Safe Sedation Practices Post-Radiological Procedures (CT and MRI) in Paediatric Patients

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ABSTRACT

Background
Children aged 0 to 12 years undergoing CT and MRI often require sedation. At Columbia Asia Hospital – Setapak, chloral hydrate has traditionally been used however pre-initiative post-sedation care was inconsistent which may create risks of unrecognized airway obstruction, falls, and delayed event detection.

Methods
A quality improvement project was initiated from June 2025 aim to focus on compliance to sedation protocol, continuous monitoring, supervised recovery in ward or Daycare, and staff training. Children aged 0 to 12 years requiring sedation with chloral hydrate and/or midazolam were included. Outcomes measured were compliance to protocol, adverse events and sedation success. Improvements were assessed based on outcomes observed between June and August 2025.

Results
Thirty-seven procedures (33 CT and 4 MRI) were performed; 5 (14%) required sedation. Protocol compliance, monitoring, and supervised recovery reached 100%. No major adverse events occurred, and sedation success was 100%.

Conclusion
Standardized sedation protocols eliminated major adverse events, improved consistency, and maintained high imaging success, demonstrating feasibility even in resource-limited settings.

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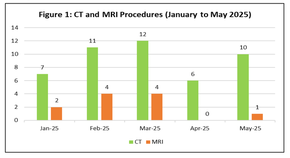
INTRODUCTION

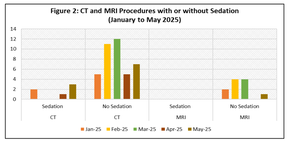
Children age of 0 to 12 years old undergoing advanced imaging such as CT and MRI often require sedation to achieve immobility. In many centres, including Columbia Asia Hospital (CAH) – Setapak, chloral hydrate has historically been the first-line sedative because of its oral administration and wide safety margin in low-resource settings.

Post-sedation care especially for both inpatients and outpatients were inconsistent. For outpatient, once the scan was completed, sedated children were handed back to their parents, who would hold the child in the outpatient waiting area until they awakened. During this period, no nursing monitoring was provided. This practice introduced potential safety risks:

- Unrecognized airway obstruction, since continuous vital sign monitoring was not performed.
- Falls or trauma from lapses in parental vigilance while the child was still drowsy.
- Delayed recognition of adverse events such as prolonged sedation.

From January and May 2025, a total of 46 CT scans and 11 MRI scans were performed in children aged 0 to 12 years. Out of 57 total procedures, 6 required sedation with chloral hydrate and/or midazolam. CT scans accounted for most sedated cases, while MRI patients mostly underwent scans without sedation as most children can cooperate during the procedure.





Aim

1. Achieve **≥95% compliance** with the standardized paediatric sedation checklist.
2. Record **zero major adverse events** during sedation or recovery.
3. Ensure **100% of patients** receive monitored nursing observation until fully awake.

METHODS AND MATERIALS

This quality improvement project was conducted at the Radiology Department from June to August 2025.

Inclusion criteria: Children aged 0 to 12 years old requiring CT or MRI under sedation (chloral hydrate and /or midazolam).
Exclusion criteria: Patients with ASA class IV, known airway anomalies, or those requiring general anaesthesia.

Intervention:
A sedation safety protocol was implemented to replace previous practice:

- **Monitoring of compliance to sedation checklist**.
- **Continuous monitoring**
  - **Inpatients -** monitored in the ward with continuous pulse oximetry, heart rate, and respiratory rate observation.
  - **Outpatients -** transferred to the Daycare Ward, where pulse, heart rate, and respiratory rate were closely monitored until full recovery.
- **Post-sedation nursing observation** – minimum 60 minutes or until the child was fully awake.
- **Staff training** – nursing and radiology teams trained in sedation monitoring and airway rescue.

Data collection:

- Sedation logs, incident reports, and monthly compliance audits.
- Outcomes: protocol compliance, sedation success rate, adverse events, and imaging success.

RESULTS

Between **June and August 2025**, a total of **37 paediatric imaging procedures** were performed under the revised sedation protocol (33 CT scans and 4 MRI scans). Sedation was required in **5 cases (14%)** in June 2025**,** the majority involving CT. Chloral hydrate was administered in 2 cases, midazolam in 2 cases, and in 1 case a combination of Chloral hydrate and midazolam. **No sedation required for radiological procedures in July and August 2025**.

Regular audit was conducted to assess compliance to the new initiatives and results shown as below:

- **100% compliance to protocol**, with all 5 sedated cases completing the standardized checklist prior to administration.
- **Continuous intra-procedural monitoring was achieved in 100%** of sedated patients.
- **Post-sedation nursing observation** in the ward or Daycare for a minimum of 60 minutes was **documented in all cases**.
- **No major adverse events** such as hypoxemia, airway obstruction, or prolonged sedation were recorded.
- The **sedation success rate was 100%,** with all sedated children achieving adequate immobility for imaging.

