

Physical Restraint Use in Adult Intensive Care Units (ICUs): A Systematic Review

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Abstract

Problem: Critically ill adults are at high risk for developing anxiety, agitation, delirium, and weakness during their ICU stay. The role physical restraints (PR) play in the development and outcomes of these symptoms has yet to be determined.

Purpose: The purpose of this systematic review of the literature was to critically evaluate the prevalence, predictors, and outcomes of PR use in adult ICUs.

Search Strategy: We searched eight computerized databases through September 2015. All studies and quality improvement projects that included the terms physical restraints, ICU, and/or critical care in their title and/or abstract were considered eligible for inclusion. Studies conducted outside the ICU, including pediatric patients, case reports, and prior reviews, were excluded.

Results of Literature Search: A total of 307 studies were screened, 41 (13%) met inclusion criteria and underwent independent, standardized data abstraction by 2 reviewers. The majority of studies were conducted outside the U.S (23/41, 56%) in diverse ICU types. Study design varied, with most being prospective (34/41, 83%), observational and/or descriptive studies that included the use of surveys and/or interviews (22/41, 55%).

Synthesis of Evidence: Actual (vs. perceived) prevalence of PR use was reported in 23/41 studies. Global prevalence rates varied widely (0-87%), with 0% PR use observed in the UK, Portugal, and Norway and 20-87% (N=6) in the US. Factors significantly associated with PR were reported in 22/41 studies and included: level of arousal, delirium, higher RN to patient ratio/nurse workload, use of tubes/catheters, medications (i.e., benzodiazepines, opioids, antipsychotics, anticholinergics, and antidepressants)

diagnosis/unit type, age, smoking/alcohol/psychiatric history, mechanical ventilation use, and infections. Few studies (13/41) evaluated the effect of PR on clinical outcomes.

These studies found PR use was significantly associated with delirium, unplanned or self-extubation, injuries including self-device removal and PR complications, agitation, longer ICU LOS, and reintubation.

Implications for Practice: While providers often use PR to protect patients from harm, evidence suggests their application is associated with substantial iatrogenic injury.

Prospective randomized controlled trials are needed to further examine the safety and effectiveness of PR use in the ICU setting.

Introduction

Family and friends of critically ill intensive care unit (ICU) patients have many concerns. Ensuring the health care facility's safety ranks as one of the top concerns for family and friends of hospitalized people. At their most vulnerable times, people entrust their safety to hospitals, believing that hospitals provide the safest environment possible while in a declined state of health. Sadly, this is not always completely true. While healthcare workers' intention always remains to protect and improve patient health, certain interventions provided by healthcare workers can lead to further injury. While these items are utilized to promote patient safety, physical restraints have been shown to contribute to patient injury. Restraints are commonly used in ICUs. Current evidence shows that restrained patients are more likely to be sedated and mechanically ventilated (Benbenbishty, 2010). There is also a relationship between restraints and delirium. As shown by multiple studies, restraints are a predictor of delirium and agitation (Burk, 2014; McPherson, 2013). Many of the current studies available today cite preventing tube dislodgement or self-extubation as the most common reasons for applying restraints (Akansel, 2007; Benbenbishty, 2010; Choi, 2003; Kandeel, 2013; Leith, 1999; Turgay, 2009; Yeh, 2004), but evidence shows that restrained patients tend to have higher rates of unplanned extubation (Chang, 2008; Ismaeil, 2014; Rose, 2015).

Purpose

The purpose of this systematic review was to critically evaluate the prevalence, predictors, and outcomes of restraint use in adult ICUs. Reviewing all the current evidence pertaining to prevalence, predictors, and outcomes of restraint use in ICUs will illuminate gaps in knowledge regarding restraint use and inspire future studies to promote

safe restraint use throughout the world. These results provide a comprehensive overview of restraint use in ICUs throughout the world, allowing healthcare professionals to become educated on the best evidence-based practice regarding restraint use. The information gained from this literature review will explore prevalence of restraint use in countries throughout the world, highlighting which countries reported the highest and lowest restraint prevalence. This information can pinpoint which factors may be predictors of restraint use. Examining the outcomes of restraint use throughout the world can also help determine what considerations should be assessed and monitored with a restrained patient.

Methods

The initial literature search included eight online databases through September 2015. The databases searched included PubMed, MEDLINE, EMBASE, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, CINAHL, Scopus, ISI Web of Science, and the International Pharmaceutical Abstracts. Accepted criteria for consideration of inclusion in this systematic review included all studies and quality improvement projects including the terms physical restraints, ICU, or critical care in their title or abstract. Studies conducted outside of the ICU, including pediatric patients, case reports, and prior reviews, were excluded. Initially, 307 studies were screened for inclusion, with 41 ultimately meeting inclusion criteria. After determining the final 41 studies, 2 reviewers completed independent, standardized data abstraction.

Results

Prevalence

Globally, restraint prevalence ranges widely between and within countries. Countries throughout the world have varying perceptions on the acceptability of restraint use, which may contribute to the wide range of global prevalence rates. Some countries, such as the United States, consider restraints to be acceptable practice, while other countries, such as the UK and Norway, consider restraints to be unacceptable (Jonghe, 2013). Nurses express difficulties using restraints due to ethical dilemmas associated with the principles of nonmaleficence, beneficence, convenience, respect to the individual, and autonomy (Yont, 2014). The literature showed overall prevalence rates of restraint use between 0-87%. The UK, Portugal, and Norway showed 0% prevalence. In comparison, studies conducted in the United States showed prevalence ranging from 20-87%. Studies conducted in Canada showed prevalence ranging from 53-76%. A prospective study of 34 adult European ICUs showed an average restraint prevalence throughout the countries of 33%, with individual unit prevalence ranging from 0-100% (Benbenbishty, 2010). This shows just how varied restraint prevalence appears in the current literature throughout the world. In a study observing perceived restraint use, 57% of ICUs reported that 75% or more of patients are restrained while on mechanical ventilation (Jonghe, 2013). The same study also reported that physical restraints are most often used in lightly sedated or agitated patients (Jonghe, 2013). The global prevalence rates are displayed in Table 1.

Table 1.

