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Geriatric Nursing

journal homepage: www.gnjournal.com

Research Paper

US and Dutch nurse experiences with fall prevention technology within nursing home environment and workflow: A qualitative study

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ARTICLE INFO

Article history:

Received 22 July 2016

Received in revised form

11 November 2016

Accepted 14 November 2016

Available online xxx

Keywords:

Fall prevention

Long-term care

Monitoring technology

Position monitors

Bed exit alarms

Pressure sensor mats

Alarm fatigue

ABSTRACT

Falls remain a major geriatric problem, and the search for new solutions continues. We investigated how existing fall prevention technology was experienced within nursing home nurses' environment and workflow. Our NIH-funded study in an American nursing home was followed by a cultural learning exchange with a Dutch nursing home. We constructed two case reports from interview and observational data and compared the magnitude of falls, safety cultures, and technology characteristics and effectiveness. Falls were a high-magnitude problem at the US site, with a collectively vigilant safety culture attending to non-directional audible alarms; falls were a low-magnitude problem at the NL site which employed customizable, infrared sensors that directed text alerts to assigned staff members' mobile devices in patient-centered care culture. Across cases, 1) a coordinated communication system was essential in facilitating effective fall prevention alert response, and 2) nursing home safety culture is tightly associated with the chosen technological system.

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Introduction

Falls and related injuries are a global public health issue that is expected to worsen with increasing population aging. In developed countries up to half of all nursing home residents fall each year. Falls incur both direct costs to the healthcare system (nurse evaluation, hospitalization, emergency room visits, pain management, and rehabilitation) and indirect costs (informal caregiving and lost social participation from fear of falling).¹ Although much is known about their multifactorial nature, falls remain a problem and the search for additional potential solutions continues, increasing in

urgency as more medically complex older adults enter long-term care amid industry nursing shortages.^{2,3}

As one compelling potential solution, fall prevention technology has yet to be examined within nursing home nurses' environment and workflow. This is true despite the fact that technology is increasingly used in hospitals⁴ and long-term-care settings to monitor movement to prevent falls. Common devices in the US include inexpensive tab alarms (corded alarms that are clipped onto a resident's clothing and sound when detached as a result of resident movement) and pressure sensitive mats (weight-sensitive sensor pads on beds or chairs that alarm when resident gets up; also called position monitors or bed monitors).⁵ Common devices in the Netherlands (NL) are infrared sensors in the resident's room to alert caregivers of movement.⁶ Tab alarms, pressure sensitive mats, and infrared sensors are all static non-obtrusive approaches to alert caregivers of resident movement in what Hamm et al (2016)⁷ call pre-falls prevention intervention systems, in contrast to other technologies that provide cognitive or physical training for residents to remedy functional deficits or other technologies that

Conflicts of interest: None.

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alert staff when residents are on the ground. Unfortunately, research has not substantiated that these movement monitors reduce falls^{8–10} or injury associated with falls.^{11,12} Nor have alternative technologies been recommended for effective use in fall prevention. Many of these potential fall prevention technologies are deemed “fall detection devices” because they typically notify staff of falls with too short notice for staff to arrive to prevent a fall.¹³

Our US research team sought to develop technology to predict bed exits based on physiological patterns. After receiving funding, we recognized that even dramatically improved technologies would necessitate understanding the nursing context in which they would be implemented. We therefore conducted a qualitative study focusing on existing technologies within nurses’ fall prevention practices at the study site where the prediction technology was being tested. A subsequent cultural learning exchange with the NL long-term care system Stichting Zorgcombinatorie Marga Klompe (SZMK) in Eastern Netherlands, provided an opportunity to replicate the investigation at a NL nursing home. The objective of this study was to examine how existing fall prevention technology was experienced within nursing home nurses’ environment and workflow. Doing so at two very different nursing home sites in the United States (US) and the Netherlands (NL) was designed to maximize differences to potentially introduce new ways of framing care problems and new ways of solving them.

