

## REVIEWS

# Nursing and organizational barriers to daily interruption of sedation in U.S. hospitals: A thematic review of the literature

Pam Baker DeGuzman \*<sup>1</sup>, Carol A. Wayner<sup>2</sup>

<sup>1</sup>School of Nursing, University of Virginia, Charlottesville, VA, United States

<sup>2</sup>Martha Jefferson Hospital, Charlottesville, VA, United States

**Received:** October 14, 2014

**Accepted:** November 11, 2014

**Online Published:** November 24, 2014

**DOI:** 10.5430/cns.v3n1p55

**URL:** <http://dx.doi.org/10.5430/cns.v3n1p55>

## Abstract

Despite focused attention on hospital-acquired infections, ventilator-associated pneumonia (VAP) infections and deaths continue to be a problem in U.S. hospitals. Research indicates that protocols are in place across hospitals but actual implementation lags behind. The inconsistencies in protocol implementation may be due to workarounds created during the process of daily interruption of sedation (DIS), which is the process of stopping the ventilated patient's sedation at a prescribed time each day to evaluate the patient's ability to wean. The purpose of this thematic synthesis of the literature was to understand how nursing and organizational barriers may affect adherence to DIS protocols in U.S. hospitals. We conducted a search using the Cumulative Index of Nursing and Allied Health Literature, using terms related to sedation and mechanical ventilation, then coded and categorized the study findings, and developed themes. Three themes emerged: (1) organizational structure does not influence DIS at either the hospital or unit level, (2) a collaborative, multidisciplinary culture may be needed to influence changes in sedation practices, and (3) the gap between evidence and practice may be due to lack of nursing education and experience. To improve outcomes, intensive care units should evaluate the impact of multidisciplinary ventilator rounding teams that include nursing, on DIS adherence and VAP rates, and ensure that nurses are up-to-date on the evidence around all aspects of sedation management.

**Key Words:** Ventilator-associated pneumonia, Ventilator weaning, Critical care nursing, Systematic review

## 1 Introduction

Despite focused attention on hospital acquired infections, ventilator-associated pneumonia (VAP) infections and deaths continue to plague U.S. hospitals. In 2012, VAPs were associated with nearly 4,000 infections in National Healthcare Safety Network facilities.<sup>[1]</sup> Ventilator weaning protocols have been shown to improve patient outcomes,<sup>[2-4]</sup> although the evidence is inconsistent.<sup>[5]</sup>

Research indicates that protocols are in place across hospitals;<sup>[4,6-8]</sup> however, while practitioners verbalize that they follow the protocols, research has indicated that actual implementation lags behind.<sup>[4,6-8]</sup> The inconsistencies in protocol implementation and outcomes may be due to workarounds created due to protocol complexity,<sup>[6]</sup> and may occur during daily interruption of sedation (DIS). DIS is the process of stopping the ventilated patient's sedation at a prescribed time each day to evaluate the patient's ability to

\*Correspondence: Pam Baker DeGuzman; Email: [deguzman@virginia.edu](mailto:deguzman@virginia.edu); Address: University of Virginia School of Nursing, PO Box 800782, Charlottesville, VA 22908, United States.

wean, and is an integral part of weaning protocols. The process allows a reduction in sedative analgesics, while maintaining patient comfort, and an assessment of patient tolerance of the sedation reduction.<sup>[2]</sup> Nurses assess patients' ability to tolerate weaning, and either completely stop the sedation or restart it at a reduced rate.

