

# ABDOMINAL WALL DEFECTS IN NEONATES: INITIAL, PRE AND POST OPERATIVE MANAGEMENT PRACTICE GUIDELINE<sup>®</sup>

## DOCUMENT SUMMARY/KEY POINTS

Neonates with abdominal wall defects will require surgery to amend the defect.

- The two most common abdominal wall defects are gastroschisis and omphalocele.
- Pre-operative management for gastroschisis and omphalocele include bowel stabilisation, thermoregulation, gastric decompression, fluid and electrolyte balance, acid-base balance and respiratory support.
- Post-operative management for gastroschisis and omphalocele include positioning, pain management, respiratory support, acid-base balance, fluid and electrolyte balance, intra-abdominal pressure monitoring, management of gastric losses, monitoring of urinary output and nutritional support.
- Ward reduction of gastroschisis can occur under favourable circumstances.
- Insertion of a silo is recommended for staged closures if primary closure is not possible.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

<b>Approved by:</b>	SCHN Policy, Procedure and Guideline Committee	
<b>Date Effective:</b>	1 <sup>st</sup> March 2017	<b>Review Period:</b> 3 years
<b>Team Leader:</b>	NUM	<b>Area/Dept:</b> GCNC

## CHANGE SUMMARY

- New practices on initial stabilization and transfer added.
- Wound management changes made
- Feeding protocol added

## READ ACKNOWLEDGEMENT

All clinical staff working in Grace Centre for newborn Care. Copy of the document is kept in the NICU at Westmead Hospital.

- Read Acknowledge Only – [all staff emailed the notice of the new document and expected to read and be aware of practices and changes]

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

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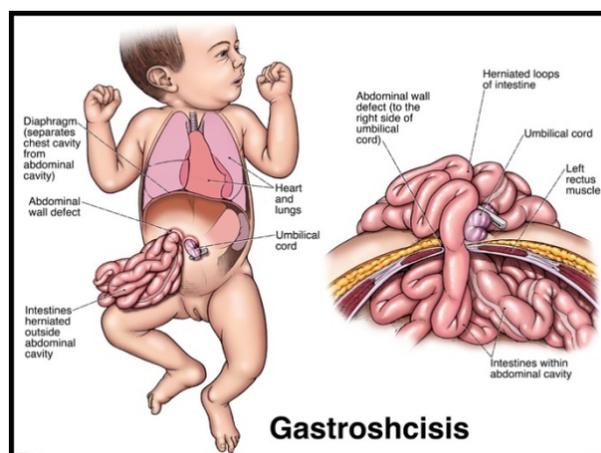
## Introduction

Neonates with abdominal wall defects require surgery to amend the defect. The two most common abdominal wall defects are gastroschisis and omphalocele<sup>1</sup>. Abdominal wall defects occur in utero when the abdominal wall muscles do not form correctly<sup>1</sup>. An incomplete abdominal wall can result in the protrusion of the internal organs either to the side of the umbilicus (gastroschisis) or into the umbilical cord (omphalocele)<sup>2</sup>. Evaluation of prenatal or postnatal outcome is based principally on bowel development during pregnancy<sup>2A</sup>.

## Part A: Gastroschisis

### Definition

Gastroschisis is the herniation of abdominal contents through an abdominal wall defect, usually to the right of umbilicus<sup>2</sup>. Abdominal contents that are herniated through the abdominal wall include variable amounts of intestines and occasionally parts of other abdominal organs. These organs have no covering membrane or sac. Gastroschisis may be associated with small bowel atresia. This should be regarded as a surgical emergency.



### Mode of delivery<sup>4</sup>

While the goal of delivery of the newborn with gastroschisis is to optimize their outcome by minimizing trauma to the exposed gastrointestinal contents, the best mode of delivery for these infants remains controversial. While there are some theoretical advantages to a caesarean section

these have not been confirmed by clinical data. Mode of delivery is determined by the obstetrician in consultation with the mother, midwives, surgeons and occasionally the neonatologist.

