New Interventions for Fall Prevention in Hospitalized Older Adults

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Acknowledgements

- Oakland University Rochester Michigan
  - Ann Whall PhD RN Nursing
  - Marisa A Ferrari, DNP Nursing
  - Osamah A Rawashdeh, PhD Engineering

- William Beaumont Hospital, Royal Oak, Michigan
  - Yvonne Avery BSN
  - Michael Maddens, MD
  - Robert Hammond, PhD Research

Objectives

1. Comprehend the significance and impact of falls in acute care settings on health care outcomes for older adults.

2. Understand the evidence for fall prevention interventions.

3. Recognize the limitations to current fall prevention interventions.

4. Identify new interventions for fall prevention.

Significance and Prevalence of falls

- Falls are the most common safety incident for older adults in hospitals with approximately 1 million/year (Titler, et al. 2011).

- Older adults are at high risk for falls in acute care settings with rates between 2.3 and 13/1000 patient days (Tinetti & Kumar, 2010).

- Older adult fallers with cognitive impairment have more severe fall injuries than those without impairment (Tzeng, 2010).
Problem Statement

- Millions of older adults are admitted to acute care setting each year and are at risk for noscomial injuries due to falls.
- Nursing is the discipline with primary responsibility for fall prevention in hospitals. (Titler, et al. 2011)
- Cognitive work analysis suggests that physical environment is a major factor in falls and that nurses are “frustrated with fall prevention” tasks. (Lopez, Gerling, Cary, Kanak, 2010)

Joint Commission requirements

- Individual research suggest that many falls in hospitals can be prevented (Dykes et al., 2010, Haines, Hill, et al., 2011).
- Joint Commission requires all healthcare facilities to have a fall prevention program in place and to conduct ongoing evaluations of that program.
- Bed alarms are one component of fall-prevention programs, specially for patients who have cognitive impairments.

Older adult falls

Hospital falls are different

- Fall Risk factors differ between settings.
- The hospitalized patient is ill, in unfamiliar environments and has lost control in performance of personal activities.
- Often physical dependent on staff.
- Rapid changes in condition (delirium) and the need for nursing staff to make adjustments.
- We cannot simply translate evidence generated outside of the hospital setting and expect that it will work in this environment.
Review

Risk Factors for older adult falls

- Ambulation assistance, disorientation, medications
- Urine/bowel control problems, and fall history among hospitalized medical-surg. patients.
- Inattention and mobility contribute to hospital falls among older adults.
  - Ferrari and Harrison (2011)

Units are different

- An intervention may be effective for one group of patients but not for others.
- A randomized trial of a falls patient education program combined with trained health professional follow-up education approach.
- Falls risk alert card with information brochure, exercise programme, education programme, and hip protectors.
- Successfully reduced falls by approximately 50% for cognitively intact older hospital patients, but not for those with cognitive impairment.
  (Haines, Hill et al., 2011).

Example

- One Setting: A midwest 1,061 bed Magnet® hospital.
  - 986 falls in 2009
    - 26% of falls (n = 254) resulted in injuries
    - 86 falls occurred on unit where high risk patients were often admitted

What are the risks?

- Falls
Mortality due to falls

- According to the World Health Organization (WHO), falls are the leading cause of injury mortality worldwide, accounting for 1/3rd of unintentional injury deaths among adults ages 60 years and older.

- In the North American region alone, falls account for 43% of the total number of injury deaths in this age group (WHO, 2011).

- Fall mortality rates have increased in the past decade—a 62% increase from 1999 to 2008 in fall mortality rates in adults ages 60 years and older (U.S. Centers for Disease Control and Prevention [CDC], 2011).

Injuries due to falls

- Almost 30% of older adults who fall experience moderate to severe injuries including:
  - hip fracture,
  - head trauma, and
  - lacerations

  (Sterling, O’Connor, & Bonadies, 2001).

Falls are a Quality measure

- The 2011 Institute of Medicine report, The Future of Nursing Leading Change, Advancing Health reported evidence linking nursing to high quality care for patients including protecting their safety.

- When caring for hospitalized older adults, one of nurses’ primary responsibilities is maintaining patient safety and preventing iatrogenic events which include falls.

