

# Bleeding and Bleeding Control



INDIAN + COUNTRY  
**ECHO**

C. Mateo Garcia, MD  
Center for Rural & Tribal EMS  
UNM EMS Consortium  
[chrmgarcia@salud.unm.edu](mailto:chrmgarcia@salud.unm.edu)

**EMS  
CONSORTIUM**





# Bleeding and Bleeding Control

## **Objectives**

- Define and discuss related statistics of prehospital hemorrhage and its impacts.
- Define factors of the 'lethal triad' and their interplay with hemorrhage.
- Identify and discuss the tools we have to combat bleeding and lethal triad in the prehospital setting.
- Discuss clinical cases and relevant lessons to management of hemorrhage.

# Case 1:



Dispatch:

42 y/o male, entrapment with hand caught in heavy equipment.

On arrival

John is a machinist and while at work decided to have 3 beers for lunch. On return to the machine shop he accidentally had his hand taken up by the gears of a piece of equipment.

# Death by hemorrhage in the US and worldwide. 2020 Data NEJM.

**Table 1.** Estimated Hemorrhage-Related Deaths per Year and Years of Life Lost in the United States and Worldwide, According to the Cause of Hemorrhage.

Cause of Hemorrhage	Deaths from Hemorrhage <sup>2*</sup>	U.S. Cases of Hemorrhage		Global Cases of Hemorrhage	
		No. of Deaths per Yr	Yr of Life Lost	No. of Deaths per Yr	Yr of Life Lost
		<i>percent</i>			
Abdominal aortic aneurysm	100	9,988 <sup>†</sup>	65,273 <sup>‡</sup>	191,700 <sup>§</sup>	2,881,760 <sup>¶</sup>
Maternal disorder	23 <sup>§</sup>	138 <sup>  </sup>	7,572 <sup>**</sup>	69,690 <sup>  </sup>	4,298,240 <sup>**</sup>
Peptic ulcer disease	60 <sup>††</sup>	1,860 <sup>  </sup>	38,597 <sup>**</sup>	141,000 <sup>  </sup>	3,903,600 <sup>**</sup>
Trauma	30 <sup>‡‡</sup>	49,440 <sup>  </sup>	1,931,786 <sup>**</sup>	1,481,700 <sup>  </sup>	74,568,000 <sup>**</sup>
Total		61,426	2,043,228	1,884,090	85,651,600

