GASTROINTESTINAL BLEEDING - SCHN

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

Policy Statements

- Manage Airway, Breathing and Circulation according to Advanced Paediatric Life Support principles.
- Establish IV access.
- Do blood tests for haemoglobin, haematocrit, coagulation profile, blood group, UECs and LFTs.
- Cross match blood.
- Give intravenous resuscitation fluid including packed red cells according to urgency.
- Give vitamin K and Fresh Frozen Plasma (FFP) if coagulation is abnormal.
- Give platelets if platelet count low.
- Notify intensivist, anaesthetist, gastroenterologist and surgeon.
- Start intravenous proton pump inhibitor (PPI)
- Measure plasma ammonia if pre-existing liver disease.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st March 2017	**Review Period**: 3 years
Team Leader:	Staff Specialist	**Area/Dept**: Gastroenterology

Date of Publishing: 23 February 2017 1:17 PM Date of Printing: 23 February 2017

CHANGE SUMMARY

- Due for mandatory review
- Addition of section 5.
- Replaces previous CHW-only document

READ ACKNOWLEDGEMENT

- Read Acknowledge Only – Gastroenterologists, Surgeons, Intensivists, Medical staff in Emergency Department.

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1 Gastrointestinal Bleeding

Children presenting with significant gastrointestinal bleeding, either upper or lower, or both, must be regarded as a medical emergency.

The causes of upper gastrointestinal bleeding include:

- Mucosal gastrointestinal diseases, including peptic ulcer disease
- Venous and arteriovenous malformations; Dulefoy lesions
- Oesophageal variceal bleeding, due to:
    - Extrahepatic portal hypertension (ie no liver disease, portal hypertension secondary to thrombosis or obstruction of the portal vein, with splenomegaly. Note that splenomegaly may not be clinically evident following an acute bleed).
    - Intrahepatic portal hypertension from chronic liver disease, as evidenced by splenomegaly and other extra-hepatic features of cirrhosis; note that upper gastrointestinal bleeding from the Roux loop will usually present as melaena, not haematemesis
    - Non-cirrhotic portal hypertension

Causes of significant lower gastrointestinal bleeding include:

- Meckel's diverticulum
- Venous and arteriovenous malformations, haemangiomas, intestinal duplications.
- Mucosal ulceration in inflammatory conditions such as ulcerative colitis and Crohn's disease.
- Intestinal lymphomas

2 Initial Management

Whatever the cause, the initial management of a patient presenting with significant gastrointestinal bleeding should include:

- Assessment of the patient's haemodynamic status. The **ABC** (**A**irway, **B**reathing, **C**irculation) approach to assessment is utilised.

  A. Airway: Assess patency of the airway.
  B. Breathing: Assess respiratory rate and oxygen saturation (pulse oximetry)
  C. Circulation: Assess heart rate, blood pressure, peripheral perfusion and end organ function. The end organs that can readily be assessed are the brain, kidney and skin.

A normal physiological response of the body is to attempt to maintain normal vital organ perfusion pressure. When cardiac output falls, various neural and hormonal compensatory mechanisms come into play, which are designed to restore circulating blood volume through salt and water retention, to increase heart rate and contractility and to raise systemic vascular resistance. When compensatory mechanisms fail, hypotension occurs. A child with tachycardia must be appropriately resuscitated to prevent hypotension which is a late and often sudden sign of shock. Recognition of early shock, prior to the onset of hypotension is necessary to optimise chances of successful resuscitation. For additional information, see the:

- Emergency Department Cardiac Arrest guidelines
- Cardiopulmonary Resuscitation and Equipment – CHW Practice Guideline: http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2006-8239.pdf