Nurses are critical to successful sedation weaning. In a study comparing two groups of ventilator-assisted patients who were weaned following different protocols, 197 medical ICU patients were weaned using a multi-disciplinary protocol that nurses implemented, and 226 patients were weaned with the standard physician-driven protocol. Patients weaned with the nurse-driven multidisciplinary protocol had lower VAP rates and fewer ventilator days.<sup>[9]</sup> A subsequent study found a higher rate of successful extubation among patients weaned with a nurse-driven protocol.<sup>[10]</sup>

Hospitals with structures and cultures that are supportive of patient care and nursing have been shown to be associated with better patient outcomes, including respiratory outcomes. A broadly recognized example is the Magnet Recognition Program<sup>®</sup>, which designates hospitals that have positive traits, including a collaborative culture.<sup>[11]</sup> These organizational behavior qualities are linked to better patient outcomes including lower mortality,<sup>[12]</sup> and lower rates of pneumonia.<sup>[13]</sup>

Two literature reviews have examined aspects of DIS implementation. One review of DIS evaluated barriers to implementation; however, the authors did not approach the review systematically, and did not differentiate between the experiences of various types of clinicians.<sup>[14]</sup> Because the nursing role in DIS protocols is separate and distinct from that of physicians, pharmacists, and respiratory therapists, it is critical to evaluate these impacts separately. The review also did not evaluate organizational-level characteristics as barriers to DIS. Another review explored adherence to sedation withdrawal protocols and guidelines, but was limited to caregiver perceptions and complexity of care, and did not investigate the impact of interdisciplinary collaboration and organizational culture.<sup>[6]</sup>

## Purpose

When processes for DIS are either not followed in a standardized way or not followed at all, patients are at increased risk of extensive ventilator days and VAP. With the intense focus on reducing VAP rates across hospitals, it is important to have a comprehensive analysis of the existing literature focused on the impact of nursing and organizational characteristics on DIS implementation. The purpose of this review was to understand how nursing and organizational barriers may affect adherence to DIS protocols. Findings from this review may be used to develop hypothesis around improving DIS protocol adherence.

## 2 Methods

A thematic synthesis of the literature was conducted. According to Lucas and colleagues, thematic synthesis is one method of literature review that allows a synthesis of qualitative and quantitative data. Because our review would potentially include both qualitative and quantitative articles, we chose this method, which groups data into themes, and can be used when new hypotheses need to be developed.<sup>[15]</sup> We searched the Cumulative Index of Nursing and Allied Health Literature (CINAHL) for literature that addressed nursing or organizational barriers to implementation of sedation protocols. Although our focus was DIS, there is limited research on this topic; thus, we included factors affecting implementation of any aspect of sedation protocols, to glean potential insights into DIS. Our search strategy used the following keywords ([MH "Ventilation, Mechanical, Differentiated"] or [MH "Mechanical Ventilation (Iowa NIC)"] or [MH "Ventilator Weaning"] or ["Mechanical Ventilation"] or [MH "Ventilator Patients"] and [MH "Sedation"]), then limited to research articles and English language, revealing 109 articles. After limiting our search to those articles that were published in the last 10 years to capture research conducted on the sedation interruption component of protocols, 91 articles remained.

Two authors (P.B.D. and C.A.W.) collaboratively evaluated the titles and abstracts of the articles, identifying those that addressed nursing or organizational barriers to sedation weaning protocols. Review articles were not included, but evaluated along with selected articles for an ancestral search. The authors discussed differences of opinion and came to consensus on the selection of articles for this review. After limiting our search to these criteria, we identified seven articles from the CINAHL review, and an additional two from the ancestral search.

Data from the reviewed articles, including type of study, sample and setting, data collection methods, outcome variables, were abstracted. Findings were coded, and categories of factors influencing success of DIS protocols were collaboratively developed. Coding and categorization disagreements were resolved through discussion, and categories of factors influencing success of DIS protocols were developed into themes.