# Predictive factors for early death from Traumatic Bleeding.

## Figures

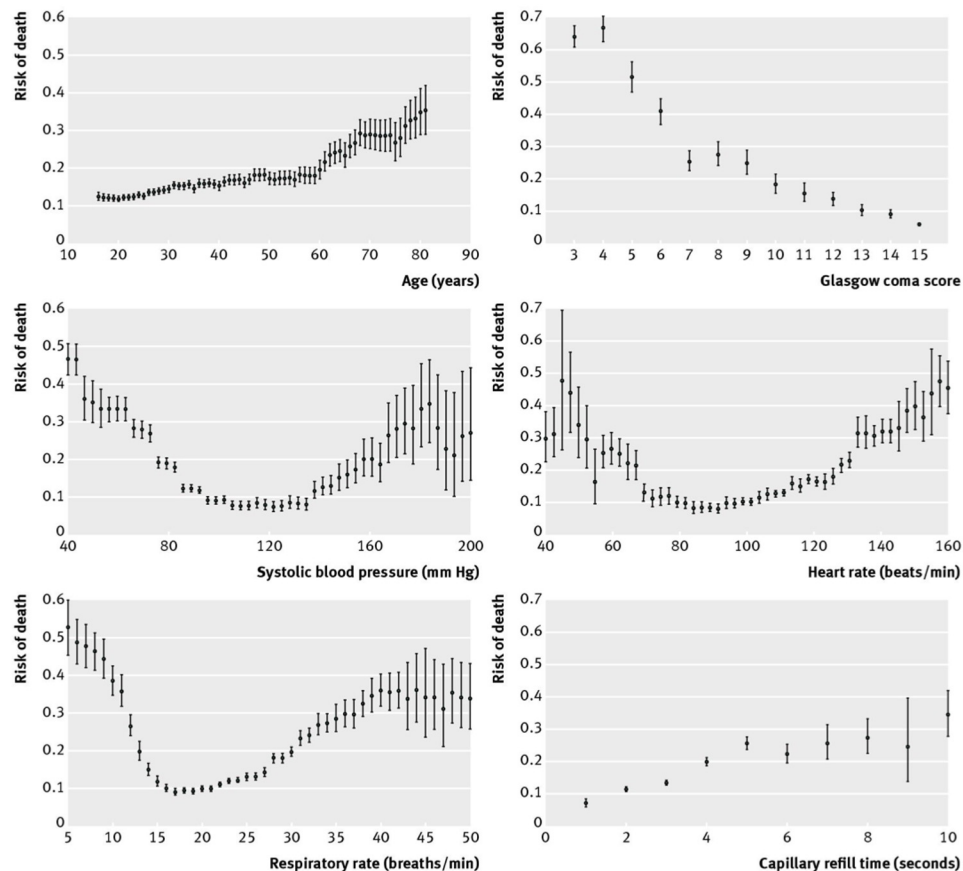


Fig 1 Association between continuous predictors and death among CRASH-2 patients

# How do we improve survivability?

## PREHOSPITAL-LEVEL CARE

### Primary Prevention and Education

Community-based violence prevention  
AAA surveillance  
Peripartum oxytocin  
*Helicobacter pylori* eradication

#### Education courses:

Bleeding Control Basic (B-Con Basic) Course  
Prehospital Trauma Life Support (PHTLS) Course  
Rural Trauma Team Development Course (RTTDC)  
Advanced Trauma Life Support (ATLS) Student Course



Bleeding Event



### Prehospital Interventions

#### Hemorrhagic identification and control

- Compressible sites**  
Use direct pressure or tourniquet proximal to bleeding site
- Junctional sites**  
Apply hemostatic dressing
- Noncompressible sites**  
Signs may be obvious (e.g., in gastrointestinal bleeding) or occult (e.g., after trauma)  
Apply pelvic binder for suspected pelvic fracture



Limited resuscitation  
Hypothermia prevention  
Rapid transport to medical facility

## HOSPITAL-LEVEL CARE

### Rapid Identification of Hemorrhagic Shock

Prehospital history of major blood loss and treatment with anticoagulants or antiplatelets  
Physical examination, radiographs, and ultrasonography of the torso (FAST) to determine sources of bleeding  
Laboratory work (blood type, blood gas with lactate, CBC, electrolytes, coagulation studies, and TEG or TEM)  
Immediate resuscitation for patients in shock with the use of rapid infuser and fluid warmer  
Early massive-transfusion-protocol activation for patients in shock



### Definitive Hemostasis

Rapidly control all sites of hemorrhage  
Examples:  
Surgical exploration  
Angiography with embolization  
Endoscopic intervention



### Posthemostasis

Reassess patient for ongoing bleeding, coagulopathy, and unpaid oxygen debt  
Perform repeat laboratory tests (blood gas with lactate, CBC, electrolytes, coagulation studies, and TEG or TEM)  
Transfusions should be compatible with blood group if possible  
Avoid over- or under-resuscitation  
Perform ultrasonography to assess intravascular volume status and cardiac function



## Case 2:



Dispatch: 37 y/o male, assaulted with multiple lacerations to back. Calling party is stating male is In and out of consciousness.

Mr. J is 37 y/o male was assaulted by unknown male with Machete on your arrival to scene what do you want to do?



# What are the categories or types of bleeding?

- Capillary
- Venous
- Arterial

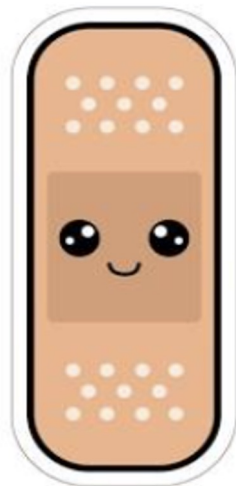


## Capillary

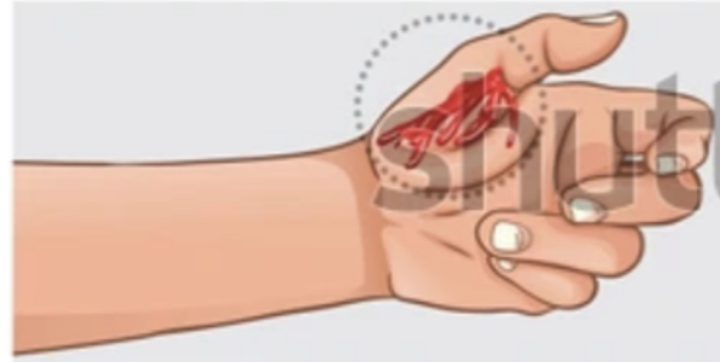
Slow And Oozing

Easily Controlled

Stops Spontaneously



- Pressure
- Wound dressing
- Band-aid
- Bacitracin/antibiotic ointment



Venous  
Steady Flow  
Easier To Control  
Low Pressure System



- Pressure
- Wound dressing
- In ER will likely get some sutures and occasionally ligation of a blood vessel.



