

The background of the slide is a photograph of a Siemens CT scanner in a clinical setting. In the foreground, a patient bed is visible, covered with a white sheet and a yellow blanket. The text is overlaid on this image.

PROCEDURAL SEDATION FOR PAEDIATRIC CT SCANS IN PORT MORESBY GENERAL HOSPITAL

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PMGH

MMED 2 2021

MMED 2 RESEARCH THESIS

INTRODUCTION

- The CT has been an important diagnostic tool since 1970s
- PMGH: 1st CT machine in 2008
- Paediatric CT scans are often complicated by anxiety in children
- The need for sedation as proven important in increase success rates of completing CT scans
- The introduction of sedation protocols are important in providing quality standardized services



DEFINITIONS

- Success: CT scan completed after the administration of sedation
- Failure: CT scan abandoned due to excessive movement of child despite administration of sedation
- Prolonged sedation: sedation exceeds 1 hours
- Non-Anaesthetist: a health worker (doctor, nurse, etc.) without advanced Anaesthesia training example Paediatric registrar



LEVELS OF SEDATION

	Minimal Sedation	Moderate Sedation	Deep Sedation	General Anaesthesia
Responsiveness	Normal	Purposeful response to verbal/tactile situation	Purposeful response to verbal/tactile situation	Unarousable even with painful sedation
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular function	Unaffected	Usually maintained	Usually maintained	May be impaired

