

# Gastroschisis v.1.0

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## PHASE I (PRENATAL)

### Inclusion Criteria

- All pregnancies complicated by fetal gastroschisis

### Exclusion Criteria

- None

### Referrals

Neonatology

Maternal Fetal Medicine

Pediatric Surgery

### Minimum Fetal Surveillance:

Ultrasound performed every 3-4 weeks after diagnosis for the following (use prenatal ultrasound checklist):

- Fetal growth
- Amniotic fluid volume
- Gastroschisis defect
- Bowel diameter (intra- and extra-abdominal)
- Stomach dimension
- Bowel wall thickness (intra- and extra-abdominal)
- Superior mesenteric artery and vein patency and velocity
- Gastric herniation (or other organ herniation)
- Any other organ abnormalities

Starting at 32 weeks:

- Non Stress test twice weekly
- Weekly ultrasound for AFI

Prenatal visit:  
[Gastroschisis slide show](#)

**!**  
**Increase surveillance**  
If other non-gastroschisis obstetric, maternal or fetal indications

**!**  
**Indicators for Delivery**  
Gastroschisis alone is not an indication for preterm delivery  
Anatomic abnormalities related to the gastroschisis are not an indication for preterm delivery

### Timing for Delivery:

- Base the timing of delivery solely on maternal and obstetric indications
- Deliver at [39 weeks](#) in the absence of maternal, fetal or obstetric indications
- Avoid preterm delivery in the absence of maternal, fetal or obstetric indications

### Mode of Delivery:

- Gastroschisis alone is not an indication for C-section
- Deliver vaginally and reserve cesarean delivery for maternal, fetal or obstetric indications

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## PHASE II (DELIVERY)

### Inclusion Criteria

- All newborn infants with gastroschisis

### Exclusion Criteria

- None

### Delivery Room Interventions and Procedures:

- Clamp and cut the umbilical cord at least 12 inches (30 cm) from the baby to preserve the option of sutureless umbilical closure
- Initiate resuscitation as per Neonatal Resuscitation Program
- Apply cardiac leads and administer vitamin K
- Position baby right side down. Place legs, exposed bowel and viscera, lower body up to axillae into “bowel bag” and secure bag opening loosely across upper chest (do not add or cover bowel with gauze). Minimize handling of bowel, monitor color and perfusion of bowel continuously, document initial appearance as well as any changes
- Monitor patient temperature continuously and use an incubator as soon as feasible
- Insert 10F Replogle nasogastric double lumen sump like tube and connect to low intermittent suction. Use syringe to apply suction to the nasogastric tube until suction is available

### IV Access and Fluids:

- Place peripheral IV for parenteral fluids and antibiotics
- In urgent/emergent situations when other access is unobtainable, an umbilical venous catheter may be placed. Cut the umbilical cord as necessary to place the UVC (leave 6cm of umbilical cord, if possible)
- At birth, begin ½ NS at 60 mL/kg/day + D10 amino acids at 60 mL/kg/day to provide [total daily fluids](#) of 120 mL/kg/day. If amino acids not available, use D5 ¼ NS at 120 mL/kg/day

### Laboratory Tests:

The following tests should be completed at birth:

- Glucose
- Blood culture and CBC
- Electrolytes

### Medications:

- Begin ampicillin 100mg/kg IV every 12 hours and gentamicin as appropriate for post-menstrual age after obtaining blood culture

Transfer to Seattle Children's Hospital

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## PHASE III (REPAIR)

### Inclusion Criteria

- Newborns with unrepaired gastroschisis

### Exclusion Criteria

- Newborn with repaired gastroschisis

### Abdominal Wall [Closure Method](#):

- Primary closure using sutureless umbilical closure technique is preferred if clinically safe and feasible
- In cases with challenging anatomy, silo closure using either spring loaded (SLS) or handsewn silo or primary fascial closure may be indicated
- Delayed closure using sutureless umbilical closure technique may be possible

### Surgical Closure Timing and Location:

- When anatomically feasible perform sutureless umbilical closure or placement of SLS in the ICU
- If using SLS, cover the defect as soon as possible with SLS, then definitively close defect when contents are adequately reduced
- Perform primary or delayed fascial closure in the OR



