

USE OF RESIDENT HANDLING EQUIPMENT BY NURSING AIDES IN LONG-TERM CARE: ASSOCIATIONS WITH WORK ORGANIZATION AND INDIVIDUAL LEVEL CHARACTERISTICS

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Low back pain is prevalent among nursing home personnel. Safe resident handling programs (SRHP) reduce injuries and costs. Previously, we reported variability in effectiveness and sought to identify reasons for differences among workers in resident handling equipment (RHE) use. In 8 nursing homes, nursing aides' (NAs) frequency of RHE use and reasons for inconsistent use were assessed by questionnaire up to 4 times after SRHP implementation. Ordered multinomial models examined correlates of RHE-usage frequency. At least two-thirds of NAs reported "often" or "always" lift use. Higher RHE use was related to higher SRHP commitment, higher prior SRHP expectations, older age, higher health self-efficacy, and lower supervisor support. "Device not available when needed" and "residents dislike" were major reasons consistently cited for not using RHE. While this program has been effective, attention to device availability, education of residents and family members on SRHP importance, and worker empowerment might increase usage further.

Keywords: safe resident handling, equipment use, nursing aides

INTRODUCTION

Musculoskeletal disorders, especially affecting the low back, are highly prevalent among healthcare personnel.¹⁻⁴ Despite evidence showing the impact of patient/resident handling equipment use on reducing injuries among direct care workers,⁵⁻¹⁰ few investigations have examined frequency of workers' equipment use or systematically evaluated reasons for not using handling devices.

Koppelaar et al¹¹ reported several potential barriers to successful safe handling interventions in healthcare: lack of staff knowledge, need, time, space, and adequate staffing; not enough available devices; and patient aversion to handling equipment. Barriers, however, were identified post-hoc, described only qualitatively, and *not* used to evaluate intervention effectiveness. Subsequently, this team conducted 2 cross-sectional assessments in 19 nursing homes and 19 hospitals on lift device use. Observations of workers revealed that handling devices were used 68% of the time required in nursing homes and 59% in hospitals.¹² Short interviews with nurses, ward leaders, and ergocoaches identified back symptoms, nurses' motivation, patient-specific protocols with guidelines for device use, knowledge of guidelines, and adequate equipment supply as determinants of device use in patient transfers.^{12,13}

Other studies examining patient handling equipment use have reported similar barriers: lack of time,¹⁴⁻¹⁶ lift policy,^{17,18} or management support;^{14,17} insufficient equipment,¹⁷⁻¹⁹ space,^{15,18,20} or staffing;¹⁴⁻¹⁶ insufficient knowledge of handling equipment;¹⁴ coworkers' nonuse of equipment;¹⁴ patient conditions;^{14,15} patient/family wishes;²⁰ and conflict with patient rehabilitation goals.^{15,21} Most of these studies were qualitative, focused on nurses only, or had a small sample size.

The present study utilized a large sample of nursing aides (NAs) surveyed after implementation of a safe resident handling program (SRHP). Previously, we reported the program's effectiveness in terms of physical exposure reduction^{22,23} and return on investment,²⁴ although with marked variability among centers in equipment use and physical workload²⁵ and net average savings.²⁴ To learn more about reasons for variability in program effectiveness, we analyzed questionnaire data from NAs because they perform the majority of resident handling in nursing homes^{22,26,27} and they were specifically targeted by this SRHP. We examined their frequency of resident handling equipment (RHE) use, identified work organization and individual characteristics related to differences in frequency of RHE use, and described reasons for not using RHE consistently.

METHODS

A large US nursing home corporation implemented an SRHP in all of its skilled nursing homes (2003-2007). As described previously,²² needs assessments for all residents were performed to inform equipment-purchasing decisions, and a third-party company provided training on RHE use, maintenance, and SRHP policies.

The investigators distributed questionnaires in 8 nursing homes on 4 survey occasions, timed relative to implementation of the SRHP in each center: 3 months, 12 months, 24 months, and 60 to 84 months post-SRHP (spanning the years from 2006 to 2013).

