Fall Prevention and Injury Reduction Utilizing Continuous Video Monitoring

NCPD 2.0 Contact Hours

A Quality Improvement Initiative

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ABSTRACT

Background: Reduction of falls and fall-related injuries in hospital patients remains a priority. Consideration of technology via continuous video monitoring (CVM) is relevant for safe, quality care with favorable cost implications.

Local Problem: Although fall rates were in the acceptable national safety standard guidelines, interventions were explored with the aim to further decrease falls using CVM.

Methods: The quality improvement project collected descriptive statistics. Run charts portrayed data trends for falls and injuries in 2-week increments over a 6-month period.

Interventions: Two-way cameras and a virtual sitter were used to observe fall risk patients.

Results: Implementation of CVM with virtual sitters depicted a 14% decline in fall rates and a 6% decrease in fall-related injury rates with positive budget implications.

Conclusion: Cost savings, fall rates, and fall injury rates all improved with the inception of video monitoring.

Keywords: continuous video monitor, fall-related injury, falls, virtual sitter

Falls and serious injuries related to falls remain a major concern in hospitals. Researchers at the Agency for Healthcare Research and Quality (AHRQ) estimate 700 000 to 1 million hospitalized patients fall yearly, with 30% to 50% of patients sustaining significant injuries.[1] Patient safety events, specifically accidental falls, are identified as one of the most documented incidents, with 3 to 5 falls per 1000 patient-days.[2] The Joint Commission describes falls as sentinel events and notes that almost 33% of falls are preventable in the United States.[3] The Institute of Healthcare Improvement identified the most prevalent fall-associated injuries as head trauma, bleeding, and fractures.[4] Less than 1% of hospital falls result in fatalities; however, this represents that nearly 11 000 deaths are sustained from a hospital injury per year.[4]

Falls result in additional hospital days and contribute to an increase in costs.[1] On average, a fall incident adds 6 to 12 days to a hospitalization and $30 000 direct costs per patient.[5] The Centers for Medicare & Medicaid Services considers falls a hospital-acquired condition and reduces reimbursement in an attempt to decrease falls and ultimately costs; however, the cost for falls in 2015 remained more than $31 billion.[5]

Continuous video monitoring (CVM) is a novel technological approach utilized to promote patient safety. CVM implementation with virtual sitters watch high fall risk patients via a 2-way camera. If patients exhibit behaviors putting them at risk for falling, such as attempting to get out of bed without assistance, the sitter intercedes verbally. Redirection via the camera and talking with a patient enable additional time for nursing staff to arrive in the room before a fall occurs.

LITERATURE REVIEW

A literature review identified evidence of a decrease in hospital-associated falls and fall-related

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injuries with CVM as an intervention.[6] Ten observational studies and 2 quasi-experimental studies (N = 12) focused on fall rates and cost savings.[6] All studies were conducted in patients older than 18 years.[6] Eleven sites in the studies were inpatient and acute care facilities, and the 12th was an inpatient rehabilitation unit.[6] All studies calculated falls per 1000 patient-days.[6] Interestingly, of the 12 studies, only 5 found a decline in the number of falls[6-11]; however, none of the studies showed an increase in falls.[6-18]

In addition, all 12 studies reported a decrease in overall costs transitioning from 1:1 sitters to virtual sitters using CVM.[6-18] Although each study reported monetary savings and recouped initial investments for cameras, monitors, and training, there were important differences. Eleven of the 12 studies incorporated patient consent into the admission process, and 1 study obtained a separate consent for each monitored patient.[6] Facilities that included the consent in the patient admission had a high participation rate.[6] The single study with the additional consent found a low participation rate (20.7%).[15]

Patient assignment for CVM varied across studies due to the selection process based on protocols specific to each site. Multiple methods facilitated determination of assignment for CVM and virtual sitter surveillance. For example, some studies developed algorithms for inclusion per individual institution[10,11,16] or unique patient populations.[10] Other studies chose to use nursing judgment rather than formulate specific guidelines[7,12] or relied solely on a fall risk assessment tool to determine eligibility for CVM.[11,15] In addition, others used a combination of a fall risk tool and nursing judgment to determine eligibility.[14,18]

