

Emergency Department care of childhood epistaxis

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ABSTRACT

Objective The aim of this review is to determine an efficient and safe primary strategy care for paediatric epistaxis.

Data sources We searched PubMed and Cochrane databases for studies referenced with key words 'epistaxis AND childhood'. This search yielded 32 research articles about primary care in childhood epistaxis (from 1989 to 2015). Bibliographic references found in these articles were also examined to identify pertinent literature. We compared our results to the specific management of adult epistaxis classically described in the literature.

Results Epistaxis is one of the most common reasons for referral of children to a hospital ENT outpatient department. The bleeding usually originates from the anterior septum, as opposed to adults. Crusting, digital trauma, foreign bodies and nasal colonisation with *Staphylococcus aureus* have been suggested as specific nosebleed factors in children. Rare aetiologies as juvenile nasopharyngeal angiofibroma appear later during adolescence. There are different modes of management of mild epistaxis, which begin with clearing out blood clots and bidigital compression. An intranasal topical local anaesthetic and decongestant can be used over 6 years of age. In case of *active bleeding*, *chemical* cauterisation is preferred to anterior packing and *electric* cauterisation but is only feasible if the bleeding site is clearly visible. In case of *non-active bleeding* in children, and in those with recurrent idiopathic epistaxis, antiseptic cream is easy to apply and can avoid 'acrobatic' cauterisation liable to cause further nasal cavity trauma.

Conclusions Aetiologies and treatment vary with patient age and the existence or not of active bleeding at the time of the examination. Local treatments are usually easy to perform, but physicians have to ponder their indications depending on the possible complications in order to inform parents and to know paediatric epistaxis specificities.

INTRODUCTION

Epistaxis is a very common condition during childhood. During a 10-year study period, epistaxis accounted for about 1 in 200 EDs visits in the USA, with an early age peak (age <10 years). In children until 19 years old, the number of ED visits that were due to epistaxis was 1 133 847 patients.¹ At least 75% of the children will have at least one episode of epistaxis. It usually resolves spontaneously, only requiring nose blowing and bidigital compression. In case of recurrent idiopathic childhood epistaxis, the optimal management remains undefined according to a recent review.² Emergency physicians are generally quite comfortable treating epistaxis in adults but, in children, knowing that

there are specific aetiologies and managements, they are sometimes less at ease. The aim of this review is to determine an efficient and safe ED strategy care specific to paediatric epistaxis.

METHODOLOGY

To retrieve relevant information on childhood epistaxis, the authors conducted a systematic review in the database of PubMed. The authors independently searched PubMed for relevant articles. The limits used in PubMed were English or French, humans, randomised controlled trial (RCT), meta-analysis and 30 years. Papers were selected based upon one or more of the following key features: epistaxis, epistaxis childhood; bleeding disorders; cauterisation; electrocautery; intranasal topical drug, paediatric otolaryngology. The first screening of the articles was based on their title. Hereafter, the abstracts of the possible relevant articles were evaluated. At last, the articles were fully analysed. Of the initial 92 articles found, only 35 articles matched our inclusion criteria.

Pathophysiology

Most cases of epistaxis in children have benign causes. In a retrospective study³ concerning 175 children younger than 18 years managed for epistaxis in the outpatient ENT clinic of tertiary medical centre, the author reported three (2.4%) cases of nasal polyps, and one (0.8%) case of juvenile nasopharyngeal angiofibroma with an average age of patients with nasal masses of 16.2 years.³ Only 4.6% had abnormal coagulation studies.

More often than in adults, paediatric epistaxis involves the anterior part of the nasal septum at Kiesselbach's plexus, accessible to local intervention.^{4 5} Epistaxis is generally associated with local dryness, leading to the formation of crusts in the nasal vestibule and at Kiesselbach's plexus.⁶ Recent studies suggested that *Staphylococcus aureus* colonisation of the nasal cavity leads to recurrent epistaxis in children.⁷⁻¹⁰ In a study analysing anterior nasal cavity samples, a positive culture for *S. aureus* was reported in 68% of children in the epistaxis group versus 20% on average in the control group without epistaxis.¹⁰ Chronic inflammation induced by the infection induces neovascularisation, inducing crusts, which in turn induce pruritus, causing most patients, including children, to manipulate the vestibule in an attempt to extract the crusts, thereby exacerbating the inflammation and local infection.^{8 11 12} Analysis of biopsy samples of thin-walled arterioles and capillaries of the plexus in five children undergoing cauterisation under general anaesthesia found inflammatory infiltrate without venous varicosity of arterial microaneurysm;



