Literature Review: Assessment of Opioid-related Sedation and the Pasero Opioid Sedation Scale

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Purpose: *To examine sedation scales and monitoring practices, specifically evaluating utilization of the Pasero Opioid Sedation Scale (POSS) in the clinical setting.*
Design: *Literature review.*
Methods: *A thorough review of the literature was conducted using three databases from January 2009 to June 2016.*
Findings: *A total of six articles were selected for the review; three descriptive survey-based design, two quasi-experimental design, and one evidence-based practice project. Three articles evaluated implementation of the POSS in a postanesthesia care unit, pediatric clinical unit or pediatric intensive care unit, and in general care areas.*
Conclusions: *The POSS is an effective tool to assess sedation and increase confidence among nurses.*

Keywords: *Pasero Opioid Sedation Scale, POSS, postanesthesia care unit, PACU, opioid-induced sedation, sedation scale.*

PERIOPERATIVE NURSES FACE a challenge in using opioids to treat pain postoperatively. There is a delicate balance in the achievement of adequate pain control while avoiding adverse effects, such as opioid-induced sedation.[1] Opioid-induced sedation ranges from drowsiness to loss of consciousness and respiratory arrest. If the nurse does not recognize the warning signs of impending opioid-induced sedation, respiratory depression may occur. "A number of criteria have been used to define respiratory depression including ventilatory frequency, percutaneous oxygen saturation, arterial blood gas analysis, and the need to administer respiratory stimulants"[2] (p. 216). In 2004, Cashman and Dolin[2] identified ventilatory frequency as the most widely used criterion, with a respiratory rate of less than ten breaths per minute as the most common cut-off value. Respiratory depression because of opioid-induced sedation is estimated to occur in 0.2% to 1% of all patients receiving opioids,[2] potentially leading to increased lengths of stay and overall costs.[3]

In 2012, the Joint Commission published a document to illustrate the number of sentinel events related to opioid administration between 2004 and 2011: incorrect doses (47%), inadequate monitoring (29%), and other factors including overdosage, adverse effects, and other medication interactions (11%).[4] In response to the Joint Commission 2001 Pain Management Standards, concern has been expressed regarding the potential for overaggressive efforts to reduce reported pain control to nil.[5] With concern about increasing opioid-related adverse events, there is growing interest in developing effective means to provide

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adequate pain control while minimizing adverse events.

Postanesthesia care unit (PACU) nurses have the role and responsibility to ensure tolerable pain levels of postsurgical patients before discharge from surgical recovery. In 2001, the American Society of PeriAnesthesia Nurses (ASPAN) attempted to address pain and comfort management by conducting a descriptive study of 220 perianesthesia nurses at multiple sites. Study findings illustrated variance of nursing practice regarding the frequency of assessments, thereby, leading to the development and publication of the ASPAN Pain and Comfort Clinical Guideline in 2003.[6,7] To date, the only guideline addressing pain and comfort management for perianesthesia nursing is the 2003 Clinical Guideline. The initial assessment of pain should include the patients' self-reports, sedation levels, nonverbal behaviors, and vital signs. After providing the recommended interventions, which may include opioid therapy, ASPAN suggests that nurses should monitor the patients for respiratory function, level of consciousness, and hemodynamic stability. Determining the patients' levels of pain should be accomplished by asking the patients to verbalize effectiveness of the intervention(s).[6] However, the guideline does not recommend the use of a standard sedation scale, nor does it provide guidance for actions to be taken for controlling pain if the patient becomes sedated during the course of opioid administration.