### Intra-op Management:

- Endotracheal intubation may not be necessary for routine sutureless umbilical closure or placement of a SLS
  - Oral sucrose is allowable in addition to IV medications for comfort during reduction
- Measure gastric pressure prior to, during and after reduction and keep it <20 mmHg
- If gastric pressure is >20mmHg, consider conversion to silo/delayed closure
- Alternative for indirect measurement of [IAP \(intra abdominal pressure\)](#) in cases of inaccurate gastric measurements



### Post Operative Pain Management:

- Use scheduled rectal acetaminophen for first line pain control (schedule for 48 hours then consider PRN)
- Use NICU Comfort & Sedation protocol



### Post Operative IV Fluids & Laboratory Tests:

- Start Parenteral Nutrition within a day of admission and follow parenteral nutrition labs plus daily bilirubin
- Provide IV Lipids at maximum of 1 gm/kg/day
- Place PICC line in NICU
- Continue total fluids at 120 mL/kg/day and adjust as clinically indicated
- The following labs should be completed at about 6 hours of age:
  - CBC (if not already done)
  - Glucose
  - Electrolytes (then every 12hrs x 48hrs)
  - Type and Screen only if going to OR

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## PHASE IV (RECOVERY)

### Inclusion Criteria

- Newborns with repaired gastroschisis

### Exclusion Criteria

- None

!

#### **Medications:**

Avoid prokinetics  
Avoid H2 blockers or proton pump inhibitors unless clinically indicated

Transfer from NICU to acute care on surgery service when off ventilation and hemodynamically stable

!

#### **Medications:**

Discontinue Amp/Gent after 48hrs unless other clinical indications for continued antibiotics

### Post Operative Feeding:

- PT/OT consult for early oral stimulation
- Start feeds when signs of bowel function are present which may include presence of bowel sounds, non-bilious NG output, flatus and/or stool and tolerates nasogastric tube removal
- Use breast milk (colostrum first if available) or standard concentration infant formula
- Start and advance feeds by 10 mL/kg/day by oral bolus
- If tolerating feed advancement for 5 days then consider advancing by as much as 20 mL/kg/day
- Place NG for bolus feeds if unable to take enteral advancement orally for 1-2 days
- Remove PICC line 24hrs after PN discontinued
- Aim for total daily caloric intake goal of  $\geq 105$  Kcal/kg/day and caloric intake necessary for normal growth

### Discharge Plan:

- Discharge from hospital when:
  - No fever for 48 hours
  - Gaining weight on full enteral feeds for 1-2 days
  - Primary care physician identified, accepts care and has follow-up scheduled in 2-3 days
  - Family education complete
  - All routine newborn screens completed
  - Wound care plan established if indicated
  - Follow up appointment with surgeon and surgical dietician made for 2 weeks post discharge

## Closure Technique

- There is no compelling data in the literature to advocate for a certain Gastroschisis closure technique or even for primary repair versus pre-formed silo placement. We have had a favorable local experience with the primary umbilical closure technique when anatomically feasible since 2010.

## Enteral Feed Advancement

- There are no recent data in the literature to guide enteral feeding advancement in babies following Gastroschisis repair. It is well established that these babies have delayed return of bowel function and are at risk for the development of necrotizing enterocolitis if enteral feeds are advanced aggressively. The current recommendation for enteral feeding advancement is based on local multi-disciplinary consensus and national input.

## IV Fluids

- Gastroschisis involves peritoneal and evaporative losses of both fluid and salt. Fluid and electrolyte balance is important in patients with Gastroschisis to ensure adequate bowel perfusion without excess edema and avoid dangerous imbalances such as hyponatremia. The evidence in the literature is not sufficient to recommend one fluid administration regimen over another. Local expert consensus supports increased fluid and salt administration in patients with Gastroschisis over routine maintenance for a newborn. Close evaluation of the fluid and electrolyte status of these patients is currently under way at SCH to determine if changes to the current fluid regimen are indicated.

## Gestational Age

- The evidence in the literature is not sufficient to recommend in pregnancies complicated by fetal Gastroschisis iatrogenic preterm delivery or Cesarean section in attempts to prevent bowel injury or intrauterine fetal demise, unless these are otherwise indicated for standard fetal, maternal, or obstetric reasons..

# Intraoperative Measurement of Intra-abdominal Pressure (IAP)

Measure gastric pressure intra-operatively prior to reduction and after reduction of fascial approximation, and keep it <20mmHg.

