

NORA for special needs kids

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No disclosures

Definitions

- ▶ NORA (Non-Operating Room Anaesthesia)
 - Anaesthesia or sedation
 - Endoscopy suite/ dental clinics/ MRI/ radiology suites/radiotherapy suites
 - Patient safety/ lack of cooperativity
- ▶ Special Needs
 - Physical, cognitive, behavioural or psychological challenges that result in the lack of cooperation with medical care
 - Additional considerations for anaesthetic care

Challenges

- ▶ Special needs child
 - Multiple stressors in the hospital environment facilitate meltdowns
 - Critically ill or not optimized particularly if late or atypical presentation
- ▶ Healthcare Staff
 - Unfamiliar with management of special needs child/ meltdowns
 - Varying levels of training with regards to resuscitation and support of anaesthesia
 - Need to expect an increased risk of periprocedural complications and difficulties
- ▶ NORA
 - Physical environment/ unfamiliarity/staff/equipment/work processes
 - Procedure specific complications such as perforation
 - Higher risk of substandard care
 - Increased risk of morbidity/mortality

The Anaesthesia Patient Safety Foundation: NORA Consensus Recommendations

- ▶ Facility
- ▶ Equipment/medication/supplies
- ▶ Staff and teamwork
- ▶ Pre-procedural care/ Patient selection
- ▶ Intra-procedural
- ▶ Post-procedural
- ▶ Continuous quality improvement

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NORA Consensus Recommendations (cont'd)

From "NORA Consensus," Preceding Page
Supplemental Table 1: Consensus summary for the safe conduct of anesthetic care in NORA locations.

