Original Article

Influence of mutual support and a culture of blame among staff in acute care units on the frequency of physical restraint use in patients undergoing mechanical ventilation

Takeshi Unoki,[1] Miya Hamamoto,[2] Hideaki Sakuramoto,[3] Masako Shirasaka,[4] Megumi Moriyasu,[5] Hong Zeng,[6] and Shigeki Fujitani[7]

[1]Department of Adult Health Nursing, School of Nursing, Sapporo City University, Sapporo, [2]Intensive Care Unit, Tosei General Hospital, Seto, [3]Department of Adult Health Nursing, College of Nursing, Ibaraki Christian University, Hitachi, [4]Intensive Care Unit and Coronary Care Unit, Japanese Red Cross Fukuoka Hospital, Fukuoka, [5]Department of Nursing, Kitasato University Hospital, Sagamihara, [6]Stroke Care Unit, Junshin Hospital, Hyogo, and [7]Emergency Medicine and Critical Care Medicine, School of Medicine, St. Marianna Medical University, Kawasaki, Japan

Aim: Reducing the use of physical restraint in intensive care units is challenging, and little is known about the influence of culture on physical restraint use in this setting. The present study aims to verify the hypothesis that mutual support and a culture of blame among staff are associated with higher physical restraint use for mechanically ventilated patients.

Methods: We undertook a survey of nurses in intensive care units caring for mechanically ventilated patients in acute care units. The perceived frequency of physical restraint, mutual support, and culture of blame were measured. We predefined a high frequency physical restraint use group and compared the institutional characteristics, human resources, mutual support, and culture of blame between this group and the others (the control).

Results: Three hundred and thirty-three responses were analyzed. The mean number of beds per nurse was not significantly different between the groups; the mean and percentage of positive responses about mutual support and a culture of blame were significantly lower in the high frequency physical restraint use group. After adjusting variables in a multivariable regression analysis, a less positive response about the culture of blame was the only independent factor to predict high frequency physical restraint use.

Conclusion: The study suggests that changing the culture of blame, rather than increasing the number of nurses, is important for reducing physical restraint use.

Key words: Behavior control, critical care, intensive care unit, mechanical ventilation

INTRODUCTION

PHYSICAL RESTRAINT (PR) is commonly used for mechanically ventilated patients; however, there are ethical issues and it has been indicated that PR is associated with development of delirium[1] and post-traumatic stress disorder.[2] To decrease PR use in acute care units, it is important to identify modifiable factors of PR, other than patient-related factors. A previous study[3] found that a lower bed-to-nurse ratio and the proportion of private rooms were not associated with PR in Japanese intensive care units (ICUs). Thus, it is necessary to explore other factors associated with the high frequency use of PR for patients undergoing mechanical ventilation.

Generally, nurses are aware of the risks of patients' self-extubation and they tend to frequently use PR to avoid it in critical care settings.[4,5] Staff vigilance has an important role in preventing unplanned extubation[6]; thus, we consider that mutual support among nurses could influence PR practice for the patients. The concept of mutual support is defined as providing feedback and coaching to improve performance or when lapse is detected, assisting team-mates in undertaking

Corresponding: Takeshi Unoki, RN, PhD, Department of Adult Health Nursing, School of Nursing, Sapporo City University, Kita 11 Nishi 13, Chuou-ku, Sapporo 060-0011, Hokkaido, Japan. E-mail: iwhyh1029@gmail.com.
Received 3 Nov, 2019; accepted 28 Nov, 2019
Funding information
No funding information provided.

a task, and completing a task for the team member when overload is detected.[7]

Additionally, we consider that a culture of blame leads to over-restraint to prevent self-extubation. According to Khatri *et al.*,[8] the culture of blame comprises the norms and attitudes within an organization that are characterized by an unwillingness to take risks or accept responsibility for mistakes because of a fear of criticism or management admonishment. Because the decision to not use PR requires nurses to risk a patient's self-extubation, the culture of blame could be an important factor of PR use. Therefore, we propose the hypothesis that mutual support and a culture of blame among ICU staff are associated with the higher use of PR for patients undergoing mechanical ventilation. In this study, we attempt to examine this hypothesis using a cross-sectional survey of nurses caring for mechanically ventilated patients in Japan.

