

Child Protection Evidence

Systematic review on

Ear, Nose and Throat

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While the format of each review has been revised to fit the style of the College and amalgamated into a comprehensive document, the content remains unchanged until reviewed and new evidence is identified and added to the evidence-base. Updated content will be indicated on individual review pages.

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Summary

This systematic review evaluates the scientific literature on abusive and non-abusive ear, nose and throat injuries published up until **June 2021** and reflects the findings of eligible studies. The review aims to answer the following clinical questions:

- What are the identified characteristics of epistaxis indicative of asphyxiation in children less than 2 years of age?
- What are the ear, nose and throat manifestations of physical abuse or fabricated or induced illness?

The 2021 update includes two new studies on manifestations of physical abuse,^{1,2} a case report of a neonate with stridor and subcutaneous emphysema² and a case series of nasal erosion as a sign of physical abuse.¹

Young children who present with epistaxis in the absence of direct trauma to the nose raises the possibility of asphyxiation.³ This finding has proved controversial, although a landmark study involving covert video surveillance identified that epistaxis was feasible following asphyxiation, however the precise association between the two has not been defined.⁴ Due to the significance of the findings, we aim to determine the probability of asphyxia from attempted suffocation for a young child presenting with epistaxis.

While injuries to the ear, nose and throat in children as a consequence of physical abuse or resulting from fabricated or induced illness are not a frequently described manifestation, they are nonetheless important to identify. As the head and neck are the most frequently targeted part of the body in physical abuse, it would seem likely that ear, nose and throat injuries will result from this.^{5,6}

Key findings:

- Epistaxis is a rare presentation in children aged less than two years, however when present it is significantly associated with asphyxiation, either intentional or unintentional
- Some young children presenting with asphyxia may have no overt symptoms; those that were symptomatic included altered skin colour, respiratory distress, altered heart rate, and a possible history of Apparent Life-Threatening Events (ALTE)
- Pharyngeal injuries (laceration and perforation) are the most frequently reported ENT injury, predominantly affecting neonates and infants who present with dysphagia, drooling, haemoptysis, and surgical emphysema
- Ear injuries most commonly affect the external ear and include auricular deformity, abrasions, petechial lacerations, and burns
- Fabrication and induction of ENT signs and symptoms most commonly involves recurrent unexplained otorrhoea or ENT lesions which fail to heal despite appropriate therapy

Background

This systematic review evaluates the scientific literature on abusive ear, nose and throat injuries published up until **June 2021** and reflects the findings of eligible studies. The review aims to answer the following clinical questions:

- What are the identified characteristics of epistaxis indicative of asphyxiation in children less than 2 years of age?
- What are the ear, nose and throat manifestations of physical abuse or fabricated or induced illness?

Methodology

A literature search was performed using a number of databases for all original articles and conference abstracts published since 1950. Supplementary search techniques were used to identify further relevant references. See [Appendix 1](#) for full methodology including search strategy and inclusion criteria.

Potentially relevant studies underwent full text screening and critical appraisal. To ensure consistency, ranking was used to indicate the level of confidence that abuse had taken place and also for study types.

Findings of clinical question 1

What are the identified characteristics of epistaxis indicative of asphyxiation in children less than 2 years of age?

1.1. Comparative studies of children with epistaxis

Of the six included studies, four (five articles) were comparative, including children with and without asphyxiation.⁷⁻¹¹

The probability of asphyxiation, either intentional or unintentional, in a child with epistaxis is 19.6% (95% CI, 12.7-28.8%). The included studies had both fatal and non-fatal cases. For the non-fatal cases clinical features associated with asphyxiation for those with epistaxis included pallor, cyanosis, respiratory difficulty, altered heart rate and reduced consciousness.^{9,10} A retrospective study of infants admitted with epistaxis identified one child with asphyxia as an aetiology where

the mechanism was inflicted smothering and the infant had co-existent hypoxic ischaemia on brain MRI.¹¹ For the fatal cases the asphyxiated children were noted to have intra-pulmonary haemorrhages or intrathoracic, or pleural petechiae.^{7,8}

1.2. Non-comparative studies of children with epistaxis

Two studies included case series of asphyxiated infants.^{12,13} One series included live infants who were observed on covert video surveillance to have inflicted asphyxiation of whom eight had co-existent epistaxis.¹³ Clinical features included pallor, cyanosis, respiratory distress, altered heart rate, and seizure.

