



Beyond Direct Pressure: Evidence Based Practice for Shock and Advance Wound Care

The Athletic Trainers Ability to think beyond the basics
On Field or Off, you may face the event





2018 Annual Symposium
18 May 2018 - 20 May 2018
Ocean City, MD






Introductions

- Mr. Edward Strapp, TP-C/FP-C, NRP, ATC
 - Trooper/Flight Paramedic, Maryland State Police
 - Rotational Athletic Trainer, US Ski and Snowboard



Introductions

Lab Assistants:

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Clinical Coordinator, Custom source Sports Medicine Bracing

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Retired Athletic Trainer for Fairfax County Police Department
Director- Public Safety Athletic Trainers Society

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Learning objectives

- Understand the need for the rapid identification and management of gross bleeding in the trauma patient
- Identify the phases of shock and the physiological changes.
- Identify the rationale for the application of different advanced wound care interventions.

Learning objectives

- Acquire the skills needed for tourniquet and wound packing interventions.
- Learn how to adapt common sports medicine equipment for tourniquet applications.
- Develop a go bag option for management of acute trauma patients.

This is why I am here



April 6, 2018



- Humboldt Broncos
- Charter Bus with a Junior Hockey Team
- Struck by an 18 wheeler.

April 6, 2018



Background

Athletic Competition

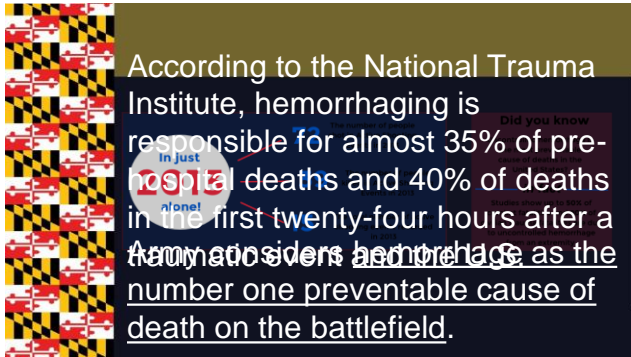
Local Event Coverage

Bus Trips

Active Shooters

- When tragedy strikes anywhere in this nation, the willingness and capability of everyday citizens to take action instead of being passive bystanders can mean the difference between life or death.
- With very little training and equipment, the individual's closest to the scene of an accident or mass casualty situation can control bleeding until first responders arrive to take over treatment.

JOE BIDEN Vice-President of the United States (Hartford Consensus)



Did you know?

In just 2013, 10,000 people died from hemorrhage. The Army considers hemorrhage as the number one preventable cause of death on the battlefield.

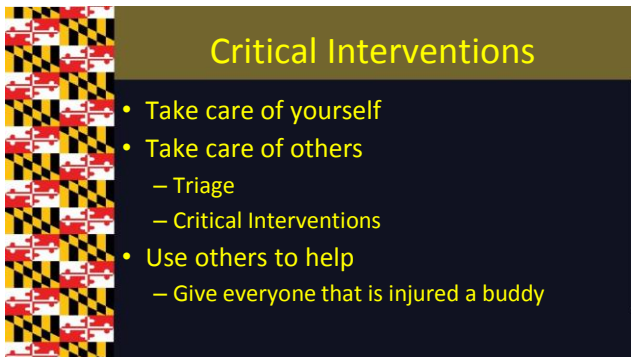


When Direct Pressure isn't Enough

- Everything has advantages and Disadvantages
- Each option can be implemented in a variety of situations

There is no "Gold Standard"

Stopping blood loss in a severe hemorrhage is really the Gold Standard



Critical Interventions

- Take care of yourself
- Take care of others
 - Triage
 - Critical Interventions
- Use others to help
 - Give everyone that is injured a buddy

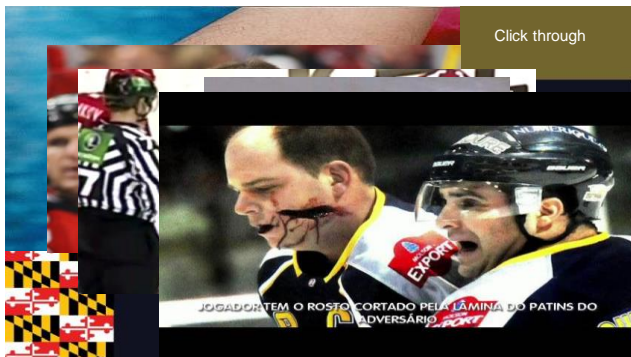
Initial Care

Where do I focus my Attention:

- ABCD
- Depending on Triage Criteria
- Depending on Resources
- Is Airway management more important? ABC
- Is Gross Bleeding most important?