Each facility determined the number of patients assigned to CVM observation. For 11 of the studies, the ratio of patients to CVM ranged between 8 to 12 patients and a single sitter. The study that occurred in a rehabilitation unit, however, reported patient to virtual sitter ratios as high as 15:1, with justification by study authors who noted the facility had a higher ratio of patients to virtual sitters due to lower patient acuity.[7]

QUALITY IMPROVEMENT

Falls can negatively influence length of stay, costs, and quality of life. Although several interventions to decrease hospital-associated falls and fall-related injuries were in use, falls continued. The fall rate 3 months preceding the intervention was 3.93 falls per 1000 patient-days. The Plan-Do-Study-Act quality improvement (QI) model was used to assess for a change below the literature findings of 3 to 5 falls per 1000 patient-days.[2] Institutional review board–exempt approval was received prior to implementation of the project.

Specific aim

This QI team aimed to implement virtual sitters utilizing CVM in hospitalized patients older than 18 years. The aim was for fall rates and fall-related injury rates to decrease comparing 3 months preimplementation of CVM with 3 months postimplementation. The secondary aim was to complete a cost analysis to determine cost-effectiveness between 3 months preimplementation and 3 months postimplementation.

METHODS

Setting and context

The project was conducted at a 244-bed Magnet-recognized suburban hospital in the mid-Atlantic United States. The hospital has served the community for more than 125 years and more recently has become part of a larger health system.

Organizational quality leaders define falls as a sudden unintentional descent to the floor and a fall-related injury as harm that occurred because of a fall via the National Database of Nursing Quality Indicators (NDNQI) reporting structure. The QI team used baseline data for 3 months prior to CVM implementation and 3 months postimplementation. The information was obtained through the hospital Fall Report via a secure software system. The daily bed census for each unit was factored into the calculation of fall rates, and nurse management staffing data were collected.

Intervention

CVM technology provided round-the-clock virtual patient observation. Individual portable video monitor carts, each with 2-way audio and visual cameras, enabled the patient to see the virtual sitter and the sitter to observe and monitor up to 10 patients. Designated patients were monitored from a central station continuously, in real time, with synchronous video/audio monitoring

technology on a secure HIPAA telemedicine platform. Close communication between the nursing staff and the sitter was via encrypted phones. Identification of patient needs and potential issues were expediently addressed, leading to a better use of resources and increased patient safety. Current standard of care safety practices such as signs, wristbands, nonslip footwear, education, safety rounds, and bed alarms continued in tandem with implementation of CVM.

Prior to operationalization of CVM, our team ensured consensus at all levels. Product promotion, buy-in, and education of key stakeholders including nursing staff, managers, and virtual sitters were paramount to the rollout of CVM. The nurse manager of the virtual sitter team was the on-site project champion to guide the process and field questions. Educational modules were assigned to all nurses, certified nursing assistants (CNAs), and virtual sitters through an online learning management system. This was ongoing to ensure competency on technology and institutional policies. Unit-based demonstrations occurred during the initial 2-week implementation period and follow-up tutorials occurring on individual units.

Partnerships nurtured with various departments brought the project to fruition, including Informational Technology personnel who addressed technicalities of the video monitoring system, and our colleagues in Housekeeping assisted with special cleaning procedures of the equipment and transition of the portable units to the next patient. The workflow process was easier with Facilities who designated space for a centralized monitoring station to provide privacy in a secluded area outside the nursing coordinator office and allocated space for cart storage when not in use.

CVM-specific policies and job descriptions were developed. Qualifications for a virtual sitter included the ability to focus, multitask, and watch multiple patients at a time. Individuals for the new CVM positions worked at the facility and were familiar with policies and safe practices. CVM of at-risk patients required special training. Virtual sitters attended an initial 2-hour introductory session in conjunction with a web-based training program. In addition, multiple interactive hands-on sessions with equipment and documentation continued. Virtual sitters received additional education in communication including how to redirect patients and when to alert nursing staff to maintain safety and prevent falls and injuries.

