Research Article

The Positive Impact of Registered Nurse Sedation Teams

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Abstract

Background: Sedation care documentation and patient safety on general care nursing units need improvement.

Purpose: To assess the impact of implementation of a registered nurse sedation team model on patient safety and thoroughness of documentation in patients receiving moderate sedation on general care units.

Methods: In 2010 a 3-month retrospective chart review determined adverse patient outcomes and incompleteness of documentation for patients receiving sedation on general care units. After implementation of the registered nurse sedation team model for 3 months, patient's sedation documentation and outcomes were assessed. The registered nurse sedation team model was implemented into practice and further outcome data from implementation through 2017 also were assessed.

Results: There was clear improvement in both required documentation during moderate sedation and patient safety (P<0.001).

Conclusion: The registered nurse sedation team model in this study improved both completeness of required sedation documentation and patient safety.

Introduction

Procedures performed with moderate sedation occur in a variety of health care settings [1-3]. However, the moderate sedation process has risks and can be associated with significant morbidity and mortality [4]. The American Society of Anesthesiologists has developed guidelines to help ensure a safe patient experience [5] and The Joint Commission (TJC) has established regulatory standards for both moderate sedation practice and documentation of the moderate sedation episode of care [6].

Registered nurses frequently assess, monitor, document and recover patients during moderate sedation, especially when these are performed on general care units [2]. In these settings, unique nursing competencies are required and include airway management and rescue skills, physiological monitoring capability, experience with administration and titration of moderate sedation medications, and understanding of regulatory documentation requirements.

Patients in general care nursing units may require moderate sedation for procedures such as dressing changes, bone marrow biopsies, and chest tube placements. Patient safety is a concern when nurses who are not familiar with or confident in providing moderate sedation are asked to do so. It is also an institutional liability when the moderate sedation documentation does not meet regulatory requirements. These concerns are relevant to any hospitals where sedation may be performed in general care areas.

General care nurses often have limited resources to care for patients that require moderate sedation [7]. One way to potentially increase the safety and documentation of procedural moderate sedation on general care wards is to develop a specialized moderate sedation team of nurses. At the Mayo Clinic, we developed a moderate sedation team, the Registered Nurse Sedation Team (RNST), to care for patients undergoing procedures on our general care units. We performed this study to assess whether implementation of our RNST model improved patient safety and thoroughness of moderate sedation documentation in adult patients receiving moderate sedation in the general care units compared to the standard care provided by general care nursing staff when asked to provide moderate sedation.

Methods

Ethical considerations for the project included maintaining confidentiality of patient's clinical records and obtaining informed consent from RNST nurses and nurse managers involved in the RNST implementation. The chart review process within the study required an institutional research authorization form signed by patients or designees to be on file in the IRB data base. Medical records of patients under the age of 18, pregnant patients, and prisoners were not included in the chart reviews. Consent was prospectively obtained from the members of the RNST to assess their sedation-related competencies prior to implementation of the project. The Institutional Review Boards at Metropolitan State University and Mayo Clinic authorized this study.

Planning the new model

Anesthesiology and nursing leadership worked collaboratively to develop the new sedation model of care for the institution's 19 general

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care units on which the great majority of sedation care was provided. Two full time equivalent nursing positions were approved by institutional leadership to provide coverage of one sedation nurse at each hospital site. Implementation of a specialized team of sedation nurses to provide sedation care on the general nursing units required identifying nurses with experience in administering sedation and who were interested in gaining additional knowledge through didactic and clinical experiences. Ten experienced sedation registered nurses were selected for the team based on demonstrated critical thinking and communication skills. Compassionate care and the ability to advocate for the patient were also considerations in choosing the sedation nurse. In addition to basic sedation competency requirements, didactic classes were provided on the topics of airway assessment and management, obstructive sleep apnea screening, carbon dioxide (CO_2) monitoring by capnography, and documentation of moderate sedation elements of care required by TJC. Nurses were also paired with nurse anesthetists in high volume operating rooms for 3 days to gain additional clinical experience in airway assessment, management, and rescue skills.