Quality outcomes Fractures

- Of those who fall in hospital, 10-20 % experience a fracture.

- The most common fractures are of the vertebrae, hip, forearm, leg, ankle, pelvis, upper arm, and hand (Scott, 1990).

- Incidence of hip fracture is greater in older women but death from hip fracture is higher among older men (Fransen et al, 2002).

- About 5% of older adults with hip fractures die while hospitalized; overall mortality in the 12 months after a hip fracture ranges from 12% to 67% (Beers & Berkow, 2005).
Falls as a Safety Outcomes

• Physical and functional impairments,
• Loss of independence, disability, (Hughes, et al 2008).
• Psychological consequences like increased fear of falling, anxiety, helplessness, or depression (Nordell, Andreasson, Gall, Thorngren, 2009).
• At least 50% of elderly persons who were ambulatory before fracturing a hip do not recover their prefracture mobility (Beers & Berkow, 2005).
• According to Veteran’s Admin. study of fracture related injuries, 55.4% resulted in hip fractures and 10.1% intracranial injuries.
• Average cost of US $23,723 per admission.


Risk Factors for fracture after a fall

• Risk factors for serious injury include diagnoses of:
  – osteoporosis, previous joint replacement, and spinal abnormalities, current use of anticoagulants, low platelet count or elevated INR or other clotting factors.

Some hospitals have a post-fall protocol that includes assessment for signs or symptoms of fracture or potential for spinal injury before the patient is moved to improve outcomes.

Surveillance

• Surveillance is a nursing intervention that has been identified as important to patient quality and safety outcomes (Schmidt, 2010).
• Defined in Keeping Patients Safe as "observing changes in patient conditions that may signal a decline in condition along with an action to prevent complications". (Institute of Medicine, 2003).
• Categories of actions such as knowing what's going on and watching are hypothesized as actions that improve both quality and safety (Schmidt, 2010).

Evidence for current fall prevention interventions

• Bed alarms
• Sitters
• Rounding
State of the Art - Surveillance

- Alarms
  - 90% of acute care fall prevention plans include bed alarms.
    (Shever, Titler, Mackin, Kueny, 2011).
  - Only 1 study that supports use (Tideiksaar, et al 1993).
  - These systems often have poor specificity (Lopez, 2011).

Bed Alarms

- 2 types of bed-exit alarms to detect bed-exiting body movements:
  - pressure-sensitive
  - pressure sensitive combined with infrared beam detectors (dual sensor system).
- Study evaluated bed exit alarms
- the occurrence of nuisance alarms, or alarms that are activated when a participant does not attempt to get out of bed.
- 14 nursing home residents were observed for a total of 256 nights
- a marginally significant difference (p = 0.059) between the alarm groups on the number of true positives for pressure-sensitive vs. dual sensor alarm.
- the dual sensor alarm may have a higher number of true positives.

Evidence on alarms

- The dual sensor bed-exit alarm was more accurate than the pressure sensitive alarm in identifying bed-exiting body movements and reducing the incidence of false alarms,
- False alarms were not eliminated altogether
Alarms

- The literature recommends use of alarms with patients who cannot be constantly supervised and need frequent reminders (Kelly, Phillips, Cain, Polissar, & Kelly, 2002).
- Two studies (Cumming, 2002; Cumming et al., 2008; Vassallo et al., 2004) recommended using alarms with patients who have delirium and cognitive impairment, cannot safely walk unsupported, or have unsafe gait.

Sitters

- The sitter utilization study was unable to provide correlation of sitter use to decreased fall rates, elopement, or assault behaviors.
- Currently, there is no research to suggest the use of constant observation reduces the risk of patient harm related to their risk for falling or harming themselves.


Sitters

- Pardee hospital saw a decrease in fall and fall-related fracture rates since implementing the "no sitter orders."
- Pardee Hospital now uses fewer sitters and the nurses report that they appreciate not losing coworkers to a sitter assignment.
- Nurses, instead of sitters, help prevent patient harm through:
  - setting bed alarms,
  - putting fall precaution magnets on patient doors and fall precaution stickers on ID bands,
  - providing slip-resistant socks,
  - encouraging family members to stay when possible.


