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Summary

Objectives

Mechanically ventilated patients commonly receive sedative medications. There is increasing evidence that sedative medications impact on patient outcomes. Nursing behaviour is a key determinant of

sedation administration. The purpose of this study was to determine factors that influence nurse sedation administration to mechanically ventilated patients.

Methods

The Nurse Sedation Practices Scale was mailed to a random sample of 1250 members of the American Association of Critical Care Nurses.

Results

A response rate of 39% was obtained. Respondents were primarily staff nurses (73%) with a bachelor's degree in nursing (59%) from various intensive care unit (ICU) settings. We limited the analysis to adult ICU practitioners (n = 423). The majority of nurses (81%) agreed that sedation is necessary for patient comfort. Nurse attitudes towards the efficacy of sedation for mechanically ventilated patients was positively correlated with nurses' report of their sedation practice (r_s = .28, p < .001) and their intent to administer sedation (r_s = .58, p < .001). Attitudes did not vary with respect to individual or practice setting characteristics.

Conclusion

Nurses' attitudes impact sedation administration practices. Modifying nurses' attitudes on sedation and the experience of mechanical ventilation may be necessary to change sedation practices with mechanically ventilated patients.

Keywords

Critical care nursing, Critically ill patients, Hypnotics and sedatives, Respiration, Artificial

Introduction

Mechanically ventilated patients are commonly sedated to ensure patient safety, to induce patient amnesia, to decrease anxiety and agitation and to prevent ventilator dysynchrony (Jacobi et al., 2002, Rhoney and Murry, 2003, Sun and Weissman, 1994, Weinert et al., 2001). However, there is increasing evidence that sedative medications impact on patients' physical and psychological outcomes. Amount or duration of sedation is associated with an increased time of mechanical ventilation, longer ICU stays and more reintubations (Kollef et al., 1998, Kress et al., 2000). Increased duration of mechanical ventilation increases the incidence of pneumonia, airway damage, decreases mobility, decreases self-care ability, and increases health care costs (De Jonghe et al., 2002, Douglas et al., 2002, Kollef et al., 1998, Ostermann et al., 2000). Sedation increases the risk of developing depressive symptoms, delirium and delusional memories of ICU (Ely et al., 2004, Nelson et al., 2000, Samuelson et al., 2006). Patients with delusional memories have an increased risk of anxiety and post-traumatic stress disorder (Jones et al., 2001).

Guidelines from the Society of Critical Care Medicine (SCCM) identify an easily arousable and calm patient as the desired level of sedation for mechanically ventilated patients (Jacobi et al., 2002). However, only 20–30% of ICUs in the United States and 29% of Canadian critical care physicians report using sedation protocols that would help achieve these aims (Mehta et al., 2006, Rhoney and Murry, 2003). Even when sedation endpoints are specified, the actual depth of sedation is often greater than desired (Martin et al., 2006).

Nursing judgment and behaviour is a key determinant of patients' sedative exposure and level of sedation. Experienced nurses look for other causes of agitation prior to administering sedative medications, while inexperienced nurses use sedative medications more readily (Egerod, 2002). Nurses consider common physical and interpersonal events such as the presence of endotracheal tubes, use of restraints and loss of control as more stressful than patients' evaluations (Cochran and Ganong, 1989). Agreement between nurses on appropriate sedation (defined by amount and type of patient movement) is inconsistent (Egerod, 2002, Weinert et al., 2001). In addition to nursing experience and assessment, other factors have been identified by nurse focus groups that influence sedation administration including quality of communication between physicians and nurses, nurses' beliefs regarding mechanical ventilation, patients' families, nurse workload, and patient acuity (Weinert et al., 2001). These factors have not been validated in a quantitative study. Understanding the complexities of sedation administration is necessary to improve the management of patients' symptoms: balancing patient comfort and minimising complications. Thus the specific aims of this study were:

1. To describe nurses' self-reported sedation administration practices and the factors that may influence those practices.
2. To identify individual or workplace characteristics that impact sedation administration practices.

Methods

Design

For this descriptive, associational study, packets including the Nurse Sedation Practices Scale, an explanatory cover letter, an incentive (laboratory value pocket guide), and a return envelope were mailed to a randomly generated list of 1250 national members of the American Association of Critical Care Nurses. A follow up letter was mailed to non-respondents within two weeks of the initial mailing. Subjects were tracked utilising a letter and number code to which only the principal investigator (J.G.) had access. The study was approved by the University of Minnesota Institutional Review Board.

