

DOI: 10.36648/2471-805X.6.2.42

A Need Identified...A Curriculum Created...Improving Procedural Sedation Training

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Citation: Couloures KG (2020) A Need Identified...A Curriculum Created...Improving Procedural Sedation Training. J Pediatr Care Vol.6 No.2:42. DOI: 10.36648/2471-805X.6.2.42

Received date: April 23, 2020; **Accepted date:** May 05, 2020; **Published date:** May 12, 2020

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Abstract

Introduction: Procedural Pediatric Sedation (PPS) has been increasingly provided by pediatric intensivists over the past decade. Pediatric Critical Care Medicine fellowship guidelines require that fellows become proficient in PPS but do not state how this proficiency should be attained. A national survey confirmed that training in procedural sedation was not standardized. A structured PPS curriculum has been created that ensures fellows receive appropriate didactic, clinical practice and simulation experience to prepare them for PPS credentialing and practice.

Methods: 4-week curriculum encompassed structured readings from a variety of clinical references. Fellows observed and then performed PPS under direct attending guidance using the Entrustable Practice principles. Fellows also participated in 1 high-acuity/low-frequency simulation session during their rotation with another 3 sessions scheduled throughout their 2nd and 3rd year of fellowship. Rotation concluded with an exam covering sedation principles that demonstrated knowledge as part of the credentialing process.

Results: Implementation of mandatory rotation in PPS resulted in PCCM fellows feeling much more comfortable in performing this procedure. All recent graduates have been credentialed in PPS without additional training (4). Fellows have become involved in PPS research resulting in 2 poster presentations at national conferences, 1 article published in PCCM, 2 textbook chapters and 3 CME webinar presentations. PPS training also resulted in job offers of first choice for all recent graduates.

Discussion: Implementation of a standardized curriculum facilitated learning of a new procedural skill by PCCM fellows. Completion of the proctored PPS curriculum provided documentation that allowed fellows to obtain sedation credentials during fellowship and in their future positions

Keywords: Procedural sedation; Medical education; Curriculum; Pediatric intensivist

Introduction

The utilization of Pediatric Procedural Sedation [PPS] has grown over the past decade with pediatricians, emergency room physicians and pediatric intensivists being the primary specialties providing this care [1]. Pediatric Critical Care Medicine [PCCM] and Pediatric Emergency Medicine [PEM] fellows are required to become proficient in PPS [2,3] but as a recent study by Hooper et al demonstrated only 61% of fellows felt adequately prepared to perform PPS and 30% reported that they needed additional training or preceptorship [4]. In the same survey, 62% responded that their fellowship program did not offer a PPS specific rotation and only 7% reported that it was available as an elective. ACGME guidelines do not specify how this training should be structured and have left it to individual fellowship programs to determine how this is accomplished [5]. And as Nadkarni points out in his editorial accompanying the article by Hooper et al, Procedural Sedation Training should not be a postscript [6].

These findings along with the American Society of Anesthesiologists statement that a sedation practitioner will have satisfactorily completed formal training in the safe administration of moderate to deep sedation gave the impetus to create a Fellows Sedation Curriculum that was identified by Hooper et al as a needed component in fellowship [4]. The curriculum is designed to ensure that fellows receive training in determining which patients are appropriate candidates for PPS, how to obtain proper informed consent and appropriate documentation. The curriculum will have them perform PPS during both invasive and non-invasive procedures since these procedures occur in separate settings, utilize different medications and have dissimilar parental expectations. Lastly, the fellows will participate in multi-disciplinary simulation scenarios that highlight teamwork principles, awareness of sedation environment and help prepare for low incidence/high-acuity events.

This curriculum contrasts with existing workshops offered by a variety of organizations and existing published curriculum in the use of structured proctoring that allows increased autonomy as the fellow demonstrates proficiency [7]. Workshops provide

intense instruction but do not have sufficient time to have the learner encounter a wide variety of sedation scenarios or patients. Also, previously published curriculum for sedation has often focused on simulation scenarios for high-acuity events such as difficult airway management and has not covered the breadth of sedation practice [8].