Reference	Location	Prevalence
Benbenbishty, J., Adam, S., & Endacott, R. (2010).	Europe	33%
Egerod, I., Albarran, J. W., Ring, M., & Blackwood, B. (2012).	Norway	14%
Martin, B., & Mathisen, L. (2005).	Europe	36%
	Norway	0%
Burry, L. D., Williamson, D. R., Perreault, M. M., Rose, L., Cook, D. J., Ferguson, N. D., . . . Mehta, S. (2014).	United States	36%
	Canada	53%
Rose, L., Burry, L., Mallick, R., Luk, E., Cook, D.,	Canada	76%

Fergusson, D.,...Mehta, S. (2015).	United States	
Mehta, S., Cook, D., Devlin, J. W., Skrobik, Y., Meade, M., Fergusson, D., . . . Burry, L. (2015).	North America	78%
Chang, L. Y., Wang, K. W., & Chao, Y. F. (2008).	Taiwan	55-82%
Liu, J., Chou, F., & Yeh, S. (2009).	Taiwan	59%
Choi, E., & Song, M. (2003).	Korea	46%
Curry, K., Cobb, S., Kutash, M., & Diggs, C. (2008).	United States	87%
Happ, M. B., Tuite, P., Dobbin, K., DiVirgilio-Thomas, D., & Kitutu, J. (2004).	United States	50%
Micek, S. T., Anand, N. J., Laible, B. R., Shannon, W. D., & Kollef, M. H. (2005).	United States	50-77%
Vance, D. L. (2003).	United States	31%
Elliott, D., Aitken, L. M., Bucknall, T. K., Seppelt, I. M., Webb, S. A., Weisbrodt, L. (2013).	Australia New Zealand	7%
Shehabi, Y., Bellomo, R., Reade, M. C., Bailey, M., Bass, F., Howe, B. (2013).	Australia New Zealand	5-31%
Ismaeil, M. F., El-Shahat, H., El-Gammal, M., & Abbas, A. M. (2014).	Egypt	50-78%
Kandeel, N. A., & Attia, A. K. (2013).	Egypt	6-46%
Jonghe, B., Constantin, J., Chanques, G., Capdevila, X., Lefrant, J., Outin, H., & Mantz, J. (2013).	France	50%
Lucidarme, O., Seguin, A., Daubin, C., Ramakers, M., Terzi, N., Beck, P., . . . du Cheyron, D. (2010).	France	13-48%
Kruger, C., Mayer, H., Haastert, B., & Meyer, G. (2013).	Germany	12%
Langley, G., Schmollgruber, S., & Egan, A. (2011).	South Africa	48%
Martin Iglesias, V., Ponton Soriano, C., Quintian Guerra, M. T., Velasco Sanz, T. R., Merino Martinez, M. R., Simon Garcia, M. J., & Gonzalez Sanchez, J. A. (2012).	Spain	15.6%
Ozdemir, L., & Karabulut, E. (2009).	Turkey	0-43%
Van Rompaey, B., Elseviers, M. M., Schuurmans, M. J., Shortridge-Baggett, L. M., Truijen, S., & Bossaert, L. (2009).	Belgium	2-38%

Predictors of Restraint Use

The literature displayed certain predictors of restraint use in adult ICUs, including delirium, higher RN to patient ratio/nurse workload, use of tubes/catheters, mechanical ventilation use, medications (i.e., benzodiazepines, opioids, antipsychotics, anticholinergics, and antidepressants), diagnosis/unit type, smoking/alcohol/psychiatric history, and infections.

Delirium

Delirium is significantly associated with restraint use. One prospective study conducted in a medical ICU in the United States showed that 77% of patients with delirium were restrained while 50% of patients without delirium were restrained ($p < .05$) (Micek, 2005). Delirium was detected using the CAM ICU scale (Micek, 2005). An altered mental status may alter a patient's ability to see the danger in pulling at tubes and catheters or trying to get out of bed. This may explain the higher incidence of restraint use in this population to prevent falls and self-injury.

A prospective study conducted in 16 mixed ICUs throughout the United States showed that nurses caring for delirious patients reported higher workloads, with a mean Visual Analog Scale (VAS) score of 4.2, compared to a reported mean VAS score of 3 ($p < 0.0001$) by nurses caring for non-delirious patients (Mehta, 2015). Although ICU nurses typically have fewer patients than nurses in other specialties, safe care for these patients is complex, and requires additional attention and creates heavier workloads for nurses.

Nurse-to-Patient Ratios

Having ample staff to care for critically ill patients is key in patient recovery. Nurse-to-patient ratios, influenced by ICU staffing, are associated with restraint use. Patients are more likely to be restrained in units with lower daytime nurse-to-patient ratios ($p = 0.001$) (Benbenbishty, 2010). It can be presumed that having fewer nurses available to monitor patients may result in increased restraint use. In a survey conducted in an acute critical care ICU in the United States, 54% of the sample answered that "sometimes" more patients are restrained when they are short staffed than when they are

fully staffed (Sherer, 1993). This information indicates decisions to apply physical restraints may be based on factors outside of obvious patient safety concerns and may relate to ability to care for multiple complex patients safely.

In order to determine if practice norms regarding physical restraint use might be different geographically, we reviewed studies outside of the US and those that compared practices between the US and other countries. A survey conducted in Norway and other European countries showed Norwegian restraint prevalence to be 14%, while other European countries had an average prevalence rate of 36% (Egerod, 2012). In the same study, Nordic nurses reported higher nurse-to-patient ratios, with a 1:1 nurse-to-patient ratio reported by 75% of Nordic nurses (Egerod, 2012). Only 26% of nurses from the other European countries reported 1:1 nurse-to-patient ratios ($p < 0.01$) (Egerod, 2012). Nordic nurses also reported smaller ICUs, with a mean of 10 beds, while nurses from the other European countries reported a mean of 15 beds ($p < 0.01$) (Egerod, 2012). From this study, one may conclude that lower restraint prevalence can be attributed to higher nurse-to-patient ratios and smaller ICUs. A prospective study conducted in Norway and the United States found similar data, with a restraint prevalence in the United States of 39% and a restraint prevalence in Norway of 0% (Martin, 2005). The study also showed higher nurse-to-patient ratios in Norway, with an average nurse-to-patient ratio of 1.05:1, compared to 0.65:1 in the United States ($p < 0.01$) (Martin, 2005). Even after adjustment for Norway having a higher median Nine Equivalent of Nursing Manpower Use Score (NEMS), the Norwegian nurse-to-patient ratio remained higher, which shows that Norwegian ICUs tend to be staffed appropriately to handle their higher workload (Martin, 2005). This may impact Norwegian nurses' lack of restraint application, due to more

ability to attempt alternatives before resorting to restraints. A survey conducted in 130 mixed ICUs in France showed a restraint prevalence rate of 50%, with a median nurse-to-patient ratio of 2.8 (Jonghe, 2013). In a survey of nurses conducted in Canada, 36% of nurses reported that restraints are applied more often when short-staffed (Leith, 1999). Similarly, a study conducted in 11 mixed ICUs in Taiwan showed that more patients are restrained when short staffed ($p=0.03$) (Yeh, 2004). Interviews conducted in 3 ICUs in South Africa reported a restraint prevalence rate of 48%, with reported nurse-to-patient ratios of 1:1 (Langley, 2011).