## Initial management in the birth unit

- Prepare as for anticipated high risk birth. The neonatal teams at Westmead and Grace Centre for Newborn care are notified of the impending birth by the shared page.
- Manage airway, breathing and cardiovascular status as per ARC guidelines (ref).
- Should airway support be required endotracheal intubation and ventilation is preferable to prolonged mask ventilation/nasal CPAP in order to minimise gut distension.
- Once the cardio-respiratory status has been stabilized, quickly inspect the bowel correcting any obvious twists on its pedicle or acute discoloration due to ischaemia. The bowel should then be positioned centrally over the abdomen and wrapped as described below
- Insert an 8FG gastric tube and aspirate the stomach. Leave the end open on free drainage.
- Ensure adequate thermal control by using an overhead warmer and drying the infant as soon as possible.

## Management of Exposed Bowel<sup>4</sup>

- Following assessment, the exposed bowel should be wrapped with clingfilm eg. Gladwrap® (or any equivalent, transparent, latex free alternative) for protection and to minimise fluid and heat loss
- The wrap does not need to be sterile
- Slide large piece of clingfilm under the baby's buttocks and back
- Place exposed organs on baby's abdomen (using sterile latex-free gloves)
- Wrap clingfilm gently around the abdomen and exposed organs
- Ensure bowel edges are not exposed to drying air
- Avoid compressing the bowel, it should remain mobile but protected
- Monitor the bowel every 15 minutes and report duskiness or blanching to the surgical and neonatal consultant/fellow/clinical NUM
- With senior input the bowel wrapping may require release, removal and and rewrapping if compression, kinking or twisting is suspected
- Support the intestines to prevent occlusion of the blood supply where the bowel exits the defect in the abdominal wall
- If necessary support the exposed intestines with your hands
- Where possible nurse the neonate on their right side, with the wrapped bowel supported perpendicular to the abdominal wall using a rolled towel or equivalent

## Stabilization

- Upon transfer to the Westmead NICU ensure the airway, breathing and any cardiovascular instability is managed as per standard practice
- Ensure the protruded abdominal contents remain wrapped and supported as described above
- Reassess the bowel status regularly to ensure the bowel remains supported and uncompromised
- Establish vascular access using a peripheral cannula in the upper limbs.
- Arterial access is not required at this stage unless there is significant respiratory or circulatory compromise. Collect blood sample for baseline gas, electrolytes, glucose and culture when IV inserted
- Commence IV fluids and monitor fluid status carefully as insensible fluid losses will be excessively high but bowel oedema is to be avoided
- Occasionally fluid through an IV bolus boluses may be required if there are excessive gastric fluid losses.
- Antibiotics: Penicillin and Gentamicin maybe required.
- Ensure continued thermal control
- Vitamin K administered prior to transfer
- Complete relevant Blue Book documentation

## Transfer from Westmead to GCNC at CHW

- After initial stabilization the Westmead staff contacts the nurse in charge at the GCNC NICU to notify them of impending transfer (team leader, NUM and medical staff)
- Adequate staff from Westmead are required for the transfer (porters, nursing, medical staff)
- The transfer equipment and battery life must be checked and adequate for heating during transfer, with enough gas available for the transfer and suction equipment in working order
- Collect additional transfer equipment (transfer pack)
- Transfer infant using specialized transfer equipment (Incubator, heated bed and shuttle)
- The parents are notified of the transfer, and are encouraged to accompany the team during the transfer
- Handover care to the GCNC nursing and medical team occurs on arrival in Grace.
- Staff check that there are identification bands on the baby and that vitamin K has been administered and documented.
- The IV cannula site is checked for patency and fluids are running to maintain blood sugar levels and hydration.

- Maternal blood should be provided for cross match if required and there are two signatures on any blood collection form..
- Check the infant's temperature and adjust the heating as required.
- Check to see if a birth weight was recorded or attended.
- A copy of the Westmead medication chart should be part of the documentation.
- Ensure the parents are offered a chair and informed when the baby has been stabilized.
- Notify the surgical team of the baby's arrival and location.
- Identify equipment that is to be returned to Westmead NICU.

## Pre-operative management in GCNC

### ***Bowel stabilisation***

- The external bowel is stabilised in the midline of the infant and observed to ensure adequate perfusion of the gut<sup>5</sup>.
- Monitor bowel colour and report duskiness and blanching to the neonatal consultant/fellow/clinical NUM and surgical team for review.

### ***Thermoregulation***

Significant heat is lost through the external bowel<sup>3</sup>. In order to maintain thermoregulation ensure:

- The bowel is wrapped in clear plastic cling film in order to minimise insensible water losses by limiting heat and evaporative losses<sup>5</sup>.
- The infant is nursed under a radiant warmer with servo control to prevent overheating<sup>3</sup>.

