New Innovations for an Old Problem—Falls

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Crash! . . . Bang! . . . Thud! . . ."Help me! Help me!"
In the past, nurses discovered patients fell this way. A noise was heard and then nurses would discover their patient fell, and then provided appropriate care after the event. Falls at home also result in admission to the hospital as a result of patients lying unfound on the floor for hours. By the time they arrive on the hospital division, patients can be severely dehydrated, bleeding, in pain, and malnourished,

Fortunately, advancements in fall prediction, prevention, warning and detection systems have likely reduced the number of falls, especially in hospitals and care settings (Oh-Park et al., 2021). Innovations in video monitoring and pressure sensors, including alarms for beds, chairs, and toilets, alert nurses and families about impending falls. Additionally, recording devices proclaiming messages like, "Call your nurse!" have likely contributed to preventing falls and related injuries. A more recent innovation, the virtual sitter, adds to video monitoring technology by setting parameters via computer, so that a warning alarm will sound when the patient moves, signaling the potential for a fall (Oh-Park et al., 2021).

Earlier fall detection technology for people at home included call systems attached to a wearable device, such as a pendant. When someone falls, they push a button and convey information to a call center, where a messenger dispatches the news to family members and first responders. The days of someone remaining down for hours are now behind us. However, systems like these depend on the notion that people will adhere to wearing the device and be able to access and activate it when needed. According to Fleming and Brayne (2008), 80% of the participants who fell who had call buttons did not use them. Reasons ranged from not wearing the device, becoming unconscious, or simply forgetting to push the button because of the trauma and emotions resulting from the fall.

Innovative fall detection devices were created by collaborating clinicians and engineers to utilize advanced technology in preventing falls. One example includes a wearable device that removes the need to push a button for activation (Kulurkar et al., 2023). This wireless sensor can detect a fall, send the information to a connected smartphone, which uses artificial intelligence (AI) algorithms to determine that a fall has occurred and communicates directly with the victim. Warrington et al. (2021) conducted a fall detection review and found that sensors placed on the trunk, foot, or leg can provide up to 93.1% sensitivity and 86.4% specificity in detecting falls. If the person who falls does not reply, emergency contacts and appropriate first responders are notified. Wearable wireless sensors can be integrated into watches, shoes, belts, or clothing. Furthermore, when people used wearable fall detection technology, they expressed greater confidence in their movement, and were likely to move more. Overall, Warrington et al. (2021) found that wearable technology offers a promising low-cost method to detect falls and access help.

In addition to wearable devices, leveraging other technological advancements contributes to reducing and detecting falls. A network of ambient sensors including cameras, pressure detectors, vibration sensors, and infrared sensors can also be placed throughout the environment as an alternate to a wearable device (Oh-Park et al., 2021). Using motion accelerators, gyroscopes, magnetometers, and Global Positioning System (GPS) technology, sensors detect rapid downward motion and location to recognize a potential fall (Kulurkar et al., 2023). Utilizing a variety of sensors, each capable of detecting multiple factors associated with patient falls, improves the accuracy of preventing and detecting patient falls

So, what comes next in fall detection after wireless technology, AI algorithms and smartphone communication? One possibility includes the use of airbags! Botonis et al. (2022) described sensor technology incorporated into special vests or jackets that detect falls then deploy air-

bags around the hips and neck, designed to reduce injury. Despite these innovative ideas, more research, collaboration, and innovation is needed for falls prevention and detection advancements. According to Warrington et al. (2021), five research questions related to fall detection technology must be further researched. These questions specifically address the effectiveness of device use for people with conditions, especially stroke, multiple sclerosis, and age-related frailty.

1. What is the most effective design system that people want to use?

2. Could we use fall detection and alerts to warn of declining balance control?

3. How can we best integrate fall risk assessment into detection technology?

4. How can we best evaluate wearable fall detection technology for extensive studies?

5. What are the most effective algorithms for fall detection and communication?

Answers to these questions may contribute to further reductions in falls, injuries, deaths, and associated costs as well as inspire the next innovations in fall detection. ◼

References online:
myamericannurse.com/?p=409032

From a Bedside Nurse—Saved by Technology: My Fall and the Power of Emergency Alerts

Contributing Author: Sandra Levine, BSN, RN

Sandra Levine, BSN, RN, shared her fall detection story with a group of retired nurses from University Hospitals, hoping it would assist them in creating a falls prevention plan and evaluating suitable detection systems for their needs. She shares this story here with the hope that it will benefit the ANA-Ohio Community. ANA-Ohio does not recommend or endorse any specific brand of a falls detection/communication system. The technology discussed in this article reflects the resources accessible to Sandra.

What happens if someone falls and is unconscious? I found out when I fell at the bottom of my basement stairs. My head hit the doorway and I became unconscious. Immediately a fall was detected by the Falls app on my Apple Watch. Fortunately, I had emergency contacts listed on my phone. The app immediately sent an alert to my husband and three children saying "*Sandy - Hard Fall No Response*" with the time and lo-cation of the fall. They had to respond to the alert.

My husband was at home but believed I was upstairs and called my name before heading up to look for me. My daughter and one son live close by and recognized an urgent situation. My daughter, a nurse, told her husband to call 911 and immediately got into her car to come to my house. She also called my husband and stayed on the line with him. My son joined the call, using the conference feature, to connect with both my daughter and husband.

When my husband saw me at the bottom of the basement stairs, he recalls wanting to wake me up and move me, but my daughter advised him to wait for the first responders to arrive. Apparently, I was breathing and not externally bleeding. Fortunately, I regained consciousness as the first responders moved me to the stretcher. However, the fall caused two brain bleeds, four fractured ribs, and a wrist fracture. How long would I have waited to be found if no one knew I had fallen? I have friends who wear a life alert button to call for help if they fall. But what if they cannot push that button? I would have been unable to push one.

The technology in the Falls app will vibrate if it detects an unsteady step and continue buzzing until the user responds to the "*Did you fall - yes or no*" question. If yes, the next prompt is "*Are you OK?*" "*Do you need help?*" I was not aware that the app would initiate an alert to my emergency contacts when I could not respond to these prompts. I share this story to encourage others to ensure up-to-date emergency contact information is saved in their phones. If you wear a watch with emergency capabilities, like fall detection, make sure to activate this option and connect it to your emergency contacts—you never know when you might need to depend on this technology to save your life. ◼