FACILITY	STAFF AND TEAMWORK
<ol style="list-style-type: none"> Anesthesiology personnel should participate in planning, construction, expansion, or remodeling of NORA locations to ensure that patient safety and anesthetic needs are met. Anesthesiology personnel should encourage facility design teams to group NORA suites together, near the OR, or the PACU, to facilitate rapid access to additional personnel and equipment when needed. A reliable source of oxygen adequate for the length of the procedure and an immediately available backup supply are required. A central oxygen supply is ideal. A scavenging or capture system for anesthetic gas is required in locations where inhaled anesthesia is used. Electrical outlets shall be sufficient to supply anesthesia equipment and labeled to identify the backup power supply. The number of outlets available for backup power shall be sufficient to power equipment required to safely care for patients. Lighting shall be available to visualize the patient, equipment, supplies, and medications. Battery-powered backup lighting shall be available. There should be sufficient space to accommodate personnel with adequate clearance and expeditious access to the patient, equipment, supplies, and medications. Sufficient space shall be available to bring emergency equipment into the room. A source of continuous suction shall be available and dedicated for use by anesthesiology personnel. Pre- and postprocedural areas shall be available for preparing and recovering the patient. 	<ol style="list-style-type: none"> Communication, team building, expectations, and training should be established through a proactive collaborative process driven by anesthesiology personnel, nursing, surgical, and proceduralist leadership. In each NORA location adequate staff shall be trained to support the patient and the anesthesiology care team. The NORA team shall include at least two individuals with appropriate certification (ACLS, BLS, or PALS) and defined responsibilities to provide patient care during emergencies. Anesthesiology personnel should triage and evaluate complex cases, assist with scheduling, and optimize quality and safety protocols. A dedicated NORA anesthesiology team should be considered to facilitate communication and the adoption of protocols and pathways. Team members names and roles should be posted in the NORA location to facilitate communication during patient care.
EQUIPMENT, MEDICATIONS, AND SUPPLIES	PREPROCEDURAL CARE AND PATIENT SELECTION
<ol style="list-style-type: none"> Anesthesiology personnel should participate in capital budget planning for equipment required to set up, maintain, and improve NORA services. When volatile anesthetics are administered, an anesthesia machine sufficient for case types and maintained to facility standards is required. Emergency airway equipment, including multiple forms of rescue (e.g., supraglottic airways, video laryngoscope, cricothyrotomy kit, etc.) is required for each NORA location. A self-inflating hand resuscitator bag capable of delivering positive pressure ventilation while administering at least 50 percent oxygen is required. In each NORA location, emergency supplies including a defibrillator, medications, and other equipment to provide cardiopulmonary resuscitation are required. Equipment and medication for treatment of MH shall be present in all locations where volatile anesthetics are used. Succinylcholine or other equivalent rapid acting paralytic medications should be immediately available for emergency airway management in all NORA locations. When succinylcholine is present, staff shall be educated on MH and prepared to provide and aid treatment. Infusion pumps should incorporate dose error reduction systems (DEERS). Diagnostic testing capability appropriate for the patient population and planned procedures is required. Appropriate blood products and the equipment required for administration, such as a fluid warmer, shall be available for procedures that may have clinically significant blood loss. MRI safe equipment, including airway equipment, infusion pumps, monitors, and anesthesia machines shall be available for MRI, and providers trained on their use. Patient monitoring consistent with operating room standards should be displayed in the MRI control room. Intralipid for treatment of local anesthetic systemic toxicity (LAST) shall be available at NORA locations where local anesthetic is used for purposes other than local skin infiltration. Patient size and weight capacity limits should be established for each NORA site to confirm patient suitability based on equipment and other available resources. Crisis manuals appropriate for the patient population, procedures, and potential therapeutic complications shall be available to staff and clearly visible in each NORA location to serve as cognitive aids during emergencies. Protective equipment, including, but not limited to lead aprons, goggles and radiation shields shall be made available to all anesthesia personnel where radiation exposure may occur. Equipment, such as inflatable mattresses, for patient transfer to and from procedure table shall be available to avoid injury to patient and personnel. 	<ol style="list-style-type: none"> A preprocedural evaluation process shall be established based on the ASA Practice Advisory for Preanesthesia Evaluation and emerging best practice. Adult and pediatric patients with elevated BMI or a diagnosis or suspected diagnosis of OSA should be evaluated on a case-by-case basis for suitability for the planned procedural location and management plan. Before each procedure, a timeout shall be conducted per The Joint Commission Universal Protocol or according to the facility protocol including site marking and laterality as indicated. Appropriate education shall be provided to team members for new or unfamiliar procedure types, and specific aspects of the case shall be reviewed with NORA staff. All patients should be assessed for fall and venous thromboembolism risk and treated appropriately.
INTRAPROCEDURE CARE	POSTPROCEDURE CARE
	<ol style="list-style-type: none"> Intra-procedural monitoring shall adhere to ASA Standards for Basic Anesthetic Monitoring with additional monitoring based on patient comorbidities and/or the nature of the procedure. A formal system to call for assistance, designate personnel to respond, and transport a patient with appropriate monitoring from the NORA location to an in-patient facility shall be established.
CONTINUOUS QUALITY IMPROVEMENT	
	<ol style="list-style-type: none"> Anesthesia personnel should establish a quality review process to identify possible new safety risks and improve care on a regular basis. Periodic emergency response simulations should be performed to review system, communication, equipment, and educational infrastructure.

NORA, non-operating room anesthesia; OR, operating room; PACU, post-anesthesia care unit; MH, malignant hyperthermia; MRI, magnetic resonance imaging; ACLS, advanced cardiovascular life support; BLS, basic life support; PALS, pediatric advanced life support; BMI, body mass index; OSA, obstructive sleep apnea; ASA, American Society of Anesthesiologists

See "NORA Consensus," Next Page

How can we make it better and safer for these children undergoing NORA?