### ***Gastric decompression***

- The infant is kept nil by mouth.
- A wide bore (8FG) intragastric tube is required to decompress the.
- Gastric decompression reduces the risk of gastric distension and respiratory compromise.
- The intragastric tube is left on free drainage and aspirated of 2<sup>nd</sup> hourly.

### ***Fluid and electrolyte balance***

- Large fluid and electrolyte losses occur from the external bowel and gastric aspirates<sup>5</sup>.
- Intravenous fluids of N/4 + 10% glucose are commenced at 90mL/kg/day.
- Fluid deficits may lead to decreased tissue perfusion and the development of metabolic acidosis.
- Fluid overload may lead to bowel wall oedema and may make reduction more problematic
- Maintaining fluid and electrolyte balance preserves bowel wall perfusion and function.

**Acid-base balance**

- Post reduction there is a risk of bowel ischaemia as the bowel is gently reduced into the abdomen and not placed. There is a risk of malrotation
- Blood gases including lactate are attended at least 4<sup>th</sup> hourly on the first night post reduction and any acidosis or lactate 3mmol/L reported to the clinical NUM/neonatologist/fellow and surgical team.

**Respiratory support**

- Prior to theatre or post reduction there may be an indication for respiratory support with mechanical ventilation. This may be due to increased intra-abdominal pressure leading to respiratory embarrassment or due to prematurity or narcotic induced apnoea.
- See the Respiratory Guideline for the care of a ventilated infant.

**Preparation for surgery**

- Prepare the infant for surgery as per Transfer of a Neonate to Operating Theatre and Other Hospital Investigative Departments Clinical Practice Guideline.
- The majority of infants with gastroschisis will have either a primary or staged repair undertaken in the Operating Theatre. Occasionally there maybe an opportunity to perform the operation in the NICU. The choice is the surgeons in consultation with the neonatal team. The procedure for a reduction or silo in the NICU is as follows.

**Primary reduction or insertion of a silo for gastroschisis in the NICU****Criteria**

Under favourable circumstances the neonatologist and surgeon may agree that an infant meets the medical and surgical criteria for the safe reduction of a gastroschisis in the newborn intensive care unit. The timing and location of the procedure is negotiated with the clinical nurse manager to ensure adequate staff are available.

**Medical criteria:**

- Respiratory support available
- Narcotic analgesia/sedation
- Intravenous access gained and intravenous fluids in progress
- Cardiorespiratory and circulatory stability Birth weight of >2000g

**Surgical criteria:**

- Informed parental consent
- No intestinal atresia
- No intestinal ischaemia
- No adhesions to abdominal wall

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- A mesenteric base that is not too narrow
- Little or no fibrous peel

### ***Pain management***

- Administration of PR Paracetamol a minimum 10 minutes prior to commencement
- Baseline pain assessment documented
- Background morphine infusion is commenced
- Neonatal registrar on standby to order a morphine bolus if indicated

### **Equipment needed**

- Procedure trolley
- Sterile drape
- Sterile gown
- Sterile gloves
- Sterile scissors
- Steristrips ®(wide)
- Tegaderm® (large)
- Absorbable suture of surgeon's choice

**Procedure**

- In order for this procedure to occur safely on the neonatal unit the following staff must be assembled in order to support the baby adequately throughout the procedure:
  - Nurse supporting the baby
  - Clinical NUM or in charge
  - Surgeon and fellow/registrar performing the procedure
  - Neonatologist or fellow and the NICU registrar.
- Baseline observations are recorded and a baseline blood gas should be documented prior to commencement.
- Pre medication is given to the infant.
- Ward reduction pack set up at the bedspace.
- The nurse looking after the infant is at the head of the bed to provide support to the infant.
- Nurse in charge/clinical support nurse and NICU RMO in the vicinity of the bedspace.
- Surgeons to commence reduction.
- If ward reduction is successful a blood gas is attended immediately post and 2 hours post procedure.
- Insert IDC to monitor bladder pressure as requested by surgeon in charge of care
- Attempted ward reduction is abandoned in favour of an operative reduction or the insertion of a silo if the ward reduction is deemed difficult or has not been successfully accomplished within 30 minutes or the reduction results in pain or cardiorespiratory compromise or extreme distress in the infant.