## Arterial

Rapid And Profuse  
Spurting With Heart Beat  
Most Difficult To Control



### Location Matters

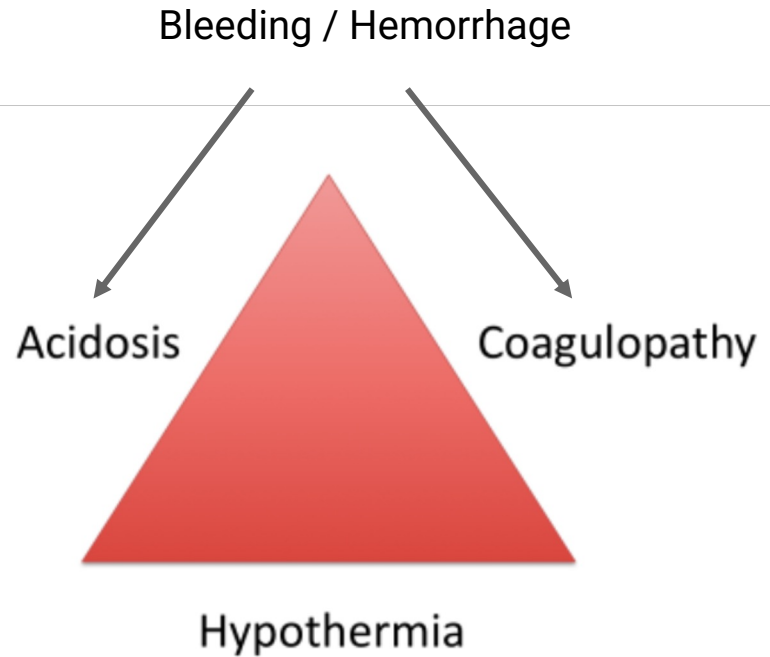
- Direct pressure
- Tourniquet application
- Application of wound packing followed by pressure dressing.

Why is it important  
to address  
significant bleeding  
early?



“Lethal triad of trauma”

Bleeding



Hypothermia and acidosis, together with coagulopathy form the 'Lethal Triad'

# Prehospital care interventions that make a difference.

1. Stop the bleeding if possible
  - i. Direct pressure
  - ii. Tourniquet
  - iii. Wound packing
  - iv. Pelvic Binder
2. Keep patient warm - Euthermic
  - i. Blanket
  - ii. Heater in ambulance
3. Initiate rapid transport
  - i. Nearest appropriate facility.
  - ii. Rapid most appropriate transport (helicopter vs ground).
4. IV access with large Bore IVs while enroute
  - i. Avoid unnecessary fluids
  - ii. Permissive hypotension
5. Bright lights and cold steel.



