

Paediatric Sedation : Keep it Safe!

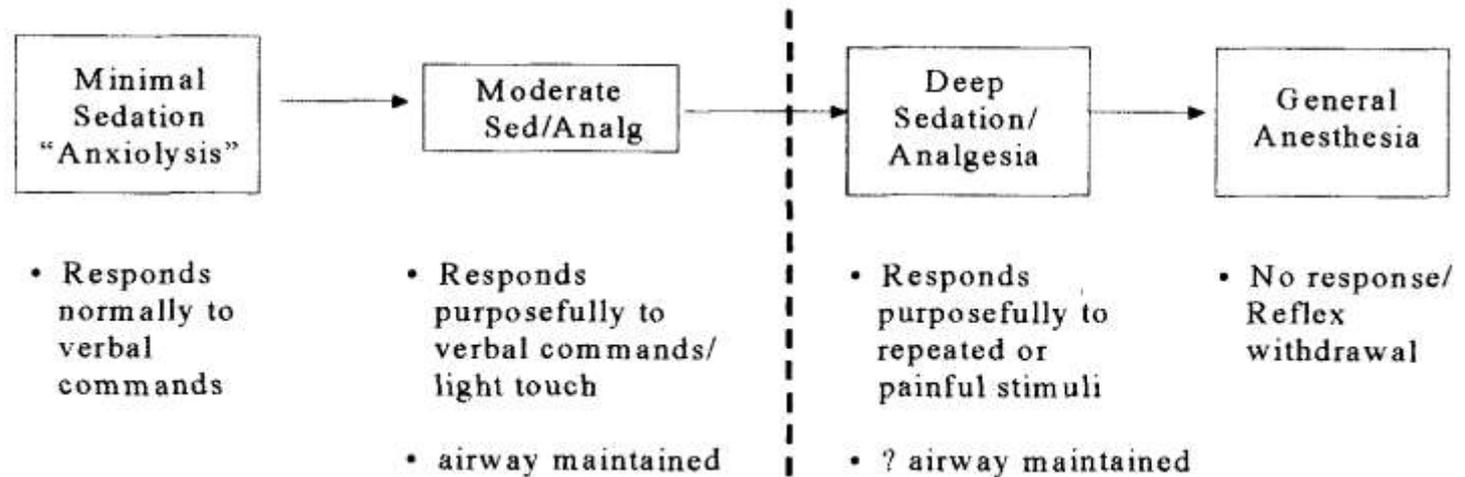


**Dr Theresa Hui
Consultant and Head
Division of Paediatric Anaesthesia
Department of Anaesthesiology
Queen Mary Hospital**

What is Sedation?

- Depression of the central nervous system and / or reflexes by the administration of drugs by any route to decrease patient discomfort without producing unintended loss of consciousness.
- Sedation is required to facilitate unpleasant diagnostic or minor surgical procedures.

ASA & JCAHO Continuum of Sedation



- Sedation is not a set of discrete, well-defined stages but a continuum where there is the transition from complete consciousness through the various depths of sedation to general anaesthesia.
- In patients of any age, attempts at moderate sedation can rapidly and unpredictably become deep sedation or general anaesthesia.

Different from adult?



Paediatric Patient

- Respiratory physiology – hypoxic more readily.
- Pharmacology differs from adult.
 - Age specific recommendation e.g. chloral hydrate : 30-50mg/kg in neonate, 50-75mg/kg - 1 month to <6 years.
- Psychology – Parent & child.



Ideal Sedating agent?

- NIL!
- All sedatives and narcotics have caused problems even in 'recommended doses'.



Risks of Sedation

- Protective reflexes - obtunded, airway obstruction may occur at any time.
- A wide variety of drugs, with potential adverse interactions, may be given.
- Absorption, distribution and efficacy of drugs – difficult to predict.
- Unpredictable individual variation in response to drugs.
- Excessive sedatives - compensate for analgesia.
- Sedation may outlast the procedure.



