

## Injury Due to Mechanical Falls: Future Directions in Gender-specific Surveillance, Screening, and Interventions in Emergency Department Patients.

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## Injury Due to Mechanical Falls: Future Directions in Gender-Specific Surveillance, Screening, and Interventions in Emergency Department Patients

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### Abstract

The Centers for Disease Control and Prevention report that among older adults ( > 65 years), falls are the leading cause of injury-related death. Fall-related fractures among older women are more than twice as frequent as those for men. Gender-specific evidence-based fall prevention strategy and intervention studies that show improved patient-centered outcomes are elusive. There is a paucity of emergency medicine literature on the topic. As part of the 2014 *Academic Emergency Medicine* consensus conference on “Gender-Specific Research in Emergency Care: Investigate, Understand and Translate How Gender Affects Patient Outcomes,” a breakout group convened to generate a research agenda on priority questions to be answered on this topic. The consensus-based priority research agenda is presented in this article.

### Introduction

This article is a product of a breakout session on injury prevention from the 2014 *Academic Emergency Medicine (AEM)* consensus conference on “Gender-Specific Research in Emergency Care: Investigate, Understand and Translate How Gender Affects Patient Outcomes.” During the breakout session on trauma and injury, the group acknowledged that injury is a multifaceted and complex topic. Therefore, the group limited this portion of our

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session's research agenda focus to the sex and gender aspects of geriatric mechanical falls as they relate to emergency medicine-based screening, surveillance, and interventions.

## Background

More than one-third of patients 65 years of age or older fall each year, and in half of such cases the falls are recurrent.<sup>1-4</sup> In 2010, 2.3 million nonfatal fall injuries among older adults were treated in emergency departments (EDs), and more than 662,000 (29%) of these patients were hospitalized.<sup>5</sup> Women live longer than men and virtually all countries have more older women than men, with current trends indicating that older women will be disproportionately affected by fall-related injuries.<sup>6</sup> Yet, men are more likely than women to die from falls;<sup>4</sup> controlling for age, the death rate attributed to falls in 2009 was 34% higher for men than for women.<sup>4</sup>

When women fall, they more often survive, but at the expense of sustaining injury: in 2009, women were 58% more likely than men to suffer nonfatal fall injuries.<sup>7</sup> Older women who fall have twice the fall-related fracture rate of older men.<sup>6,8</sup> Women who fall are 1.8 times as likely to be hospitalized as men.<sup>6</sup> Over 95% of hip fractures are fall-related.<sup>7</sup> In 2009, of the 271,000 reported hip fractures, the rate for women was almost three times the rate for men.<sup>9</sup> Hip fractures are the most serious and costly fall-related fractures.<sup>10</sup> Women are also more likely to fall again.<sup>11</sup> Even non-injurious falls often signal the beginning of a downward spiral of fear leading to inactivity, which in turn, leads to decreased strength and accompanying deterioration of balance. All combined, these factors can result in a loss of independence in performing normal daily activities.<sup>12</sup>

The U.S. census projects a doubling of the population of elders, age 65 years and older, between 2012 and 2060, from 43.1 million to 92.0 million.<sup>13</sup> As the U.S. population ages, fall-related injuries will increase,<sup>14,15</sup> and these injuries will be associated with significant morbidity from reduced mobility, decreased functioning, and loss of independence.<sup>16</sup> In 1994, the total cost of fall-related injuries among adults 65 years and older was \$27.3 billion, and by 2020 the cost is expected to reach \$54.9 billion (in 2007 dollars).<sup>17</sup>

In an effort to address these disturbing statistics, a large number of randomized controlled trials (RCTs) and quasi-randomized trials have investigated the efficacy of a number of different intervention strategies aimed at improving balance and reducing fall incidence rates among older adults.<sup>18-22</sup> However, emergency medicine (EM) specialty-specific intervention trials are uncommon, and gender-specific, stratified intervention trials are nonexistent. Because the burden of recurrent falls is significant, fall reduction becomes relevant to all emergency physicians, regardless of their level of interest. The issue has become compelling from a preventive health perspective. Our full role in the surveillance, screening, and intervention aspects of this public health dilemma is yet to be determined. In the consensus conference process, we prioritized the important and relevant research questions in this domain specifically for EM.