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epistaxis was secondary to both neovascularisation and micro-trauma due to chronic inflammation.¹¹

Children are far more susceptible than *adults* to having a particular cause of bleeding: epistaxis secondary to foreign bodies. Epistaxis is then due to local inflammation with granuloma formation that can mask the foreign body. In this case, epistaxis is often associated with unilateral nasal obstruction and purulent rhinorrhea. After removal of the foreign body, granulomas will disappear spontaneously without recurrence of epistaxis.

In case of nasal trauma, epistaxis is not systematically suggestive of fracture of the nasal bone. Only displaced fractures and septum haematoma require surgery. In case of facial bone fractures, posterior epistaxis can be abundant, due to tearing the branches of the internal maxillary or ethmoidal artery. In the hereditary haemorrhagic telangiectasia (Osler-Weber-Rendu syndrome), epistaxis can be an early symptom of the illness before the onset of telangiectasias.

It is important to take into account the age range when looking for an aetiology. For example, juvenile nasopharyngeal angiofibroma or illicit drug inhalation is more likely to be found in adolescents. Epistaxis is rare under the age of two therefore orienting towards coagulopathies or maltreatment. The main potential pitfalls regarding childhood epistaxis aetiologies are reported in [box 1](#).

Local haemostatic intervention for active bleeding

Preliminaries

In case of active bleeding, whatever the origin of the epistaxis, the initial approach is similar in both adults and children: Cleaning the nasal cavity or cavities, by nose blowing or aspiration, to remove clots, which perpetuate bleeding by local fibrinolysis. In adults, this procedure should be followed by anaesthetising and retracting the nasal mucosa by cotton wicks or non-woven compresses impregnated with an intranasal topical anaesthetic and decongestant (xylocaine naphazoline), left in place for a few minutes. Local anaesthesia facilitates examination and subsequent manoeuvres, and, in many cases, is enough to stop the haemorrhage.

In children, anaesthetic and decongestant solution is indicated only in those over 6 years of age, due to the risk of convulsions associated with high concentration of the Lidocaine in younger children. No studies are underway or planned to expand the use of these local anaesthetics in children younger than 6 years. Lidocaine is an anaesthetic amide, which locally interrupts the propagation of nerve impulses along the nerve fibre by blocking sodium channel-dependent voltage. This drug is also contraindicated in patients with uncontrolled epilepsy. In young children for whom topical anaesthesia is contraindicated, the administration of oral analgesia, such as acetaminophen, should be performed to decrease suffering. Only one randomised double-blind

study¹³ in children (aged 3–12 years) compared the use of a local anaesthetic (lidocaine hydrochloride 1%) combined with a decongestant (xylocaine hydrochloride, Nasa Rhinathiol 0.05%) to the use of a decongestant alone (xylocaine hydrochloride 0.05% nasal spray) or to a placebo (normal saline solution) before performing a flexible nasal endoscopy. This study showed no statistically significant difference between the three solutions as to the level of pain; decongestant nasal spray alone was associated with the lowest score of pain. The objective of the endoscopy is to determine the origin of the bleeding: left or right, anterior or posterior. A head mirror and nasal speculum are sufficient to identify Kiesselbach's plexus lesions, but flexible or rigid endoscopy is required to examine the posterior and superior parts of the nasal cavities. When the origin of bleeding is not anterior, nasal endoscopy is an essential procedure, identifying the bleeding site in most cases (80%).¹²

Digital compression

In most cases, epistaxis resolves spontaneously after nose blowing and bidigital compression both in adults and children. Bidigital compression is effective, easy to perform either by the patient or by the **emergency physician**, and frequently spontaneously performed by the patient, who should however be advised to bend the head forward rather than backward. Bidigital compression can also be replaced by nose clips. Bleeding of the nasal plexus usually responds to simple pinching of the tip of the nose between thumb and index finger. If these first measures prove insufficient and an anterior bleeding site is clearly visible, cauterisation should be considered.