Instruments

The Nurse Sedation Practices Scale (NSPS) was developed by the principal investigator to measure self-reported sedation administration practices and identify factors associated with sedative medication administration. The NSPS was developed in three phases: item development, revision based on expert review and local sample data, and revision based on national sample data. In phase one, items were developed from a secondary analysis of existing transcripts from nurse focus groups on sedation practices (NSPS-I) (Weinert et al., 2001). The Theory of Planned Behavior (TPB) served as a guiding framework for analysis of focus group data. According to the TPB, intention to act is influenced by three constructs: an individual's attitude towards the behaviour, social pressure regarding appropriate behaviour and perceptions of the difficulty involved in behaviour performance (Ajzen, 1991, McCarty et al., 2001). Focus group transcripts were coded by the above TPB constructs. Themes that occurred with the greatest frequency were developed into NSPS items. In phase two, the instrument was revised after critical care researchers and practitioners review and local pilot data analysis (n = 34) (NSPS-II). In phase three, the scale was revised based on item, reliability, and factor analysis of the national sample data (NSPS-III).

Version III of the NSPS consists of 28 items and five subscales: attitudes, subjective norm, perceived behavioural control, sedation orders and goals, and sedation practices. The response format is a five point Likert scale ranging from strongly agree to strongly disagree. Items are positively and negatively worded with reverse scoring for the latter. Subscale scores range from 1 to 5 and are tabulated by adding scores of all items within a subscale and dividing by the number of items answered by each respondent. There is no total NSPS score calculation. Higher scores within each subscale reflect the following:

- Attitudes scale: a positive evaluation of the efficacy of sedative medications for relieving the distress of mechanically ventilated patients.
- Subjective norm scale: a strong influence of others on sedation practice.
- Perceived behavioural control scale: low perceived influence of non-patient factors on sedation practices.
- Sedation orders and goals scale: high degree of perceived independence to determine sedation administration.
- Sedation practices scale: an increased tendency to administer sedation.

Data analysis

NSPS-III responses were analysed with SPSS version 11.5. Reliabilities for the various subscales for this sample were assessed using Cronbach's alpha. Descriptive statistics were used to summarise sample characteristics and item responses. Due to the non-normal distribution of the various subscales, Spearman correlation coefficients (r_s) were calculated to estimate linear relationships among subscales. The linear form of the association was confirmed with scattergrams. Differences in subscale scores by respondent and workplace characteristics were analysed using Kruskal–Wallis or Mann–Whitney tests for categorical variables and Spearman correlations for continuous variables. Post hoc analysis of differences between groups was evaluated with Mann–Whitney tests using the Bonferroni method to adjust alpha levels.

From the 1250 surveys mailed to a random national sample of American Association of Critical Care Nurse members, 484 were returned partially or totally completed and 12 were returned marked as respondent ineligible (i.e. no longer caring for mechanically ventilated patients) or as a duplicate mailing for a response rate of 39%. Due to the special needs of the paediatric population and construction of the scale based on focus groups with adult intensive care unit nurses, nurses working in paediatric intensive care units were excluded. Additionally surveys with two or more unanswered items within a subscale were excluded from this analysis. Based on these criteria, 423 surveys (87% of returned surveys) were included in the data analysis.

Results

Survey respondent characteristics

Table 1 summarises characteristics of respondents. Respondents were predominantly staff nurses (73.3%) with a bachelor's degree in nursing (58.9%). Years of ICU experience ranged from less than one year to greater than 20 years. Half of respondents (49.5%) were certified in critical care nursing.

Approximately half (52.2%) of respondents worked in a combined medical-surgical unit. Sedation assessment scales were utilised in 70.4% of the respondent's units and sedation protocols in 60.5%. The Ramsay or Modified Ramsay Scale was most frequently used on respondents' units (70.8%), followed by the Riker-Sedation Agitation Scale (9.6%) and the Richmond Agitation Sedation Scale (9.6%).

Table 1. Respondent characteristics: not all items were completed by all respondents; therefore, percentages do not sum to 100.

Variable	**No. (%) of respondents (*n* = 423)**
Nursing position	
Staff nurse	310(73)
Nurse manager	29(7)
Nurse practitioners	14(3)
Clinical nurse specialist	9(2)
Administrator	7(2)
Faculty	3(1)
Type of critical care unit	
Medical–surgical	220 (52)
Cardiac	87 (21)
Medical	33(8)
Surgical	29(7)
Neurological	18(4)
Trauma	14(3)
Type of hospital	
Community non-profit	195 (46)
University medical center	99 (23)
Community for profit	68 (16)
County	13(3)
Highest nursing degree	
Bachelors	249 (59)
Masters	69 (16)
Associate	63 (15)
Diploma	38(9)
Years of ICU experience	
<5 years	90 (21)

5–10 years	102 (24)
11–15 years	92 (22)
16–20 years	54(13)
>20 years	85 (20)

Scale reliabilities

Reliabilities of the subscales ranged range from 0.60 to 0.80 (Table 2).

