Overview

To initiate our accelerated effort to develop targeted funding announcements, PCORI staff reviewed existing research from multiple sources to identify gaps in comparative effectiveness research (CER), obtaining 488 topics and questions. We reviewed and ranked these topics, applying balancing criteria, and presented 11 topics to PCORI’s Program Development Committee for approval. In December 2012, PCORI’s Board of Governors approved the topic of treatment options to prevent injuries from falls in the elderly as one of five topics for potential development into a PCORI Funding Announcement.

On March 12, 2013, PCORI convened an ad hoc workgroup meeting in Washington, DC, to gain a multifaceted perspective on high-priority research topics, identify critical gaps in research, and distinguish research topics with the potential to produce long-lasting, high-impact results. The ad hoc workgroup included patients, researchers, stakeholders, and other webinar guests. Public comment was welcomed prior to, during, and after this meeting. To identify research gaps and questions in this topic area, the workgroup focused on the factors contributing to falls injuries, patient-centered outcomes, and methodology.

The workgroup identified five “top-tier” research topics and related research questions. These topics are: medication management, addressing balance defects, information technology, diagnostic checklists, and preventive programs. The related research questions are shown in Table 3.

On May 6, 2013, these topics were presented to PCORI’s Board of Governors. The board approved the development of a funding announcement addressing preventing injuries from falls in the elderly.

“Falls are the leading cause of fatal and nonfatal injuries among older adults. With the aging demographics, estimates have projected that direct medical costs for fatal and nonfatal fall-related injuries could reach $55 billion by 2020.”

—Jack M. Guralnik, Researcher
Background

PCORI is interested in identifying research questions that evaluate important choices faced by patients and that have a good chance of providing evidence that can reduce uncertainty, support decision making, change practice, and improve patients’ health outcomes. PCORI views these gaps in the evidence base on strategies for preventing injuries from falls in the elderly as an area where we can contribute to improving health outcomes.

The United States has both social and economic implications associated with its aging population. People are not only living longer; they are also seeking to maintain their living independence. In the elderly population, the occurrence of a fall may reduce their quality of life by threatening or taking away their independence. To date, there are no widely used guidelines nor documented evidence-based best practices to treat, respond to, and prevent patient falls. Although the elimination of any falls is unlikely, there is research that shows promise in identifying the risks associated with injurious and recurrent falls. The financial, physiological, and psychological effects of falls in the elderly are far-reaching. Strategically, the field of fall prevention research can be advanced by the inclusion of research that is evidence-based; leverages the use of technology; improves on current performance indicators and assessments; and evaluates new approaches to therapy, including exercise, nutrition, and pharmacology interventions. For additional information, please see Opportunity Snapshot: Preventing Injuries from Falls in the Elderly.¹

In December 2012, PCORI’s Board of Governors approved the topic of preventing injuries from falls among the elderly as one of five topics for potential development into PCORI Funding Announcements. To learn more about the process followed to select these topics, see Summary of Accelerated Process to Generate Targeted PCORI Funding Announcements.²

PCORI identified three research areas of interest as areas of potential research funding, shown in Table 1, and invited the public to submit comments and research questions related to these topics. See Table 2 for a full list of questions submitted by the public.

PCORI convened an ad hoc workgroup to help identify research gaps and questions in this topic area. The workgroup participants represented diverse perspectives, including researchers, patients, other stakeholders, and PCORI science and engagement staff. See a list of participants and detailed biographies.³ For more on the workgroup selection process, see Methodology for Selecting Workgroup Members for Preventing Injuries from Falls in the Elderly.⁴ The workgroup met on March 12, 2013, in Washington, DC. Public comments were welcomed before, during, and after the meeting.

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¹ Available at pcori.org/funding-opportunities/funding-announcements/preventing-injuries-from-falls-in-the-elderly/#snapshot
² Available at pcori.org/assets/PCORI-Accelerated-Process-to-Generate-Targeted-Funding-Announcements.pdf
⁴ Available at www.pcori.org/assets/PCORI-Accelerated-PFA-Methodology-Workgroup-Preventing-Injuries-From-Falls-in-Elderly.pdf
Meeting Summary

Research Presentations

During the meeting, topic experts presented current research and perspectives on research opportunities. These are summarized below and available here.  