Methods

We used a case study approach with a multiple-case (holistic) research design, following Yin (1984),¹⁴ in order to examine nurses’ experience of technology in fall prevention within two distinct and bounded systems (i.e., cases).¹⁵ We used a convenience sample of two nursing homes. The study protocols were approved by the Emory University Institutional Review Board. The lead author researcher was present at both case study sites.

Sample

Case 1 (US site)

An initial study at a 168-bed nonprofit academic teaching nursing home in Atlanta, Georgia, United States, was conducted in May 2013. The home had a superlative rating from US Nursing Home Compare.¹⁶ Study participants included site administrators (the administrator and assistant administrator), nurse managers (unit managers, licensed practical nurses (LPNs)) and registered nurses (RNs), and direct care nurses (certified nursing assistants (CNAs)).

Case 2 (NL site)

A replication of the study at a 152-bed nursing home in Winterswijk, Netherlands occurred in May 2014. The home had a superlative rating from the NL Ministry of Health, Welfare and Sport.¹⁷ Finding equivalent focus group populations was challenging because of differing nurse educational systems in the two nations. There was no Dutch equivalent to a CNA, an entry level nursing position that requires no more than a high school diploma and 8 weeks of training but whose role is to assist residents with their activities of daily living, take vital signs and inform the licensed nurse of any changes in resident health or function. The Dutch nursing system has five levels, or *niveaux*, and it was determined through discussions with administrators and staff that the *niveau* 3 mid-level nurse had the most overlap with the American CNAs, although they receive a full three years of training. The *niveau* 4 and 5 nurses that we included in our nurse manager group had

supervisory roles and were therefore considered equivalent to the US unit managers.

Focus group participants were selected by the site administrator depending on employee availability. Each potential participant was presented a consent form emphasizing that participation was voluntary and was then offered the opportunity to sign and participate. Consistent with local customs, monetary incentives (US \$15) and lunch were offered at the US site only.

Data collection

Data included staff interview data, observations, and facility records. At each site we first conducted two 90 minute in-depth interviews with administrators to obtain an overview of policies, procedures, and personnel in place to deal with falls, as well as to ask permission and help in recruiting nurse participants for focus groups. We then conducted two 90 min focus groups with nurses of different levels, using a common interview guide; questions and sample probes are displayed in Table 1. All interviews were conducted in native languages except in the case of the first Dutch administrator interview which was conducted by the lead author in English. All focus group participants completed brief questionnaires identifying background characteristics. Finally, the lead author wrote field notes on several site visits.

Analysis

Cases were analyzed separately to understand how each bounded system functioned on its own terms but in relation to the same interview questions. Extensive discussion and debriefing occurred following each focus group with research teams in US and NL. Individual and group interviews were recorded and transcribed verbatim. Two authors (VO and BV), working with another (AV), translated the Dutch transcripts into English.

Magnitude of the problem of falling, safety cultures, technological systems, and technological effectiveness were characterized in descriptive case reports, triangulating across multiple information sources within cases (administrator interviews, direct care staff focus groups, nurse manager focus groups, and observations) to establish themes. Case reports were then compared to establish cross-case patterns. In addition to deep engagement with the transcripts, the first two researchers met biweekly to discuss findings, challenging and informing the ongoing analysis and increasing credibility of the results. Finally, we re-visited each site to observe or discuss technology with staff following focus group sessions to confirm our understanding.

Table 1
Focus group guide.

Question	Sample probes
1 What experiences have each of you had here with resident falls?	Particular falls? Warning signs? Frequency of falls? Impact of falls?
2 As a staff person working here, what responsibilities do you have with regard to falls?	Monitoring of residents? Reporting falls? Fall prevention?
3 How big a task is preventing falls in terms of your other work duties?	Effort involved? Priorities in terms of rest of work? Effect on workflow?
4 What tools ^a do you use that give you information about residents?	Types of systems? Kind of information received? Problems with the tools?
5 What tools do you use to deal with falls?	For prevention? Advantages of these tools? Problem with these tools?
6 Can you imagine technology would be useful to help you prevent a fall?	Type? Modality? Location?

^a From technology to low-tech tools.

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