Arrangement in PMGH prior to study

**Deep sedation provided by
Anaesthetist in CT room**

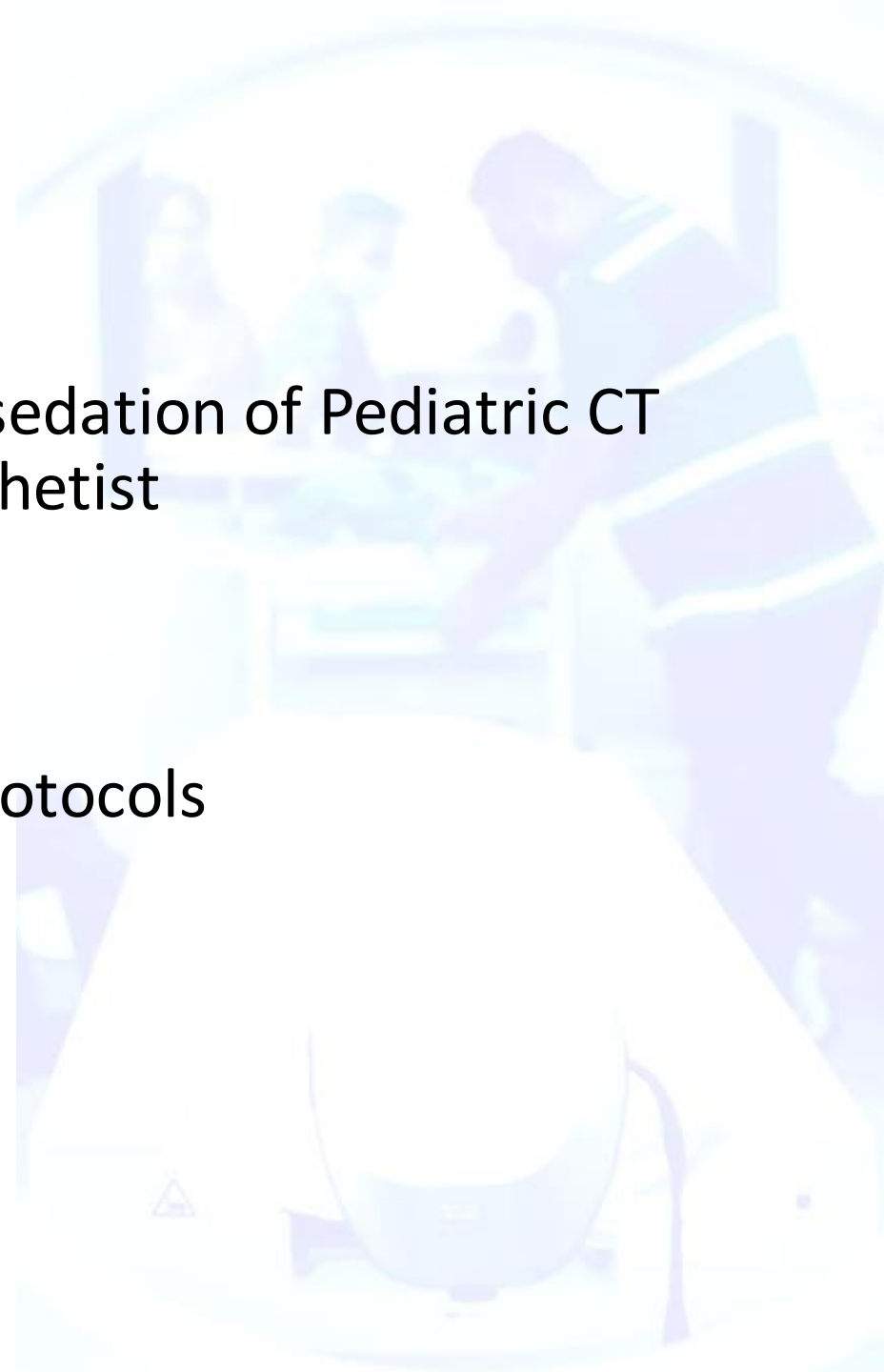


AIM

Assess safety and effectiveness of procedural sedation of Pediatric CT scans provided by non-Anesthetist

Secondary Aims

1. Identify risk factors for failure of sedation protocols
2. Identify complications from sedations



Methodology

- Prospective Observational Cohort
- Sample Size: 99 participants
- Site of Study: Port Moresby General Hospital
- Study Period: Sept 2020-June 2021 (10 months)
- Ethical clearance: SMHS Ethics and Research Committee



- Data collected from pre-sedation assessment, intra procedural and post sedation assessment forms
- Data analysis: inputted on an excel spreadsheet and analysed using stata
- No financial assistance required

