Guideline

Emergency Department Management of Epistaxis

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Supercedes	1.0				
Applicable to	All CHQ staff involved in the care and emergency management of children with epistaxis				
Authorisation	Executive Director Clinical Services				

Purpose

This guideline provides clinical practice guidelines to guide clinicians involved in the emergency management of children with epistaxis.

Scope

This work instruction applies to all staff involved in the care and management of children with epistaxis.

Related documents

Appendices

- Flow chart for acute management
- **Severe bleeding in the context of facial trauma / head injury**
- **Patients on warfarin**
- **Hypertension**
- **Leukaemia**
- **Hereditary haemorrhagic telangiectasia**

Procedures, Guidelines, Protocols

- CHQ-PROC-02908 Massive Transfusion Protocol

Introduction

Epistaxis is a common condition in children encountered in the community and in the Emergency Department (ED)[1,2]. Bleeding from the anterior portion of the nasal cavity known as Kiesselbach's plexus accounts for 90-95% of all epistaxis,[1,3] and most episodes will resolve with direct compression of this area ie gentle pressure on the nasal alae for 5-10 minutes[4]. Whilst childhood epistaxis is common – up to 60% of children will have had at least one nose bleed by age 10 years – it is usually venous in origin and rarely severe.[5] Most episodes can be effectively treated in the ED and will not require nasal packing or hospital admission. [6]

Aetiology[13]

In the majority of cases bleeding arises from a normal vein without any obvious abnormality to account for it, although there may be contributing factors.[9] Most cases are due to a normal vessel in the nasal vestibule aggravated by digital manipulation. However allergic rhinitis, trauma and vestibulitis are all commonly associated with recurrent epistasis and thus successful management may be enhanced by addressing these conditions.

Other common causes include incorrect use of topical steroid sprays resulting in trauma and post operative bleeding associated particularly with turbinate surgery. Bloody rhinorrhoea is also a common presentation post adenoidectomy and if associated with fever may benefit from oral antibiotics.

It is important to consider any potential contributing factors and red flags for underlying aetiologies.

Red flags for Paediatric Epistaxis

Young age (under 2 years old)	Epistaxis is a rare cause of emergency department presentation in children under the age of 2 years[17,18] Potential aetiologies include acute rhinitis/ coryza, NAI (deliberate suffocation – consider if BRUE or SIDS and epistaxis), hereditary haemorrhagic telangiectasia, coagulation disorder, fall or minor trauma and idiopathic[17]
Adolescent male	Consider risk of Juvenile Nasopharyngeal Angiofibroma (JNA) – a benign very vascular tumour that can be locally invasive and can cause severe or recurrent epistaxis[25,26] 'Classic triad' = unilateral nasal obstruction, epistaxis, nasal discharge[15] (in an adolescent male)[27] New onset epistaxis in adolescent male with no obvious bleeding source on anterior rhinoscopy or absence of other obvious cause should be referred to ENT for follow up
Suggestion of underlying bleeding disorder	Prolonged epistaxis (> 30 min) despite adequate first aid Easy bruising Evidence of other bleeding - petechiae, purpura, ecchymoses, menorrhagia, GI bleeding, past history of prolonged bleeding after surgical challenges eg dental extractions, tonsillectomy, circumcision, minor trauma Evidence or presence of liver disease Family history of known bleeding disorder, history of recurrent epistaxis, menorrhagia, bleeding after surgical challenges

Suspicion of malignancy – local or systemic	Easy or abnormal bruising, petechiae, purpura Bleeding gums, pallor, lethargy, generalised lymphadenopathy, hepatosplenomegaly
Severe bleed	Need for resuscitation is rare in children with epistaxis and indicates unusual / more complex case[30]
Bleed recalcitrant to treatment	Consider systemic underlying cause (<10% of presentations) Consider mechanical /anatomic causes (foreign body, mass)
Recurrent ED presentations	Failed medical management may be associated with higher risk of underlying bleeding diathesis.

ALERT

Not all sources of epistaxis are from the nasal canal, consider risk of swallowed button batteries if no obvious anterior site source of bleeding is evident.

See Coroners report: https://www.courts.qld.gov.au/__data/assets/pdf_file/0004/444289/cif-steer-sa-20151103.pdf

Assessment

The aim of the assessment should be to:

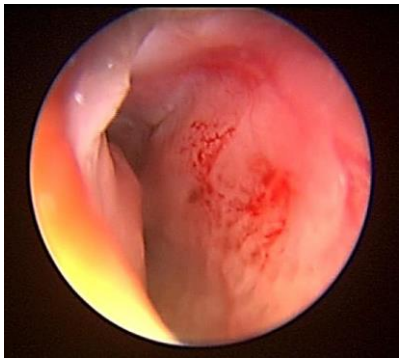
1. Rapidly identify the child with serious bleeding who requires emergent management – in this instance proceed with resuscitation and haemorrhage control and return to detailed assessment once clinical situation allows
2. Identify the small group of patients who require further investigation or referral
3. Identify a cause / bleeding site where possible; tailor management options to findings
4. Identify which children can be safely discharged from the emergency department

History and examination should be focused on seeking details and findings to suggest red flags as above.

A thorough bleeding history should be obtained including history of epistaxis, medication history, easy bruising or petechiae, prolonged bleeding after surgical challenge, menorrhagia, family history or history of migraine (Children with migraine have increased incidence of recurrent epistaxis[31]).

