

Role of Technology in Falls Prevention: A Patient-centered Approach

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PATIENT SAFETY EXPERTS

Amy Hester, PhD, RN

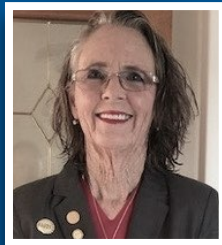
Chairwoman, Chief Executive Officer
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Dr. Hester co-founded HD Nursing, which uses an evidence-based program to help organizations reduce falls and injuries from falls, in 2010. She is co-developer of the Hester Davis Scale for fall risk assessment, a nationally recognized expert on fall prevention, and the author or coauthor of numerous articles in peer-reviewed and non-peer-reviewed publications. Dr. Hester was director of nursing research and innovation at the University of Arkansas for Medical Sciences. Her past nursing experience includes medical/surgical and neurological units and multiple leadership positions.

Patricia A. Quigley, PhD, APRN, CRRN, FAAN, FAANP, FARN

Patricia A. Quigley Nurse Consultant, LLC
St. Petersburg, Florida
Former Associate Director of VISN 8 Patient Safety Research Center of Inquiry at James A. Haley Veterans' Hospital in Tampa, Florida



Dr. Quigley has conducted 35 research studies related to falls and written or co-written more than 60 peer-reviewed manuscripts and produced many other articles and media items. She served as associate director for 11 VISN 8 Patient Safety Center of Inquiry center grants from 1999-2016, totaling over \$13 million. Dr. Quigley has served as the subject matter expert for various initiatives, including a fall toolkit from AHRQ, and is a past member of the NQF Patient Safety Complications Steering Committee. She is a member of the NQF Patient Safety Standing Committee and consults with nursing staff, quality management, and patient safety coordinators to reduce fall risk.

Linda Stevens, DNP, RN-BC, CPHQ, CSPHP

Director, Nursing Quality & Safety
UW Health Nursing Quality & Safety
Madison, Wisconsin



Dr. Stevens is responsible for regulatory compliance in the department of nursing and patient care services. Working with the interdisciplinary team members under her leadership, UW Health achieved a 27% decrease in falls with injury in 1 year. Dr. Stevens received her DNP from Rush University in Chicago. She is board certified in nursing informatics, and holds certifications in healthcare quality and as a safe patient handling professional. Dr. Stevens is an expert in nursing leadership, process improvement, high reliability, and cross-functional team collaboration. Her past experience includes clinical nurse specialist in quality and safety and nursing informatics specialist at UW Health.

FRONTLINE STAFF/MANAGERS

All three have been involved in implementing technology, such as bed and chair sensors, in their facilities.

Edlina Hilson, MBA, MSN-APRN, FNP, AGACNP, CCRN-BC

Patient Care Nurse Manager
Baptist Health Rehabilitation
Homestead, Florida

Amanda Nygren

Lead Health Unit Coordinator
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Charles Peworksi, MSN, RN

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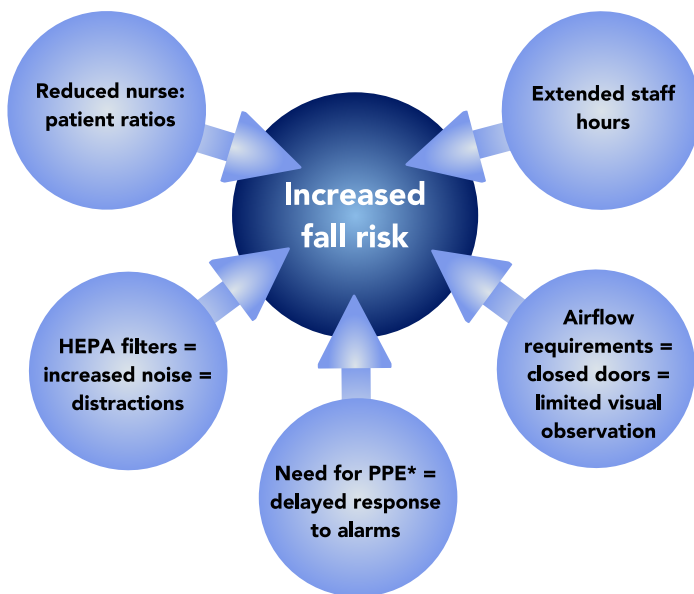
700,000 to 1,000,000. That's the estimated number of hospitalized patients who fall each year,

according to the Agency for Healthcare Research and Quality.¹ Another estimated 1.3 million patients in nursing homes fall each year.

Medical costs associated with falls in adults 65 years and older have been estimated to be about \$50 billion annually.² In addition, organizations can suffer financial loss from lawsuits related to preventable falls.

More importantly, falls can lead to serious injury and even death. However, the COVID-19 pandemic has made prevention efforts difficult (Figure 1). For example, airflow requirements result in closed doors to patient rooms, limiting visual observation, and the need to add equipment such as HEPA filters increases noise levels, which contribute to distractions. In addition, nurses responding to alarms are delayed by having to don personal protective equipment before entering the room of a patient with COVID-19, and then removing that equipment

Figure 1. Impact of Covid-19 on Fall Prevention



*PPE = personal protective equipment

before responding to an alarm from the room of another patient.