A series of fatal asphyxiation and sudden infant death cases included four infants with epistaxis. All the children had previously presented with ALTEs).¹² Post-mortem features in asphyxiated children included intra-pulmonary haemorrhages and intrathoracic petechiae (the later were also seen in non-asphyxiated children).

1.3. Key evidence statements

- Epistaxis when present is significantly associated with asphyxiation, either intentional or unintentional
- Some young children presenting with asphyxia may have no overt symptoms; those that were symptomatic included altered skin colour, respiratory distress, altered heart rate, and a possible history of ALTE.

1.4. Research implications

- Given the enormous clinical and forensic significance of epistaxis in young infants, future prospective studies with clearly defined aetiologies for epistaxis, including asphyxiation, would make an important contribution.

1.5. Limitations of review findings

- Although comparative studies were identified, the number of infants within these studies was small, thus limiting the validity of the systematic review.

There is a lack of large-scale comparative studies with explicit confirmation of asphyxiation as a mechanism of injury.

Findings of clinical question 2

What are the ear, nose and throat manifestations of physical abuse or fabricated or induced illness?

2.1 ENT manifestations of physical abuse

Throat injuries

A systematic review included 16 studies detailing throat injuries in 25 children, with an age range of 15 days to two years (median four months).⁶ The majority of the injuries (n=20) were pharyngeal lacerations or perforations.¹⁴⁻²⁵ Presentations commonly including dysphagia, drooling, respiratory distress, haemoptysis or haematemesis, neck swelling and pyrexia. A minority had surgical emphysema involving the neck or chest. The mechanism of pharyngeal injury was attributed to forceful introduction of an object or finger in approximately half the cases. In five cases there were no associated pharyngeal injury: three infants presented following insertion of foreign bodies into the throat (baby wipes, a bolt)^{26,27} or neck (needles),²⁰ one had bilateral vocal cord paralysis following a shaking injury,²⁸ and one had extensive surgical emphysema and a pneumomediastinum.²² The reported associated injuries in these 16 studies included external bruising and petechiae (n=4), intraoral injury (n=2), fractures (n=11) and intracranial injury (n=2).

The 2021 update identified one further case report describing a 28-day old neonate with stridor due to right vocal cord paralysis, history of bloody oral secretions, subcutaneous emphysema, and pneumomediastinum.² Physical examination found the patient to have a high-pitched inspiratory stridor, which was audible at rest and became louder during crying. The cry was strong and mildly dysphonic. There was no evidence of mouth or oropharyngeal trauma with no petechiae, bruising, or lacerations. Frenula were intact. No skin abrasions or bruising on the face, neck, or thoracic cavity were present. There was also no palpable subcutaneous emphysema. The injury was caused by a solid jolt, causing the head to move back and forth forcefully and was admitted by the father.

Ear injuries

Ear Injuries resulting primarily in bruising to the pinna are considered in the systematic review on [bruising](#). This systematic review considers other features of ear injury and includes eight studies describing injuries in 13 children aged nine months - 12 years (median two years).⁶ The majority affected the external ear and included auricular deformity, abrasions petechiae, lacerations and chemical burns. The three children with chemical burns all had tympanic

membrane perforation and two of these had profound sensorineural hearing loss and facial weakness.^{29,30} Three further children who presented with bleeding from the ear also had tympanic membrane perforations.^{31,32} Blows to the pinna led to ‘cauliflower ear’ deformity, grazing, or swelling and tissue destruction.³³⁻³⁷ One infant suffered hearing loss as a result of a blow that caused ossicular discontinuity.³¹ Co-existent external injuries including bruising, burns and a bite mark were described in five children, of whom two also had intracranial injuries and another had a foreign body in the throat.