The RNST used specialized, mobile sedation carts to provide sedation care at patient's bedsides. Each cart contained monitoring equipment, a laptop computer, a portable telephone, and supplies for airway support and rescue ($17,000.00 U.S. 2010) each. Systems were developed for ordering the sedation process through computerized physician order entry and for scheduling sedation care through a currently utilized system.

A two-week pilot project was implemented in 2010 on three general care units, which historically performed the greatest number of procedures needing sedation. The purpose was to develop and test the processes, systems, and equipment associated with the RNST model. Ten patients required sedation care during the test period and provided adequate testing of the systems and processes. The RNST medical director, an anesthesiologist, provided oversight during the sedation episodes of care. RNST members reviewed patient histories with the anesthesiologist and sedation plans were developed for each patient. Medications were administered per sedation order-set guidelines.

Prior to initiation of the project, the RNST participated in a simulated sedation learning activity. The simulated scenarios involved situations in which the sedation nurses had to utilize airway rescue skills successfully and communicate and advocate for their patients' clinical needs. This learning activity was beneficial to the sedation team nurses. It also provided scenarios to test the functionality of the new sedation carts and to modify storage of rescue supplies when needed for immediate use. After the successful completion of the 2-week RNST trial, a large scale communication plan was developed for physicians, mid-level providers, nursing staff, unit secretaries and anesthesiologists. Implementation of the RNST occurred during October 2010. The RNST provided care weekly, Monday through Friday, 8 am to 4 pm. Off-hour sedation care was provided by an anesthesia care team on general care units.

Evaluating the new model
The aims of this project were to improve patient outcomes and the quality of moderate sedation documentation using a dedicated sedation monitoring team of registered nurses. A quasi-experimental, post-test design with nonequivalent comparison groups was used to achieve these aims. A retrospective chart review was undertaken to determine the number of adverse patient outcomes and the completeness of sedation documentation during a 3-month period prior to implementation of the RNST and for the 3-month period afterwards. Demographic data on age, gender, and Body Mass Index (BMI) were used to assess comparability of the data between the two pre and post-implementation groups.

In order to assess the impact of the RNST on the patients and the staff nurses on the units where the RNST was implemented, a survey was sent to consenting nurse managers weekly for one month, and then every two weeks as the project progressed over the next 2 months. This tool provided feedback on the effectiveness of the system processes associated with this model and of the RNST throughout the 3-month implementation period.

Measures
Two tools were used to collect data from the patients' electronic medical records. A retrospective chart assessment tool was developed in 2008 by one of the authors (MAJ) to audit documentation of TJC sedation standards in the medical center's procedural areas. The tool lists 18 required elements of assessments that need to be documented during the pre-, intra-, and post-procedural sedation episode of care. Elements were recorded dichotomously where 1=present and 0=not present in the chart. Mayo Clinic's Patient Demographic Information and Quality Indicators form was used to collect data about the age, gender and BMI of patients and record the presence or absence of six patient outcomes designated as quality indicators. These quality indicators included (1) use of reversal agents, (2) sedation complications, (3) admission to the next higher level of care, (4) oxygen O_2 saturation<90%, (5) cardiac arrest, (6) death.

Mayo Clinic's Research Electronic Data Capture (REDCap) database was utilized to secure information and aid in analysis of the chart review data. Data validation and integrity checks are incorporated into the program as well as auditing abilities. [8] All data elements for both pre- and post-implementation groups were accounted for and entered into the REDCap system. A trained research assistant reviewed patient records for the study. A total of 180 abstracted data items from 10 patient records were reviewed by a second trained abstractor to assess the reliability of the data abstraction, both pre- and post-RNST. From this review, the percentage agreement was found to be 95.6% and 99.4% for the pre and post period, respectively. A similar process was used to assess clinical outcomes of patients undergoing moderate sedation on all Mayo Clinic Rochester general care units after full implementation of the model on November 19, 2010 and through March 20, 2018.