- **“A Standardized Assessment and Intervention to Prevent Recurrent Falls”** Lewis Lipsitz, MD, Professor, Harvard Medical School; Director, Institute for Aging Research, Hebrew SeniorLife

  When patients visit the emergency department (ED) after a fall, the health providers tend to conduct a visible inspection for sustained injuries and assess their vital signs; however, additional assessments should be included to determine reasons why the fall occurred. Additional assessments include: (1) examining patients for gait or mobility issues while walking; (2) conducting visual tests and eye exams to determine likelihood of future falls; (3) checking for hypotension; and (4) ensuring physicians are diagnosing injuries from the actual fall versus another diagnosis, since falls are typically multifactorial. The implementation of an intervention checklist in the ED was also suggested to assess fall risk factors, such as patient medications, blood pressure, methods to respond to problems found, and referral information to direct patients to the appropriate care-providers for follow-up. As a supplement to fall prevention research, the healthcare industry could leverage detection methods, including electronic feedback devices; products such as the Philips Lifeline device; postcard diaries; monthly telephone calls; post-fall interviews; self-management; and patient-centered tool kits to detect, monitor, and prevent falls. Patient-centered tools and assessments should include recommendations on the following: improving posture, balance, and strength through exercise; mitigating medication side effects; working with patients with limited mobility (e.g., in wheelchairs); guidance for using contractors to update patients’ homes; and usefulness of devices to monitor patient activity.

- **“Home-based Exercises and Programs for Fall Prevention”** Jane Mahoney, MD, Professor of Geriatrics, University of Wisconsin; Executive Director, Wisconsin Institute for Healthy Aging

  Home-based exercises and programs have been suggested to be effective in preventing initial and recurrent falls. However, the specific role that exercise plays in fall risk reduction is unclear, given the variance in the type of exercises that are prescribed, the duration of the exercise regimen, and the patient’s adherence to the proposed exercise regimen. Currently, all falls are grouped together, regardless of location (e.g., indoors or outdoors), causation (e.g., balance issue, heart attack, stroke), or outcome (e.g., injurious or non-injurious). The classification of falls is important to the development of customized prevention and intervention strategies. The medical industry can play a vital role in determining how to develop safe and effective regimens for patients to use in the home, which include home-based exercises and programs as a long-term, daily habit. Implemented programs should also include metrics to measure dissemination, as well as to determine success and key barriers to program implementations.

- **“Balance Therapy and Fall Prevention”** Stephanie Anne Studenski, MD, MPH, Professor of Medicine, University of Pittsburgh

  Balance therapy has been identified as a critical risk factor for falls, but the nature of balance therapy in fall prevention is less understood. Barriers exist for balance research, due to the specific components and a lack of established guidelines. Physical therapists and exercise trainers have guidelines to follow, but there are no

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6 http://www.lifelinesys.com/content/lifeline-products
guidelines for healthcare providers to define, implement, or assess “balance,” which is the variability in the type of activities that the medical community implements as balance-related (e.g., having patients stand on one foot or using 3-D virtual reality sessions). The research is lacking in the classification of balance exercises and conditions under which the balance activity occurs (e.g., in isolation or while multitasking). The focus of falls needs to be increased to include falls that occur outside of the home, since falls can occur in any environment. There is also a need to distinguish indoor falls from outdoor falls to ensure appropriate and effective treatment options are delivered based on the nature and characteristics of the fall. The workgroup also discussed the baby boomer generation. This population is aging, but they want to stay active, and some refuse to use walking aids (e.g., canes and walkers) to assist with their limited physical mobility. Since this population may be resistant to the use of walking aids, the medical industry needs to determine how to help this group remain active, while at the same time, maintain low fall risk. Education-related communications should be prepared to help patients be proactive in conversations with their healthcare providers, to inform them on how to use exercises and protective equipment, as well as to consider preventive examinations to help patients identify and prevent fall risks.

- “The Role of Cognitive Compromise in Fall Events” Steven Wolf, PhD, PT, FAPTA, FAHA, Professor, Department of Rehab Medicine and Medicine, Emory University School of Medicine

A patient’s justification and explanation of the reason for the fall can provide valuable insight to healthcare providers. Typical responses from patients include, “I didn’t see the object before the fall.” Given the frequency of this response from patients, the healthcare providers should strive to increase their understanding of the conditions that increase and decrease fall risk, including observations, thoughts, or activities patients were doing at the time of the fall.