**Post-operative management**

On return to the NICU from the Operating Theatre the infant will be intubated and ventilated and managed according to the [Respiratory Management in the Neonate](#).

**Position**

- Nurse the infant in a supine position.

**Pain management**

- A morphine infusion remains and the dose maybe titrated according to the pain score algorithm.
- In some infants a wound analgesia catheter maybe in-site with a Bupivacaine infusion. The pain team are to be notified for information.
- Pain assessment scores are to be conducted every 2 hours in the immediate post operative periods for the first 24 hours.

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- Then every 4 hours for the next 48 hours and continue as long as analgesia is being used for pain relief.
- Adjust analgesia according to pain assessment scores. Refer to [Pain Management in Newborn Infants Clinical Practice Guidelines](#).

#### **Wound Management (Primary Closure)**

- The abdominal wound is assessed every four hours for any swelling, redness or leaking and the sutures are intact.
- The abdomen maybe tense following a primary reduction and closure.

#### **Wound Management (Staged Silo Closure)**

- The silo will need to be supported in a vertical position.
- Observe every two hours to ensure no tension is place on the suture line at the base of the silo.
- The silo will be reduced every 24 hours by the surgical team.
- Inform the surgical team is any discoloration occurs in the bowel.

#### **Respiratory support**

Observe for respiratory compromise due to increased intra abdominal pressure causing increased pressure on the diaphragm.

#### **Acid-base balance**

- Post reduction there is a risk of bowel ischaemia as the bowel is gently reduced into the abdomen. There is a risk of malrotation
- Blood gases including lactate are attended at least 4<sup>th</sup> hourly for 24 hours post reduction and any acidosis or lactate 3mmol/L reported to the clinical NUM/neonatologist/fellow and surgical team.
- Attend regular blood gases to monitor for metabolic acidosis.

#### **Fluid and electrolyte balance**

- Surgery during the neonatal period can further disturb fluid and electrolyte balance<sup>3</sup>.
- Attend regular blood gases or EUC to monitor for electrolyte imbalances.

#### **Intra-abdominal pressure monitoring**

- Observe the infant for development of abdominal compartment syndrome.
- Signs of increased intra-abdominal pressure include:
  - Rising lactate
  - Increase in bladder pressure
  - Increase in ventilatory support.

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- Tense and possibly tender abdomen.
- Discolouration of abdominal wall and lower limbs.
- Increase in pain relief.
- Hypotension requiring inotropic support.
- Decreased or absent urine output.
- To monitor intra-abdominal pressure refer to [Bladder Pressure Monitoring Practice Guideline](#).

### **Gastric Losses**

- Continue with a wide bore (8FG) intragastric tube on free drainage with frequency of aspirations as per surgeons.
- When gastric losses are >20mL/kg, a sample should be sent for electrolyte analysis and intravenous replacement fluids are commenced.

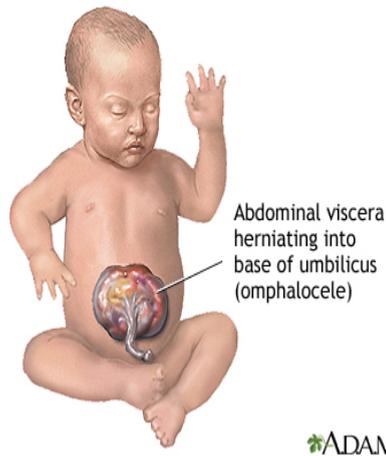
### **Urinary output**

- Increases in intra-abdominal pressures may lead to a compromise in renal blood flow<sup>2</sup>.
- A decrease in urine output to less than 1mL/kg may be due to a decrease in urine production or bladder distension.
- Insert an indwelling urinary catheter to relieve bladder distension and to allow a more accurate measurement of urine output.

## **Part B: Omphalocele**

### **Definition**

Omphalocele is a midline defect of the anterior abdominal wall that results in the herniation of abdominal contents into a membrane-covered sac<sup>2</sup>. The defect can be variable in size. The membrane covered sac consists of three layers. The inner layer consists of peritoneum, the outer later consists of amnion and the middle layer consists of Wharton's jelly<sup>6</sup>. Herniated abdominal contents include variable amounts of intestine, often parts of the liver and occasionally other organs<sup>6</sup>. The defect may be centred in the upper, mid or lower abdomen and the size and location of the defect have important implications for management. Unlike gastroschisis omphalocele is associated with genetic abnormalities and other congenital anomalies. These include Trisomy 13, Trisomy 18 Beckwith-Wiedemann syndrome, and congenital heart defects<sup>1</sup>.