Time of Day

Some literature shows a connection between the time of day or shift and restraint use. In a survey of Turkish ICU nurses, 12.7% of nurses reported restraints are used most often between 0800-1600 and 49.2% of nurses reported restraints are used most often between 1600-0800 (Akansel, 2007). Of the remaining nurses, 28.5% said “other (depends on patient’s condition)” and 7.9% said “N/A” (Akansel, 2007). The high percentage of nurses reporting restraint use during night shift could be due to decreased staff members at night. Time of day can also influence the type of restraint use. One study showed a statistical significance between types of restraint used in morning and afternoon shifts. According to Kandel (2013), side rails were used more often in afternoon shifts (22.8%) than morning shifts (15.3%). Also, more than one type of restraint was used more often in morning shifts (68.8% vs. 60.9%) (Kandeel, 2013).

Restraint Reduction Interventions

Many studies looked at the nurses’ education levels to determine if this had any impact on their restraint use. Current research shows a lack of restraint education for

nurses, with one study showing 95% of nurses reporting not receiving any restraint education (Akansel, 2007). Akansel (2007) found no statistically significant difference in restraint use based on the nurses' education level ($p>0.05$). Leith (1999) studied Canadian ICU nurses with education levels ranging from diploma level to Master's level of education, and found that these educational differences lead to a non-uniform restraint practice. Egerod (2009) found that Nordic nurses had more sedation education than US nurses (92% vs. 76%, $p<0.01$). Recall that Norway tends to have lower prevalence of restraint use. Some studies showed that nurses' length of clinical experience working as nurses can impact restraint use. Sherer (1993) found that the longer a nurse has worked in critical care, the more positive their attitude tended to be towards the use of restraints.

Restraint education interventions may be a useful way to increase safe restraint practices and decrease restraint use. Ozdemir (2009) studied the effect of a restraint education intervention on nursing practice. The sample of nurses included mostly graduates from vocational health high schools and nursing schools (Ozdemir, 2009). This study used a pre-post-test design. Prior to the intervention, nurses were not assessing their patients' body positioning properly, with only 3% of nurses checking body positioning. After utilizing the intervention, 75% of nurses checked body positioning (Ozdemir, 2009). Nurses also improved on controlling excessive noise post-test, with 100% of nurses controlling excessive noise post-test, compared to 0% of nurses pre-test (Ozdemir, 2009). Also improved was the category of ensuring pain relief, which improved from 30% pre-test to 100% post-test (Ozdemir, 2009). These results showed that the difference between the pre-test and post-test restraint practices was statistically significant in favor of the post-test group ($p<0.001$) (Ozdemir, 2009).

Vance (2003) conducted a similar study, in which a treatment interference protocol was introduced to nurses and the results from pre-test and post-test were compared to determine the effectiveness of the intervention. Before enacting the protocol, inappropriate restraint use was at 67%, which improved to 31% inappropriate restraint post-intervention (Vance, 2003). This study showed a 36% decrease in inappropriate restraint use after the intervention, demonstrating the positive impact of restraint education on decreasing restraint use in ICU nurses (Vance, 2003).

Yeh (2004) looked at a population of nurses in which 57% had attended courses in school regarding restraints. Of the sample, 97% had received no continuing education on restraint use and 0% reported having restraint training at the medical center (Yeh, 2004). Of this sample, there was no significant difference between the registered nurses and vocational nurses regarding age ($p=0.67$), number of years of experience ($p=0.59$), or number of years working as a nurse ($p=0.86$) (Yeh, 2004). The results showed that the average accuracy rate from the questionnaire on restraint knowledge was statistically significant ($p<0.01$), with improvements in accuracy rate from 58.4% to 70.5% (Yeh, 2004).

In many studies, the nurses expressed similar reasons for applying restraints, including preventing patients from removing tubes, preventing self-extubation, preventing falls, or protecting a patient with impaired mental status. The most commonly reoccurring main reason for restraining was to prevent patients from removing or pulling on tubes (Akansel, 2007; Choi, 2003; Kandeel, 2013; Leith, 1999; Martin, 2005; Minnick, 2001; Turgay, 2009; Yeh, 2004). Another common main reason for restraining

a patient was to prevent self-extubation (Benbenbishty, 2010; Yeh, 2009). Turgay (2009) reported that 54% of nurses applied restraints because of convenience.

Device Association With Restraint Use

In the ICU, patients typically have numerous tubes, catheters, and devices which are necessary for their treatment. Unfortunately, devices such as feeding tubes and urinary catheters are uncomfortable and can be predictors of restraint use (Kruger, 2013). One study reported that nasogastric tubes specifically are predictors of restraint use ($p=0.0004$) (Choi, 2003).

Although many nurses report the prevention of device removal as a main reason for utilizing restraints, device removal frequently occurs in restrained patients. Evidence shows a strong relationship between unplanned extubation in restrained patients. Mechanical ventilation has been shown to be a predictor of restraint use ($p<0.05$) (Minnick, 2007; Benbenbishty, 2010). In 65% of French ICUs, restraints are applied for more than half of patients' duration ventilated (Jonghe, 2013). In mechanical ventilated patients with restraints, there is an increased risk of unplanned extubation ($p<0.05$) (Ismaeil, 2014). In one study, 77.8% of patients with restraints completed self-extubation ($p=0.042$) (Ismaeil, 2014). A study comparing a control group to an unplanned extubation group found that restrained patients had increased rates of unplanned extubation (42.9% v. 16.5%, $p<0.001$) (Chang, 2008).

Medication Association With Restraint Use

Medications such as benzodiazepines, opioids, and antipsychotics are frequently used in an ICU setting. In a study of Canadian and US ICUs, restrained patients received higher daily doses of benzodiazepines, opioids, more days of infusions, and more daily

benzodiazepine boluses ($p < 0.0001$) (Rose, 2015). More restrained patients also received haloperidol ($p = 0.02$) and atypical antipsychotics ($p = 0.003$) (Rose, 2015). Restrained patients are more likely to be sedated ($p < 0.001$) (Benbenbishty, 2010). In general, literature shows that restrained patients generally receive more sedatives. However, Nordic nurses reported lighter target Richmond Agitation Sedations Scale scores ($p < 0.01$), which means they make an effort to lightly sedate patients (Egerod, 2012). Along with lower target RASS scores, Nordic nurses use more sedation assessment tools (91% v. 67%, $p < 0.01$) and perform sedation interruption daily (53% v. 39%, $p = 0.03$) (Egerod, 2012). Another study conducted in Norway and the United States showed a statistically significant difference in restraint incidence between the United States and Norway ($p = 0.001$) and showed that patients are more sedated in Norway ($p < 0.001$) (Martin, 2005). This opposes Egerod's results regarding sedation in Norway, although both studies show low prevalence of restraint use. This further supports the idea that policies vary not only between countries, but also within countries, producing very different outcomes in patient sedation.