Non-pharmacological techniques for painless procedures



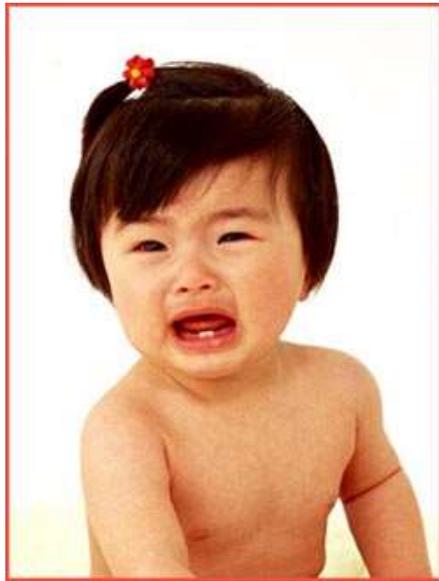
School age children (>5 years old)

- Distraction / reassurance.
- Child friendly.
- Parental presence.



Small infant

- Sleep deprivation.
- After a feed.
- Warm / quiet environment.



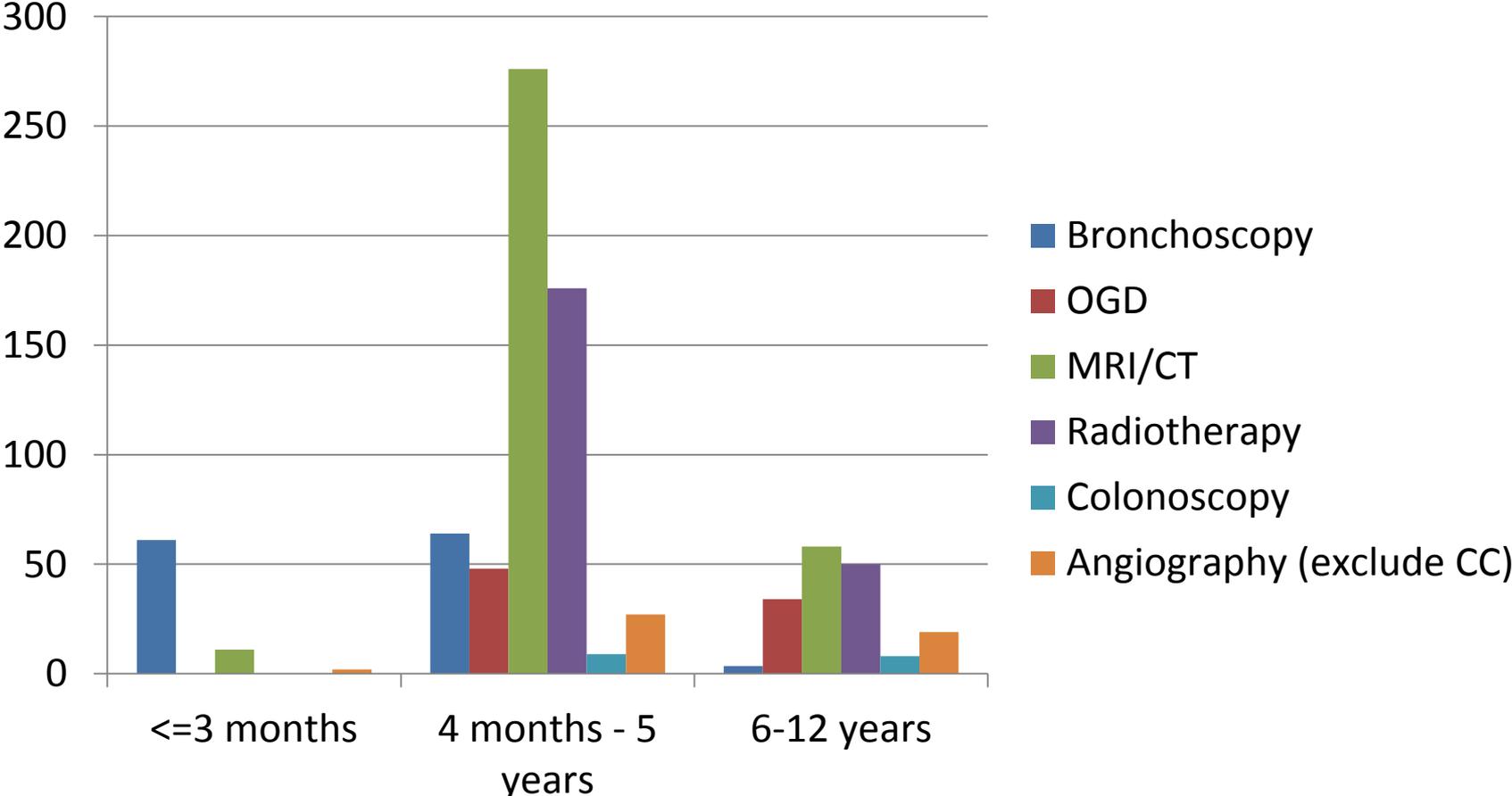
Children aged 4 months to 5 years, require deep sedation / general anaesthesia.

