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## Technological Change in Hospitals' Fall Prevention Methods<sup>1</sup>

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### Background

Most of us have experienced a fall, and the unexpected consequences that can come with it—the twisted ankle from slipping on ice, or the bruised ego from tripping over one's shoes. Multiple areas of research, from biomechanics to medical practice, focus on falls and the vast range of physical and economic damages they cause. Beginning in the 1980s, research on hospital fall prevention showed that methods of the time failed to prevent—and occasionally caused or worsened—the injury and financial expense of falls.<sup>2</sup> Later, U.S. medical policy changes emphasized hospital falls statistics, essentially mandating that hospitals bear the costs of falls and responsibility to prevent them, lest they face financial penalties or loss of accreditation.<sup>3</sup> The existing knowledge regarding falls and subsequent policy changes led hospitals and other professional health care organizations to explore several available means of fall prevention to manage costs and improve patient safety.

The World Health Organization (WHO) defines falls as any unintentional descent to any lower surface.<sup>4</sup> When patients lose balance and “sit” themselves with force on other objects, they are still at risk of injury from the incident, so such a scenario is still considered a fall in a hospital.

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<sup>2</sup> Howard S. Rubenstein, et al. “Standards of medical care based on consensus rather than evidence: The case of routine bedrail use for the elderly.” *Law, Medicine and Healthcare* 11, no. 6 (1983): 272; Todd J. Ferlo, et al. “Injury and death associated with hospital bed side-rails: reports to the US Food and Drug Administration from 1985 to 1995.” *American Journal of Public Health* 87, no. 10 (1997): 1676

<sup>3</sup> Sharon K. Inouye, Cynthia J. Brown, and Mary E. Tinetti. “Medicare nonpayment, hospital falls, and unintended consequences.” *New England Journal of Medicine* 360, no. 23 (2009): 2390.

<sup>4</sup> World Health Organization. “Falls.” World Health Organization, Geneva Switzerland. April 26, 2021. Accessed at <https://www.who.int/news-room/fact-sheets/detail/falls>

With this wide definition of falls, hospitals have considerable incentive to minimize their occurrence and severity, both to protect themselves and their patients.

To answer the falls problem, hospitals and nursing homes at first relied heavily on restraints. Restraints could be chemical, such as sedating medications, or mechanical (physical) restraints, such as high side rails or tie-down straps for keeping patients in bed.<sup>5</sup> However, the use of these methods and devices spurred ethical debate over the uses and misuses of restraints, the loss of autonomy and dignity of patients,<sup>6</sup> and the injury or death of patients while physically restrained.<sup>7</sup>

Currently, Medicare heavily regulates the use of sedatives as chemical restraints. Similarly, mechanical restraints are strictly controlled in hospitals, requiring hourly documentation and daily justifications for sufficient medical conditions to justify their use.<sup>8</sup> Given the practical limitations of maintaining these protocols for restraining patients, and the wide variety of underlying needs thought to be driving patients' actions before falls,<sup>9</sup> hospitals gained additional reason to try implementing other methods.

One early alternative to restraints was employing bedside sitters—usually, experienced certified nursing assistants (CNAs) with whom visiting family members could interact, providing information or insight into the patient's needs—and another was using sensor-triggered alarms which would sound loudly if a patient was attempting to leave their bed or chair. Studies on bed alarms and similar technologies found that fall rates were not significantly improved by these devices, and that better staff and patient education improved hospital fall rates instead.<sup>10</sup> As for

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<sup>5</sup> In the U.S., all four bed rails in a raised and locked position on a hospital bed counts as a mechanical restraint and would be subject to the same monitoring and documentation requirements as wrist or leg ties. See <https://www.jointcommission.org/standards/standard-faqs/hospital-and-hospital-clinics/provision-of-care-treatment-and-services-pc/000001668/> for additional information.

<sup>6</sup> Moss, Robert J., and John La Puma. "The ethics of mechanical restraints." *The Hastings Center Report* 21, no. 1 (1991): 22-25.; Rubenstein, Howard S., et al. "Standards of medical care based on consensus rather than evidence: The case of routine bedrail use for the elderly." *Law, Medicine and Healthcare* 11, no. 6 (1983): 271-276.