A point prevalence study conducted in New Zealand and Australia showed a restraint prevalence rate of 7%, with 22% of all the patients on the unit being lightly to moderately sedated and 31% deeply sedated (Elliott, 2013). In Elliott's study, nurses performed routine sedation assessments on only 63% of intubated and ventilated patients (2013).

While a link has been discovered between unplanned extubation in restrained patients, there is also an increased risk of unplanned extubation in patients with decreased sedation ($p < 0.05$) (Ismaeil, 2014). A French survey showed that restraints are used less

frequently in deeply sedated patients (Jonghe, 2013). Literature suggests that some nurses prefer to use sedatives as an alternative to restraints. A survey of Egyptian nurses showed that 75% of nurses use sedatives as an alternative to restraint use, resulting in one-third of patients (27.3%) being sedated (Kandeel, 2013). A survey of 235 acute-critical care nurses displayed that 38% of the sample would “always” rather sedate patients instead of restraining patients (Sherer, 1993). A mixed method study of South African ICUs showed that of 219 patients, 48% were restrained, with 47 restrained patients on sedative or analgesic medication and 59 patients restrained without medication (Langley, 2011). Some studies have explored the need for new sedation protocol. One study examined a technique of Early Goal-Directed Sedation (EGDS) and compared this to standard sedation with mechanically ventilated patients. The study displayed that light sedation, with a Richmond Agitation Sedation Score (RASS) of -1 to -2 in the first 48 hours, was more common in the EGDS group compared to the standard sedation group, with 66% vs. 38% ($p=0.01$) (Shehabi, 2013). EGDS patients had significantly less restraints (5% vs. 31%, $p=0.03$) than the standard sedation patients (Shehabi, 2013). The results of Shehabi’s study conclude that a technique of early goal-directed sedation is a safe way to achieve early light sedation and decrease restraint use.

Unit Type and Restraint Type

Restraint use varies depending on unit type and location, but which types of ICU utilize restraints most often is not clearly defined. The current literature examines different types of ICUs and utilizes different interventions that affect the prevalence of restraints. Many studies regarding restraint use do not specify the type of ICU studied. Restraint use in medical ICUs varied from 46% to 77% (Choi, 2003; Micek, 2005).

Restraint use was slightly higher in surgical ICUs and ranged from 59% to 87% (Liu, 2009; Curry, 2008). Studies in mixed ICUs showed restraint use ranging from 31% to 78% (Vance, 2003; Mehta, 2015). The study of a respiratory ICU in Egypt showed a restraint incidence of ranging from 50%-78% (Ismaeil, 2014).

The types of restraints used also varied between studies. Benbenbishty (2010) studied restraint use in European ICUs and found that larger units were more likely to use commercial wrist restraints, while smaller units had to use other supplies as restraints. Gauze was often used as a form of restraint when commercial wrist restraints were not used. Akansel (2007) discovered that gauze was used by 89% of Turkish nurses. Similarly, Kandeel (2013) found that 97% of Egyptian nurses stated gauze was the most commonly used type of restraint. Akansel (2007) also noted that 50% of nurses reported using 4-point restraints and 41% reported utilizing wrist restraints. Many studies found wrist restraints to be the most common (Curry, 2008; Fowler, 1997; Leith, 1999; Martin, 2005; Minnick, 2007; Ozdemir, 2009; Turgay, 2009; Vance, 2003; Yont, 2014).

Smoking, Alcohol, and Psychiatric Disorders

A history of smoking, alcohol, or psychiatric disorders in patients contributes to restraint use. Typically, tobacco or alcohol use prior to ICU admission contributes to delirium development and subsequent restraint use. Delirious patients are more likely to have a history of tobacco (31.5% vs. 16.2%, $p=0.002$) or alcohol use (34.6% vs. 20.9%, $p=0.009$) (Mehta, 2015). In addition, patients with delirium are more likely to be restrained (86.3% vs. 76.7%, $p=0.014$) (Mehta, 2015). Although this study showed a relationship between delirium and restraints, there was no shown relationship between any psychiatric conditions affecting the incidence of delirium (Mehta, 2015). Another

study showed that more restrained patients had a history of a neurological condition (17% vs. 14%, $p=0.047$) and tobacco use (23% vs. 12%, $p=0.05$) (Rose, 2015). In this study, a history of alcohol use actually resulted in patients being less likely to have restraints applied, but the author explained that “this association is likely spurious” (Rose, 2015, p. 11). Lucidarme (2010) evaluated the impact of abrupt nicotine absence and the development of agitation and delirium in ventilated patients. Nicotine abstinence in smokers was not associated with delirium, but it did increase the incidence of agitation (64% vs. 32%, $p=0.0005$) (Lucidarme, 2010). This study suggests that patients with tobacco dependency should be carefully monitored, due to their likelihood of agitation.

Outcomes of Restraint Use

Restraints, although utilized with the intention of keeping patients safe, often have negative effects on patients. Current literature explores the possibility of multiple outcomes resulting from restraint use, including the patient’s length of stay, mortality, injuries, falls, delirium, and self-extubation.

Length of Stay

In the current literature regarding restraint use that monitored patient length of stay, the results do not show restraint use affecting patients’ length of stay (LOS) greatly. In a survey of Turkish nurses’ perception of restraint use, only 6% of nurses agreed that restraints cause longer LOS (Akansel, 2007). In a study examining predictors of agitation in critically ill patients, which has been shown to be a predictor of restraint use, ICU LOS ($p=0.12$), number of hospital days after ICU discharge ($p=0.89$) and total hospital LOS ($p=0.56$) did not differ between agitated and non-agitated patients (Burk, 2014).