Statistics on Some Common Paediatric Procedures Performed in HA in 2008

Age	Bronchoscopy	OGD	ERCP	MRI/ CT	Radiotherapy	Colonoscopy	Angiography (excluding CC)
<= 3months	59	1	0	3542	0	1	0
4months - 5years	71	21	3	9163	58	16	214
6-12 years	23	73	3	10160	14	24	110
Total	153	95	6	22865	72	41	324

In 2008, there were a total of 23556 procedures done in children (as tabled) in HA hospitals. Other common procedures like LP, change of dressings in burn patients, EEG, eye examinations, wound care, removal of sutures etc are not included in the above statistics.

Number of Paediatric Sedation Procedures by Anaesthesiologists in 2015 (Jan 15 - Dec 15)



Who provide Paediatric Sedation in HA?

- Paediatricians , anaesthesiologists, paediatric surgeons, orthopaedic surgeonsetc.
- Mostly residents, sometimes AC / houseman /consultant.
- Variable training.





What happened when sedation
went wrong?



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Adverse Sedation Events in Pediatrics: A Critical Incident Analysis of Contributing Factors

Charles J. Coté, Daniel A. Notterman, Helen W. Karl, Joseph A. Weinberg and Carolyn McCloskey
Pediatrics 2000;105;805

- Critical incident analysis of sedation-related adverse events.
- 95 incidents – 60 deaths /neurologic injury.
- Contributing factors:
 - Inadequate resuscitation.
 - Inadequate monitoring.
 - Inadequate pre-sedation medical evaluation.
 - Lack of an independent observer.
 - Medication errors.
 - Inadequate recovery.

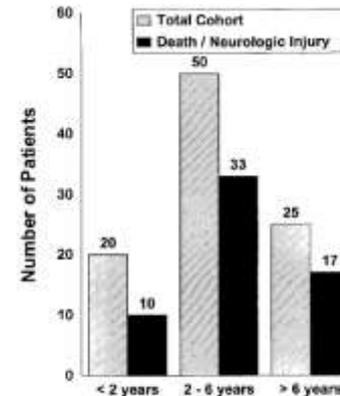
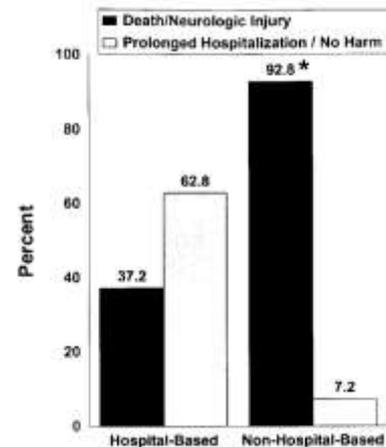


Fig 1. Distribution of cases by age. Note that the majority of patients were 6 years old or less but that there was no relationship between age and adverse outcome.



What are the measures to enhance safety in paediatric sedation?



	Hospital Authority Head Office	Document No.	HAHO-COC-GL-PAE-001-v01
	Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures	Issue Date	30/12/2013
		Review Date	30/12/2016
		Page	1 of 35

Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures

FOR HAHO INTERNAL CIRCULATION ONLY

Version	Effective Date
1	31 December 2013
Previous Version: Guidelines for Sedation of Children in Diagnostic and Therapeutic Procedures	Year 2000

Document Number	HAHO-COC-GL-PAE-001-v01
Author	Paediatric Sedation Guideline Working Group
Custodian	Secretary, Co-ordinating Committee in Paediatrics
Approved/ Endorsed By	Co-ordinating Committee in Anaesthesiology Co-ordinating Committee in Paediatrics
Approval Date	18 December 2013
Distribution List	HA Staff

Pre-sedation Assessment

- *All* patients should be evaluated prior to procedure for their risk and suitability for sedation.
- Medical history :
 - major illness
 - congenital defect
 - recent or current illness
 - allergy history
 - use of medication
 - past history of sedation or anaesthesia
- General examination – pulmonary / cardiac status.
- Baseline HR, BP, RR and temp.