Workers' own self-assessed general use of RHE was obtained with a 5-point frequency scale. A separate question asked respondents to consider that if they did not use RHE every time they moved a resident, then to choose the main reason for not using it. The options listed were "too much effort," "coworkers do not use," "do not need them," "not enough time," "residents dislike," and "device unavailable"; participants could also write in responses to the question. These free-text responses were reviewed and categorized. Most write-in responses indicated "some residents don't require lifts" or "my residents are ambulatory," which were categorized as "do not need them." Others fell into the already existing categories; for example "sling unavailable" was categorized as "device unavailable." A small number of "other" responses remained.

The multiple-choice options "device unavailable" and "residents dislike" were added to the questionnaire on the second survey occasion.

Workers' opinions about specific features of the SRHP were also assessed, using a 4-point Likert scale (strongly disagree to strongly agree).²⁸ These 11 questions about the SRHP were grouped for analysis into 3 theoretical constructs (Table 1). Other survey items covered demographics, musculoskeletal symptoms, physical and mental health (eg, work limitations²⁹), health behaviors (eg, health self-efficacy³⁰), physical and psychosocial aspects of the work environment (eg, physical job demands, psychological job demands, decision latitude, supervisor support, coworker support³¹), workplace safety,³² and workplace assault.

Data analysis

Self-reported frequencies of RHE use and reasons for inconsistent use were calculated for NAs for each survey occasion. Reasons for inconsistent RHE use were also examined by frequency of RHE usage (never/rarely, sometimes, often, always).

Statistical Modeling

Because participants had up to 4 opportunities to complete surveys, ordered multinomial models with a cumulative logit link with a random intercept (GLIMMIX procedure) were

TABLE 1

CATEGORIZATION OF QUESTIONS ABOUT SRHP FOR DATA ANALYSIS	
Safe Resident Handling Program Question	SRHP Scale
1. Coworkers support each other to use patient lifting devices.	SRHP Commitment
2. Employee suggestions about patient lifting are supported by management.	
3. I alert other employees when they place themselves at risk during a patient lift.	
4. My supervisor makes every effort to ensure that employees have what they need to be safe at work.	
5. Management is responsive to employee concerns about patient lifting.	
6. When it comes to patient lifting, I am asked for my input on how I use my work space.	
1. It takes too long for employee suggestions about patient lifting to go through the proper channels.	SRHP Obstacles
2. Job duties on my unit often prevent employees from acting as safely as they would like.	
3. I find it easy to get access to the patient lifting devices on my unit. (<i>reverse coded</i>)	
1. If patient lifting devices were used with every patient lift, the risk of getting injured would be very low.	SRHP Prior Expectations
2. I think that the Injury Reduction Program will help me and my coworkers avoid injuries in the future.	

used to account for repeated measures when examining data from all surveys. The outcome variable was frequency of RHE usage (never/rarely, sometimes, often, always). Survey-specific logistic regression models and generalized linear models of data from all time periods were used to examine potential predictor variables, including the 3 SRHP scales along with individual and work organization characteristics. Variables significantly related to the outcome in survey-specific bivariate models were given further consideration in multivariable models. Odds ratios for being in a higher compared to lower frequency usage group were reported. SAS 9.3 was used for cross-tabulations and regression modeling.

RESULTS

Response rates from these specific 8 centers ranged from 52% to 93% over the four survey occasions. Responses from 776 unique NAs over the 4 survey periods, totaling 1,372 surveys, were included for analysis. For each survey, the study population was primarily female with an average age of 40 years (Table 2), implying that new employees were roughly balanced by retirements or loss to follow-up. Selected population characteristics (individual, work organization, and SRHP) are reported in Table 2.

Of the 8 centers in the sample, 6 had roughly the same number of skilled beds and FTEs, while 2 were smaller (Table 3). The difference in clinical staffing ratios may reflect a difference in laws between 2 states (centers 1-4 versus centers 5-8). More variation is evident in NA retention, employee satisfaction, and CMS health inspection ratings (Table 3).