<sup>7</sup> Joan Ferlo Todd, et al. "Injury and death associated with hospital bed side-rails: reports to the US Food and Drug Administration from 1985 to 1995." *American Journal of Public Health* 87, no. 10 (1997): 1675.;

<sup>8</sup> Centers for Medicare and Medicaid Services. "CMS Publishes Final Patients Rights Rule on Use of Restraints and Seclusion." December 8, 2006. Accessed at <https://www.cms.gov/newsroom/press-releases/cms-publishes-final-patients-rights-rule-use-restraints-and-seclusion> on 8/9/2023

<sup>9</sup> Pekka Kannus, et al. "Prevention of falls and consequent injuries in elderly people." *The Lancet* 366, no. 9500 (2005): 1887.

<sup>10</sup> Katrina Bressler, et al "Elimination of position-change alarms in an Alzheimer's and dementia long-term care facility." *American Journal of Alzheimer's Disease & Other Dementias* 26, no. 8 (2011), 599; Meg E. Morris, et al.

the patient companions, or “sitters,” who would remain at the patient’s bedside throughout a regular shift, ensuring they remained in bed by preventing impulsive actions,<sup>11</sup> there were other limitations. On one hand, having a worker dedicated to a single patient for the duration of their shift results in an expensive, resource-limiting solution to hospital falls. On the other hand, in cases where a sitter cannot be spared due to staffing concerns, patients’ family members are often used as an alternative, despite the differences in training.<sup>12</sup>

Studies conflict on whether clinicians consider these fall prevention methods useful, especially patient sitters, and whether any new technology addresses other factors that create the conditions for falls. Low staffing and inadequate training are cited by nurses as reasons behind the variable effectiveness of sitters,<sup>13</sup> but research efforts regarding sitter use are not aimed at addressing these underlying factors.

With the staffing strains of post-pandemic life, hospitals have increasingly turned to “telesitters,” or remote video monitoring (RVM) of patients. Some of these systems simply broadcast real-time footage of the patient and their activity, without additional measures to obscure the appearance or identity of patients. Other patient surveillance systems discern patient motion by less detailed camera technology, such as depth cameras which use distances to the “object” to render a shape and determine position.<sup>14</sup>

As the body of research demonstrated that sitters were not solving the hospital falls problem,<sup>15</sup> another, newer body of research on telesitting is beginning to demonstrate interesting, but inconclusive, results of its own.

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"Interventions to reduce falls in hospitals: a systematic review and meta-analysis." *Age and ageing* 51, no. 5 (2022), 9.

<sup>11</sup> Huey-Ming Tzeng and Chang-Yi Yin. "Using family visitors, sitters, or volunteers to prevent inpatient falls." *JONA: The Journal of Nursing Administration* 37, no. 7/8 (2007): 329-330.

<sup>12</sup> Huey-Ming Tzeng and Chang-Yi Yin. "Using family visitors, sitters, or volunteers to prevent inpatient falls." *JONA: The Journal of Nursing Administration* 37, no. 7/8 (2007): 332-333.

<sup>13</sup> Amanda Garcia, et al. "Nurses' perceptions of recommended fall prevention strategies: A rapid review." *Journal of nursing care quality* 37, no. 3 (2022): 255-256.

<sup>14</sup> Josh Brown, et al. "Automated depth video monitoring for fall reduction: A case study." In *Proceedings of the IEEE/CVF Conference on computer vision and pattern recognition workshops* (2020): 1188-1189

<sup>15</sup> Adela M. Greeley, et al. "Sitters as a patient safety strategy to reduce hospital falls: a systematic review." *Annals of internal medicine* 172, no. 5 (2020): 317-324.

## Case Study

In the Midwestern United States, a study on the development of a new telesitting program took place at a relatively small, urban hospital.<sup>16</sup> For 9 months prior to the experimental program, researchers tracked the number of falls across three adult inpatient units (hospital wards): neuroscience, geriatrics, and intermediate care.<sup>17</sup> Any patient admitted to one of the three units was eligible for the RVM study, with a few specific exceptions. Further inclusion criteria to select patients involved previous fall histories, presence of certain medications, alcohol/substance withdrawal, or confusion/poor judgment—the highest risk patients.

For the active phase of the telesitter study, the researchers obtained Institutional Review Board (IRB) approval to waive direct participant consent, as consent was considered to fall under the hospital's usual patient paperwork to consent for treatment within the hospital; thus, these patients would not know that they were part of a study on video monitoring.<sup>18</sup> This study, and most others involving the new implementation of remote video monitoring for patients, followed this pattern of not describing or obtaining consent from patients specifically for camera observation.