# Direct pressure

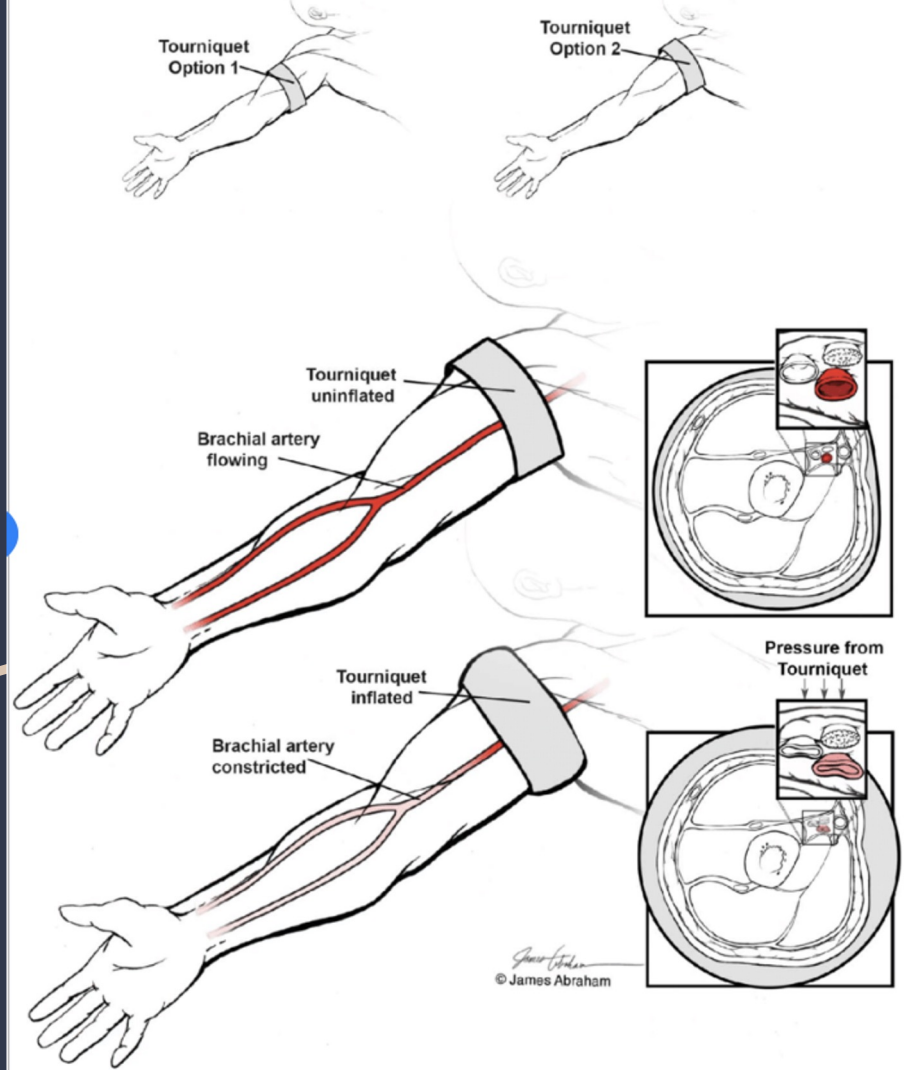
- This is the go to primary mode of bleeding control.
- Albeit less helpful with internal hemorrhage.





# Tourniquets

- Several brands and types
- Know what you carry
- Know how to apply and use them.



# Junctional tourniquets.

What areas of the body might a junctional tourniquet be useful to stop/slow hemorrhage?

- Several brands and type.
- If you have one on your rig know how to apply and use it.



# Pelvic Binder

- Great for bleeding in pelvis.
- Works by reducing potential space for bleeding.
- Many brand and iterations
- Also can use impromptu binder
  - by cutting up the side of the pants and using pant legs tied over front as impromptu binder.
  - Can also use a sheet tied around pelvis w/ a square knot
- What is the proper positioning/ bony landmark?



# Wound Packing for junctional areas.



## What is Haemostatic Gauze?

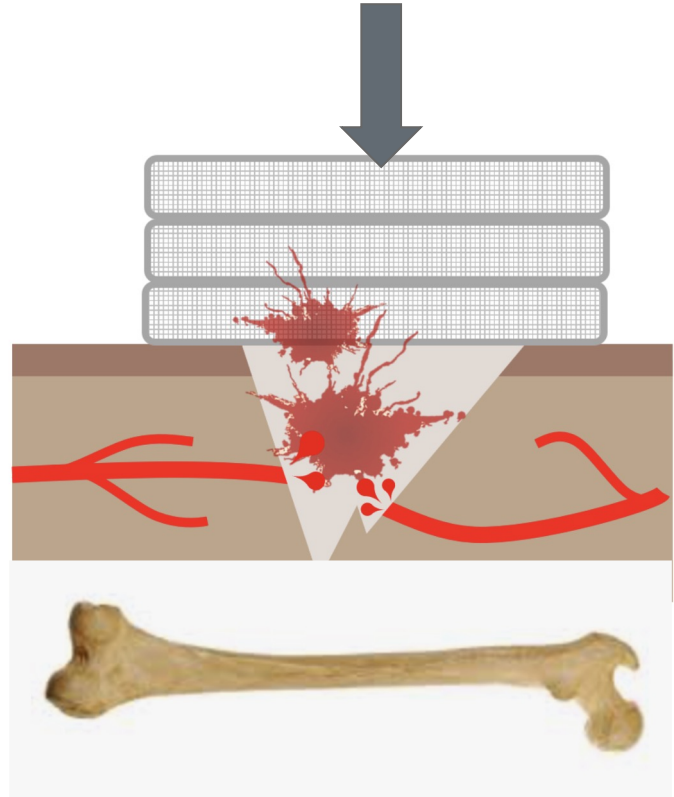
Haemostatic gauze is regular gauze impregnated with clotting agents that help promote the clotting of blood.