Without a protocol or algorithm guiding how to manage patients' pain, nurses may find it difficult to manage pain appropriately and determine when opioids can be safely administered. Historically, nurses have incorporated subjective data to include clinical judgment, nonverbal behavior, and self-reported pain scores, along with vital signs, to determine if additional doses of opioids can be safely administered.[6] However, these approaches reflect increased variability and decreased reliability. Often, a physician's order for pain medication is prescribed in accordance with the patient reported pain level; however, the subjective report of pain does not correlate with the patient's sedation level. Patients may be able to report a pain score of 7 or higher, yet could be excessively sedated. If the nurse administered an opioid to the patient with no consideration of the patient's sedation level, the patient may be at high risk for developing advanced opioid-induced respiratory depression.[8]

Sedation scales are used to assess sedation levels and provide nurses with a useful tool to make decisions about the timing of medication interventions and when to intervene based on patients' sedation levels. The Pasero Opioid Sedation Scale (POSS) is a tool developed to identify advancing sedation before it is compounded by continued opioid administration and results in clinically significant respiratory depression or apnea, thereby enhancing patient safety during pain management with opioid analgesics. The tool (Figure 1) is designed to correlate a level of sedation with a specific intervention providing additional support in clinical decision making, and appropriate and timely escalation of care. The levels of sedation range from sleep, easy to arouse (S)/awake and alert (1)/slightly drowsy, easily aroused (2)/frequently drowsy, arousable, drifts off to sleep during conversation (3)/somnolent, with minimal or no response to verbal and physical stimulation (4).[9]

The POSS indicates the nurse may administer opioids to a patient at sedation level S (*sleep, easy to arouse*) if it has been determined that the patient's respiratory status (rate, depth, regularity, and airway patency) is optimal. Patients assigned a sedation level of 1 or 2 may receive opioid administration; however, beginning at sedation level 3, the recommendation is that the nurse should provide nonopioid therapies to treat pain because the patient is becoming too sedated. Nonopioid therapies commonly used in the PACU may include acetaminophen or nonsteroidal anti-inflammatory drugs. A sedation level of 4 is indicative of somnolence, with minimal or no response to verbal and physical stimulation. This level is unacceptable and deems an escalation of care, to include stopping the opioid and consideration of administering naloxone.[9] The purpose of this article was to review sedation scales and monitoring practices, specifically, evaluating use of the POSS in the clinical setting.

S = Sleep, easy to arouse
Acceptable; no action necessary; may increase opioid dose if needed
1 = Awake and alert
Acceptable; no action necessary; may increase opioid dose if needed
2 = Slightly drowsy, easily aroused
Acceptable; no action necessary; may increase opioid dose if needed
3 = Frequently drowsy, arousable, drifts off to sleep during conversation
Unacceptable; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory; decrease opioid dose 25% to 50%[1] or notify primary[2] or anesthesia provider for orders; consider administering a non-sedating, opioid-sparing nonopioid, such as acetaminophen or a NSAID, if not contraindicated; ask patient to take deep breaths every 15-30 minutes.
4 = Somnolent, minimal or no response to verbal and physical stimulation
Unacceptable; stop opioid; consider administering naloxone[3,4]; stay with patient, stimulate, and support respiration as indicated by patient status; call Rapid Response Team (Code Blue) if indicated; notify primary[2] or anesthesia provider; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory.

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*Appropriate action is given in italics at each level of sedation.
[1] If opioid analgesic orders or hospital protocol do not include the expectation that the opioid dose will be decreased if a patient is excessively sedated, such orders should be promptly obtained.
[2] For example, the physician, nurse practitioner, advanced practice nurse, or physician assistant responsible for the pain management prescription.
[3] For adults experiencing respiratory depression give intravenous naloxone very slowly while observing patient response ("titrate to effect"). If sedation and respiratory depression occurs during administration of transdermal fentanyl, remove the patch; if naloxone is necessary, treatment will be needed for a prolonged period, and the typical approach involves a naloxone infusion. Patient must be monitored closely for at least 24 hours after discontinuation of the transdermal fentanyl.
[4] Hospital protocols should include the expectation that a nurse will administer naloxone to any patient suspected of having life-threatening opioid-induced sedation and respiratory depression.

Figure 1. Pasero Opioid Sedation Scale (POSS)*. NSAID, nonsteroidal anti-inflammatory drug.