Chemical cauterisation

Chemical cauterisation is the preferred method of cautery in children. It classically uses a silver nitrate pearl, less aggressive towards the mucosa than chromic or trichloroacetic acid; it is fashioned extemporaneously and applied directly on the visible bleeding site. Caustic pencils (75% silver nitrate, 25% potassium nitrate) may also be used; the pencil is applied on the bleeding site with strong pressure for 5–10 s.¹⁴ Effects vary with concentration and exposure. Silver nitrate may produce a blackening of the skin (silver sulfide deposit), which is inoffensive but can take time to fade. **ENT specialist or emergency physician with training** can perform chemical cauterisation: silver nitrate can be used when the site of bleeding is clearly visible. The physician only needs a headband lamp and a nasal speculum to identify the bleeding site on the anterior septum at the entry of the nose. The speculum also allows protection from accidental contact; if the caustic pencil accidentally touches the surrounding skin, the area should be rapidly and meticulously rinsed with physiological saline to avoid the caustic and blackening effect on the vestibule or upper lip. The pencil should be disposed of after use. During the cauterisation, the child should be well immobilised to limit accidental movement. Depending on the impact of the epistaxis or the recurrent epistaxis, management under general anaesthesia should be discussed for a complete and painless management.

Electrocautery

This is an old procedure initially done using a thermocautery electrode. The development of nasal endoscopy has led to the use of monopolar or bipolar electrodes.¹⁵ The electrocautery knife comprises an electric circuit, which heats a metal loop. The technique uses heat energy, achieving haemostasis by local heating rather than direct contact.¹⁴ In adults, it is performed under local anaesthetic, with a 0° or 30° lens. It is simple, quick,

Box 1 Potential pitfalls of aetiologies in childhood epistaxis

- ▶ *Foreign body* (epistaxis with unilateral purulent rhinorrhea)
- ▶ *Child maltreatment* or *coagulopathies* (if child <2 years old)
- ▶ *Juvenile nasaopharyngeal angiofibroma* (recurrent unilateral epistaxis in adolescent)
- ▶ *In case of nasal trauma*, epistaxis does not equal nasal bone fracture

painless, inexpensive and effective in more than 90% of cases, avoiding the need for hospital admission. In children, electric cauterisation should only be performed by an ENT specialist.

Indications

In adult epistaxis, several recent literature reviews found cauterisation of an identified bleeding site to be the optimal treatment.^{14 16} In the 1990s, more than 70% of cases of anterior epistaxis referred to ENT physicians were managed by anterior packing.¹⁷ Recent studies showed a change in attitudes in adult management: Supriya *et al*¹⁸ recommended total resolution of anterior epistaxis by cauterisation, based on a study of 100 consecutive admissions. Likewise, Soyka *et al*¹⁹ reported 84% efficacy for cauterisation in anterior epistaxis, in a series of 591 local interventions; only failures were managed by anterior packing.¹⁶ When the bleeding site is visible, cauterisation is therefore to be preferred over anterior packing.

Many centres perform electrocautery as first-line treatment in adults.²⁰ Soyka *et al*²¹ reported a significantly lower haemostasis failure rate with electrocautery than with chemical cauterisation: 12% vs 22%.²¹ In active bleeding, bipolar forceps were more effective than silver nitrate,¹⁶ the main limitation being unavailability in most EDs. Johnson reported a longer nosebleed-free period using bipolar electrocautery rather than silver nitrate cauterisation and a lower incidence of recurrent epistaxis within 2 years of treatment.²²

In children, like in adults, cauterisation is always preferred to anterior packing in case of persistent anterior bleeding when the site of bleeding is clearly visible to avoid pain and self-manipulation of packing.^{4 23} As opposed to adults, chemical cauterisation is the preferred first-line treatment over electric cauterisation in children because electric cauterisation requires general anaesthesia in children and specific ENT management. In case of refractory anterior bleeding and posterior bleeding, a packing may be performed²³ by emergency physician or ENT specialist.

