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PAEDIATRIC EMERGENCY MEDICINE

Design and roll out of standardised approach to paediatric procedural sedation in Victorian emergency departments

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Abstract

Objectives: Children sometimes require minor procedures in the ED for which sedation is needed. Information from Victorian EDs indicated that processes for paediatric procedural sedation were variable, both within and between health services. The aims of this project were to improve safety and reduce variation in practice with respect to paediatric procedural sedation in EDs by rolling out a standardised paediatric sedation programme in Victorian EDs.

Methods: The project was managed by a clinical network with support of an expert reference group; however, implementation was conducted at the local ED level. The approach was multi-modal and grounded in quality and safety theory. It included revision of evidence-based training materials, information sheets and risk assessment/procedure documentation forms, information on a child and family-centred approach, a before-and-after clinical governance assessment, and train-the-trainer activities. The project was evaluated by clinical audit of cases, analysis of before-and-after clinical governance assessments, numbers of staff completing training and credentialing, and qualitative feedback on the programme from ED staff.

Results: Fourteen EDs completed the project; 10 metropolitan and four regional/rural. Significant shifts in nine key clinical governance items were found, including structured training and credentialing, provision of parent information sheet, and monitoring of adverse events. The clinical audit showed >75% compliance, with seven indicators including recording of weight, fasting time and baseline observations, composition of sedation team, and documentation that discharge criteria were met. Nine hundred and seventy-one staff were trained within the project period.

Conclusion: This multi-modal implementation strategy has achieved clinical practice improvement across organisational boundaries.

Key words: *children, procedural sedation, safety, standardised approach.*

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Introduction

About 300 000 children under the age of 15 present to Victorian EDs each year.[1] Some of them require invasive investigations and procedures. In the past, inadequate management of pain was common, including physical restraint of a struggling child (so-called 'brutaine'). It has become increasingly recognised that children often require sedation for these procedures.[2]

Sedation has both benefits and risks. If managed well, it can be effective and safe, minimising pain and anxiety for patients and parents and providing optimum conditions for the safe completion of procedures.[3,4] If managed poorly, it carries the risks of unconsciousness, suppression of vital protective airway reflexes and hypoventilation. The keys to safe and successful treatment are case selection, having staff appropriately trained to administer sedation and having strong clinical governance arrangements, especially procedures, to maximise safety and effectiveness. This includes clinical audit and adverse event monitoring.[5,6]

Anecdotal evidence from Victorian EDs, supported by a national survey,[7] reported that processes for paediatric procedural sedation were inconsistent, both within and between hospitals, as was training and credentialing of staff to perform procedural sedation. At the same time, the Emergency Care Improvement and Innovation Clinical Network (ECIICN) management team were aware that the Royal Children's and Sunshine Hospitals had collaborated to develop a standardised approach to paediatric procedural sedation (including training and credentialing), but that this had not been widely disseminated. This project aimed to develop and rollout a standardised approach to paediatric procedural sedation in Victorian EDs based on that work.

Methods

Emergency Care Improvement and Innovation Clinical Network

ECIICN works with emergency clinicians across the State of Victoria (Australia) to improve quality of care in the 40 EDs that report patient-level data to the Department of Health. The EDs range in size from 5000 to >75 000 patient presentations per year. Eighteen are in metropolitan Melbourne, five are in regional cities, 13 are in rural towns and four are specialist hospitals (one children's, two maternity/gynaecology, and one eye and ear). ECIICN consists of a small management team, funded by the Department of Health, working with the sector via a multidisciplinary steering group and project reference groups. It conducts projects over a range of areas with the underlying principles of implementing evidence-based care, reducing variability in practice, improving quality and safety, and building clinician capacity to lead improvement. Projects are managed centrally, but implementation is performed locally, with adaptation of approach and materials to meet the local environment and resources.

Design

For this project, our approach was multi-modal and grounded in quality and safety theory. Key activities were:

1. Development of a clinical governance self-assessment checklist for hospitals to use to assess their clinical governance arrangements (including policies and procedures) around paediatric procedural sedation before and after local implementation (Supporting Information Appendix S1).
2. Updating and adapting training materials previously developed by the Royal Children's and Sunshine Hospitals for use across a variety of hospital types. The materials included a training manual, a lecture, and written and practical competency assessments. The programme focuses on the use of nitrous oxide and ketamine as sedation agents, but also addresses the use of propofol and other agents in selected cases.
3. Revising a risk assessment and procedure documentation form (previously developed by the Royal Children's and Sunshine Hospitals) for latest evidence and broad applicability (Supporting Information Appendix S2).
4. Conduct of train-the-trainer and project management activities for participating hospital lead clinicians (medical and nursing).
5. Development of a clinical audit tool to assess compliance with key quality and safety measures (Supporting Information Appendix S3).
6. Development of a DVD on child and family-centred care.