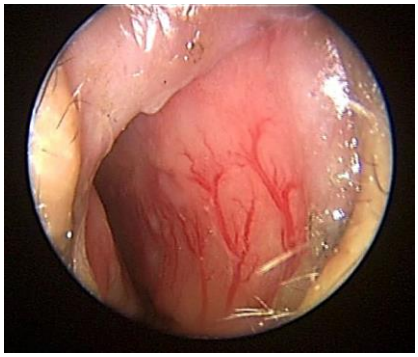
Examination should include a generalised exam looking at haemodynamic status, clinical evidence of anaemia, signs of underlying disorder (see Red Flags) and localised examination of the nasopharynx. This can normally be done with an otoscope (lighting and magnification). Use of topical vasoconstrictor and anaesthetic spray (eg Lidocaine 5%-Phenylephrine 0.5% (Co-Phenylcaine Forte®) spray) can reduce bleeding and optimise view, will be more effective after clot removal[34] (If clot is present remove manually or have patient blow nose, this may help stop bleeding by reducing fibrinolytic agents in the clot that keep vessels open[34]). Inspect anterior septum and nares for bleeding point, prominent vessels, abnormal vessels / telangiectasia, crusting, polyps / mass. Crusting is the most common finding (two-thirds of children with nosebleeds)[33]. Visible vessels on the anterior septum are present in 40-50% of children with epistaxis, are

almost always on the side bleeding occurs when symptoms are unilateral, and are uncommon on the other side.[32,23] Nasal polyps are rare in children except in the presence of cystic fibrosis, and even when present rarely cause bleeding[32].



Ulceration of the right anterior nasal septum causing epistaxis

Figure 2:[36]



Prominent vessels located on the right anterior cartilaginous septum in Kiesselbach's plexus/Little's area

Figure 3:[3]

Who needs routine laboratory investigation?

A small subset of patients with epistaxis will have an underlying bleeding disorder [9].

The presence of the risk factors or red flags as in the table above should prompt consideration of laboratory testing in the ED:

The vast majority of children who present to the ED with epistaxis will not require any blood tests.

Consideration should be given to the most appropriate timing and follow up of the laboratory investigations. Children with large volume severe bleeds will require investigation in the ED whilst those children with recurrent presentations of mild bleeds or positive bleeding history may be optimally investigated in the outpatient setting. The identification of mild bleeding disorders can require sophisticated testing that is not indicated in the emergency setting, and is best facilitated with a referral from the General Practitioner for consultation with a Paediatric Haematologist. Any investigations required will be determined by Haematologist and it is preferred for this not to be done in the acute phase (as can be affected by inflammatory change) or in the community.

Emergency Treatment

General Management

Rapid assessment of general appearance, vital signs, airway stability, breathing, circulation and mental status are necessary to identify children who require airway intervention and/or fluid resuscitation.

Reference to the Massive Transfusion Protocol, Airway Management and Resuscitation Guidelines should be undertaken as required for the shocked bleeding patient with potential airway compromise.

ALERT

Signs of shock or airway compromise in the presence of epistaxis constitute an

ENT EMERGENCY

- **Resuscitation and haemorrhage control**
  - **Reference to Airway Management and Resuscitation Guidelines**
  - **Insert Rapid Rhino**
- **Utilise the Massive Transfusion Protocol**
- **Ensure emergent notification of ED Consultant, ENT and Anaesthetic teams**

Acute Management

Acute management can commence once the patient has undergone rapid assessment of ABCD. Management of epistaxis in children entails control of acute haemorrhage and prevention of recurrence by controlling underlying local or systemic disease processes[10].

The majority of epistaxis in children is acute, sporadic and self-limited and usually responds to simple compression, but may require cautery, nasal packing or more aggressive measures[10].

Direct compression:

If the patient is actively bleeding, seat them upright and ask them to lean forward (to minimise the swallowing of blood) and apply pressure onto the soft cartilaginous part of the nose (NOT the bridge of the nose) for 10 minutes by squeezing the nose between thumb and side of the index finger[5,6,7]. Persistent bleeding is often due to inadequate treatment / pressure.

Use of Vasoconstrictors:

To help determine the site of bleeding the use of vasoconstrictors applied via spray (eg Lidocaine 5%-Phenylephrine 0.5% (Co-Phenylcaine Forte®) spray) or cotton wool to Little's area may help. If bleeding remains uncontrolled, cautery or packing may be required.

Tranexamic Acid:

Systemic - All patients in whom bleeding does not stop with simple pressure should be administered Tranexamic acid IV 10mg/kg/dose (Max 1g/dose) 8 hourly. All admitted patients should continue on Tranexamic acid until ENT review.
Topical Tranexamic acid - also been found to be useful and is a safe consideration – most authors report 10% (use IV preparation 1000mg/10mL). Various application options including cotton wool held direct on bleeding site or topically applied to absorbable nasal packing. Note: This is considered off label/off license/non LAM use – seek and document parental consent and fill in IPA (individual patient approval) form.[34,35]

Topical Antiseptic / Emollient:[10]
If Staphylococcus aureus colonisation is not suspected simply use a topical lubricant such as paraffin ointment as first line treatment for dry friable nasal mucosa; apply to the nasal vestibule with the tip of the little finger in the evening regularly for 2-3 months; unclear gain but may be useful and is low risk.