## Method of Consensus Process

This article presents the results of the breakout session related to sex- and gender-specific research in the ED focused on trauma and injury, with specific attention to the domain of mechanical falls, at the 2014 *AEM* consensus conference. The standardized modified nominal group technique (NGT) described in the executive summary<sup>23</sup> was facilitated by an electronic polling system. The 31 initial questions posed by the nine-member workgroup (Data Supplement 1) were ranked by the workgroup participants on a four-option Likert scale from 1-not very important to 4-very important. Those questions with a mean of 3.0 or greater were put forth on the SAEM website for further ranking and open-ended feedback from registrants and stakeholders. Responses were gathered and the mean score of each question from this online iteration was displayed to the consensus attendees during their onsite voting session. Thirty-nine consensus attendees (list available in the front matter) participated in the trauma breakout group and prioritized the proposed agenda using the Poll Everywhere voting method.

### Consensus Research Agenda for Injury Due to Mechanical Falls: Surveillance, Screening, and Interventions in the ED

**Surveillance**—More than 70% of injury-related ED visits among persons age 65 years and older in 2010 were related to falls.<sup>22</sup> Falls continue to be the number one cause of geriatric trauma and have an increasing fatality rate.<sup>24</sup> Surpassing traffic crashes, falls suffered by seniors are both the leading cause of spinal cord injury in the United States and have a trend of rising incidence.<sup>25</sup> A Centers for Disease Control and Prevention (CDC) report showed that during the 10-year period of 1993 to 2003, fatality rates for geriatric falls increased 45.3% for men and 59.5% for women respectively.<sup>26</sup>

The changing incidence of fractures seems debatable and the disparity may be in the geographical region or time period studied. Fractures are reported as increasing in Scotland. In one study, the incidence of fractures increased 50% in approximately the last 50 years, although the increase in males was only 5%, compared with 85% in females.<sup>27</sup> Conflicting reports in Ontario and Finland suggest that the incidence of fractures has declined in each studied age group,<sup>28,29</sup> potentially due to increased recognition and treatment of osteoporosis, although the absolute number of fractures continues to rise as the number of elderly persons rises.

As described, men are more likely to die from falls.<sup>4</sup> It is unknown if sex-specific bedside treatment and resuscitation for mechanical fall victims could improve geriatric patient outcomes (for example, which sex is more likely to be hypothermic, or experience traumatic brain injury [TBI], or suffer multiple rib fractures and need intubation, or are there differences in how fluid resuscitation affects secondary congestive heart failure by sex). The effect of EM providers' choice of admitting service has not been analyzed by sex, but it has been suggested that using a geriatric fracture service improves outcomes.<sup>30-32</sup>

### Consensus Prioritized Surveillance Research Questions

- What differences exist in sex-specific geriatric trauma care for injuries sustained from mechanical falls that could improve clinically significant patient outcome measures?
- Does ED decision of admitting service (orthopedic, trauma, hospitalist) affect the morbidity or mortality of those who fall?
- Is there any component of ED care that influences why men are more likely to die from falls?

**Screening**—The use of a quick, reliable, and valid fall risk screening tool to identify high-risk patients and trigger further fall-related assessments and interventions is important to any clinical environment. However, in the ED setting, the assessment must be easy enough to administer that it will not burden acutely ill patients. ED setting fall screening and risk assessment has not been extensively studied, and certainly not with gender as a priority. There have been risk assessments that focus on individual risk factors such as screening for inappropriate medication use in the elderly,<sup>33</sup> or screening tools that assess multiple risks simultaneously. An analytical review of 21 fall screening tools<sup>34</sup> suggested that only two nursing assessments<sup>35,36</sup> had both the sensitivity and specificity above the median (81% and 75% respectively) to be considered useful. However, five of the 21 assessment tools had sensitivity and specificity both greater than 70%.<sup>35-39</sup> Of these five tools, only two described how long it takes to complete (less than 1 minute), and only one has been replicated in publications by other investigators.<sup>40</sup> All of these nursing fall risk assessments are significantly dated, have not had sex-specific analyses, and are not established as useful in the ED setting.