Participants

Participation was open to the 21 EDs with more than 5000 paediatric presentations per year (excluding Royal Children's and Sunshine Hospitals). Participation was by an expression of interest process and required

identification of clinical leads for the project and evidence of support from the ED director and nurse unit manager and an appropriate executive sponsor. Awareness of the project was raised by showcasing it at a Paediatric Evidence-Based Care Update Forum held in conjunction with the local paediatric clinical network.

Implementation process

Participating hospitals were supplied with the clinical governance checklist, manual and educational materials. They assessed their clinical governance status against the checklist, identified areas for attention and acted on these. If after the clinical governance assessment, health services decided that paediatric procedural sedation was not appropriate in their ED, they were able to withdraw from the project. In parallel, they customised the training materials for the local environment. A training workshop was conducted for the medical and nurse lead from each site. They were then responsible for local roll out of training using a train-the-trainer model. At the conclusion of the project, EDs repeated the clinical governance checklist and conducted an audit of cases against key criteria from the risk assessment and sedation record.

Evaluation

The project was evaluated by:

1. Before-and-after comparison of clinical governance checklist items.
2. Report of number of staff trained in the 6 month project period.
3. Audit of a convenience sample of clinical cases performed after implementation of the programme (to a maximum of 20 per site). Data were collected by local clinicians and supplied to the ECIICN management team for analysis and pooling as de-identified data. Where required, approval of low-risk ethics panels was obtained.
4. Qualitative feedback.

Feedback to participants

Each site received feedback detailing its clinical governance improvements, the number of staff trained compared with the state total, and performance against the clinical audit criteria compared with the pooled state data.

Results

Fifteen EDs participated in the project, of which 14 successfully completed all elements. Ten were metropolitan and four were rural/regional. This represents 67% of eligible EDs. Data from the 14 completing hospitals are presented. In these EDs, paediatric annual presentations ranged from approximately 5300 to 18 400.

Clinical governance

Key clinical governance results are summarised in Table 1.

Table 1. Clinical governance assessment results

Item	Pre-improvement project (%)	Post-improvement project (%)	Significance
Do you have a specific policy for paediatric procedural sedation in your ED?	93	93	NS
Is there a structured paediatric procedural sedation training programme and competency-based assessment tool?	21	93	$P < 0.01$
Is there a database of staff credentialed to perform paediatric procedural sedation?	29	86	$P < 0.01$
Are staff required to have basic paediatric life support training before undertaking sedation training?	93	100	NS
Are nursing staff formally trained in the use of nitrous oxide?	50	100	$P < 0.01$
Are nursing staff formally trained to assist a doctor performing parenteral sedation?	21	64	$P = 0.03$
Are there restrictions on which doctors can perform parenteral sedations?	79	93	NS
Are doctors formally trained in the use of ketamine?	36	64	NS
Do you have a parent information sheet about this procedure?	36	100	$P < 0.01$
Do you actively use distraction techniques in your ED?	79	100	NS
Is the sedation episode documented in the patient medical record?	93	100	NS
Is there monitoring of adverse events associated with sedation?	64	93	NS
Is there regular audit of paediatric procedural sedation episodes?	7	43	$P = 0.08$

NS, not significant.

Training

During the 6 month project period, 971 staff were trained and credentialed; 616 nurses and 355 doctors.

Clinical audit

Two hundred and fifteen cases were audited; 60% were boys. Nitrous oxide was used in 142 (66%), ketamine in 57 (27%) and other agents in 16 (7%). Results of the clinical audit are shown in Table 2.

Qualitative feedback

A number of specific comments were received from EDs. Regarding clinical governance, staff reported:

- The project has also highlighted some of our deficiencies when using sedation and has facilitated improvements in overall safety in our practice
- Auditing completed and embedded into 'business as usual' practices for sustainability

Regarding training, staff reported:

- Staff are better educated on procedural sedation and are able to answer any questions family members have to a higher standard
- A collaborative approach. Although I have been doing paediatric sedation for quite a while, I found many new ideas and information to improve practice
- Staff feeling more confident when using nitrous and ketamine and encouraging its use when appropriate

Regarding impacts on children and families, staff reported:

Table 2. Clinical audit results

Item	Per cent compliance
Was a risk assessment performed and documented?	73
Was fasting time documented?	80
Did fasting time exceed recommended?	83
Were the names and designation of the sedation team recorded?	88
Was the number and mix of credentialed staff correct for the sedation used?	90
Was the child's weight recorded on charts?	85
Were medications recorded on drug charts?	67
Were baseline observations documented?	90
Were 5 min observations documented during the sedation episode?	63
Were discharge criteria met and documented?	79

- Taking time in talking to child and parent in preparing them for the procedure saves time during procedure
- Using distraction techniques reduces the child's anxiety/distress
- Better parental confidence in ED's capacity to do procedure

Regarding impacts on staff, they reported:

- Although we are a small department . . . I felt we had a real sense of being involved in something significantly helpful for the clinical management of children in pain
- Almost every shift is now covered by an ED physician who has been supporting the use of nitrous. Before we began only our nurse practitioner was using the machine. Our department has benefited greatly from the use of nitrous
- It made me reassess how I approach the situation, particularly distracting the child and different ways to hold the child in a comforting way and encouraging the parent to help
- This project has increased the interest, participation in training and avocation for procedural sedation in the ED. It has started to change the culture related to sedation using nitrous oxide. It is predicted that the positive outcomes and benefits of nitrous oxide for sedation as an adjunct to care will reinforce this change and continue to impact this cultural change

Discussion

This project has demonstrated that, when provided with an evidence-based programme and activities to support implementation, a standardised paediatric procedural sedation programme was adopted by a large proportion (67%) of eligible EDs. It also showed that the programme resulted in significant shifts in policies and procedures (clinical governance) and that, for most elements, compliance with key audit criteria was high.

Standardisation in processes has been shown to improve safety in a range of industries, including aviation[8] and food handling.[9] In healthcare, variation in practice has been shown to contribute to error and standardisation of processes to reducing adverse events.[10,11] Some recent focuses have been prevention of central-line-related infections and treatment of myocardial infarction.[12]

EDs are busy, unpredictable environments, often with unstable patients and high staff turnover. Standardised procedures offer opportunities to minimise risk for patients and stress for practitioners. Examples of

where standardised procedures have improved safety and effectiveness include standardised i.v. infusion protocols[13] and standardised i.v. pain management protocols.[14] Our pre-project consultation found that there was significant variation in practice regarding paediatric procedural sedation, both within and between health services. This posed risks as there were inconsistent processes for authorising staff to perform sedation, assessment and monitoring during sedation episodes and post-sedation care. There were also gaps in monitoring of adverse events and in clinical audit. This project expanded on work performed by Royal Children's and Sunshine Hospitals by adding clinical governance and clinical audit components, and updating and generalising the content so that it was suitable for health services with varying resources. Although participation was voluntary, uptake was high, probably reflecting both a perceived need and an attractive programme.

Feedback from EDs was positive. As well as direct project-related impacts, staff also reported improvements in medical-nursing teamwork, an important aspect of emergency medical care.

With projects like this, sustainability is a key question. We have secured resources to conduct further train-the-trainer activities to ensure a future pool of trainers and for some minor changes to the supporting materials. Most EDs report that training and credentialing is already integrated into 'routine' activities.

This project has some limitations that should be considered when interpreting its results. The clinical governance assessment results are reliant on data from a self-assessment, and thus potentially open to bias. Staff training numbers were reported by participating hospitals and are not verifiable. Data for the clinical audit were collected retrospectively from clinical records, and so they are subject to problems with missing data. Thus, the results might underestimate compliance with the audit elements. The number of cases audited by EDs varied from 5 to 20, largely based on patient volume, and although designed as a consecutive sample, it is likely in reality to be a convenience sample in some EDs; this is not possible to quantify. That said, EDs reported clinical audit data on all cases between implementation and the project closure date to a maximum of 20, so selection bias is unlikely. Results of the audit might have been influenced by data from higher-volume EDs. Pre-implementation documentation was not assessed, and clinical outcomes such as success of procedure and adverse event rate were not measured either pre- or post-implementation. This reflects the pragmatic, quality improvement design of the project.

Conclusion

This multi-modal implementation strategy has achieved clinical practice improvement across organisational boundaries, with improvements in clinical governance arrangements and key processes for safe and effective care.

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Competing interests

JP and EC are employees of the Department of Health (Victoria). A-MK is a member of the editorial board of *Emergency Medicine Australasia*. JP, EC and A-MK were members of the ECIICN management team at the time of the project.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix S1. Paediatric procedural sedation: safe clinical practice assessment.
Appendix S2. Risk assessment and record form.
Appendix S3. Clinical audit matrix.