedic patients include iADLs and ADLs (independent activities of daily living and activity of daily living), frailty, expected outcomes versus optimal outcomes, pre-injury or baseline functional status, quality of life, and social support. Several "geriatric giants" of impairment that appear in the elderly have been established including immobility, instability, incontinence, and impaired memory/intellect [5]. These often lead to a loss of independence, higher risk for falls, and increased frailty. Optimal care of the older orthopaedic patient depends on a well-coordinated, collaborative team of experts along the entire continuum of care.

Coordination and cooperation among a large interdisciplinary team is critical to the care of older patients, particularly in the setting of acute orthopaedic injury. Transition of care of an older patient is critical to outcomes and may be a time of particular vulnerability to older fracture patients [8]. Interdisciplinary care is an important part of care for older patients, and fellowship training in geriatric orthopaedics necessitates a broad appreciation for the collaborative benefits of many different disciplines (Fig. 1). Exposure to palliative care,

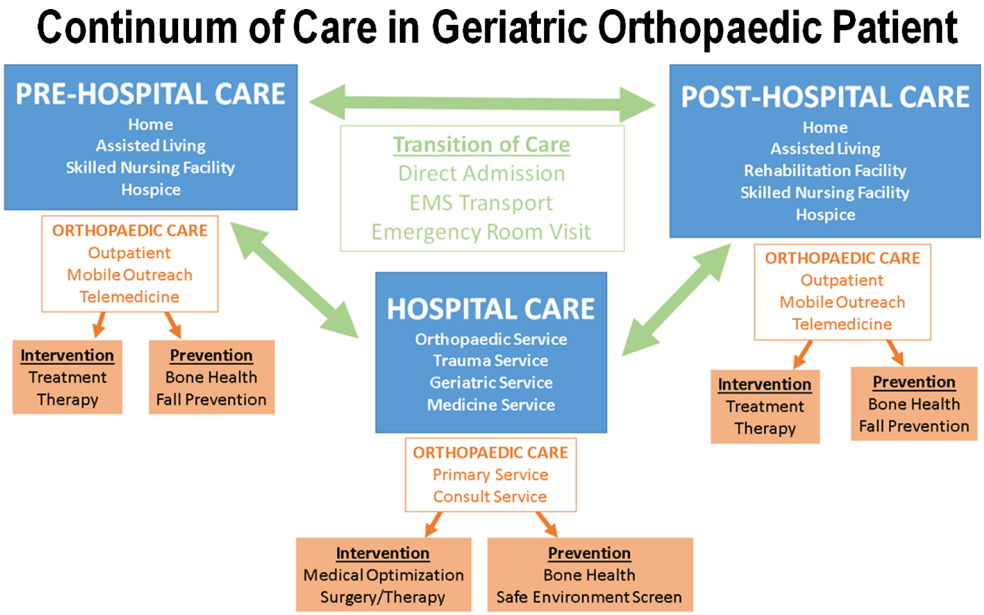

Fig. 1 Diagram of the continuum of care in geriatric orthopaedic patients

hospitalists, geriatricians, physical therapists, anesthesiologists, case managers, and emergency physician strategies for care of elderly patients enhances an orthopaedic surgeons understanding of optimized care for older patients. In fellowship training, the orthopaedic fellow should engage with many of the other specialties and learn about CMS, Medicare requirements, and postacute care facilities.

Mobile Outreach

With over 70% of people over the age of 65 requiring long-term assisted living or nursing home healthcare, this has substantial societal and financial consequences [9]. It is imperative that we transform our current healthcare practices to accommodate this dramatic shift in demographics and provide the best healthcare possible to allow for the "baby boomer" generation to preserve functional independence and a high quality of life. Despite the societal concerns for the barriers to healthcare for the older population, the question still remains—how will we transform health care practices to overcome the barriers to provide efficient, effective, safe, and supportive healthcare for older patients while continuing to focus on minimizing healthcare system costs?

There are many barriers to healthcare for older patients, not only for patients but also for their family members and caregivers out in the community. Travel to physician visits and emergency departments for health care and follow-up visits can be a significant disruption to patient's environment, lead to delirium, missed medication doses, and significant financial costs for transportation or dependence on family members for communication/cognitive needs. At the same time, helping transport or attend clinic visits with older family members helps facilitate patient care and communication but can lead to significant loss of time at work and financial hardships for family members. Often, transportation barriers or inability to attend clinic visits due to transportation or physician availability leads to unnecessary emergency department visits and even readmissions to the hospital due to complex care needs. Under current Medicare guidelines, a hospital stay of 3 days may be required in order to get a patient into a skilled nursing facility to provide supervised care, even if the patient was sent from a skilled nursing facility for evaluation of a non-urgent issue. Utilization of emerging technologies in telemedicine and capitalizing on the specialty expertise and training for advanced practice providers could help overcome many barriers to orthopaedic care for older patients. Mobile outreach could provide a unique bridge to older patients in society by providing efficient, effective specialty orthopaedic care and research with the potential to transform the way we practice musculoskeletal care for older patients.