All relevant **staff received focused training** on safe post-procedure monitoring, emphasizing on early recognition of sedation-related complications, use of standardized monitoring protocols, complete documentation of observations and escalation pathways for managing adverse events.

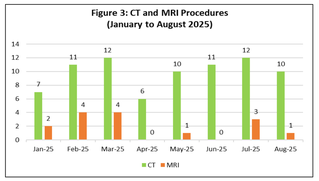
MANAGEMENT OF PAEDIATRIC PATIENT FOR PROCEDURE UNDER SEDATION (ORAL CHLORDHYDRATE)

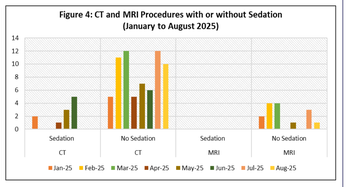
FLOW		RESPONSIBILITY
Upon confirmation patient for sedation		**Consultant**
• Send patient to ASC for the procedure • Consultant to order medication and indicate in CARE21 • SRN OPD collect medication from pharmacy and send patient to ASC. • Staff Nurse verify with consultant before administer medication	→	**Consultant PCA Staff Nurse OPD & ASC**
• Place patient and guardian in the comfort cubicle. • Staff nurse OPD serve medication as per prescribed. Verify by Staff Nurse ASC.	→	**Consultant PCA Staff Nurse OPD & ASC**
• Procedure perform by Consultant • Continue observation in Day Care till patient stable. *Follow SOP of Use of Sedation, MED 011 /04* • Monitor vital sign and record every 30 Minutes • Once the patient fully awake, allow for taking orally	→	**Consultant Staff Nurse ASC**
• Indicate and document report into CARE 21 • Update consultant on the status before allowing for discharge • Accompanied guardian to Cashier. • Proceed for discharge.	→	**Consultant Staff Nurse ASC PCA**

Pediatric Sedation Checklist for CT/MRI Procedures

Sedation Phase	Checklist Items	Yes	NO
Pre-Sedation	Confirm indication for sedation		
	Review medical history: allergies, medications, conditions		
	Allergies : If yes :		
	Check fasting status: Last meal:		
	Consent obtain		
	Explain procedure. Refer prescription chart		
	Ensure resuscitation equipment and monitoring devices available.		
	Take vital sign as baseline		
During Sedation	Continuous monitoring: SpO₂, HR, RR, consciousness Record vitals every 5–10 minutes		
	Avoid unnecessary stimulation during scan		
	Watch for adverse reactions Maintain airway patency		
	Provide comfort.		
	Document vital signs.		
Post-Sedation	Continue monitoring until baseline consciousness returns		
	Check stable vitals and adequate breathing Ensure no residual sedation effects		
	Document sedation agent, dose, route, time Record monitoring data and recovery status		
	Continue to monitor the patient until patient is fully recovered • Airway patency • Breathing patterns		
	Confirm discharge criteria met		
	Provide post-care instructions to guardian		
	Plan should include instructions on post procedure home care		
	Patient must be reviewed by a Consultant before discharge		
	Name of staff		
	Staff signature		
	Date		

GRAPHS AND TABLES

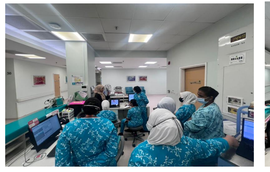




Pre vs Post Intervention Outcomes (Paediatric Sedation for CT and MRI)

Outcome	Baseline (Jan to May 2025)	Intervention (Jun to Aug 2025)
Total procedures	57	37
Sedated cases	6 (11%)	5 (14%)
Sedation checklist compliance	Not monitored	100%
Continuous monitoring documented	Not monitored	100%
Post-sedation nursing observation	Not monitored	100%
Adverse events	0	0
Sedation success	Not monitored	100% (5/5)

Staff training





DISCUSSION

This project showed that a standardized sedation protocol improved safety and consistency in radiology procedures for paediatric patients age 0 to 12 years old at CAH – Setapak. Over three months, 37 imaging procedures were performed, with 5 (14%) requiring sedation. Compliance with the checklist, continuous monitoring, and supervised recovery reached 100%. No major adverse events occurred. CT required sedation more often than MRI.

These findings are consistent with published reports showing that chloral hydrate, when combined with standardized protocols, remains a safe and effective sedative for children in low-resource settings. International guidelines emphasize the importance of structured checklists, continuous monitoring, and supervised recovery to minimize sedation-related morbidity.

The main limitations of this project include short duration, and relatively small sample size. Nevertheless, the intervention achieved full compliance, no major adverse outcomes, and sedation success above 95%, establishing a strong foundation for expansion and for benchmarking against national standards.

CONCLUSIONS

The introduction of a standardized sedation protocol in paediatric radiology at CAH – Setapak achieved 100% compliance with monitoring and recovery standards and eliminated major adverse events. These results show that safe and reliable sedation is achievable through structured protocols, even in resource-limited settings. Future work should focus on expanding the protocol to other radiology services and benchmarking against national standards.

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