Patients eligible for the intervention were identified via the nursing staff. Nurses used an algorithm to guide nursing judgment and evaluated patients on admission, after a safety event, and during daily nursing rounds to identify at-risk patients appropriate for CVM. This intervention allowed for simultaneous monitoring of patients and freed up a 1:1 sitter for patient care on the unit. The algorithm detailed the inclusion/exclusion criteria and the CVM policy. Once selection occurred, education was provided by the nurse to the patient and family regarding the role of the virtual sitter and the CVM equipment. Virtual sitter introductions included a demonstration on how to gain attention with a hand wave. If a patient attempted to get out of bed without assistance, the virtual sitter verbally redirected the patient and reported the activity or patient needs to the nurse. If the verbal interaction did not deter the patient, a loud emergent audio alarm alerted the nurse that immediate attention was necessary. If more than 3 redirects in a span of 30 minutes occurred, the patient was removed from CVM with reassignment to 1:1 in-person observation. Flow sheets for documentation were used for virtual sitters to track communication with patients and staff.

Measures

The QI team selected and defined measures for the intervention with definitions used by the NDNQI. A fall is an unintentional descent to the floor that may or may not incur an injury.[19] A fall-related injury is defined as harm incurred by a fall, broken into 5 definitive categories: *none*—no injury occurred and confirmed by a radiograph, CT scan, or postfall assessment; *minor*—a simple intervention was necessary such as ice, elevation, topical medication, and cleaning of a bruise or abrasion; *moderate*—required sutures, Steri-Strips, splints, or joint or muscle strain; *major*—needed a cast, surgery, blood products, or additional consults for neurological or internal injuries; and *death*—a result of fall injuries.[19] The total number of falls and fall-related injuries was calculated according to the AHRQ definition for falls per 1000 patient-days.

Fall rates per 1000 occupied bed days were calculated dividing fall numbers by bed occupancy and multiplying by 1000.[1] *Fall-related injury*

rates per 1000 occupied bed days were calculated dividing fall-related injury numbers by bed occupancy and multiplying by 1000.[1]

The falls and injury data were collated using the MIDAS Fall report. Fall data 3 months prior to video monitoring implementation were retrieved from the MIDAS Fall report and for 3 months postimplementation.

In addition, occupancy rates were a factor. *Bed occupancy* was the number of patient occupied beds in the hospital at a set time each day. The daily bed census at the same time each day for each unit was shared via the census report to calculate fall rates. *Demographics and patient characteristics* data were collected from the MIDAS Fall report and included age, sex, marital status, language, day including the time the fall occurred, and the type of falls and injury. Another area of note was the *cost savings*. The cost was calculated with virtual sitter hours listed on the nursing management staffing reports and multiplied by the hourly rate plus benefit rate to determine the daily cost of the intervention. This intervention cost was subtracted from the cost of using 1:1 sitters for total overall cost. Supplemental reports for falls data collection and support included the Virtual Sitter report. The Virtual Sitter report was collected daily with information on location of patient assignments, alerts, falls, fall-related injuries, and discharges.

Patient identifiers were removed from all data collection. Every report received a code, and each patient had a unique number. This system was created to recognize and decrease data duplication and eliminated use of patient identifiers. The only missing data were the shift a fall occurred, which was not significant for this project. For these patients, 999 was entered as a place holder for this variable and noted as Unspecified in Supplemental Digital Content, Table (available at: http://links.lww.com/JNCQ/A878).

Study of interventions

The biweekly data collection of fall rates and fall injuries over the 6-month period assessed the trend and captured a more informative picture. The first 3 months did not use CVM, and the second 3 months of data included implementation of CVM. Methods to ensure use of CVM with virtual sitters and fall reporting adherence comprised education at the onset and weekly review of tools and importance of thorough documentation including a revision of the virtual sitter tool. All Virtual Sitter reports were collected daily by the nurse manager. Fall reports and Virtual Sitter reports were reviewed, extraction of relevant data was entered for analysis on a spreadsheet, and the information was double-checked for accuracy.

Analysis

Descriptive statistics were used to characterize the sample and setting, as well as falls and falls with injuries from January 1, 2020, through June 30, 2020. Preintervention data collection for 3 months began in January 2020, with implementation of video monitoring in April 2020 and data collected through June 2020. Analyses used Microsoft Excel and SPSS software (IBM, Armonk, New York).

Run charts graphically portrayed the data trends for fall rates and fall-related injury rates over a 6-month period from January 1, 2020, through June 30, 2020. The time frame on the run charts depicted 2-week increments for a total of 12 data points. Run charts, a QI-specific analytical tool, were simple yet effective for assessing variations in the health care process. Run charts visually depicted the falls and fall-related injuries pre– and post–virtual sitter intervention and assisted to determine whether improvement occurred.