Furthermore, with many clinicians leaving hospital systems or long-term care settings, staff often are stretched too thin. This staff reduction, combined with prolonged work hours, may have serious consequences. For example, during the second quarter of 2020, rates of falls that caused major injury increased by 17.4% in skilled nursing facilities, according to data submitted to the Centers for Medicare and Medicaid Services.³ In addition, a report from the American Nurses Association notes that inadequate nurse-patient ratios increase fall risk, while higher RN staffing levels reduce inpatient patient falls.⁴

So how can organizations keep patients safe in these difficult times?

Technology is one tool that clinicians and administrators in hospitals and long-term care facilities can wield to enhance their fall prevention efforts. Like any tool, however, proper use of technology is key to its success.

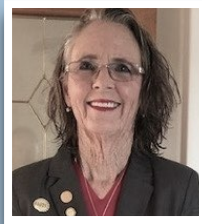
Role of Technology in Fall Prevention: A Patient-centered Approach aims to help clinicians and organizations use a patient-centered approach to reduce falls. It presents information obtained from an extensive literature review and input from fall prevention experts, as well as frontline managers and staff nurses who have implemented technology to prevent falls. Part 1 reviews the role of technology and how it can be evaluated; Part 2 focuses on how to integrate technology into a comprehensive fall prevention program.

Note: Many efforts are underway to explore the use of innovative technology to prevent falls, including wearable sensors and virtual reality; however, these tend to be used more in the community setting, and additional work is needed before widespread use can occur. Therefore, this report focuses primarily on technology commonly used in hospital and long-term care settings, such as chair and toilet sensors and positioning devices. Appendix A contains the methodology for the report.

EXPERT INSIGHTS

**Patricia A. Quigley PhD,
APRN, CRRN, FAAN, FAANP,
FARN**

“Technology can be used as part of three main strategies:



A WIDE SAFETY NET

This includes patient-engaged video technology, which can help prevent problems such as dislodgement of IV catheters and facilitate immediate identification of urgent changes in patients' conditions, such as respiratory distress.

FALL PREVENTION

Examples are sensor systems for beds and chairs, which notify nurses that the patient needs assistance.

INJURY PREVENTION

This technology is used to reduce injury should a fall occur. For example, floor mats and hip protectors reduce negative effects of falls.”

Amy Hester, PhD, RN

“Many falls happen when people slide out of their chairs, especially older people who don't have good core strength. Positioning devices are lowtech, but they're very effective. Side rails are underutilized because people don't understand how to use them properly. Keeping side rails up to prevent a patient from falling out of bed is not a restraint. However, it is important to be mindful of how side rails are used. More modern beds have side rail configurations that may allow a patient to exit or fall from the bed due to wide gaps between the upper and lower rails or between the lower rail and footboard.”



Part 1: Role of technology

The technology used in fall prevention is designed to keep patients safe. For example, when a patient at risk is moving unexpectedly, a chair sensor will alarm to notify staff. Staff can then intervene to assist the patient and prevent a fall, or, if a fall has already occurred, to mitigate any injury. The goal is not to restrict movement, but rather to avoid negative consequences of a fall.

Technology also can increase efficiency. For example, when an alarm alert prevents a mishap, nurses save time they would otherwise spend on the additional care and documentation associated with a fall.

Unfortunately, technology is not always used effectively. In a study by Hoke and Zekany, of 67 falls that occurred in a progressive cardiac care unit over 2 years, only one patient who fell had an activated bed alarm.⁵ Because that alarm was set at its lowest setting, it would be activated only when the patient was completely out of bed. The authors speculate that a more sensitive setting may have prevented the fall.

Any products used to prevent falls must be considered within the context of the patient's needs, and the technology must be easy for staff to use. If technology is cumbersome to use, its effectiveness is reduced. It must also be the right technology, and appropriate selection requires understanding the various options.

TYPES OF TECHNOLOGY

A common method of fall prevention technology is the use of sensors. Sensors may be integrated into pads for chairs or toilets: When patients' movements indicate they are getting near the edge, an alarm sounds so staff can respond and help patients exit safely. These devices contain pressure sensors alone or a combination of pressure sensors and an infrared beam (dual system) to detect the exit.⁶ Sensors also can be embedded into floor mats; the patient's weight on the mat triggers the alarm. Most hospital beds now have sensors incorporated into them, but bed pad sensors are still used in some facilities.

Devices that use sensors can be wired or wireless. Both can connect to the nurse call system, eliminating alarm sounds at the bedside and providing information about

EXPERT INSIGHT

Linda Stevens, DNP, RN-BC,
CPHQ, CSPHP



"I always encourage people to consider what problem they are trying to solve with the technology and to trial more than one product in the clinical setting, with different patient populations and different levels of care."

the patient's location, which speeds staff response. Other alarm options include a local alarm and an alarm on a staff member's mobile device.

Wireless systems provide two significant benefits: reduced tripping hazards for patients and staff and greater ease and efficiency in moving patients because the alarm and pad do not have to be in close physical proximity. To ensure maximum benefit, it is helpful for devices such as chair and toilet pad sensors to have visual or audio controls that confirm the pad and the alarm are paired.

TECHNOLOGY EVALUATION

Organizations should assemble a team of experts to evaluate the product before purchasing it. This team, consisting of clinicians who will be using the product and representatives from purchasing, finance, materials management, and bioengineering, develops a plan for evaluation and decision making.