If Staphylococcus aureus colonisation is suspected (yellow crusting), perform MRO nasal swab and review results. Decolonisation options include topical antiseptic ointments or oral antibiotics (if associated with recurrent boils/furunculosis). Due to increasing use in hospital and community settings, Mupirocin (Bactroban®) resistance is increasing. Refer to CHQ-GDL-01063 Recurrent Boils (furunculosis): Guidelines for management and Staphylococcal decolonisation (MRSA and MSSA) for guidance on management.

Cautery:

Nasal cautery is a commonly used treatment for recurrent idiopathic epistaxis but only if a distinct bleeding point is identified. It is painful and can affect compliance for any future procedures. Chemical cautery involves the use of silver nitrate sticks directly applied to dilated vessels on Little's area, causing a chemical burn which scleroses the vessel. It is preferable to use the 75% preparation of silver nitrate - compared to the 95% concentration - as the higher concentration is associated with greater tissue damage and potential for complications including pain [43].

> At QCH ED, this procedure must be performed by or under the supervision of experienced senior staff.

Floseal Hemostatic matrix (Baxter):

Topical use of this human thrombin should be considering before packing. Multiple adult studies have shown this absorbable haemostatic agent to be highly effective. It is more comfortable than nasal packing and if successful in controlling bleeding could be used in the ambulatory setting, avoiding admission[44]. This agent is can be sourced from QCH theatres.

Nasal packing:

If local therapy fails, the easiest form of controlling the bleeding can be achieved by tamponade through the use of anterior nasal packing with nasal balloons (e.g. rapid rhino balloon pack with a self-lubricating hydrocolloid fabric covering or dissolvable versions of Kaltosat and Nasopore). Nasal packing should be avoided in patients less then 1 year of age because of the risk of aspiration. However, serious epistaxis warranting nasal packing in this age is rare[10]. Patients who are thought to require nasal packing require early discussion or review by ENT. Packing is painful and patients should be given adequate analgesia prior to insertion. All patients with packs in situ require admission.

Rapid Rhino is recommended for its ease of insertion and removal including less patient discomfort compared to other anterior packs, and at least equivalent effectiveness. See appendix 4 on details of how to use.

Posterior Nasal Packing:

If anterior packing fails or bleeding is catastrophic, or there is a known history of posterior bleeding, insert a posterior nasal pack. A Foley's catheter is commonly used as a posterior nasal packing device.

Where a posterior bleed is suspected, using a larger than usual size of Rapid Rhino (ie using the 7.5cm device) may be successful in controlling a posterior bleed, particularly where the use of a Foley's catheter is problematic eg in concomitant head trauma.

Use of Antibiotics & Nasal Packing

Traditional teaching is that prophylactic antibiotics should be used when a nasal pack is inserted to prevent infective complications such as sinusitis, otitis media and toxic shock syndrome, however there is limited evidence in the literature to support their use. [48, 49]

Current practice at QCH is to prescribe antibiotics in the following circumstances –

- Immunosuppressed patients
- Patients with structural heart disease
- Posterior nasal pack in-situ

Antibiotic Choice for the management of children with nasal packing who are deemed at high risk for infective complications	
Antibiotic	**Dose**
Amoxicillin/clavulanic acid **(Augmentin DUO/ Curam DUO)**	22.5 mg/kg/dose (amoxicillin component) orally twice daily (Max 875mg amoxicillin component per dose) for 5 days
Cefalexin	For patients with a confirmed delayed type hypersensitivity to penicillins (eg rash) 30mg/kg (max 1g/dose) orally three times a day for 5 days
Trimethoprim/sulfamethoxazole **(Bactrim/ Septrin)**	For patients with a confirmed immediate type hypersensitivity to penicillins (eg anaphylaxis) 4 mg/kg/dose (trimethoprim component) orally twice daily (Max 160mg trimethoprim component per dose) for 5 days

Consideration can also be given to using regular paraffin or other topical lubricant at night whilst the packs are in-situ.

Special Cases

1. Severe bleeding in the context of facial trauma / head injury
2. Patients on warfarin
3. Hypertension
4. Leukaemia
5. Hereditary haemorrhagic telangiectasia

Who needs referral to ENT?

1. **Inpatient Referral**
    a) Emergent referral of severe bleed or ongoing bleeding in the ED despite treatment
    b) Any patient who requires nasal packing will require referral to ENT for admission
2. **Outpatient Referral**
    a) Minor recurrent bleeds that are frequent enough to be troubling to the patient / family – discharge with request for referral to ENT OPD by the patient's GP
    b) Bleeding of uncertain cause with a 'red flag' that does not require emergent intervention but needs specialist review eg young age, adolescent male; discuss with ENT if uncertain

Discharge Instruction

Once bleeding is controlled patients should be discharged with topical treatment to moisturise the nasal vestibule. Topical treatments which include a vasoconstrictors, antiseptic, antibiotic or steroid can all be considered, although overuse of topical antibiotics may be associated with resistance leading to the recommendation of judicious prescription.