METHODS

THE STUDY WAS a cross-sectional, anonymous online survey. The study was approved by the ethics committee of the affiliated university. Participants were informed about the purpose of the study, survey length, and analysis process before the survey was administered. In this study, PR was defined as the use of a mechanical wrist restraint.

Participants

The participants were certified nurses in intensive care (CNICs) and their candidates who cared for mechanically ventilated patients in an ICU or high care unit (HCU).

At the time of the questionnaire distribution, there were 1,175 CNICs and 25 candidates. According to the Japanese Nursing Association, 859 nurses were working in ICUs or HCUs at 6 months before the start of this survey; thus, we assumed that the population of this questionnaire was approximately 900. Because there were a few CNICs in a single unit, we expected to reduce the sampling bias and duplicate responses from single ICUs/HCUs.

Survey

The survey was completed online from January 13, 2019 to March 5, 2019. To avoid people other than CNICs responding to the questionnaire, its link was distributed only through closed mailing lists, including the mailing list of the CNIC association and the mailing list of a certified school whose members were strictly limited to CNICs or the candidates.

Survey development

Through an interactive process, the research team, which included clinical nurses and educators, developed a 10-item demographic questionnaire and a six-item PR-related questionnaire based on the patient's situation, which included being alert and responding to commands, not being fully awake but responding to commands without delirium, any movement without eye contact, and being comatose. Respondents were asked to answer the perceived frequency of PR use under the four-specific situation at the time that it was used most frequently around a day. Additionally, we included a seven-item scale that assessed mutual support among the medical team and a six-item scale that evaluated the unit's culture of blame; both were subscales of prevalidated scales. The types of ICU were divided into two groups according to physician staffing: high-intensity ICUs (i.e., all care directed by intensivists, or mandatory intensivist consultation) and low-intensity ICUs (i.e., elective intensivist consultation or no intensivist available).[9]

Measurements of mutual support and culture of blame

Mutual support among the medical team was measured using a subscale of the TeamSTEPPS Teamwork Perceptions Questionnaire (T-TPQ) that was developed by the USA's Agency for Healthcare Research and Quality.[10] Its psychometric properties have been validated in the hospital setting.[11] The translation into Japanese and use of only one subscale was permitted. In the scale, each item is an assertion to which respondents rate their level of agreement on an ordinal five-point Likert scale (disagree strongly, disagree slightly, neutral, agree slightly, and agree strongly).

The culture of blame was measured using a subscale of the Incident Reporting Culture Questionnaire (IRCQ).[12] The IRCQ consists of 20 items that measure the incident reporting culture. In the present study, one subscale, named "collegial atmosphere of unpleasantness and punishment for reporting incidents" was used as an index of the culture of blame. The IRCQ's psychometric properties have been validated in its original language in Taiwan.[12] The translation into Japanese and use of only one subscale was permitted by the original author. In the scale, each item is a statement to which respondents rate their level of agreement on an ordinal five-point Likert scale (disagree strongly, disagree slightly, neutral, agree slightly, and agree strongly).

Because no validated Japanese versions of the T-TPQ or IRCQ existed, we translated them using the back-translation method by referring to guidelines.[13] The detail of translation processes is described in Appendix S1.

Statistical methods

We summarized the respondents' general characteristics with descriptive statistics. The data are described as the number and percentage, median and interquartile range (IQR), or mean and standard deviation.

The survey measures were aggregated by calculating the percentage of positive responses (slightly agree or strongly agree) in the mutual support scale. Because all items of the culture of blame scale were negative phrases, the survey measures were aggregated by calculating the percentage of negative responses (slightly disagree or strongly disagree). The internal validity of each subscale's items was assessed using Cronbach's alpha coefficient.