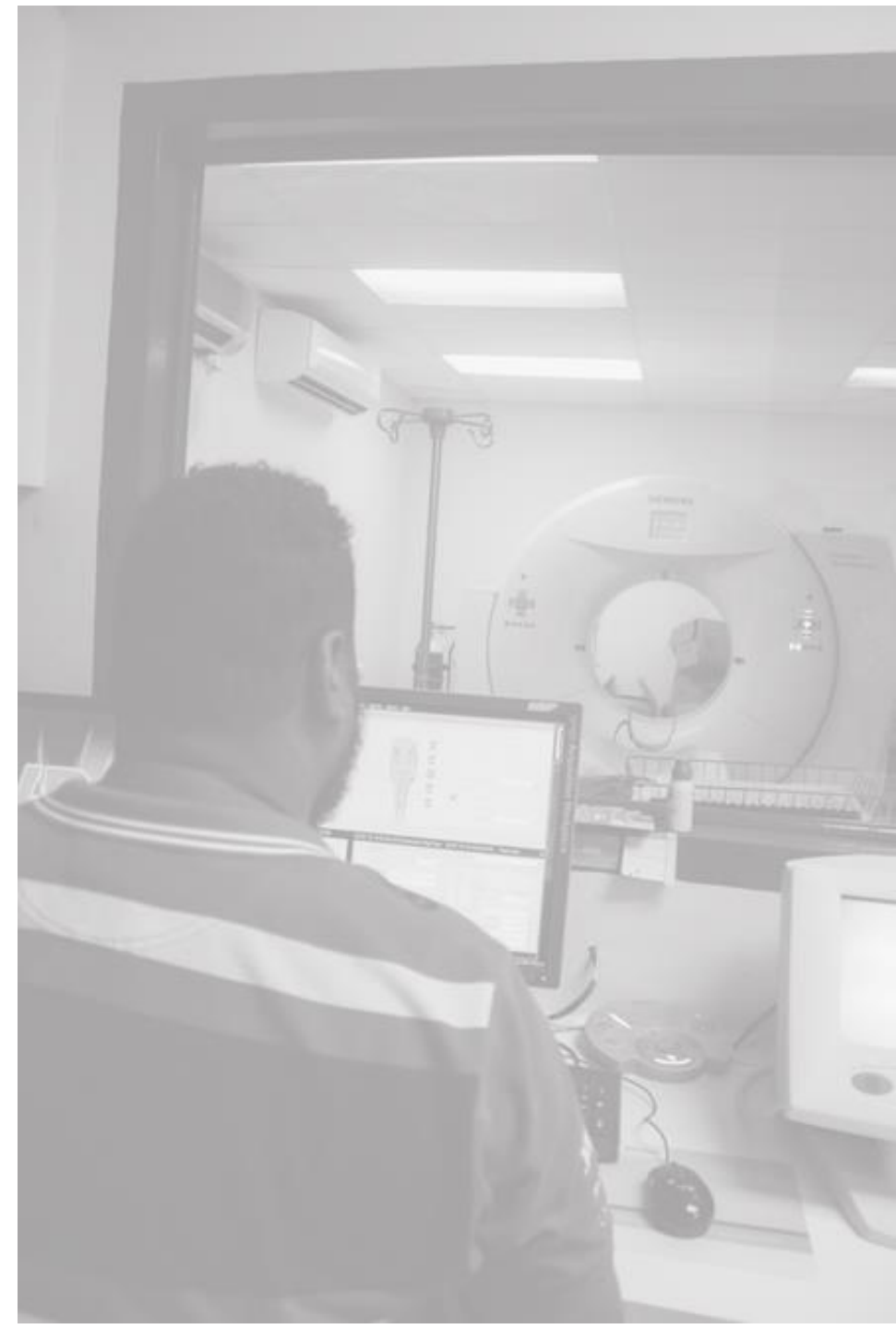


ASA CLASS

ASA class	Physical status
1	Normal healthy patient
2	Patient with mild systemic disease
3	Patient with severe systemic disease
4	Patient with severe systemic disease that is a constant threat to life
5	Moribund patient not expected to survive without emergent procedure