A cost analysis was done comparing 1:1 sitter hours with virtual sitter hours. During the months of April, May, and June 2020, a total of 2152 hours were allotted to virtual sitters. The virtual sitters replaced 7031.5 hours of 1:1 sitter expenditure. The total amount of hours saved was 4879.5 hours multiplied by the hourly wage ($15.00) added to 33% for benefits ($4.95).

Ethical considerations

Patient consent for care included CVM in the overall admission process. Privacy considerations were acknowledged via information about the virtual sitter program, including the inability to record. Patients were viewed in real time. During patient care, the camera was turned toward the door. Audio was off and turned on when signaled by someone in the room or when the virtual sitter interacted with the patient.

RESULTS

A total of 93 patients (51% female) experienced falls. The majority of patients were aged 65 to 84

years (57%), English-speaking (98%), and married (41%). There was not a predominant day of the week for falls. The project was to start on a designated unit; however, it was rolled out hospital-wide due to COVID-19. The patients on the medical-surgical units had the most falls, with increased numbers of patients found on the floor (49%) as a as result of not asking for assistance to go to the bathroom or attempting to pick something up. Detailed demographics are presented in the Supplemental Digital Content, Table (available at: http://links.lww.com/JNCQ/A878).

Implementation of CVM in conjunction with standard fall precautions demonstrated a 14% reduction in median fall rates from 3.93 falls per 1000 patient-days from January through March 2020 (preintervention period) to 3.37 falls per 1000 patient-days from April through June 2020 (postintervention period) in hospitalized patients. Fall-related injuries decreased from 0.95 to 0.89 per 1000 patient-days postintervention—a 6% reduction. A run chart was used to look objectively at the data collected on both falls and fall-related injuries before and after the implementation of CVM (Figure). A special cause variation is the shift noted by a specific or assigned factor such as CVM. Over the initial 3 months, 1 virtual sitter monitored up to 10 patients for a savings of 2152 patient-hours. Based on the average hourly rate and benefits paid to virtual sitters, the total cost saving was equivalent to more than $97 000.00 in 1:1 sitter expenditure that was eliminated with video monitoring.

DISCUSSION

Fall prevention and fall-related injury prevention continue to be a priority in hospitals. This QI team aimed to decrease falls and fall-related injuries in hospitalized patients using CVM. The secondary aim was to determine whether the use of CVM impacted cost. A change occurred in reduction of both fall and fall-related injury rates over 3 months with a substantial cost savings. Patient quality and safety were a strength of the project, as was the underlying cost-reduction factor.

Interpretation

In this improvement project, CVM had positive outcomes regarding both safety and cost. Virtual sitters may continue as a fall prevention strategy, as the literature supports many hospitals experienced encouraging results in terms of fall reduction.[6-11] In addition, the cost savings for hospitals that introduced CVM were convincing.[6-18]

Nursing leadership saw the value in CVM and thereby increased the usability in this facility.