We predefined high PR use by referring to a previous survey[3] and expert opinion. If the following three conditions were satisfied, we regarded the response as indicating a high frequency of PR use: (i) PR was used for more than 50% of mechanically ventilated patients who were alert and responding to commands; (ii) PR was used for more than 75% of mechanically ventilated patients who were not fully awake but responding to commands without delirium; (iii) PR was used for more than 25% of mechanically ventilated patients who were comatose.

Responses other than high PR use were predefined as the control. The respondents' demographic characteristics, mutual support, and culture of blame were compared between the high PR use and the control group using Fisher's exact test for categorical variables or the Mann–Whitney *U*-test or Student's *t*-test for continuous variables. To assess the factors associated with high PR use, we used multivariable logistic regression and reported the results using the odds ratios and 95% confidence intervals. The statistical analyses were carried out using EZR (Saitama Medical Center, Jichi Medical University, Japan).

Table 1. Characteristics of acute care units and nurses in Japan who responded to a survey regarding the use of physical restraints for critically ill patients undergoing mechanical ventilation

Characteristic	*n* (%)
CNIC	310 (93.1)
Experience in critical care units, years	
<5	22 (6.6)
5–9	95 (28.5)
10–14	137 (41.1)
>15	79 (23.7)
University hospital	89 (26.7)
ICU setting	
High intensity	107 (32.1)
Low intensity	226 (67.9)
EICU	80 (24.0)
HCU	69 (20.7)
Written guideline use	171 (48.6)
MSA	
2:1	245 (73.6)
4:1	88 (26.4)
Characteristic	**Mean ± SD**
No. of beds	10.57 ± 5.48
No. of beds per RN	
Daytime	1.32 ± 0.51
Night-time	2.26 ± 0.64

CNIC, certified nurse in intensive care; EICU, ICU specialized in emergency medicine; HCU, high care unit; ICU, intensive care unit; MSA, minimum standard assignment; RN, registered nurse; SD, standard deviation.

RESULTS

THREE HUNDRED AND seventy-four CNICs and candidates responded. The response rate was approximately 40%. As 29 responses had incomplete data, and eight respondents worked on general wards, two worked in pediatric ICUs, and two worked in stroke care units, they were excluded, and 333 responses were analyzed. The respondents' characteristics are shown in Table 1.

Figure 1 shows the perceived PR use for patients undergoing mechanical ventilation in the four different consciousness and sedation situations.

Table 2 shows the comparison of the variables between the predefined high PR use group and the control group. There was no statistically significant difference between the two groups in terms of the proportion of university hospitals, high-intensity ICUs, HCUs, minimum standard patient-to-nurse assignment of 2:1, or mean number of beds per nurse during both the daytime and night-time. The mean percentage of positive responses for both mutual support and culture of blame was statistically significantly less in the high PR use group than in the control group. After adjusting for the HCU, the mean number of beds per nurse during the night-time, mean percentage of positive responses for mutual support, and median percentage of positive responses for culture of blame, it was found that the culture of blame was an independent factor for high PR use (Table 3).

DISCUSSION

TO OUR KNOWLEDGE, this is the first study to assess the association between the frequency of PR use for