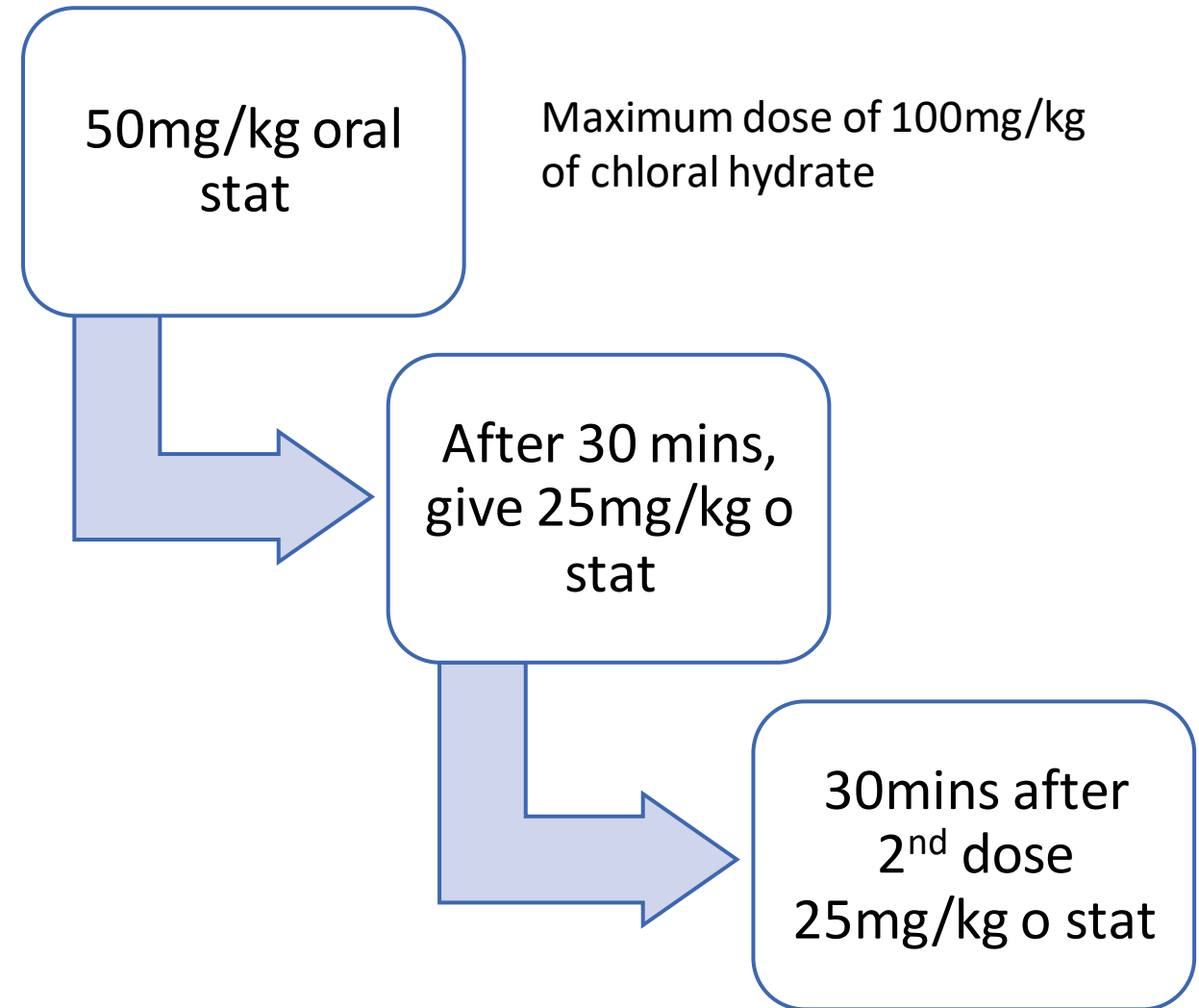
ASA FASTING CRITERIA

- 2 hours since last drink of clear fluids
- 4 hours since last breastmilk
- 6 hours since last solids eaten



