ED Post-Tonsillectomy Hemorrhage

Disclaimer

This clinical pathway is intended to provide general guidance and should not replace clinical judgment. It is meant to assist licensed practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches to the diagnosis and management of a particular condition. A particular patient's circumstances should always be taken into account when a practitioner is deciding on a course of management.This clinical pathway is current as of the date of publication and will be reviewed periodically to align with any updated best practices or evidence; however, new development may notbe represented in the published version. The treating practitioner assumes all risks associated with care decisions. Phoenix Children's accepts no liability for the content of this clinical pathway or the outcomes a patient might experience where a practitioner consulted the content of this clinical pathway.

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ED Management of Post-Tonsillectomy Hemorrhage

No Bleeding in > 3 hours
Small Historical volume
No Clot
Initial Presentation

Off Pathway

No Active Bleeding
< 30 mL historical volume
No Clot
Initial Presentation

Consider discharge

No Active Bleeding with **> 30 mL historical volume**
OR Clot present
OR Repeat Presentation

Observation
- Observe for 3 hours
- Hydrate/PO challenge
- Alert ENT of clinical status
- Consider IV
- Consider Neb TXA

Bleeding Resumes?
- No
- Yes

Active bleeding
Initial Management
- Water Gargle
- IV access x 1
- 20ml/kg IV NS or LR
- PRN Zofran
- Initial Labs: CBC, PT/PTT, Thrombin time, Type and Screen
- Consult ENT ASAP (Note 1)
- See transfusion criteria (Note 2)
- For Bleeding Diathesis see Note 5

Any of the following?
- High Volume Bleed
- Vital Sign Instability
- Requiring Transfusion

- No
- Yes

Disposition

Admit if (Note 6):
- High Volume Bleed
- IV TXA administration
- Hgb<8
- Transfused PRBC's
- Bleeding disorder
- Poor PO
- Poorly controlled pain
- Provider discretion

Discharge Plan:
- Ensure patient has follow up with ENT 3-4 weeks after surgery
- Strong return precautions if rebleeds
- Consider TXA prescription for 14 days or until eschar falls off (Note 7)
- Resume standard Post-opp care and medications (NSAID's ok)

Urgent Management
- Place patient in a high acuity room
- Give Neb TXA (Note 3)
- Repeat Neb TXA up to 3x if bleeding persists
- Given IV TXA if bleeding persists after Neb TXA x3
- Recheck 20 minuts after TXA

Bleeding Resumes?
- No
- Yes

Resuscitative Management
- Place in the resuscitation room
- Obtain IV access x2
- Obtail full set of labs (Note 4)
- Have the patient sit up, lean forward
- Apply direct pressure to bleed if able
- Give Neb AND IV TXA (Note 3)
- Repeat Neb TXA up to 3x if bleeding persists
- Consider transfusion (Note 2)

Operating Room
(Off pathway)

Alert the following ASAP:
- ENT on call (Note 1)
- OR
- Anesthesia on Call

Assess need for additional IV/Resusitative measures

Note 1: On-Call ENT
Contact the originating surgeon/ group to discuss management. If does not have privileges at Phoenix Children's, contact the Phoenix Children's ENT provider on call.

Note 2: Transfusion Criteria:

Hgb < 7	Transfuse
Hgb < 8	if any ongoing bleeding or symptomatic anemia
Hgb 8 -10	if ongoing heavy bleeding

Note 3: Tranexamic Acid (TXA) Dosing: (Contraindicated in thrombotic disease)

Nebulized
≤25 kg – 250 mg q 20 min. up to 3x
>25 kg – 500 mg q 20 min. up to 3x

Intravenous
10mg/kg up to 1000mg q8 hours

Note 4: Labs in Resuscitative Management
Initial labs + Fibrinogen, Retic count, Factor 9, Platelet function assay, and VWD screen (VWF antigen, VWF activity, and factor 8 assay)

Note 5: If Bleeding Diathesis
ASAP consult to Hematology provider on call for further recommendations and adjunctive target therapies.