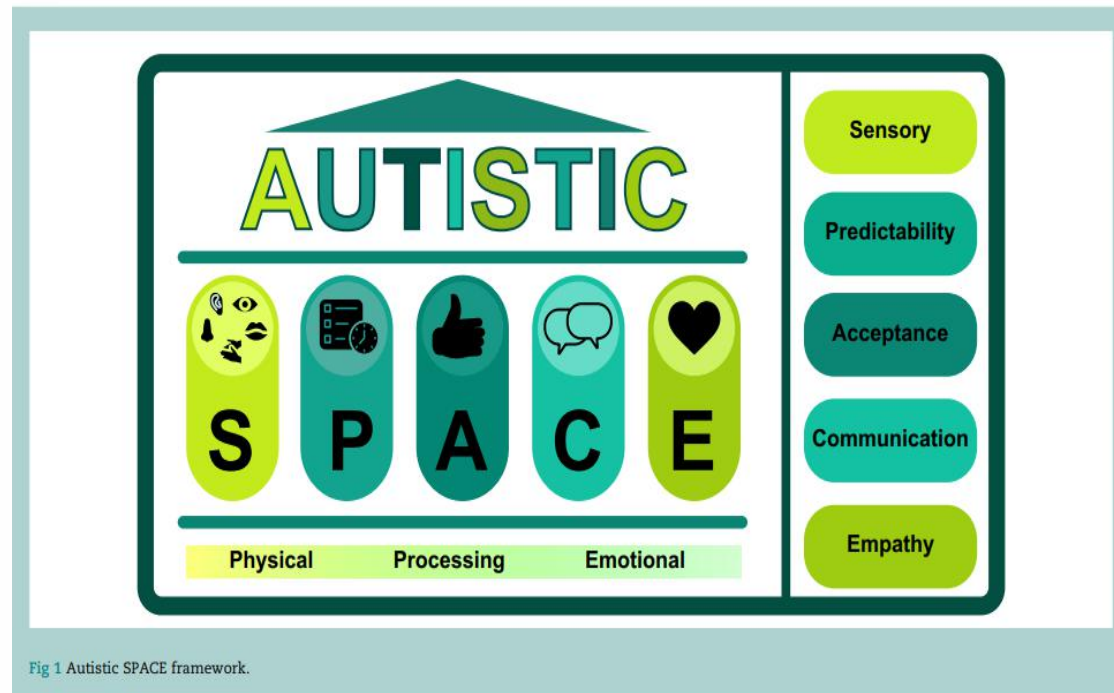
- ▶ The goals:
 - Minimize hospitalization time
 - Minimize stressors to avoid meltdowns

- ▶ Ways to achieve goals
 - Stakeholder engagement
 - Recognise that parents/ caregivers are the experts
 - Develop an individualised care plan
 - Educate and train patient, caregivers and staff
 - Develop and make available resources
 - Modify physical environment where possible
 - Modify processes and workflows

Staff and teamwork: educate to understand

- ▶ Specific special needs
 - Collaboration difficulties (autism, intellectual disability, phobias)
 - Motor dysfunction (cerebral palsy, epilepsy, neuromuscular disorders)
 - Condition associated systemic involvement: Genetic disorders/ syndromes
- ▶ Higher incidence of co-morbidities
 - Increased need for hospital visits/ investigations/ need for NORA
- ▶ Developmental delays
 - Communication/ mobility issues
- ▶ Behavioural/ psychological challenges
 - Anxiety
- ▶ Treatment: medication, ketogenic diet, interventional therapy

Autism spectrum disorder



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Autistic people are 3 times more likely to be admitted from emergency department and twice more likely to die

Staff and teamwork in the context of NORA for special needs kids

- ▶ Trained in airway management/ resuscitation/ assessment of depth of sedation
- ▶ Trained in understanding and preparing the child for sedation/ anaesthesia/ procedure
- ▶ Work in coordinated fashion
- ▶ Good communication