Criteria to be evaluated include the following (see "Fall Prevention Technology Evaluation" a tool for evaluating technology related to preventing falls):

- **Functionality.** This is the basic function of the technology. For example, alarms may be transmitted locally but also to the nurses' station or nurses' mobile devices. How the technology performs in real-life situations can be evaluated with a pilot study.
- **Ease of use.** Staff are more likely to adopt products that are easy to use. Assessment of this includes checking for clarity of the instructions for use.
- **Cost.** Costs should be evaluated in the context of the organization's fall rate (and the costs associated with those falls) and the estimated number of falls the product will prevent. The initial purchase cost and ongoing costs for disposables and maintenance should be considered.
- **Cybersecurity and equipment safety.** It is important to ensure the product meets standard electrical safety guidelines. Prompted by cyberattacks in recent years, many organizations now require a security evaluation for any device brought into the facility. Personal data stored in mobile devices and transmitted via wireless

FALL PREVENTION TECHNOLOGY EVALUATION

Use this tool when evaluating technology products related to preventing falls, keeping the goal of improving patient outcomes top of mind.

Functionality



- How does the product perform under real-life conditions? (Consider a pilot program that tests the product with different target patient populations.*)
- How difficult is it for staff to “work around” safety features, such as alarms?
- How sensitive are alarms?
- How are alarms communicated (e.g., in the room, nurses’ station, nurses’ mobile devices)?
- Is the technology wired or wireless?
- What is the capability for interoperability with the electronic health record?
- Are materials in contact with the patient waterproof?

Ease of use



- How complicated is it to use the product? Use a scale of 1 to 5, with 1 being hard to use (for example, design is not intuitive) and 5 being easy to use (for example, design is intuitive).
- How clear are the instructions for use?

Cost



- What is my budget for this purchase?
- What is the initial cost for equipment?
- What is the ongoing cost for disposables?
- What is the cost of ongoing maintenance?
- What is the estimated product life of nondisposables?
- What is the average cost of a patient fall?
- What is our current annual fall rate?
- What is the estimated number of falls that will be avoided each year?

Cybersecurity & safety



- Does a department in our organization need to evaluate the technology for security?
- Does the equipment meet standard electrical and other safety guidelines?
- Does the equipment use Bluetooth or Wi-Fi?

Education



External (from manufacturer)

- What content is covered by the manufacturer? (Is it simply how to use the product, or is it broader in scope, such as how fall prevention strategies promote patient safety?)
- How is education delivered? Options might include videos, brochures, posters, and webinars; ideally, there are multiple sources to meet different learners’ needs.
- Is education in-person, virtual, or both?
- Who provides the education? (What is their expertise?)
- When is the education provided? (Are off-shifts covered?)

Internal

- What staff and materials will be needed to provide education?
- How will use of the product be integrated into orientation of new staff the per diem staff?

Ongoing considerations



- Does the organization have the cleaning supplies recommended by the manufacturer?
- Is the equipment easy to clean?
- Who will fix any problems?
- Who will perform routine maintenance? (in-house staff, manufacturer, or a combination?)
- Does the manufacturer have a help line?
- Does the manufacturer have online support?
- What is the warranty?
- What has been the experience of other organizations that are similar in size and serve similar populations? Questions to ask:
 - How long have you been using the product?
 - How would you rate support from the manufacturer in terms of:
 - Initial implementation:
 - Follow-up support:
 - Use a scale: 1 = poor, 2 = fair, 3 = good, 4 = excellent
 - Would you choose the product again?
 - How durable and reliable is the product?
- How will new staff be educated?
- How will competency be verified? (For example, will a return demonstration be required annually?)
- How broad an impact would the product have? (For example, can it be used to prevent a fall and reduce injury from a fall?)

Other



- *Here are examples of items that could be included in a survey as part of a pilot study.
- Rate each of the following statements (strongly agree, agree, neutral, disagree, strongly disagree).
 - The product [insert name]
 - Makes my job easier.
 - Improves patient safety.
 - Is easy to use.
 - Works as intended.
 - How does this compare to [name of current product]? (better, about the same, worse)
 - Would you recommend purchasing this product? (yes/no)
 - Please provide the reason for your response:

TIPS FROM THE FIELD

Edlina Hilson, MBA, MSN-APRN, FNP, AGACNP, CCRN-BC

“The most important factor when evaluating a technology is how it will improve patient safety. I look for a product that is easy to use. A wireless product means less clutter, and disposables are helpful to reduce the risk of infection.”

Charles Peworski, MSN, RN

“An important factor is ease of staff use. We want to relieve the burden on nurses, not create burdens.”

networks may be vulnerable to cyberattacks. Cloud-based systems make it easier to identify at-risk patients but still pose privacy risks.⁷ However, alarms related to bed, chair, and floor mat sensors do not typically transmit any sensitive patient data.

- **Manufacturer education support.** Professional development staff have multiple demands, such as staffing shortages, that make providing education challenging. Therefore, the level of education support the manufacturer will supply is crucial. In addition to in-person instruction, it is helpful to ask about supplemental resources such as videos and webinars. Often these resources can be embedded into an organization’s existing education platform for ease of use.
- **Ongoing considerations.** Factors such as the level of service the manufacturer provides after the initial

INTEGRATING TECHNOLOGY INTO A FALL PREVENTION PROGRAM

Here is summary of steps to take when integrating technology into a fall prevention program.

OBTAIN BUY-IN

- Involve top leaders.
- Benchmark fall rates against national averages.

