

## **How to Stop Bleeding without a Hospital**

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Bleeding kills. Every second of uncontrolled hemorrhage worsens outcomes. Stopping it can mean the difference between living and dying. And it has to be done long before the patient gets to the trauma bay. In the field. With limited resources. By a small crew, or even by a single person. If we are going to talk about stopping bleeding though, we need to know how much blood we are talking about. An understanding of how much matters.

(\*\* Next, pig video, video plays \*\*)

This is a pig that the army is graciously slicing open for us. The femoral artery and vein are transected right about here. If this happens, you are not going to stop the bleeding. We talk about it all the time. Speculate about the junctional bleeder, and what we should do about it. This wound will bleed out before you ever have time to do anything about it.

(\*\* Next, Curious George Band-aids \*\*)

But on the other hand, my 3 year is endlessly suffering all kinds of scrapes that requiring banding. Preferably with Curious George band-aids. This kind of bleeding obviously doesn't worry us, and does not need to be stopped.

It is not a common occurrence to come across uncontrolled bleeding. Even for us that deal with blood daily, it is one thing to see it neatly sucked into the vacuum container or be soaked up with sponges. But in the field on the ground, everything looks like a blood bath.

(\*\* Next, Coke Can \*\*)

For any shift, I go through at least 1 or 2 cans of this. How much is in them... 12oz, or if you have ever read closely 355 mL. One can of blood on the ground does not worry. Two has my attention and we should try applying direct pressure. This should be with focused pressure with your fingertips. Your palm or a large bulky dressing spreads the force out over a large area, reducing the pressure making it far less effective. Another mistake is applying dry pressure dressing over wet dressings. That just soaks up more blood and wicks away the clotting factors from the site of the endothelial damage where a clot needs to form. Some minor to moderate bleeding on the extremities can be controlled with direct pressure, but by the time we get to...

(\*\* Next, 3 Coke Cans \*\*)

three cans, the bleeding is significant. I am worried, and we need to stop it. And if we do, the patient has a chance of living. When direct pressure fails, or there are multiple wounds, or you need your hands free for other duties, a tourniquet is necessary.

(\*\* Next, tourniquet. \*\*)

This is my EMS bag I carry with me on outdoors and in my car.

(\*\* Take CAT tourniquet out of the bag \*\*)

How many have been told somewhere along your career, that if you put place a tourniquet, the patient will lose the leg. That is nonsense. The myth developed from the Civil War. Soldiers would have their legs shot off or blown off by a canon ball, and a tourniquet would be applied. When you were finally evacuated from the field, maybe 2-3 days later after the battle was over, the poorly trained surgeons would see the tourniquet and use it as triage maker. If a tourniquet was on, you were so badly injured, they would just take the leg.

But this is just patently false. AS Dr McGonigal just talked to you about with REBOA occluding the aorta, patients are not losing their leg. Vascular surgeons will also tell you, during an open aorta repair, the aorta will be cross-clamped for 60-90 minutes and those patients are not coming out of the operating room with their legs amputation.

We have learned that tourniquets are invaluable tools for controlling life threatening hemorrhage. At the great expense of our service men and women, we have now have large database of tourniquet applications. Out of the first 800, 3 had the same bad outcomes. Numbness of the distal toes. And they each had the tourniquet applied for longer than 3 hours. If it comes down to bleeding out, or have some numbness of my times, that is an easy decision.

There are several different kinds of tourniquets. This one called a CAT tourniquet has a velcro strap and windlass to tighten it and apply pressure. They don't work well on the dual bones of the distal arm or leg, and need to be placed on the mid muscle of the upper arm or leg.

(\*\*\* Next, SWAT-T, take out of bag, Next \*\*\*)

This one is a wide rubber band that gets wrapped around the extremity and tightened.

While you aren't going to lose the limb, you do need to address pain control. Cut off blood flow hurts. In training, we learn how to apply them and tighten them we below the amount that would be required to cut of arterial flow, and was incredibly painful. A properly placed tourniquet will cut off arterial flow and produce extreme pain. Adequate anesthesia is necessary, and this is another road that leads to ketamine.

(\*\*\* Next, Clotting Sponge, take out of bag \*\*\*)

Not quite a tourniquet that cuts off arterial flow, hemorrhage control bandages can apply pressure and help stop bleeding. Useful when you need something short of a tourniquet but more than a Curious George bandaid. Long compressible ACE wrap or gauze with a hemostatic agent.

They sell these now at Cabelas and Gander Mountain as Adventure Kits. There is pictures of shooting, off-roading, hiking on here. I am not sure these got together with the alcohol that often accompanies these activities, but they are for sale.

(\*\*\* Next, Israeli Bandage, take out of bag \*\*\*)

This type called an Israeli Bandage, has the hemostatic dressing and a ACE wrap. (\*\*\*) Open, and demonstrate (\*\*\*) It needs to be packed tightly against the wound, and pressure applied with the ACE wrap. It contains a windlass, that lets you apply some pressure.

(\*\* Next, Celox Z-Fold gauze, take out of bag \*\*)

This type is Z-fold gauze with coated with the hemostatic agent. The technique for packing the wound is critically important and should ideally be taught in a live tissue training environment. Proper technique pushes the hemostatic agent to the bottom of the wound and is successively packed in with a single finger to maintain effective pressure on the bleeding source.

(\*\* Next, Celox hemostatic granules \*\*)

Another option, draw the ire though some of the trauma surgeons in the room may object, are the hemostatic powders. QuickClot or Celox. These get poured into the wound to help promote clotting. (\*\* Open packet, and pour into a glass \*\*) They act by exothermic reaction, which can cause some tissue damage, but between the choice of deadly bleeding and an exothermic reaction, there is no choice.

Beyond controlling external hemorrhage, we can take also take steps to control internal hemorrhage.

(\*\* Next, SAM Splint, take out of bag \*\*)

Broken bones can be straightened back in anatomic position and splinted. Internal bleeding, especially from a pelvic fracture also benefits from stabilization with a pelvic sling.

Once we have some control of the hemorrhage, we can take additional steps to promote clotting. This is done by avoiding the lethal triad of trauma. Hypothermia, acidosis, and coagulopathy.

(\*\* Next, warming blanket \*\*)

Warm your patients up, or better yet keep them warm to start with.

(\*\* Next, IVF fluids \*\*)

Keep them perfused by giving them the bolus of crystalloid fluids or preferably blood products if available. Though with damage control resuscitation, restoration of normal blood pressure is not the control.

(\*\* Next, TXA \*\*)

There is likely even a role for tranexamic acid, TXA, prehospital. Trauma patients have a hyper-fibrinolysis state, and TXA inhibits the breakdown of clots once they have formed. The CRASH-2 trial showed a 1.5% mortality decrease in all comers. NNT 125. More recent studies have shown even better rates in hemorrhagic shock trauma patients.

(\*\* Next, Ambulance \*\*)

And then ultimately expeditious transport to the nearest trauma center. They stay-and-play model does is not beneficial, and there is benefit of getting the patient to the trauma bay.

(\*\* Next, Blank \*\*)

Thank you very much.