Topical preparations available include:

- Vaseline®
- Pawpaw ointment - available from community pharmacy
- Fess® nasal gel (contains Sodium chloride - Glycerol - Geranium oil - Olive oil - Sesamum indicum seed oil - Dl-alpha-tocopherol) - available from community pharmacy
- Nasalate® cream (contains phenylephrine and chlorhexidine) - available from community pharmacy
- Kenacomb® ointment- triamcinolone, neomycin, gramicidin and nystatin

The contributing role of allergic rhinitis in children presenting with epistaxis should be considered. Patients with symptoms or signs of allergic rhinitis may benefit from consideration of topical nasal steroids and or oral antihistamine with an aim to reduce nasal mucosa inflammation and reduce and nasal trauma from rubbing.[50] Correct administration of topical steroid sprays however should be demonstrated to prevent trauma to the septum and further aggravation of vessels on the septum.

Key stakeholders who reviewed this version:

- SMO QCH Emergency
- SMO ENT QCH
- Director of Haematology QCH
- Director of Infectious Diseases QCH
- Pharmacist Advanced - Antimicrobial Stewardship, QCH

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Guideline revision and approval history

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1.0 14/06/2018	Director Paediatric Emergency Department	Divisional Director, Critical care	Executive Director Medical services
2.0 15/02/2023	ED SMO	Depute Director Emergency	A/Divisional Director Critical Care

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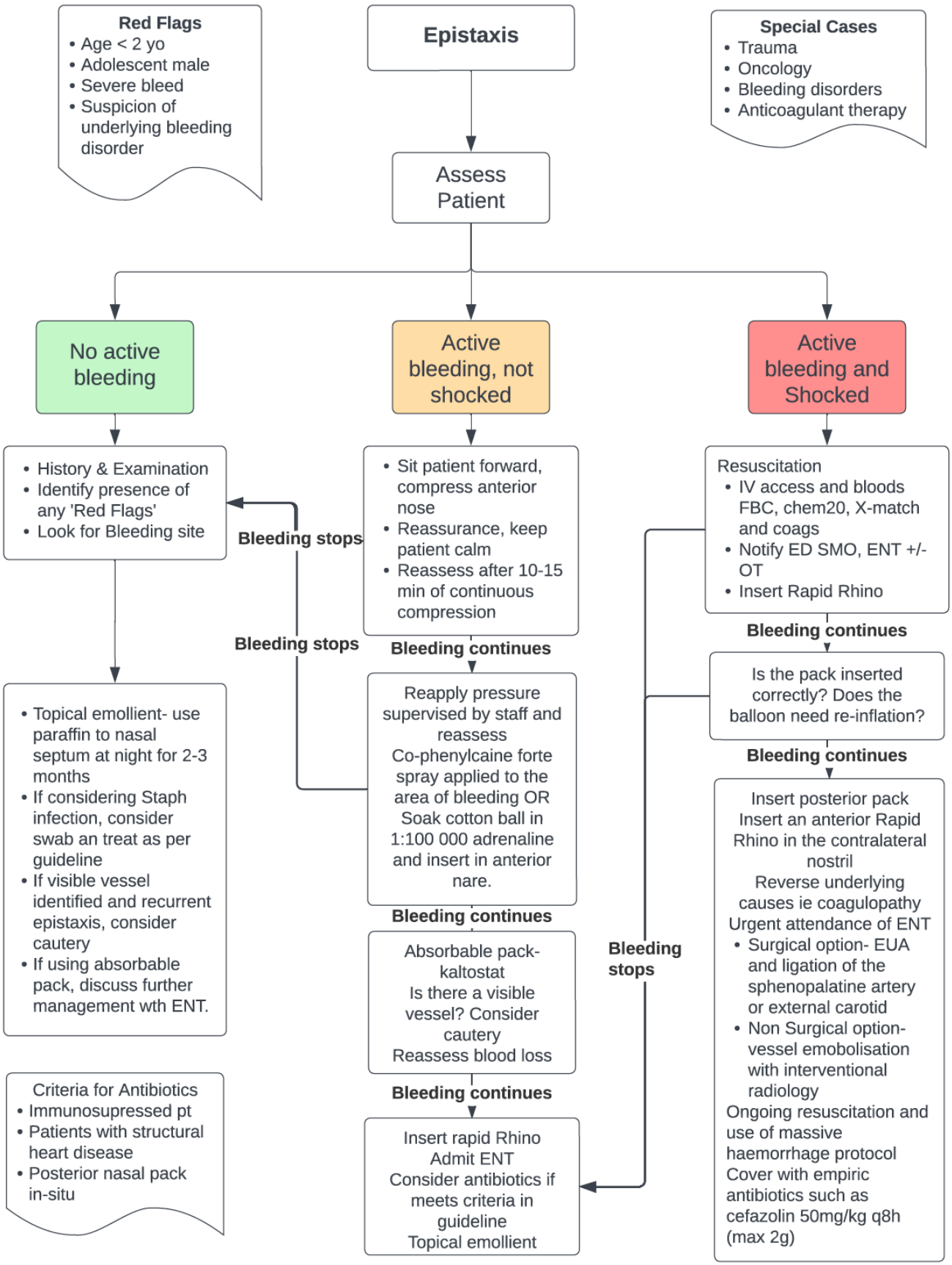
Accreditation references	NSQHS Standard: 1, 3, 4, 7, 9