From the centralized monitoring unit (CMU), a room most hospitals have for remotely monitoring heart rhythm and blood pressure devices, a telesitter monitors multiple patients, notifying nurses or nurses' aides when a patient exhibits behavior that could lead to a fall. With RVM, cameras are used to visualize patient activity and transmit the feed to the CMU. Two-way microphones also allow the telesitter to verbally redirect the patient to prevent a fall, but patients with confusion and delirium often become more confused and more likely to fall when instructions from a disembodied voice are heard.<sup>19</sup> Generally, the technicians in the CMU receive training to

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<sup>16</sup> A Magnet hospital has voluntarily undergone an extensive and costly application process to demonstrate commitment to research and leadership development of the nursing staff. Eligibility requirements emphasize levels of attainment in education, especially among those responsible for management and unit-based learning for nurses in that system. For more information, please see the site for the organization governing Magnet status, the American Nurses Credentialing Center (subset of the American Nurses Association) at <https://www.nursingworld.org/organizational-programs/magnet/>

<sup>17</sup> Neuroscience units would specialize in medical conditions that affect the brain (but not necessarily a new *traumatic* brain injury); geriatrics units would specialize in care for the elderly; intermediate care units specialize in patient populations whose cases are not complex or severe enough for ICU (intensive care unit) care, but more complex than the general medical-surgical units should handle.

<sup>18</sup> Lisbeth Votruba, et al. "Video monitoring to reduce falls and patient companion costs for adult inpatients." *Nursing economics* 34, no. 4 (2016): 186.

<sup>19</sup> Katrina Bressler, et al. "Elimination of position-change alarms in an Alzheimer's and dementia long-term care facility." *American Journal of Alzheimer's Disease & Other Dementias* 26, no. 8 (2011): 604.

learn to use the equipment to monitor patients on RVM and learn a stepwise protocol for notifying nurses or nurses' aides when a patient exhibits behavior that could lead to a fall. Over the course of these studies, patients were monitored using RVM, and data were collected for each patient regarding falls, reasons for monitoring, interventions made by the technician, and recording time.

Most individual studies claim to find a statistically significant reduction in falls due to RVM technology. During the 9-month active phase of one study, the units showed a rate of 1.6% for the patients selected for RVM and a fall rate of 1.7% among the population of remaining patients on the units. The study also found that the RVM system improved patient safety and reduced staffing costs associated with bedside sitters. Other studies show greater reductions in fall rate following the implementation of their study program, but early systematic reviews covering the still-growing literature on RVM do not substantiate the positive outcomes seen in the case studies. One such systematic review observed that only 5 out of 12 studies reviewed showed a decline in falls rate, but it still concluded that cost savings without increases in falls made RVM a technology with value for falls prevention.<sup>20</sup>

Beyond inconclusive results, other new fall prevention methods have emerged blurring the line between surveillance and restraint technologies and raising ethical and privacy concerns. One such remote video monitoring system included a "virtual bed rail" system, in which physical rails along the side of the bed were replaced by a motion-detecting sensor which would alert those at the nursing station that the patient was moving beyond the designated boundaries. While the patient remains physically unrestrained, any defined movements across the boundary will trigger a response from those monitoring the alert system.<sup>21</sup> Nurses report that hospitals' zero-tolerance attitude toward falls leads to reducing the patient's freedom of movement, known to worsen patient outcomes.<sup>22</sup> Patients confined to their beds are also those likely to receive in-bed bathing and care, and thus are already at risk of losing their claim to privacy after losing the autonomy to walk more freely; and this compromises the hospital's ethical duty to offer patients autonomy and dignity in their care.

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<sup>20</sup> Beth Hogan Quigley, Susan M. Renz, and Christine Bradway. "Fall prevention and injury reduction utilizing continuous video monitoring: a quality improvement initiative." *Journal of nursing care quality* 37, no. 2 (2022): 128.

<sup>21</sup> Mirza, Noveera A., Joshua A. Christian, and Christopher M. LaJeunesse. "Remote video monitoring is another example of "dying on the machine" for critically ill patients." *Clinical Research in Practice: The Journal of Team Hippocrates* 3, no. 2 (2017): 2.

