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How does the introduction of a pain and sedation management guideline in the paediatric intensive care impact on clinical practice? A comparison of audits pre and post guideline introduction

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ABSTRACT

Despite the use of guidelines to inform practice for pain and sedation management there are few evaluations of the effect of their introduction on clinical practice. Previous evaluations of the protocols and guidelines used to manage pain and sedation in the paediatric intensive care unit (PICU) report increases in pain and sedation medication administration post guideline introduction. In most reported cases the guideline was accompanied by a treatment algorithm. To our knowledge there is no published data on the effect of introducing a guideline without a treatment algorithm on pain and analgesia administration.
Purpose: To evaluate the impact the introduction of a pain and sedation guideline will have on clinical practice.
Methods: A 19 bed PICU was audited for one month prior to the introduction of a guideline and one month post.
Findings: The proportion of patients receiving oral Clonidine increased ($p = 0.001$) and the administration of Ketamine, particularly via bolus ($p = 0.003$), reduced after the introduction of the guideline. The use of a validated pain tool to assess pain increased by 25% and communication of management plans increased by 25%. The documentation of the use of boluses increased by 36%.
Conclusion: The introduction of a clinical practice guideline for pain and sedation management in PICU contributes to changes in medication administration, use of validated pain assessments, improved documentation of boluses and communication of management plans.

Introduction

The 2006 consensus guidelines on sedation and analgesia in critically ill children established a standard for clinical practise in paediatric intensive care units[1] (Box 1). The guidelines include key recommendations that cover dose and administration for analgesia and sedation medication, the use of validated pain and sedation assessment tools, withdrawal assessment, and the inclusion of non-pharmacological pain management.

Assessment of pain and sedation with a validated assessment tool has been shown to improve the quality of treatment provided and improve the management of the patient's pain and sedation,[2–4] and has the potential to reduce ventilator dependent days.[5,6] Self-report of pain is considered the gold standard, but this is often not achievable in critically ill children due to both developmental age and the acute treatments provided such as intubation and sedation. A survey of adult intensive care nurses found that 33% of nurses use vital signs to assess pain in their patients who are unable to communicate.[7] This is despite evidence that suggests that observations such as heart rate and blood pressure are unreliable as pain assessments in the adult intensive care environment.[8] It seems reasonable to assume that vital signs are overused also as pain assessments in paediatric intensive care.

In addition to the regular assessment of pain and sedation, documentation and communication are an important part of acute health care. Changes to the child's pain or sedation requirements should be regularly communicated to child's nurse and medical team, and interventions accurately prescribed and transcribed. This has been long established as an intervention that provides a safety barrier to prevent harm and allow for an accurate history of

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Box 1: Summary of the consensus guidelines on sedation and analgesia in critically ill children

- *Non-pharmacological interventions*: Any correctable environmental and physical factors causing discomfort should be addressed alongside the introduction of pharmacological agents. A normal pattern of sleep should be encouraged.
- *Pain assessment and analgesic management*: All critically ill children have the right to adequate relief of their pain.
- *Pain assessment*: Pain assessment should be performed regularly and routinely documented by using a scale appropriate to the age of the patient. Patients who cannot communicate should be assessed for pain related behaviours and physiological indicators of pain. A therapeutic plan should be established for each patient and regularly reviewed.
- *Recommended analgesic agents*: Continuous infusions of Morphine or Fentanyl are recommended for the relief of severe pain. Non-steroidal anti-inflammatory drugs or Paracetamol may be used as adjuncts to opioids.
- *Sedation assessment*: Adequate analgesia should be provided to all children in intensive care regardless of the need for sedation. The use of clinical guidelines for sedation is recommended. The level of sedation should be regularly assessed and documented using a sedation assessment scale, such as the COMFORT scale.
- *Recommended sedative agents*: Midazolam is the recommended agent for the majority of critically ill children requiring intravenous sedation. It should be given by continuous infusion. Clonidine given by infusion may be used as an alternative to Midazolam. Early use of enteral sedative agents is recommended. Propofol should not be used to provide continuous sedation in critically ill children.
- *Withdrawal syndrome assessment, prevention and management*: The potential for opioid and benzodiazepine withdrawal should be considered after 7 days of continuous therapy. When discontinued, the doses of these medications must be tapered.
- Playfor et al.[1]

treatment.[9] Therefore a key aim of a pain and sedation guideline is to improve communication of management plans and documentation of medications.