## Pre operative management

### ***Protecting the herniated viscera***

- Position the infant on their back with support of the sac to avoid vascular decompression<sup>3</sup>.
- Whilst providing developmentally supportive interaction there should be a conscious effort to minimize over handling of the infant. The goal is to provide comfort but not to interfere with the integrity of the herniated sac. Cuddles may occur with the defect supported.

### ***Thermoregulation***

Significant heat is lost through the herniated viscera<sup>3</sup>. In order to maintain thermoregulation:

- The herniated viscera should be covered with a clear plastic cling film in order to minimise insensible water losses by limiting heat and evaporative losses<sup>5</sup>.
- Nurse the infant under a radiant warmer<sup>3</sup>.

### ***Gastric decompression***

- The infant is kept nil by mouth.
- Insertion of a wide bore (8FG) intragastric tube is required for gastric decompression<sup>1</sup>.
- Gastric decompression reduces the risk of gastric distension and respiratory distress<sup>2</sup>.
- The intragastric tube is to be left on free drainage with a minimum of 4<sup>th</sup> hourly aspirates.

### ***Fluid and electrolyte balance***

- Fluid and electrolyte losses are increased in an infant with omphalocele, with greater losses occurring when the membranous sac has ruptured<sup>6</sup>.
- Intravenous fluids of N/4 + 10% Glucose are commenced at 60mL/kg/day.
- Careful fluid and electrolyte balance is required to ensure adequate hydration without oedema.
- Fluid deficits may lead to decreased tissue perfusion and the development of metabolic acidosis.

- Maintaining fluid and electrolyte balance preserves bowel wall perfusion.

### ***Blood glucose monitoring***

- 2<sup>nd</sup> hourly blood glucose monitoring is required if the infant has suspected Beckwith-Wiedemann syndrome. If BSL low then measure hourly until stable.
- Frequency can be decreased when blood glucose levels have stabilized.

### ***Preparation for surgery***

Prepare the infant for surgery as per the [Transfer of a Neonate to Operating Theatre and Other Hospital Investigative Departments Clinical Practice Guideline](#).

## **Post-operative management**

### ***Position***

- Nurse the infant in a supine position. If the closure is only partial. Herniated bowel/liver will need to be supported when the infant needs to change position to prevent pressure sores).
- The use of a nest to support the supine position with a gel head pillow to ensure no pressure points occur.
- Two nurses or one nurse and parent can support the infant and the defect during turning and re-positioning.

### ***Pain management***

- Pain scores are recorded every 2 hours in the immediate post-operative 24 hours.
- Then every 4 hours for the next 48 hours and continue as long as analgesia is being used.
- Adjust analgesia according to pain assessment scores. Refer to [Pain Management in Newborn Infants Clinical Practice Guidelines](#).

### ***Wound Management***

- The goal is to protect the viscera from rupturing through protection until the contents have settled into the abdomen and the size has been reduced to enable a surgical closure.
- Several methods maybe used by the specific surgeon and will be monitored by the surgical team:
  - The viscera is regularly painted with saline or alcohol to enable a crust to form.
  - The defect is painted with silver dioxide and a firm dressing applied.
  - The defect is painted with normal saline and a vacuum dressing applied.
  - A silo is inserted in the operating room to protect the potential or ruptured sac.

- The nurses' responsibility is to ensure the wound remains intact and any traction avoided through support aids such as a 'doughnut' ring of combine rolls.

### **Acid-base balance**

- Attend regular blood gases to monitor for metabolic acidosis.
- Monitor lactate.

### **Fluid and electrolyte balance**

- Surgery during the neonatal period can further disturb fluid and electrolyte balance<sup>3</sup>.
- Attend regular blood gases or EUC to monitor for electrolyte imbalances.