- Pass Replogle tube into stomach
- Confirm position by drainage of gastric contents or by surgeon during surgery.
- Prime transducer tubing with normal saline and connect transducer to the replogle tube using a blue “Christmas tree” connector
- Prime replogle with normal saline and calibrate transducer to ensure accurate measurements
- Fluctuations in pressure during ventilation cycle desirable for accuracy.

Alternatives for indirect measure of IAP (suggested but not required)

- Measure intra vesical (bladder) pressure
  - Pass Foley catheter into bladder
  - Connect to separate pressure transducer using blue “Christmas tree” connector
  - Confirm fluctuations in pressure by applying pressure to bladder
  - Aim to keep intra-vesical pressure <20mmHg
- Measure ventilator plateau pressures or peak inspiratory pressures
  - Using pressure cycled (ventilation 15mmHg) adjust rate aiming for normal  $P_{eCO_2}$  36-40mmHg
  - Monitor increase in pressure during abdominal closure
  - Pressure increases >10mmHg suggest significant diaphragmatic splinting and a significant increase in abdominal pressure with risk of abdominal compartment syndrome.
  - Plateau pressure >10-15cmH<sub>2</sub>O above intravesical or intragastric pressure are considered a risk for compartment syndrome (Banieghbal 2006).
  - Elevation of CO<sub>2</sub> >50mmHg also suggests that closure may be unsafe (Puffinbarger 1996).
- Measure differential pulse oximetry
  - Place pulse oximeters on upper and lower limbs
  - A differential of >5% suggest a risk of abdominal compartment syndrome (Hong, 2008).
- Use splanchnic perfusion pressure (SPP=MAP-IAP) if gastric pressure >18mmHg. Use spring loaded silo if SPP>43.

**Note: We recommend using cmH<sub>2</sub>O. Some publications measure mmHg while others use cmH<sub>2</sub>O which at 22mmHg equates to 27.2cmH<sub>2</sub>O- a significant difference. These measurements are therefore simply guidelines which are conservative.**

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## Prenatal Visit Gastroschisis Slide Show

- This slide show is for internal Seattle Children's Users only. If you are not an SCH user, please return to the algorithm using the back button below.

[Gastroschisis Prenatal Visit Slide Show](#)



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# Gastroschisis Approval & Citation

Approved by the CSW Gastroschisis Pathway team for the November 18, 2015 go live.

## CSW Gastroschisis Team:

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Neonatal ICU, Co-Owner  
UW Perinatal Medicine, Stakeholder  
Neonatal ICU, Stakeholder  
Neonatal ICU, Stakeholder  
Neonatal ICU, Clinical Nurse Specialist  
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Madlyn Murrey, RN, MN  
Bob Sawin, MD

Retrieval Website: <http://www.seattlechildrens.org/pdf/gastroschisis.pdf>

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# Evidence Ratings

This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children's. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94.):

Quality ratings are *downgraded* if studies:

- Have serious limitations
- Have inconsistent results
- If evidence does not directly address clinical questions
- If estimates are imprecise OR
- If it is felt that there is substantial publication bias

Quality ratings are *upgraded* if it is felt that:

- The effect size is large
- If studies are designed in a way that confounding would likely underreport the magnitude of the effect OR
- If a dose-response gradient is evident

Guideline – Recommendation is from a published guideline that used methodology deemed acceptable by the team.

Expert Opinion – Our expert opinion is based on available evidence that does not meet GRADE criteria (for example, case-control studies).

## Quality of Evidence:

★★★★ High quality

★★★○ Moderate quality

★★○○ Low quality

★○○○ Very low quality

Guideline

Expert Opinion

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# Summary of Version Changes

- **Version 1.0 (11/18/2015):** Go live

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## Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither the authors nor Seattle Children's Healthcare System nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such information.