Some interventions targeted at decreasing restraint use or decreasing delirium have been effective in decreasing LOS. Although medical professionals should employ all possible interventions to prevent agitation in critically ill patients, sometimes this response is unavoidable. Khan (2013) studied the impact of utilizing a computer-based clinical decision support system (CDSS) that recommends discontinuing physical and chemical restraints in reducing the incidence of delirium in elderly ICU patients. Unfortunately, results from Khan's study did not show that utilizing a CDSS impacts ICU LOS. The CDSS group had a mean LOS in the ICU of 7.4 days, while the control group had a mean LOS in the ICU of 5.7 days ($p=0.71$) (Khan, 2013). Michaud (2014) examined early pharmacological treatment of delirium and restraint use, and results showed that the group receiving early pharmacological treatment of delirium had shorter ICU LOS (9.5 vs. 16 days, $p<0.001$) and shorter hospital LOS (14.5 vs. 22 days, $p<0.001$). These results highlight the importance of early detection and treatment of delirium in decreasing restraint use and hospital and ICU length of stay. Titsworth (2012) researched the effect of implementing the Progressive Upright Mobility Protocol (PUMP), which focuses on increasing mobility in the neuro ICU population. This protocol was shown to decrease the number of days in restraints ($p<0.05$) and reduce neuro ICU length of stay ($p<0.004$) and hospital length of stay ($p<0.004$) (Titsworth, 2012). Hospital length of stay significantly decreased post-protocol, with a LOS of 12 days pre-protocol to 8.6 days post-protocol ($p<0.01$) (Titsworth, 2012).

Duration of Restraint Use

The current literature explored durations of restraint use. Choi (2003) discovered that the majority (70%) of patients are typically restrained for 1-24 hours. The mean

restraint application duration per patient was 3.62 days, and the mean restrained period per incidence was 23 hours (Choi, 2003). Kandeel (2014) observed restraint use in an Egyptian ICU, and discovered that the majority (58.8%) of patients were restrained for 3-4 days. Maccioli (2003) and the American College of Critical Care Medicine Task force 2001-2002 developed clinical practice guidelines for maintaining patient safety while using restraints. Maccioli (2003) and the task force created 9 recommendations regarding patient safety and restraint use, including creating the least restrictive environment, only using restraints in clinically appropriate situations, attempting alternatives, limiting restraint orders to 24 hours maximum, and assessing restrained patients every 4 hours. The guidelines also stressed the importance of educating patients and family members before applying restraints (Maccioli, 2003). These recommendations create the basis for a patient-safety conscious culture of restraint use. One study found that 93% of nurses check restrained patients at least every 2 hours, which is within these recommendations (Sherer, 1993). Elliott (2013) studied the assessment of analgesia, sedation, and delirium in ICUs in Australia and New Zealand. In Elliott's study, 46% of patients had pain documented 4 hours before the study observation (Elliott, 2013). Routine sedation assessment was recorded in 63% of intubated and ventilated patients, and routine assessment of delirium occurred in only 3% of patients (Elliott, 2013). Leith (1999) questioned Canadian ICU nurses about their restraint use, and found that a majority of the nurses follow Maccioli's recommendations regarding restraints. Of the nurses surveyed, 100% check restraint sites for bruising, 85% explore the reason for restraint and check restraints every 2 hours, 88% explain to patients the reason for applying restraints, and 97% explain to family members the rationale for applying restraints (Leith, 1999).

Patient Mortality

Only 4 studies currently available regarding restraint use investigated patient mortality, so evidence is limited regarding restraint use and patient mortality. Current evidence does not show a relationship between restraints and mortality. Only 11% of Turkish nurses agreed that restraints increase patient mortality (Akansel, 2007). In Burk's study of agitated and non-agitated patients, the two groups did not differ in mortality ($p=0.11$) (2014). Khan's (2013) previously mentioned study focusing on the computer-based CDSS to reduce the incidence of delirium in elderly ICU patients also did not have an impact on mortality ($p=0.42$). Lucidarme's (2010) study of nicotine withdrawal in ventilated patients did not show a statistically significant difference in patient mortality between the smoker and non-smoker group ($p=0.1$). Due to the lack of evidence regarding restraint use and mortality, future studies should focus on the relationship between these factors.

Injuries, Falls, Extubation, and Infection

Controversy exists regarding restraints and their impact on patient injuries, falls, extubation, and infection. In a survey of Turkish nurses, 87% thought that restraints reduce injuries and 92% thought that restraints reduce fall rates (Akansel, 2007). In comparison, in a survey of South African medical professionals, all of the doctors and many nurses agreed that injuries, including death, were possible complications of restraint use (Langley, 2010). According to Kandeel (2013), a nurse's level of experience may impact the frequency of restraint assessment. Experienced nurses more frequently assessed restrained patients than less experienced nurses ($p=0.01$) (Kandeel, 2013). Of the complications observed upon assessment by nurses, 96.5% of nurses reported redness

as the most observed manifestation, followed by bruising, swelling, and edema (Kandeel, 2013). Turgay (2009) studied restraint use in Turkish ICUs and found that 36.8% of nurses reported complications after restraint application, with skin breakdown as the most commonly reported complication. The most common behavioral change noted in restrained patients was anxiety, reported by 60.8% of nurses (Kandeel, 2013). Burk's study of predictors of agitation in ICUs examined adverse events in 200 patients (2014). Among the agitated patients, 27% experienced adverse events (Burk, 2014). Of the adverse events documented, 91% involved pulling out noncritical catheters or tubes, 15% self-extubated, 9% pulled out catheters or other tubes, 3% fell out of bed, and 3% removed restraints (Burk, 2014). This study showed that agitation is associated with numerous adverse events. Ozdemir (2009) studied the impact of an education program on nurses' practices for agitated patients. Prior to the education program, nurses applied restraints to 17/40 patients, while no restraints were applied after the program (Ozdemir, 2009). The difference between the groups regarding restraint use was statistically significant in favor of the post-test group ($p < 0.001$) (Ozdemir, 2009). Research by Burry (2013) showed only 4.6% of patients accidentally removed devices; however, 75.8% of these incidents occurred during Daily Sedation Interruption, which may suggest that the most apparent time for accidental device removal is during light sedation. Martin (2005) found that the United States had higher incidence of restraint use than Norway and the only incidences of unplanned device removal occurred in the United States. All 7 incidents of unplanned device removal occurred in restrained patients (Martin, 2005). Chang (2008) researched the influence of restraints on unplanned extubation of ICU patients, and found that restrained patients had higher rates of unplanned extubation

(42.9% vs. 16.5%, $p < 0.001$) and higher rates of nosocomial infection (21.5% vs. 9.2%, $p = 0.005$). In this study, 82% of unplanned extubations occurred in patients with restraints (Chang, 2008). Curry (2008) explored characteristics of unplanned extubation in the ICU, and found that 87% of patients were restrained at the time of extubation ($p < 0.001$). In this study, 31 patients self-extubated, with 15 patients needing to be re-intubated (Curry, 2008). According to Curry (2008), “Reintubation after an unplanned extubation is expensive, and unplanned extubation can be physically traumatic to the patient. Our hospital estimated an additional \$15,000 in patient charges just for the 15 reintubation procedures that were performed” (p. 49). In this study, 89% of extubations happened when the nurse was not at the bedside, which shows the importance of constantly monitoring patients (Curry, 2008). Also, most patients had low levels of sedation in the hour leading up to extubation (Curry, 2008). Ismaeil (2014) conducted research that showed an increased risk of self-extubation (92.31%, $p < 0.05$) with the use of restraints. Of the planned and unplanned extubation groups, 92.5% of patients in the planned extubation group survived, while only 59.26% of patients in the unplanned extubation group survived (Ismaeil, 2014). Michaud (2014) showed that patients receiving early pharmacological treatment of delirium had a shorter median time to extubation of 3 days compared to 6.5 days in the group that did not receive treatment ($p < 0.001$). Rose (2015) showed that more restrained patients unintentionally removed devices (26% vs. 3%, $p < 0.001$) and required reintubation (8% vs. 1%, $p = 0.01$).