SPEAKING OUT AND DRIVING CHANGE FOR CHILDREN

children

at Risk

for sedation

Airway problems like difficult airway

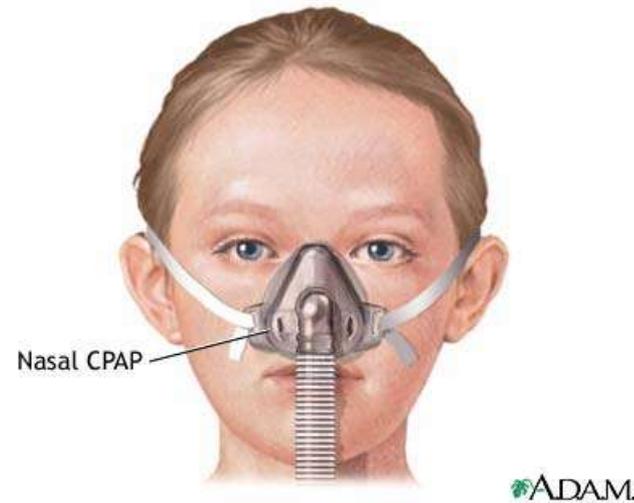


Tumour inside oral cavity (2 days old)



Mucopolysaccharidosis

Obstructive Sleep Apnoea

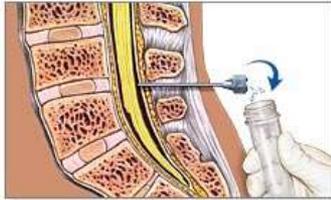


The Morbidly Obese



Invasive / painful procedures

- deep sedation / general anaesthesia is required



Spinal fluid
is collected
for testing



Past failed sedation or paradoxical reaction to sedation





Prematurity or ex-premature infants <60 weeks post-conceptual age

Active pulmonary, cardiovascular, GI or neurologic problems



Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures. Hospital Authority 2013

ASA 3 and Greater

The American Society of Anesthesiologists's (ASA)

classification of physical status:

1. A normal healthy patient.
2. A patient with mild systemic disease (eg. A child with controlled reactive airway disease)
3. A patient with severe systemic disease (eg. A child who is actively wheezing)
4. A patient with severe systemic disease that is a constant threat to life (eg. A child with status asthmaticus)
5. A moribund patient who is not expected to survive without the operation (eg. A patient with severe cardiomyopathy requiring heart transplantation)

**Presence of anaesthesiologist /
experienced medical practitioner is
recommended!**

Fasting Guideline

Ingested material	Minimum fasting period (hours)
Clear fluids (10mls/kg)	2
Breast milk	4
Infant formula, non-human milk, light meal	6
Heavy meal or fatty food	8

Examples of clear fluids include water, glucose water, infant electrolyte solutions, real or artificial fruit juices without pulp, carbonated beverages, clear tea and black coffee without any type of creamer or milk.

Sedationist

- Qualified individual “competency-based education, training and experience”.
- Sound knowledge of the drugs / antidotes.
- Able to rescue the patient from the next level of sedation / anaesthesia.
- Practitioner intending to induce moderate sedation are competent to manage a compromised airway and inadequate oxygenation and ventilation.
- Practitioner intending to induce deep sedation are competent to manage an unstable cardiovascular system as well as a compromised airway and inadequate oxygenation and ventilation.
- Present throughout the procedure.
- Completely dedicated to that task.

Facilities and Equipment

- Adequate area and lighting for procedure and resuscitation
- Provision of an Emergency Cart for resuscitation equipment and drugs.
- Defibrillator readily available.
- A stethoscope



Basic airway management equipment



1) Source of compressed O2.



2) Source of suction.



3) Self-inflating breathing bag-valve set.



4) Age appropriate facemasks, oropharyngeal airway, nasal airway and suction catheters.

