Use of Assistive Devices to Lift, Transfer, and Reposition Hospital Patients

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Background: Devices to lift, transfer, and reposition patients are recommended for healthcare workers' and patients' safety, but their intended use has yet to be fully realized.

Objective: The aim of this study was to describe hospital nursing staff use of lift/transfer devices and the presence of factors at the time of lifts/transfers with potential to influence whether devices are used.

Methods: Participants were 108 US nursing staff in a university-based medical center and two community hospitals. A self-completed questionnaire was used to collect demographic and work characteristics, typical frequency of patient lifts/transfers, training in and typical use of lift equipment, and specific factors that could influence use. Proportional distributions of lifting/transferring and repositioning frequencies in a typical shift, amount of equipment use, and factors present were examined overall and across worker and work-related characteristics.

Results: Although trained in equipment use, only 40% used equipment for at least half of lifts/transfers. During lifts/transfers, factors often present included patient unable to help with lift/transfer (91.3%) or of a size/weight where participant needed assistance to help lift/transfer (87.5%); availability of others who could assist with manual lift (86.3%) or use of lift equipment (82.4%); and equipment functioning properly (86.4%), having supplies available (82.5%), and being easy to retrieve from storage (81.6%). During repositioning tasks, physical assistance was "always/almost always" provided from coworkers (83.3%) and often perceived as "very helpful" (92.6%) in reducing physical demands. Physical assistance from patients was less common (14.0% "always/almost always") yet perceived as "very helpful" by 66.3%. One fifth always used friction-reducing devices.

Discussion: Despite training in their use, nursing staff use of available lift equipment and assistive devices is limited. Factors present at the time of lifts/transfers that may influence equipment/device use reflect a complex mix of patient, worker, equipment, and situational characteristics.

Key Words: cross-sectional • lift equipment • patient lifting • patient repositioning

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Manual lifting, transferring, and repositioning of patients are regular job tasks among nursing personnel, and they present a well-documented risk of injury among nurses and nursing care assistants (NCAs) (Choi & Brings, 2016; Davis & Kotowski, 2015), as well as adverse events among patients (Nelson & Baptiste, 2004). Although there are differences between and within countries (Edlich et al., 2005), national guidelines, regional legislation, and research-based recommendations emphasize the importance of safe patient handling and mobility (SPHM) programs, including the provision of lift equipment and other assistive devices designed to move patients, for workers' and patients' safety in healthcare settings.

Safe patient handling and mobility programs may prevent work-related injuries and associated measures (e.g., lost work days and medical/indemnity costs) (Thomas & Thomas, 2014), as well as increase patient safety and satisfaction (Nelson & Baptiste, 2004); however, there is conflicting evidence on effectiveness. Additionally, effectiveness may vary over time

and by patient acuity level (Teeple et al., 2017). Indeed, even with recommended SPHM programs and related components in place, barriers exist that can hinder workers' adoption of safe patient handling practices into nursing care (Kanaskie & Snyder, 2018; Koppelaar, Knibbe, Miedema, & Burdorf, 2011; Schoenfisch, Myers, Pompeii, & Lipscomb, 2011; Schoenfisch, Pompeii, et al., 2011).

Recognizing the barriers to safe patient handling, recent studies of SPHM program effectiveness have sought to better understand the intermediate outcome of use (or lack of use) of patient lift/transfer devices, including factors that could influence such use (de Ruiter & Liaschenko, 2011; Koppelaar, Knibbe, Miedema, & Burdorf, 2013; Myers, Schoenfisch, & Lipscomb, 2012; Noble & Sweeney, 2018; Schoenfisch, Myers, et al., 2011; Schoenfisch, Pompeii, et al., 2011; Thomas & Thomas, 2014). Influencing factors are diverse and encompass workers' characteristics and experiences (e.g., training, prior use), patient characteristics, patient handling/mobility task, perceptions related to lift use (e.g., need, time required, self-efficacy), equipment availability and accessibility, competing demands, social support, and safety climate.

OBJECTIVE

The purpose of this report is to describe hospital nursing staff use of patient lift/transfer devices and the presence of factors or situations at the time of lifts/transfers that have the potential to influence whether lift/transfer equipment is used. Knowing the prevalence of such factors and situations present at the time of a lift/transfer is important when considering opportunities for prevention from a public health perspective. This report reflects baseline data on average or typical use and exposure to factors collected through a questionnaire administered to nurses and NCAs in three hospitals as part of a prospective study to explore the influence of proximal factors on the use and nonuse of patient lift/transfer equipment.

METHODS

Study Setting

The study took place in three hospitals within a university-based healthcare system in North Carolina: a tertiary care medical center and two smaller community hospitals. In 2004, the medical center implemented a "Minimal Manual Lift Environment" (MMLE) policy on its inpatient care units that involved the purchase of patient lift/transfer devices and training of nursing staff in their use. The policy and its supporting facets were adopted at the community hospitals the following year. Types of equipment varied per unit (based on needs of the patient population) and initially included dependent lifts, sit-to-stand lifts (powered and nonpowered), and a few ceiling lifts and air-assisted lateral transfer devices. All units had access to disposable friction-reducing devices (known as plastic liners).