Emotional Impact

Restraints emotionally impact patients and family members, though their impact is not well documented. Only 4 studies included in this literature review mention the

patients' perceptions of restraint use. Fowler (1997) thoroughly explored patient reactions and memories of being restrained. Patients expressed feelings of discomfort, fear, and frustration, and felt the need to communicate these feelings (Fowler, 1997). One of the patients said restraints made them feel "like an animal" and stated, "It was the worst thing anyone could have done to me" (Fowler, 1997, p. 96). Another patient stated, "Even if my hands were untied I would not have pulled the tube out" (Fowler, 1997, p. 96). This points out the fact that this patient in particular was alert and oriented enough to have full understanding of their situation, but was unable to do anything to change the circumstances. Of the patients surveyed, 3 actually wrote to "untie their hands" (Fowler, 1997, p. 96). Minnick (2001) studied elderly patients' reports of restraint use in the ICU, and found that only 40% of patients surveyed remembered being restrained but did not describe the situation as being extremely distressing. The patients accepted the use of restraints as necessary because of a lack of alternatives (Minnick, 2001). Happ (2004) studied communication ability, method, and content among ventilated patients in the ICU and found that most communication (63%) occurred when patients were not restrained. Family members of restrained patients are also impacted by the event of restraining their loved one. Kang (2013) studied 200 family members of restrained ICU patients and used a scale called the "Instrument of family's emotional response toward restrained patients," in which 5 was the highest score. Kang (2013) found that the highest scoring familial responses included acceptance (3.56), depression (3.02), helplessness (2.94), anxiety (2.87), shock (2.74), avoidance (2.64) and grudge (2.08). These results show an overall negative emotional response from family members of restrained individuals, which may

be improved with better education about restraint use or inclusion of family members in the decision to use restraints.

Delirium

Delirium, a common complication in the ICU, may also be linked to restraint use. Rose (2015) studied prevalence, risk factors, and outcomes related to restraint use in mechanically ventilated adults. Patients were screened for delirium using the Intensive Care Delirium Screening Checklist (Rose, 2015). Results showed a higher incidence of delirium in restrained patients compared to patients who were never restrained (59% vs. 33%, $p < 0.001$) (Rose, 2015). McPherson (2013) researched modifiable risk factors of delirium in cardiovascular ICUs, and found that patients who had restraints or devices that prevented mobilization were more likely to have delirium the following day ($p < 0.01$). In this study, the prevalence of delirium was 26%, occurring in one in four patients in the cardiac ICU (McPherson, 2013). Benzodiazepine use upon admission was also predictive of a three-time increased delirium risk ($p = 0.04$) for patients during their time in the cardiac ICU (McPherson, 2013). These results make the clear distinction that physical and chemical restraints expose patients to a greater risk of developing delirium in cardiac ICUs, and highlights areas of improvement where protocols could prevent this complication.

Other studies show that delirium may cause increased ICU LOS. For example, Mehta (2015) looked at prevalence, risk factors, and outcomes of delirium in mechanically ventilated patients and found that delirious patients had longer ICU LOS (12 vs. 8 days, $p < 0.0001$). In this same study, delirious patients were more likely to be restrained (86.3% vs. 76.7%, $p = 0.014$) and restrained for a longer duration, with a

median of 5 days restrained in comparison to 2 days ($p < 0.0001$) (Mehta, 2015). Other factors independently associated with the development of delirium included restraint use ($p = 0.0003$), antipsychotic administration ($p = 0.047$), and midazolam dose ($p = 0.049$) (Mehta, 2015). Mehta's study also showed that delirium is not only associated with longer ICU LOS, but also can contribute to the removal of central venous or arterial catheters (2015). In this study, 9.7% of delirious patients removed catheters in comparison to 3.1% of non-delirious patients (Mehta, 2015). Delirious patients were more likely to be extubated compared to non-delirious patients (36.8% vs. 58.3%) (Mehta, 2015). Mehta (2015) also found that delirious patients had longer durations of mechanical ventilation, with a median of 13 days versus 7 days for non-delirious patients ($p < 0.0001$). The development of delirium may also impact a patient's ability to be extubated. After delirious patients passed a trial of unassisted breathing, they were still less likely to be extubated compared with non-delirious patients (36.8% vs. 58.3%, $p = 0.0003$) (Mehta, 2015). Micek (2005) utilized the CAM-ICU to detect delirium in mechanically ventilated patients, and found that 47% of patients developed delirium for at least one day while in the ICU. Results also showed that more CAM-ICU positive, or delirious, patients received continuous midazolam infusions (59% vs. 32%, $p < 0.05$) or fentanyl infusions (57% vs. 32%, $p < 0.05$) and wore restraints (77% vs. 50%, $p < 0.05$) compared to CAM-ICU negative patients, without delirium (Micek, 2005). CAM-ICU positive patients had longer durations of restraint use (3 vs. 1 day, $p < 0.037$) than CAM-ICU negative patients (Micek, 2005). However, in this study, the length of stay in the ICU and hospital did not differ between CAM-ICU positive patients and CAM-ICU negative patients (Micek, 2005). This evidence further shows how delirium development

is associated with certain sedative medications and restraint use. Michaud (2014) explored early pharmacological treatment of delirium and its potential to decrease restraint use. Michaud's results show that the median time from ICU admission to delirium onset was 4.5 days for the group receiving early treatment and 5 days for the non-treatment group ($p=0.435$) (Michaud, 2014). This finding is not statistically significant, although the treatment group seems to have had a slightly faster onset of delirium. Within the first 3 days of ICU stay, the first positive delirium score was documented in 70% of the treatment group and 72% of the non-treatment group ($p=0.857$), which suggests that in both groups, delirium was not preexisting on ICU admission and must have developed in the ICU (Michaud, 2014).