Review of Literature

Search Strategy

A literature search was performed from January 2009 to June 2016 using PubMed, Cumulative Index to Nursing and Allied Health Literature, and Google Scholar Databases. Search terms included *monitor, monitoring, opioid-induced, Pasero Opioid Sedation Scale, respiratory depression,* and *sedation*. MeSH terms used were *monitoring, physiologic; analgesics, opioid; respiratory insufficiency/complications/nursing,* and *prevention and control*. The initial literature search identified 14 articles for review and analysis. Six articles were selected for this review based on titles and abstracts: three descriptive survey-based design, two quasi-experimental design, and one evidence-based practice project (Table 1). The quasi-experimental design studies evaluated the efficacy of using the POSS in a clinical setting. Kobelt et al[8] is the only study identified that sought to determine the efficacy in a PACU setting, and Quinlan-Colwell et al[10] assessed if the tool was safe and effective in the pediatric population. The setting for the pediatric population was a pediatric clinical unit and pediatric intensive care unit.[10]

Table 1. Evidence Table

Study	Purpose	Design/Methods	Sample/Setting	Data Analysis	Findings	Significance for Practice/Patient Care Outcomes
Kobelt et al[8]	To assess the perception of changes associated with the implementation of the PACU POSS protocol	Quasi-experimental design Two anonymous retrospective post-test surveys, using 10-point rating scales were created for PACU and postsurgical unit nurses	N = 67 nurses N = 842 patients meeting inclusion criteria for purposes of medical record reviews PACU and postsurgical unit nurses	Paired-sample *t* tests	Increased PACU and postsurgical unit nurses' perceptions of quality of care delivered in the PACU related to opioid administration, and comfort with communicating pain and sedation assessments between units during patient handoffs; increased PACU nurses' confidence in administering opioid medications to meet pain needs and to avoid oversedation; did not affect the average length of stay for PACU patients; did not increase notifications of physicians and anesthesia care providers for assistance due to patients' altered sedation status; did not affect the amount of opioid medications given; did not affect the intensity of pain	Focusing on safe administration of opioids with use of the POSS did not affect patients' perception of discharge pain intensity; in the postintervention group 68.4% of patients compared with 54.6% in the preintervention group were able to report pain intensity at discharge from the PACU; and the use of the POSS protocol enabled the nurse to decide if patients' sedation levels were appropriate for patients to receive additional opioid doses and physician notification and subsequent interventions to treat advancing sedation were not required

(Continued)

Table 1. Continued

Study	Purpose	Design/Methods	Sample/Setting	Data Analysis	Findings	Significance for Practice/Patient Care Outcomes
					reported by patients; increased number of patients who were sufficiently alert to provide a pain intensity rating at discharge from the PACU; was adopted readily by the PACU nurses as demonstrated by consistent application of the protocol and associated interventions with opioid administration and when evaluating discharge readiness	
Quinlan-Colwell et al[10]	To determine if the POSS was appropriate and safe to use with pediatric patients; to evaluate the quality and frequency of registered nurse documentation of sedation in pediatric patients before and	Quasi-experimental design Convenience sample for intervention and control groups; surveys were anonymous and voluntary	Intervention group (n = 27) Control group (n = 25) Pediatric nurses assigned to pediatric clinical unit and pediatric intensive care unit (N = 43)	χ^2 test was used to test differences between cohorts; P value $< .05$ was considered statistically significant	POSS was at least safe as standard of care; improvements were noted in frequency of documentation of respiratory rate assessment before administration of an opioid; and nurses reported the POSS	Tool provided standardized information regarding how alert or sedated a patient was before and after administration of an opioid