Adverse effects

Overall, no severe adverse effects have been reported with chemical or electrical cauterisation. Silver nitrate cauterisation may be painful for children, despite local anaesthesia, and the failure rate is high.^{12 24} A histopathological study comparing 75% vs 95% silver nitrate found the latter to cause deeper burns, liable to increase the rate of complications, including septal perforation: septal cauterisation can atrophy the nasal mucosa, leading to crusts and perforation, especially in children.^{2 25} In line with this study, Glynn, in 2011, concluded that, for chemical cauterisation, 75% silver nitrate was preferable to 95% silver nitrate: it is more effective in the short term and also less painful for children.²⁶

Unilateral septal cauterisation is recommended, rather than simultaneous bilateral cauterisation, due to the theoretic risk of septal perforation.^{27 28} However, in a study of 37 children aged 5–16 years, one-step bilateral cauterisation proved feasible, without septal perforation, at a mean 8-month follow-up (range, 2–14 months).²⁹ Likewise, Link³⁰ demonstrated the feasibility of bilateral cauterisation in bilateral epistaxis, without side effects at 2-month follow-up (n=46).³⁰ To reduce the risk of septal perforation, Pope and Hobbs, in a literature review,¹⁴ recommended a 4–6-week interval between cauterisations.

In electrocautery, the theoretical risk of nasal burn due to heating of the nostril and turbinate can be reduced by using a large speculum to push the ala aside.¹⁴

Other local treatments

After successful treatment of active bleeding, treatments classically described in the literature include nasal saline instillation to humidify the nasal cavity and prevent crust formation and recurrences,³¹ in adults as well as in children. Oils can be used in children over 3 years of age to cover the mucosa and prevent drying. These treatments are recommended in first-line management for mild epistaxis.

In adults, various other pharmacological agents have been tested in topical application: oxymetazoline, a vasoconstrictor, in association with cauterisation or not,³² epsilon-aminocaproic acid³³ and tranexamic acid (Exacyl).³⁴ Reported antifibrinolytic agents, however, failed to prove efficacy over placebo.

Anterior nasal packing

When nose blowing and bidigital compression are ineffective and if the bleeding site is not identifiable, anterior packing should be performed by emergency physician or ENT specialist. Different types of nasal packing materials are available and are as effective on initial haemorrhage control. When considering the potential pain at removal, calcium alginate or Vaseline gauze is preferred to Merocel. Furthermore, Vaseline gauze is usually easier to obtain in ED while Merocel have been shown to cause more bleeding than the other materials at removal.^{35–37}

Procedure in case of non-active bleeding

In adults, when anterior septum telangiectasias are visible, but there is no active bleeding, cauterisation may be proposed.

In children, especially when not cooperative, antiseptic cream is easy to apply and seems recommended in order to avoid ‘acrobatic’ cauterisation liable to cause further nasal cavity trauma. Moreover, crusts formed secondarily to cauterisation may induce subsequent bleeding.

These findings taken together were drawn up into a decision tree for the management of paediatric (vs adult) epistaxis (figures 1 and 2).

Procedure in case of mild recurrent anterior epistaxis

Childhood recurrent idiopathic epistaxis is defined by repeated, self-limiting nasal bleeding usually originating from the anterior septum in patients younger than 16 for which no specific cause has been identified according to the Cochrane review²: there is, however, no consensual definition of the severity nor the frequency of these recurrent nosebleeds.³⁸ A cross-sectional study of 1218 children (aged 11–14 years) found that up to 9% of children may present with mild recurrent epistaxis.

In adults, many centres, in case of recurrent anterior epistaxis, electrocautery is performed as first-line treatment: a lower rate of recurrence in the month following treatment has been observed after bipolar electrocautery versus chemical cautery (12% vs 22%).^{20 21}

In children, the optimal management of recurrent idiopathic epistaxis remains undefined according to a recent review.² The most common treatment for idiopathic recurrent childhood epistaxis is cauterisation of vessels present in the anterior part of the septum, usually using a silver nitrate pencil under local anaesthesia, and/or antiseptic nasal cream.² The 2012 Cochrane meta-analysis² found no consensus regarding the efficacy of these treatments. A recent chart review²² compared the outcome of children aged 2–18 years with anterior epistaxis treated *intraoperatively* with either bipolar electrocautery or silver nitrate chemical cautery. Within the first 2 years, there was a lower rate of recurrence after bipolar electrocautery versus