Although applied in most areas of critical care medicine, there have been few studies evaluating the effect of introducing guidelines or protocols of pain and sedation in paediatric intensive care.[10] The term guideline and protocol are used interchangeably in the literature; however both terms are used to describe the provision of a summary of best practice. Often included in guidelines or protocols are treatment algorithms.[1,11] A treatment algorithm dictates treatment more strictly then a protocol or guideline alone.

Of the studies that have evaluated the introduction of a guideline, the results have been varied. The introduction of a nursing led sedation algorithm and protocol in a PICU in the Netherlands resulted in an increased administration of Morphine ($p = 0.004$) and Midazolam ($p = 0.001$) in their pre-test post-test study.[12] The authors were unable to explain the increase in Midazolam and Morphine use but suggested that it may be due to improved sedation treatment. However, it is not clear if the improved sedation treatment was due to following best practice recommendations in their protocol or by adhering to the structure of the treatment algorithm. Evaluation of the effect of a guideline without an algorithm would be beneficial to determine the outcome of one intervention prior to introducing the other.

In 2010 a Canadian PICU collected data on 10 children treated with a sedation protocol.[10] The protocol involved the use of a treatment algorithm to titrate medication to achieve a score deduced from a pain and sedation assessment tool. The authors followed up the same subjects before and after the introduction of the protocol. They found that the patients received higher doses of Fentanyl ($p = 0.024$) and Midazolam ($p = 0.002$) while on protocol. Additionally, they found no difference in breakthrough bolus treatment ($p = 0.378$). The authors of this study reported that prior to the introduction of a protocol, sedation levels were generally under estimated.[10] They concluded that although the dose of these medications increased, the episodes of under-sedation are moderated.

Not all reports of guidelines have indicated an increase in analgesic and sedative medications, Deeter et al.[13] performed a retrospective cohort study evaluating a nurse driven sedation protocol. They measured the median duration of Morphine and Lorazepam infusions and reported a reduction in administration.[13] However due to their retrospective study design, they were unable to capture total dose per day. They also reported a reduction in ventilated days and length of stay in their post intervention group. Similar to the studies by Ista et al.,[12] and Alexander et al.,[10] Deeter et al.,[13] implemented their protocol with educational support, used a pain and sedation assessment tool and evaluated staff compliance to the protocol. Although, unlike Ista et al.,[12] and Alexander et al.,[10] pain was also to be managed by the accompanying algorithm. Deeter et al. [13] first administers analgesics to treat the child's pain before giving sedatives, perhaps this approach contributed to their differing outcomes.

A study conducted in a Korean PICU also reported a decrease in the dosage used in their analgesic and sedative infusions, Fentanyl and Midazolam.[14] However their sedation protocol utilised the pharmacist to perform the pain and sedation assessments using a COMFORT score and the medications were titrated by the physicians with consultation of the nursing staff. This model of care is different to those used by Alexander et al.,[10] Ista et al.[12] and Deeter et al.[13] in which the protocols were nursing driven. This different model of care may have contributed to the decreased dosage of analgesic and sedatives reported by Jin et al. [14]

Differences in the study designs, patient populations, models of care and methodological limitations may all contribute to different outcomes. Published results of sedation protocols in adult intensive care also have reported changes to medication doses with the introduction of a sedation protocol or guideline.[15] O'Connor et al.[15] suggest that intensive care units should carefully monitor the introduction of sedation protocols in order to evaluate the impact it will have in their institution.

Methods

The aims of this study are to evaluate the change in (a) administration and dosage of medications, (b) assessment of pain and sedation and (c) documentation of medication and communication of management plans following the introduction of a clinical guideline into the paediatric intensive care.

Sample and setting

A pre and post chart audit was performed in a 19 bed paediatric intensive care unit within an Australian paediatric hospital. The unit cares for patients from birth to 18 years. The conditions managed include congenital heart disease, trauma, respiratory, and general surgical. The data collection was performed by seven nurses who had volunteered to assist with the project. The first audit was performed over a period of four weeks to establish a baseline of current practice in relation to the identified key areas. The second audit was performed one week after the guideline was introduced for a further four weeks. All patients that were being