	after implementation of the POSS				tool was safe, appropriate for use with the pediatric population, and easy to use	
Smith et al[11]	To identify patient risk and establish monitoring parameters for patients receiving opioid analgesics in an effort to prevent unintended excessive sedation and potentially fatal respiratory depression in general care units	Evidence-based project/ academic medical center Questionnaire completed preimplementation and postimplementation	n = 76 (Preimplementation) n = 67 (Postimplementation) Nurses on pilot units	No test of significance	Nurses were better able to identify patients at risk for oversedation when administering opioids, and nurses reported understanding the tool to assess for oversedation	Bedside nurses have demonstrated an improved ability to identify patients at risk for oversedation when administering opioid medications and report providing safer care to these patients with the new sedation and respiratory monitoring policy
Jungquist et al[1]	To identify the frequency and scope of patient monitoring to detect unintended advancing sedation and respiratory depression among those receiving systemic and neuraxial opioids and to determine how technology-supported monitoring practices were implemented and evaluated	Descriptive study Online survey; the ASPMN surveyed its membership in the winter of 2013 to evaluate monitoring practices	N = 102	Frequencies; content analysis design for open-ended survey question	Many institutions maintain pain management practices that do not integrate sedation assessments and respiratory parameters as recommended	Increased vigilance in patient assessment would likely require staff education and competency validations
Nisbet and Mooney-Cotter[12]	To report measures of reliability and validity of three sedation scales currently used to measure sedation as an outcome of opioid	Descriptive survey-based study Online survey (six demographic questions)	N = 96 medical-surgical nurses employed at a large (830 beds) suburban level I trauma hospital	Content validity established by a 15-member panel of	RASS and the POSS were found to be valid and reliable scales to determine sedation during opioid administration for	The POSS can be considered to be a superior sedation scale for the measurement of opioid sedation and is

(Continued)

Table 1. Continued

Study	Purpose	Design/Methods	Sample/Setting	Data Analysis	Findings	Significance for Practice/Patient Care Outcomes
	administration for pain management in noncritical care settings—ISS, RASS, and POSS		Random convenience sample	content experts; Cronbach's α to establish reliability; percentage agreement; and, paired-sample *t* tests for total correct score by the nurse and total rating of the scale by the nurse regarding overall scale performance	pain management in the noncritical care setting; POSS was found to have the highest reliability in the study sample; use of the POSS resulted in more frequently assigned correct sedation scores and correct nursing actions in both the study sample and the panel of experts; POSS was rated overall by nurses as being more easy to use, offering more useful information to make decisions, and resulting in greater confidence in scores assigned and actions taken than either the ISS or the RASS	recommended for the assessment of sedation in adult patients during opioid administration for pain management in noncritical care settings
Willens et al[13]	To establish current opinions regarding the effectiveness, perceived benefits, and shortcomings of existing practices used to monitor advancing sedation and respiratory	Descriptive study Online survey; respondents document use of pulse oximetry/ $ETCO_2$ monitoring and sedation scales during oral and IV opioid administration	N = 147 from 90 unique institutions across the United States	Frequencies; patterns and themes for open-ended survey items	Lack of sufficient monitoring of patients taking opioids for pain control One-third of patients on PCA have increased frequency and timing of monitoring; modes of monitoring were	Inconsistencies in clinical practice; a need for the development of high-level evidence to establish best practices

				depression in hospitalized patients taking opioids to manage acute pain
				not found to be evidence based; electronic monitoring (continuous or intermittent) was sorely lacking; financial issues and availability of equipment could be major considerations in whether a patient received electronic monitoring; 64% of respondents who used sedation scales indicated a benefit of using numbers to determine a patient's level of sedation; and, the most frequently used scales, in descending order, were the Aldrete, POSS, Ramsey Scale (and Modified Ramsey), and Riker Scale. Lack of standard of care for monitoring patients for opioid-induced respiratory depression

$ETCO_2$, end tidal carbon dioxide; ISS, Inova Health System Acute Care Sedation Scale; IV, intravenous; PACU, postanesthesia care unit; PCA, patient-controlled analgesia; POSS, Pasero Opioid Sedation Scale; RASS, Richmond Agitation and Sedation Scale.