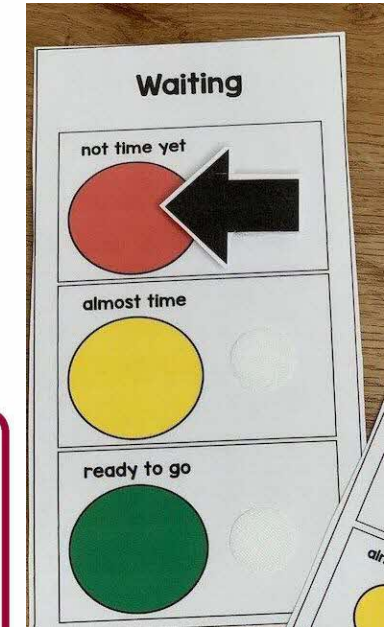
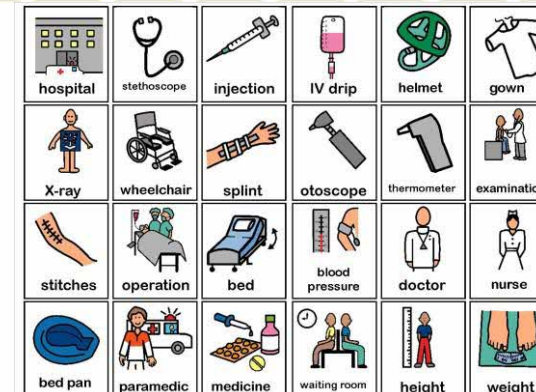
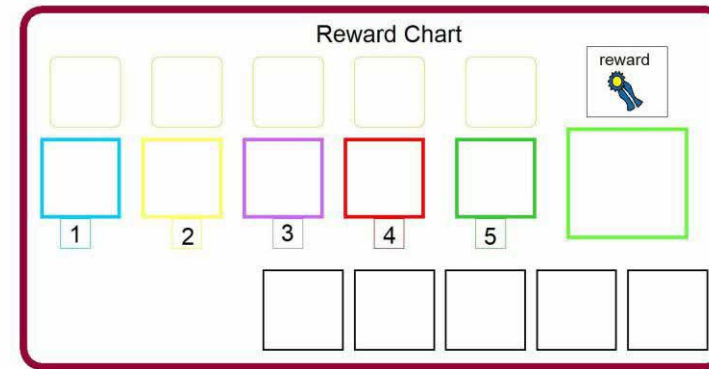
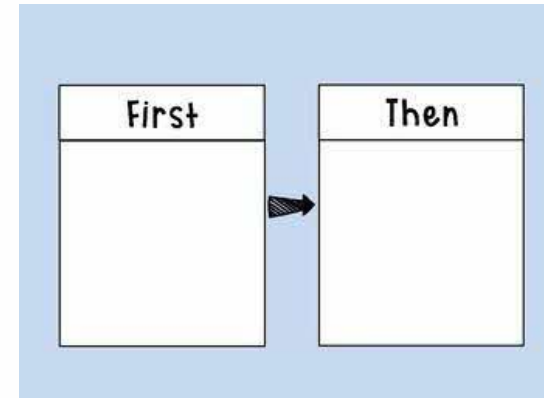
Staff and teamwork: Health care team communication

- ▶ Easy identification of child: health records/ visual symbols/hospital passport
- ▶ Team huddles and communication regarding:
 - Avoidance of triggers
 - Reduction of wait time
 - Flexibility for nursing and discharge criteria
 - How to communicate with parents/ child
 - Child's normal coping mechanisms



Staff and teamwork: The Dos

- Increase predictability
- Respect personal space
- Speak quietly and gently using simple, direct speech
- Give time for processing and decision making
- Work with normal coping mechanisms
- Recognize patient may not wish to communicate with you directly




Staff and teamwork: Environment Modification

- ▶ Sensory toolkit to enhance coping mechanism
- ▶ Quiet Rooms
- ▶ Gliders
- ▶ Padded surfaces



Preprocedural care and assessment

- ▶ Minimally 1 week before planned procedure
- ▶ Assess the child in person/ virtually
 - Anaesthetic risk and optimization of comorbidities
 - Suitability for management as outpatient/same day admission/inpatient
 - ▶ Identify the main caregiver who will be your partner to educate and prepare the child
 - ▶ Work within the normal routines of the child
 - Timing of procedure/ fasting
 - ▶ Partner with primary care physician
 - Determine the need for other procedures to be done concomitantly e.g. blood investigations/ lumbar punctures/examination under anaesthesia



The chart is titled "My Daily Routine" and is divided into two columns: "Morning" and "Evening". Each column contains a list of activities with corresponding icons. The Morning column includes: Get dressed (clothes icon), Eat breakfast (plate and fork icon), Have a wash (sink and water icon), Brush teeth (toothbrush icon), Brush hair (hairbrush icon), and Put on shoes and coat (shoes and coat icon). The Evening column includes: Go to the toilet (toilet icon), Have a bath (bathtub icon), Put on pyjamas (pyjamas icon), Brush teeth (toothbrush icon), Bedtime story (book icon), and Go to sleep (moon and bed icon).