Nose injuries

No papers focussed on physical injuries to the nose. Willging 1992 reported the prevalence of head and neck injuries in a five year retrospective case series of children evaluated for abuse.³⁸ Of 1390 experiencing physical abuse, 5% had injuries to the nose, which included bruising, abrasions, lacerations, fractures and burns.

A small case series of six children with nasal erosion was identified in the 2021 update.¹ Three of the children met abuse rankings for inclusion in the review. A three-month-old girl presented with nosebleeds and was found to have a pushed in midface, absence of the nasal septum, and missing inferior right nasal cartilage. The mother stated she would push an aspirator all the way into the baby's nose, holding her entire body weight on it. Two brothers, aged 22 months and four years, also presented with nosebleeds. Their physical examinations found destruction of the bilateral outer nasal cartilage in the younger brother and absence of right nasal vestibule without changes to the left nasal vestibule in the older. Physical assessment of the children was notable for erosion of the bilateral nares and deformed nasal grooves. Their mother was observed during the hospital admission forcibly ‘cleaning’ the nose of the younger child.

2.2 ENT manifestation of fabricated and induced illness (FII)

A systematic review⁶ identified 14 studies³⁹⁻⁵² detailing FII in 84 children, with an age range of seven months to 14 years (median two years).⁶ The only case series⁴⁴ reviewed records of 104 children seen over a 24-year period with ‘paediatric condition falsification’ where there was evidence that the child’s caretaker intentionally falsified history of non-existent illness, extremely exaggerated history of legitimate illness, fabricated medical signs and symptoms, or actually induced illness in the child. In this series, 45 children underwent ENT surgery. All had myringotomies and insertion of grommets, often repeatedly, and an unstated number had additional procedures including tonsillectomy and adenoidectomy, and sinus drainage. Commonly, the initial myringotomy tubes were placed prior to the first birthday. Some of the children with middle ear disease were reported by their mother to have severe hearing loss in spite of audiological evidence to the contrary. As a result, several children were taught sign

language, fitted with hearing aids, or their mothers demanded hearing-impaired educational services in the face of documented normal or minimally abnormal hearing.

The remaining 13 studies were single case reports. Three of these reported verbal fabrications including otitis media, noisy breathing and sinusitis occurring in conjunction with fabricated symptoms in other organs.^{39,42,45} As a consequence, the children had experienced multiple investigations and procedures. By the age of 14, one of these children had undergone a total of 40 surgical procedures, including 11 ENT procedures for alleged chronic sinusitis.³⁹

Three papers reported fabrication of physical signs. Trajber 1996 reported a three year old with episodes of bleeding from the ear, nose and mouth, and also haematuria, which led to multiple investigations.⁵¹ Analysis of the 'blood' showed that it was dyed liquid. Reports of recurrent aural discharge by Bouchier 1983 and Bennett 2005 involved introduction of maternal blood and maternal saliva respectively into the external ear.^{40,41}

Seven authors described induction of signs affecting the ear, nose and throat. Magnay 1994 reported an infant with excoriation of the inner aspect of both nostrils.⁴⁶ She was also reported to have bloody diarrhoea and had cutaneous lesions around the anus, ankles and the soles of each foot. She had undergone endoscopy, laparotomy and placement of a central line for intravenous nutrition before the fabrication and induction were recognised. Tamay 2007 described a six year old with recurrent skin lesions and burns to the pharynx and oesophagus on endoscopy due to administration of 'mouthwash' containing sodium hydroxide.⁵⁰ A sibling had died some months earlier and had suffered recurrent cutaneous ulceration and scarring which was attributed to cicatricial pemphigoid.