- Establish appropriate intravenous access. Insert at least one large bore cannula into a vein. If the patient is shocked or still actively bleeding, 2 cannulae should be inserted. If intravenous access cannot be obtained within a reasonable timeframe (usually 90 seconds in the shocked patient), then the intraosseous route should be utilised. For additional information, see the Emergency Department Cardiac Arrest guidelines and the Cardiopulmonary Resuscitation and Equipment – CHW Practice Guideline: http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2006-8239.pdf
- Blood testing for haemoglobin, haematocrit, coagulation profile, blood group and cross match. Check baseline UECs and LFTs.
- Notify the on-call Gastroenterologist and Surgeon, and request Paediatric Intensive Care Unit/HDU review. Patients with major bleeding may require a PICU/HDU bed.
- Haemoglobin values early in the course of acute bleeding may be minimally decreased. In addition, patients with significant intravascular volume depletion may have an overestimated haemoglobin level which may not reflect the "true" haemoglobin until after fluid resuscitation and equilibration. Thus haemoglobin levels should be checked on a regular basis, at least four hourly or more frequently as determined by the clinical scenario.
- Initial therapies for gastrointestinal bleeding include:

- Immediate intravenous fluid resuscitation with appropriate volumes (10-20mL/kg aliquots) of either 0.9% sodium chlorideor a plasma expander such as 4% Normal Serum Albumin (NSA).
- Appropriate transfusion of packed red blood cells, dependent on the clinical scenario and haematocrit and haemoglobin levels. (O negative, group specific or cross matched, depending on urgency).
- Adult studies demonstrate that a restrictive transfusion policy in adults bleeding due to portal hypertension, targeting a haemoglobin of between 70 and 80, is associated with lower portal pressures, less rebleeding and lower rates of transfusion reactions, resulting in lower mortality[1]. However the target haemoglobin for blood transfusion in children who have gastrointestinal bleeding is uncertain, and should always take into account the haemodynamic status and presence of ongoing bleeding.
- If the coagulation profile is abnormal, give intravenous Vitamin K (0.3 mg/kg to maximum 10 mg) and Fresh Frozen Plasma. An appropriate initial dose of FFP is 20mL/kg over 1 hour (NOTE: this may be given as part of the volume resuscitation). **Ionised calcium levels may fall during rapid FFP infusion, which may cause or worsen hypotension, so ionised calcium should be monitored and replaced appropriately using calcium chloride.**
- Cryoprecipitate may be required, particularly in those children with liver disease with low fibrinogen levels. Do not use cryoprecipitate for volume resuscitation. If the platelet count is less than 50,000 platelets should be administered if there is continued bleeding.
- Consultation with Haematology is recommended if ongoing treatment of coagulopathy is required. The use of recombinant Factor VIIa may be considered in a child with coagulopathy and uncontrolled bleeding, although randomised controlled trials (adult patients) have not shown a clear advantage[2]**.** Other options to discuss with Haematology include tranexamic acid and vitamin C therapy.

3 Specific Therapies for Upper Gastrointestinal Bleeding

Please note that the primary resource for drug dosing at CHW is Meds4Kids with links to the supporting resource Paediatric Injectable Medicines Handbook. Meds4kids is regularly updated as the need arises and may contain other useful information

At Sydney Children's Hospital Randwick the Australian Medicines Handbook-Children's Dosing Companion should be used at the primary reference supported by the Paediatric Injectable Guide

3.1 Proton Pump Inhibitor (PPI) therapy

Intravenous proton pump inhibitor (omeprazole or pantoprazole) therapy should be empirically started in all patients with significant upper GI bleeding. Recent adult studies suggest that intermittent PPI dosage is as effective as continuous infusion[3,4]. The dosages and administration regimens used in children are not well established, but ideally should be:

Omeprazole

- **Dose:**

  1-2 mg/kg/dose twice daily intravenously (maximum dose 80/**day**

- **Brand name:** Omeprazole Sandoz IV
- **Presentation:** Powdered 40 mg vial
- **Preparation:** To reconstitute the vial add 10 mL glucose 5% in water or sodium chloride 0.9% from a 100 mL bag to form a 4 mg/mL solution. Mix the vial thoroughly to dissolve. Draw up the required dose and transfer to the 100 mL infusion bag.
  - **Administration::** Infuse over 20 to 30 minutes. CHW: http://webapps.schn.health.nsw.gov.au/injectables/browse/omeprazole
- **Patient Monitoring:** Monitor infusion site for thrombophlebitis or extravasation which can cause tissue damage.

Adverse effects: Generally well-tolerated. May increase the risk of gastro-intestinal infections (including Clostridium difficile infection. Common (>1%): headache, nausea, vomiting, diarrhoea, abdominal pain, constipation, flatulence. Rare (<0.1%): alopecia, confusion, haemolytic anaemia, pancreatitis, microscopic colitis.