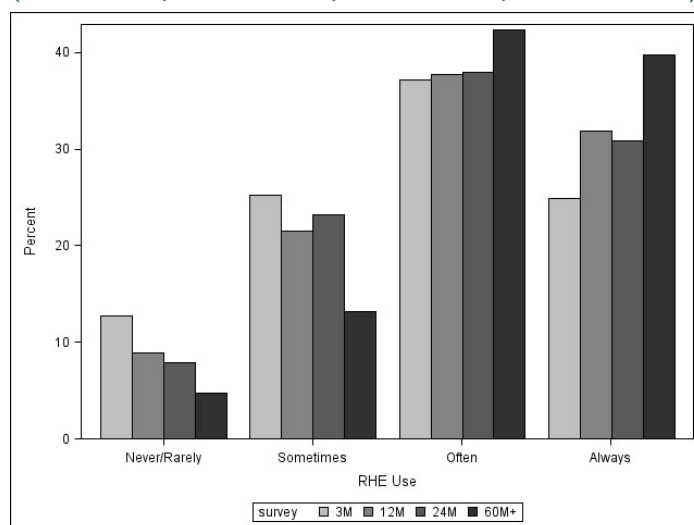
Frequency of Use

About two-thirds of NAs reported that they “often” or “always” use RHE at the first 3 time periods, increasing to 82% at the last time period (Figure 1). The frequency of “sometimes” using RHE declined at the last time period from a fairly consistent 20% at earlier periods, and the frequency of “never/rarely” also declined over time from the first survey period.

Work Organization, Individual, and SRHP Characteristics Affecting RHE Use

Frequency of RHE use when moving residents was positively associated with workers’ age, seniority, back pain, work limitations, health self-efficacy, decision latitude, coworker support, perceived workplace safety, perceived commitment of management to the SRHP, and prior expectations about SRHP benefits. Workers who reported back or knee pain interference with work, inadequate staffing, and any assault in the past 3 months were less likely to use RHE. These vari-

Figure 1: Frequency of RHE Use Reported in 4 Surveys
(3M: n = 345, 12M: n = 358, 24M: n = 327, 60M+: n = 274)



ables, along with supervisor support and physical job demands, were entered into multivariable models.

Perceived SRHP commitment, own prior expectations of the SRHP, age ≥ 40 years, health self-efficacy, and lower supervisor support were retained as correlates of higher RHE use (Table 4). Excluding supervisor support (Model 2) resulted in a smaller coefficient for SRHP commitment, suggesting confounding between these 2 variables, which were positively correlated (Spearman $r = 0.36$, $P < 0.0001$).

Stated Reasons for Not Using Handling Equipment

The reason most often endorsed for not using RHE was “device not available when needed,” cited by around 20-30% of respondents in each survey in which this response option was offered (Figure 2). The second most common reason was “residents dislike them.” “Residents dislike them” and “device unavailable” had fairly constant frequencies among those who answered this question. In contrast, “too much effort” and “not enough time” became less important issues over time.

The reasons for not using RHE were distributed differently according to stated frequency of use. “Residents dislike” and “device unavailable” were the most common reasons stated for not using RHE regardless of reported frequency of use but were most important for *often* and *always* users (Figure 3). “Not enough time” became a less important reason for not using RHE over time, particularly among always users. Never/rarely users were more likely to cite “too much effort” and “co-workers do not use” consistently over time. It should be noted that all percentages in Figure 3 are based on small cell sizes.