Morning		Evening	
Get dressed		Go to the toilet	
Eat breakfast		Have a bath	
Have a wash		Put on pyjamas	
Brush teeth		Brush teeth	
Brush hair		Bedtime story	
Put on shoes and coat		Go to sleep	

The special needs child at risk of anaesthesia complications

▶ Risk factors

- Seizures
- Preoperative respiratory problems
- Overall poor preoperative state including malnutrition
- Mitochondrial disease
- MTHFR (methylenetetrahydrofolate reductase) gene polymorphism
- Increased homocysteine levels
- Vitamin B complex deficiency or B12 deficiency

▶ Complications

- Respiratory complications
- Delayed awakening
- Neurodevelopment regression
- Thrombosis

Pre-procedure: Planning for NORA technique

- ▶ Requirements of the procedure
 - Tolerance for movement
 - Expected level of pain
 - Position
- ▶ State of medical condition/optimization of comorbidities
- ▶ Availability of intravenous access
- ▶ Urgency
- ▶ Prior patient experience and acceptability
- ▶ Facility/ Access
- ▶ Safety
- ▶ Sedation or general anaesthesia

Pre-procedure: developing an individualised care plan

- ▶ Made in conjunction with the caregiver
- ▶ Considers the patient's condition and requirements
- ▶ Discussion should include
 - Fasting
 - Continuation of normal medication
 - Premedication
 - Restraints
 - Child life/ play therapist
 - Choice of induction
 - Recovery plan
 - Reunion with caregiver before child fully awake
 - Removal of intravenous line before the child is fully awake
 - Continued need for sedation/restraint/splints to keep tubes/drains/lines in
 - Pain management

Pre-procedure: Preparation and resources

- ▶ Hospital passport
 - Filled by caregiver
 - Allows the healthcare team to understand the child better
 - Allows for easier and more rapid navigation through the hospital
- ▶ Toolkit
- ▶ Education resources
 - Videos
 - Social stories
- ▶ Child life specialist

What's in the toolkit?



HOSPITAL PASSPORT
Getting to know Me

Hospital label: _____

I like to be called: _____

Family contact person: _____

Main carer (if different from above): Contact details: _____

My usual doctor in the Department of Child Development/Hospital: _____

Who also is involved with my treatment and care:
Name: _____
Relationship: _____
Contact: _____

My religion: _____

How I would like you to communicate with me: _____

How I usually communicate (e.g. communication cards, verbal etc): _____

Please do not assume there is nothing I don't express pain in the usual way

How I communicate when I'm in pain: _____

How to tell that I'm in pain: _____

Things I can't cope with that will cause distress: _____

How you can assist (distraction, you and how you): _____

What I like (things that make me happy e.g. music, music, particular types of food, repetitive interest): _____

Pre-hospital preparation

Toolkit can be obtained from the hospital:
- Mask
- Hospital Passport
- Patient Information leaflet

You may wish to consider creating a reward/token box for your child.

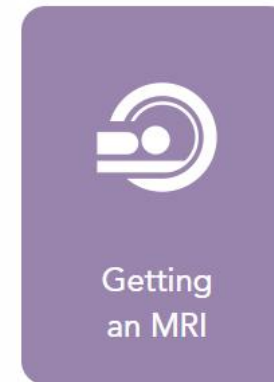
Checklist to prepare for my hospital visit

Things to bring to hospital:

- Favourite toy/book/things that I like to do
- Jacket
- Snacks
- Hospital passport
- Personal communication aids
- Things I need to help me cope when I'm distressed

By the hospital:

- Notify staff of special needs
- Submit original hardcopy of the Hospital Passport at registration
- Obtain a special sticker for your child so that our staff is aware of your child's need



BMC autism friendly social stories

Getting a PET Scan



Today I am getting a PET scan done! The PET scan gives doctors cool pictures of what's going on in my body. On the day of the test, there are some special rules for me for eating and drinking. These are for me to stay strong and healthy!