FORM A TEAM

- Ensure representation from multiple disciplines.
 - Consider: nurses, nurse managers, advanced practice nurses, occupational therapists, physical therapists, pharmacists, quality experts, physicians, bioengineers, maintenance staff, informaticists, facilities management staff, community representatives (former patients, families)
- Have at least one representative from senior management.

ESTABLISH GOALS AND A TIMELINE

- Conduct a self-assessment.
- Analyze impact of new technology.

CREATE A PLAN

- Consider a bundle of interventions, including technology.

- Ensure that the following elements are included:
 - Screening and assessment
- Care plan (technology, activity, rounding, visual cues, huddles, documentation, transitions)

PROVIDE EDUCATION

- Educate everyone who will come in contact with the technology, including clinicians, transporters, and therapists; also educate patients and families.
- Use multiple methods (e.g., videos, face-to-face).
- Assess competency (e.g., post-test, return demonstration using a checklist).
- Develop strategies to avoid alarm fatigue (e.g., proper patient selection, proper use of equipment, criteria for discontinuing the technology).

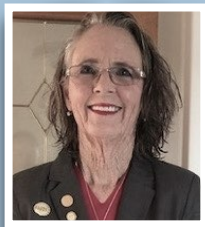
MONITOR AND FOLLOW UP

- Analyze fall data at least monthly.
 - Conduct audits.
 - Share data with staff.
 - Check competency with technology.
 - Hold non-punitive debriefing and root cause analysis if a fall occurs.

EXPERT INSIGHT

Patricia A. Quigley

"A bioengineer on the fall prevention team can help ensure that engineering and technology solutions are fully operational and integrated into workflow and care delivery. They can address and resolve barriers to implementation within and across clinical settings applied to varied patient populations. For example, with sensors that use wireless and/or corded technology, bioengineers work with nurses and patients to ensure all aspects of the information technology are fully integrated from the computer workstations to the patient's room. All systems are then communicating without interruption at all times."



training, education of new staff, equipment maintenance, and ongoing competency assessments should be considered. It may be helpful to talk with leaders at other organizations who have experience with the product and the manufacturer.

Another factor to consider when evaluating technology is its effect on workflow. For example, a common problem is staff forgetting to turn technology back on after performing an activity with the patient, so it would be helpful if the technology had prompts to remind staff of this crucial step. In the case of wireless technology, one-step pairing of the sensor with the alarm is ideal to streamline the implementation process.

Of course, technology alone is not sufficient to prevent falls. The team must determine how to integrate technology into a comprehensive fall prevention program.

Part 2: Integrating technology with prevention

For optimal success, technology must be part of an organization's overall fall prevention program, which includes several steps that are outlined here. (For an overview, see "Integrating Technology into a Fall Prevention Program".) These steps are derived from fall prevention literature, standards, recommendations from The Joint Commission, and input from the experts and frontline staff consulted for this report.

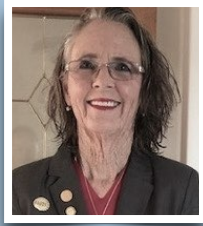
OBTAIN BUY-IN

Before starting a fall prevention program that includes technology, gain buy-in from top leadership by presenting fall data for the organization, national data on the costs of falls, and how a prevention program can offset costs. For example, the Centers for Medicare & Medicaid Services does not reimburse for costs associated with falls that occur in hospitals. Involvement of top leadership facilitates subsequent buy-in at all levels, including unit leaders and staff.

EXPERT INSIGHT

Patricia A. Quigley

“All universal precautions have to be individualized. For example, many organizations require non-skid socks for every patient. If you put nonskid socks on a patient with a shuffling gait, you’ll increase the trip hazard—producing a new fall risk because this intervention was not individualized. Nurses must use their clinical judgment. Another example is keeping the bed in the lowest position. That was never intended to be a universal fall precaution applied to all patients; it was designed to reduce the distance that a patient falls from the bed, reducing the severity of a fall-related injury. Suboptimal height creates a fall risk. The height of the bed for safe exit—to transfer or stand—depends on the patient. You want the height to be at a point where the patient can safely transfer, stand up, and sit down, with or without assistance.”



FORM A TEAM

Key members for a fall prevention team include nurse managers, staff nurses, advanced practice nurses (e.g., clinical nurse specialists, nurse practitioners), occupational and physical therapists, pharmacists, quality experts, and representatives from senior management.

Other possible members include an environmental services representative (since staff from this service would be cleaning items such as floor mats), a physician, and a bioengineer, who can address safety and ongoing maintenance of technology. The informatics department can help integrate documentation of fall prevention interventions, such as use of technology, into the electronic health record. (This documentation also promotes efficient workflow by ensuring all staff know of planned fall prevention interventions.) Some innovative organizations have added former patients and family members to the team for their perspectives.

The team should understand the purpose of the program and promote just culture principles, such as not blaming others if a fall occurs, to avoid unintended consequences. For example, a study found that if a unit was defined as “high-fall,” multiple, repetitive messages that had a blaming tone were often delivered.⁸ This caused nurses to restrict patients’ activities as a means to prevent falls and protect their units from further pressure by having everyone run when an alarm sounded. On other hand, nurses on low-fall units would progress patients.

Most importantly, the team needs to have the authority to make decisions.

ESTABLISH GOALS AND A TIMELINE

To establish goals, the team should perform a self-assessment by analyzing fall data and conducting a SWOT analysis, which looks at strengths, weaknesses, opportunities, and threats. The value of new technology should be assessed, and users should test the new product before it is purchased. (See Part 1 for more details.)