Recurrent aural discharge was reported by four authors. Mra 1997 described a three year old who had CSF otorrhoea following an accidental skull fracture.⁴⁹ The leak was sealed and a lumbar drain for CSF was inserted under the same anaesthetic. CSF otorrhoea persisted and led to two further surgical procedures, but there was no evidence of leakage from the previously sealed area. Ultimately staff recognised that the mother was instilling CSF from the drain into the child's ear and was also tampering with the central line. Di Biase 1996 described a three year old with chronic suppurative otitis media and recurrent sepsis due to injection of faeculent fluid into a central line.⁴³ Manning 1990 also reported induction of chronic suppurative otitis media with bleeding and perforation of the tympanic membranes caused by the child's mother.⁴⁷ White 1985 reported an infant aged 11 months with persistent haemorrhagic otitis media.⁵² The development of multiple haematomas and abnormal coagulation studies led to toxicology which confirmed warfarin poisoning.

The only death among the case reports was that of a 21 month old who had five previous admissions with the history that she had stopped breathing or choked on food, and that her father had resuscitated her.⁴⁸ Investigations did not show any cause for the events. Bleeding from the mouth and nose was reported to have occurred in some of these episodes. On the final

presentation, she could not be resuscitated. Emergency department staff found a balloon in her oropharynx. Post-mortem lung histology showed intra-alveolar haemosiderin suggesting that previous episodes of ALTE were in fact induced upper airway obstruction.

ENT features of FII are frequently just one aspect of a variety of reported symptoms and signs in affected children, who often have extensive medical histories consisting of a variety of unusual signs and symptoms and are subjected to numerous invasive procedures. FII should be considered in children with ENT symptoms or signs which are recurrent or intractable despite appropriate treatment.

2.3 Key evidence statements

- Pharyngeal injuries are the most frequently reported ENT injury, predominantly affecting neonates and infants who present with dysphagia, drooling, haemoptysis, and surgical emphysema
- Ear injuries most commonly affect the external ear and include auricular deformity, abrasions, petechial lacerations, and burns
- Fabrication and induction of ENT signs and symptoms most commonly involves recurrent unexplained otorrhoea or ENT lesions which fail to heal despite appropriate therapy.

2.4 Research implications

- Future studies of assault as a mechanism of ENT injury should include injuries that may be due to maltreatment.

2.5 Limitations of review

- There are few large-scale comparative studies of accidental and non-accidental ENT injuries, and this precludes a meta-analysis of specific injuries or clinical features.

Other useful resources

The review identified a number of interesting findings that were outside of the inclusion criteria. These are as follows:

Clinical question 1

- A large study of children presenting with Apparent Life Threatening Events (ALTEs), unexplained deaths or Sudden Infant Death Syndrome (SIDS). This study included infants with possible suffocation but did not meet the inclusion criteria for this review⁵³
- A study of children with fatal abuse of whom 11 experienced asphyxia⁴
- American Academy of Pediatrics' recommendation for features which may indicate intentional asphyxiation.⁵⁴

Related publications

- Rees, P., A. Al-Hussaini and S. Maguire (2017). "Child abuse and fabricated or induced illness in the ENT setting: a systematic review." *Clin Otolaryngol* 42(4): 783-804.

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Appendix 1 – Methodology

We performed an all-language literature search of original articles, their references and conference abstracts published since 1950. The initial search strategy was developed across OVID Medline databases using keywords and Medical Subject Headings (MeSH headings) and was modified appropriately to search the remaining bibliographic databases. The search sensitivity was augmented by the use of a range of supplementary ‘snowballing’ techniques including consultation with subject experts and relevant organisations, and hand searching selected websites, non-indexed journals and the references of all full-text articles.

Prior to the 2021 update, identified articles, once scanned for duplicates and relevancy, were transferred to a purpose-built Microsoft Access database to coordinate the review and collate critical appraisal data. Where applicable, authors were contacted for primary data and additional information. Translations were obtained when necessary. Relevant studies were scanned for eligibility by the lead researcher and those that met our inclusion criteria were reviewed. For the 2021 update studies were managed using Endnote and only data included in English language papers or with an English language abstract were accessed for relevancy. No contact was made with authors in this update.

Standardised data extraction and critical appraisal forms were based on criteria defined by the National Health Service’s Centre for Reviews and Dissemination.⁵⁵ We also used a selection of systematic review advisory articles to develop our critical appraisal forms.⁵⁶⁻⁵⁹ Articles were independently reviewed by two reviewers. A third review was undertaken to resolve disagreement between the initial reviewers when determining either the evidence type of the article or whether the study met the inclusion criteria. Decisions related to inclusion and exclusion criteria were guided by Cardiff Child Protection Systematic Reviews, who laid out the basic parameters for selecting the studies.