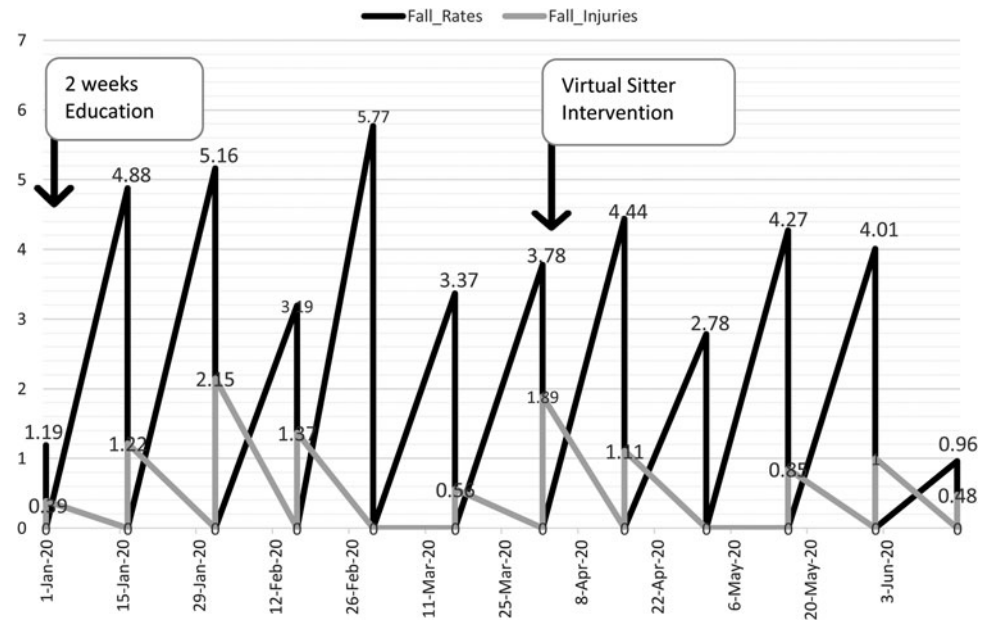

Figure. Falls and fall-related injuries per 1000 occupied beds. *Note*: Rates determined using 1000 patient-days.

Virtual sitter communication was a strength and appeared to delay patients getting out of bed without assistance, adding precious seconds to prevent falls. This was important during COVID-19 and was an unintended consequence. The QI team initially planned to implement CVM on the cardiac unit, but isolation protocols during COVID-19 expedited the implementation of CVM to all units of the hospital. Positive outcomes of CVM included decreased patient falls and fall injuries and isolation patients could communicate with virtual sitters who expedited needs prior to nurses donning personal protective equipment. Unforeseen benefits included decreased length of stay and reduced overtime, and reassignment of CNAs to 1:1 sitters decreased, therefore CNAs remained on the unit in direct care, potentially decreasing falls.

Limitations

The duration of the project was a limitation. Data for 6 months or more postintervention would have been preferred; however, the constraint imposed by graduation requirements of the team lead limited the time frame of the project. Lack of control of extraneous factors that possibly confounded the effect of CVM on fall rates and fall-related injury rates such as patient profiles potentially limited data collected. Another limitation was the cost analysis that investigated savings on nursing hourly rates based on the total saved hours and not on purchase price of program expansion. The projected time to recover the outlay costs of the equipment cost, setup, and technical support is 2 years. This will vary with the number of cameras at an institution.

The initial plan was to target a specific unit for CVM and rollout over time; COVID-19 precipitated the rapid release of CVM to the entire hospital. The impact of this broad release was system-wide, including education of additional staff nurses. The results could have taken a negative turn; however, the ability to monitor additional patients, including those in COVID-19 isolation, and the freeze on elective surgical procedures supported the decision. The decline in census challenged the bed occupancy rates and demographics. The patient population might look different as CVM continues and elective surgical procedures resume.

Expansion of CVM will entail investment in additional cameras. Based on the pilot nature of this QI project, only 10 cameras were available, limiting the number of patients assigned to monitoring. Because of this limitation, the fall prevention analysis could have been substantially more if patients who fell and did not receive CVM had the opportunity. Continuous monitoring could have potentially precluded a fall. Algorithms were utilized to adjust for the limited equipment and select the patients deemed at high risk for falls.

Next steps

The next steps will be to determine the sustainability of the CVM process. Favorable feedback from staff, patients, families, nurse champions, and management was received. Support for utilization continues, with current data with fall and fall-related injury rates disseminated to each unit. Positive support of the project includes a display of signs on units with the number of days without falls for staff, patients, and families to view. Impact on staff usage with new upgrades to the technology includes documentation integration into the electronic health record (EHR). The EHR feature was adopted after completion of this project.

Consideration of the cost-benefit and return on investment continues to be a driving factor. Budget allocations for the purchase of additional cameras have been stalled because of COVID-19 budget constraints. Growth of the program with additional cameras and virtual sitters continues as a goal. The vision to spread to additional contexts includes self-harm prevention and staff safety. These have implications for practice and research as does how the number of cameras impacts falls, how response time is influenced, and the psychological impact of CVM on patient care from different perspectives including the patient, family, and nursing.

CONCLUSION

The QI team found value in the use of CVM as an intervention to reduce falls and fall-related injuries in hospitalized patients, specifically in older adults. Future use of innovation, such as CVM, will require additional evaluation for sustainability and return on investment. As CVM with virtual sitters evolves, patient safety and quality care remain a priority in terms of fall prevention and injury reduction.

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