### Box 1: Patients and Other Stakeholders

Workshop participants included researchers, patients, and other stakeholders. Below is a list of patient and other stakeholder participants.

- **Bonita (Lynn) Beattie, MHA, MPT, PT**
  Vice President of Injury Prevention, National Council on Aging

- **Melissa Benton, PhD, RN, GCNS-BC, FACSM**
  Associate Professor, College of Nursing, Valdosta State University; American College of Sports Medicine

- **Mary Brennan-Taylor**
  Patient Safety Advocate, Consumers Union Safe Patient Project

- **Michael Duenas, OD**
  Chief Public Health Officer, American Optometric Association

- **Patricia McGaffigan, RN, MS**
  Interim President, National Patient Safety Foundation

- **Kathryn Murray**
  Early Stage Advisor, Alzheimer’s Association

- **Eric Orwoll, MD**
  Associate Vice President for Research, Oregon Health and Science University, National Bone Health Alliance

- **Patricia Quigley, PhD, MPH, ARNP, CRNP, FAAN, FAANP**
  Associate Director, VISN 8 Patient Safety Center of Inquiry, American Nurses Association

- **Diane C. Vaughn, RN, C-DONA/LTC, LNHA**
  Vice President, Clinical Services at Benedictine Health System, American Health Care Association

- **Lisa Alter Winstel**
  Chief Operating Officer, Caregiver Action Network
engaged in before, during, and after falls. The conducted post-fall assessment may assist in the identification of any treatable conditions, such as vision or cognitive impairments that increase fall risk or recurrence. Longitudinal studies that include cognitive awareness may help to understand the nature of environmental factors (e.g., quality of light in the room) and distractors (e.g., multitasking of chores and talking on the telephone) from the patients’ perspective, as well as from the healthcare providers’ perspective, will assist in the development of customized and effective fall preventions.

Discussion

Workshop participants, including researchers, patients, and other stakeholders (see Box 1) discussed research gaps and opportunities, sharing diverse perspectives. Below is a summary of key points and topics discussed.

- The field of falls research should include healthcare providers to promote patient education among the most at-risk populations. One barrier to patient education as an intervention is patients’ silence about their fall history. If not asked directly about their fall history, only a fraction of patients report having experienced a fall to their provider. The most recent intervention guidelines and related best practices for preventing falls are not being applied in clinical practice or emergency response settings. There is a continuous misunderstanding of how to evaluate and assess patients for fall risks. For example, there is a lack of universally accepted and standardized assessments for muscle quality and strengthening, or assessments to help patients understand how they are doing or to educate patients on their risks to avoid falling before it occurs.

- Advances in the field of fall prevention research will undoubtedly require healthcare providers to engage the primary caregivers and community-based interventions to reduce fall risk among patients. For elderly couples, the most able-bodied member of their dyad tends to care for the less able-bodied member. Fall prevention research and education should include the dynamic of the dyad and the role of caregivers, to understand how to integrate caregiver safety as part of the strategic options to prevent falls.

- The healthcare industry must also develop better strategies for emergency medical technicians (EMTs) to respond to patients who have experienced falls. One workshop participant reported that the highest number of emergency calls in New Hampshire came from elderly individuals who had experienced a fall, with one person calling over 70 times for emergency assistance due to a fall. EMTs are often trained to simply respond to an emergency call, which often does not include an assessment of why the fall occurred, or other such fall recurrence prevention techniques. In response to the EMT burden due to falls, 42 states have joined to bridge the gap in needs and services by building an infrastructure that unites EMTs and primary healthcare providers to increase knowledge and best practices for fall prevention, assessment, and treatment.

- For individuals who have experienced a fall, the fear of falling again often impacts their confidence and limits their previous level of independence. People who were living independently prior to their injurious fall may spend a significant amount of time in short- or long-term care residential facilities to recuperate. Falls occur not only among elderly people living independently, but also among those living in hospice, short-term, and long-term rehabilitation facilities. However, some people who could benefit from some of the fall recovery treatments (e.g., exercise programs focused on building strength and balance) offered in these facilities are denied coverage by their insurance company.
because they are deemed as “unable to improve from therapy.” Since no universal policy exists related to physical therapy, insurance companies are able to make the distinction between what is or is not reimbursable based on their prognosis. Many could benefit from building their strength, muscles, and overall durability, even patients who may not regain full functioning. This is another issue that should be addressed.