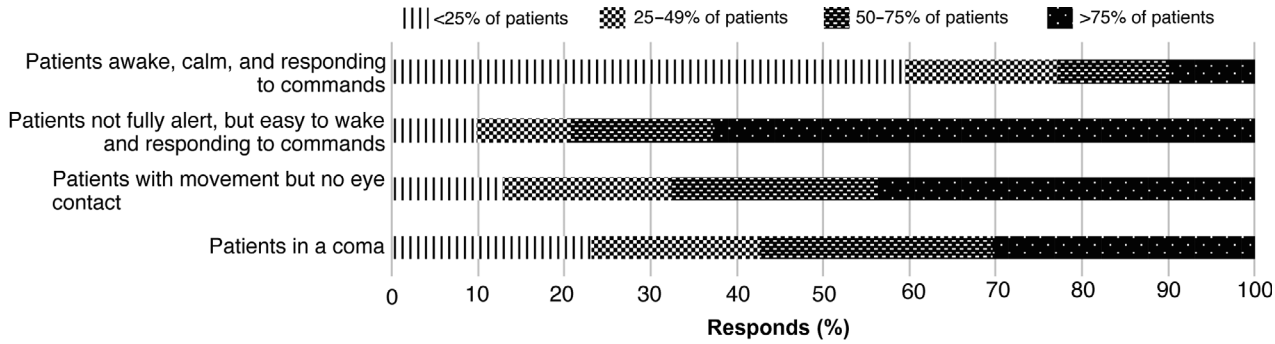

Fig. 1. Frequency of physical restraint of mechanically ventilated patients in Japanese acute care units under different situations.

patients undergoing mechanical ventilation, mutual support by medical staff, and collegial atmospheres of unpleasantness and punishment for reporting incidents. The study indicates that a culture of blame for incident reporting is an independent factor of high PR use.

Generally, PR is used to avoid self-extubation in endotracheally intubated patients. According to a systematic review published in 2012, unplanned extubation occurred in a median of 7.3 (IQR, 4.0–11.0) per 100 ventilated patients.[14] The need to reintubate patients with unplanned extubation is associated with worse outcomes.[15]

In the present study, a positive response regarding the culture of blame was negatively associated with high PR use. One explanation for this finding is that nurses use PR in order to avoid self-extubation because they want to avoid blame from colleagues, managers, and other health-care professionals. A culture of blame is not personal but is an organizational issue. Important processes to reduce unnecessary PR for mechanically ventilated patients include not only each nurse's personal skills but also creating an organizational environment that avoids a culture of blame.

Inconsistent with our hypothesis, lower mutual support among health-care professions was not a factor for high PR use. Few studies have examined teamwork and PR use in the ICU. There are two explanations for the non-significant association between mutual support and the higher PR use. In this study, we attempted to clarify the factors that influence the high PR use. Thus, responses were divided into high PR use and other (control) according to a predetermined analytical policy. The control included a variety of levels of PR use, which is one possible reason why we did not find an association between mutual support and high PR use. Second, mutual support is a teamwork construct. From their systematic review, Mendez-Tellez *et al.*[16] found that studies of the aspects of teamwork included communication, leadership, collaboration, and a coordinated team climate/culture. In this study, measuring only one construct of teamwork is a possible reason for not finding a significant relationship.

It is believed that insufficient human resources, particularly the number of patients per nurse, influence PR use. In this study, the number of beds per nurse was not associated with higher use of PR. Previous observational studies have suggested that the patient-to-nurse ratio does not influence PR use.[17,18] Additionally, our finding is consistent with a previous survey undertaken in Japan that was limited to ICUs with a bed-to-nurse ratio of 2 at most. Unlike the previous study's cohort, we included both ICUs and HCUs with bed-to-nurse ratios of 2–4 at most; however, in this study no significant association was found between the bed-to-nurse ratio and higher PR use.

The present study has some limitations. First, the response rate could not be precisely determined because there were no data regarding the number of CNICs working in ICUs/HCUs when the study started; however, from the Japanese Nursing Association's survey in July 2018, we assumed approximately 900 CNICs and candidates were working in critical care areas and that 853 nurses were working in ICUs/HCUs and emergency centers (including ICUs). Because of the questionnaire's distribution method, there is potentially a selection bias. However, the respondents were certified nurses working in settings with a broad range of ICU characteristics and they were from different geographical areas, with various numbers of ICU beds, and within different types of hospitals (university versus non-university). Therefore, our findings reflect the current clinical practice in various ICUs in Japan. Additionally, there were duplicate responses from single units in this survey; however, as there are generally few CNICs in a single unit, the influence of the duplicate responses on our findings is limited. Second, there are possible differences between what the respondents reported and their actual practice, which is because, unlike direct observations, a self-administered questionnaire relies on the respondents' perceptions. Finally, we did not have data about the sedation practice, which possibly influenced the PR use. A previous study indicated that over-sedation was independently associated with the number of days of PR of patients