An early evaluation of the MMLE program suggested that adoption was limited (Lipscomb, Schoenfisch, Myers, Pompeii, & Dement, 2012; Schoenfisch, Lipscomb, Pompeii, Myers, & Dement, 2013; Schoenfisch, Myers, et al., 2011; Schoenfisch, Pompeii, et al., 2011). Efforts in subsequent years (beginning late 2014/early 2015) by health system ergonomists and nursing leadership targeted this concern, in part through a refocusing of the program on patient outcomes (e.g., early mobility, reduced falls, and reduced pressure injuries). For example, patient caregivers' use of equipment for lifts and transfers is currently driven, in part, by the use of the Bedside Mobility Assessment Tool, based on the Banner Mobility Assessment Tool (Boynton et al., 2014). New versions and types of equipment were introduced on units as well (e.g., air-assisted patient lift devices, specialty walkers). The SPHM program is currently known by the acronym "Duke MOVES: Move Often, Very Early, and Safely" (https://www.safety.duke.edu/ergonomics/sphm). Under the guidance of a nursing-led health system oversight committee, the program is standardized across the health system based on Facility Guidelines Institute's recommendations related to patient handling and movement (https://www.fgiguidelines.org/resource/patient-handling-and-movement-assessments/#) and with greater adherence to the American Nurses' Association National Safe Patient Handling and Mobility Standards (https://www.nursingworld.org/nurses-books/safe-patient-handling-and-mobility-interprofessional-national-standards-ac/).

Baseline Questionnaire

The baseline questionnaire included questions related participants' personal demographics (e.g., age, gender), current work-related information (e.g., unit, job title), training in the use of lift equipment, typical frequency of patient lifts/transfers, and typical use of lift equipment. Similar questions were used in a prior study evaluating the effectiveness of lift equipment in the health system (U.S. DHHS/CDC/NIOSH R01OH008375). Participants were also asked whether certain specific factors that could potentially influence use of lift equipment had ever been present during their patient lifts/transfers. Factors were identified based on the extant literature (Hignett & Richardson, 1995; Koppelaar, Knibbe, Miedema, & Burdorf, 2009), prior studies of the nursing population in the health system (Schoenfisch, Myers, et al., 2011; Schoenfisch, Pompeii, et al., 2011), interviews with nurses and NCAs as part of the broader prospective study, and pilot testing (see "Pilot Testing" section). Factors included those related to patients, workers, equipment, and specific situations. For questions related to lift equipment use and factor presence, we asked participants to respond based on their experiences on average in a typical 4-week period.

In line with the broader study, the focus of the baseline questionnaire was on patient lifts and transfers, such as helping a patient get in/out of bed or move around on the unit.

However, it was clear from the interviews that repositioning (e.g., scooting a patient up in bed, turning a patient, repositioning extremities, and moving a patient side to side) was a topic of interest among the nurses and NCAs. Therefore, questions were included in the baseline questionnaire to gather information about repositioning task frequency; frequency of physical assistance from patients, coworkers, and through the use of friction-reducing devices (e.g., plastic liners); and helpfulness of assistance in reducing the physical demands of repositioning tasks.

At the end of the baseline questionnaire, free response questions were included to solicit participants' additional thoughts about patient lifting, repositioning, and lift equipment. Also, participants were asked if they were interested in participating in the second phase of the broader parent study, in which case they were instructed how to indicate interest to research study staff. All study procedures were approved by the institutional review boards of the University of North Carolina at Chapel Hill and Duke University.

Pilot Testing

The baseline questionnaire was pilot tested (four nurses, three NCAs) and revised based on feedback to ensure that (a) the questionnaire was feasible for nurses and NCAs to complete within 20 minutes and applicable to each hospital and unit type; (b) questions related to types of patient lifts and transfers, lift equipment use, and potentially influential factors were well defined and measurable; and (c) the online platform functioned as intended and was user-friendly.

Participant Recruitment

The research investigators worked closely with the health system's ergonomics division, nursing unit managers, and health system and nursing leadership to facilitate participant recruitment. Methods included informational fliers placed on nursing units; emails sent from nursing unit managers to their nursing staff; e-newsletters sent from the vice president of patient care and system chief nurse executive for the health system; and presentations by research investigators at clinical team lead meetings, staff meetings, and lift equipment training sessions. Inclusion criteria included a job title of nurse or NCA; working in one of the three study hospitals; and working on a critical care, intermediate, or step-down unit. Exclusion criteria included working on a pediatric or labor/delivery unit given the less frequent need for lift equipment for those patient populations, as well as working in the radiology or emergency departments. Participants were not offered compensation for the baseline questionnaire. In line with power calculations for the broader study purpose in which the questionnaire was used, collection of 150 completed baseline questionnaires was sought. Baseline questionnaire weblinks were distributed to staff from December 2015 through March 2016.