Table 2. Scale reliability and item responses: not all items were completed by all respondents; therefore, percentages do not sum to 100.

Subscale and items	**Reliability**	**Median (*n*)**	**Disagree or strongly disagree (%)**	**Neutral (%)**	**Agree or strongly agree (%)**
Attitudes	0.8	3.86 (423)			
Sedation necessary for patient comfort		4 (422)	1.4	9.7	80.8
Easier to care for alert intubated patient		2 (423)	55.3	27	17.7
Prefer sedation if they were ventilated patient		5 (423)	4.5	7.8	87.7
Limit patient recollection of ICU as desired outcome		4 (422)	21	17.5	61.4
Mechanical ventilation as uncomfortable		4 (421)	1.7	8.1	90.2
Mechanical ventilation as stressful		4(422)	1.7	6.4	91.9
All mechanically ventilated patients should be sedated		3 (422)	45.7	21.6	32.7
Subjective norms	0.61	3.25 (423)			
Influence of other nurses knowledge on sedation practices		4 (423)	25.3	20.8	53.9
Influence of other nurses attitudes on sedation practices		3 (423)	33.1	22.7	44.3
Patient's family request sedation		3 (422)	36.1	21.3	42.6
Influence of patient's family on sedation administration		3 (422)	34.6	17.5	47.9
Sedation orders and goals	0.62	4.0 (423)			

Physician considers nursing assessment for sedation orders		4 (423)	8.1	8.3	83.7
Broad parameters with sedation orders		4 (422)	13	9	78
Clear communication sedation goals between nurse/physician		4 (422)	20.3	19.6	60.1
Perceived behavioral control	0.6	3.0(423)			
Use sedation due to communication difficulty		2 (423)	86.3	7.6	6.1
Nurse to patient staffing ratio influenced sedation practice		2 (422)	65.1	7.1	27.6
Sedation administered to complete other nursing functions		2 (422)	52.8	9	38.1
Agreement with physician regarding sedation level		3 (423)	45.7	25.5	28.8
Sedation practices	0.66	3.56 (423)			
Oversedated if no cough reflex		4 (419)	10	8.8	81.1
Oversedated if respond only to noxious stimuli		4 (421)	16.2	10	73
Oversedated if not following commands		4 (422)	34.6	13.5	51.9
Undersedated if spontaneously moving hands and feet		2 (423)	76.1	10.6	13.3
Undersedated if spontaneously moving trunk and legs		4 (423)	32.2	11.3	56.5
Undersedated if reaching for ETT or lines		4 (422)	4.9	6.4	88.6
Undersedated if tachypneoic		4 (422)	10.2	19.9	69.9
Undersedated if ventilator disynchrony		4 (423)	7.8	9.2	83
Undersedated if heart rate and BP elevated		3 (418)	27.5	28.5	44
Intention to sedate all mechanically ventilated patients		3 (422)	33.7	18.7	47.6

Subscale responses

1.1.1. Attitude towards sedation administration and mechanical ventilation

Respondents (*n* = 423) generally had an unfavourable evaluation of the experience of mechanical ventilation and a favourable evaluation of the benefits of sedative administration (median: 3.7). The majority of respondents felt (agree or strongly agree) that sedation was necessary for patient comfort; would prefer to be sedated if they were intubated, and characterised mechanical ventilation as uncomfortable and stressful (Table 2). Only 17.7% of respondents felt it was easier to care for a awake and alert mechanically ventilated patient (MVP) (54.3% strongly disagree/disagree; 27% neutral). About one-third (32%) of respondents agreed with the statement that "all mechanically ventilated patients should be sedated." Forty-five percent disagreed and 21.6% responded as neutral.

1.1.2. Subjective norms

Other nurses' knowledge and attitudes influenced respondent's sedation administration for 53.9% and 44.3% of respondents respectively. About half (47.9%) of respondents indicated patients' families had influenced their administration of sedation.

1.1.3. Sedation orders and goals

Over two-thirds of respondents agreed or strongly agreed that physicians considered their assessments when ordering sedation and that sedation orders were written with broad parameters for nurse discretion. Sixty percent of respondents agreed that sedation goals were clearly communicated between physicians and nurses.

1.1.4. Perceived behavioural control

The impact of daily work issues such as staffing, communication difficulties or need to complete other nursing functions on sedation administration was evenly distributed (median: 3). Nurse to patient staffing ratio (27.6%) and the need to complete other nursing functions (38.1%) had influenced sedation administration for about one-third of respondents. Forty-five percent of respondents agreed with physicians on appropriate sedation levels while 29% disagreed.