NB: IV omeprazole is currently not licensed for use in children, but is still used in clinical practice.**Pantoprazole**

For continuous IV infusion dosage and administration regimen of pantoprazole for upper GI bleeding refer to the pantoprazole entry in the SCH Paediatric Injectable Guidelines:

3.2 Octreotide

Vasoactive drugs like the somatostatin analogue octreotide have a significant effect in the treatment of patients with bleeding oesophageal varices secondary to portal hypertension. Octreotide acts as a splanchnic vasoconstrictor, and also inhibits several gastrointestinal hormones (such as glucagon and Vasoactive Intestinal Peptide, VIP) which are thought to be

splanchnic vasodilators. There are both long and short acting octreotide preparations; short acting octreotide is used in upper GI bleeding. The elimination of octreotide from the plasma has an apparent half-life of 1.5 hours so a continuous infusion is required. A recent meta-analysis of 11 trials showed a significant improvement in the control of acute haemorrhage and a significant reduction in mortality[5]**.**

CHW - Octreotide is stored in the fridge in the After-hours Drug Room and in the Pharmacy. Notify Pharmacy as soon as possible of intended usage as stocks are limited.

- **Presentation:** 1 mL ampoules: 50 microgram/mL; 100 microgram/mL; 500 microgram/mL.
- **Dosage:** Loading dose of 1 microgram /kg, followed by a continuous infusion of 1- 2 microgram/kg/hour **(maximum 50** microgram **/hour)**, titrated every 8 hours to response, up to 5 microgram /kg/hour **(maximum 50** microgram **/hour)**, for between 2-5 days. Taper dose by 50% every 12 hours when no active bleeding occurs for 24 hours; may discontinue when dose is 25% of initial dose.
- **Administration:**

  CHW:
  http://chw.schn.health.nsw.gov.au/o/apps/pharmacy/injectables/search.php?name=OCTREOTIDE

  SCH:
  http://sch.sesahs.nsw.gov.au/departments/pharmacy/resources/sch_paediatric_injectable_guidelines.pdf
- **Patient Monitoring:** Continuous heart rate; Blood pressure at least ½ hourly; and blood glucose every 4 hours whilst on infusion. ECG and measurement of QTc prior to commencement
- **Metabolism:** Octreotide is mostly metabolized by the liver, although 30% of octreotide acetate is excreted in the urine unchanged. Thus, octreotide accumulates in patients with moderate to severe renal or hepatic insufficiency.
- **Side Effects:** The side-effects reported with octreotide infusions include hyperglycaemia (less commonly hypoglycaemia), dizziness, nausea, vomiting, abdominal pain and diarrhoea. The drug has minimal systemic haemodynamic effect, although bradycardia has been described. Should be used cautiously in patients with known cardiovascular disease due to reports of QT prolongation. Commonest reported laboratory abnormalities include thrombocytopaenia and hyerbilirubinaemia.

When the patient is haemodynamically stable, with no contraindications for upper gastrointestinal endoscopy, endoscopic therapy will be organised.

NB: Octreotide is currently not licensed for use in children, but is still used in clinical practice.

3.3 Endoscopy with either sclerotherapy or variceal banding

For those patients with significant upper gastrointestinal bleeding, upper gastrointestinal endoscopy is usually performed by the Gastroenterology Service. This is usually done when

the patient has been resuscitated and medically stabilized, though is occasionally performed in an emergency setting. Endoscopy both confirms the source of bleeding (oesophageal varices, peptic ulcer or arteriovenous malformation) and at the same time therapeutic manoeuvres such as oesophageal variceal sclerotherapy or band ligation, or peptic ulcer injection or clipping, can be performed.

3.4 Balloon tamponade

In the event of oesophageal variceal bleeding which is not controlled by either pharmacologic or endoscopic therapy, balloon tamponade using one of several tube designs (Sengstaken-Blakemore, Minnesota, Mallinckrodt or even a Foley's catheter) may be performed. The Minnesota tube is an adaptation of the Sengstaken-Blakemore (S-B) tube, the difference is that the S-B tube does not have an oesophageal suction port to prevent aspiration. For small children, a large adult size Foley catheter (with a 30 cc balloon) may be the only tube of suitable size.