These haemostatic agents come in one of three groups based on the mechanism of action:

1. Factor concentrators
2. Procoagulant supplements
3. Mucoadhesive agents - Sponges

Wound Packing:  
Creates internal  
pressure and a  
matrix for clot  
formation.

- When packing a wound utilize pushing on the bone as a hard surface to help put pressure on bleeding vessels.

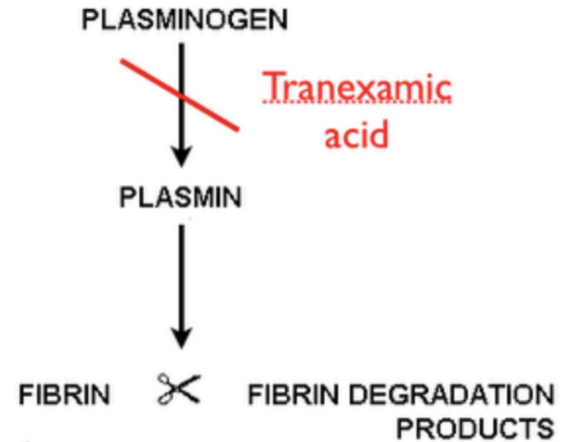
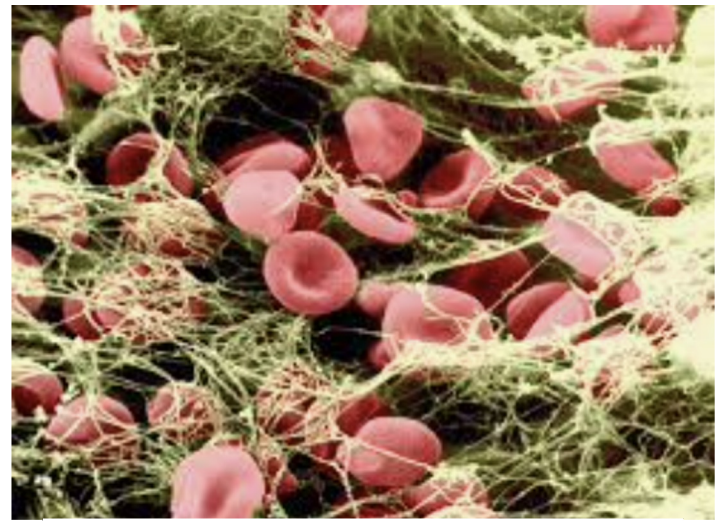


# Wound Packing for junctional areas.

1. Pack wound.
2. Apply a pressure dressing if possible.
3. Continue to hold Direct pressure
  - Minimum 3 minutes for hemostatic type gauze packing.
  - Minimum of 5 minutes for regular gauze rolls.



# Tranexamic acid



# Wound Packing Essentials

A wound that's deep and bloody, with bleeding that doesn't respond to direct pressure, is a good candidate for wound packing.

## Step 1: Stop the bleeding. Now!

**Immediately apply direct pressure to the wound**, using gauze, clean cloth, elbow, knee — whatever it takes to slow or stop the hemorrhage — until you have time to get out your wound packing supplies.

Place your gloved fingers — with or without a dressing — into the wound to apply initial pressure to the target area (with your target being the vein, artery or both) and compress the source of bleeding.

Whenever possible, utilize a bone to assist with bleeding control.



## Step 2: Pack the wound with gauze. Tightly!

Your goal is to completely and tightly pack the wound cavity to stop hemorrhage. Using either hemostatic or plain gauze, begin packing the gauze into the wound with your finger, while simultaneously maintaining pressure on the wound.

It's critical that the gauze be packed **as deeply into the wound as possible** to put the gauze into direct contact with the bleeding vessel. By doing so, you're simultaneously putting direct pressure onto the bleeding vessel and allowing the hemostatic agent to work.



### Step 3: Keep packing!

The key to successful wound packing is that the wound be **very tightly packed**, applying as much pressure as possible to the bleeding vessel. This pressure against the vessel is the most important component of hemorrhage control.