<sup>22</sup> *Ibid*, 5-6

Privacy with RVM is a concern for clinicians and patients alike, especially as hospital patients are rarely informed of, let alone actively choosing the use of this technology during their admission. While most hospital-based studies did not evaluate patient perceptions of RVM technology, a study that included a consent form specific to the video-monitoring that patients would experience received a strikingly low participation rate compared to those who did not include a specific consent.<sup>23</sup> In another study, physicians surveyed were concerned about the lack of privacy in RVM not only for the patients but also for themselves.<sup>24</sup> Additionally, studies regarding the adoption of home-monitoring fall prevention technologies show that privacy concerns are a deterrent for substantial numbers of consumers.<sup>25</sup>

## Processing Questions

- 1) What are the fall prevention technologies that have been used over the past few years by hospitals?
- 2) What functions do a bedside 'sitter' fulfill? How do those functions compare to what a "telesitter" can do?
- 3) What ethical or privacy concerns might exist with telesitting? What comparisons can be made between the concerns about analog restraint technologies and the newer, digital technology of RVM?
- 4) What were the problems with the sitter system that telesitting was supposed to address? What problems remain unsolved or what new problems were added?

## Thematic Reflection and Discussion

### Patient autonomy

In contemporary research, there are certain main principles of research ethics: autonomy, beneficence, nonmaleficence, and justice. Generally, autonomy is the intrinsic right for a patient to make decisions for themselves, without influence from others; informed consent is often considered to be "the way [the principle of autonomy] is to be applied."<sup>26</sup> Beneficence means to

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<sup>23</sup> Beth Hogan Quigley, Susan M. Renz, and Christine Bradway. "Fall prevention and injury reduction utilizing continuous video monitoring: a quality improvement initiative." *Journal of nursing care quality* 37, no. 2 (2022): 124.

<sup>24</sup> Young Ju Kim, et al. "Staff acceptance of video monitoring for coordination: a video system to support perioperative situation awareness." *Journal of clinical nursing* 18, no. 16 (2009): 2368.

<sup>25</sup> Tamara Mujirishvili, et al. "Acceptance and Privacy Perceptions Toward Video-based Active and Assisted Living Technologies: Scoping Review." *Journal of Medical Internet Research* 25 (2023), 8-9.

<sup>26</sup> Jane Dryden. "Autonomy," *The Internet Encyclopedia of Philosophy*, <https://iep.utm.edu/autonomy/#H5>, accessed August 9, 2023

“do good” by the patient, and nonmaleficence means not to do harm to the patient, in the absence of being able to do good for them. Justice aims for equal treatment and fairness for all people in whatever process of treatment or research undertaken.<sup>27</sup>

- 1) Many patients in hospitals may not be aware that they are being monitored by video, given that consent forms may not be clear enough about it, or can be an insufficient way to create such awareness. What are your expectations about being surveilled in a hospital room? What kind of good or harm remote video monitoring can cause to a patient, in your opinion?
- 2) In hospitals, autonomy is touted as a reason for nurses to promote patient independence in performing daily self-care tasks. How might RVM impact a patient’s ability to “do for themselves” in a hospital setting? How would this have differed with sitters? With chemical and mechanical restraints?
- 3) In several studies, nurses found other ways to use the RVM system beyond monitoring fall risk—for example, monitoring for patients pulling at IVs, or surveillance for self-harm. As a patient in such a hospital, would you expect to be notified of novel ways video monitoring technology is being used on you or would you prefer to delegate the decision about the use of RVM to the hospital administration? Why? If you were a clinician at the hospital, would your answer change? Why or why not?

### **Patient Privacy**

Usually, patients are required to wear hospital gowns which are open to the back and have snaps on the arms to allow for easy removal from a person lying down. Patients who, for whatever reason, cannot stand or walk for long periods of time often remain in bed on high fall precautions. These patients usually receive personal hygiene care in their beds.

- 1) In some studies regarding telesitting, patients withdrew their permission for monitoring after serious threats (such as Covid-19) had passed. In your opinion, considering patient (and clinician) autonomy and privacy, should this technology be an everyday solution to hospital problems? Or should we limit uses of such monitoring technology to crisis situations, like Covid-19? Why?

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<sup>27</sup> Vickie A. Miracle. "The Belmont Report: The triple crown of research ethics." *Dimensions of critical care nursing* 35, no. 4 (2016): 225-226.

2) Please review this patient handout, in particular pages 7-8, from a hospital using RVM technology available on the internet:

[https://www.umms.org/uch/-/media/files/um-uch/for-health-professionals/telesitter\\_video\\_policy.pdf?upd=20200129155351](https://www.umms.org/uch/-/media/files/um-uch/for-health-professionals/telesitter_video_policy.pdf?upd=20200129155351)

- a) Which situations are considered acceptable to turn the camera off in this hospital? Does this hospital policy allow for the patient who received this handout to opt out the monitoring system? How so?
  
- b) How do patients' privacy and autonomy intertwine in hospital policies such as this one? How does one limit the other?