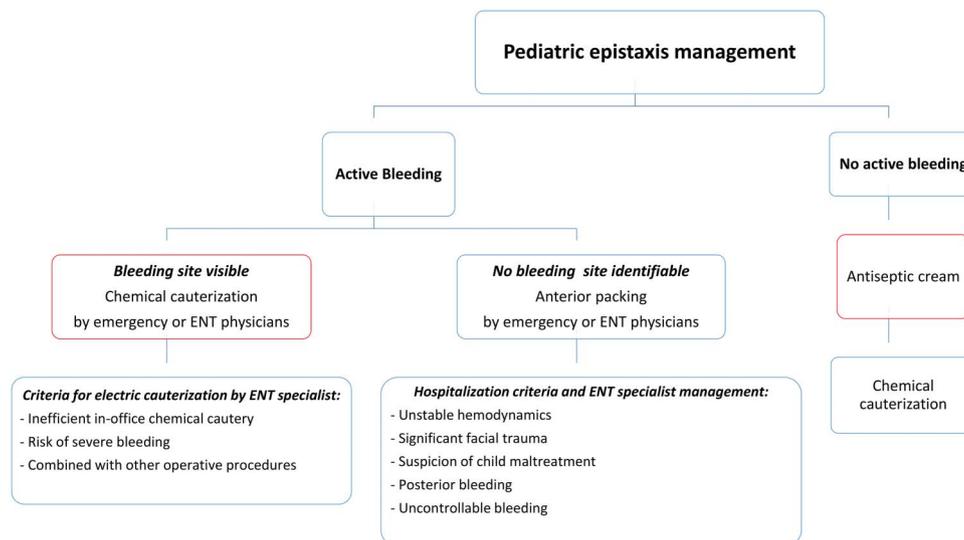


Figure 1 Paediatric epistaxis management.

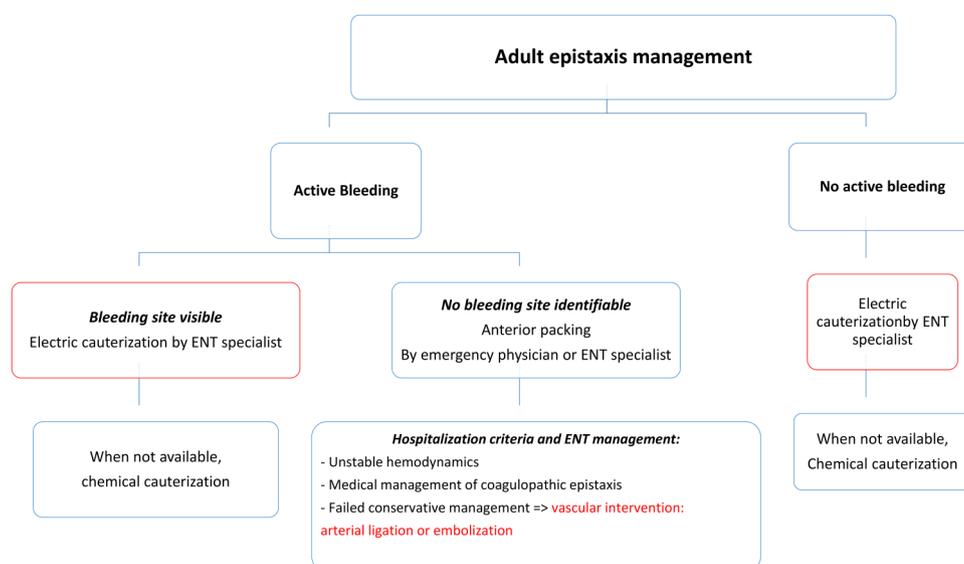


Figure 2 Adult epistaxis management.

chemical cautery (2% vs 22%). However, at 2 years follow-up, there was no difference between the two groups. The authors concluded to the superiority of bipolar electrocautery in children who will not tolerate in-office chemical cautery, in those with a risk of severe bleeding, or when it can be combined with other operative procedures.²² In a recent series of 100 patients with minimal recurrent epistaxis, the recurrence rate was not statistically different between children treated by silver nitrate cauterisation and children treated by propranolol during 1 month.³⁹ Further prospective randomised studies should now be conducted to determine the respective indications of propranolol and electrocautery in children with recurrent idiopathic epistaxis. Children with bothersome recurrent epistaxis may benefit from bipolar forceps electrocautery of the septum under general anaesthesia; but the advantage over alternative approaches has yet to be assessed. In all cases, recurrent idiopathic epistaxis requires an ENT expertise.