It is also not clear whether more accurate sex-specific screening for fall risk can be done in the ED with a physical function instrument (e.g. timed “Up and Go” test),<sup>41</sup> or with psychological tests (for example, versions of the Falls Efficacy Scale).<sup>42-44</sup> Probably the most widely distributed and recent screening tool and information has been provided by the CDC and delivered under the auspices of their Stopping Elderly Accidents, Deaths, and Injuries (STeADI) program that includes a tool kit for providers.<sup>45</sup> This tool kit, which has an algorithm for identifying a patient at risk, begins with three risk screens: 1) has the patient fallen in the past year, 2) does the patient worry about falling, or 3) has the patient admitted that he or she feels unsteady while standing or walking? Unfortunately the algorithm subsequently becomes very complex for risk assessment and intervention limiting the ED practicality, nor is it sex-specific.

In summary, the literature reveals that fall risks exist in several domains, and that there are numerous instruments from which the clinician might choose to screen and assess fall risks.<sup>34</sup> However, none of these have confidently been demonstrated to be ED-appropriate, and none of them are sex-specific. Of those described, it would seem prudent that the most relevant and contextually appropriate tools be adapted to the ED setting by those understanding its unique work flow and time and personnel limitations.

### Consensus Prioritized Screening Research Questions

- Should screening for fall risk be applied universally in the ED, or should it be applied to specific population groups? (i.e., age/sex/live alone—gradation of vulnerability)
- What is the most feasible falls-risk tool for men and women in the ED setting?

**Intervention**—Risk factors for falls can be categorized as modifiable and nonmodifiable, extrinsic and intrinsic (see Table 1); such classifications have led to individual and comprehensive risk assessment and intervention methodologies.<sup>46-48</sup> The CDC recommends providers first focus on these modifiable risk factors: lower body weakness, difficulties with gait and balance, use of psychoactive medications, postural dizziness, poor vision, problems with feet and/or shoes, and home hazards.<sup>45</sup> Studied interventions include stand-alone strategies (e.g., comprehensive fall risk assessments with or without follow-up, exercise, medication management, fall-risk education and behavior change, home hazard reduction) or multifactorial interventions that include modification of two or more different strategies.<sup>49</sup> Isolated specialty-specific intervention manuscripts are rare, but a 2012 Cochrane Review<sup>18</sup> recommended some interventions that are ‘likely to be helpful’ and may be considered in the context of EM:

- Multifactorial interventions that include individual risk assessment, resulted in a reduced rate of falls.
- Home safety assessment and modification interventions were effective in reducing the rate of falls. These interventions were more effective in people at higher risk of falling, including those with severe visual impairment.
- Group and home-based exercise programs reduced both the rate of falls and risk of falling.
- Gradual withdrawal of psychotropic medication also reduced rate of falls.

It is possible that these interventions or types of referrals could be modified such that they would be effective in the ED setting. Moreover, each of these more general interventions begs the question of whether each sex has the same degree of benefit, or should geriatric fall prevention be tailored for the sexes.

Certainly the effect of insurance coverage and the cost of services cannot be underestimated in the assessment of intervention choices that would be ideal for the ED. Of all of these potential opportunities, it is unknown if intervention(s) were sex-specific, which would be the most realistic and well-received by staff and patients, and most effective in the ED setting.

### Consensus Prioritized Intervention Questions

- Does medication reconciliation in the ED setting decrease fall risk differently in men and women?
- What sex-specific ED based interventions are the most effective at prevention of future falls in the never-fallen?