Note 6: Admission
6a-6p – Admit to ENT
6p-6a – Admit to Hospitalists with ENT consult
- Clear liquids only & IV in place

Note 7 - Consider TXA prescription for 14 days or until eschar falls off **
(Only available at PCH OP pharmacy)

Oral Tranexamic acid and Aminocaproic acid dosing:

Tranexamic Acid Dosing (available as 650mg tablets)	Weight	Aminocaproic Acid Dosing (available as 500 and 1000 mg tablets; 250mg/mL solution)
162.5 mg PO BID	<5 kg	250 mg PO Q6h
162.5 mg PO BID	5-8 kg	500 mg PO Q6h
325 mg PO BID	8-10 kg	500 mg PO Q6h
325 mg PO BID	10-12 kg	1000 mg PO Q6h
325 mg PO BID	12-18 kg	1000 mg PO Q6h
650 mg PO BID	18-20 kg	1000 mg PO Q6h
650 mg PO BID	20-22 kg	1500 mg PO Q6h
650 mg PO BID	22-25 kg	1500 mg PO Q6h
650 mg PO BID	25-30 kg	2000 mg PO Q6h
650 mg PO BID	30-40 kg	2500 mg PO Q6h
1300 mg PO BID	>40 kg	3000 mg PO Q6h

**** Contraindications:** Thromboembolic Disorders, ongoing hemorrhage, Hormonal contraceptive, renal impairment, hx of hypersensitivity reaction to TXA.

Scope

Inclusion Criteria –
- Post tonsillectomy hemorrhage presenting to Phoenix Children's Emergency Department
- Bleeding within the last 3 hours
- Bleeding diathesis

Exclusion Criteria –
- Bleeding > 14 days post-surgery

Pathway Goals

- Reduce the need for acute OR management in patients with post-tonsillectomy hemorrhage.
- To improve overall management of post tonsillectomy hemorrhage

Key Clinical Recommendations with Evidence Based Supporting Material

Tonsillectomy with and without adenoidectomy (T&A) is one of the most common surgical procedures done in pediatric patients in the United States [1]. Despite being routine, complications from this procedure are a frequent cause of emergency department (ED) visits and unplanned hospital admissions. Among these, post tonsillectomy hemorrhage (PTH) is the most significant, occurring in 1-10% of cases [2,3,4] and accounting for an estimated annual healthcare expenditure of $9.5 million [9]. Despite this clinical and financial burden, practice guidelines for managing and determining the disposition of ED patients with PTH remain limited. In the last 5 years there has been increasing evidence of the benefit of nebulized TXA for hemostatic control. This document aims to review the supporting research behind these claims and outline a pathway to guide providers in managing post-tonsillectomy hemorrhage.

Hemorrhage is not only the most common post-tonsillectomy complication but also the most life-threatening, with an estimated mortality rate of 7.04 deaths per 100,000 procedures [24]. Despite the lifesaving potential of early management and stabilization in the ED [18], no established guidelines currently exist to direct ED providers in managing PTH [12]. Current interventions often fail to prevent admissions or the need for surgical intervention, with 3.6–7.8% of patients requiring hospitalization [7,8,9].

The lack of standardized ED guidelines for managing PTH contributes not only to clinical challenges but also to significant healthcare spending. A review of the National Readmission Database from 2010–2015 highlights the financial impact of post-tonsillectomy readmissions, revealing that readmissions resulted in combined hospital costs averaging $14,000 more than for patients who were not [9]. Reducing hospital readmissions through comprehensive research and uniform guidelines is key to optimizing care and lowering wasteful healthcare expenditures.

In response to the clinical and financial challenges posed by PTH, some institutions have taken steps to establish guidelines for its management. In the last decade several case reports and case series have shown the benefits of nebulized tranexamic acid for hemostatic control [15]. With this success in mind, several institutions have implemented the use of TXA in management of post tonsillectomy hemorrhages.

Despite the commonality as well as the significant morbidity and mortality associated with post tonsillectomy hemorrhages, there is paucity of clinical practice guidelines regarding management and disposition for patients presenting to the ED. We hope that our pathway will better guide PEM providers, preventing unnecessary admissions and the need for further surgical intervention, improving patient outcomes and reducing the financial burden.