Having a timeline, such as a deadline for completing the SWOT analysis, will help keep the team focused.

EXPERT INSIGHTS

Amy Hester

“Three categories that commonly get overlooked during a fall risk assessment are the patient’s fluid volume and electrolyte status, sensory status, and behavior.



Some patients are at risk for falls because of low sodium, but nurses often overlook that. Sensory status includes those who don’t have normal feeling in their feet because of diabetic peripheral neuropathy. Patients with a history of anxiety, depression, or alcohol abuse are much more likely to fall than are those who are behaviorally noncompliant or impulsive. Nurses also have to be careful about normalizing things they regularly see in their patient population. For example, on an oncology floor, peripheral neuropathy caused by chemotherapy is a common problem, but nurses might not contextualize it as a risk for developing pressure injuries or increased risk for a fall because they see this side effect so often.”

Linda Stevens

“It can be hard during a pandemic to be consistent in patient safety initiatives, but it’s important to focus on basics such as intentional hourly rounding, bedside shift report, safety huddles, and leader rounding. These are important for patient safety.”



CREATE A PLAN

Many plans include bundles of interventions. Some of these interventions can be universal (applicable to all patients), such as those addressing prevention of accidental falls related to environmental risks (e.g., cluttered rooms, multiple cords, poor lighting). However, bundles must be adapted to accommodate for patients’ individual needs.

Bundles typically include several strategies that may be part of a larger plan. For example, one organization uses:

- Yellow fall bundle interventions (e.g., wristband, door magnet)
- Family notification and involvement in care (if they are able)
- Bed alarms and chair alarms application
- Scheduled environmental checks activation, and physician notification of any Morse Fall Scale score (discussed later in this report) changes.⁹

One resource is the Fall TIPS toolkit (www.falltips.org), which has been supported by research published in peer-reviewed journals. This single-page communication tool has been shown to reduce falls when used in conjunction with a three-step process:

- Fall risk screening/assessment
- Tailored/personalized care planning
- Consistent preventative interventions.

When the toolkit is used in conjunction with engagement of patients and family, falls and fall-related injuries are reduced.¹⁰

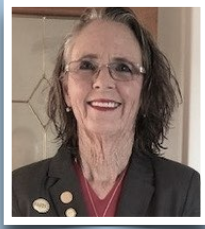
Here is a closer look at elements a fall prevention plan should include.

Screening and assessment. Because patients are in unfamiliar surroundings and have health conditions, many are at risk for falling. Categories of fall risks include biological (e.g., vision impairment, gait disturbances), environmental (e.g., obstacles on the floor, slippery surfaces), behavioral (e.g., lack of exercise, improper medication use, sleep hygiene), and demographic (e.g., gender, age, history of falls). All interact, so risk in more than one increases overall risk.⁷

EXPERT INSIGHT

Patricia A. Quigley

"It [Hester Davis Scale for Fall Risk Assessment] identifies actual fall-risk factors so that you can link an intervention to a risk factor. It encourages nurses to look at the effects of patients' diagnoses and helps them assess for fall risk factors. Nurses can then make modifications as needed."



Risk assessment may be a two-step process. The first is to use a general screening tool such as the Morse Fall Scale (MFS) or Hendrich II Fall Risk Model™. This type of tool screens for *anticipated physiologic* falls, which are falls caused by intrinsic physiology factors a patient has, such as delirium. These falls are predictable and preventable. However, screening tools do not identify patients at risk for *unanticipated physiologic* falls, which are caused by unexpected intrinsic events such as a new stroke.

If the screening tool is positive, a deeper assessment should be performed to determine what is causing the patient's fall risk.

Another strategy is to omit the screening step and use an assessment tool to evaluate the patient. For example, the Hester Davis Scale for Fall Risk Assessment helps the clinician assess whether the patient is at risk, what degree of risk exists, and why the patient is at risk so that individualized interventions can be implemented.¹¹

Clinicians should keep in mind the most common fall risk factors: previous history of falling; gait instability; lower limb weakness; urinary incontinence or frequency and/or the need for toileting; agitation, confusion, or impaired judgment; and medications, especially sedative hypnotics.¹²

Nurses are well positioned to work with prescribers and pharmacists to prevent the use of medications that can contribute to falls. A medicine or time of administration might need to be changed because of an increased fall risk. A good resource is the Beers List, which lists medications associated with falls (e.g., opioids, antidepressants) and the Choosing Wisely Campaign, which summarizes recommendations from well-respected organizations. For example, the American Geriatrics Society recommends against using benzodiazepines or other sedative-hypnotics in older adults as a first choice for insomnia, agitation, or delirium.

The Hendrich II Fall Risk Model builds in medication categories and adverse effects that increase fall risk¹³, and the Hester Davis Scale evaluates the use of

EXPERT INSIGHTS

Amy Hester

“Technology can be very helpful, but you need to consider possible limitations. One is the low air loss mattress. These have a different weight distribution, so bed sensors may not detect the patient exiting the bed. In that case, consider other technology such as video monitoring, although there are some privacy concerns with that.”



Amy Hester

“Your care plan should match the right intervention to the right patient at the right time, and that includes clinical decision support for your technology interventions.”

TIP FROM THE FIELD

Charles Peworksi

“Wireless is helpful because it removes trip hazards.”

cardiovascular, central nervous system, and diuretic medications in addition to chemotherapy in the last month.

