DPM NEWS

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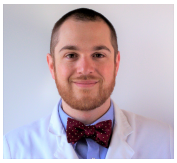
Tranexamic Acid (TXA) for EMS!

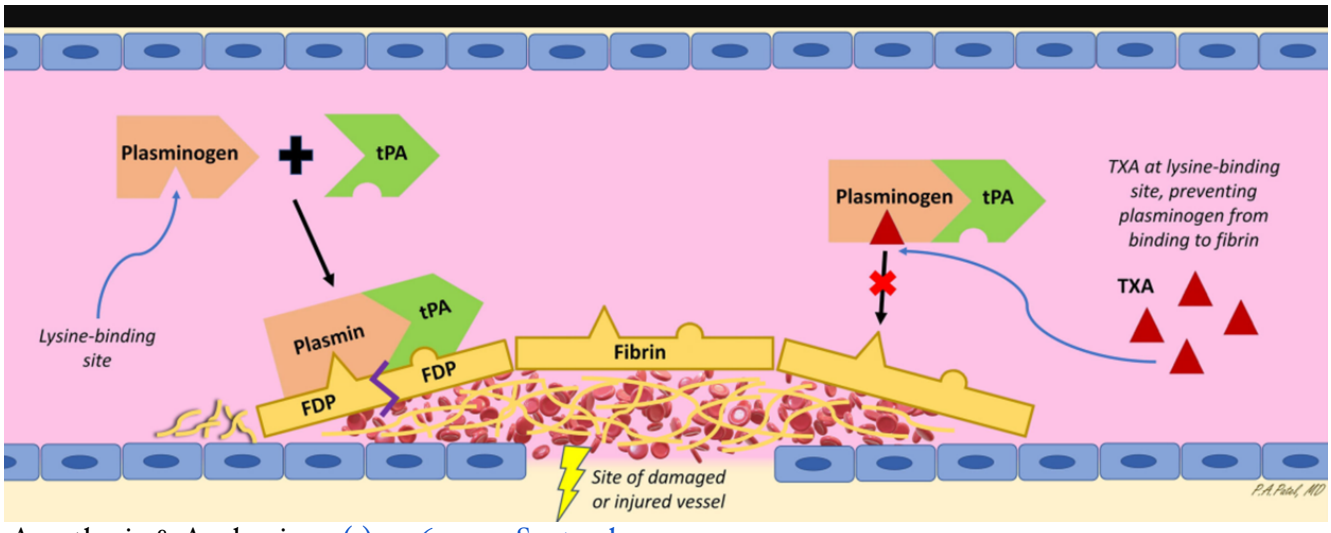


Tyler Lemay MD, NRP

Tranexamic acid was added to the NYS Collaborative Protocols in 2022 and updated in the 2025 Collaboratives effective 7/1. As local agencies add TXA or discuss adding it I wanted to review the function of TXA, the recent evidence supporting its use and how you can integrate this treatment into your resuscitation.

Function:

As an overview, TXA slows down the body's natural process of breaking down blood clots. In theory this leads to more stable blood clots and should reduce dangerous bleeding. I don't think you need to memorize the entire clotting cascade to make sense of this, but understanding the bigger pieces can help identify patients who might (or might not) benefit:



Anesthesia & Analgesia 135(3):p 460-473, September 2022.

When a blood vessel is cut or injured, the body collects platelets and debris at the site of bleeding and ties it all together by building Fibrin. This plugs the hole but may block downstream blood flow and will eventually need to be broken down and absorbed. tPA is produced naturally in the body and works by turning Plasminogen (a precursor) into Plasmin, an active cutting enzyme which starts chopping up the Fibrin to dissolve the clot. TXA works by delaying this process, preventing Plasminogen from converting

to Plasmin, allowing the clots to stabilize dangerous bleeding until surgery or endovascular intervention can treat the injury.

It's easy to see a potential risk of TXA here - blood clots that can't be broken down might lead to a stroke, pulmonary embolism or MI that your body would normally have prevented. This risk has been closely monitored in TXA research and trials show almost no risk that the TXA might cause dangerous thrombosis.

The Evidence:

TXA was first researched in the 1950s as a possible treatment for post-partum hemorrhage. The first major trial supporting widespread adoption in emergency medicine was CRASH-2. A large, multi-center, randomized controlled trial (RCT) CRASH-2 showed that sick adult trauma patients were less likely to die (28-day mortality 14.5% vs 16%) if given TXA. They found no increase in MI, stroke or PE (0.3% vs 0.5%). Importantly, they found no benefit for patients receiving TXA after 3 hours.

The WOMAN trial attempted to demonstrate a similar benefit in women with post-partum hemorrhage. There is LOTS of discussion about the trial online, but here are the high points:

No change in the primary outcome of death or hysterectomy (5.3% vs 5.5%)

Less likely to die from bleeding (1.5% vs 1.9%, risk ratio 0.81)

No increase in DVT, PE, MI, Stroke (0.3% vs 0.3%)

The trial was widely reported as positive and might suggest benefit for post-partum hemorrhage, but there are a lot of 'maybe', 'if' and 'possibly' when discussing this trial.