## 3 Results

Nine articles were analyzed and are presented in Table 1. The earliest article was from 2006 and the most recent was from 2013. All of the articles were authored by multidisciplinary groups; only one did not include at least one nurse as an author,<sup>[7]</sup> and one did not include a physician.<sup>[15]</sup> Other disciplines included among authors were pharmacy and social work.<sup>[7,8,17,18]</sup> The studies were conducted in a variety of geographical locations including the U.S.,<sup>[17-21]</sup> and Denmark;<sup>[22]</sup> others covered multiple countries or regions.<sup>[7,8,16]</sup>

The majority of these studies evaluated the beliefs of physicians and nurses.<sup>[7,16,17,22]</sup> Two surveyed only nurses.<sup>[18,19]</sup>

The majority of the studies were descriptive. Five of the studies measured practitioners' perceptions of barriers and attitudes toward DIS,<sup>[7,16-19,22]</sup> and one measured practitioners' attitudes about delirium management and outcomes.<sup>[8]</sup> Two of the nine studies used inferential methods. One evaluated the relationship of organizational culture on use of DIS,<sup>[21]</sup> and one that utilized chart review to determine the effect of a multidisciplinary ventilator bundle team on compliance with sedation-related protocols.<sup>[20]</sup>

### 3.1 Categorical analysis

Seven categories of factors influencing success of DIS protocols were identified: (1) lack of communication, (2) difference in beliefs, (3) lack of collaboration, (4) differences in practice, (5) multidisciplinary teams, (6) organizational characteristics, and (7) organizational structure.

### 3.2 Thematic analysis

The information derived from the categorical analysis was developed into themes. The themes were (1) organizational structure does not influence DIS at either the hospital or unit level (2) a collaborative, multidisciplinary culture may be needed to influence changes in sedation practices, and (3) the gap between evidence and practice may be due to lack of nursing education and experience.

#### 3.2.1 *Organizational structure does not influence DIS at either the hospital or the unit level*

Little evidence exists that examines the influence of organizational structure on DIS outcomes, and of the two studies reviewed, both examined the effect of structure at the hospital and unit level. Miller and colleagues surveyed 386 lead infectious disease practitioners from randomly selected U.S. hospitals.<sup>[17]</sup> They found that elements of hospital structure (size, academic affiliation and number of ICU beds) did not influence DIS use. Their conclusion was reinforced by a survey of 348 Australian and New Zealand ICU physicians and nurses in which no difference in DIS use was found between different size ICUs, or among Australian counties, states, or territories.<sup>[16]</sup>

#### 3.2.2 *A collaborative, multidisciplinary culture may be needed to influence changes in sedation practices*

Research has demonstrated that in many cases, physicians and nurses perceived their sedation decisions as being made collaboratively, and this multidisciplinary collaboration may have a positive effect on sedation outcomes. Guttormson's study of sedation perceptions among ICU nurses revealed that 84% believed that physicians considered the nursing assessment when writing sedation orders, and 60% felt that nurses and physicians had clear communication

around sedation goals.<sup>[19]</sup> Egerod's study had similar findings, with nurses reporting their perception that most decisions were made collaboratively between physicians and nurses.<sup>[22]</sup> Mendez and colleagues examined ventilator outcomes between a multidisciplinary ventilator rounding team, including physicians, nurses, respiratory therapists, and pharmacists providing real-time feedback to nurses; compared to the standard intensive care unit rounding team in a MICU.<sup>[20]</sup> Compliance with the DIS protocol was higher for the multidisciplinary rounding team (62%) than for the usual ICU rounding team (54%).

Despite the documented positive effects of multidisciplinary collaboration, there continues to be a lack of collaboration around patient sedation practices, particularly between physicians and nurses. In a survey of 904 members of the Society of Critical Care Medicine (including physicians, nurses and pharmacists), Tanios and colleagues analyzed the most commonly cited barriers to use of DIS. One of the top barriers cited was lack of nursing acceptance of the protocol, with almost 60% of respondents citing this as one of the top 3 barriers.<sup>[7]</sup> The findings did not differentiate responses according to profession, but 69% of the respondents identified as physicians; thus, it is possible that the physicians were concerned about nursing's acceptance of the DIS protocols. Guttormson and colleagues found that despite nurses reporting clear communication about sedation goals between nurses and physicians, 46% of nurses did not in fact agree with physicians regarding the ordered level of sedation.<sup>[19]</sup> Similarly, Egerod found that ICU physicians and nurses reported that most decisions were made collaboratively; nevertheless, twice as many physicians than nurses perceived decisions as being made during conferences that only physicians attended.<sup>[22]</sup> O'Connor and colleagues found that 50% of respondents reported restarting sedation during DIS at the nurse's discretion. However, the response did not differentiate between physicians and nurses, and with 75% of the respondents being nurses, it is difficult to discern if physicians, nurses, or both have this perspective.<sup>[16]</sup>