The Nurse Manager Survey was developed by one of the authors (MAJ) and consisted of six fixed-response questions and a comment box. Questions addressed the timeliness of the sedation nurse, whether the staff nurse was aware of the scheduled sedation time, the sedation nurse's use of the Situation-Background-Assessment-Recommendation (SBAR) communication tool in the patient report, the level of support that the sedation nurse provided to the patient during sedation care, the degree of impact that the sedation nurse had on unit staffing workload, and the manager's assessment of the RNST concept.

Data analysis
Data were analyzed using SAS Version 9.2 (SAS Institute Inc., Cury, N.C.) and were summarized using the mean and standard deviation (SD) for continuous variables and frequency counts and percentages for nominal variables. Each of the 18 items on the retrospective chart assessment tool was quantified as: 1=yes, present in the patient's record; or 0=no, absent from the patient's record. The total number of documented items was calculated for each patient, and the mean number of documented items was compared between groups using the paired t-test. For each element, the percentage of charts with documentation was summarized and compared between the two groups using the Fisher's exact test. Due to the number of comparisons performed, p-values ≤ 0.001 were considered statistically significant.

The data retrieved for the six quality indicators on the Patient Demographic Information and Quality Indicator form were compared between pre- and post-RNST implementation using Fisher's exact test. A similar analysis was done for any complication comparisons between the pre-implementation 3-month period and the 7+year period post-implementation. Data from the Nurse Manager Survey were collated and reported as percentages. Comments returned on the surveys were

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reviewed and assigned to one of three categories: needs improvement, general comment, and positive response.

Results

Pilot study

There were 103 patient records that met the inclusion criteria for the 3-month pre-implementation chart review data and 96 that met the inclusion criteria for the 3-month post-implementation RNST chart review. Age, years (58.4 ± 15.8 versus 54.5 ± 17.8, p=0.105 for pre versus post-RNST respectively); gender (59.2% male versus 68.3%, p=0.899), (40.8% women versus 41.7%, p=0.899) and BMI, kg/m², (28.8 ± 6.8 versus 29.0 ± 7.3, p=0.820) were similar between groups. The percentage of patient charts that met all 18 elements of documentation was 0 % in the pre-implementation group and 52% for the RNST, (p<0.001). The number of 18 required elements charted for each group demonstrated that the general care floor nurses had a mean of 11.3, (SD=2.9) items charted compared to 16.9 (SD=1.4) elements charted by the RNST (p<0.001). When assessing the 18 elements individually, 13 of the 18 elements were charted more frequently during the RNST (all p<0.001) (**Table 1**). Only documentation elements for the intra-procedure period were found not to be significantly different between the two groups. The analysis of the six patient outcomes for the pre and post-RNST groups indicated no statistical difference in findings using the Fisher's exact test (**Table 2**).

	Pre-Sed. Team N = 103 (%)	Post-Sed. Team N = 96 (%)	Pa
Pre-assess heart rate	80(78)	96(100)	<0.001
Pre-assess blood pressure	80(78)	96(100)	<0.001
Pre-assess O₂ Saturation	81 (79)	96(100)	<0.001
Pre-procedure pain score	68(66)	96(100)	<0.001
Pre-procedure RASS score	68(66)	96(100)	<0.001
Pre-procedure score	80(77)	92(96)	<0.001
Intra-Immediate assess	76(74)	95 (99)	<0.001
Intra-heart rate	91(88)	89(93)	0.34
Intra-blood pressure	91(88)	93(97)	0.03
Intra-O₂ Saturation	90(87)	92(96)	0.04
Intra-pain score	61(60)	74(77)	0.009
Intra-RASS score	70(68)	75(78)	0.11
Post-assess pain score	56(54)	83(86)	<0.001
Post-assess RASS score	69(67)	86(89)	<0.001
Post-assess score	73(71)	91(95)	<0.001
Discharge-pain score	7(7)	88(92)	<0.001
Discharge-RASS score	8(8)	94(98)	<0.001
Discharge score	12(12)	92(96)	<0.001