Self-report of sedation administration practices

Nurses agreed that patients with no cough reflex or responding only to noxious stimuli were oversedated (81.1% and 73%). Interpretation of a patient's inability to follow commands was not as clear. Fifty-two percent agreed that the patient was oversedated and 34.6% disagreed when unable to follow commands.

The majority of nurses interpreted a patient moving trunk and legs, reaching for endotracheal tube or lines, tachypnea, or ventilator dysynchrony as signs of undersedation. Spontaneous movement of hands and feet was not identified as undersedation (76% disagreed or strongly disagreed). Ventilator dysynchrony was an indicator of undersedation for respondents while heart rate and blood pressure elevation were not.

Intention to administer sedative medication

Forty-eight percent of respondents indicated they intended to sedate all mechanically ventilated patients while 34% disagreed and 18.7% had a response of neutral.

Association among influencing factors and self-reported sedation practices

Nurse attitudes toward the MVP experience had a moderate positive correlation with the Sedation Practices subscale (r_s = .28, p < .01) and intent to administer sedation to all MVPs (r_s = .58 p < .01). Although statistically significant, other subscales had only weak correlations with the Sedation Practices subscale and intention to administer sedation item (Table 3).

Table 3. Correlations of subscales with sedation practices and intention to administer sedation: *p < .05; **p < .01.

	Attitude toward behaviour	**Subjective norm**	**Sedation orders and goals**	**Perceived behavioural control**
Sedation				
Administration	.28**	.16**	.14**	.10*
Behaviours				
Intention to				
Administer	.58**	.10*	.11*	.07
Sedation				

Respondent and practice setting characteristics and subscale scores

There were no significant differences on subscale scores based on certification as a critical care nurse (CCRN), nursing role (e.g. staff nurse and nurse manager), type of ICU or type of institution. The attitudes and subjective norm subscale scores did not significantly differ with any individual or practice setting characteristics evaluated.

The sedation orders and goals subscale score varied with respect to ICU experience (r_s = .15, p = .002), nursing degree, sedation assessment scales and sedation protocols. Respondents that utilised a sedation assessment scale (median: 4; IQR: 3.33–4.33) perceived their level of independence with sedation administration as greater than those not using an assessment scale (median: 3.67; IQR: 3–4; $z_{(407)}$ = −3.45, p = .001). Similarly, sedation protocols (median: 4; IQR: 3.33–4.33) increased respondents' sense of autonomy with sedation administration versus no protocol (median: 3.67; IQR: 3.33–4.33; $z_{(399)}$ = −2.10, p = .036). Nursing degree had a significant effect on the Sedation Orders subscale scores ($\chi^2_{(3,419)} = 9.44$, p = .02) as respondents with bachelor's degree (median: 3.87, IQR: 3.33–4.33) had higher median scores than other degrees. This was only statistically significant when respondents with bachelor degrees were compared to respondents with diplomas (median: 3.67, IQR: 3–4; $z_{(285)}$ = −2.561, p = .01). Within the Sedation Orders subscale, the item that differentiated between those utilising assessment scales ($z_{(407)}$ = −3.98, p < .001); utilising protocols ($z_{(399)}$ = −4.36, p < .001), and level of nursing degree ($\chi^2_{(3,419)} = 9.44$, p = .01) addressed quality of communication between the nurse and physician. Additionally, those using an assessment scale more strongly agreed that physicians considered their nursing assessment when determining the patient's sedative needs ($z_{(407)}$ = −2.22, p = .03).

Self-reported sedation administration subscale scores were higher for respondents using a sedation assessment scale (median: 3.67, IQR: 3.33–3.89) than those without (median: 3.56, IQR: 3.33–3.78;

$z_{(407)}$ = −2.565, *p* = .01). Respondents that utilised a sedation scale indicated stronger agreement that three items indicated undersedation: reaching for the endotracheal tube (ETT) or lines, tachypnea and ventilator dysynchrony.

Perceived behavioural control scores were higher for those using assessment scales (median: 3, IQR: 2.75–3.5) than those without (median: 3, IQR: 2.75–3.25; $z_{(407)}$ = −1.95, *p* = .05). Sedation assessment scale utilisation resulted in greater reported agreement with physicians on sedation goals.