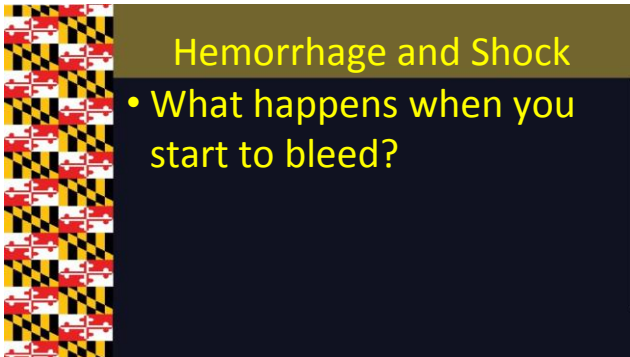
Circulation

- Evaluation and Recognition is Key
- Basic bandaging of soft tissue injuries is often overlooked by first responders.
- These basic concepts are critical to the casualty's survival.



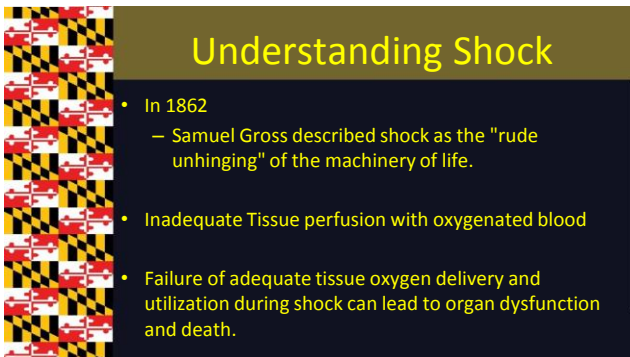


Hemorrhage and Shock



Hemorrhage and Shock

- What happens when you start to bleed?



Understanding Shock

- In 1862
 - Samuel Gross described shock as the "rude unhinging" of the machinery of life.
- Inadequate Tissue perfusion with oxygenated blood
- Failure of adequate tissue oxygen delivery and utilization during shock can lead to organ dysfunction and death.

Hemorrhage and Shock

- What happens when you start to bleed? – it depends on how much blood you lose

Hemorrhage and Shock

Bleeding from extremity wounds

- How quickly this occurs obviously depends on where and how the damage occurs, but...
- Bleeding out and death can occur in 3 to 5 minutes in the worse case.

Recognizing Shock

- May be difficult to judge blood loss
- Look for Signs and Symptoms
 - mental status
 - radial pulse

Recognizing Shock

- mental status
- radial pulse
- heart rate (HR)
- blood pressure (BP)
- respiratory rate (RR)
- likelihood of death

Normal Adult Blood Volume



5 Liters Blood Volume

500 cc Blood Loss



4.5 Liters Blood Volume

500 cc Blood Loss

- Mental state – alert
- Radial pulse – full
- Heart rate – normal or somewhat increased
- Systolic blood pressure – normal
- Respiratory Rate – normal
- Is he going to die from this? NO

1000cc Blood Loss



4.0 Liters Blood Volume

1000 cc Blood Loss

- Mental state – alert
- Radial pulse – full
- Heart rate – Slightly Elevated 100 +
- Systolic blood pressure – Normal if Lying,
- Respiratory Rate – normal
- Is he going to die from this? NO

1500cc Blood Loss



3.5 Liters Blood Volume

1500cc Blood Loss

- Mental state – alert but anxious
- Radial pulse – may be weak
- Heart rate – 100+
- Systolic blood pressure – may be decreased
- Respiratory rate – 30
- Is he going to die from this? PROBABLY NOT

2000cc Blood Loss



3.0 Liters Blood Volume

2000cc Blood Loss

- Mental state – confused/lethargic
- Radial pulse – weak
- Heart Rate – 120+
- Systolic blood pressure – decreased
- Respiratory rate – >35
- Is he going to die from this? MAYBE

2500cc Blood Loss



2.5 Liters Blood Volume

2500cc Blood Loss

- Mental state – unconscious
- Radial pulse – absent
- Heart rate – 140+
- Systolic blood pressure – markedly decreased
- Respiratory rate – over 35
- Is he going to die from this? PROBABLY

Normal Adult Blood Volume

- Approximately 5 liters of blood in an average size adult
- Casualty can bleed out in as little as 3 minutes



Controlling Bleeding

Direct Pressure or Pressure Bandage

Tourniquet


Wound Packing

Clotting Agents

Major Blood Vessels

- Major blood vessels can be found on the medial side and high on the extremities.
- These areas are the best place to control massive bleeding from extremities.