Care plan. Results from the in-depth assessment, which includes identification of fall risk factors, form the backbone of the plan to prevent falls.

Several elements are integral to the care plan.

Technology. The organization should have a system in place for identifying which patients would benefit from technology such as chair or toilet sensors. For example, one program implemented bed and chair alarms for high-fall-risk patients.¹⁴ Another organization required a bed sensor for all impulsive or confused patients in a progressive cardiac care unit.⁵ Wireless versions of items such as chair sensors can be helpful because they provide wider range of patient positioning options compared to wired devices.

Technology is indicated for patients unable to participate in fall prevention efforts because of cognitive issues such as delirium. For example, it is important for clinicians to know when an at-risk patient is getting up without assistance; chair and toilet sensors help provide the necessary intelligence. (Refer to Part 1 for a discussion as to types of technology.)

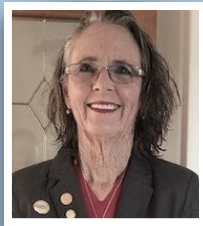
Clinicians also need to keep in mind that patients, even those without cognitive impairment, do not always understand their risk for falling. For instance, a study by Hoke and Zekany found that nurses most commonly attributed unassisted falls (no staff was not present at the time of the fall) to the patient not calling for assistance, but patients were focused on the activity they were doing at the time, such as reaching for something.⁵ Nurses thought bed/chair sensors would have been the most helpful in preventing these falls.

Activity/distraction tools. Strength and balance exercises can help reduce fall risk. Staff also need to stay with high-fall-risk patients while toileting. Providing paper and pens, coloring pages, crayons, or simple puzzles can help distract patients with

EXPERT INSIGHTS

Patricia A. Quigley

"Safety is patient-specific, not setting-specific. For example, if a patient needs a floor mat in the nursing home to prevent injury from a fall, that floor mat needs to accompany the patient to any setting of care, unless the new setting has carpeted flooring. Whether in an emergency department or a hospital unit, if a patient fall injury plan of care requires a floor mat, every organization has a responsibility to ensure a floor mat is at the patient's bedside. Fall risk factors can increase or decrease with changes in conditions and responses to treatment. For example, the need for a bed alarm should be based on clinical criteria—cognitive impairment and mobility status. If a patient's cognitive status improves and delirium resolves, a bed alarm is not needed. This example illustrates that care planning is dynamic, based on comprehensive and continuous patient assessment."



Linda Stevens

"Structure is key to having a system for intentional rounding. It's an excellent time to perform interventions to prevent falls, such as toileting."



TIP FROM THE FIELD

Edlina Hilson

"Our nurses and clinical partners work closely together to prevent falls. We use multiple approaches, including hour rounding, bed sensors, and keeping call buttons near patients."*

*a nursing assistant role

dementia so that they do not try to get up on their own.¹⁴

Rounding. Regular, intentional rounds help anticipate patient needs. Rounds, which should include proper placement of the technology and assessing toileting and pain needs, need not take excessive time. For those without dementia, asking an open-ended question, such as "What can I do for you?" is better than a yes or no question such as "Do you need anything?" Patients are more likely to respond to the first so that nurses can address their needs at that time rather than making another trip to the room later. In addition, a proactive toileting approach, which establishes set times to assist patients to the bathroom, may help reduce falls.¹⁵

Sufficient nurse:patient ratios are essential to ensure rounding can occur. These ratios can be challenging when the hospital is facing a staffing shortage, as is the case for many facilities. However, the short time it takes to check in with patients can end up saving time by preventing problems.

Visual cues. Signs can alert staff to patients who are at high risk for falling. To protect the patient's privacy, it is better to use colored stickers or wristbands to identify those at risk, rather than printing "fall risk." A stop sign in the patient's room can be used to remind staff and family that the patient needs assistance before getting up, as can a white board with a symbol such as a red square.^{14,16}

Huddles. During daily huddles, staff and the charge nurse should review who has technology in place for fall prevention and who might benefit from it, based on risk. When staffing constraints exist, it can be tempting to omit huddles, but when done efficiently, they talk little time and can prevent falls.

Documentation and transitions. In addition to verbal sharing during huddles and handoffs, staff need to document the use of technology in the patient's health record to ensure continuity of use. A consistent format for handoffs, which includes what technology is being used to prevent falls, will help avoid information being missed. Handoffs should be done at the patient's side.

TIP FROM THE FIELD

Amanda Nygren

“For education related to a new product [bed and chair sensors], we demonstrated it for staff, discussed it during huddles, sent emails, and posted quick information sheets at computers. We also discussed it with housekeeping so they knew what would be thrown out and how to clean the equipment. Communication is key. You need to get everyone on the same page, including travelers who are new to the unit.”

Rohm found that developing “My Safety Plan” for patients was helpful. The plan, which is in checkbox format, is placed on an 11 X 17 inch dry-erase board that is in view of the patient and includes any mobility devices needed.¹⁷

Fall care plans need to follow the patient during transfers from one unit or facility to another. They also are not static; they should be reevaluated at least daily and when the patient condition changes.