Pre-procedure: Mask practice for planned inhalational induction

- ▶ Applied behavior analysis
- Behaviour training
 - Reward child when mask is accepted on face and prolong duration of mask being placed on face
- Systematic desensitization by graduated exposure to stressful stimulus
 - Repeated practice with the mask
- Mirroring technique
 - Demonstrate on doll

SPECIAL INTEREST ARTICLE

WILEY **Pediatric Anesthesia**

Behavioral training and mirroring techniques to prepare elective anesthesia in severe autistic spectrum disorder patients: An illustrative case and review

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Summary

Children with autistic spectrum disorder are more likely to become distressed during induction of anesthesia. Inhalational induction is almost always the preferred route with acceptance of the face mask often presenting a considerable challenge. Tempering measures to facilitate gas induction such as forced premedication and physical restraint are no longer viable options except in extenuating circumstances. Recent research interest has focused on the need for advanced planning in collaboration with the caregiver to tailor an individualized perioperative plan. This plan may

Pre-procedure: Reducing anxiety

- ▶ Normal coping mechanisms
 - Devices
 - Games
 - Video
 - Pressure application
- ▶ Premedication
 - Amnesia
 - Anxiolysis

Drug	Route	Dose	Onset time
midazolam	IN	0.2-0.3mg/kg	5-10min
	Oral	0.5mg/kg max 20mg	10-15min
	IV	0.05-0.1mg/kg	1-3min
	PR	0.5mg/kg	10-20min
Lorazepam	Oral/IV	0.05-0.1mg/kg max 4mg	20-30min/1-3 min
Clonidine	Oral/ IV/IN	1-4mcg/kg (max 200mcg)	30-60min
dexmedetomidine	IN/IV (slow bolus over 10min)	1-3mcg/kg (150- 200mcg)/ 1mcg/kg	30-60min
Ketamine	IM	4-6mg/kg	3-5min
	IV	0.5-1mg/kg	1min
	Oral	3-8mg/kg	

Intraprocedural: Techniques for NORA

- ▶ General anaesthesia
- ▶ Sedation
 - Propofol
 - **Dexmedetomidine**
 - Midazolam
 - Opioid: remifentanyl/ fentanyl
 - Barbiturates
 - Oliceridine
 - Remimazolam
- ▶ Route of administration

Maddirala and Theagrajan: Non-operating room anaesthesia

Table 2: Drug dosages for sedation in children			
Drug	Age	Route	Dose
Midazolam	6 months to 5 years	IV	0.05 to 0.1 mg/kg (max 6 mg)
		5 years to 12 years	0.025 to 0.05 mg/kg (max 10 mg)
	<32 weeks neonates	IM	0.1 to 0.15 mg/kg
		Per rectal	1 mg/kg
		Sublingual	0.5 to 0.75 mg/kg
		Intranasal	0.2 to 0.3 mg/kg (max 10 mg/kg)
		IV infusion	0.03 mg/kg/hr
>32 weeks neonates	IV infusion	0.06 mg/kg/hr	
Pentobarbital		IV infusion	0.06 to 0.12 mg/kg/hr
		IV	1 to 3 mg/kg
Propofol		IM	2 to 6 mg/kg
		IV	2.5 to 3.5 mg/kg
Ketamine		IV infusion	125-150 mcg/kg/min
		IV (sedation)	0.5 to 2 mg/kg
		IV (analgesic)	0.1 mg/kg
Etomidate		IV infusion (analgesic)	0.1 to 0.3 mg/kg/hr
		IV	0.1 to 0.3 mg/kg
Dexmedetomidine	<1 year	IV infusion	1 to 2 mcg/kg over 10 min, then 0.5 to 1 mcg/kg/hr
		IV infusion	1 to 2 mcg/kg over 10 min, then 0.5 to 1.5 mcg/kg/hr

Intraoperative considerations

- ▶ Requirements for hypnosis may be less for those with intellectual disability
- ▶ Keep things simple to ensure a rapid, smooth recovery
- ▶ Pay attention to induction environment: light, sound, people
- ▶ Minimise unnecessary conversation, hands off approach
- ▶ Avoid premedication if possible
- ▶ Avoid nitrous oxide (mitochondrial disease and MTHFR deficiency)
- ▶ Ensure good hydration (avoid Ringer's lactate with mitochondrial disease)
- ▶ Postoperative nausea and vomiting prophylaxis
- ▶ Ensure good analgesia
- ▶ Ensure normal glucose, temperature, acid-base balance
- ▶ Avoid hypoxia
- ▶ Avoid prolonged propofol infusions (mitochondrial disease)