Findings

Implementation of the POSS

The search query yielded two articles designed to evaluate the safety and efficacy of the POSS in a clinical environment. Kobelt et al[8] conducted a quasi-experimental study (1) to measure the efficacy of the POSS with interventions in the PACU; (2) to increase PACU nurses' perceptions of their confidence in assessing sedation associated with opioid administration and in the quality of care provided; and (3) to facilitate communications during patient handoffs postoperatively regarding safe opioid administration. The POSS protocol was implemented across two PACUs–general and orthopaedic. Surveys were distributed among 67 nurses, 46 from postsurgical units and 21 from two PACUs. A 10-point Likert Scale was used to capture changes in perceptions associated with the implementation of the POSS protocol, 1-point as least favorable to 10-point as most favorable. A review of 842 medical records was used to evaluate the efficacy of the protocol, preimplementation and postimplementation. Study authors concluded an increased perception of quality care delivered related to opioid administration and communication of pain and sedation assessments during patient handoff. They also noted increased nurses' confidence regarding opioid administration, including the avoidance of oversedation. Implementation of the tool did not affect the length of stay in the PACU, increase notification to PACU providers (anesthesia or surgeons), amount of opioid medication administered, or patient reported pain level. The protocol raised awareness among patients and nursing staff. Study authors noted that an increased number of patients were able to report a pain level on discharge from the PACU and increased compliance among PACU nurses with the protocol, including associated interventions of opioid administration and evaluation for discharge. The overall findings support use of the POSS protocol in the PACU.[8]

Quinlan-Colwell et al[10] sought to determine if using the POSS in a pediatric population was a safe and effective tool and to evaluate the quality and frequency of nursing documentation of sedation in pediatric patients before and after implementation of the POSS. A convenience sample was used to identify patients in the intervention group (n = 27) and control group (n = 25). The groups comprised pediatric patients admitted to the medical center for similar diagnoses; however, nurses caring for patients in the control group did not use a standardized assessment tool to monitor sedation levels. An anonymous voluntary survey recorded the perception of 43 nurses who administered opioids to patients in the intervention group for analgesia and used the POSS to assess sedation in the pediatric clinical unit or pediatric intensive care unit. The nurses found the tool to be safe and appropriate for the pediatric population. Implementation of the tool positively impacted the frequency of documentation of respiratory rate assessments before opioid administration. In addition, compliance regarding the documentation of pain score assessments increased by 16% after implementation. The tool standardized nursing assessments and corresponding documentation, thereby optimizing safe and effective pain management.[10]

Smith et al[11] conducted an evidence-based practice project to standardize the way nurses assess for and monitor opioid-induced sedation in general care areas. A multidisciplinary team selected and implemented a hospital-wide policy requiring nurses' use of the POSS before and after opioid medication administration, to monitor sedation levels.[11] A four-point Likert Scale captured nursing knowledge of patient assessment, monitoring, and risk factors related to opioid administration, preimplementation and postimplementation. Implementation of the policy enhanced the nurses' ability to identify patients at risk for opioid-induced sedation, including clinical decision making regarding the administration of opioids. In addition, the nurses reported ease of understanding the tool when assessing for oversedation. Monthly audits for compliance prompted unit-level education, resulting in 51% improved compliance with documentation of the initial POSS assessment over the 30-month timeframe.[11]

Comparison of Commonly Used Sedation Scales

Nisbet and Mooney-Cotter[12] conducted a descriptive survey-based study to describe the validity and reliability of three sedation scales–the Inova

Health System Acute Care Sedation Scale (ISS), the Richmond Agitation and Sedation Scale (RASS), and the POSS. Ninety-six nurses employed across medical and surgical units at a level I trauma hospital were randomly selected to complete a 25-question online questionnaire regarding demographics, scales, and knowledge of the relationship of advancing sedation to respiratory depression. A team of 15 content experts was selected to establish reliability and validity for the sedation scales. Selection was based solely on expertise. The expert panel successfully established content validity and reliability for the RASS and POSS. Validity was not established for the ISS. The nurses deemed the POSS significantly easier to use than the RASS or ISS.[12] The content experts determined "use of the POSS more often resulted in the correct score and the correct actions chosen"[12 (p. 161)].