Appendix 1: Flowchart



Appendix 2: Cautery Method

Method

1. Choose an appropriate patient
    - Cooperative
    - Minor bleed with visible culprit vessel on anterior nasal septum
    - Very unlikely to be appropriate in pre-schoolers
2. Wash hands and wear gloves
3. Establish haemostasis prior to use of silver nitrate stick; achieve with direct pressure, +/- suction to remove any clot
4. Anaesthetise the area to be cauterised with co-phenylcaine spray
    - Can spray directly onto septum
    - May be more effective to wet a cotton ball with the co-phenylcaine spray and apply this to the nasal septum (one side only) for 1-2 minutes
    - Then remove and gently pat dry to maximise effectiveness of silver nitrate application
5. Apply a paraffin barrier to enclose the area of treatment prior to performance of the cautery ie at entrance to nares.
    - Moisture can cause the silver nitrate to drip and cause grey or black staining of the skin around the nares or upper lip; this can be cosmetically troubling for patients.
    - If staining does occur, the stain will fade as the skin naturally exfoliates (1-2 weeks); gentle rubbing with some aqueous cream on a cue tip may hasten removal of the stain if used early (for use on intact skin not the area of cauterised septum; do not rub or apply friction to the area of treatment).
6. Wet just the tip of the silver nitrate stick with some sterile water
    - If it is too wet the risk of dripping and staining is increased
    - If there is a pinpoint of active bleeding, the tip will not need to be moistened
    - **Note** there is no role for silver nitrate cautery in the emergency management of brisk, moderate or severe bleeding
7. Gently roll the applicator tip over the mucosa or at the pinpoint bleeding site until a grey eschar forms or for a maximum of 5 seconds [45]
    - Do not perform prolonged, extensive or bilateral septal cautery as there is an associated risk of necrosis and perforation
    - Do not extend cautery to normal nasal mucosa[10]
8. Check that bleeding has ceased and give post-cautery care advice

Care Post-Cautery

- Use a nasal antiseptic moisturiser such as Kenacomb® (Gramicidin; Neomycin sulfate; Nystatin; Triamcinolone acetonide) applied to area of cautery on nasal septum twice a day for 1 week
- Advise the use of simple analgesia (paracetamol) for discomfort
- Advise to avoid rubbing or blowing nose for a week after the cautery
- No boisterous play / contact sports / heavy lifting for 1 week
- Patients who have been treated with nasal cautery should be referred for follow up to their General Practitioner; they do not necessarily require ENT follow up.

Appendix 3: Anterior Nasal Packing

Whilst there are other forms of anterior nasal packing (eg traditional Vaseline gauze packing, expandable nasal tampon), Rapid Rhinos are recommended as the outer carboxycellulose layer promotes platelet aggregation and is activated by soaking in WATER; the balloon is inflated with AIR and conforms to the shape of the nasal cavity, promoting haemostasis by tamponade.

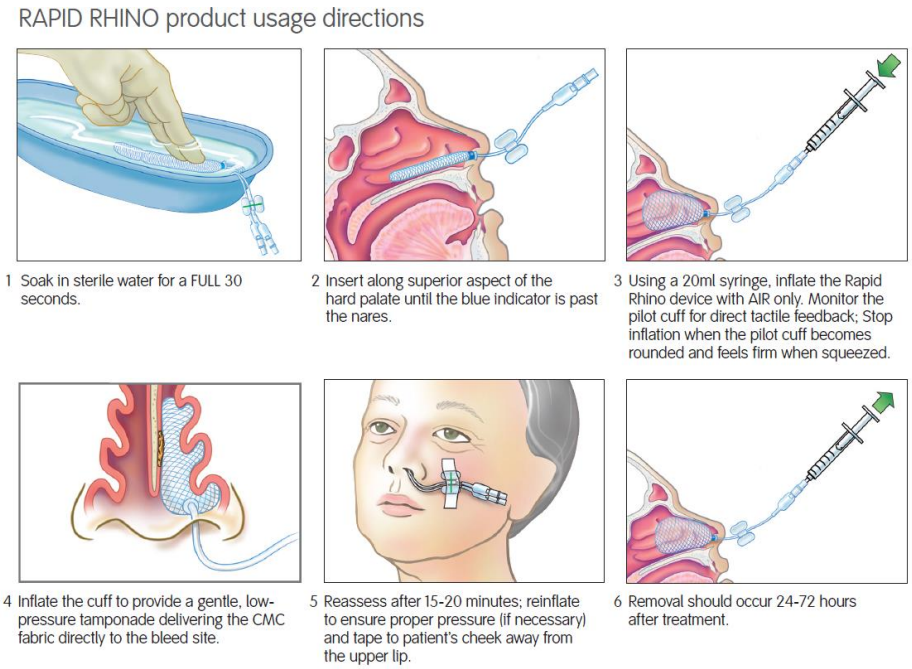
There are some cases when it may be preferential to try an absorbable haemostatic packing agent such as kaltostat / calcium alginate dressings that will not require removal, for example in oncology patients with non-life threatening epistaxis.

Rapid Rhino Sizes Stocked at QCH

Rapid Rhino 550
- 5.5 cm anterior tamponade
- Most commonly used mid-size device all ages

Rapid Rhino 450
- 4.5 cm anterior inflatable
- Use in <8 year old children and patients with small nasal anatomy

Rapid Rhino 750
- 7.5 cm device which may be useful in controlling posterior as well as anterior bleeding



Source: Smith & Nephew. (2015). Rapid Rhino Nasal Pac.
http://www.smithnephew.com/global/ent/rr_epistaxis_solutions_brochure_rr117lpdf

Appendix 4: Posterior Nasal Packing:

If anterior packing fails or bleeding is catastrophic, or there is a known history of posterior bleeding, insert a posterior nasal pack. A Foley's catheter is commonly used as a posterior nasal packing device.