The curriculum utilizes the focused practice principles of workshops but allows the learner to practice these skills under direct observation in a variety of settings over several weeks. Also, in recognition that high-acuity events are rare and may not be encountered during the rotation a simulation session is incorporated into the rotation with additional sessions scheduled throughout the senior years of fellowship. The curriculum also includes a proficiency worksheet and sedation knowledge test that document PPS competency for credentialing.

Methods

After the publication by Hooper et al, it was recognized that pediatric critical care fellows did not have a structured experience in pediatric procedural sedation [PPS]. This shortcoming was highlighted when a fellow required several months of proctoring before they could work independently. This led to a curriculum designed by the Director of Pediatric Sedation. It was determined that the early part of the second year of fellowship training would be optimal since the fellow would have undergone 4 weeks of training with anesthesia in the operating room and had 7 months of pediatric intensive care service time. These experiences ensured that that fellow was proficient in airway management and cardiorespiratory support.

One week prior to the rotation, the fellows were sent an educational packet that included a primer on pediatric sedation,

sedation guidelines from the American Academy of Pediatrics [9] and the practice guidelines from the American Society of Anesthesiologists [10]. They were also loaned a Pediatric Procedural textbook for in-depth reading [11]. At the beginning of the rotation, the fellows were introduced to the sedation nursing staff and given a 50-minute PPS overview presentation. The presentation reviewed key aspects of the guidelines, definitions of minimal, moderate and deep sedation and proper preparation for sedation. The presentation concludes with several case scenarios that facilitated discussion about patient evaluation, airway management and medication selection.

Fellows began their proctored sedations with short invasive procedures where the airway was readily accessible, and their mentor was at their side. As they demonstrated proficiency and knowledge of potential adverse effects their progress was documented in the proficiency worksheet (**Table 1**) and they were granted more autonomy in performing these sedations. The next step involved performing sedations that were not invasive but had limited access to the patient's airway. Proficiency was again documented on the proficiency worksheet (**Table 1**) and the fellow was given further autonomy using Entrustable Professional Activity concept [12]. During the second half of the rotation, the fellow participated in a high-fidelity simulation along with the sedation nursing staff. At the end of the rotation, the fellows took a 50-question procedural sedation test and then graded against the procedural sedation answers. Incorrect answers were reviewed along with any other questions that arose after taking the test. A score of 85% or higher was needed along with demonstration of proficiency in PPS as documented on the checklist to permit credentialing in PPS.

Table 1: Sedation competencies.

SEDATION COMPETENCIES				
To be completed by sedation certified attending who is present in room while fellow is performing sedation. Any actions not directly observed may also be discussed.				
Items in bold must be reviewed at each sedation. A total of 5 sedations must be completed by fellow, with a PASS assessment				
Date:	Patient MRN:			
Area of Focus	Items to look for [required items in Bold]	Acceptable	Needs Improvement	Unacceptable
TRIAGE/PREPARATION				
History	HPI: current illness, need for procedure			
	NPO time , last meal, clears vs solids			
	PMH: past anesthesia or drug reactions , past experience with sedation			
	Current medications and medical problems			
	FH: family members with reactions to anesthesia/sedation			
Physical Exam	Airway: tonsils, jaw, ability to open mouth, loose teeth			
	Resp: rate, quality of breathing, breath sounds			