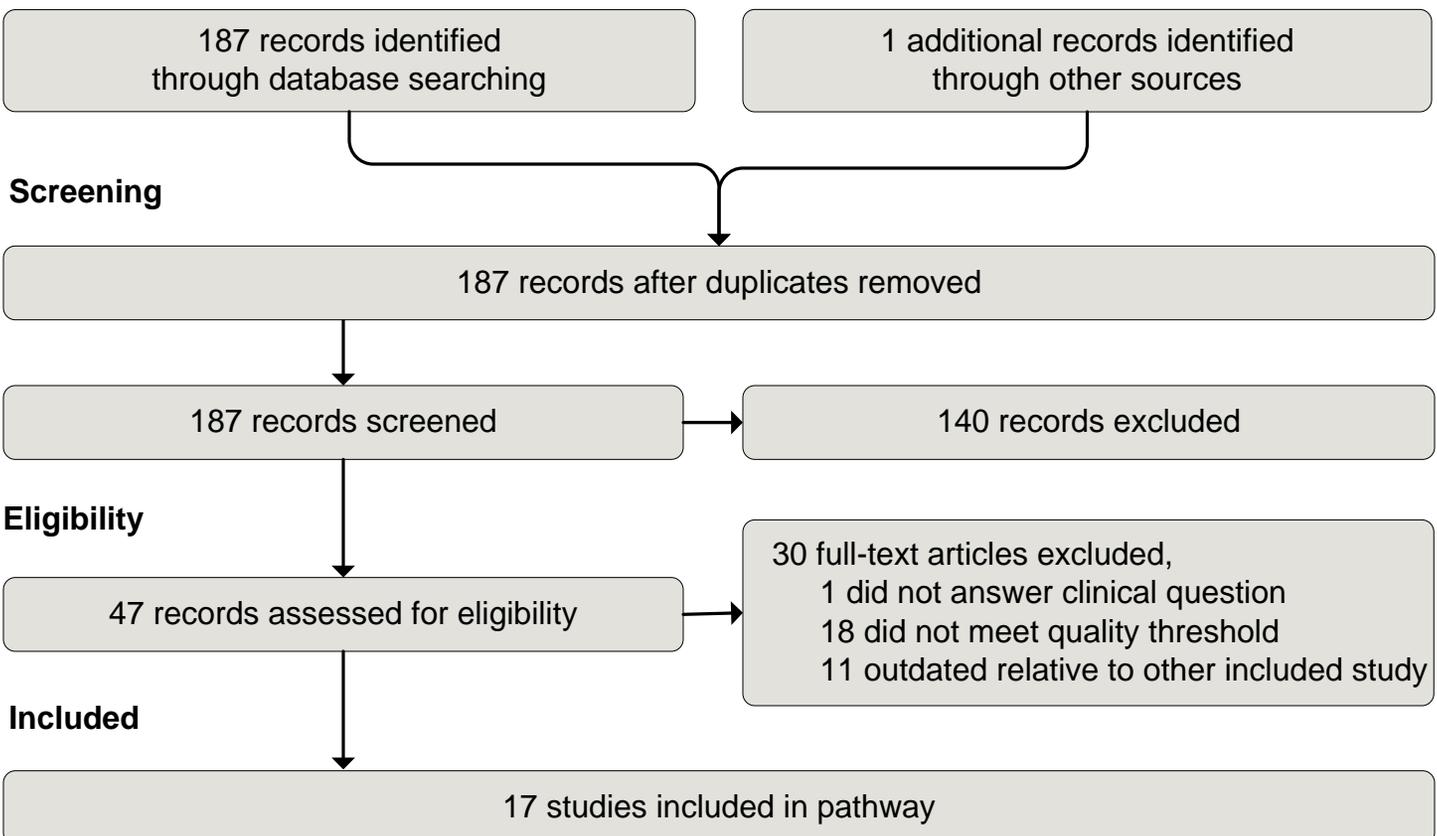
Readers should confirm the information contained herein with other sources and are encouraged to consult with their health care provider before making any health care decision.

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# Bibliography

Studies were identified by searching electronic databases using search strategies developed and executed by a medical librarian, Susan Groshong. Two periodic review searches were completed in March and April, 2015, updating searches originally performed in 2009, 2011, 2012 and 2013. The following databases were searched on the Ovid platform: Medline, Cochrane Database of Systematic Reviews, and Cochrane Central Register of Controlled Trials; elsewhere: Embase, Clinical Evidence, National Guideline Clearinghouse, TRIP and Cincinnati Children's Evidence-Based Care Recommendations. Retrieval was limited to humans (any age), English language and the period September 1, 2009 to current. In Medline and Embase, appropriate Medical Subject Headings (MeSH) and Emtree headings were used respectively, along with text words, and the search strategy was adapted for other databases using their controlled vocabularies, where available, along with text words. Concepts searched were gastroschisis, feeding regimen, fetal indications for delivery and fluid management. All retrieval was further limited to certain evidence categories, such as relevant publication types, Clinical Queries, index terms for study types and other similar limits.

## Identification



Flow diagram adapted from Moher D et al. BMJ 2009;339:bmj.b2535

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