Conclusions

The current literature regarding restraint use is vast and expansive. However, future studies should be conducted to get an improved overview of concerns regarding restraint use. There is limited information regarding which types of ICUs utilize restraints most often. This information would be helpful in determining which ICUs should receive restraint use interventions and education more promptly. There is also limited information about restraint use and mortality. Although the literature included in this study did not show a link between restraint use and patient mortality, very few studies included this information in their results. Exploring the emotional impact of restraint use with critically ill patients is needed to provide more comprehensive patient-centered care. . Implementing restraint education programs demonstrates benefits in restraint reduction and providing this education more widely may be beneficial. More studies of sedation protocols as a restraint reduction strategy are necessary. Researching the prevention of

delirium in restrained patients would also be beneficial, since delirium was such a common predictor and outcome of restraints in the current literature. The topic of restraint use in ICUs has been extensively researched throughout the world, but there is still information to be discovered in order to promote the safest and most evidence-based restraint use.

References

- Akansel, N. (2007). Physical restraint practices among ICU nurses in one university hospital in weastern [sic] turkey. *Health Science Journal, 1*(4), 7p.
- Benbenbishty, J., Adam, S., & Endacott, R. (2010). Physical restraint use in intensive care units across europe: The PRICE study. *Intensive & Critical Care Nursing : The Official Journal of the British Association of Critical Care Nurses, 26*(5), 241-245.
doi:10.1016/j.iccn.2010.08.003 [doi]
- Burk, R. S., Grap, M. J., Munro, C. L., Schubert, C. M., & Sessler, C. N. (2014). Predictors of agitation in critically ill adults. *American Journal of Critical Care : An Official Publication, American Association of Critical-Care Nurses, 23*(5), 414-423.
doi:10.4037/ajcc2014714 [doi]
- Burry, L. D., Williamson, D. R., Perreault, M. M., Rose, L., Cook, D. J., Ferguson, N. D., . . . Mehta, S. (2014). Analgesic, sedative, antipsychotic, and neuromuscular blocker use in canadian intensive care units: A prospective, multicentre, observational study. [Utilisation des analgesiques, sedatifs, antipsychotiques et bloqueurs neuromusculaires dans les unites de soins intensifs canadiennes: etude

observationnelle prospective, multicentrique] *Canadian Journal of Anaesthesia = Journal Canadien d'Anesthesie*, doi:10.1007/s12630-014-0174-1 [doi]

Chang, L. Y., Wang, K. W., & Chao, Y. F. (2008). Influence of physical restraint on unplanned extubation of adult intensive care patients: A case-control study. *American Journal of Critical Care : An Official Publication, American Association of Critical-Care Nurses*, 17(5), 408-15; quiz 416. doi:17/5/408 [pii]

Choi, E., & Song, M. (2003). Physical restraint use in a korean ICU. *Journal of Clinical Nursing*, 12(5), 651-659. doi:789 [pii]

Curry, K., Cobb, S., Kutash, M., & Diggs, C. (2008). Characteristics associated with unplanned extubations in a surgical intensive care unit. *American Journal of Critical Care : An Official Publication, American Association of Critical-Care Nurses*, 17, 45-51; quiz 52.

Devlin, J. W., Nava, S., Fong, J. J., Bahhady, I., & Hill, N. S. (2007). Survey of sedation practices during noninvasive positive-pressure ventilation to treat acute respiratory failure. *Critical Care Medicine*, 35(10), 2298-2302.
doi:10.1097/01.CCM.0000284512.21942.F8

Egerod, I., Albarran, J. W., Ring, M., & Blackwood, B. (2012). Sedation practice in nordic and non-nordic ICUS: A european survey. *Intensive Care Medicine*, 38, S35.

Elliott, D., Aitken, L. M., Bucknall, T. K., Seppelt, I. M., Webb, S. A., Weisbrodt, L., . . . Australian and New Zealand Intensive Care Society Clinical Trials Group and the

George Institute for Global Health. (2013). Patient comfort in the intensive care unit: A multicentre, binational point prevalence study of analgesia, sedation and delirium management. *Critical Care and Resuscitation : Journal of the Australasian Academy of Critical Care Medicine*, 15(3), 213-219.

Fowler, S. B. (1997). Impaired verbal communication during short-term oral intubation. *Nursing Diagnosis : ND : The Official Journal of the North American Nursing Diagnosis Association*, 8, 93-98.

Happ, M. B., Tuite, P., Dobbin, K., DiVirgilio-Thomas, D., & Kitutu, J. (2004). Communication ability, method, and content among nonspeaking nonsurviving patients treated with mechanical ventilation in the intensive care unit. *American Journal of Critical Care : An Official Publication, American Association of Critical-Care Nurses*, 13, 210-218; quiz 219-220.

Ismaeil, M. F., El-Shahat, H., El-Gammal, M., & Abbas, A. M. (2014). Unplanned versus planned extubation in respiratory intensive care unit, predictors of outcome. *Egyptian Journal of Chest Diseases and Tuberculosis*, 63, 219-231.

Jonghe, B., Constantin, J., Chanques, G., Capdevila, X., Lefrant, J., Outin, H., & Mantz, J. (2013). Physical restraint in mechanically ventilated ICU patients: A survey of french practice. *Intensive Care Medicine*, 39(1), 31-37. doi:10.1007/s00134-012-2715-9

- Kandeel, N. A., & Attia, A. K. (2013). Physical restraints practice in adult intensive care units in egypt. *Nursing & Health Sciences, 15*(1), 79-85. doi:10.1111/nhs.12000 [doi]
- Kang, J., Eun-Nam Lee, Eun Young, P., Lee, Y., & Lee, M. M. (2013). Emotional response of ICU Patients' Family toward physical restraints [korean]. *Korean Journal of Adult Nursing, 25*(2), 148-156. doi:10.7475/kjan.2013.25.2.148
- Khan, B. A., Calvo-Ayala, E., Campbell, N., Perkins, A., Ionescu, R., Tricker, J., . . . Boustani, M. A. (2013). Clinical decision support system and incidence of delirium in cognitively impaired older adults transferred to intensive care. *American Journal of Critical Care, 22*, 257-262.
- Kruger, C., Mayer, H., Haastert, B., & Meyer, G. (2013). Use of physical restraints in acute hospitals in germany: A multi-centre cross-sectional study. *International Journal of Nursing Studies, 50*(12), 1599-1606. doi:10.1016/j.ijnurstu.2013.05.005 [doi]
- Langley, G., Schmollgruber, S., & Egan, A. (2011). Restraints in intensive care units--a mixed method study. *Intensive & Critical Care Nursing : The Official Journal of the British Association of Critical Care Nurses, 27*(2), 67-75. doi:10.1016/j.iccn.2010.12.001 [doi]
- Leith, B. A. (1999). Canadian critical care nurses and physical restraints. *Official Journal of the Canadian Association of Critical Care Nurses / CACCN, 10*(1), 10-14.