Large double balloon catheters which consist of an anterior and a posterior balloon in a single device exist but are not stocked at QCH. Where a posterior bleed is suspected, using a larger than usual size of Rapid Rhino (ie using the 7.5cm device) may be successful in controlling a posterior bleed, particularly where the use of a Foley's catheter is problematic eg in concomitant head trauma.

Note that posterior bleeds are very uncommon in paediatrics and the use of posterior packing is not routine for minor ongoing bleeding, but is preserved for serious haemorrhage not controlled with anterior packing, or when a posterior bleed is suspected (ongoing severe posterior oropharyngeal blood flow). Obviously call ENT.

NOTE: insertion of a nasal pack in the presence of significant bleeding can be a messy business; wear **eye protection and a facial shield** in addition to an apron and gloves.

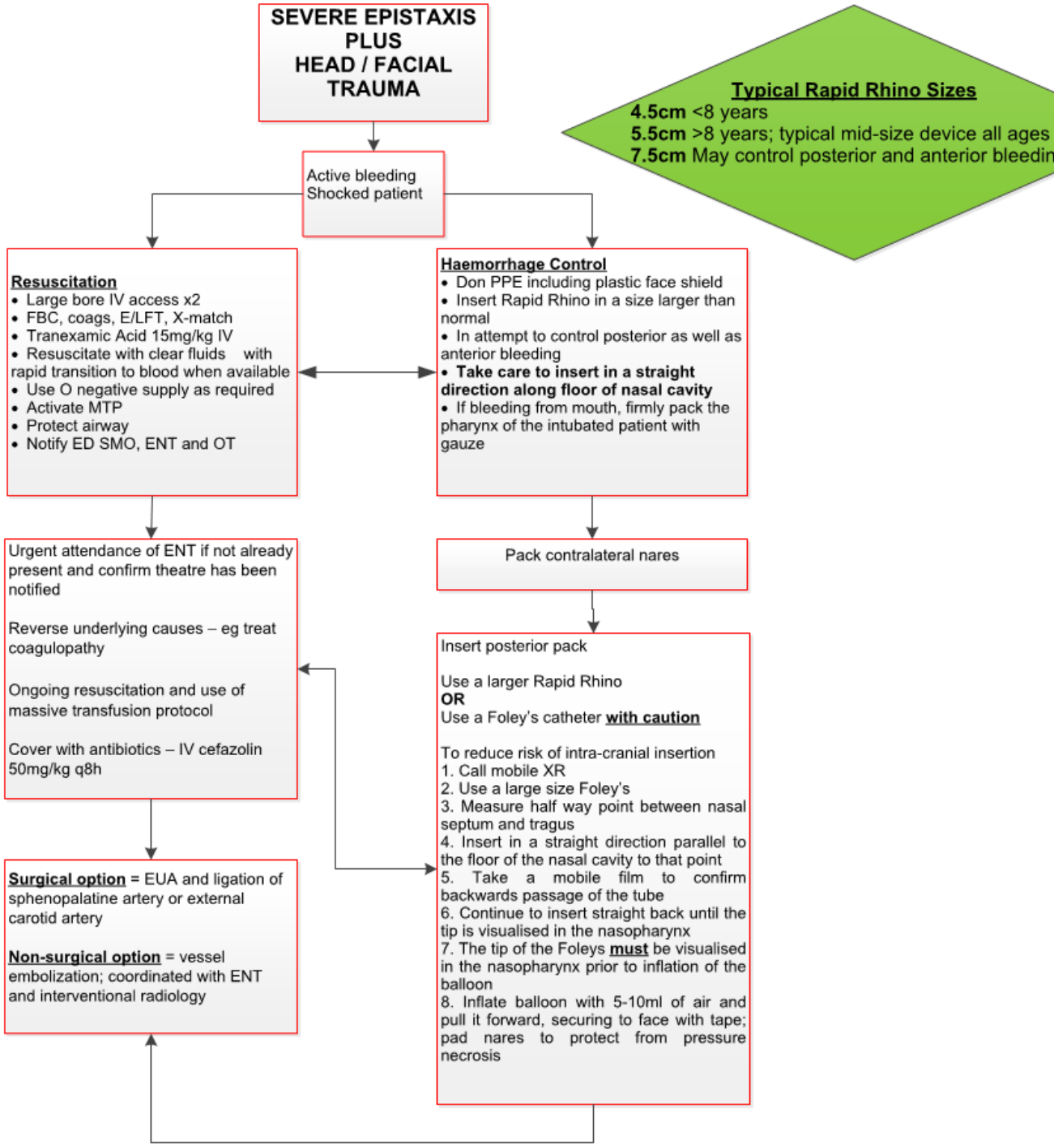
Insertion of Foley's balloon catheter as posterior pack