- A host of reasons, other than natural physical decline associated with aging, can contribute to the occurrence of falls or increase the risk for falling. Interventions that do not include fall assessments tend to diminish the relative impact of the proposed preventions or interventions. Intrinsic fall risk factors include cognitive and visual impairments, limited mobility and gait issues, and polypharmacy (i.e., multiple medications). More understanding of the role of prescribed medications (e.g., glucocorticoids, muscle relaxants, anti-hypertensive), polypharmacy, and their side effects on balance and mobility, particularly for the treatment of neurological disorders, need to be studied further as a potential factor for fall prevention. Additionally, the role of dietary supplements such as vitamin D and calcium, to counteract the side effects of prescribed medications and reduce the occurrence of falls, should also be investigated.

Action

The workgroup followed a three-step process to narrow broad research ideas into a concise list of well-defined high-priority research questions for potential PCORI funding:

Step 1: Identify Priority Areas of Interest
The workgroup reviewed the list of questions shown in Table 2 and deliberated to identify and prioritize six broad priority areas of interest for further research, listed below. Topics that were not selected through this process will be retained for future consideration.

- Risk assessment
- Medication management
- Interventions for fall prevention: home-based and other environments
- Physical interventions in strength and balance
- Data needs and important study groups
- Disparities and barriers

Step 2: Major Categories Developed from Research Areas of Interest
The workgroup deliberated to identify critical research gaps and specific interventions related to the six broad areas of interest listed in Step 1.

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7 Prior to the workgroup meeting, PCORI identified three research areas of interest as areas of potential research funding, shown in Table 1, and invited the public to submit a comment or research question related to these topics. A compiled list of research questions and gaps is shown in Table 2.
**Risk Assessment**
- Checklist and tools for interventions for providers and caregivers to prevent falls (e.g., continuum of care model, discharge planning, community-based, nursing home, hospital care, professional caregivers, and families and other caregivers)
- Fall characteristics related to outcomes (high-activity, direction)

**Medication Management**
- Medication management and adherence

**Interventions for Fall Prevention: Home-Based and Other Environments**
- Intervention adherence (e.g., episode-based and positive messaging of staying healthy at home longer)
- Engaging caregivers and families (e.g., group interventions with providers, patients, and their families)
- Emergency medical system and emergency medicine interventions
- Safe mobility and fall prevention from wheelchairs

**Physical Interventions in Strength and Balance**
- Exercise intervention with appropriate outcomes (e.g., dose-effects and pre-post measurements)

**Disparities and Barriers**
- Subpopulation-specific issues (e.g., cognitive impairment)

**Data Needs and Important Study Groups**

**Step 3: Research Areas of Interest for Potential Funding**
The workgroup deliberated to reach consensus on some of the highest priority areas for PCORI’s consideration for potential research funding, identifying five top-tier research topics:

- Medication management
- Addressing balance defects
- Information technology
- Diagnostic checklists
- Preventive programs

Research questions for each topic are shown in Table 3.

On May 6, 2013, these topics were presented to and approved by PCORI’s Board of Governors as topics for targeted funding announcements. PCORI is developing funding announcements to support research on these questions.

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Meeting summary prepared by Kara Odom Walker, MD, MH, MSHS; Lauren Holuj, MHA; Amy Grossman, MA; and external consultants. Posted June 6, 2013 and available on PCORI’s website.  

Questions that compare different strategies for preventing falls, including exercise and balance training.

In the United States, falls are the leading cause of injuries in the elderly. Populations at high risk for falls include the following: white women; individuals aged 80 years and older; patients with disabilities, dementia, depression, history of stroke, Parkinson’s disease, dizziness and vertigo, urinary incontinence, and diabetes; and patients in hard-to-reach locations (e.g., nursing homes, hospice care, and short- and long-term rehabilitation facilities). Although only 10% of falls result in fractures, white women are disproportionately more likely than Hispanic, Asian, or African-American women to experience a hip fracture from their fall. To date, there are several ongoing studies to investigate intervention strategies to prevent falls. These studies strive to understand the relationships between falls and risk factors, such as balance, exercise, and vitamin D supplements. Of these interventions, exercise in group settings, home-based exercise programs, updates to patient’s visual prescriptions, and understanding adverse effects associated with patient medications were all discussed as promising areas of research. The exact combination for successful multifactorial fall prevention strategies is unknown. The continuation of fall prevention research should also include a focus on balance training as part of standard exercise training.