TABLE 2

INDIVIDUAL, WORK ORGANIZATION, AND SRHP CHARACTERISTICS OF NAS IN 4 SURVEYS (8 NURSING HOMES, 2006-2013)				
	3 month follow-up (n = 353)	12 month follow-up (n = 370)	24 month follow-up (n = 355)	60+ month follow-up (n = 294)
<i>Individual Characteristics</i>				
Gender (% female)	91.5	93.3	93.4	93.7
Age (mean years, SD)	39.8 (12.8)	40.5 (12.9)	40.3 (13.9)	38.9 (13.1)
Seniority (mean years, SD)	11.3 (9.8)	11.5 (9.8)	12.1 (10.3)	10.9 (10.2)
Back pain (n, % reporting)	182 (51.6)	199 (53.8)	173 (48.7)	156 (53.1)
Back/knee pain interference with work (n, % reporting moderate or more interference)	48 (13.8)	45 (12.5)	43 (12.4)	36 (12.3)
Work limitations mental-interpersonal subscale – mean of 7 items (mean score, SD)	61.3 (39.0)	88.6 (19.3)	90.8 (14.6)	92.0 (15.6)
Work limitations output subscale – mean of 5 items (mean score, SD)	59.5 (40.4)	88.0 (20.2)	90.9 (15.1)	91.6 (15.9)
Health self-efficacy - sum of 9 items (mean score, SD)	25.7 (5.9)	26.8 (5.3)	26.3 (5.4)	25.5 (5.7)
<i>Work Organization Characteristics</i>				
Psychological job demands - sum of 2 items (mean score, SD)	5.9 (1.2)	5.6 (1.1)	5.7 (1.1)	5.8 (1.1)
Decision latitude - sum of 2 items (mean score, SD)	5.1 (1.2)	4.9 (1.1)	5.2 (1.1)	5.3 (1.3)
Supervisor support - sum of 2 items (mean score, SD)	5.4 (1.6)	5.4 (1.5)	5.2 (1.5)	5.3 (1.6)
Coworker support - sum of 2 items (mean score, SD)	5.5 (1.3)	5.7 (1.2)	5.6 (1.2)	5.7 (1.2)
Physical job demands – mean of 5 items (mean score, SD)	13.5 (3.3)	12.8 (3.1)	12.9 (3.3)	12.9 (3.1)
Perceived workplace safety – mean of 4 items (mean score, SD)	2.6 (0.5)	2.7 (0.5)	2.7 (0.5)	2.6 (0.3)
Adequate staffing (n, % disagree)	224 (63.6)	208 (56.7)	211 (60.5)	148 (51.0)
Frequency of assault (n, % ever)	193 (55.3)	193 (52.9)	183 (52.4)	160 (55.0)
<i>SRHP Characteristics</i>				
SRHP Commitment – mean of 6 items (mean score, SD)	3.0 (0.5)	3.0 (0.5)	3.0 (0.5)	3.0 (0.4)
SRHP Obstacles – mean of 3 items (mean score, SD)	2.3 (0.5)	2.2 (0.5)	2.2 (0.5)	2.1 (0.5)
SRHP Prior Expectations - mean of 2 items (mean score, SD)	3.2 (0.6)	3.1 (0.5)	3.0 (0.5)	3.1 (0.6)
* Note: Number of responses varies slightly by row due to missing values				

TABLE 3

SIZE AND OTHER CHARACTERISTICS (2012) OF 8 NURSING HOMES FOLLOWED AFTER SRHP IMPLEMENTATION						
	Number of Skilled Beds	Annual Full-Time Equivalent Employees	Clinical Staffing Ratio*	Annual NA Retention	Employee Satisfaction Score (range 1-4)	CMS Health Inspection Rating (range 1-5)
Center 1	113	122	2.64	79.6%	1.69	3
Center 2	131	137	2.23	80.4%	1.65	3
Center 3	117	112	2.26	73.2%	2.05	2
Center 4	118	127	3.07	70.8%	1.92	5
Center 5	61	64	4.71	62.5%	1.74	1
Center 6	65	93	4.98	68.2%	2.04	5
Center 7	123	128	5.46	60.4%	1.95	1
Center 8	108	126	6.37	70.2%	1.88	1
* Nurses and NA FTEs per resident day						

TABLE 4

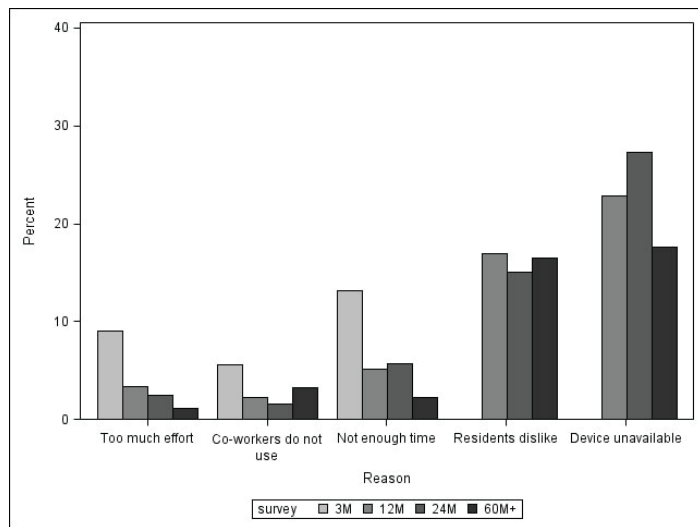
GENERALIZED LINEAR MODELS OF LEVELS OF RHE USAGE (CATEGORICAL) SELF-REPORTED BY NAs IN 4 SURVEYS				
	Model 1	Model 2	Model 3	Model 4
SRHP commitment	2.224 (<i>P</i> < 0.0001)	1.777 (<i>P</i> = 0.0031)	2.134 (<i>P</i> = 0.0003)	2.133 (<i>P</i> = 0.0003)
SRHP prior expectations	1.413 (<i>P</i> = 0.0217)	1.598 (<i>P</i> = 0.0027)	1.510 (<i>P</i> = 0.0089)	1.548 (<i>P</i> = 0.0055)
Age (ref: < 40 years)	1.496 (<i>P</i> = 0.0093)	1.552 (<i>P</i> = 0.0067)	1.563 (<i>P</i> = 0.0059)	1.538 (<i>P</i> = 0.0088)
Supervisor support	0.896 (<i>P</i> = 0.0248)		0.88 (<i>P</i> = 0.0097)	0.872 (<i>P</i> = 0.0069)
Health self-efficacy		1.034 (<i>P</i> = 0.0145)	1.034 (<i>P</i> = 0.0153)	1.033 (<i>P</i> = 0.0174)
Assault (ref: none)				0.760 (<i>P</i> = 0.0631)
n	1201	1150	1136	1128
AIC	2932	2779	2749	2724