Monitoring Practices

Willens et al[13] conducted a descriptive-based study to evaluate monitoring practices among the American Society for Pain Management Nursing (ASPMN) membership. Survey feedback from 102 participants indicated many institutions maintain recommended pain management practices, specifically integration of sedation assessments and respiratory parameters.[1] Ninety percent of the respondents reported using sedation scales, and 72% implemented an intervention based on the sedation score. The most commonly used sedation scale was the POSS, with implementation in 53% of hospitals surveyed. Other commonly used sedation scales were the RASS (42%), Aldrete Scale (39%), and Glasgow Coma Scale (37%). It is important to note that some hospitals reported use of more than one sedation scale. Jungquist et al[1] concluded that monitoring practices have improved since 2009. Specifically, noting an increase in the use of sedation scales and the subsequent prevention of adverse events. The POSS was the most commonly used sedation scale used in this study.[1]

Willens et al[13] conducted a descriptive study to determine current opinions regarding the effectiveness, benefits, and deficiencies of existing practices used to monitor advancing sedation and respiratory depression in hospitalized patients receiving opioids for management of acute pain. An online survey was disseminated to ASPMN membership from 90 different institutions. The different monitoring methods covered in the survey were pulse oximetry monitoring, end tidal carbon dioxide ($ETCO_2$) monitoring, and sedation scales. Ten different sedation scales were used among the institutions, including the POSS. Among patients receiving intravenous (IV) or oral opioids, 37% were monitored with intermittent pulse oximetry, and 13% were monitored with continuous pulse oximetry. No institutions used $ETCO_2$ monitoring for patients receiving IV or oral opioids. Sixty-four percent of respondents reported assigning a number to sedation, 47% assigned an intervention to certain sedation scores, 60% reported that nurses regularly documented and appropriately used the sedation scales, and 42% reported that their use prevented adverse effects related to opioid administration. Only 21% of respondents reported using the POSS. Study authors concluded inconsistencies regarding clinical practices related to no standard of care for monitoring patients for opioid-induced respiratory depression.[13]

Discussion

There is limited research regarding the implementation of the POSS in a PACU and other clinical settings. Kobelt et al[8] and Quinlan-Colwell et al[10] used survey-based designs to assess perception, monitor compliance, and evaluate documentation and appropriateness of the tool in a PACU and a pediatric setting, respectively. Smith et al[11] conducted the sole evidence-based practice project to standardize monitoring of sedation in adult and pediatric patients receiving opioid analgesia. Nurses' ability to report improved identification of patients at risk for oversedation and to understand the POSS tool may be a result of the additional efforts to improve compliance and unit-level education.

Study limitations include design and sample size. All quasi-experimental and descriptive studies were retrospective and the subjects were part of a convenience sample and not randomized.[10] The retrospective design was quick and cheap and was not prone to loss of follow-up. However, recruitment by convenience sampling was not representative of the general population and prone to selection

bias. In addition, sources of error in chart reviews or from the use of electronic medical records, recall bias, or misclassification introduce potential biases.

The evidence-based practice project conducted by Smith et al[11] also used questionnaires' preimplementation and postimplementation to identify patient risk and establish monitoring parameters. The use of questionnaires introduces the same potential of recall bias or misclassification; however, the implementation process being conducted at an academic medical center lends to replication success.

Implications for Practice and Conclusions

The limited publications regarding implementation of a POSS in the PACU or other clinical setting reinforce the need for further research. Additional research or evidence-based practice projects should be conducted to evaluate the tool's applicability to the general population, improved outcomes, and financial impact. Overall, the literature supports the goal of the POSS, citing the potential for fewer opioid-related adverse events and increased confidence among nursing staff.

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