The Joint Commission recommends having a standardized handoff communication process for care transitions.¹⁸ Evidence supporting this recommendation includes an integrative review, in which six of eight studies (75%) reported that implementing interventions designed to improve shift-to-shift handover communication decreased the number or proportion of patients who experienced a fall.¹⁹

PROVIDE EDUCATION

Education about a new technology is an ideal time to reinforce the overall fall prevention program. All staff who will come in contact with the technology, such as nurses, nursing assistants, therapists, and transport staff, need to be educated. So do non-direct care staff who will be in the patient’s room, such as dietary and environmental services, and staff who will be interacting with the patient, such as speech language pathologists. Failure to educate can lead to more false alarms, such as when a transporter moves the patient from the bed to the wheelchair.

Several factors should be considered when providing education.

Delivery. Education needs to be tailored to the audience. For example, compared to nurses, nursing assistants have had less training in identifying those at risk for falls, so they may need additional instruction. This group also may be unclear about their role. For instance, Reich found that although “patient care technicians believed that falls and falls with injury were problematic, they did not believe they had the authority or autonomy to work as part of the inter-disciplinary team to prevent falls and falls with injury.”²⁰ A certification program helped encourage engagement with a

EXPERT INSIGHTS

Amy Hester

"Re-education is particularly important if the patient has improved, but is still at risk for a fall. Patients may overestimate their improvement or not want to bother staff. You can say something like: 'We're going to continue the plan of care to keep you safe until your discharge to home. I know you sometimes don't want to bother me, but that's what I'm here for, so don't hesitate to call me.'"



TIP FROM THE FIELD

Charles Peworksi

"I like to have the manufacturer's representative provide education because they are the experts. They have the passion to show how the product can be used most effectively."

multidisciplinary team. Part of that education was clarifying the technician's role in fall prevention:

- Place the patient on fall precautions.
- Place a bed or chair alarm on the patient.
- Place fall prevention socks on the patient.
- Place a fall identification wristband on the patient.
- Place a fall prevention sign on the patient's door.
- Call for a specialty bed and transfer the patient to the bed.
- Contact the fall team.
- Participate in a post-fall debrief.

Educating the technicians resulted in an 84% decrease in falls with injury rates post-intervention.

Interactive education may improve retention. For example, one organization used videos showing correct and incorrect responses to various scenarios.²¹ Such videos can be made quickly and posted online for staff to review on demand. Videos can include how to set up, use, and troubleshoot the technology and various types of alarms. Additional videos can include ancillary prevention measures such as non-slip socks, keeping a bed in low position, and putting pads around it.

Videos also can be used to engage patients and families.⁹ For example, a video on an organization's TV station or available on demand via a computer or mobile device could provide fall prevention information.

Organizations can partner with product manufacturers in delivering education, both during and after the initial launch. For example, the manufacturer may provide speakers or videos, and the education department staff can ensure the information meshes with the facility's terminology and policies.

A short post-test and return demonstration will help ensure staff can properly use the equipment. A checklist is helpful to ensure all key points are

EXPERT INSIGHTS

Linda Stevens

"We assess patients on admission, daily, and whenever a patient's condition changes. Nurses revise interventions based on changes in condition. They can choose from a list of interventions in the electronic health record. It's also important to engage in continuous quality improvement related to technology. You might see the initial success wane, indicating a need to re-educate staff. You want to be sure the technology is being used appropriately and meeting the desired goals."



Amy Hester

"Be direct with families about their role. Say something like, 'Here's what we're going to do to keep your family members safe, and here's how you can partner with us to do that.'"



addressed in the return demonstration. In addition, scenarios can be used to check staff's knowledge about how to troubleshoot potential problems. Post-test results and the completed checklist should be included in the employee's record.

Patients and families. Education for patients and families is key for success and should include the reason for prevention interventions (including technology)—to help avoid harm caused by falls.

A study by Hill and colleagues found that patients who received fall prevention education believed it "raised their awareness, knowledge, and confidence to actively engage in fall prevention strategies, such as asking for assistance prior to mobilizing."²²

However, even patients who have received education (and those who do not have cognitive impairment) may be reluctant to request assistance for multiple reasons, such as not wanting to "bother" staff. The Hill study noted that patients reported the following reasons why they would not seek assistance: feeling overconfident, desiring to be independent, or thinking staff would be delayed in helping them.²² In addition, Timmons and colleagues noted that patients sometimes felt embarrassed if they accidentally triggered an alarm.²³ Staff need to reassure these patients and remind patients about the importance of calling for assistance. Other research supports that patients' risk of falls by score often does not correlate with their perceived risk for falling, and that patients often don't understand prevention measures.^{24,25}

A review by Stockwell-Smith and colleagues found that family education is an effective strategy for preventing falls in patients with cognitive impairment.²⁶ In addition, families who are caregivers can educate staff about strategies to care for these patients, which can provide insights into how to prevent falls.

Families need to know the importance of not interfering with the technology, for example, turning off alarms, and to let staff know when they are leaving the patient's room. For those who express interest in knowing more, it can be helpful to provide a one-page summary of the technology for reference. Families, too, need re-education when patients improve.

EXPERT INSIGHTS

Linda Stevens

"To reduce alarm fatigue, make sure to use technology based on your assessment of what is truly needed for the patient. Having a bed alarm on every patient on a unit will lead to too many false alarms and contribute to nurse burnout."



Patricia A. Quigley

"Obtain a baseline organizational assessment of expected fall program attributes at the organization, unit, and patient levels. Determine where gaps exist, such as attributes not fully implemented. Select three to four attributes to improve. Launch work teams for each program attribute, and monitor progress toward your goal. For example, if barriers exist to floor mat implementation, over a 3-month period, select five to ten patients who need floor mats and, at random, round on the units and those patients to measure if they are used correctly. If it's 100%, you can move on to something else. Audit frequency depends on what the results of the audit are and how important it is to be able to get that percentile ranking up in terms of performance."