Data Management and Analysis

Data were managed in Qualtrics and analyzed using SAS statistical software. Descriptive statistics were used to summarize participants' demographic and work-related characteristics, lift equipment training experiences, frequency of lifting/transferring and repositioning per shift, any use of lift equipment and other assistive devices/approaches, and factors present at the time of lifts/transfers. Nursing units were categorized into surgical, medical, or mixed-type units based on primary function. The proportional distributions of lifting/transferring and repositioning frequencies in a typical shift, and amount of equipment use, were examined across participants' demographic and work-related factors. Variation in equipment use by type of equipment was examined. Variation in the proportion of factors present by participants' job title (i.e., nurse or NCA) was also assessed. Differences were examined with a chi-square test or Fisher's exact test (if $\geq$20% of cells have an expected count of fewer than five subjects), with $p < .05$ representing statistical significance. Free text responses to "other" category options and open-ended questions were reviewed by study investigators and sorted into the categories that emerged. The frequency and/or proportion of responses within each category are reported. Analyses related to lifting/transferring and repositioning frequency were restricted to participants who self-reported spending at least 75% of their time engaged in patient care (i.e., hands-on care, patient education, documentation, and everything done to care for patients). Analyses related to equipment use were restricted to participants who reported performing lifts/transfers as part of their job.

RESULTS

Participant Demographic and Work-Related Information

Of the 134 subjects who began the questionnaire, 108 completed it (80.6%). Most participants were female (86.1%) (Table 1). Common race categories were White (72.2%) and Black (15.7%). The average age of participants was 32.4 years (SD = 9.8, median = 29, minimum–maximum = 21 to 59). Two thirds (66.7%) of participants worked in the medical center, and 22.2% and 9.3% worked in the two community hospitals. Three fourths of participants were nurses and 25.9% were NCAs. Most participants worked on units that cared for a mix of medical and surgical patients (63.0%) (e.g., cardiology, oncology, and neurology), whereas 17.6% and 10.2% worked on medical-only and surgical-only units, respectively. Although a majority of participants (70.4%) had worked less than 3 years on their current unit, nearly one half (46.3%) had $\geq$5 years of experience in patient care.

Nearly all participants (90.7%; n = 98) spent at least 75% of their time at work engaged in patient care. Among these participants, patient lifting and transferring were a regular part of the job, and one quarter (26.5%) performed a lift/transfer more

TABLE 1. Demographic and Work-Related Characteristics of Participants

	n (%)
Gender	
Female	93 (86.1)
Male	14 (13.0)
Missing	1 (0.9)
Age (years)	
<25	22 (20.4)
25 to <30	35 (32.4)
30 to <35	18 (16.7)
≥35	33 (30.6)
Race	
White	78 (72.2)
Black	17 (15.7)
Other	10 (9.3)
Missing	3 (2.8)
Work hospital	
Main hospital	72 (66.7)
Community hospital A	24 (22.2)
Community hospital B	10 (9.3)
Other[a]	2 (1.9)
Job title	
Clinical nurse I	21 (19.4)
Clinical nurse II	39 (36.1)
Clinical nurse III	15 (13.9)
Clinical nurse IV	3 (2.8)
Nursing care assistant	28 (25.9)
Other	1 (0.9)
Missing	1 (0.9)
Work unit	
Medical-only	19 (17.6)
Surgical-only	68 (63.0)
Medical-surgical mix	11 (10.2)
Other/unknown	10 (9.3)
Years on current unit	
<1	34 (31.5)
1 to <3	42 (38.9)
3 to <5	14 (13.0)
5 to <10	8 (7.4)
≥10	9 (8.3)
Missing	1 (0.9)
Years in patient care role	
<1	12 (11.1)
1 to <3	27 (25.0)
3 to <5	19 (17.6)
5 to <10	26 (24.1)
≥10	24 (22.2)

[a] Worked in more than one hospital.

than 10 times on a typical shift—a proportion that was somewhat higher for NCAs (38.5%) than for nurses (21.1%) ($\chi^2 = 2.99$, $p = .08$) (Figure 1; Table S1, Supplemental Digital Content 1, http://links.lww.com/NRES/A303). No other demographic or work-related variables were significantly associated with lift/transfer frequency.