### **Intra-abdominal pressure monitoring**

- Observe the infant for development of abdominal compartment syndrome.
- Signs of increased intra-abdominal pressure include:
  - Increase in ventilatory support.
  - Increasing lactate
  - Tense and possibly tender abdomen.
  - Discolouration of abdominal wall and lower limbs.
  - Increase in pain scores and medication requirement.
  - Progressive worsening of metabolic acidosis and or respiratory acidosis, high lactate levels.
  - Hypotension requiring inotropic support.
  - Decreased or absent urine output.
- To monitor intra-abdominal pressure refer to Bladder Pressure Monitoring Clinical Practice Guideline.

### **Gastric Losses**

- Continue with a wide bore (FG8) intragastric tube on free drainage with frequency of aspirations as per surgeons.
- When gastric losses are >20mls/kg, sample should be sent for electrolyte analysis and intravenous replacement fluids should be commenced.
- Gastric aspirates and gastric residuals are also commonly relied upon as indicators of feed readiness and feed tolerance; however, there is no clinical description or guideline of what defines tolerance or intolerance using these methods<sup>10,12</sup>.

### **Urinary output**

- Increases in intra-abdominal pressures may lead to a compromise in renal blood flow<sup>2</sup>.

- A decrease in urine output to less than 1ml./kg/ hour may be due to a decrease in urine production or bladder distension
- Insertion of an indwelling urinary catheter may be needed to relieve bladder distension and to allow a more accurate measurement of urine output.

## Feeding Infants with congenital abdominal defects

- Typically infants with congenital wall abnormalities have significant morbidity associated with difficulties in commencing and progressing enteral feeds<sup>7,8</sup>. The delay in the establishment of enteral feeds contributes to lengthy requirements for central venous access, dependence on total parenteral nutrition (TPN), small bowel bacterial overgrowth (SBBO), increased risk of sepsis and TPN related cholestasis resulting in a prolonged length of hospital stay, sometimes months.
- Inconsistencies in feeding management when introducing and increasing feeds for infants with gastroschisis can contribute to their extended length of stay (LOS)<sup>9</sup>. Possible reasons for inconsistencies include practice grounded in tradition, personal opinion and past experiences are often relied upon to guide feeding management with a lack of available research to guide practice. Opinions regarding what defines best practice for feeding management is dependant on the signs of the infant and often differs between surgeons, neonatologists and nurses<sup>9,10,11</sup>.

### **Recommendation for early oral feeding**

Studies have demonstrated the benefits to the infant with gastroschisis if human milk is used to initiate feeding as opposed to artificial feeds. With research concluding that feeding with human milk in the NICU is associated with a significantly decreased hospital stay<sup>12</sup>. Additionally infants receiving solely human milk have a considerably decreased time from initiation of feeds to the achievement of full feeds<sup>14</sup>.

- It is recommended that minimal enteral feeds ( 1ml 4<sup>th</sup> hourly of breast milk should be commenced as soon as available.
- Further grading up of feeds will be guided by the neonatologist in consultation with the surgeon<sup>8</sup>.
- The exact timing is still being researched, but evidence shows that for every day that enteral feeding is delayed the attainment of full feeds is delayed<sup>8</sup>.