Alarms. A Cochrane review noted that the effect of bed and chair sensors on reducing falls is uncertain because of the lack of high-quality research.²⁷ Yet, if used correctly, alarms can be helpful in alerting staff so they can prevent a fall or, if a fall occurs, staff can be on the scene more quickly to reduce physiologic and psychological effects of any injury associated with the fall.

Therefore, proper use of alarms is a key education topic. Studies have shown that nurses often fail to set alarms correctly.^{5,28} Timmons and colleagues found that nurses sometimes ignored alarms for patients they "knew" were either bed-bound or "healthy."²³ Staff should understand that appropriate patient selection criteria can help avoid excessive alarms.

If a product permits different sensitivity levels, it is better to choose high sensitivity initially. If alarms are too frequent, the sensitivity setting can be lowered, but the alarm should not be deactivated.

It is important to take steps to avoid alarm fatigue, caused by excessive alarms, which can lead to staff failing to respond promptly or even deactivating the alarm.

Strategies include rounding, reviewing medications for interactions and adverse effects, moving supplies closer to the patient, and planning restorative or group activities during times when falls are more likely to occur, such as after meals and during the evening.²⁹

MONITORING AND FOLLOW-UP

Monitoring includes ongoing patient assessment and adjustments to the care plan as needed, as well as effectiveness of the technology and the overall fall prevention program, so that policies and protocols can be refined as needed. This monitoring can help reinforce desired behavior. Share fall data at least monthly and discuss areas for improvement. Encourage staff to share success stories related to how the technology prevented falls, as well as near misses that may provide valuable lessons.

One tool is the Falls TIPS Quality Audit, which consists of four simple questions:

EXPERT INSIGHTS

Amy Hester

"It's best to audit 10 patients every month, share results, and make adjustments as needed.

Audit your high-risk patients because that's where you can make the most difference. Auditing technology is easy because it's visible. You can look into the room to see if the armband is on, floor mats are down, and the positioning belt is on, and some beds have visual checks you can use to see if the rails and bed exits are configured correctly. In addition, don't assume that maintaining competency is easy just because it's a lowtech device. Fall prevention technology is like any other technology: A ventilator, a blood pressure machine, and an IV pump all require competency, and so does fall prevention technology like bed exit alarms or floor mats."



Linda Stevens

"Technology is an important supplement to nursing care.

You need to have an individualized plan of care that combines technology, when appropriate, and human observation and interaction. Keeping the focus on the patient will help reduce falls."



- Is the patient's Fall TIPS report hanging at the bedside? (Question can be adapted to reflect organizational policy.)
- Can the patient/family verbalize the patient's fall risk factors?
- Can the patient/family verbalize the patient's personalized fall prevention plan?
- If you answered "no" to any question, did you provide peer-to-peer feedback?

A fall prevention checklist that is completed by each shift can help identify areas for improvement.²⁷ A quality improvement project that used this technique found that the most frequently missed intervention was setting the bed alarm, which was set incorrectly 19% of the time.

Sustain gains by including the technology when onboarding new staff and having periodic reviews of related competencies. In addition, regular education programs about the technology and other fall prevention strategies will help reinforce best practices.

If a fall occurs, a non-punitive debriefing and root cause analysis will help identify gaps in the overall plan. For example, a debriefing might identify the need to review the appropriate response to chair sensor alarms. Or, it might be a case where a patient's risk factor was not identified, pointing to the need to reexamine the assessment tool used in the organization.

CONCLUSION

Integrating technology options of all types, ranging from floor mats to chair and toilet sensors, into an organization's fall prevention program helps to enhance its effectiveness. This starts with thoughtful evaluation of potential technology, using a tool such as that on page 4, to ensure it supports patient safety and fits into clinicians' workflow. By following a few steps—such as careful patient assessment, thorough education for patients and families, regular monitoring and follow-up, and routine assessment of staff competencies—clinicians and organizations can keep staff and patients safe. These efforts will ensure that technology is effectively incorporated into care that is truly patient-centered.

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Appendix A

Methodology

Information for this report was gathered through a literature review, interviews with patient safety experts, and frontline staff.

Fall Prevention Literature Review

Targeted literature searches were developed by a PhD-trained medical librarian. Each search was run in two separate biomedical databases: PubMed (NLM) and CINAHL (EBSCO), completed between 5/19/21 and 6/18/21. The searches included a mix of appropriate subject headings (MeSH/CINAHL Subject Headings), and keywords focused on the following topics:

- Technology to prevent falls
- Wireless-device fall prevention technology
- Nurses and wireless technology/healthcare technology
- Cybersecurity for wireless healthcare devices
- Nursing aspects
- Implementation of fall prevention programs
- Evaluation methods (e.g., checklists, surveys) to evaluate implementation of new nursing technologies.

All returned citations were limited to English, human, adults (age 21+), and published within the last 6 years. Initial results were screened by the medical librarian and the report author for relevance to the project. A second search for information published between 6/19/21 and 2/3/22 focused on the following:

- Technology to prevent falls (hospitals, long-term care)
- Implementation of fall prevention programs
- Evaluation methods (e.g., checklists, surveys) to evaluate implementation of new nursing technologies.