- What sex-specific ED-based interventions are the most effective at preventing recurrent falls?

## Limitations of The Process

There was strong agreement to prioritize the eight questions put forth in this research agenda throughout the iteration process. In fact, with each iteration the ranking of these questions went up. At the conference itself, the concurrent session may have created a selection bias amongst the audience in the consensus breakout groups. In addition, the confines of the schedule meant that open communication and discussion on the day of the conference was limited to a brief time period. Questions and other areas of research on this topic that numerous attendees put forth as important to the agenda did not have adequate time for full discussion and further ranking. The open feedback comments provided were qualitatively grouped and are presented in Table 2.

It should be noted that the instructions for voting were to prioritize based on the importance to the bedside EM clinician. Therefore, some research questions that would be very important to general community members or basic scientists did not receive priority.

## Conclusions

The eight surveillance, screening, and intervention questions put forth from this consensus process should be prioritized as a sex- and gender-specific research agenda in the domain of mechanical falls. Additionally important areas as they relate to falls that merit attention by researchers and funders are in the themes of emergency medical services, substance abuse, family violence, and the concept of frailty.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**Risk Factor Categorization**

**Table 1**

<b>Factors</b>	<b>Intrinsic Risk Factors</b>	<b>Extrinsic Risk Factors</b>
Nonmodifiable factors	Age Sex Race Chronic disease: physical Chronic disease: psychological	
Modifiable factors	Acute illness Incontinence History of falls Gait & mobility impairment Visual/sensory deficits Fear of falling	Medications/side effects Home hazards (ex. handrails, grab bars, tripping hazards, lighting) Footwear Improper use of assistive device

**Table 2**  
**Responses from the breakout group audience regarding what other areas (or questions) should be considered important parts of the research agenda for gender-based mechanical falls research**

Emergency Medical Services	<ul style="list-style-type: none"> <li>• How does EMS care and gender of the provider and fall victim interact with outcomes?</li> <li>• Can EMS involvement in falls prevention (and frailty screening) prevent recurrent ED visits?</li> <li>• Is there a role for EMS in screening patients in their homes for falls and when transporting home patients for non-fall-related ED visits and specifically does it prevent hospital visits?</li> <li>• Can EMS lift assist calls be an opportunity for fall prevention and intervention?</li> </ul>
Substance Use	<ul style="list-style-type: none"> <li>• How does alcohol use vary by gender in the fall victim?</li> <li>• Are the NIAAA recommendations safe enough when considering the interaction between alcohol and the elderly who fall?</li> <li>• What relationship exists between legal and illicit drugs and gender-based falls?</li> </ul>
Violence	<ul style="list-style-type: none"> <li>• What is the relationship between physical abuse and the fall victim? Does it vary by gender?</li> <li>• Should the issue of gender-based violence and how it interacts with elderly falls be explored?</li> </ul>
Frailty	<ul style="list-style-type: none"> <li>• Do organ systems age at varying patient ages, and does this aging vary by sex?</li> <li>• Are there gender differences in frailty that affect falls, and how can frailty be identified in the ED?</li> <li>• Is being elderly best estimated by age or a measure of physiological health (best stated as frailty)? Does frailty occur at a similar age or onset for each sex?</li> </ul>
Miscellaneous	<ul style="list-style-type: none"> <li>• Does it improve crowding to screen for falls?</li> <li>• Does screening for falls in the ED save money?</li> <li>• Would fall prevention be implemented better in outpatient offices or inpatient settings than in the ED?</li> <li>• Is there value of a social worker screening and intervention in the ED setting for fall victims?</li> <li>• Does gender of the home care provider or support individual influence outcomes after fall?</li> <li>• What technologies can be developed to reduce falls and provide accurate data on falls?</li> <li>• Is there a way to link elder resource groups to home visits that include safety evaluation?</li> <li>• Can extended care facilities have response teams trained to prevent unnecessary ED visits for post fall injury assessment?</li> </ul>