- Advanced airway management equipment
 - Laryngoscope handles (tested) and blades (age appropriate)
 - Endotracheal tubes
 - Stylets (appropriate sizes for endotracheal tubes)
- Intravenous equipment
 - Catheters / IV sets / IV fluids / syringes and needles.
- Emergency medications
 - Adrenaline
 - Atropine
 - Ephedrine
 - Lignocaine
 - Glucose
 - Hydrocortisone
 - Diazepam
 - Pharmacological antagonists :
Naloxone and Flumazenil.



Monitoring

- Pulse oximeter – HR, SpO₂.
- Blood pressure.
- ± ECG / RR.
- ETCO₂ if available for deep sedation.



Documentation

Use of standardized form and record.

1) Pre-sedation:

- Pre-sedation medical evaluation
- Fasting Status

 醫院管理局 HOSPITAL AUTHORITY	Paediatric Sedation	Patient's Particular (Please attach patient's gown label)
	PRE-SEDATION ASSESSMENT	
Diagnosis:		Procedure:
Date of Procedure:		Location of Procedure:
Body Weight (Kg):		If applicable: BR (no):
ASA: <input type="checkbox"/> I <input type="checkbox"/> II Mild systemic disease / <input type="checkbox"/> III Severe systemic / <input type="checkbox"/> IV Life threatening / <input type="checkbox"/> V Moribund		BSA (m ²): Pre-anaesthetic: <input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI <input type="checkbox"/> VII <input type="checkbox"/> VIII <input type="checkbox"/> IX <input type="checkbox"/> X
CURRENT MEDICAL HISTORY		PHYSICAL EXAMINATION
Heart Disease: <input type="checkbox"/> No <input type="checkbox"/> Yes:		Artery Abnormalities: <input type="checkbox"/> No <input type="checkbox"/> Large <input type="checkbox"/> Small
Lung Disease: <input type="checkbox"/> No <input type="checkbox"/> Yes:		<input type="checkbox"/> Breeding Chain Loud <input type="checkbox"/> Baring <input type="checkbox"/> Other:
Active / Recent URTE: <input type="checkbox"/> No <input type="checkbox"/> Yes:		CVS Abnormality: <input type="checkbox"/> No <input type="checkbox"/> Yes:
CHF Disease: <input type="checkbox"/> No <input type="checkbox"/> Yes:		Significance Abnormality: <input type="checkbox"/> No <input type="checkbox"/> Yes:
Bleeding Tendency: <input type="checkbox"/> No <input type="checkbox"/> Yes:		Neurological Abnormality: <input type="checkbox"/> No <input type="checkbox"/> Yes:
GI Reflux: <input type="checkbox"/> No <input type="checkbox"/> Yes:		Presence of Loose Teeth: <input type="checkbox"/> No <input type="checkbox"/> Yes:
Obstructive sleep/Apnoea: <input type="checkbox"/> No <input type="checkbox"/> Yes:		Other Abnormal ECG: <input type="checkbox"/> No <input type="checkbox"/> Yes:
Previous Sedation Failure: <input type="checkbox"/> No <input type="checkbox"/> Yes:		Details of Risk Ver:
Other Disease: <input type="checkbox"/> No <input type="checkbox"/> Yes:		
Details of Risk Ver:		
Infection Prevalence: <input type="checkbox"/> None / <input type="checkbox"/> Bacterial <input type="checkbox"/> Contact <input type="checkbox"/> Droplet <input type="checkbox"/> Airborne		
Baseline Vital Signs: BP: ___/___ mmHg HR: ___/min RR: ___/min SpO ₂ : ___% Temp: ___°C		
Consciousness level: <input type="checkbox"/> Alert <input type="checkbox"/> Drowsy <input type="checkbox"/> Confused <input type="checkbox"/> Comatose		
CURRENT MEDICATIONS		
DRUG ALLERGY: <input type="checkbox"/> No <input type="checkbox"/> Yes. → Please specify		
SUMMARY: Risk of Sedation: <input type="checkbox"/> Low Risk <input type="checkbox"/> Moderate Risk <input type="checkbox"/> High Risk		
SEDATION PLAN: <input type="checkbox"/> Oral Sedation <input type="checkbox"/> IV Sedation <input type="checkbox"/> Oral + IV Sedation		PARTICULAR:
<input type="checkbox"/> Need ICU Support <input type="checkbox"/> Need O ₂ <input type="checkbox"/>		
OTHER:		
IF ORAL SEDATION IS PLANNED:		IV Consideration before Oral Sedation: <input type="checkbox"/> No <input type="checkbox"/> Yes
GI after oral sedation: <input type="checkbox"/> No <input type="checkbox"/> Yes: <input type="checkbox"/> Large		Monitoring required after Oral sedation: <input type="checkbox"/> No <input type="checkbox"/> Yes
Executed by: <input type="checkbox"/> HCA <input type="checkbox"/> Nurse <input type="checkbox"/> Doctor		<input type="checkbox"/> NR <input type="checkbox"/> Sp O ₂ <input type="checkbox"/> RR <input type="checkbox"/> Consciousness <input type="checkbox"/> OTHER:
Doctor doing the Pre-Sedation Assessment		
Name:	Signature:	Date/Time:

Recovery and post procedure care

3) Post-sedation monitoring, discharge criteria and status, disposition of the child.

- Awakened while still fully monitored.
- Continued monitoring of SpO₂.
- Sedated child should never be left unobserved.
- Remained in recovery area till cardiovascular and respiratory stability are assured.

 HOSPITAL AUTHORITY	Hospital Authority Head Office	Document No.	HAHO-COC-GL-PAE-001-00
	Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures	Issue Date	30/12/2013
		Review Date	30/12/2016
		Page	1 of 35

 醫院管理局 HOSPITAL AUTHORITY	Paediatric Sedation	Patient's Particulars (Please attach patient's gum label)
	RECOVERY PHASE	
Immediate Sedation Outcome: <input type="checkbox"/> Intended level of sedation obtained <input type="checkbox"/> Failed sedation <input type="checkbox"/> Deeper level of sedation obtained than intended <input type="checkbox"/> Any airway intervention other than simple chin lift <input type="checkbox"/> * Adverse event occurred requiring treatment <input type="checkbox"/> # Reversal agent given (# Monitoring must be continued for a minimum of 2 hours after use of Naloxone or Flumazenil) <input type="checkbox"/> Recovery phase > 2 hours (Slow to wake up)		Other Events/ Comments:

Checklist for Discharge to Ward			
Patient is able to maintain airway, breathing well and SpO ₂ satisfactory		<input type="checkbox"/> Yes <input type="checkbox"/> No	
BP/ heart rate / RR are stable	<input type="checkbox"/> Yes <input type="checkbox"/> No	Patient is easily arousable	<input type="checkbox"/> Yes <input type="checkbox"/> No
Continue O ₂ supplement to ward	<input type="checkbox"/> Yes <input type="checkbox"/> No	Continuous SpO ₂ inward	<input type="checkbox"/> Yes <input type="checkbox"/> No
Monitoring in ward: SpO ₂ / BP/P / RR / Conscious level every _____ hr		<input type="checkbox"/> 24 hour in-patient observation needed: e.g. children with obstructive sleep apnoea	
Other Notes / Plan:			
Checked by: _____ (Name/Rank) Signature: _____ Time: _____ Date: _____			

Checklist for Discharge Home
<input type="checkbox"/> All vital signs (temp, HR, BP and RR) have returned to normal levels
<input type="checkbox"/> Patient is awake (or has returned to baseline level of consciousness)
<input type="checkbox"/> Nausea, vomiting and pain have been adequately managed
<input type="checkbox"/> Discharge information explained to patient or parent
Discharge information sheet given? <input type="checkbox"/> Yes <input type="checkbox"/> No
Other Notes:



Paediatric Sedation Course



- In 2014, COC (Paediatrics) in conjunction with HKCA.
- Simulation-based Training for Enhancing Sedation Safety in Children having Diagnostic & Therapeutic Procedure.
- Held at Simulation Centre at NDH.



Paediatric Sedation Course



- Pre-course web-based lectures followed by quiz.
- 12 provider courses : 112 doctors & 111 nurses.
- Mainly for paediatricians and nurses.
- Mandatory for trainees in paediatric.
- ?Extend to staff in other specialties.



Summary

- Paediatric sedation can be risky.
- Adoption of measures to enhance safety and adequate staff training are important to keep paediatric sedation safe in the Hospital Authority.