Lift Equipment Training and Use

All participants had received training on lift equipment use, most within the past 6 months (92.6%). Nearly all training involved a hands-on component (94.4%) and 38.0% included online instruction. Among participants who performed lifts/transfers as part of their job (97.2%; $n = 105$), 40% used lift equipment for at least half of the lifts/transfers (23.8% "half the time," 13.3% "more than half the time but not always," and 2.9% "always"). The proportion of participants who used lift equipment for at least half of lifts/transfers did not vary by age ($\chi^2 = 1.05$, $p = .79$), gender ($\chi^2 = 0.94$, $p = .33$), race ($p_{\text{Fisher's Exact}} = .67$), hospital type ($\chi^2 = 0.04$, $p = .84$), unit type ($\chi^2 = 1.20$, $p = .55$), or job title ($\chi^2 = 0.91$, $p = .34$) (Table S2, Supplemental Digital Content 2, http://links.lww.com/NE/A577). Lift equipment use did not increase with increasing years of patient care experience overall (Cochrane-Armitage $Z = -1.3719$, $p = .17$). However, a significant increase was observed within the first 5 years (<1: 16.7%; 1–2: 34.6%; 3–4: 55.6%; Cochrane-Armitage $Z = -2.1921$, $p = .03$), after which the proportions of participants who used lift equipment for at least half of lifts/transfers were 42.3% (5–9 years) and 43.5% (≥10 years). Lift equipment use also varied by type of equipment. Among participants with the particular piece of equipment on their unit, more commonly used types of equipment included the powered floor-based dependent lift (75.7%), specialty walker (68.4%), and nonpowered sit-to-stand lift (60.4%). Less frequently used pieces of equipment included the ceiling lift (53.5%) and powered sit-to-stand lift (46.6%).

Factor/Situation Presence at Lift/Transfer

While thinking about patient lifts and transfers they performed, on average, in a typical 4-week period, participants indicated whether certain specified factors or situations had ever been present at the time of a lift/transfer (Table 2). More commonly present factors included the patient being physically, mentally, or medically unable to help with lift/transfer (91.3%) or of a size or weight where the participant needed assistance to help lift/transfer (87.5%); availability of others who could assist with manual lifting (86.3%) or with use of lift equipment (82.4%); and lift equipment functioning properly (86.4%), having supplies available (82.5%), and being easy to retrieve from storage (81.6%). Participants less commonly experienced patient/family refusal of lift equipment (15.4%), pain during shift (12.7%), a feeling of not being comfortable using the lift equipment (11.8%), and inability to get the device into the room or under bed/stretcher (8.7%). For all factors/situations, there was no statistically significant difference in presence by job title (Table S3, Supplemental Digital Content 3, http://links.lww.com/NRES/A304).

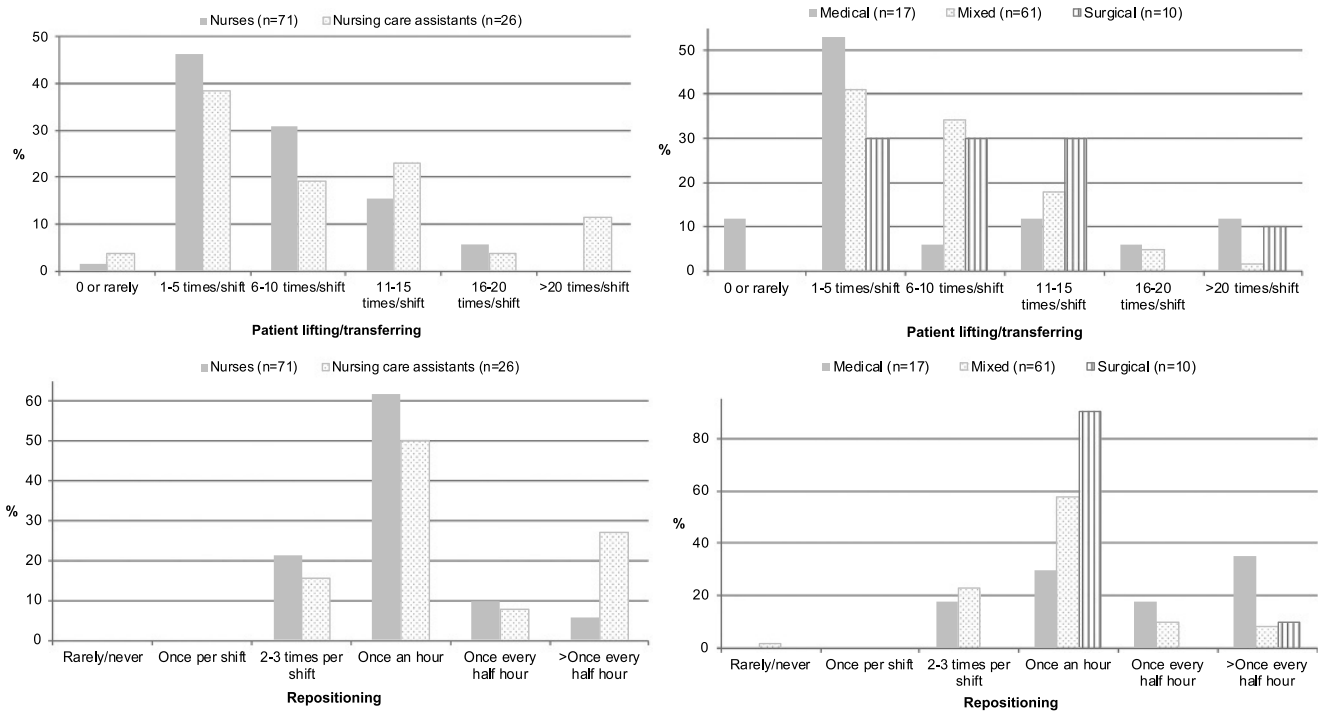

FIGURE 1. Proportional distributions of lifting/transferring and repositioning frequencies in a typical shift, stratified by job title and unit type, among nursing staff who reported spending at least 75% of time at work engaged in direct patient care ($n = 98$).