Table 2. Comparison of respondents' characteristics and factors related to institutions, practices, mutual support, and culture of blame, grouped according to high frequency physical restraint use or others

Characteristic	Highly frequent restraint use (*n* = 75)	Other (*n* = 258)	*P*-value
Demographics of respondents			
CNIC, *n* (%)	70 (93.3)	240 (93.0)	1.0
Clinical experience in critical care, years			
<5, *n* (%)	4 (5.3)	18 (7.0)	
5–9, *n* (%)	18 (24.0)	77 (29.8)	
10–14, *n* (%)	37 (49.3)	100 (38.8)	
>15, *n* (%)	16 (21.3)	63 (24.4)	0.477
Characteristics of institutions			
University hospital, *n* (%)	21 (28.0)	68 (26.4)	0.769
ICU setting			
High-intensity care unit, *n* (%)	20 (26.7)	87 (33.7)	0.265
MSA patients : nurse			
2:1, *n* (%)	50 (66.7)	195 (75.6)	0.138
HCU, *n* (%)	20 (26.7)	49 (19.0)	0.149
No. of beds, mean ± SD	11.2 (6.2)	10.4 (5.2)	0.279
No. of beds per RN			
Daytime, mean ± SD	1.39 ± 0.52	1.30 ± 0.52	0.177
Night-time, mean ± SD	2.32 ± 0.69	2.24 ± 0.63	0.320
Practices regarding physical restraint			
Written guideline use, *n* (%)	42 (56.0)	129 (50.0)	0.431
Routine rounds/conference	51 (68.0)	177 (67.4)	1.000
Mutual support and culture of blame			
Mutual support, mean ± SD	0.52 (0.63)	0.64 ± 0 .32	0.006
Culture of blame, median (IQR)	0.60 (0.20–0.80)	0.60 (0.40–1.00)	0.011

CNIC, certified nurse in intensive care; HCU, high care unit; ICU, intensive care unit; IQR, interquartile range; MSA, minimum standard assignment; RN, registered nurse; SD, standard deviation.

in ICUs.[19] We consider that the effect of the sedation depth in each ICU on our findings was limited, because we asked about the perceived frequency of PR at different sedation levels from awake to comatose. Additionally, data about the severity of illness and patient category were not collected. We consider that these factors did not influence our findings, because a previous study suggested that the acute physiology and severity of illness and patient category were not independently associated with PR use.[19]

Table 3. Factors related to highly frequent physical restraint use in acute care units based on logistic regression analysis

Factors	Odds ratio	95% CI	*P*-value
HCU	1.300	0.616–2.750	0.489
Beds/RN during night-time	1.110	0.691–1.790	0.662
Mutual support scale	0.614	0.200–1.880	0.394
Culture of blame scale	0.405	0.174–0.942	0.036

CI, confidence interval; HCU, high care unit; RN, registered nurse.

CONCLUSIONS

WE FOUND THAT a culture of blame for incidents was independently associated with high PR use for mechanically ventilated patients. To reduce high PR use in this population, changing the culture of blame might be more important than increasing the number of nurses per patient.

ACKNOWLEDGEMENTS

THE AUTHORS THANK Ms. Yuka Komatsu, Mr. Takahiro Shimizu, Dr. Satoshi Nakata, Mr. Daisuke

Tsukahara, and Mr. Takashi Arita for collecting the data. In addition, they thank Dr. Hui-Ying Chiang and Ms. Rei Tomotake for participating in the translation process.

DISCLOSURE

Approval of the research protocol: The protocol for this research project was approved by a suitably constituted Ethics Committee of the Sapporo City University and it conforms to the provisions of the Declaration of Helsinki, Approval No. 1826-1.
Informed consent: Informed consent was obtained from all respondents.
Registry and registration no. of the study: N/A.
Animal studies: N/A.
Conflict of interest: None.