NSAID's

The use of NSAIDs, specifically ibuprofen, in managing post-tonsillectomy pain in pediatric patients is supported by current clinical guidelines and evidence. The American Academy of Otolaryngology-Head and Neck Surgery recommends the use of ibuprofen for pain control after tonsillectomy, either alone or in combination with acetaminophen, due to its efficacy and safety profile [15].

A systematic review and meta-analysis involving 1747 children found that NSAIDs, including ibuprofen, did not increase the risk of postoperative bleeding, secondary bleeding, readmissions, or the need for reoperation due to bleeding [15]. Another meta-analysis confirmed that perioperative ibuprofen administration did not significantly increase the incidence of primary or secondary post-tonsillectomy hemorrhage (PTH) compared to control groups, while also reducing postoperative nausea and vomiting [29].

A noninferiority randomized clinical trial comparing ibuprofen to acetaminophen found no significant difference in the rate of severe bleeding requiring surgical intervention, although the study could not completely exclude a higher rate of severe bleeding in the ibuprofen group [30]. Additionally, a retrospective study showed that ibuprofen prescribing practices were not associated with an elevated risk of surgically managed PTH [31].

In summary, the recommendation is that NSAIDs, particularly ibuprofen, can be safely used for pain management in pediatric patients post-tonsillectomy without significantly increasing the risk of hemorrhage. This aligns with the guidelines from the American Academy of Otolaryngology-Head and Neck Surgery [15].

Tranexamic Acid:

Mechanism of Action

Tranexamic acid (TXA) is a synthetic derivative of lysine that exerts anti-fibrinolytic effects by blocking lysine binding sites on plasminogen molecules, inhibiting the interaction of plasminogen with formed plasmin and fibrin. Inhibition of plasminogen activation results in stabilization of the preformed fibrin meshwork produced by secondary hemostasis [6].

Indications

Tranexamic acid (TXA) has been widely utilized in adult medicine for many years to manage bleeding across diverse clinical contexts. Recently, nebulized TXA has been shown to be an effective, non-invasive mode of hemostasis with great applications in the emergency department. More specifically, there is evidence indicating its superior efficacy in some clinical contexts such as hemoptysis, epistaxis, post-tonsillectomy hemorrhage, and ECMO/pulmonary hemorrhage [25, 15, 27,28]. Its uses in pediatrics are still under investigation, with immense promise in various clinical applications such as pulmonary hemorrhage, epistaxis, and post-tonsillar hemorrhage. For example, some studies have shown that nebulized TXA significantly reduces the odds of rebleeding and the need for more invasive interventions in epistaxis. It has been shown to improve patient outcome for those with pulmonary hemorrhage, especially in the setting of ECMO [21,22,23].

PTH specific data:

Given the morbidity and mortality associated with post tonsillectomy hemorrhage, much research has gone into evaluating ways to best manage this complication. Conservative treatments such as gargles, application of topical hemostatic agents, and blood product replacement have been long used without significant impact. In the last 5 years, several studies have shown inhaled tranexamic acid as a viable option for hemostatic control. Its use for PTH treatment specifically was first noted in various case reports and case series, including two at our institution [15]. As a result of this growing evidence several institutions have studied the use of nebulized TXA as an adjunct to routine PTH care.

A 2021 retrospective study by Erwin et al. found that nebulized tranexamic acid significantly reduced the need for operating room intervention in pediatric post-tonsillectomy hemorrhage. Bleeding resolved in 67% of patients receiving TXA, reducing the attributable risk for surgery by 44% (number needed to prevent harm: 2.3; $p = 0.005$) [13].