Sitters

- One study findings suggested that a significant reduction of fall and after the implementation of hourly nurse rounding.
- Nurse rounds also increased patient satisfaction (P < 0.05).
- Another study on an acute medical unit at an academic tertiary care center, that according to national benchmarks, was one of the hospital's top 3 units for numbers of falls for several years.
- Interventions including structured hourly rounds had an effect on the falls rate benchmark.


Rounding
Limitations to current fall prevention interventions

• No single intervention, including bed alarms, has been shown to be effective in preventing high-risk patients from falling
• Acute Care is complex environment
• Reliability of devices
• Sensitivity to alarms, etc
• Consistent use of bed alarms by nursing staff is questionable; may be related to excessive false alarms (Kwok, Mok, Chan, & Tam, 2008).

Limitations- Bed alarms

• Criteria for use of bed alarms have not been clearly established, and it often is difficult for nurses to predict who will attempt to get out of bed unassisted.
• Bed-alarm types include systems built into hospital beds, standalone technology, or portable systems that consist of a sensor pad and a monitor alarm, voice alarms, and seat belt alarms for wheelchairs.

Acute Care as complex environment

• Communication gaps
• Shever (2011) described nurse manager responses to name fall prevention interventions.
• The most common fall prevention interventions included bed alarms (90%), rounds (70%), sitters (68%), and relocating the patient closer to the nurses’ station (56%).
• 29% of nurse managers identified physical restraints as an intervention to prevent falls
• only 10% mentioned ambulation.

Reliability of devices

• Dependence on alarms for surveillance.
• False positive alarms decreases staff vigilance.
• Four major constraints were identified that inhibit nurses’ ability to prevent patient falls. (Lopez et al 2010)
• Study at 572-bed Magnet academic medical center on East coast.
• All constraints relate to work processes and the physical work environment, opposed to safety culture or nursing knowledge, as currently emphasized.
• The constraints were: cognitive ‘head data’, temporal workload, inconsistencies in written and verbal transfer of patient data, and limitations in the physical environment.
Time- motion

- 55% of time was spent on indirect patient care
  - (16% of overall time on clerical duties, 15% communication with unit staff, 9% shift report, 9% using MIS, 6% equipment gathering),
- 45% on direct patient care
  - (33% time in patient room, 12% preparing and administering medication).

New interventions for fall prevention

- Video monitoring
- Motion sensing using accelerometers
- Gait analysis
- Optical sensors

Video monitoring for fall prevention

- Current technology on one 66 bed unit includes:
  1. Realtime video-monitoring (VM) of 2 private / 3 semi private rooms on unit.
  2. Live video streamed to a monitor on unit.
  3. Audio to room to question/cue.
- This intervention with other interventions reduced falls incidence on this unit.
Technology related themes

- **Fatigue**
  - “Having four hours. I think you lose your mind.”
  - “I don't think you focus on the patients after a certain period of time.”
  - “It's the most boring job in the entire world.”
  - “I would say that 4 hours is pushing it. 4 hours at a time is the cut off.”

- **Stressful**
  - “When they all start getting agitated sometimes it gets a little stressful.”
  - “Some days it's cake and some days it chaos.”
  - “When there are 6 patients that aren't responding to verbal cues and the staff are already in the other rooms it just gets a little stressful.”

- **Intervention does not fit the patient**

  - “We've gotten a lot of combative people using it.
  - “…they really just need to be restrained or have a sitter”

Technology related themes for nursing care

- **Efficiency**
  - “The fact that the monitors are there we can watch those 8 patients a lot more efficiently.”
  - “I feel like if you had 9 or 10 patients, that would be a little too much.”
  - “I think it works well for directable patients, people you can reason with.”

- **Setting Priorities**

  - “Your focus is definitely on the ones who are not redirectable cause you have very limited time to handle the problem.”

- **Assessment Processes**

  - “They need a reevaluation process like in a 24 hour or 48 hour.”
  - “I think it is slightly harder for some people …..when they talk overhead. The patients can't understand them.”

Limitations

- **Limitations with video-monitoring**

  - Patient privacy
  - Cost of video equipment
  - Cost of trained observers
  - Observer overload
  - Observer distraction

Pressure sensing devices

- **Smart Carpet** is a new technology that has been discovered to sense falls in the home by using sensors within a foil sheet that is placed underneath an individual's own carpet.