Participants were asked to provide a free text response on the factor they perceived to influence their use of lift equipment the most. Seventy-one percent of participants who performed lifts/transfers as part of their job ($n = 75/105$) responded. Half of responses ($n = 38/75$) were related to the patient's condition, including their ability to help with the lift/transfer, and/or the lift being required for the patient (e.g., lift equipment use noted in physical therapy's recommendations to nursing staff). Nearly one fifth (18.7%; $n = 14$) of participants noted "time" as an influencing factor; responses centered around the fast pace of nursing work in general, the time to locate equipment/supplies and set them up in a patient's room, and patients' urgency for assistance, such as needing to use the restroom. Other factors included safety of the patient (12.0%) or self (12.0%), accessibility of equipment (12.0%) or staff (10.7%), equipment sling being under the patient (6.7%), and confidence in ability to use the equipment properly (6.7%).

Repositioning

In a typical shift for participants who spent ≥75% of their time at work engaged in patient care, 79.6% ($n = 78$) performed a repositioning task(s) (e.g., turning patients in bed, moving patients side to side in bed, scooting patients up in bed, repositioning extremities) at least once per hour (Figure 1). One fifth (21.4%) performed a repositioning task at least once every half hour, and this proportion was higher for NCAs (34.6%) compared with nurses (15.5%) ($\chi^2 = 4.25$; $p = .04$), males (50.0%) compared with females (16.5%) ($p_{\text{Fisher's Exact}} = 0.02$), and medical-only units (52.9%) compared with both surgical-only (10.0%; $p_{\text{Fisher's Exact}} = 0.04$) and mixed medical–surgical (18.0%; $p_{\text{Fisher's Exact}} = 0.01$) (Supplemental Table S1).

Among all participants, physical assistance was "always/almost always" provided from coworkers (83.3%) and often perceived as "very helpful" (92.6%) in reducing physical demands during repositioning tasks (Figure 2). Physical assistance from patients was less common (14.0% "always/almost always"), although perceived as "very helpful" by 66.3%. Participants' use of friction-reducing devices varied: "always/almost always" (19.4%), "sometimes" (54.6%), or "never" (25.9%). Most found them "very" (76.3%) or "somewhat" (22.5%) helpful. In free text responses ($n = 58$), participants' recommendations to reduce the physical demands associated with repositioning tasks included increased availability/use of friction-reducing liners (37.9%; $n = 22$), increased availability/use of assistive bed functions (e.g., turn assist) (31.0%; $n = 18$), use of physical assistance from patients/coworkers (25.9%; $n = 15$), and additional staff (8.6%; $n = 5$).

DISCUSSION

In this study, self-reported lift equipment use by nurses and NCAs was a regular, although not ubiquitous, occurrence in patient care. Among nursing staff with up to 5 years of experience, lift equipment use >50% of the time increased with increasing years of patient care experience. In a recent study by Lee and Lee (2017), job tenure in nursing was also positively

TABLE 2. Frequency and Proportion of Nursing Staff (n = 105) for Whom Factors Were Present at the Time of Lifting or Transferring

Factors or situations	*n* (%)[a]
Patient related (one missing per category)	
Patient physically, mentally, or medically unable to help with lift or transfer	95 (91.3)
Patient was of size or weight where I needed assistance to help lift or transfer	91 (87.5)
Patient would not tolerate the lift due to patient condition	43 (41.3)
Patient or family wanted to use lift equipment	24 (23.1)
Patient or family refused lift equipment	16 (15.4)
Other	4 (3.8)
Worker related (three missing per category)	
Availability of others who could assist with manual lift	88 (86.3)
Availability of others who could assist with use of lift equipment	84 (82.4)
Person(s) assisting wanted to use lift	53 (52.0)
Person(s) assisting did not want to use lift	33 (32.4)
Presence of others who have influence	21 (20.6)
I'm not comfortable using lift equipment	12 (11.8)
Other	1 (1.0)
Equipment related (two missing per category)	
Lift equipment was functioning properly	89 (86.4)
Lift equipment supplies (slings, belts) were available	85 (82.5)
Lift equipment was easy to retrieve from storage	84 (81.6)
Battery was fully charged	81 (78.6)
Lift equipment located in close proximity to patient	71 (68.9)
Not enough room to use lift equipment	38 (36.9)
Couldn't get the device into the room or under bed/stretcher	9 (8.7)
Other	4 (3.9)
Situational (three missing per category)	
Sling was already under patient	53 (52.0)
Patient had urgency to use bathroom	48 (47.1)
Lift was in patient's room or just outside room	43 (42.2)
I was told to use lift, or it was required for patient	42 (41.2)
I was in a hurry	34 (33.3)
Unit was short-staffed	29 (28.4)
Patient almost fell	25 (24.5)
Patient was uncooperative	23 (22.5)
Patient fell	19 (18.6)
I was experiencing pain during my shift	13 (12.7)
Other	2 (2.0)