Discussion

The aims of this study were to describe factors that influence nurse sedation administration to mechanically ventilated patients and to identify individual or workplace characteristics that impact sedation practices. As predicted by the Theory of Planned Behavior, a third of the variance in intention to sedate mechanically ventilated patients was accounted for by nurses' attitudes. However, other theory constructs did not have a significant association with sedation administration. Reasons for this may be related to measurement error, sample characteristics or characteristics inherent to nurse sedation administration. Nurses with a more positive evaluation of the efficacy of sedation for relieving distress associated with mechanical ventilation were more likely to administer sedation based on self-report. Confirming the results of Weinert et al. (2001), the majority of nurses in this study held an attitude toward mechanical ventilation as an uncomfortable and stressful event that requires the use of sedative medications to improve patient comfort. Decreasing patient recall of time on the ventilator was also seen as a desired outcome of sedation. However, there is no clear level of arousal below which amnesia is ensured and promoting amnesia is inconsistent with findings that patients find the inability to recall events of the ICU distressful (Cochran and Ganong, 1989, Hafsteindottir, 1996). There was a dichotomy in nurses' responses: two-thirds of respondents agreed that sedation was necessary for patient comfort but only one-third agreed that all mechanically ventilated patients should be sedated. Perhaps reflecting nurse respondents' attempts to achieve a balance between individualising patient care and the extent to which they perceive ventilation as inherently uncomfortable.

The majority of respondents agreed on the amount and type of patient activity that indicates an appropriate sedation level, for instance a patient that opens eyes and responds to noxious stimuli but is not reaching for the ETT or invasive lines. However, approximately 15% of respondents felt no response to noxious stimuli or no spontaneous movement was an appropriate sedation level for patients. This contrasts with SCCM guidelines of maintaining patients at an easily arousable level of sedation (Jacobi et al., 2002) but is consistent with report of actual practice where one-third of sedation assessments rated patients as either unarousable or minimally arousable and only 2.6% of nurses' assessments rated patients as oversedated (Weinert and Calvin, 2007).

Attitudes and subjective norm subscale scores did not significantly vary with any workplace or individual characteristics measured including level of education, experience, or the use of sedation assessment tools or protocols. Self-reported sedation administration, perceived behavioural control, and sedations orders and goals subscale scores varied with ICU experience and the use of sedation protocols or assessment scales. In this study benefits of sedation protocols and assessments included a higher perceived independence and control over sedation administration practices as well as better communication and shared sedation goals with physicians. Indicating that sedation protocols and

assessment scales may help minimise the lack of consistent goals and terminology to describe levels of sedation in the ICU reported by Egerod (2002). Greater ICU experience also increased the respondents' sense of independence in sedation administration. This is a similar finding to Walker and Gillen's (2006) study where experienced nurses had greater confidence when managing sedation. Interestingly, respondents that utilised an assessment scale on their unit were slightly more likely to identify patient behaviours and respiratory patterns as indicative of undersedation including reaching for ETT tubes or lines, tachypneoa and ventilator dysynchrony.

Limitations

Limitations of this study include the use of a new instrument and response bias. The NSPS was developed for this study by the PI. A small number of items in some subscales impact the scales ability to fully describe factors and with alpha reliabilities less than 0.8, subscales may not reflect a unidimensional construct. Additionally, description of sedation practices was based on self-report which may not accurately reflect actual sedation administration at the bedside. Although the response rate was fair for a mailed survey, over half of those contacted did not respond. It may be that both the original sample and respondents are not representative of critical care nurses in general. Demographics show nurses with varied levels of experience from assorted hospital and critical care settings. However, the percentage of respondents that utilised a sedation protocol on their unit was almost double that reported for the U.S. (Rhoney and Murry, 2003) suggesting that nurses working on a unit with sedation protocols may be more aware of issues surrounding sedation and therefore more likely to respond to this survey.

Conclusion

The majority of nurse respondents felt that sedation was necessary for patient comfort and characterised mechanical ventilation as uncomfortable and stressful. These attitudes influenced nurses' self-reported sedation administration practices. Furthermore, these attitudes did not vary significantly in relation to any individual or practice setting characteristic measured. Although nurses' knowledge was not evaluated in this study, there are indications of knowledge gaps such as a belief that sedation can ensure amnesia or awareness of appropriate sedation levels. Evaluation of nurses' knowledge of sedative medications and their management is an important area of future research. Since respondents using sedation assessment scales and protocols indicated a greater perceived control over their sedation practice and better communication between nurses and physicians, our results support widespread implementation of sedation assessment scales and protocols in ICU. Implementation should incorporate education on sedative medications and symptom management and discussion of nurses' attitudes toward sedation of mechanically ventilated patients. Sedation practice changes utilising this implementation approach will need evaluation of protocol adherence and patient outcomes.

Conflict of interest statement

The authors have no conflicts of interest to disclose.

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