Our panel of reviewers included paediatricians, paediatric radiologists, orthopaedic surgeons, research officers, designated and named doctors and specialist nurses in child protection. All reviewers underwent standardised critical appraisal training, based on the CRD critical appraisal standards.

Inclusion criteria

Criteria used to answer “What are the identified characteristics of epistaxis indicative of asphyxiation in children less than 2 years of age?”

Inclusion	Exclusion
Studies of all observational evidence types other than case report (minimum 3 cases)	Personal practice
English and non-English articles	Review articles
Patients aged <2 years	Case report
Epistaxis defined as any bleeding from the nose/ nasal haemorrhage	Case series (<3)
Studies where the population only includes children with epistaxis in the absence of asphyxiation	Studies where the population includes adults and children and the data for children cannot be extracted
Studies with a mixed population of children with epistaxis as a result of asphyxiation and not as a result of asphyxiation	Likelihood of asphyxiation rank 4-5, or mixed rank
Asphyxiation of any aetiology (confirmation rank 1-3) defined as deprivation of oxygen from upper airway obstruction, inflicted or unintentional	Likelihood of no asphyxiation rank C1-C2
No asphyxiation (confirmation rank A-B2)	Methodologically critically flawed papers
	Study exclusively addresses epistaxis in association to: <ul style="list-style-type: none"> • Trauma (blunt or penetrating) • Prior nasal surgery • Post mortem examination alone • Medical causes of epistaxis (coagulation disorder, congenital disorders, pre-existing ENT disease)
	Oral bleeding only

Criteria used to answer “What are the ear, nose and throat manifestations of physical abuse or fabricated or induced illness?”

Inclusion	Exclusion
Studies of all observational evidence types	Formal consensus/expert opinion/personal practice/review article
English and non-English articles	Studies only involving accidental or iatrogenic ear nose or throat injuries
Patients aged <18 completed years	Management of injury papers
Ear is defined as the auricle (external ear) to the internal acoustic meatus including the pharyngotympanic tubes	Studies of complications or outcomes of abusive ear, nose or throat injuries
Nose is defined as the external nose to the nasopharynx including the sinuses	Studies where the population includes adults and children and the data for children cannot be extracted
Throat is defined as the oropharynx to the laryngopharynx including the lingual and palatine tonsils	Oral injuries
Ear, nose or throat injuries, signs or symptoms as a result of physical abuse or fabricated or induced illness	Bruising alone
Physical abuse or FII (confirmation of abuse rank 1-3)	Burns to throat or external nose
	Ear, nose or throat injuries as a result of sexual abuse
	Epistaxis as a result of asphyxiation
	Likelihood of physical abuse or fabricated or induced illness rank 4-5, or mixed rank
	Likelihood of no physical abuse or fabricated or induced illness C1-C2

Databases

Databases	Time period searched
ASSIA (Applied Social Sciences Index and Abstracts)	1987 – 2021
Child Data	1958 – 2009 [†]
CINAHL (<i>Cumulative Index to Nursing and Allied Health Literature</i>)	1982 – 2021
Cochrane Central Register of Controlled Trials	1996 – 2014
EMBASE	1980 – 2021
MEDLINE	1950 – 2021
MEDLINE In-Process and Other Non-Indexed Citations	1951 – 2021
Open SIGLE (System for Information on Grey Literature in Europe)	1980 – 2005 [*]
Pubmed E publications (Epub ahead of print)	2014
Scopus	2009 – 2021
Social Care online (previously Caredata)	1970 – 2014
Trip Plus	1997 – 2005 [†]
Web of Knowledge – ISI Proceedings	1990 – 2014
Web of Knowledge – ISI Science Citation Index	1981 – 2014
Web of Knowledge – ISI Social Science Citation Index	1981 – 2014
[*] ceased indexing [†] institutional access terminated [‡] no yield so ceased searching	
Journals 'hand searched'	Time period searched
Child Abuse and Neglect	1977 – 2014
Child Abuse Review	1992 – 2014

Search strategy

The below table presents the search terms used in the 2021 Medline database search for ear, nose and throat, truncation and wildcard characters were adapted to the different databases where necessary. Changes to the search strategy were adopted only after consultation with the clinical expert sub-committee.