[a] Percentage among the nonmissing.

associated with use of lift equipment at least 50% of the time. Although self-reported training in lift equipment use did not vary by nursing experience in this study, it is plausible that more seasoned nursing staff have had more opportunity to engage in informal training opportunities and hands-on experience that provide them the knowledge and confidence to use equipment. It is also plausible that staff with higher tenure choose to seek work on units that embrace a focus on worker safety. Notably, there are indications that the previously observed trajectory of increased lift equipment use (Schoenfisch, Pompeii, et al., 2011) has not waned. Continued efforts to promote the use of lift equipment—in part through evidence-based revisions of the health system's SPHM program—have likely contributed to this pattern.

Nursing staff reported using particular types of equipment more than other types of equipment, with use greater for powered floor-based dependent lifts and specialty walkers compared with ceiling lifts and powered sit-to-stand lifts. Similar findings were observed among nursing staff at two hospitals in Denmark, in which floor-based lifts were more likely to be used than ceiling lifts or sit-to-stand lifts (Risør, Casper, Andersen, & Sørensen, 2017). Although data were not collected in this study to address why differences by equipment type occurred, prior research with nursing staff in the same health system supports the findings (Schoenfisch, Pompeii, et al., 2011) in part through differences in equipment ease of use (e.g., user-friendly design, compatibility with facility design) by type, as well as limited availability of ceiling lifts at the study hospitals.

Lift equipment use did not vary by job title, a notable finding given the potential for NCAs to engage more frequently in patient-handling tasks compared with nurses, as found in this study and other research (Menzel, Brooks, Bernard, & Nelson, 2004; Schoenfisch & Lipscomb, 2009). A recent study among hospital registered nurses (RNs) and NCAs observed that both RNs and NCAs believed that NCAs had a higher level of expertise in the use of lift/transfer devices, in part due to the higher potential for NCAs to have gained experience in equipment use through work in long-term care settings (Kanaskie & Snyder, 2018), where more frequent lift equipment use has been observed (Koppelaar et al., 2011). Despite a potential for NCAs to possess greater expertise in lift/transfer device use and actual use of lift equipment (Wardell, 2007), research suggests that physical work demands are not associated with nurses' safe work behavior, including lift equipment use (Lee, Faucett, Gillen, Krause, & Landry, 2010), in line with our findings.

More common factors that staff indicated were present at the time of lifts or transfers in a typical 4-week period reflected a mix of characteristics related to the patient, worker, and equipment. Regarding the patient, perceptions about the patient's ability to assist with the lift/transfer, as well as the patient's physical mass, were nearly always present at the time of the lift/transfer. Notably, of participants' free text responses related to the factor perceived to influence their use of lift equipment the most, over half were directly related to the patient. In addition to a patient's ability to assist with the lift/transfer, participants noted that they were strongly influenced by whether the lift was deemed required in a patient's care. Other studies have observed patient-related factors influencing nursing care staff decisions around assistive device use, including patient comfort/preferences (de Ruiter & Liaschenko, 2011) or motivation (Kanaskie & Snyder, 2018), size/weight (de Ruiter & Liaschenko, 2011; Schoenfisch, Myers, et al., 2011), physical/cognitive condition (and ability to assist with the lift/

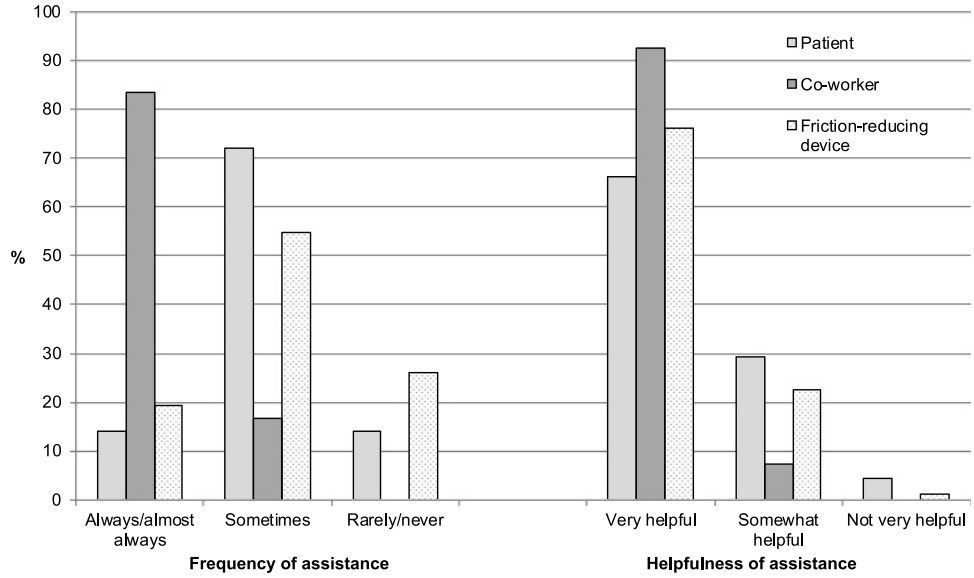

FIGURE 2. Frequency of assistance and perceived helpfulness of assistance in reducing physical demands of repositioning tasks, by type of assistance (i.e., patient, coworker, or friction-reducing device) ($n = 108$).