DISCUSSION

In this sample of 8 nursing homes, an SRHP was generally effective, although about one-third of NAs reported using RHE infrequently, even after 5 years. We had previously reported variability in SRHP success for ergonomic exposure reduction²⁵ and cost savings²⁴ in this same company; the present findings regarding factors related to increased RHE use and reasons for inconsistent RHE use may explain some of that variability.

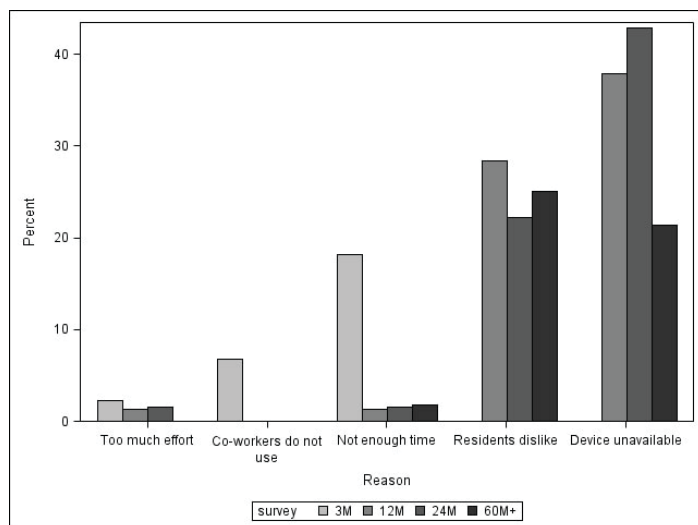
Older workers and those with higher health self-efficacy were more likely to use RHE frequently. Those with higher health self-efficacy have a stronger belief in their ability to improve their own health and to overcome barriers, so it is unsurprising that these employees were more likely to report frequent RHE use. Both health self-efficacy and outcome expectations are influenced by positive experiences of change, such as health mastery and removal of barriers to healthy behaviors,³³⁻³⁵ so participatory health programs that empower workers could plausibly also enhance SRHP effectiveness.

Figure 2: Reasons for Not Using RHE Reported by NAs in 4 Surveys (3M: n = 264, 12M: n = 264, 24M: n = 226, 60M+: n = 181)



*Note: “Do not need” (3M: 23%, 12M: 12%, 24M: 16%, 60M+: 12%) and “Other” (3M: 49%, 12M: 38%, 24M: 32%, 60M+: 47%) were used in calculations of percentages but are not shown in this graph.

Figure 3: Reasons for Not Using RHE Reported by “Always” Users, by Time Period (3M: n = 44, 12M: n = 74, 24M: n = 63, 60M+: n = 56)



We did not expect to find higher supervisor support negatively associated with RHE use and wondered if this might result from negative confounding with SRHP management commitment. The SRHP commitment scale included 4 items related to supportive supervisors/management, and it was strongly *positively* correlated with supervisor support. In the multivariable model, when SRHP commitment was removed, supervisor support was no longer significant. Conversely, removing supervisor support reduced the coefficient for SRHP commitment (Model 2). Thus, it could be

that the combined effect of SRHP commitment and supervisor support is positive but less than additive, resulting in the negative coefficient for the latter variable.