There is limited literature addressing the influence of unit and hospital culture on sedation practices. In one study, both a leadership-driven safety culture and staff receptivity to change were associated with regular self-reported DIS use.<sup>[17]</sup> In the qualitative portion of another study, respondents described unit culture as having a strong influence on nurses' and physicians' sedative and analgesic rates and doses.<sup>[16]</sup>

#### 3.2.3 *Gap between evidence base and practice may be due to lack of nursing education and experience*

Using focus groups of physicians, nurses and respiratory therapists, Miller and colleagues found only one shared belief: that every patient should be considered eligible for sedation interruption every day.<sup>[17]</sup> Practitioners from different disciplines lacked a shared understanding of why to

perform DIS when weaning. Reasons for performing DIS included weaning from the ventilator, minimizing sedation medications, performance of neurologic examination, evaluation of pain, and reducing length of stay. Even though physicians and nurses were relatively congruent in these reasons for performing DIS, physicians thought that other professionals had different goals for DIS, and there was no consensus between physicians and nurses about the prioritization of these goals. In addition, although they agreed with the other reasons for conducting DIS, respiratory therapists' goals were predominantly governed by achieving ventilator weaning. Egerod and colleagues<sup>[22]</sup> also identified disagreement between physicians and nurses regarding their beliefs about the side effects of sedatives and analgesics. They found that nurses perceived more gastrointestinal side effects related to sedatives, and physicians perceived more respiratory depression with regard to analgesics. Guttormson and colleagues<sup>[19]</sup> found that nurses have consistent

knowledge about many signs of over and undersedation, but they differed widely in other areas of knowledge. In particular, they differed in their interpretation of a patient's sedation level related to their ability to follow commands. When a patient could not follow commands, more than half of the nurses concluded that the patient was oversedated; while over one-third of nurses disagreed with this conclusion. Nearly half thought that a patient's elevated blood pressure and heart rate meant that the patient was undersedated, but more than one-quarter did not come to this conclusion. Similarly, more than half concluded that if a patient was spontaneously moving their trunk and legs, they were undersedated if they were, but nearly one-third disagreed. Lastly, 61% agreed that limiting patient recall of the ICU was a goal of sedation, even though Ethier<sup>[23]</sup> found no differences in patient recall between patients who received a DIS protocol and those who did not.

**Table 1:** Characteristics of reviewed literature

Setting	Source	Design	Data collection method	Factors influencing success of DIS implementation
ICUs	Egerod, Christensen, & Johansen, 2006 (Denmark)	Cross-sectional Descriptive Comparative	Self-administered questionnaire	Lack of Communication Differences in Beliefs
ICUs	Guttormson, Chlan, Weinertb, & Savik, 2010 (U.S.)	Descriptive Associational	Self-administration of Nurse Sedation Practices Scale	Lack of Collaboration Differences in Beliefs Differences in Practice
Medical ICU	Mendez, Lazar, DiGiovine, Schuldt, Behrendt, Peters, & Jennings, 2013 (U.S.)	Retrospective Correlational	Electronic chart review	Multidisciplinary Teams
Hospitals with at least 50 beds and an ICU	Miller, Krein, Saint, Kahn, & Iwashyna, 2012 (U.S.)	Descriptive Stratified Random Sample	Survey	Organizational Characteristics
Medical ICU	Miller, Bosk, Iwashyna, & Krein, 2012 (U.S.)	Qualitative Exploratory	Focus groups	Differences in Practice
ICUs	O'Connor, Bucknall, & Manias, 2010 (Australian and New Zealand)	Cross-sectional Descriptive	Internet-based survey	Organizational Characteristics Differences in Practice
ICUs	Patel, Gambrell, Speroff, Scott, Pun, Okahashi, Strength, Pandharipande, Girard, Burgess, Dittus, Bernard, Ely, 2009 (North America)	Descriptive	Survey	Differences in Practice
Academic Medical Center ICUs	Roberts, de Wit, Epstein, Didomenico, & Devlin, 2009 (U.S.)	Qualitative Descriptive	Interviews Survey	Nursing characteristics Patient characteristics
ICUs	Tanios, de Wit, Epstein, & Devlin, 2009 (International)	Descriptive	Survey	Lack of Collaboration Organizational Structure Multidisciplinary Teams