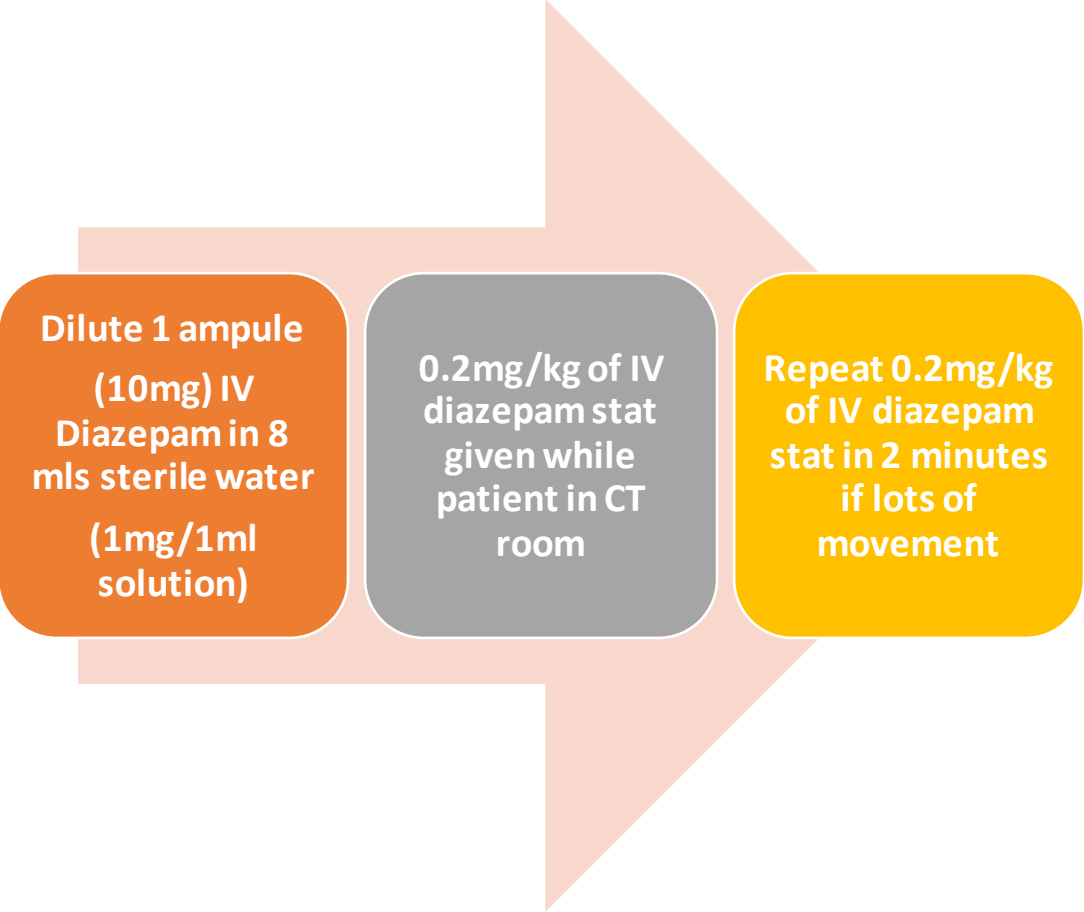
METHODOLOGY- CHLORAL HYDRATE PROTOCOL

1. Ensure emergency equipment available
2. MO available (IVC if needs contrast)
3. Meet selection criteria for sedation
4. Parental consent + present
5. Risk assessment
6. Pre-sedation vitals
7. Drug administration
8. 30min post sedation vital observation
9. Meet sedation score of 2 then do CT scan
10. Continue 30min observations till patient reaches recovery score of 6



METHODOLOGY- IV DIAZAPEM PROTOCOL

1. Ensure emergency equipment available
2. MO available
3. IVC in situ
4. Meet selection criteria for sedation
5. Parental consent + present
6. Risk assessment
7. Pre-sedation vitals
8. Drug administration on CT bed
9. Meet sedation score of 1/2 then do CT scan
10. Continue 10min observations till patient reaches recovery score of 6



Dilute 1 ampule
(10mg) IV
Diazepam in 8
mls sterile water
(1mg/1ml
solution)