Distal to Proximal

Most venous hemorrhages or simple arterial hemorrhages from the distal third of an extremity are generally well controlled with an absorbent bandage placed direct over the wound

Direct Pressure
Pressure Dressing


Price D, Beshyah E. New Approaches to the management of traumatic external hemorrhage. J trauma. 2011;13:47-55



Distal to Proximal

- The Closer an artery is to the left ventricle, the greater the force exerted on the vessel's wall. The more proximal an arterial is to the heart, the greater amount of force needed to tamponade the vessel and stop hemorrhage
- **120 lbs of pressure to occlude a proximal to a femoral artery hemorrhage**
- Proximal Arterial Hemorrhage is life threatening

Blaivas M, Shiver S, et al. Control hemorrhage in critical femoral or inguinal penetrating wounds- An Ultrasound Evaluation. Prehosp Disaster Med. 2006;21(6):379-382



Distal to Proximal

- Mangled Extremities and especially junctional wounds must be immediately packed, preferably with gauze impregnated with hemostatic agent

Groin, Axilla, Shoulder and Neck

Bulger, E, Snyder D et al. An evidence-based prehospital guideline for external hemorrhage control: American College of Surgeons committee on Trauma. Prehosp Emerg Care. 2017;18(2):163-173

The Bottom Line...

Is it bleeding a little or a lot?

When in doubt, use a tourniquet.

The Military has studies bleeding control extensively and concluded that early tourniquet application, before the onset of shock, saves lives with little to no associated complications

In 2009 Kragh, Littrel, Jones et al completed a study of 499 patients with 862 tourniquets on 651 limbs.....

Direct Pressure on Wound Site



Hemorrhage Control

- Assess the situation.
- Expose the wound.
- Attempt to control the bleeding with direct pressure or a pressure dressing.












Tourniquet


- Adaptive
- Commercial
 - CAT
 - SOF-T
 - SOF-T Wide
 - Swat T





Application

- 2-3 inches above the wound
- Watch for other sites of bleeding
 - » above the wound
- Multiple bleeding sites
 - » proximal application



Application

- Should be tight enough to stop bleeding
- The tourniquet should never be placed
 - Joint (knee or elbow)
 - Over an impaled object
- Extremity should be exposed
- Document application time
 - Write on patient!

Application

- A prehospital tourniquet should not be removed by EMS personnel without authorization from their EMS Sponsor Hospital/Medical Direction
- If application exceeds six hours, removal should only be done by the physician providing definitive care

CAT

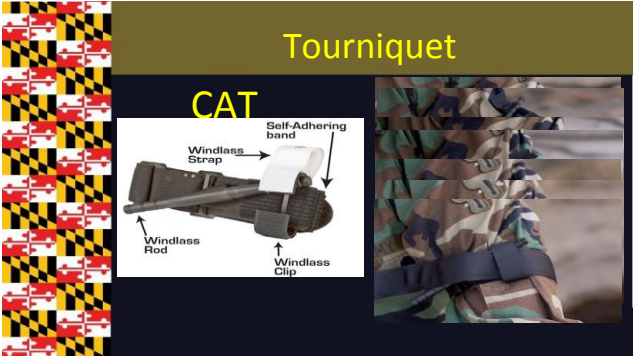
(Combat Application Tourniquet)

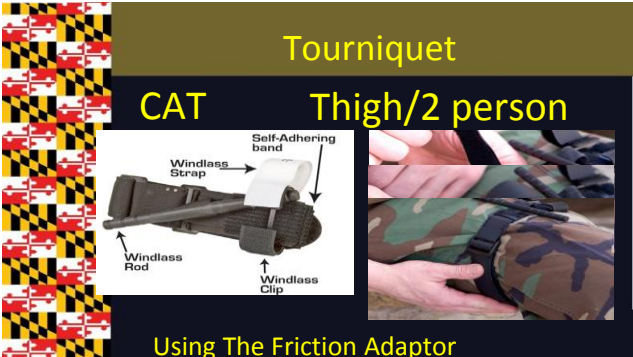


SOFTT

(Special Operations Forces Tactical Tourniquet)