A 2022 retrospective cohort study by Spencer et al. examined 55 patients with post-tonsillectomy hemorrhage, 27 treated with TXA (via IV, nebulized, or topical) and 28 managed with observation alone. Hemostasis was achieved in 100% of TXA-treated patients without operative intervention, compared to 53% in the non-TXA group. TXA use also reduced opioid consumption both in-hospital and at discharge, highlighting its potential to prevent surgery and improve pain management in postoperative tonsillar hemorrhage [14]

In 2023, Shin et al. conducted the largest retrospective cohort study on nebulized tranexamic acid (TXA) for post-tonsillectomy hemorrhage. They found that nebulized TXA was associated with lower rates of operative intervention (36.1% vs. 60.2%; OR 0.37, 95% CI 0.22–0.63) and repeat bleeding events (4.9% vs. 14.2%; $p < 0.02$). Patients with active bleeding or visible clots in the tonsillar fossae showed even greater benefit, with operative rates of 47.4% in the TXA group compared to 76.7% in controls (OR 0.27, 95% CI) [15].

A recent retrospective chart review at Children's Mercy, Kansas City, has shown similar benefits. In their review of 41 patients presenting with PTH from March 2023 to June 2023, they found that the use of nebulized TXA appears to be associated with a lower rate of return to the operating room for control of post-tonsillectomy bleeding [26].

Lastly, a recent metanalysis reviewed nine studies (2 case reports, 4 case series, and 3 retrospective comparative studies) regarding clinical efficacy of nebulized TXA for treating PTH. They found that across all studies "reoperation to control bleeding was 0.27 (95% CI: 0.08-0.5). The rate of reoperation to control bleeding was significantly lower in the nebulized TXA arm compared to the no-TXA arm (n = 3 studies, RR = 0.55, 95% CI [0.39-0.77], $p < 0.001$)" [20].

All of these retrospective studies and case reports support inhaled tranexamic acid as viable options for hemostatic control in pediatric post-tonsillectomy hemorrhage. By implementing it into our pathway we hope to have similar improved outcomes as aforementioned.

Side Effects:

While oral and intravenous tranexamic acid (TXA) have been linked to delayed adverse effects, nebulized TXA has shown no such complications, likely due to its limited systemic bioavailability. In the referenced studies, no adverse events were reported following its use. A systematic review and meta-analysis by Alghamdi et al. further confirmed the safety of nebulized TXA for post-tonsillectomy bleeding, identifying no significant adverse effects across multiple studies [20].

Known side effects for Systemic TXA (IV) include Hypersensitivity reactions, Vision changes, Seizures, Myoclonus, and thromboembolic events.

Contraindications:

Similar to its side effects, limited data exists regarding contraindications of nebulized TXA. Given its limited systemic bioavailability few to none have been noted. Here are some of the contraindications of systemic TXA:

1. Thromboembolic Disorders: TXA is contraindicated in patients with active thromboembolic disease or a history of thrombosis or thromboembolism.
2. Hypersensitivity: Any known hypersensitivity to TXA or its components
3. Subarachnoid hemorrhage: Cerebral edema and infarction may occur.
4. Use with hormonal contraception: Additive prothrombotic risk of thromboembolic adverse reactions
5. Renal Impairment: Use caution in patients with severe renal impairment due to the risk of accumulation and potential toxicity.
6. Significant drug interactions exist, requiring dose/frequency adjustment or avoidance. Consult drug interactions database for more information

Medication Recommendations

Medication	Dose
Tranexamic Acid (TXA)	Nebulized ≤25 kg – 250 mg every 20 min. up to 3x >25 kg – 500 mg every 20 min. up to 3x Intravenous 10mg/kg up to 1000mg every 8 hours
Ondansetron	Intravenous 0.15 mg/kg/dose up to 8mg every 8 hours as needed

Admission Criteria

- High Volume Bleed
- IV TXA administration
- Hgb<8
- Transfused pRBC's
- Bleeding disorder
- Provider discretion

Discharge Criteria

Discharge Criteria
- Ability to tolerate PO
- Cessation of bleeding after interventions

Discharge recommendations:
- Discuss discharge plan with ENT
- Consider TXA prescription for 14 days or until eschar falls off in pts with resolved bleeding
- Resume standard post-op care and medications (NSAID's ok)

Patient and Family Education/Discharge Planning

- Advise family to resume standard post-op care and medications
- Ensure proper follow-up with ENT

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