Questions that compare promising strategies among older adults at varying degrees of risk.

A comparison between the effectiveness of exercise therapies and other clinical treatments in older adults may help doctors recommend preventative measures and targeted treatment for patients who have a previous history of, or are at highest risk of, falling. As the medical industry continues to research proposed effectiveness of interventions for falls, the workgroup described other areas that require immediate attention, including: (1) the relationship between falls and other diseases and comorbid conditions, (2) the psychological impacts of falls (e.g., debilitating fear and lack of confidence), (3) patients’ overall quality of life, and (4) hard-to-reach patients. To better understand and prevent some of the leading causes of falls, the workgroup also mentioned the role of advanced and mobile technologies, such as sensors to monitor risk behaviors and provide feedback about the nature and frequency of patients’ falls, to be able to analyze this data and provide immediate communications to the patient to cease any high-risk behavior immediately.

Questions that compare strategies to overcome provider-, system-, or patient-level barriers and thereby reduce risks of falls and resulting injuries.

Some of the modifiable risk factors at the provider level for reducing the risk of falls and injuries from falls are the increased thoroughness in developing patient fall profiles (that include assessing previous falls and identifying risk factors for future falls), identifying medical conditions in their patients that warrant referral to alleviate and reduce fall risk (e.g., referral to an ophthalmologist for vision issues), and promotion of fall risk-reduction regimens that are appropriate and easily incorporated into the patient’s current routine. System-level factors that research should target for fall prevention include the availability of transportation for physical therapy or exercise offered outside of the patient’s home, beneficial strategies for immobile patients, availability of reimbursement, and caregivers’ knowledge and roles. At the patient level, cultural, linguistic, and lifestyle aspects may mediate the efficacy of targeted strategies. Patient-centered fall risk-reduction programs should include cultural, linguistic, and lifestyle aspects to target strategies for diverse populations and cultures. Research that incorporates patient and provider stakeholders’ involvement in the development of interventions and strategies to target and educate adults including high-risk patients and populations predicted to experience future falls appears most promising. Rather than standardized approaches to preventing falls in the elderly, developed strategies should take into account the variation in types of barriers present, by leveraging caregivers, healthcare providers, and patients themselves to implement treatment and preventive practices.
## Table 2: Compiled Research Questions/Gap Areas

<table>
<thead>
<tr>
<th>Major Factors Impacting Falls Injuries</th>
<th>Prioritized Research Questions/Gap Areas</th>
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<tbody>
<tr>
<td><strong>Risk Assessments</strong></td>
<td><strong>Major Gap:</strong> A cognitive screening test with tailored factors for assessment of risks for falls</td>
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<td><strong>Major Gap:</strong> A classification system for what is considered ideal strength/muscle and test for risk assessment. Identify outcomes such as what is the ideal strength at specific ages (e.g., as related to sarcopenia and dynopenia)</td>
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<td>- Can existing or modified dynamic measures yield a meaningful screen for cognitive compromise among older adults? Can such tests be segregated based on behavioral or physical diagnoses?</td>
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<td>- What is the comparative effectiveness of using a standardized assessment checklist that triggers specific interventions in order to prevent recurrent falls?</td>
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<td>- Consider contextual issues, including vision screening</td>
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<td><strong>What is the comparative effectiveness of alternate methods of patient outreach, with families and caregivers, to identify and treat older adults with elevated fall and injury risk?</strong></td>
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<td>- Patient and family tool kit, including vision screening</td>
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<td>- Compare effectiveness of using surrogate markers of falls (e.g., balance and strength), using new technologies:</td>
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<td>- Accelerometers</td>
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<td>- Injurious falls identification</td>
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<td>- Biomarkers in sarcopenia</td>
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<td>- Approaches to fall intervention that identify specific issues in an individual</td>
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<td>- Compare effectiveness of new technologies to measure lean mass index, which could be measured in elderly patients to ensure they are meeting ideal strength requirements to preventing falls</td>
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<td><strong>What is comparative effectiveness of training EMS (or other settings in the continuum of care) to link with other services/coordinate care? (especially concerning stabilization techniques to treat fallers rather than just picking them up)</strong></td>
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<td><strong>Medication Management</strong></td>
<td><strong>Major Gap:</strong> What role do medications—either inappropriately prescribed or improperly managed—play in contributing to falls in older adults?</td>
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<td>- What is the comparative effectiveness of greater pharmacists’ interventions or other medication risk screening to reduce the incidence of injuries from falls in older people?</td>
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<td></td>
<td>- High-priority settings/populations and high-risk medications</td>
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<td>- Home-based interventions</td>
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<td>- What is the comparative effectiveness of antipsychotics, diuretics, and other medications that optimizes outcomes (vs. risks/benefits)?</td>
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<td>- What are effective interventions for their drug regimens that engage patients</td>
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and their caregivers on safe medication management that reduces fall and injury risk?
- Expert (pharmacist, clinician)
- Patient and caregiver engagement
- Focus on transitions in care, team-based approach to care and risk assessment