Two RCTs have attempted to study TXA given by EMS for traumatic hemorrhage. Both were medium sized RCTs of TXA given to trauma patients before arrival at a trauma center. The patients were less sick than CRASH-2 and came from a mix of air and ground transports and included some early interfacility transports (think Strong West to Strong for a trauma patient who drove themselves). Both trials failed to demonstrate strong statistical evidence of benefit:

STAAMP trial showed 30-day mortality was 8.1% with TXA and 9.9% without

ROC-TXA trial showed 28-day mortality was 14% with TXA and 17% without

Notice that both trials showed a *larger* benefit than CRASH-2 but neither trial could confirm the effect was statistically reliable:

Trial	# of patients	Mortality (p value)
CRASH-2	20,127	14.5 vs 16.0 (p=0.0035
STAAMP	903	8.1 vs 9.9 (p=0.17)
ROC-TXA	966	14 vs 17 (p=0.26)

You might wonder if these trials were just too small to demonstrate the mortality difference that we all suspect is there - thankfully a group of researchers from Pittsburgh combined the results for us and found almost exactly the same results as CRASH-2: Mortality was reduced from 12.1% without TXA to 10.5% and after some fancy statistics it looks more convincing that TXA is responsible for this change in mortality without more adverse effects.

I can't tie this up in a tidy summary without losing some of the important details, but the big picture is that patients who are bleeding to death probably benefit if given TXA early, 2 grams IV is probably the best dosing strategy, and complications are unlikely to result from the TXA.

The protocol

The NYS Collaborative protocol is helpfully titled "Shock - Adult: Hemorrhagic Shock" and tells us most of what we need to know about when to use TXA:

- *Patients >14 years old and those who appear to be adults*
- *Signs of shock you suspect are due to dangerous hemorrhage (trauma or OB)*
- *Systolic BP <100, MAP <65*
- *In addition to everything else we do to treat these patients, we can now give them: Tranexamic Acid 2 grams IV/IO over 10 minutes*

Putting it all together

The challenge in EMS remains focusing on the right interventions at the right time with limited resources. In a warm trauma bay with a coordinated team, TXA looks like a real benefit with very little risk. If we add TXA for that same patient on the pavement but forget to warm them, fail to oxygenate or ventilate them, fail to protect an injured cervical spine and delay their access to a trauma center, I think there is real risk we can make them worse. To that end, my priorities for patients bleeding to death are:

1. **Immediate treatment of life threats (find and treat hemorrhage, BLS airway)**
2. **Rapid transport and early notification of the trauma center**
3. **Active warming, maximize hemorrhage control enroute (pelvic binder, check tourniquets)**
4. **Large bore IV/ IO access but *avoid* IVF unless hypotension is life threatening**
5. **2g TXA IV/ IO if you are trained and equipped**

Let's keep focusing on the interventions we know save lives in trauma, keep our priorities in the right order and use TXA to save even more lives in our injured and bleeding patients!

Lots of good reading here, definitely worth additional reading!
https://mlrems.org/GetFile.aspx?fileID=15360
https://emergencymedicinecases.com/evidence-txa-tranexamic-acid-bleeding/
https://first10em.com/the-crash-2-trial/
https://thesgem.com/2018/04/sgem214-woman-the-txa-trial-for-post-partum-hemorrhage/
https://rebelem.com/should-we-rubber-staamp-prehospital-txa/
https://pmc.ncbi.nlm.nih.gov/articles/PMC11422517/

When to Pull the Chute

Christopher Galton MD, NRP, FP-C

Recently my good friend, Terry Taylor II, retired after many years of honorable service at the Rochester Fire Department. I think when life changes for those around you, it's natural to think about how that impacts you and how you would respond to those changes. One of my favorite quotes is attributed to Charles De Gaulle. "Graveyards are full of indispensable men." Many of us wonder how the world will move forward when we decide to stop working or transition roles and this limits our willingness to make that change.

I find it hard to reconcile these thoughts. On one hand, we are all above average and think that we are the best paramedics and EMTs the world has ever seen. I think we struggle to realistically consider retirement at the right time because there is a ridiculous, persistent competitiveness within emergency services. If you haven't heard the conversation about why one ambulance agency is better than another or why my fire service is better than the city or town next door, you haven't been in the business long enough.

I clearly have not retired yet, I just took a bit of a writing hiatus from the DPM newsletter (I actually think Rathfelder was sick of dealing with the repercussions of my articles). That does not mean that I don't realistically think about my own shelf life. I'm known as a guy that burns the candle very hot and my body definitely lets me know that picking up thousands of patients off the ground has a cost. I also recognize that even the best leaders should not lead indefinitely. Everyone can be replaced and there are plenty of people out there with new, dynamic ideas. Let others pick up the torch and forge a new path.

Finances are always a concern and some of us have defined benefit plans while others have employer sponsored retirement plans. Whatever options you have, take advantage of them early and max out your opportunities. The jobs that we have incur physical, mental, and emotional risks for a variety of reasons and we never know when our ability to perform those duties might come to an end. Responsibly recognizing that risk necessitates understanding and planning for retirement when we are starting our work life, not ending it.