Insertion of a balloon tamponade tube will require the child to be intubated and ventilated. Hence insertion of a tamponade device is performed in either the Emergency Department if bleeding is torrential, or the Operating Room at time of endoscopy or in the PICU by the on-call surgeon with PICU and Gastroenterology assistance. These tubes are inserted into the stomach, and then the gastric balloon is inflated and the tube is withdrawn until resistance is felt at the gastroesophageal junction. The oesophageal balloon is then inflated. The position of the balloon should be checked radiographically. Traction (using a 0.5 kg weight or a 500 mL plastic bag of IV fluid) is maintained via a pulley system above the patient's head. Alternatively, a device placed on the head of the patient similar to a crash helmet, to avoid displacement of the tube when the child moves his or her head can be utilised.

Balloons represent a bridge to further therapies, as more than 24-48 hours of pressure on the gastroesophageal junction and oesophagus may result in oesophageal ulceration and perforation. The size of balloon to be used should be discussed with the on-call surgeon and gastroenterologist.

Other issues to consider regarding use of balloons:

- the gastric and oesophageal balloons must be deflated for 15 minutes every 6 hours
- monitor position of tube radiographically at least every 24h
- a pair of scissors should be at the bedside in case balloon ports need to be cut for rapid decompression: balloon may migrate and cause acute upper airway obstruction.

These balloons and a pulley are kept in the PICU in the GI Bleeding Box in the Main Store Room. Sengstaken-Blakemore balloons are also kept in the Operating Suite on the Gastrostomy trolley. It is paramount that these devices are regularly checked for their use-by-date as they are infrequently required. As such support and equipment may be necessary from adult colleagues at Westmead/ Prince of Wales Hospital, as clinically required.

3.5 Shunts

Surgical shunts

If bleeding is still uncontrolled, shunt surgery will be considered. Various surgical shunts are possible, depending on the anatomy of the portal vasculature and the preference of the on-call surgeon. An emergency MRI venogram (MRAV) or splenoportogram will be required preoperatively to outline the venous anatomy – in some situations the anatomy may not be suitable for shunt surgery.

Transjugular Intrahepatic Portosystemic Shunt (TIPS)

One other shunt option is the use of TIPS. TIPS is a stent inserted by an interventional radiologist via the internal jugular vein, which is then usually placed via the middle hepatic vein into the liver parenchyma and wedged into the portal vasculature, thereby creating a porto-systemic shunt. This is a bridge to liver transplantation. This is a therapy not often employed in children, due to issues surrounding the smaller size of paediatric patients and inexperience in the use of this therapy. The shunt may be associated with side-effects including encephalopathy, infection and blockage.

3.6 Gastric Transection

Should all above measures fail, and shunting is not possible, then gastric transection with oversewing of the gastric/oesophageal varices may be required.

3.7 Liver Transplantation

In those patients who have significant liver disease, urgent listing for liver transplantation may be required.

3.8 Occult Gastrointestinal Bleeding

Patients without liver or peptic ulcer disease can have significant gastrointestinal bleeding, for which a specific cause is often obscure. In certain situations localising and treating the bleeding requires involvement of Nuclear Medicine (Red Blood Cell Scans) and Interventional Radiology (angiogram and embolization).

4 Upper Gastrointestinal Bleeding in Patients with Liver Disease

Patients with decompensated liver disease, and severe portal hypertension with oesophageal variceal bleeding, may develop other complications associated with their bleed.

4.1 Increased risk of infection

There should be a low threshold for blood culture and the commencement of empiric antibiotics to cover gram negative organisms and other gut flora such as enterococcus. Also consider fungal prophylaxis with fluconazole.

4.2 Renal dysfunction

Children with liver disease may develop hepatorenal syndrome in the setting of an acute variceal bleed. Monitoring of electrolytes, urea and creatinine is required.

4.3 Hypoglycaemia

Hypoglycaemia may occur in children with liver disease and should be avoided by giving appropriate amounts of intravenous glucosesolution.

4.4 Encephalopathy

Bleeding into the gastrointestinal tract represents a protein load which a decompensated liver may not adequately cope with. Blood ammonia levels should be measured.