1. exp Child/	52. otitis media.mp.
2. exp Child, Preschool/	53. pharyngitis.mp.
3. exp Adolescent/	54. oropharynx.mp.
4. exp Infant/	55. laryngopharynx.mp.
5. Infant/ or exp Infant, Newborn/	56. Otorhinolaryng*.mp.
6. (child: or toddler: or baby or infant* or adolescent*:.mp.	57. Otolaryngo*.mp.
7. 1 or 2 or 3 or 4 or 5 or 6	58. paranasal sinus*.mp.
8. exp Child Abuse/	59. submandibular gland*.mp.
9. exp Battered Child Syndrome/	60. parotid gland*.mp.
10. exp Shaken Baby Syndrome/	61. palatine tonsil*.mp.
11. exp Airway Obstruction/ or exp Asphyxia/	62. (bleed* adj3 ear*).mp.
12. (child abuse or battered child or battered baby or shaken baby or asphyxia or airway obstruction).mp.	63. (caustic adj3 ear*).mp.
13. suffocat*.mp.	64. hypopharynx*.mp.
14. asphxia*.mp.	65. hypopharynx* perforat*.mp.
15. nonaccidental injur*.mp.	66. perichondritis.mp.
16. non-accidental injur*.mp.	67. Animals/
17. nonaccidental trauma.mp.	68. animal stud*.mp.
18. non-accidental trauma.mp.	69. exp "Review"/
19. soft tissue injur*.mp.	70. exp Child Abuse, Sexual/
20. Infanticide.mp.	71. sexual abuse.mp.
21. abusive trauma.mp.	72. allerg*.ti.
22. (child maltreatment or child protection).mp.	73. surg*.ti.
23. (child adj3 maltreatment).mp.	74. congenital.ti.
24. (child adj3 physical abuse).mp.	75. 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74
25. child murder.mp.	76. cohort*.tw.
26. covert homicide.mp.	77. controlled clinical trial.pt.
27. child homicide.mp.	78. exp Epidemiologic Methods/
28. exp Munchausen Syndrome by Proxy/	79. exp Case-Control Studies/
29. Factitious disorder by proxy.mp.	80. (case\$ and control\$).tw.
	81. exp case report/
	82. (case\$ and series).tw.

30. Fabricat* ill*.mp.	83. exp case studies/
31. Induc* ill*.mp.	84. exp Cohort Studies/
32. Munchausen Syndrome by proxy.mp.	85. 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 32 or 33
33. unnatural death.mp.	86. 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66
34. exp Epistaxis/	87. 76 or 77 or 78 or 79 or 80 or 82 or 84
35. exp Ear/	88. 7 and 85 and 86 and 87
36. exp Nose/	89. 88 not 75
37. exp Pharynx/	
38. (epistaxis or ear or nose or throat or pharynx).mp.	
39. nosebleed.mp.	
40. nose bleed.mp.	
41. (bleed* adj3 nose).mp.	
42. nasal hemorrhage.mp.	
43. nasal haemorrhage.mp.	
44. nasal bleed*.mp.	
45. intra-alveolar haemorrhag*.mp.	
46. intra-alveolar hemorrhag*.mp.	
47. oronasal bleed*.mp.	
48. oronasal haemorrhag*.mp.	
49. oronasal hemorrhag*.mp.	
50. otalgia.mp.	
51. (otitis adj3 extern*).mp.	