transfer) (de Ruiter & Liaschenko, 2011; Hignett & Richardson, 1995; Kanaskie & Snyder, 2018; Schoenfisch, Myers, et al., 2011), medical equipment attached to or surrounding the patient (de Ruiter & Liaschenko, 2011; Schoenfisch, Myers, et al., 2011), and lift use as a stated part of the patient's care plan and/or treatment goals (de Ruiter & Liaschenko, 2011; Koppelaar et al., 2011, 2013). Of note, a patient's condition as related to lift and transfer decisions can change over the course of a shift and may be marked by emergent needs (de Ruiter & Liaschenko, 2011; Kanaskie & Snyder, 2018; Noble & Sweeney, 2018). Further, sometimes, information of importance when considering assistive device use (e.g., patient weight, historical knowledge of patient) is not available (de Ruiter & Liaschenko, 2011; Schoenfisch, Myers, et al., 2011).

Staff availability, to assist with a manual lift or use of the lift equipment, was the most common worker-related factor present at the time of lifts/transfers. A recent study comprising a survey of inpatient nursing staff suggested that staffing level was the most common factor influencing nursing staff members' decision to use lift equipment, as staffing levels influenced the amount of time available to conduct a lift/transfer with a device (Noble & Sweeney, 2018). Schoenfisch, Myers, et al. (2011) observed that staffing was an important influential factor in lift equipment use as well, at times promoting use of lift equipment (e.g., lift use as the only way to lift a patient if there are not staff around to help manually lift) and at other times discouraging use (e.g., social pressure from staff to perform the transfer manually). This example reflects how staffing is a complex factor influencing lift equipment use (de Ruiter & Liaschenko, 2011).

Several equipment-related factors were often noted as present at the time of lifts/transfers, including functionality, availability of supplies, and retrieval ease. Retrieval ease may be related to the concept of time, as well as sufficient number of lifting devices more generally—both complex but important factors influencing lift equipment use as observed in other studies (D'Arcy, Sasai, & Stearns, 2012; de Ruiter & Liaschenko, 2011; Koppelaar et al., 2013; Noble & Sweeney, 2018; Schoenfisch, Myers, et al., 2011). Functionality has been discussed in terms of the ability to use a device, as well as patient safety.

Repositioning

Patient repositioning was a common task in our study hospitals, with three quarters of participants indicating that they performed a repositioning task at least once per hour. Other reports suggest that repositioning makes up a substantial proportion of all patient handling tasks among nursing staff, and this proportion may vary by unit type (Callison & Nussbaum, 2012; Poole Wilson, Davis, Kotowski, & Daraiseh, 2015). The benefits to patients of repositioning are well documented and include a reduction in complications associated with bed rest (e.g., pressure injuries, respiratory infections) (Weiner, Kalichman, Ribak, & Alperovitch-Najenson, 2017). Repositioning tasks were deemed most physically demanding by several of our study participants, in contrast to prior studies (Callison & Nussbaum, 2012; Garg, Owen, & Carlson, 1992). However, they remain a high-risk activity for worker injury, supported by biomechanical evaluations suggesting that repositioning is associated with high physical demands and awkward postures (Marras, Davis, Kirking, & Bertsche, 1999).

Several approaches have been recommended and evaluated to reduce the physical and postural demands of patient repositioning. In the health system in which the study took

place, the SPHM program promotes the use of friction-reducing devices (e.g., plastic liners, air-assisted lateral transfer devices), ceiling lifts, and verbally asking patients to assist in the repositioning task. In a recent study by Noble and Sweeny (2018), inpatient nursing staff reported using devices more frequently for repositioning tasks (i.e., moving patients up in bed [82%], turning patients side to side [68%]) and transfers to a stretcher (85%) than for ambulation (41%) and transfers to a chair (54%), bedside commode (49%), or bathroom (42%). Another study reported less frequent lift equipment use for repositioning tasks (20%) (Wardell, 2007).

Although the use of a friction-reducing device or other assistive approach may reduce the physical/postural demands of a repositioning task (Bacharach, Miller, & von Duvillard, 2016; McGill & Kavcic, 2005; Skotte & Fallentin, 2008; Weiner et al., 2017), other factors such as time, patient condition, availability of assistive devices, (perceived) effectiveness in terms of repositioning, and number of caregivers needed also influence a healthcare worker's decision to use or not use a particular repositioning approach (Bacharach et al., 2016; Weiner et al., 2017).