Medications and potential drug interactions with anaesthetic agents

Drug	Use	Potential problems
Antipsychotics e.g. risperidone, olanzopine	Modify disruptive symptoms	Hypotension, proarrhythmic
Psychostimulants e.g. methylphenidate (Ritalin)	Improve inattentive or hyperactive symptoms but sometimes can worsen behavior or mood	May require an increase in amount of sedative premedication
Antidepressants	Improve mood symptoms particularly associated with rigidity or obsession	Varied depending on class of drug
Mood stabilizers eg lithium	Stabilize mood	Reduced requirements of anaesthetic agents, prolongation of depolarizing muscle block, increased toxicity with NSAIDS
Antiepileptics	Management of seizures	Drug interactions due to enzyme induction/ protein binding etc eg reduced duration of muscle relaxants

Post-procedural

- ▶ Delayed awakening maybe seen with those on antiepileptics and intellectual disabilities
- ▶ Allow recovery in quiet environment with minimal monitoring
- ▶ Early reunion with caregiver
- ▶ Flexibility with discharge criteria
- ▶ Watch out for complications
 - Respiratory complications
 - Airway obstruction
 - 30% ASD, 29.2% Trisomy 21, 17.1% intellectual disability
 - Hypotension
 - Nausea and vomiting

Summary

- ▶ There are added risks for children with special needs undergoing NORA
- ▶ Understanding the special needs and partnering with the primary caregiver is key to developing an individualised care plan
- ▶ Team approach and communication is important in choosing the appropriate NORA technique
- ▶ Added considerations can lead to a more positive and safer experience of NORA for children with special needs

Thank you very much for your attention

Passport

1. How does the patient communicate best?

- Pictures
- Spoken language
- Written Words
- Device/Tablet
- Gestures/Signs
- Others: _____

2. How does the patient communicate pain?

- Spoken Language
- Crying/Screaming
- Self-Injury
- Aggression
- Others: _____

3. Does the patient have problems with:

- Seeing
- Hearing
- Mobility
- None of the above

4. Are there specific triggers that might lead to a meltdown because the patient is overwhelmed by the situation/ environment?

- Bright Lights
- Loud Noises
- Physical Touch
- Crowd
- Others: _____

5. What are the signs shown by the patient before going into full meltdown?

6. Are there specific coping mechanisms used by the patient?

- Pressure (e.g., hug, gentle squeezing, massage)
- Swings (e.g., using swings, trampolines, rocking movements)
- Specific routine
- Gadgets/ Device (e.g., Headphone)
- Others: _____

7. Does the patient have any special interests (favorite characters, activities, toys, etc.)?

8. How does the patient normally take medication?

- Syrups in cup
- Syringe
- Crushed tablets
- Whole tablet

Passport

9. What would help the patient understand the procedure/physical examination?

- Talk with the patient through the exam
- Demonstrate on another person
- Show a picture schedule
- Others: _____

10. Does the patient engage in behaviors that could be a safety concern?

- Bolting
- Self-Injurious Behaviors
- Hitting, Kicking, etc.
- Others: _____

11. What other information should we know to help make the patient more comfortable? E.g., feeding, diet, sleeping, toileting, routines



The graphic is a blue-bordered clipboard with a silver clip at the top. It contains the logo of KK Women's and Children's Hospital (a red cross in a blue square) and the text 'KK Women's and Children's Hospital SingHealth'. Below the logo is the title 'Pre-hospital preparation' in a blue, cursive font. Underneath is a 'Toolkit (can be obtained from the hospital)' list: '- Mask', '- Hospital Passport*', and '- Patient Information leaflet'. A note says 'You may wish to consider creating a rewards/token box for your child.' The main title 'Checklist to prepare for my hospital visit' is in a large, blue, cursive font. To the right is a cartoon rabbit. Below the title is a list of 'Things to bring to hospital': 'Favourite toy/book/things that I like to do', 'Jacket', 'Snack', 'Hospital passport', 'Normal communication aids', and 'Things I need to help me cope when I'm distressed'. Below that is a list of 'At the hospital': 'Notify staff of special needs' and 'Submit original hardcopy of the Hospital Passport at registration'. At the bottom right are cartoon illustrations of a boy and a girl.