Assault at work in the previous 3 months was also possibly related to less frequent equipment use. Workers may understandably avoid using equipment with residents who are resistant and have previously assaulted them. Nearly half of this population reported recent assault, which included important physical and mental health consequences.³⁶ Since this problem is so widespread, it is a plausible obstacle to consistent RHE use.

Reasons reported most frequently by NAs for not using RHE consistently were “device unavailable” and “residents dislike them.” Of particular note, these were the most important barriers even for *often* and *always* users, indicating their substantial importance as potential obstacles to SRHP effectiveness.

Device unavailability has been noted previously.^{11,13,17-19} In the long-term care sector, cash flow is an endemic problem, so insufficient equipment and space for convenient storage are both understandable. Nonetheless, if devices and slings are not always available when needed, expensive equipment purchases will not yield the desired benefits.

A recent qualitative study of nursing home and home care patients explored perceptions of equipment to understand their aversion. Patients worried about technical quality (safety) of equipment, nurses’ skill level, pain and discomfort associated with use, and loss of dignity.³⁷ These perceptions are also likely relevant for the nursing home residents cared for by our study population. Incorporating these topics into resident and family education might help to alleviate fears. Even *often* and *always* users suggested that they would use RHE more often if residents were more accepting of RHE use. The role of supervisors in this situation also deserves attention.

In this study, the long follow-up period (60+ months) allowed us to determine that “not enough time” became a less important barrier to use over time, at least for many workers. Insufficient time has been frequently reported as a barrier to RHE use.^{11,14-16} Most studies reporting time as a barrier, however, have collected information after relatively short follow-up periods. It has been suggested that as equipment users become more experienced, the amount of time spent using devices for handling decreases. In a 2014 study of ceiling lift use, regular users completed 9 handling tasks faster than beginner or intermediate users.³⁸ As part of our larger study, an observational analysis of NAs’ ergonomic exposures and resident handling activities demonstrated

that NAs spent less time handling residents 2 years after the SRHP began,²² again suggesting an effect of increasing experience.

Strengths and Limitations

Some limitations to this study exist. Although we have longitudinal data, our analyses were cross-sectional (to maximize sample size), so the temporal direction of the associations between independent variables and increasing RHE use cannot be determined. Data used in our analyses were collected by questionnaire, which could potentially introduce information and selection bias. Respondents' responses, however, were kept confidential and the generally high response rates were reassuring.

The analysis of reasons for not using RHE by frequency of equipment use and time period resulted in small samples for each subcategory, so these percentages may be unstable. Results from regression modeling in this study are likely generalizable to nursing homes but not necessarily to hospitals, which may have different determinants of RHE use due to organizational differences, faster patient turnover, and more variation in patient acuity.²⁷ Participants' reasons for not using RHE, however, are consistent with the prior literature, most of which reports on hospital nurses.

Finally, in the analysis of reasons for inconsistent RHE use, the responses for "do not need them" were ambiguous. Examination of write-in responses to the question revealed that while our intended meaning was that workers felt they could perform handling tasks without using RHE, the participants themselves may have meant otherwise. For example, the following was submitted as a write-in response: "I do not need them because residents are ambulatory and don't need to be lifted."

Several factors strengthened the study, including a large sample of participants, which helped ensure responses were representative of the NA population in this long-term care company. The largest prior systematic study of equipment use determinants involved more facilities but fewer participants than ours.^{12,13} Systematic SRHP evaluation through questionnaire was a planned study activity, so a variety of individual and work environment characteristics were available to explore with regression modeling. The only other quantitative studies of determinants of equipment use mostly reported on program-specific factors such as knowledge of procedures, strict guidance on RHE use, and adequate supply of devices.^{12,13}

CONCLUSIONS

This study identified both individual and work environment characteristics that may influence NAs' use of RHE and ultimately SRHP effectiveness. Organizational commitment and NAs' program expectations and health self-efficacy were particularly important for increasing RHE use. Barriers to consistent RHE use should be addressed when implementing and evaluating safe handling interventions. While this program has been effective, attention to device availability and maintenance might increase usage further. This nursing home company would likely benefit from increasing workers' decision-making opportunities and empowerment,^{39,40} as well as consistent education of residents and their family members as to the importance of the SRHP.

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