0.2mg/kg of IV
diazepam stat
given while
patient in CT
room

Repeat 0.2mg/kg
of IV diazepam
stat in 2 minutes
if lots of
movement

RESULTS

CT SCANS ORDERED

■ Head ■ Abdomen ■ Neck ■ Chest ■ Spine ■ Multiple regions

33.8% of booked Paediatric CT scans required procedural sedation

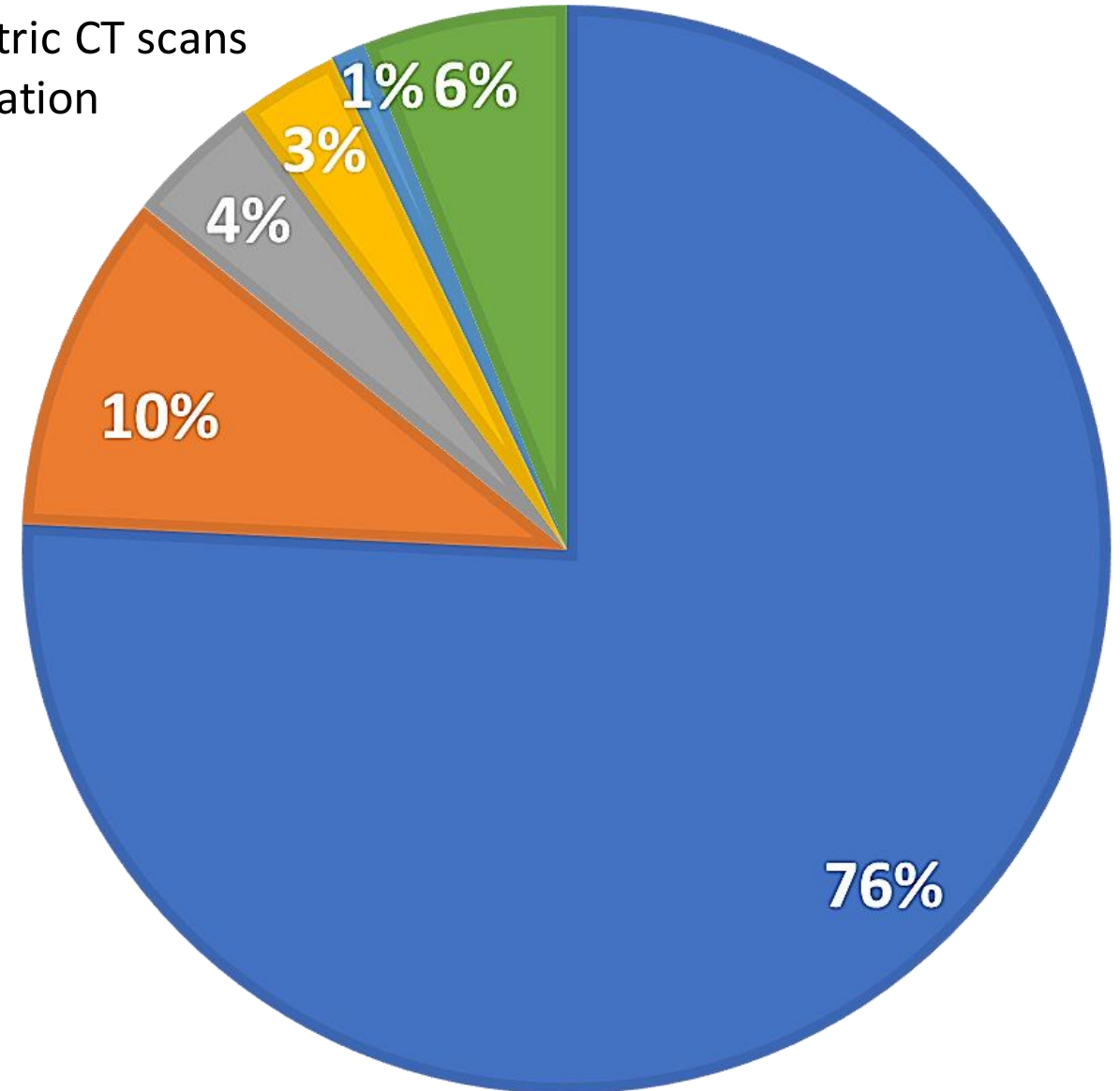
293 booked Paediatric CT scans

procedures excluded (n=194)

sedation events (n=99)

Chloral hydrate (N=49)

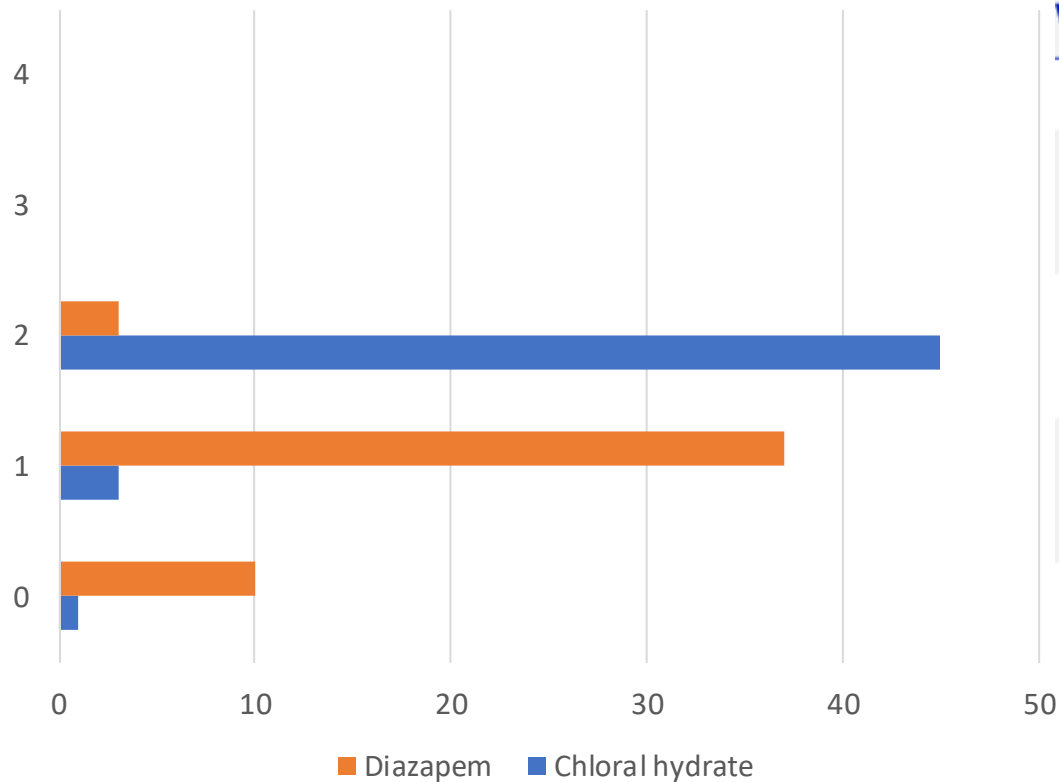
IV Diazepam (n = 50)