 KK Women's and Children's Hospital
SingHealth

Pre-hospital preparation

Toolkit (can be obtained from the hospital)

- Mask
- Hospital Passport*
- Patient Information leaflet

You may wish to consider creating a rewards/token box for your child.

Checklist to prepare for my hospital visit

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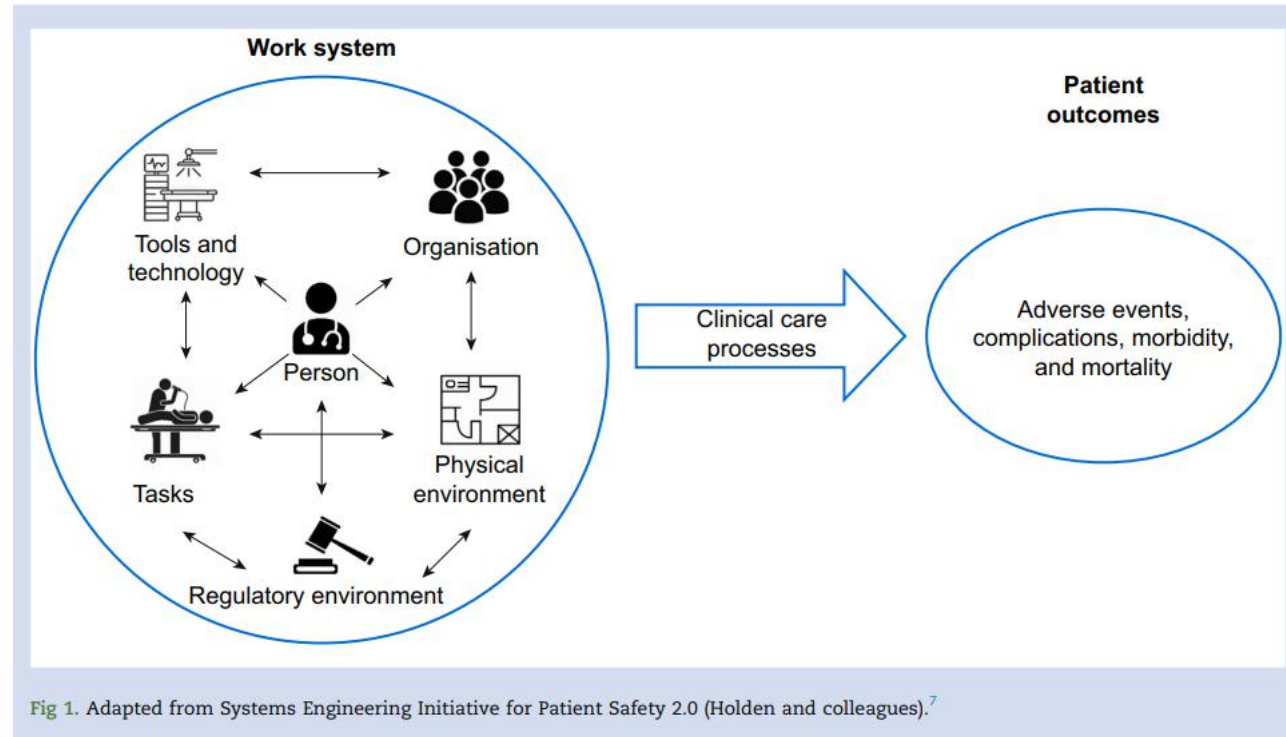
At the hospital:

- Notify staff of special needs
- Submit original hardcopy of the Hospital Passport at registration

Precautions for Mitochondria myopathies

- ▶ Avoid nitrous oxide which causes homocysteine and overall oxidative stress to increase
- ▶ Avoid premedication if possible
- ▶ Avoid Ringer's lactate
- ▶ Ensure good hydration, normal glucose, temperature, acid-based balance, avoid hypoxia
- ▶ Avoid prolonged propofol infusions
- ▶ Infection precautions

How can we make it better and safer for these children undergoing NORA?



Morbidity, mortality, and systems safety in non-operating room anaesthesia: a narrative review. Abigail D. Herman et al. British Journal of Anaesthesia, 127 (5): 729e744 (2021)