- What is the comparative effectiveness of patients who meet the criteria based on evidence-based practice to be on anticoagulation for atrial fibrillation or congestive heart failure to have their anticoagulation discontinued due to a high fall risk?
- What is the comparative effectiveness of use of calcium and vitamin D in nursing home patients post falls? (especially as it is very difficult for patients to ingest)

### Interventions for Falls Prevention

**Suggested Guiding Principle:** Bundle interventions and apply lessons learned from related fields

- **Major Gap:** Can specific interventions be devised to foster better awareness of personal space in the presence of internal or external distractors? If so, who is best positioned to implement such interventions?

- What is the comparative effectiveness of the following two methods of falls prevention: education to heighten awareness of fall risk situations versus exercise/balance training?

### Interventions for Falls Prevention: Home-Based

- Comparative benefits of LIFE interventions as compared to siloed interventions?

- **What is the effectiveness of various types and regimens of balance treatment?**
  - Composite of vision, strength, proprioception
  - Frequency, regimen, characteristics, and type of exercise

- Comparative effectiveness of using new technologies as a tool for home-based risk assessment and treatment, looking at comorbidities?

- What is the comparative effectiveness of different activity-tracking technologies for risk assessment of injury from falls? GPS, Halter-like device, iPad apps for neuro-motor control assessment?

### Interventions for Falls Prevention: Other Environments (nursing home, assisted living, community senior homes, settings requiring special attention)

- What is the comparative effectiveness of technological advances that could work as early detection warning devices for older adults who are at high risk for falling? What is the comparative value of assistive living technologies (ALT) on reducing the number and frequency of falls in the elderly as compared to environments without ALT?

- **What is the comparative effectiveness of involving patients and families in falls risk assessment that routinely occurs in hospitals, as well as the development of a falls prevention plan?** Compare different methods for family caregivers to become the first line against fall prevention and be educated about the risk associated.
What is the correlation between professional staffing ratios and falls on night shift in long-term care facilities?

Can falls and associated injuries be prevented in the nursing home (or other high-risk settings) by proactive measures to prevent hypotension and dehydration?

What is comparative effectiveness of different staffing models for nursing home facilities? (especially new technologies such as quiet care monitoring of movement, which could lead to earlier detection of falls)

### Interventions for Falls Prevention: Physical Interventions in Strength and Balance

- **Major Gap**: How can seniors remain active without increasing risk of fall injury?

- **What is the comparative effectiveness of different types of balance intervention (dose-effect) that could influence treatment effectiveness in fall and injury prevention?** What is the comparative effectiveness of participation in a self-led, group, video, or Internet-delivered program of home balance exercise to improve balance and decrease falls compared to receipt of written information?

- What is the comparative effectiveness of different kinds of physical therapeutic programs and/or activity to prevent falls for elderly who reside in senior public housing or in different types of communities?

- Compare different methods to elongate the benefits of therapy after therapy is complete. Compare effectiveness for methods to move these programs to the home; measuring home exercise adherence and feasibility of extending programs to the home/community centers.

- Does a class of tai chi twice a week with a behavioral intervention to increase home practice result in increased home practice, increased balance, and reduced falls over 18 months, compared to a tai chi class twice a week without the home practice behavioral intervention?