In recurrent childhood epistaxis, other local treatments can be used. Vaseline showed no benefit over placebo in recurrent epistaxis in children⁴⁰ but other studies in children found

antiseptic nasal cream to be as effective as isolated cauterisation (n=48),^{24 41} and chlorhexidine-neomycin cream to be as effective as cauterisation associated to the cream (n=64).²⁷ In contrast, Calder *et al*,⁴² in a prospective randomised double-blind study (n=93), found a slight superiority (improved subjective number of bleeding episodes in the month following treatment) for silver nitrate cauterisation associated to antiseptic cream (twice daily) compared with cream alone.^{31 42} In conclusion, in children with mild recurrent epistaxis, after successful haemostasis with silver nitrate cauterisation, Naseptin can be prescribed by **emergency physicians**; patients should be then addressed to ENT specialist. The cream should be applied generously on the anterior third of the nasal septum, twice daily for 2 weeks.⁴³ Naseptin, comprising chlorhexidine and neomycin (Naseptin1, Alliance Pharmaceuticals Limited, Chippenham, Wiltshire, UK), showed efficacy over placebo, with a 26% reduction in absolute risk of recurrence in the month following treatment.⁴⁴ This finding seems to bear out the hypothesis of bacterial etiopathogenesis. The superiority of Naseptin is probably related to reduced crust formation and hence reduced nasal cavity trauma:

Table 1 Short-term management of recurrent anterior mild epistaxis by emergency physician

In adults:	In children:
▶ Chemical cauterisation by emergency physician or anterior packing if the bleeding site is not identifiable	▶ Chemical cauterisation
▶ Electric cauterisation by ENT specialist if it is possible	▶ Antiseptic/neomycin cream after successful haemostasis
▶ Systematic ENT evaluation	▶ Systematic ENT evaluation

it constitutes an air barrier, preventing dehydration of the nasal mucosa, favouring the elimination of local staphylococcal infection. However, according to the 2012 Cochrane meta-analysis,² large-scale prospective RCTs with at least 1-year follow-up are needed to assess the efficacy of antiseptic cream and the different types of cauterisation and to determine the long-term management. The short-term management of recurrent anterior epistaxis by emergency physicians is summarised in [table 1](#).

HOSPITALISATION AND REFERRAL

A recent practice guideline⁴ suggests a specific management for paediatric cases, which necessitate emergency care hospitalisation and management by ENT specialist: unstable haemodynamics, a significant facial trauma (potential fractures), a suspicion of child maltreatment, a possible posterior bleed or inability to identify the source of the bleed and, of course, uncontrollable bleeding. Additional exams are usually unnecessary, except in case of abnormally frequent recurrences or in case of abundant bleeding. A large retrospective series of 175 children with epistaxis managed in a tertiary care hospital reported, in selected patients, that anaemia concerned 20.6% of the patients, elevated partial thromboplastin time in 4% and an abnormal platelet function analysis in only 0.8% of patients.³

CONCLUSIONS

Children's epistaxis is usually benign and generally spontaneously stops at the time of the emergency consultation. Given the high risk of recurrence in childhood, the emergency physician has an important educational role to reassure the family. Aetiologies and treatments vary with patient age and the existence or not of active bleeding at the time of the examination. Local treatments are usually easy to perform, but physicians have to ponder their indications depending on the possible complications in order to inform parents and to know childhood epistaxis specificities versus adults. Recurrent mild epistaxis, especially in children, may require specialised ENT management, as it may be cured by limited local haemostatic intervention.

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Emergency Department care of childhood epistaxis

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