Pre-review screening and critical appraisal

Papers found in the database and hand searches underwent three rounds of screening before they were included in this update. The first round was a title screen where papers that obviously did not meet the inclusion criteria were excluded. The second was an abstract screen where papers that did not meet the inclusion criteria based on the information provided in the abstract were excluded. In this round the pre-review screening form was completed for each paper. These first two stages were carried out by a systematic reviewer at the RCPCH and a clinical expert. Finally, a full text screen with a critical appraisal was carried out by members of the clinical expert sub-committee. Critical appraisal forms were completed for each of the papers reviewed at this stage. Examples of the pre-review screening and critical appraisal forms used in previous reviews are available on request (evidence@rcpch.ac.uk).

Appendix 2 – Rankings

Ranking of confirmation of physical abuse or fabricated or induced illness (FII) in children presenting with ear, nose or throat injuries, signs or symptoms thereof, studies ranking 1-3 were included; ranking of exclusion of physical abuse and FII in children presenting with ear, nose or throat injuries, signs or symptoms, studies ranking A-B2 were included. Ranking of quality of examination, studies were not excluded on these standards

Criteria used to confirm physical abuse or FII	
1	Physical abuse or FII confirmed at case conference, family, civil or criminal court proceedings, admitted by perpetrator or independently witnessed
2	Physical abuse or FII confirmed by stated criteria including multidisciplinary assessment
3	Physical abuse or FII defined by stated criteria
4	Physical abuse or FII stated but no supporting detail given
5	Suspected physical abuse or FII
Criteria used for active exclusion of physical abuse and FII from control group	
A	By multidisciplinary assessment or child protection, clinical investigation or forensic recreation of the scene or sudden death investigation
B1	By checking either the child abuse register or records of previous maltreatment
B2	By confirmation of organic disease or witnessed accidental causes
C1	Stated but no detail given
C2	No attempt made to exclude physical abuse and FII
Quality of ear examination	
1	Examination by otolaryngologist with appropriate illumination
2	Examination by doctor with appropriate illumination
3	No examination or no details provided
Quality of nasal examination	
1	Endoscopy with decongestant

2	Examination by otolaryngologist with appropriate illumination
3	Examination by doctor with appropriate illumination
4	No examination or no details provided
Quality of throat examination	
1	Endoscopy
2	Examination by otolaryngologist with appropriate illumination
3	Examination by doctor with appropriate illumination
4	No examination or no details provided

Ranking of confirmation of intentional or unintentional asphyxiation in children with epistaxis, studies ranking 1-3 were included—and ranking of exclusion of intentional and unintentional asphyxiation in children with epistaxis, those ranking A-B2 were included.

Ranking	Criteria used to confirm intentional asphyxiation	Criteria used to confirm unintentional asphyxiation
1	Intentional asphyxiation confirmed at case conference or strategy meetings or SUDI review/ Procedural Response to Unexpected Deaths in Childhood (PRUDiC) process or civil or criminal court proceedings or admitted by perpetrator or independently witnessed or confirmed at post-mortem	Unintentional asphyxiation confirmed at or SUDI review/ Procedural Response to Unexpected Deaths in Childhood (PRUDiC) process or admitted by parent or carer or independently witnessed or confirmed at post-mortem
2	Intentional asphyxiation confirmed by stated criteria including multidisciplinary assessment (social services/ law enforcement/ medical) or sudden death investigation	Unintentional asphyxiation confirmed by stated criteria including multidisciplinary assessment (social services/ law enforcement/ medical) or sudden death investigation
3	Intentional asphyxiation defined by stated criteria	Unintentional asphyxiation defined by stated criteria

4	Intentional asphyxiation stated but no supporting detail given	Unintentional asphyxiation stated but no supporting detail given
5	Suspected intentional asphyxiation	Suspected unintentional asphyxiation
Ranking	Criteria used for active exclusion of intentional and unintentional asphyxiation from control group	
A	By multi-disciplinary assessment or child protection clinical investigation or forensic recreation of the scene or sudden death investigation	
B1	By checking either the child abuse register or records of previous abuse	
B2	By confirmation of organic disease or witnessed causes of epistaxis that are not asphyxiation-related	
C1	Stated but no detail given	
C2	No attempt made to exclude asphyxiation	

Appendix 3 – Flow of studies

2021 update