### **Continuous versus bolus feeds**

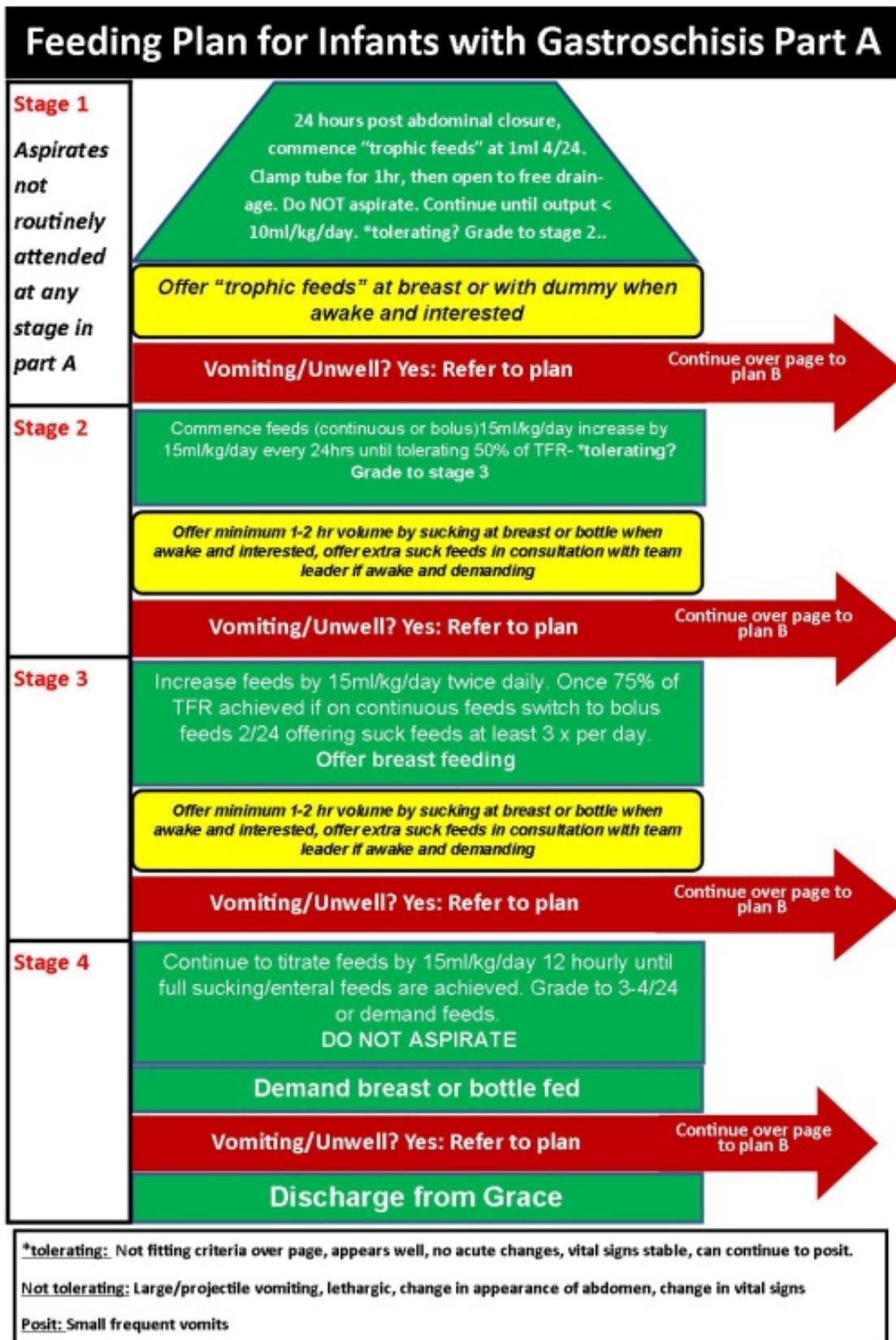
- No current evidence conclusively exists for either continuous or bolus feeds for infants with gastroschisis.
- Currently this is guided by clinician preference, however continuous feeds do limit the amount of oral feeds an infant can have, does limit bonding between parent and infant due to lack of oral feeds.
- Continuous feeds do lead to larger gastric residuals due to the constant infusion of milk, leading to more confusion surrounding feeding management.

**Feeding intolerance**

- The definition of feed intolerance varies with gastric residuals commonly relied upon as an indicator of feeding tolerance<sup>12</sup>.
- Gastric residuals have been thought to be an early warning sign of the development of necrotising enterocolitis (NEC). This is based on the theory that the volume of gastric residual is a correct reflection of the actual gastric volume, and offers evidence of gastric emptying. With raised gastric residuals demonstrating delayed gastric emptying and feed intolerance<sup>12</sup>.
- Routine aspiration of gastric tubes is not based on evidence and can delay the attainment of full enteral feeds by up to 6 days<sup>12</sup>.
- The use of gastric residuals to monitor feed tolerance has been deemed a time consuming practice that causes significant confusion in regards to feeding management, and could cause harm to the delicate gastric mucosa and also potentially lead to the loss of essential gastric enzymes<sup>12</sup>.
- Assessment of feeding tolerance should be based on experienced clinical judgement, warning signs such as increasing abdominal distension, discomfort, changes in vital signs, increased vomiting (not posits) unwillingness to suck – not wanting to feed, lethargy and the Clinical Practice Guideline.