- Does a six-month class of tai chi twice a week result in increased home practice, increased balance, and reduced falls over 18 months, compared to a three-month class of tai chi twice a week? Is a six-month class feasible for communities to implement, and is it as accepted by older adults as a three-month class?

### Data Needs and Important Study Groups

- **Major Gap**: Identified data needs and research subgroup populations for investigation

- Does a multicomponent intervention targeted at the specific problems of stroke/Parkinson’s reduce fall injuries in older adults with frequent falls related to stroke/Parkinson’s disease?

- Would a culturally and linguistically adapted program, such as Stepping On (called Pisando Fuerte, which is a small-group workshop shown to reduce falls by 30%) be feasible to implement, have wide reach, and be effective in reducing falls among Hispanic elders at high risk for falls?

- What is comparative effectiveness of accurately understanding the reasons for
<table>
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<tr>
<th>Disparities and Barriers</th>
<th>Ideas for Discussion</th>
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<tr>
<td><strong>Major Gap:</strong> Identify important disparities and barriers to reducing injuries from falls</td>
<td><strong>General Ideas:</strong></td>
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<tr>
<td>What barriers and facilitators are there that prevent people from making changes according to falls prevention guidelines, especially pertaining to changes in environmental/self-care? (specific barriers to consider are insurance, financial burden, or choice)</td>
<td>Checklist and tools for interventions for providers and caregivers to prevent falls</td>
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<td>o Continuum of care model, discharge planning, community-based, nursing home, hospital care</td>
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<td>o Professional caregivers and families and other caregivers</td>
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<td>Intervention adherence</td>
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<td>o Episode-based</td>
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<td>o Positive messaging (stay healthy at home longer)</td>
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<td>Engaging caregivers and families</td>
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<td>o Group interventions with providers, patients, and their families</td>
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<td>EMS (emergency medical system)/emergency medicine interventions</td>
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<td>Medication management and adherence</td>
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<td>Fall characteristics related to outcomes (high activity, direction)</td>
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<td>Safe mobility and fall prevention from wheelchairs</td>
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<td>Exercise intervention with appropriate outcomes</td>
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<td>o Dose-effects</td>
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<td>o Pre-post measurements</td>
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<td>Subpopulation-specific issues</td>
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<td>o Cognitive impairment</td>
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**Prioritized Ideas:**

- New technologies to identify older people at risk and improve compliance
- Compare checklist approach versus usual care in multiple settings and toolbox of interventions for providers and caregivers to manage fall risk |
| o Continuum of care model: discharge planning, community-based, nursing home, hospital care, home, PT/OT |
| o Professional caregivers and families and other caregivers |
| Intervention adherence |
| o Episode-based |
| o Positive messaging (stay healthy at home longer) |
- Engaging caregivers and families
  - Group interventions with providers, patients, and their families
  - Caregiver support
- Can we translate EMS/emergency medicine interventions to US to see reduced recidivism rates for falls?
  - Potential feasibility for different models
- Dynamic cognitive interventions with physical training interventions versus usual interventions to reduce falls interventions
- Medication management and adherence
  - At-risk patients: hospitalized, facility
  - Checklist of medications
- Fall characteristics related to outcomes (high activity, direction)
- Safe mobility and fall prevention from wheelchairs or other mobility aids
  - Hospital, LTC, nursing homes, assisted living
  - Transfer-based care
  - Post fall huddle, wheelchair mobility clinics
  - Outcomes: head injury, hip fracture, etc.
- Exercise intervention with appropriate outcomes
  - Dose-effects
  - Pre-post measurements
  - Location
  - Environmental interventions: outdoor interventions, walkability
- Subpopulation-specific issues
  - Cognitive impairment
- Among those with two falls or injuries that year, does optimized vision compared to usual care (visual acuity alone) reduce falls?
- Staffing models associated with falls
### Topic: Medication Management

**Question 1. Medication Management Strategies**
What is the relative effectiveness of different strategies for safe medication management that reduce falls and injury risk among older persons?