In order to build and maintain a successful outreach practice, strategic planning, business acumen, and specialty advanced practice provider training is necessary. Geriatric orthopaedic surgeons could be uniquely positioned to help organize and lead mobile outreach and telemedicine clinics for musculoskeletal care. Bringing care to the patient instead of the patient coming to the provider may help alleviate many of the barriers to caring for older patients both for acute trauma such as fractures and for more chronic care such as osteoarthritis management. It also offers a tremendous opportunity for education and easier communication among care providers and family members. Fellowship-trained geriatric orthopaedic surgeons may be pivotal to help bring this type of treatment paradigm to the forefront of musculoskeletal care in elderly patients.

Bone Health Clinic

Metabolic bone changes occur with aging, including decreased bone mass and loss of biomechanical strength which leads to osteopenia and osteoporosis. The loss of the bone's ability to resist fracture as individuals age places older individuals at high risk for low-energy fractures that occur when a patient falls from standing height or low heights (fragility fracture) [10]. Osteopenia and osteoporosis is often unnoticed and untreated in people over the age of 65 until after fracture [11]. Over 1.5 million fragility fractures occur in the USA annually, with up to 50% of women and 30% of men over the age of 50 sustaining fractures in the remainder of their lifetime [12, 13]. Prior fragility fracture, fear of falling, and decline in mobility, coordination, balance, and strength are some of the strongest predictors for future fragility fracture. Estimated annual costs in the USA for fragility fractures are over 17 billion dollars. The risk of second fragility fracture is significantly higher than the risk for initial fracture [14, 15]. Over 50% of patients with fragility hip fracture may fall at least once in the year after hip fracture and nearly 30% may experience recurrent falls. These subsequent falls place them at high risk for a second fracture [16–19]. Orthopaedic follow-up after a first fragility fracture may offer a chance for meaningful education and intervention for osteoporosis and fall prevention.

As part of the "Own the Bone" program through the American Orthopaedic Association, orthopaedic surgeons are encouraged to help design and manage fracture liaison services. This has led to a significant increase in interest and in education of musculoskeletal health care providers to help manage osteoporosis. Screening labs such as calcium, vitamin D levels, and DEXA screens can help establish fracture risk and provide data to the patient to encourage bone health initiatives. Post injury care visits offer an opportune time to discuss fall prevention strategies, vitamin D and calcium supplementations, encourage weight-bearing exercises, poly-pharmacy discussions, and possible initiation of osteoporosis medications.

Fractures may trigger inspiration and motivation for prevention of future injury in the early setting of fracture care. However, this can be a time commitment and additional education that may not be feasible in a busy surgical practice. In addition, many orthopaedic surgeons may not feel comfortable prescribing osteoporotic medications and although primary care providers and endocrinologists are often motivated to help intervene for bone health, the timing of initiation of screening and therapy may miss the a window of opportunity where the patient may be most likely to feel motivated for improved bone health due to transportation to clinic visits, mobility challenges in the setting of acute fracture [6•]. Despite the availability and well-established literature demonstrating the effectiveness of bisphosphonates, teripartide, and other osteoporotic medications to prevent fragility fracture, the prescribing and actual compliance of medication use in fragility fracture patients is low [7•]. Geriatric orthopaedic surgeons may be able to have meaningful impact in the early fracture period by supervising and mentoring advanced practice providers to deliver bone health education in the early fracture time period.

Surgical Experience

Operative treatment in older orthopaedic patients requires a well-coordinated team of experts to optimize the patient for early operative care and minimize unnecessary tests and consultations that may increase costs and lead to delays in surgery [7•]. The time to surgery, particularly in hip fractures, affects the morbidity and mortality for the patient [20, 21]. Everything along the continuum of care from pre-hospital transportation to medical clearance, perioperative care, post-operative hospitalization, and post acute care is pivotal for the outcome of the older patient. Details regarding this are beyond the scope of this proposal; however, the geriatric orthopaedist should have broad knowledge of these optimal treatment guidelines.

Osteoporosis in older patients is also an important consideration for surgical care. The microarchitecture and decreased bone mass associated with osteoporosis decreases fracture healing potential and makes implant fixation difficult. As the structural integrity of the bone is compromised, the ability for implants to "fix" into bone requires different techniques and technology than fracture care for younger patients. Geriatric orthopaedic surgeons need to have training about fixation techniques for fragility fractures such as implant choice, avoidance of multiple drill holes, and careful consideration of stress risers in high-risk regions of bone that may lead to hardware failure or subsequent periprosthetic fractures. Implant techniques such as locked plating technology, dual plating, far cortical locking screws, and bone augmentation with cement, allograft bone, autograft bone, and bone substitutes play an important role in treatment of osteoporotic bone [22, 23•, 24]. Intraoperative changes in plan may be necessary if initial fixation techniques do not provide the stability necessary for the fracture to heal due to fracture comminution or poor bone quality [25]. In addition, meticulous soft tissue handling, wound closure, and prevention of wound breakdown are important for surgical care in older patients. Dedicated fellowship surgical training techniques are important to help with treatment and perhaps even advance current implant and fixation technologies.

Conclusion

Elderly patients require a unique approach to orthopaedic care that accounts for the complex musculoskeletal needs of the

patient. The bio-psychosocial needs often need to be considered in treatment strategies as well as for prevention strategies to prevent future fragility fractures. Geriatric orthopaedic fellowship training is a necessary paradigm shift to provide the most efficient, effective, safe, supportive, and cost-effective musculoskeletal healthcare possible for older patients.

Compliance with Ethical Standards

Conflict of Interest Julie Switzer reports grants from Stryker, outside the submitted work. Carmen Quatman declares no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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