1. Arrange light source and preferably have patient sitting up / upright position
2. Have suction available, with an assistant continuing to apply suction as you pack the nose
3. Spray nasal passage with co-phenylcaine spray
4. Apply sterile white soft paraffin as lubricant to the tip of the Foley's Catheter (10-14 French in adolescents / adults)
5. Insert device into the side of bleeding, directing horizontally along the floor of the mouth towards the ipsilateral earlobe
6. Ask the patient to keep their mouth open and visualise the tip of the catheter in the back of the throat; younger / unco-operative children use a tongue depressor
7. Inflate the balloon with a small amount (eg 3ml) of air and pull the catheter forward until it 'catches' in the back of the nose
8. In an awake co-operative patient, aim to inflate with up to 10ml of air (recommendation for adults / adolescents), stopping when it becomes too uncomfortable; there are no available recommendations of volumes to use in young children; it seems reasonable to slowly inflate with air in young patients stopping when the patient is no longer able to tolerate it (or ideally just before then); expect this to be a painful procedure
9. Have an assistant maintain firm traction while you pack the anterior nasal cavity with a Rapid Rhino
10. Secure the Foley catheter with an umbilical clip or tubing clamp at the nostril to prevent it slipping backwards
11. Place a wad of gauze between the clamp and the patient's nose to prevent pressure necrosis
12. Secure the catheter to the patient's face with tape[46]
13. Ongoing monitoring; balloon may require reinflation

Posterior packing with 10F Foley catheter[45]

Appendix 5: Severe bleeding in the context of facial trauma / head injury

- Can result in catastrophic bleeding from nasopharynx which is difficult to control
- Complicated by co-existing head injury and the real risk of intracranial insertion of nasally inserted packing material [51,52]
- Despite this risk, severe / life-threatening bleeding will still need to be addressed by local measures – case by case risk / benefit analysis
- If decision is made to pack the nose, first use a single balloon Rapid Rhino to provide anterior tamponade
- Ongoing bleeding – pack contralateral nares
- Ongoing bleeding (from mouth) – pack pharynx of the intubated patient with gauze
- Ongoing bleeding – options are a dual balloon nasal packing device, a longer than usual nasal packing device(Rapid Rhino) or a Foleys catheter
    - Rapid rhino with anterior and posterior balloon are available in 9cm size but are <u>not</u> stocked at QCH
    - Using a larger than normal Rapid Rhino may provide some posterior tamponade, and may be preferential to inserting a Foley's catheter in these instances; see box above for usual sizing of Rapid Rhino device
    - Presumably less risky than using a Foley's catheter as a posterior pack due to the stiffness of the device; may be easier to guide insertion straight back
    - Consider use of a Foley's catheter as a posterior packing device in the event of life – threatening bleeding where there is a delay to theatre and the above steps have been unsuccessful; the tip of the catheter **<u>must</u>** be visualised in the nasopharynx prior to balloon inflation
- Other tips to reduce the risk of intra-cranial insertion include
    - Using a large sized Foley's catheter,[51]
    - Inserting in a straight direction parallel to the floor of the nasal cavity with direct visualisation along the inferior meatus[50]
    - Using portable XR to identify the passage of the tube after an initial segment has been passed; recommendation is after 10cm in adults;[53] suggest measure half way point between nasal septum and tragus and use that as maximum point at which to take first film
    - It has also been suggested to fill the catheter with contrast medium;[54] potential increased risk of airway soiling
- Correct trauma coagulopathy
- Airway protection
- The obtunded patient is at risk of inhaling the nasal packing material



Appendix 6: Patients on warfarin

- Adult consensus guidelines regarding bleeding in the warfarinised patient, and warfarin reversal, exist; [55] partly reproduced below
- There are no consensus guidelines for paediatrics, with variability in the route, dose and indications for vitamin K, and the use of Activated Prothrombin Complex Concentrate (Prothrombinex-VF) found on perusal of the literature[55-59]
- The underlying principles of management remain -
    - Early liaison with haematologist / treating team
    - Weigh up the risk of bleeding versus the risk of thrombosis
    - Address the following questions –
        - Is there active bleeding? Of what severity?
        - What is the reason for anti-coagulation?
        - What is the patient's INR?
- The options for warfarin reversal are

1. Withhold the dose and monitor INR – for those patients with no bleeding, no high risk of bleeding** and INR <4.5
    - If INR ≥4.5 discuss with haematologist; patient may benefit from a small dose of vitamin K to reduce the risk of rebleeding
2. Vitamin K to reverse the anticoagulant effect of warfarin
    - Delayed onset
    - Oral and IV routes can be used; onset is faster with the IV (6-8 hours) than the oral (24 hours) route[58]
    - Intra-muscular injection of Vitamin K should be avoided
    - If all other routes are unavailable it can be administered subcutaneously, although it will take longer to work
    - Dose = 30mcg/kg IV given over 10-20 minutes[62]
    - Higher doses may be required in some cases, balanced against thrombotic risk and indication for warfarinisation
    - 30mcg/kg is a reasonable starting dose; liaise with appropriate subspecialists re need for higher dosing
    - Note that patients with deranged LFTs may need repeat doses; recheck INR at 4-6 hours
3. For immediate reversal, the options are FFP or prothrombin complex concentrates (PCC)
    - PCC is the preferred agent over FFP
    - Prothrombin-VF is the only PCC routinely used for warfarin reversal in Australia and New Zealand; it contains factors II, IX, X and low levels of factor VII[54]
    - It completely reverses a high INR within 15 minutes[55]

- Add FFP if the bleeding is life threatening
- Use FFP if Prothrombin-VF is unavailable
- Vitamin K should still be given to sustain the reversal effect

Management of Patients on Warfarin with Active Bleeding.