Table 1: Elements of sedation documentation in the pilot study.
[a]Comparison of sedation documentation (% documented) for Pre-Sedation Team implementation versus Post-Sedation Team implementation using Fisher exact test.
Abbreviations: Pre-Sed. Team-Pre-implementation sedation team, RASS-Richmond Agitation Sedation Scale, Post-Sed. Team-Post-implementation sedation team, Pre-asses-Pre-procedure assessment, Intra-Intra-procedure assessment, Post-assess-Post-procedure assessment, Discharge-Discharge assessment.

Forty-two Nurse Manager Surveys were completed by nurse managers. The questions and responses regarding the scheduling process, nurse-to-nurse communication, level of support for patient and nurse, and overall assessment of the RNST concept demonstrated positive results for the RNST concept (**Table 3**). Ninety-five percent of the nurse managers stated that the RNST concept provided benefits to the patient and staff nurse. Qualitative comments included on the survey reflected the same assessment. Twenty-three positive comments were submitted regarding patient care, safety, or efficient processes. Three comments were submitted which provided suggestions for communication or scheduling issues.

	Pre Sed. Team N= 103 (%)	Post-Sed. Team N = 96(%)	Pa
Any Complication	6(5.8)	2(2)	0.28
Admit to next higher level of care	3(2.9)	0(0)	0.25
Cardiac arrest	0(0)	0(0)	---
Death	0(0)	0(0)	---
Oxygen Saturation<90	1(1.0)	2(2.0)	0.61
Sedation Complications	1(1.0)	0(0)	1
Use of reversal agents	1(1.0)	0(0)	1

Table 2: Patient Outcome Indicators in the pilot study.
[a]Comparison of patient outcomes for Pre-Sedation Team implementation versus Post Sedation Team implementation using Fisher's exact test.

	Nurse Manager Survey Results	% Response
1	Did Sedation RN arrive on time?	
	No, consistently behind schedule	0
	Occasionally on time	0
	Yes, consistently on time	100
2	Was staff nurse aware of the sedation procedure?	
	Staff nurse was not aware of sedation time	0
	Staff nurse was occasionally aware	4.8
	Staff nurse was consistently aware	95.2
3	Did the Sedation RN use SBAR communication tool in patient report?	
	No SBAR was not used	0
	Occasionally SBAR was used	10
	Yes, SBAR was used consistently	90
4	Rate the level of support that the Sedation RN provided to the patient.	
	Below expectations	0
	Met expectations	38
	Exceeded expectations	62
5	Rate the degree of impact that the Sedation RN had on unit staffing workload.	
	Sedation RN had no impact	5
	Sedation RN had minimal impact on staffing workload	8
	Sedation RN decreased staffing workload	87
6	Overall, what is your assessment of the RN Sedation Team (RNST) concept?	
	RNST concept does not meet expectations of patient or staff nurse	0
	RNST concept has merit	4.8
	RNST concept provides benefits to patient and staff nurse.	95.2

Table 3: Nurse Manager Survey Results (n= 42*). *Due to missing data, n=40 for questions #3 and #5.
Abbreviations: SBAR = Situation, Background, Assessment, Recommendation.

Post-implementation patient safety outcome comparison

After completion of the pilot study, the RNST model was implemented throughout all 42 general care adult units in the two Mayo Clinic Hospitals in Rochester. During the 7+year period between November 19, 2010 and March 20, 2018, 4,009 patients received sedation care with the RNST model. Forty-five of these 4,009 patients (1.1%) experienced at least one complication compared to 6 of the 103 patients (5.8%) in the pre-implementation portion of the pilot study. The improvement in frequency of adverse complications was significant (P<0.001).