REFERENCES

1 McPherson JA, Wagner CE, Boehm LM *et al*. Delirium in the cardiovascular ICU: exploring modifiable risk factors. Crit. Care Med. 2013; 41: 405–13.
2 Jones C, Bäckman C, Capuzzo M, Flaatten H, Rylander C, Griffiths RD. Precipitants of post-traumatic stress disorder following intensive care: a hypothesis generating study of diversity in care. Intensive Care Med. 2007; 33: 978–85.
3 Unoki T, Sakuramoto H, Ouchi A, Fujitani S, JSEPTIC Nursing Research Group. Physical restraints in intensive care units: a national questionnaire survey of physical restraint use for critically ill patients undergoing invasive mechanical ventilation in Japan. Acute Med. Surg. 2019; 6: 68–72.
4 Bryan M. Use of physical restraints from a bedside practice perspective. Am. J. Crit. Care 2009; 18: 101–2.
5 Dolan J, Dolan Looby SE. Determinants of nurses' use of physical restraints in surgical intensive care unit patients. Am. J. Crit. Care 2017; 26: 373–9.
6 Tindol GA Jr, DiBenedetto RJ, Kosciuk L, Tindol GA, DiBenedetto RJ, Kosciuk L. Unplanned extubations. Chest 1994; 105: 1804–7.
7 Baker DP, Amodeo AM, Krokos KJ, Slonim A, Herrera H. Assessing teamwork attitudes in healthcare: development of the TeamSTEPPS teamwork attitudes questionnaire. Qual. Saf. Health Care 2010; 19: 1–4.
8 Khatri N, Brown GD, Hicks LL. From a blame culture to a just culture in health care. Health Care Manage. Rev. 2009; 34: 312–22.
9 Pronovost PJ, Angus DC, Dorman T, Robinson KA, Dremsizov TT, Young TL. Physician staffing patterns and clinical outcomes in critically ill patients: a systematic review. JAMA 2002; 288: 2151.
10 TeamSTEPPS® Teamwork Perceptions Questionnaire (T-TPQ) Manual [homepage on the internet]. Agency for Healthcare Research and Quality [cited 28 Jun 2010]. Available from: https://www.ahrq.gov/teamstepps/instructor/reference/teamperceptionsmanual.html#Salas.
11 Keebler JR, Dietz AS, Lazzara EH *et al*. Validation of a teamwork perceptions measure to increase patient safety. BMJ Qual. Saf. 2014; 23: 718–26.
12 Chiang HY, Hsiao YC, Lin SY, Lee HF. Incident reporting culture: scale development with validation and reliability and assessment of hospital nurses in Taiwan. Int. J. Qual. Health Care 2011; 23: 429–36.
13 Sousa VD, Rojjanasrirat W. Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. J. Eval. Clin. Pract. 2011; 17: 268–74.
14 da Silva PSL, Fonseca MCM. Unplanned endotracheal extubations in the intensive care unit: systematic review, critical appraisal, and evidence-based recommendations. Anesth. Analg. 2012; 114: 1003–14.
15 da Silva PSL, de Carvalho WB. Unplanned extubation in pediatric critically ill patients: a systematic review and best practice recommendations. Pediatr. Crit. Care Med. 2010; 11: 287–94.
16 Mendez-Tellez PA, Thompson DA, Pronovost PJ *et al*. A systematic review of teamwork in the intensive care unit: what do we know about teamwork, team tasks, and improvement strategies? J. Crit. Care 2014; 29: 908–14.
17 Luk E, Sneyers B, Rose L *et al*. Predictors of physical restraint use in Canadian intensive care units. Crit. Care 2014; 18: R46.
18 van der Kooi AW, Peelen LM, Raijmakers RJ *et al*. Use of physical restraints in Dutch intensive care units: a prospective multicenter study. Am. J. Crit. Care 2015; 24: 488–95.
19 Sneyers B, Luk E, Perreault M *et al*. Factors influencing the use of physical restraints in Canadian ICUs. Crit. Care 2013; 17: S147–8.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix S1. Translation processes of the subscales of the Teamwork Perception Questionnaire (T-TPQ) and Incident Reporting Culture Questionnaire (IRCQ) from the original language to Japanese.