Examples of possible strategies include (but are not limited to):
- Choice of medications
- Engagement of patients and caregivers in self-management of medications
- Emergency medical system (EMS) educational interventions
- Review/modification of medication regimens by clinical experts
- Automated analysis of risks of medication regimens
- Home-based medication management interventions
- Sharing of medication information as patients transition between providers
- Education of providers about medications’ risks of causing falls and injuries

### Topic: Addressing Balance Defects

**Question 2. Tailored Treatments to Address Balance Defects**
What is the relative effectiveness of different regimens/doses/durations of treatments tailored to address specific balance defects over time among people at high risk for falls and injuries?

Examples of possible balance defects include (but are not limited to):
- Decreased muscle mass (sarcopenia, dynopenia, frailty), peripheral sensory neuropathy, central or peripheral motor neuropathy, visual or cognitive impairments, and/or flexibility

Examples of possible tailored treatments may include (but are not limited to):
- Strength training, static balance training, dynamic balance training, varieties of tai chi, vision enhancement, and various devices

Examples of the treatment delivery modes may include (but are not limited to):
- Written self-led programs, group-based interventions, video-based, or Internet

Examples of at-risk populations may include (but are not limited to):
- People with Parkinson’s disease, Alzheimer’s, multiple sclerosis, history of stroke, and/or those who have experienced a previous fall

### Topic: Information Technology

**Question 3. Effectiveness of Information Technology**
What is the relative effectiveness of information technologies in assessing and reducing the risk of falls and injuries in at-risk populations?

Examples of relevant information technologies include (but are not limited to):
- EHRs and instruments that measure strength and balance activity; tracking technologies that monitor motion, detect falls and near-falls; and mHealth devices that communicate (culturally/linguistically appropriate) messages alerting patients to imminent fall risks, support self-care, and enhance adherence to therapeutic regimens
**Topic: Diagnostic Checklists**

**Question 4. Effectiveness of Diagnostic Checklists**

How effective are diagnostic checklists linked to therapeutic interventions (including patient/caregiver self-management tool kits) in reducing falls and injuries, when used by professionals in emergency and primary care settings?

Examples of the items on diagnostic checklists may include (but are not limited to):
- **Medications**: (e.g., anti-hypertensives, tamsulosin and alpha blockers, anti-psychotics, sedatives and hypnotics, tricyclic anti-depressants, dopaminergics, anti-histamines, digoxin)
- **Orthostatic hypotension**
- **“Get Up and Go” test**
- **Gait disorder**
- **Neurological exam**
- **Vitamin D**
- **Environmental safety**
- **Physical exercise**
- **Avoid alcohol**
- **Recommend Lifeline device**

Examples of components of patient/caregiver self-management tool kits may include (but not limited to):
- Medication review and precautions, water bottle and fluid prescription, support stockings, exercise prescription, shoe recommendations, VNA PT referral, home safety checklist, vitamin D pills (1,000 IUs daily), Lifeline device, pedometer and activity goal, and instructions.

Examples of at-risk populations may include (but are not limited to):
- People with Parkinson’s disease, Alzheimer’s, multiple sclerosis, history of stroke, and/or those who have experienced a previous fall.

**Topic: Preventive Programs**

**Question 5. Scalable, Sustainable, Multi-Component, Ongoing Preventive Program**

Compared to usual care, will a scalable, sustainable, multi-component, ongoing preventive program significantly reduce injuries from falls among people who are at high risk for experiencing injurious falls?

- **Scalable**—the program comprises features that could be implemented throughout the United States without encountering serious obstacles.

- **Sustainable**—the program’s costs are expected to be offset by reductions in the costs of treating the population’s injuries from falls.

- **Ongoing, multi-component and preventive**—the program is designed to:
  - Identify continuously the people who are at risk for injurious falls
  - Define their individual risk factors
  - Provide evidence-based treatments (e.g., medication modification, targeted strength and balance training) and self/caregiver-management support (e.g., tool kits) that address all of their risk factors
  - Reassess their progress and adjust their treatments and support as needed over time
  - Possibly use innovative information technology to optimize these program components

- **Injuries**—tissue damage (e.g., fracture, contusion, concussion, hemorrhage) that requires medical evaluation and care at a healthcare facility (e.g., ED, urgent care center, primary care office, hospital).

- **High risk for injurious falls**—people who have fallen recently and those who have conditions that increase the likelihood of injury-related falls (e.g., Parkinson’s disease; stroke; frailty; impairment in mobility, cognition, vision, or balance).