	CHLORAL HYDRATE	DIAZAPEM
Patients (n=99)	49	50
Sex (Male:Female)	68 (68.7):31 (31.3)	
Median Age	24 months (IQR 12-36 months)	
Median Weight	11 kg (IQR 9-15 kg)	
Success Rate	97.9%	80%
Failure (Fisher's exact p = 0.008)	1	10
Required only one dose	41 (84%)	7 (14%)
Required top up doses	8 (4 needed 1 top up; 4 required 2 top up)	43
Reached a sedation score of 2 or more	45	3
Recovery >1 hours	4	0
Complications (Airway, breathing or circulation)	0	0
Other complications-vomiting	4	0

UNIVERSITY OF MICHIGIN SEDATION SCORE (UMSS)

Maximum Sedation score achieved



Value	State of the patient
0	Awake and alert
1	Minimally sedated: tired/sleepy; appropriate response to verbal conversation and/or sound.
2	Moderately sedated: somnolent/sleeping; easily aroused with light tactile stimulation or a simple verbal command.
3	Deeply sedated: deep sleep; aroused only with significant physical stimulation.
4	Unarousable

STEWARD RECOVERY SCORE

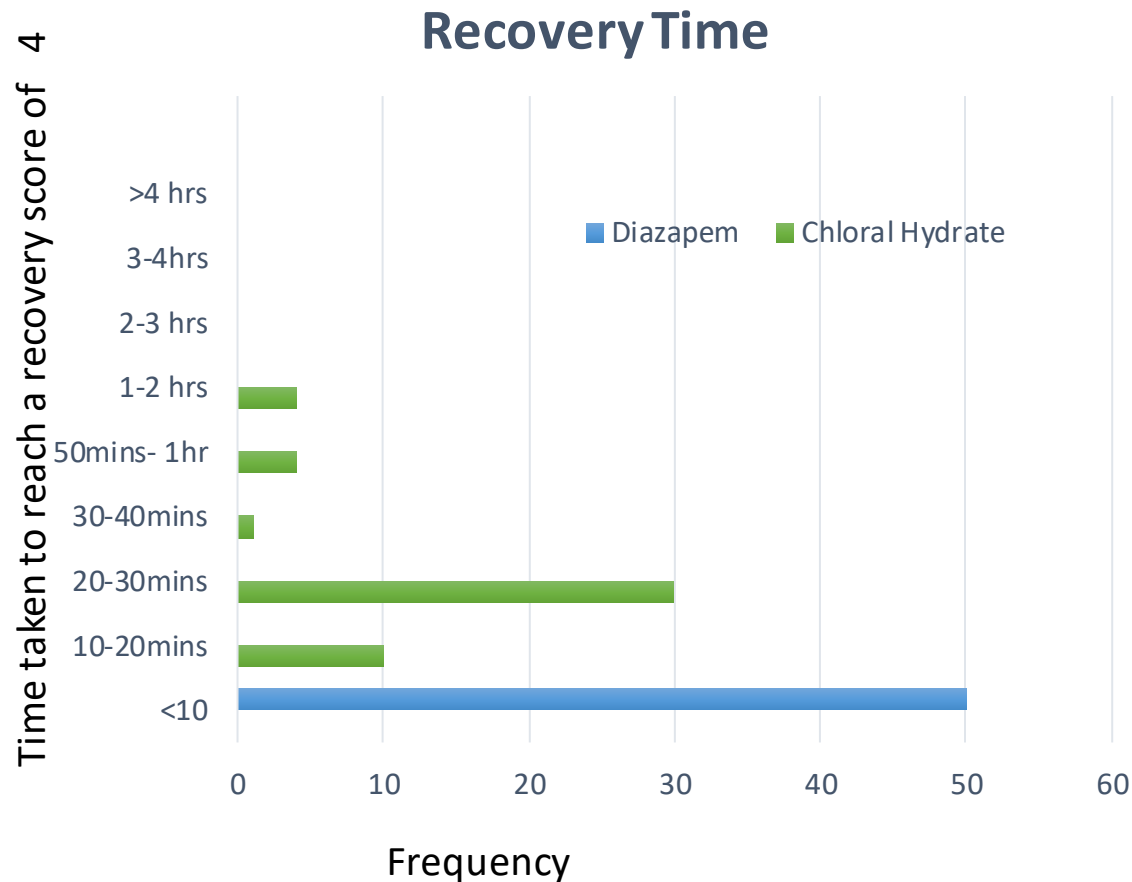


Table 3. Steward Postanesthetic Recovery Score

CONSCIOUS

Awake	2
Responding to stimuli	1
Not responding	0

AIRWAY

Coughing or crying	2
Maintaining good airway	1
Airway requires intervention	0

MOVEMENT

Moving limbs purposefully	2
Nonpurposeful movement	1
No movement	0

Adapted from: Krauss B, Brustowicz, RM. Postsedation evaluation. In: *Pediatric Procedural Sedation and Analgesia*. Philadelphia: Lippincott, Williams and Wilkins; 1999.

Results-Factors that could influence success

- The most significant factors that influence success of sedation included (1) the drug used (2) ASA score

SUCCESS	Odds Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
NumberofCTregions	1.694024	2.024421	0.44	0.659	.162818	17.6253
DRUG	.0479181	.0608161	-2.39	0.017	.0039828	.5765225
AGE	.9967359	.0143283	-0.23	0.820	.9690448	1.025218
ASA	.1693385	.1216888	-2.47	0.013	.0414068	.692532
_cons	56222.6	190957.5	3.22	0.001	72.25102	4.37e+07

Discussion

- The first monitoring sedation guideline was published in 1985 in response to reports of three deaths in a single dental office. The aim of the guideline was to establish uniform standards for sedation throughout all paediatric subspecialties
- Chloral hydrate has been used in children since 1894. Adverse effects are few when given in a single dose orally. The main disadvantage is gastric irritation leading to vomiting. Repeated doses may cause CNS depression, hyperbilirubinaemia in newborns and metabolic acidosis. It produces effective sedation in 89-90% of patients