DIS = Daily interruption of sedation; ICU = Intensive Care Unit

The articles reviewed also revealed a variety of practices around sedation management. Despite the availability of DIS protocols and knowledge of their benefit, two studies have documented their limited use. Patel conducted a survey of ICU practitioners, and found that over three-quarters had a DIS policy, but less than half practiced DIS more than

half the days.<sup>[8]</sup> O'Connor and colleagues also found that 65% of respondents felt that DIS was either definitely or most likely to be beneficial to patients. However, just over half of respondents stated that they used it on 25% or more of their patients, and only 23% of nurses used it on more than 75% of their patients.<sup>[16]</sup> They also found a lack of

consensus around reasons for determining that patients were unsuitable for DIS. These reasons included unstable neurological status (43%), unstable respiratory status (28%), or unstable cardiovascular status (18%). Because 76% of respondents were nurses, and no breakdown in responses between physicians and nurses was reported, it is difficult to ascertain if nursing, physicians, or the two groups together are creating the barrier to practice change.

Nurses' sedation practices are influenced by their perceptions and beliefs about the patient and family's experience of sedation. In their survey of members of American Association of Critical Care Nurses, Guttormson and colleagues found an overwhelming majority of nurses view mechanical ventilation as both uncomfortable (90%) and stressful (92%) for patients. In addition, nearly half the nurses agreed that a family's request for sedation influenced their sedation practices. They also found that a large majority agreed sedation was necessary for patient comfort (81%), and would prefer sedation if they themselves were ventilated (88%).<sup>[19]</sup> Tanios and colleagues found that one-fifth viewed a patient's potential attempt to remove a device as a barrier to DIS.<sup>[7]</sup> These findings did not differentiate between physicians, nurses and pharmacists, so it is not possible to determine how this view influences nurse-specific barriers to DIS. Roberts and colleagues surveyed 130 nurses in 2 academic medical centers to determine predictors of DIS use, and found multiple patient-related factors. Nurses were more likely to perform DIS if they perceived the patient to be more stable, if the patient was younger, and if the patient was not admitted with sepsis. They were less likely to perform DIS if the patient was either deeply sedated or had been agitated in the prior 24-48 hour time period.<sup>[18]</sup>

Nursing experience with DIS may be a predictor of DIS implementation, but the research is very limited. Only one study was found that evaluated the characteristics of nursing related to DIS. Roberts and colleagues revealed that nurses were more likely to perform DIS if they had performed DIS either once or more in the past, and there was a trend for nurses to perform DIS if they were younger or had completed CE in the past year related to ICU sedation.<sup>[18]</sup>

## 4 Discussion

The purpose of this review was to understand the nursing and organizational barriers that may affect nursing adherence to DIS protocols. Our review revealed three themes: (1) organizational structure does not influence DIS practice, (2) a collaborative, multidisciplinary culture may influence changes in sedation practices, and (3) the gap between evidence base and practice may be due to differences in nursing education and experience.