Back to the title of this article. When to pull the chute, or paraphrased, when is the right time to retire? Everyone has to come to this answer on their own. I have worked with hundreds of colleagues that have retired over the years and the only thing that has become clear is each individual needs to come to that point on their own. No bit of cajoling or banter will make that happen. Some will be ready to make a clean cut and just stop working all together while others will need to ratchet back until it's finally time to bid work good bye. Others will never be able to let it go, which is OK, as long as the work is what brings them enjoyment and they want to continue.

The trap we all need to avoid is working too long and then missing the time when we are retired and in good health. That's the window that gives us the chance to check everything off our bucket lists. There is nothing more sad than watching someone wait too long, then not have the chance to do all the things they looked forward to doing when they retired.

I was reminded recently that everyone that is not retired wants to give the newly retired person advice on what to do in retirement. Maybe we should all just take that advice and stuff it. Instead of offering advice to our former colleagues and friends, take all those neurons and focus our energy on getting ourselves over the line, in good health, financially stable, and with a positive outlook. We are doing righteous work for

those in need and we should be able to look back on a career with pride. We need to pull the chute and glide down to a safe landing, not pull too late and end up a red stained Flat Stanley.

I can be reached at christopher_galton@urmc.rochester.edu with questions and always appreciate any comments, good or bad.

Toradol

Erik Rueckmann MD

Let's talk about that little vial in your kit that doesn't come with a lock and key: **Toradol**, also known as *ketorolac tromethamine*. It's part of the non steroidal anti inflammatory drug class and is effective, reliable, and doesn't put your patient to sleep or drop their blood pressure like a narcotic might.

But while Toradol may seem like the golden child of prehospital analgesia, it's not without some **serious fine print**. Every medication comes with risk and so let's dive into when it works like a charm—and when it can turn into trouble.

Here's what the FDA warns--

- **Bleeding risk:** Ketorolac should not be used in patients with a high risk of bleeding, hemorrhagic diathesis, cerebrovascular bleeding, and incomplete hemostasis. Because of its antiplatelet properties, ketorolac increases the risk of GI bleeding. The drug also increases postoperative bleeding risk when compared with opioids.
- **Gastrointestinal risk:** Ketorolac can cause peptic ulcers and perforations of the stomach or intestines. In an extensive pooled data study it was shown to increase the relative risk for peptic ulcers.
- **Cardiovascular thrombosis**: Ketorolac can cause an increased risk of cardiovascular thrombotic events, myocardial infarctions, and hemorrhagic stroke. Heart failure is a significant risk factor for the adverse effects of NSAIDs. A large case-controlled study spanning multiple European countries tested the risk of heart failure for 27 different NSAIDs, including 92,163 hospital admissions for heart failure and 824,6403 control patients. Seven NSAIDs were shown to increase the risk of heart failure, with ketorolac having the highest risk.
- **Renal risk**: Ketorolac can cause renal damage and potentially failure. In a population-based case-controlled study conducted in Europe, ketorolac was shown to have the highest odds ratio of increasing the cumulative risk for chronic kidney disease.

FOR EMS BLEEDING RISK IS THE PRIMARY CONCERN

Toradol **inhibits platelet function**, which means it can **increase bleeding risk**. That's why we need to think before pushing any medication, especially ketorolac in:

- **Trauma patients with suspected internal bleeding**
- **GI bleeds or peptic ulcers** (past or present)
- **Any patient with active bleeding—visible or not-so-visible**
    - **Head bleeds**
    - **Pelvic/long bone fractures**

- **OB-GYN related concerns—i.e. ectopic pregnancy**

Even minor bleeding (think: nosebleeds, oral lacerations) can become more stubborn once Toradol is on board. NSAIDs reduce **renal blood flow**, particularly in **dehydrated**, **hypovolemic** or **elderly** patients. If your patient has borderline perfusion—or you've just pumped in two liters of fluid to bring up their pressure—Toradol can potentially cause additional kidney injury.

Avoid Toradol in:

- **Known renal disease**
- **Shock states or hypotension**
- **Patients over 65**

Here's where Toradol could be helpful:

- **Musculoskeletal Pain**
  LOWER back pain, strains, sprains, etc. - Toradol loves those jobs. It's important to think about your differential—upper back pain may be a heart attack, an elderly patient with abdominal pain and low back pain could be a AAA, etc.
- **Dental pain**
- **Known Kidney Stones**
- **Simple Isolated Extremity Trauma without concern for other injuries**

Now, just like you wouldn't use the jaws of life to open a granola bar, Toradol has its limits. Avoid it when:

- The patient has active bleeding
- Diagnoses that include a possibility of active bleeding
  - Trauma, GI bleed, head bleed,
- GI bleeding history especially ulcer history
- Major trauma patient
- Patients with renal impairment
- NSAID allergy
- Chest pain
- Pregnancy, especially in the third trimester
- Hypovolemia or dehydration – it's a kidney-hater in these cases

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Upcoming Events

- October 20th – MLREMS REMAC Meeting
- October 20th – MLREMS REMAC Regional Case Review
- October 27th – MLREMS Preceptor Class
- November 17th – MLREMS Council Meeting