Liu, J., Chou, F., & Yeh, S. (2009). Basic needs and their predictors for intubated patients in surgical intensive care units. *Heart & Lung, 38*(3), 208-216.

doi:10.1016/j.hrtlng.2008.06.002

Lucidarme, O., Seguin, A., Daubin, C., Ramakers, M., Terzi, N., Beck, P., . . . du Cheyron, D. (2010). Nicotine withdrawal and agitation in ventilated critically ill patients. *Critical Care (London, England), 14*(2), R58. doi:10.1186/cc8954 [doi]

Maccioli, G. A., Dorman, T., Brown, B. R., Mazuski, J. E., McLean, B. A., Kuszaj, J. M., . . . American College of Critical Care Medicine, Society of Critical Care Medicine. (2003). Clinical practice guidelines for the maintenance of patient physical safety in the intensive care unit: Use of restraining therapies--american college of critical care medicine task force 2001-2002. *Critical Care Medicine, 31*(11), 2665-2676. doi:10.1097/01.CCM.0000095463.72353.AD [doi]

Martin Iglesias, V., Ponton Soriano, C., Quintian Guerra, M. T., Velasco Sanz, T. R., Merino Martinez, M. R., Simon Garcia, M. J., & Gonzalez Sanchez, J. A. (2012). Mechanical restraint: Its use in intensive cares. *Enfermeria Intensiva, 23*, 164-170.

Martin, B., & Mathisen, L. (2005). Use of physical restraints in adult critical care: A bicultural study. *American Journal of Critical Care : An Official Publication, American Association of Critical-Care Nurses, 14*(2), 133-142. doi:14/2/133 [pii]

McPherson, J. A., Wagner, C. E., Boehm, L. M., Hall, J. D., Johnson, D. C., Miller, L. R., . . . Pandharipande, P. P. (2013). Delirium in the cardiovascular ICU: Exploring

modifiable risk factors. *Critical Care Medicine*, 41(2), 405-413.

doi:10.1097/CCM.0b013e31826ab49b [doi]

Mehta, S., Cook, D., Devlin, J. W., Skrobik, Y., Meade, M., Fergusson, D., . . . Burry, L. (2015). Prevalence, risk factors, and outcomes of delirium in mechanically ventilated adults*. *Critical Care Medicine*, 43, 557-566. doi:10.1097/CCM.0000000000000727

Micek, S. T., Anand, N. J., Laible, B. R., Shannon, W. D., & Kollef, M. H. (2005). Delirium as detected by the CAM-ICU predicts restraint use among mechanically ventilated medical patients. *Critical Care Medicine*, 33(6), 1260-1265.

Michaud, C. J., Thomas, W. L., & McAllen, K. J. (2014). Early pharmacological treatment of delirium may reduce physical restraint use: A retrospective study. *Annals of Pharmacotherapy*, 48(3), 328-334.

Minnick, A., Leipzig, R. M., & Johnson, M. E. (2001). Elderly patients' reports of physical restraint experiences in intensive care units. *American Journal of Critical Care : An Official Publication, American Association of Critical-Care Nurses*, 10(3), 168-171.

Minnick, A. F., Fogg, L., Mion, L. C., Catrambone, C., & Johnson, M. E. (2007). Resource clusters and variation in physical restraint use. *Journal of Nursing Scholarship*, 39(4), 363-370. doi:10.1111/j.1547-5069.2007.00194.x

Ozdemir, L., & Karabulut, E. (2009). Nurse education regarding agitated patients and its effects on clinical practice. *Contemporary Nurse*, 34(1), 119-128.

doi:10.5555/conu.2009.34.1.119 [pii]

Rose, L., Burry, L., Mallick, R., Luk, E., Cook, D., Fergusson, D.,...Mehta, S. (2015).

Prevalence, risk factors, and outcomes associated with physical restraint use in mechanically ventilated adults. *Journal of Critical Care*, 31 (1).

Scherer, Y. K., Janelli, L. M., Wu, Y. W., & Kuhn, M. M. (1993). Restrained patients:

An important issue for critical care nursing. *Heart & Lung : The Journal of Critical Care*, 22(1), 77-83.

Shehabi, Y., Bellomo, R., Reade, M. C., Bailey, M., Bass, F., Howe, B., . . . for the

Sedation Practice in Intensive Care Evaluation (SPICE) Study Investigators and the Australian and New Zealand Intensive Care Society (ANZICS) Clinical Trials

Group. (2013). Early goal-directed sedation versus standard sedation in

mechanically ventilated critically ill patients: A pilot study*. *Critical Care Medicine*, 41(8), 1983-1991. doi:10.1097/CCM.0b013e31828a437d

Titworth, W. L., Hester, J., Correia, T., Reed, R., Guin, P., Archibald, L., . . . Mocco, J.

(2012). The effect of increased mobility on morbidity in the neurointensive care unit. *Journal of Neurosurgery*, 116(6), 1379-1388. doi:10.3171/2012.2.JNS111881

Turgay, A. S., Sari, D., & Genc, R. E. (2009). Physical restraint use in turkish intensive care units. *Clinical Nurse Specialist CNS*, 23(2), 68-72.

doi:10.1097/NUR.0b013e318199125c [doi]

- Van Rompaey, B., Elseviers, M. M., Schuurmans, M. J., Shortridge-Baggett, L. M., Truijen, S., & Bossaert, L. (2009). Risk factors for delirium in intensive care patients: A prospective cohort study. *Critical Care (London, England)*, *13*(3), R77. doi:10.1186/cc7892
- Vance, D. L. (2003). Effect of a treatment interference protocol on clinical decision making for restraint use in the intensive care unit: A pilot study. *AACN Clinical Issues: Advanced Practice in Acute & Critical Care*, *14*(1), 82-91.
- Yeh, S., Hsiao, C., Ho, T., Chiang, M., Lin, L., Hsu, C., & Lin, S. (2004). The effects of continuing education in restraint reduction on novice nurses in intensive care units. *Journal of Nursing Research (Taiwan Nurses Association)*, *12*(3), 246-255.
- Yont, G. H., Korhan, E. A., Dizer, B., Gumus, F., & Koyuncu, R. (2014). Examination of ethical dilemmas experienced by adult intensive care unit nurses in physical restraint practices. *Holistic Nursing Practice*, *28*(2), 85-90. doi:10.1097/HNP.000000000000013 [doi]