Our findings that organizational structure does not influence DIS practice is reflective of some, and in contrast to other, previous research that has examined the impact of organiza-

tional structure on VAP rates. One study that reviewed the effect of ICU type (medical versus surgical) on VAP rates in 25 ICUs across eight hospitals found in that ICU type did not have any significant effect on VAP rates.<sup>[24]</sup> Although our findings were similar, none of the studies in our review evaluated the impact of ICU type on DIS. A study of VAP rates in community hospitals found that rates were higher in small hospitals than in medium or large hospitals.<sup>[25]</sup> Only one of the studies we evaluated the impact of hospital size on DIS use. Given the literature that suggests that stated DIS use may not be equated with actual use,<sup>[4,6-8]</sup> hospital size may have no impact on stated use, but an actual impact on adherence to protocols. Additional research is needed to evaluate the impact of hospital size on adherence to DIS protocols, and its subsequent impact on sedation outcomes.

Our synthesis demonstrated that multidisciplinary collaboration may affect sedation practices positively, and lack of this collaboration may have a negative effect on use of DIS protocols. A small body of literature is emerging that demonstrates that unit culture may also have an effect on sedation practices. We found no studies that have examined the impact of a multidisciplinary ICU culture on DIS adherence. Interventional studies are needed that examine how whether an interdisciplinary ventilator rounding team can influence nurses' adherence to DIS protocols, as well as provide additional information about the impact of these teams on infection rates.

Our findings revealed a range of knowledge and beliefs around sedation management and a variety of practices among and within nursing, medicine, and other disciplines. These findings may indicate a lack of evidence-based knowledge and a strong influence of perception of patient's and family's experiences and recent experience and education with sedation management, on sedation management practice. Two studies were found that examined the impact of continuing education on VAP rates and adherence to DIS protocols, with mixed results. A study examining the impact of nurse-led sedation education among 71 ICU nurses found improvements in both nurse compliance with ventilator bundle protocols, and a reduction in VAP rates.<sup>[26]</sup> Another study using a pre-post design to examine compliance with components of a ventilator bundle among 48 nurses in a 16-bed ICU, found no change in VAP rates.<sup>[27]</sup> These studies were limited by single ICU settings, with small numbers of patients. Future research should be conducted using larger samples across multiple hospitals to evaluate the impact of education on DIS adherence.

### 4.1 Limitations

This review was limited by several factors. Our methods included only a review of CINAHL literature and any ancestral search stemming from those results. This may have led to the small number of evidence-based studies we found that investigated barriers to DIS. We were also limited in

our attempt to determine nursing characteristics that may be barriers to DIS because, of the studies we examined, several did not distinguish findings between nursing and other disciplines. Future studies investigating barriers to DIS should recognize not only that DIS is a multidisciplinary effort, but also that the various disciplines play different roles, and therefore may have varying perspectives.

## 4.2 Recommendations for practice

This review suggests the need for nurses to participate in interdisciplinary teams when sedation decisions are being made. Including nurses in daily ventilator rounding teams may be a way to change culture and improve outcomes. Further, our review highlights the need for additional education for nurses around many aspects of sedation administration. Clinicians may lack standardized knowledge about the reasons for and effects of DIS. Nurses want patients to feel comfortable; thus, hospitals need to provide current

evidence-based knowledge about aspects of DIS that contribute to or detract from that goal. Combining this education with a multidisciplinary approach may have a larger impact on outcomes.

## 5 Conclusion

Improving patient ventilator-associated outcomes through proper use of DIS requires many disciplines working collaboratively. To improve adherence to protocols, a daily multidisciplinary approach should be considered. The effect of multidisciplinary ventilator rounding teams that include nurses need to be tested to evaluate their impact the adherence to these protocols. Additionally, because many misconceptions may exist around both the patient experience and potential complications of ventilator weaning, nurse educators should ensure that all staff have current education about the evidence about all aspects of sedation management.

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