	CV: heart rate, blood pressure, heart sounds, perfusion			
	ASA classification			
Informed consent	Risks: medication side effects-Airway, Respiratory, CV			
	Benefits: decrease pain anxiety, increase success			
Medication plan	drugs, doses, limits, sequence, emergency drugs and reversal agents			
Supplies and monitoring	suction/oxygen: knows location, has set up, knows how to operate			
Personnel	identifies sedation attending and person responsible for monitoring vital signs			
SEDATION				
Medication	appropriate dose, interval and use of adjuvants			
Monitoring	reacts appropriately to changes in patient condition			
CONCLUDING SEDATION				
	communicates post procedure monitoring needed and sedation events to team			
	completes sedation note			
Circle Grade				
PASS: no unacceptable actions, >all bold items assessed, <10%of assessed items need improvement CONTINUED SUPERVISION NEEDED: All BOLD items not assessed, >10%actions need improvement. FAIL: unacceptable actions.				
Resident Name/Signature: _____ Attending Name/Signature: _____				

Results

Implementation of the curriculum resulted in 1-2 fellows becoming eligible annually for credentialing in PPS. 7 fellows have completed the curriculum with 100% positive feedback on the learning experience through positive evaluations on the post-rotation evaluation and biannual self-assessment during fellowship review. The faculties have also noted improved proficiency in procedural sedation both within and outside of the pediatric intensive care unit during semi-annual fellow evaluations.

Unintended benefits of implementing this curriculum have been increased interest in sedation both as needed during the care of children in the Pediatric Intensive Care Unit and during PPS. The increased interest has led to 2 abstract and poster presentations at national meetings, a manuscript published in Pediatric Critical Care Medicine (4), 2 book chapters (13,14), 3 continuing medical education webinar presentations, 2 quality improvement projects and increased interest in PPS as a career pathway.

Discussion

The curriculum has achieved the goal of increasing the skill set of PCCM fellows and increased their post fellowship value in the marketplace by allowing them to show proof of PPS proficiency. Depending on the structure of the fellowship this curriculum can

be implemented on its own or in tandem with other rotations that allow flexible distribution of the fellow's time. In our case, the procedural sedation curriculum was scheduled in tandem with another rotation which facilitated better utilization of this time block without infringing upon time in the PICU or dedicated research time.

The use of high acuity/low frequency simulation scenarios fostered greater awareness of potential complications and improved performance when these complications have arisen. The fellows thanked the faculty for developing these scenarios because they felt well-prepared when an intravenous line malfunctioned during a sedation or a child has had post-sedation delirium. The inclusion of the nursing staff during these simulations has also fostered a culture of teamwork that has carried on past the rotation.

As stated previously, the unintended benefit of formal education in pediatric procedural sedation has been greater interest and awareness not only of potential research opportunities in sedation but also in how these principles are applied to patients in the pediatric intensive care unit. The spill-over effect has led to greater awareness of delirium and what measures can be used to decrease prevalence and manage it. In addition, the knowledge of sedation medication pharmacodynamics and pharmacokinetics has resulted in greater confidence by the nursing staff when fellows recommend changes in sedation management of intubated patients.

The use of Entrustable Practice to gradually grant autonomy fostered an environment of success and also enhanced parental comfort with a “physician-in-training” performing the sedation. Upon introduction of the fellow to the family, statements were made such as, “Dr. X is in fellowship and they are learning procedural sedation, they have completed their airway training and their 1st year of fellowship. They will be performing the sedation, but I will be here and available for any questions or assistance as needed. Do you have any concerns, and do we have your permission?” This approach allowed fellows to transition seamlessly into an environment that had been exclusively the domain of attending physicians, while maintaining excellent patient safety and good rapport with the families.

Conclusion

As pediatric procedural sedation becomes an expected skill set amongst various pediatric providers the use of formalized curriculum such as the one described will need to become the standard. The proposed curriculum will now need to be trialed and modified as needed by other institutions and programs to determine if it should become the standard for credentialing and practice of PPS. As the curriculum or variants are adopted, a repeat survey will need to be performed to assess whether standardized curriculum has improved training in Pediatric Procedural Sedation.

ACKNOWLEDGEMENT

I would like to thank the Society for Pediatric Sedation and Pradip Kamat, MD for their support.

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