- In this study the success rate of chloral hydrate was 97.9% and the main complications were vomiting (4) and prolonged sedation/CNS Depression (4) noted in the all 4 patients who received the total of 100mg/kg of chloral hydrate. Which is consistent with numerous studies internationally.

- Diazepam is commonly indicated in the treatment of acute ethanol withdrawal, anxiety, muscle spasms, preoperative anxiety, sedation in ICU and treatment of seizures. Adverse effects include CNS and respiratory depression, dependence and withdrawal symptoms
- No data is available on the comparison the use of IV Diazepam to chloral hydrate. However, sedation failure rates of chloral hydrate were similar between groups for comparisons with oral dexmedetomidine, oral hydroxyzine hydrochloride, oral midazolam and oral clonidine
- Multiple studies compare the use of midazolam and diazepam in pre-operative gastrointestinal procedures. All of whom suggest midazolam is a better drug of choice
- Diazepam and midazolam are both effective for conscious sedation in ED patients. Midazolam causes less pain on injection, a significantly greater degree of early sedation, and a more rapid return to baseline function
- In this study IV Diazepam had a 80% success rate in the CT room with no complications noted. It is also important to not that it was a significant risk factor for failure compared to chloral hydrate with a fisher's exact $p=0.08$

Limitations

- Man power shortages “one man show”
- Non-availability of sedatives
- Missing information
- Scheduling issues
- Small sample size
- This study was carried out throughout the Pandemic



Conclusion

Detailed pre-sedation assessment, intra-procedural observation and post-sedation observations are important to ensure safe and effective sedation occurs as noted with the low occurrence of complications

This study proves that a non-Anesthetist can provide safe and effective sedation with the use of oral chloral hydrate and intravenous diazepam



Recommendation

- More accessibility of sedatives
- Diversification of sedation options
- Reintroduction of chloral hydrate into the catalogue
- Establishments of sedation teams within the Paediatric Departments
- Proper planning for post sedation observations
- More studies for procedural sedations



Acknowledgement

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