Patient Safety and Satisfaction

Of participants' free text responses detailing the factor they perceived to influence their use of lift equipment the most, 12% were related to patient safety—a factor of importance as described by others (de Ruiter & Liaschenko, 2011; Elnitsky, Lind, Rugs, & Powell-Cope, 2014; Hignett & Richardson, 1995; Myers et al., 2012; Schoenfisch, Myers, et al., 2011). Studies have shown enhancements to patient safety with the use of lifting devices, including reduced incidence of pressure injuries (Gucer, Gaitens, Oliver, & McDiarmid, 2013; Kennedy & Kopp, 2015; Walden et al., 2013) and falls (Kennedy & Kopp, 2015). Patient harm (e.g., skin- and fall-related outcomes, serious injury, and death; Ali & Glenister, 2001; Elnitsky et al., 2014; Nelson & Baptiste, 2004) may result from the use of lifting devices as well, such as through use of a faulty device, use of a device/supply that is not compatible with the patient's characteristics, or incorrect use of a device. Related is the need for caregiver training in the safe use of lift equipment (de Ruiter & Liaschenko, 2011; Kanaskie & Snyder, 2018; Myers et al., 2012; Nelson & Baptiste, 2004; Schoenfisch, Myers, et al., 2011), including formal training, refresher training, and regular hands-on use. Of concern, time barriers to receiving training have been described (Elnitsky et al., 2014; Schoenfisch, Myers, et al., 2011).

Although patients' and families' preferences to use or not use lift equipment were not prevalent, they have been described as important (de Ruiter & Liaschenko, 2011). Garg and Kapellusch (2012) observed that patients perceived the use of lift/transfer devices to be more comfortable and safe than manual handling. More generally, in the United States, high levels of patient satisfaction are important to hospitals; under the U.S. federal Patient Protection and Affordable Care Act, it is a prominent factor in determining the level of reimbursement.

Limitations

The factors explored in this study were derived from the literature, as well as through interviews and structured feedback of nursing staff at the study hospitals. We concur with others (Cook & Nendick, 1999) that these factors should not be viewed as mutually exclusive: They may be on the same causal pathway and/or interact in additive, synergistic, or antagonistic ways. Further, they do not capture the concept of culture (Myers, Nyce, & Dekker, 2014; Myers et al., 2012), which influences how nursing staff use the presence or absence of particular factors in deciding whether to use a patient lift/transfer device.

Factor presence was self-reported based on staff perception, rather than an "objective" measure of occurrence. However, because staff-perceived presence is that which will, in practice, drive staff decisions around lift/transfer device use, we believe that its use as a measure of factor presence is appropriate. Frequencies of lifting/transferring and repositioning were also obtained via self-report, and we recognize that these are likely a substantial underestimate of the true frequencies (Callison & Nussbaum, 2012; Poole Wilson et al., 2015).

The use of patient lift and transfer devices, although deemed integral to an SPHM program, is only one of many safe patient-handling practice behaviors. Other important behaviors have been described (Lee et al., 2010), including assessment of the environment as it relates to a particular lift/transfer (e.g., patient condition, physical space available), making needed adjustments before the lift/transfer (e.g., moving furniture, adjusting bed height), and asking for patient or coworker assistance in the lift/transfer. Additionally, the use of other hospital equipment or related features, such as hospital bed contour positioning options (Mehta, Horton, Agnew, & Nussbaum, 2011), may be important supplements to the use of lift/transfer devices when promoting SPHM.

The size and characteristics of the study population examined were a function of the broader prospective study. The size precluded well-powered stratification by factors of interest. Further, responses were limited to nurses and NCAs in a small group of U.S. hospital and patient care unit types. We recognize the limited generalizability as well as likely selection bias (favoring workers with an interest in safe patient handling) in such a sample.

CONCLUSION

Despite regular lifting, transferring, and repositioning of patients as part of their job, nurses' and NCAs' consistent use of available lift equipment and other assistive devices has yet to be fully realized, even with acknowledgment of recent formal training. However, efforts to promote the use of lift equipment have been refined over time in the study's health system, likely

contributing to continued increases in lift equipment use. This study suggests that factors commonly present at the time of patient lifts/transfers reflect a complex and potentially dynamic mix of patient-, worker-, and equipment-related characteristics. The presence of situational factors, though less common, was not insignificant. From a public health perspective, factor prevalence is an integral part of understanding opportunities for effective intervention. For example, not being able to get a lift device into a patient's room may strongly influence nonuse of the equipment. However, if this situation rarely presents itself during a lift/transfer, focusing considerable resources on addressing it is unlikely to affect overall effectiveness in practice. To increase the appropriate use of assistive devices for patient handling tasks, ultimately reducing task-associated biomechanical demands and physical risks that lead to injury, there remains a need for research examining when and why recommended devices are used or not used by patient care staff. Finally, given the relatively high frequency and physical demands of repositioning tasks, a continued understanding of surrounding circumstances, including the decision to use a repositioning assistive device or approach, is warranted.

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