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Discussion

The implementation of the RNST model significantly improved patient safety. The pilot study was not designed to have sufficient power to demonstrate improved patient safety with this model but to provide complication frequencies for future comparisons. In the 7-year period after implementation of the model, patient safety improved 5-fold. While the care delivered by the RNST providers likely played an important role in this improvement, their experiences and impact on the overall moderate sedation practice over time also were important factors. During this period, there were 4,621 requests for moderate sedation on our general care units. As the team gained experience, their triage and patient selection skills increased. In 2011, they were asked to provide care to 518 patients. They found that 68 of these patients were too ill to receive moderate sedation on a general care unit, redirecting these patients to care provided by nurse anesthetists. They also initiated transfers of 7 additional patients to higher care units. Over time and with the shared insights of the RNST members, the ordering physicians and general care unit nurses learned to have a greater appreciation of when and for which patients moderate sedation was appropriate and safe on general care units. In 2017, there were 595 requests for moderate sedation care. Only 18 of these patients were triaged to other sites for their care. The improvement in patient selection and triage very likely played a significant role in the improved outcomes of moderate sedation during this period.

The implementation of the RNST model significantly improved the completeness of documentation during sedation episodes of care. With additional training, education, and experience the RNST members have acquired the competencies to thoroughly document the safe care they provide to patients needing sedation in general care units. In the pilot study, the RNST accurately documented the sedation assessments with a higher level of accuracy than the general care nursing staff for the pre and post-procedure time frame and at discharge. Five intra-procedure assessment measures did not show significance. We believe that general care nurses know to monitor the patient's vital signs during the sedation procedure; however, they are not aware of the numerous sedation assessments required prior to and after the procedure is completed.

Teaming anesthesiologists with the RNST members provided an additional level of safety to the complex sedation process. The implementation of the RNST raised the awareness of the Department of Anesthesiology about the number of high acuity patients receiving sedation on the general care units. Involving the anesthesia care team, both anesthesiologists and nurse anesthetists, provided the sedation nurses expert resources when needed. If the RNST and physician assessed that the patient's medical status was too acute to provide sedation on the general care unit, either the patient could be moved to the surgical recovery room where the RNST would have additional anesthesia support immediately available or a nurse anesthetist could be sent to the patient's bedside to provide care.

Limitations

Several limitations were identified with the pilot portion of this project. First, documentation of the RNST was negatively affected due to an 8-week period of intermittent technical difficulty with wire-less computer conductivity. The RNST had to manually enter vital sign data during some sedation cases, instead of having the data automatically link to the sedation electronic medical record. In addition, the sample size of the Nurse Manager Survey (n=42) would not be considered large enough to determine statistical significance.

Practice implications

The RNST model could be utilized in any size hospital where there is a low volume sedation practice; however, the model has financial costs (e.g., nurse salary, sedation care) that may be difficult for small hospitals to support. The medical center leadership involved in this project approved a full time nurse position and sedation cart for each hospital site to support the busier daytime procedures needing sedation. Their support of this project as a safety and quality initiative for patient care outweighed the expense absorbed by the institution. A cost-effectiveness assessment of this model would not only include the direct expenses of the model but the reduction in expenses associated with anticipated adverse outcomes. Further, this model has evolved to include a greater number of patients over the past five years. A portion of these patients (e.g., those undergoing dressing changes) previously returned to the operating rooms multiple times for these procedures. The expenses associated with the additional procedures in expensive operating rooms and their potential displacement of patients who might not be able to access busy operating rooms need to be considered. Additional studies to evaluate the effectiveness of specialized teams on patient outcomes are also needed.

Conclusion

Nurses involved in providing moderate sedation need to maintain competency in airway assessment and management as well as understand TJC sedation documentation requirements. Nurses providing sedation in low volume areas are challenged to maintain these skills. The RNST model in this study demonstrated the level of completeness of sedation documentation required by TJC as compared to general care nursing staff. It also improved outcomes for patients who received moderate sedation on the general care floors. Collaborative health care teams, such as used in this RNST model, provide viable solutions to standardize sedation care and potentially improved patient safety.

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