CLINICAL SETTING **NOTE:** In all cases, seek senior advice from Haematology	**RECOMMENDATION**
INR≥1.5 with life threatening (critical organ) bleeding	Cease warfarin therapy and administer- • Vitamin K* 30mcg/kg IV over 10-20 minutes; adult dose = 5 -10mg **AND** • Prothrombinex-VF 50iu/kg **AND** • FFP 15ml/kg IV
INR≥2.0 with clinically significant bleeding (not life-threatening)	Cease warfarin therapy and administer- • Vitamin K* 30mcg/kg IV over 10-20 minutes; adult dose = 5-10mg **AND** • Prothrombinex-VF 25-50iu/kg **OR** • FFP 15ml/kg IV
Any INR with minor bleeding	Omit warfarin Repeat INR the next day and adjust dose to maintain INR in the therapeutic range If the bleeding risk is high** or the INR is ≥4.5, consider an oral dose of vitamin K

Source: Adapted from Tran et al 2013

* Not for intramuscular injection; Konakion MM®, the intravenous preparation of vitamin K (phytomenadione), may be given orally.
** Major bleed in previous four weeks, major surgery in previous two weeks, thrombocytopenia with platelets less than 50 x 109/L, known liver disease or concurrent antiplatelet therapy.

PROTHROMBINEX DOSING

- Recommended dose or prothrombinex in 2005 was 25- 50 IU/kg[63]
- This has been replaced in 2013 by doses according to initial INR and the target INR[64]
- These recommendations are based on panel consensus rather than gradable evidence
- These doses could be used if the initial INR and the target INR are known at the time of the presentation

	Initial INR			
Target INR	**1.5-2.5**	**2.6-3.5**	**3.6-10.0**	**>10.0**
0.9-1.3	30 IU/kg	35 IU/kg	50 IU/kg	50 IU/kg
1.4-2.0	15 IU/kg	25 IU/kg	30 IU/kg	40 IU/kg

Recommendations for reversal of warfarin in adults - Seek early advice if any bleeding occurs

Clinical setting		Recommendation
Bleeding **SEEK SENIOR ADVICE**	INR greater than or equal to 1.5 with life-threatening (critical organ) bleeding	Cease warfarin and give- • Vitamin K* 5-10 mg IV and • ProthrombinexTM-VF 50 units/kg and • FFP 150-300 mL. If ProthrombinexTM-VF is unavailable, increase FFP dose to 15 mL/kg. Assess INR frequently until clinically stable
	INR greater than or equal to 2 with clinically significant bleeding (not life-threatening)	Cease warfarin and give- • Vitamin K* 5-10 mg IV and • ProthrombinexTM-VF 35-50 units/kg. If ProthrombinexTM-VF is unavailable, give FFP 15 mL/kg. Assess INR frequently until clinically stable.
	Any INR with minor bleeding	Omit warfarin Repeat INR the following day and adjust warfarin dose to maintain INR in target therapeutic range. If bleeding risk is high** or INR greater than 4.5, consider vitamin K1-2 mg orally or 0.5-1 mg IV.

Source: adapted from Tran et al. 2013
* Not for intramuscular injection; Konakion MM®, the intravenous preparation of vitamin K (phytomenadione), may be given orally.
** Major bleed in previous four weeks, major surgery in previous two weeks, thrombocytopenia with platelets less than 50 x 10^9/L, known liver disease or concurrent antiplatelet therapy.

Note: For patients that have been treated for warfarin reversal, reassess the patient for suitability of warfarin therapy.

Appendix 7: Hypertension[65]

- In the first instance the focus should be on haemorrhage control rather than reduction of blood pressure
- Hypertension may prolong epistaxis but does not cause it
- Analgesia and providing comfort and reassurance are preferable to anti-hypertensive therapy in the acute phase

Appendix 8: Leukaemia

- Associated thrombocytopenia can cause refractory epistaxis
- Cautery generally ineffective and may worsen bleeding [41]
- Packs can be effective acutely but rebleeding often occurs on their removal[41]
- Also potential for infection in immunocompromised patient with nasal pack
- Preferentially pack nose gently with a haemostatic agent that does not require removal eg Kaltostat[40]
- Rapid rhino nasal pack may still be required in the emergency situation with severe bleeding
- Consultation with oncology team and use of platelet transfusion in presence of active bleeding and platelet count < 20;

Appendix 9: Hereditary haemorrhagic telangiectasia

- Inherited vascular disorder
- Associated with arteriovenous malformations (AVMs) and telangiectasia (small dilated blood vessel in skin or mucous membranes)
- Common clinical manifestations = epistaxis, iron deficiency anaemia, GI bleeding and the presence of mucocutaneous telangiectasia (lips, fingertips, oral mucosa, nose)
- AVMs occur mainly in the pulmonary (>50% of patients), cerebral (approx. 10% of patients) and hepatic (>30%) circulations
- Manifestations develop with increasing age
- Epistaxis is usually the earliest sign and occurs in childhood; average age of onset is 12 years
- Pattern of epistaxis is variable – can be occasional mild nuisance bleeds only although studies suggest the majority of patients have very frequent bleeds (daily to weekly) [66,67]
- Nosebleeds are generally spontaneous although may be associated with changes in posture (bending forward), exercise, certain foods eg spices or minimal trauma
- Epistaxis can predate the appearance of telangiectasia by years
- Significance is that epistaxis is the index symptom of the disease; suspicion of the diagnosis may allow screening for and treatment of visceral AVMs before the person becomes symptomatic