4.5 Further Hepatic Synthetic Dysfunction

Significant bleeding may result in reduced hepatic blood flow, further compromising hepatic function.

5 Bleeding or Suspected Bleeding in Children Undergoing Invasive Interventions/Procedures Pre and Post Liver Transplantation

Children awaiting liver transplant, and those who have recently been transplanted, are at high risk for bleeding.

Any invasive intervention increases the risk in these patients, most of whom are **coagulopathic and thrombocytopaenic**. Interventions include liver biopsy, and chest or peritoneal drains for drainage of ascites.

The bleeding can be into the **gastrointestinal tract, the abdomen, lung or thoracic cavity**.

Coagulopathic patients who undergo invasive intervention require:

1. Therapy with fresh frozen plasma (FFP) for at least 24 hours prior to the procedure, unless urgent intervention is needed. Haematological consultation is required before embarking on FFP infusion.
2. Having platelets available prior to the procedure, and to be given as required (according to platelet count and clinical scenario).
3. Paediatric Intensive Care Team consultation, with a low threshold for admission to PICU (as dictated by the on-call Intensivist).
4. Demonstration that the coagulation/platelet abnormalities have been improved by FFP and/or platelet infusion prior to performing the procedure.
5. Having appropriate amounts of cross-matched blood available prior to the procedure.
6. Continuation of the FFP/platelets for at least 72 to 96 hours post procedure.
7. Frequent monitoring of clinical parameters post procedure, including cardiorespiratory and abdominal examination, and level of consciousness.
8. Haemodynamic assessment as outlined earlier (pulse rate, respiratory rate, blood pressure, continuous saturation monitoring)
9. Frequent monitoring of laboratory parameters post procedure:
    - **FBC**
        - **i.** six hourly over first 48 hours
        - **ii.** then reducing in frequency over subsequent days depending on clinical scenario
    - **Coagulation**
        - **i.** twice daily for the first 48 hours
        - **ii.** then at reducing frequency depending on results, clinical scenario and status of FFP infusion
        - **iii.** consider TEG (thromboelastogram) as an assessment of coagulation status
    - **Biochemistry**

iv. electrolytes, blood sugar twice daily for first 48 hours, then at reducing frequency

v. serum ammonia and liver function tests (daily)

Notes:

- Children with end-stage liver disease who have occult bleeding into the gastrointestinal tract, abdominal or thoracic cavity following an intervention can be **difficult to recognise**.
- Typical vital clinical signs of early acute bleeding can be **unreliable**, and may not become apparent until a critical event occurs.
  For example; unrecognised **raised intracranial pressure (ICP)** may cause bradycardia and hypertension, in contrast to the tachycardia and hypotension seen with blood loss.
- In addition, **post-procedure confusion** can be attributed to any one or combination of bleeding, encephalopathy (with or without hyperammonaemia), pain, post-anaesthesia or sepsis.
- Therefore a **high index of suspicion, frequent expert clinical review** and **frequent laboratory monitoring** is required for these children post-procedure.

If bleeding is identified or strongly suspected, the following steps should be followed:

• urgent administration of cross-matched blood is mandated

• if blood is not cross-matched, O negative blood should be urgently obtained from Blood Bank and administered

• the on-call Gastroenterology/Hepatology Consultant should be notified and should review the patient urgently

• PICU and Surgery should be notified and review the patient urgently

6 Lower Gastrointestinal Bleeding

- Lower gastrointestinal bleeding should first be characterized as either melaena or haematochezia. The presence of melaena suggests bleeding from the upper gut, while haematochezia implies lower gut bleeding. This is important as the site of the bleed can determine different causes.
- Significant lower GI bleeding should be initially managed as outlined above to maintain haemodynamic stability.
- Generally the Surgical Team should be primarily involved, along with Gastroenterology, in the management and assessment of children with significant lower GI bleeding. Many of the causes are surgical, in particular Meckel's Diverticulum and Intussusception.
- The investigation of significant lower GI bleeding may require consultation with Radiology to identify the site and cause of bleeding. Tests such as Nuclear Medicine Red Blood Cell scans, angio CT and angiograms may be required.

7 References

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