- It is able to sense where the person is in the home as well as when that person is walking, running or lying prone/supine on the floor.

- This advance in technology allows the equipment to call for help if the person is unresponsive, (Aud, et al. 2008)
Pressure sensors

- Fall sensors in shoes
- [http://www.youtube.com/watch?v=y5mkyQD7rPE](http://www.youtube.com/watch?v=y5mkyQD7rPE)

Motion Sensors

Accelerometers

- How accelerometers work
  [http://www.youtube.com/watch?v=KZVgKu6v808](http://www.youtube.com/watch?v=KZVgKu6v808)
- Human Movement captured with accelerometers
- Intel
  - [http://www.youtube.com/watch?v=WufwYYSJ5xY](http://www.youtube.com/watch?v=WufwYYSJ5xY)

Research on Motion sensors

- Pilot study tested the feasibility of a wireless five sensor, motion detection system (5S-MDS) in an acute care setting with hospitalized older adults.

- Specific Aim: To determine if a motion detection system is clinically feasible for the hospitalized older adult patient.
  - Are sensors acceptable to hospitalized older adults?
  - Do hospitalized older adults wearing sensors maintain skin integrity under the sensor?
  - Does data from the sensors (motion monitoring system) correlate with video monitoring data?
Methods

- Setting: older adults in a Midwest hospital unit in 2011.
- Five older adult subjects wore the sensors (5S-MDS) for 8 hours.
- They completed a set of 32 scripted movement tasks.
- Sensors attached to ankles, wrists and chest while performing scripted movement scenarios.

Measures

- Skin assessment tool
  - Dichotomous rating
  - The prototypical wireless system included 5 sensors (4.5 cm in length, 2.8 cm in width, and 1.3 cm in height).
- Acceptance questionnaire
  - VAS for acceptance of sensor at each body location.

Technology

Results

N = 5  Hospitalized older adults
1 Male and 4 female
Mean age 90.2 (5.6)
- Day of testing = Mean day 4.2 (range 1-16)
- All were assessed as “high risk for falls”
Results

- Acceptance by subjects
  - Overall acceptance= 4.77 out of 5

- Skin Assessment
  - Alteration in skin integrity = 0
  - Skin integrity was maintained 100%

- Sensor Accuracy
  - Electronic sensor data output always matched the video output
  - No time delay between the sensor data output and video output

Patient Acceptance

Overall acceptance= 4.77 out of 5

- Wrist acceptance= 4.72 out of 5
- Leg acceptance= 4.64 out of 5
- Chest acceptance= 4.96 out of 5

Research using Optical fibers

- Optical fibers in the carpet's underlay create a 2D pressure map that distorts when stepped on.
- Sensors around the carpet's edges then relay signals to a computer which is used to analyze the footstep patterns.
- When a change is detected - such as a sudden stumble and fall - an alarm can be set to sound.
- By monitoring footsteps over time, the system can also learn people’s walking patterns and watch out for subtle changes, such as a gradual favouring of one leg over the other.

Optical sensing devices

- Defining the user requirements for wearable and optical fall prediction and fall detection devices for home use
  - A qualitative study about the development of fall prediction sensors and systems.
  - Interviews to discuss wearable and optical sensors in the home.
  - Optical sensors in high-risk areas such as the bathroom and toilet.
  - Wearable sensors were at a higher preference than optical sensors because of their unobtrusiveness.
  - Security and mobility were prime reasons for use.
  - Govercin et al 2010
Intel's Global Director of Product Research

• http://www.youtube.com/watch?v=C7uYZ1_gyU4
  – Start at 2 minutes

Passive Fall detection

• http://www.youtube.com/watch?feature=endscreen&NR=1&v=09YrJcMHy9w

Questions

• Thank you!

References


New patients

1 in 5 newly admitted nursing home patients has a fall within 1 month.

Based on Medicare/Medicaid data on more than 230,000 first-time residents admitted to nearly 10,000 nursing homes across US in 2006.

21 percent had at least one fall during their first 30 days in the facility.

Patient were in a new place and are unfamiliar to the staff.

• Natalie Leland, a research OT - University of Southern California, in Journal of the American Geriatrics Society.2012

References