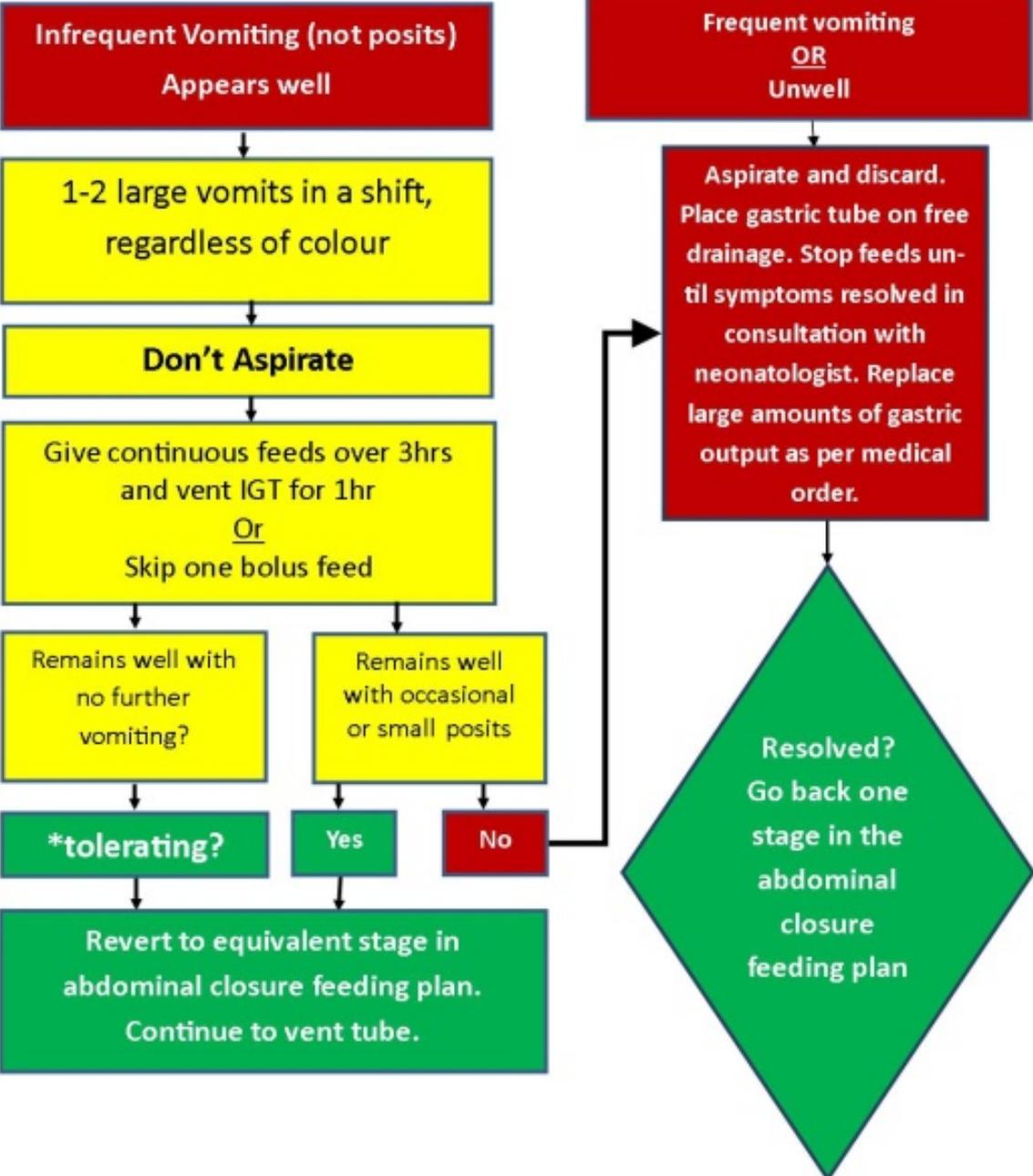
**Feeding protocol for Infants with Gastroschisis**

Based on a current study and evidenced from the literature the following protocol has been implemented to support the feeding of infants following repair of a gastroschisis (Hobson).



Gastroschisis feeding plan developed by Donna Hobson. Grace Centre for Newborn Care– The Sydney Children's Hospital Network

## Feeding Plan for Infants with Gastroschisis Part B



**\*tolerating:** Not fitting above vomiting criteria, appears well, no acute changes, vital signs stable, can continue to posit.

- **Not tolerating:** projectile vomiting, lethargic, change in appearance of abdomen, change in vital signs
- **Posit:** Small frequent vomits

Gastroschisis feeding plan developed by Donna Hobson. Grace Centre for Newborn Care– The Sydney Children's Hospital Network

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