This explains why plain gauze (without an impregnated hemostatic agent), when tightly packed, is also quite effective.



### Step 4: Apply firm pressure!

Apply **very firm pressure to the packed wound for 3-8 minutes**. This step pushes the packing firmly against the bleeding vessel and aids in clotting.

## Step 5: Secure a snug pressure dressing and transport.

After applying pressure for 3-8 minutes, **place a snug pressure dressing over the wound.** You may consider splinting or immobilizing the area, if possible because movement during transport can dislodge the packing and allow hemorrhage to restart.



## Step 6: Check for continued hemorrhage.

Should the bleeding continue, hemostatic gauze manufacturers **recommend removal of the original packing and repacking with fresh gauze.** The rationale for this is that they assume it wasn't packed properly the first time, or perhaps the packing didn't quite get to the bleeding vessel.

For additional information about  
Stop The Bleed, go to:  
<https://www.dhs.gov/stopthebleed>  
or use your QR reader to go to the  
website straight away:



Special thanks to Dr. Peter P. Taillac, FACEP; Scotty Bolleter, BS, EMT-P [P]; and A.J. Heightman, MPA, EMT-P for content. Photos are courtesy of A.J. Heightman, MPA, EMT-P/Pennwell Corporation

The 'Stop the Bleed' campaign was initiated by a federal interagency workgroup convened by the National Security Council Staff, The White House. The purpose of the campaign is to build national resilience by better preparing the public to save lives by raising awareness of basic actions to stop life threatening bleeding following everyday emergencies and man-made and natural disasters. The Department of the Defense owns the 'Stop the Bleed' logo and phrase.



# Homeland Security

# Case 1:



Dispatch:

42 y/o male, entrapment with hand caught in heavy equipment.

On arrival

John is a machinist and while at work decided to have 3 beers for lunch. On return to the machine shop he accidentally had his hand taken up by the gears of a piece of equipment.

# Case 1:



On initial assessment, patient is screaming in pain, diaphoretic, with noted minimal bleeding from hand which is wedged in between two gears. Machine has been turned off.

Vitals:

HR: 135 BPM

BP: 145/88

RR 24

# Case 1:



Your crew along with Firefighters are able to disassemble gears and free his hand. Now what would you like to do?

What if it were now spurting blood from hand?

# Case 1:



You all successfully splint his hand and apply non adherent wound dressing follow by dry gauze.

On exam he is found to have normal capillary refill despite two of his fingers only being held on by soft tissue with noted open fractures.

He has no further noted bleeding from hand and you transport him Code one to the hospital.

## Case 2:



Dispatch: 37 y/o male, assaulted with multiple lacerations to back. Calling party is stating male is In and out of consciousness.

Mr. J is 37 y/o male was assaulted by unknown male with Machete on your arrival to scene what do you want to do?

What if you notice significant persistent bleeding from gaping wound on Right back?

## Case 2:



You can see his back as shirt is cut up but still covering the front. His pants are soaked in blood and his is conscious but becomes dizzy if you sit or stand him up.

HR: 120

BP: 92/60

RR: 32

What would you like to do for this patient?



## Case 2:



- You choose to pack wound and wrap with Kerlix.
- You turned up heat in back of ambulance and exposed his body for a full assessment where you noticed a puncture wound on his anterior chest that was bubbling. You then appropriately placed a chest seal over that wound.
- Once done with dressings and chest seal you covered the patient with blankets to protect from hypothermia.
- You transported Code 3 to the nearest appropriate facility, with a good radio report for them to prepare.

What questions  
Do you have?



# Citations:

- Cannon, J. *Hemorrhagic Shock*. N Engl J Med 2018;378:370-9. DOI: 10.1056/NEJMra1705649
- Perel, P. et al. *Predicting early death in patients with traumatic bleeding: development and validation of prognostic model*. BMJ 2012 ;345:e5166 doi: 10.1136/bmj.e5166 (15 August 2012).
- Borke, J and Zieve, D. A.D.A.M. Editorial team. <<https://medlineplus.gov/ency/imagepages/1067.htm>> last updated: 11/13/2021
- Stop the Bleed. *Department of Homeland Security*. <[https://www.dhs.gov/sites/default/files/publications/STB\\_Aplying\\_Tourniquet\\_08-06-2018\\_0.pdf](https://www.dhs.gov/sites/default/files/publications/STB_Aplying_Tourniquet_08-06-2018_0.pdf)> STB\_Tourniquet\_08-06-2018