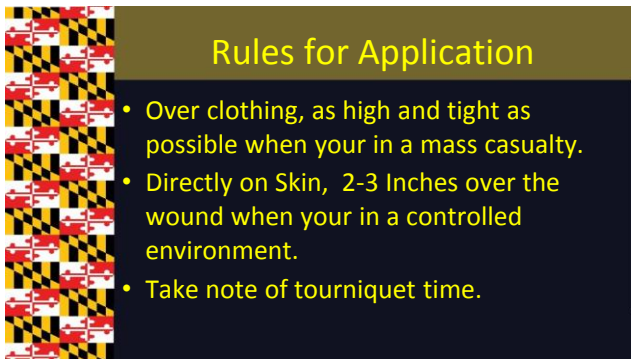


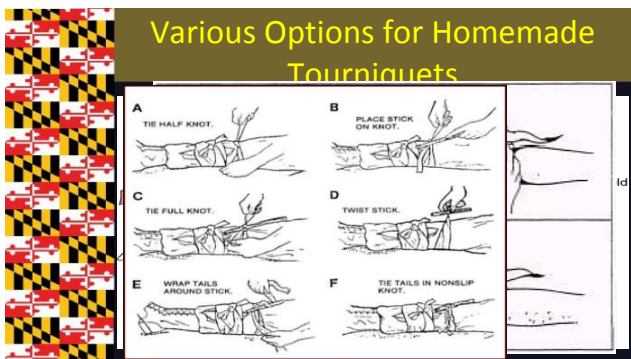












REMEMBER...

- Tourniquets can be used for:
 - Life threatening extremity hemorrhage
 - When direct pressure or pressure dressing can not be applied

Tourniquet Mistakes

- Not using one when you should
- Using a tourniquet for minimal bleeding
- Not making it tight enough – the tourniquet must eliminate the distal pulse
- Not using a second tourniquet if needed
- Waiting too long to put the tourniquet on
- Periodically loosening the tourniquet to allow blood flow to the injured extremity

Reassessment

- Be sure to reassess all interventions:
 - After any movements.
 - During patient reevaluation.
- Consider using a second tourniquet for any continued uncontrolled bleeding.
- Perform a rapid full body exam to rule out any additional uncontrolled bleeding.



Non-Extremity Massive Bleeding

- Tourniquets are ineffective in the following areas:
 - Neck
 - Armpit
 - Groin
- Treatment for these areas includes:
 - Direct pressure
 - Pack wound, if applicable
 - Pressure dressing

Pressure Dressing

- Emergency trauma dressing:
 - Maintains pressure created by itself.
 - Used in conjunction with hemostatic dressing.
 - Direct pressure in the armpit, groin or neck.



Packing Gauze

- Bleeding can be controlled utilizing wound packing techniques and direct pressure:

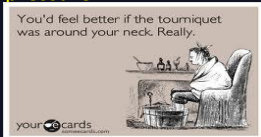
- Kerlix – rolled gauze
- Z-Pak – folded gauze



Wound Packing

- When a tourniquet won't work
- Expose the wound
- Locate the bleeder
- Place FOCUSED direct pressure
- Pack the wound

Consider Hemostatic Dressings



Expose & Identify

- Expose the wound
 - Clear clothing
 - Spread the wound



Expose & Identify

- Open clothing around wound
- If possible, remove excess pooled blood from the wound while preserving any clots already formed in the wound
- Locate source of most active bleeding



Expose & Identify

- Locate the offending vessel
 - Look and Feel
 - Find the Vessel



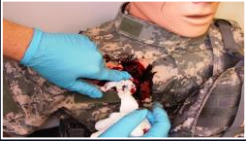
Wound Packing

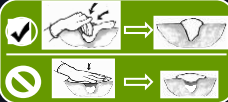

- Apply Focused Direct Pressure
 - Thumb or 2 Fingers, DIRECTLY on the vessel



Wound Packing

- Pack Combat Gauze tightly into wound and directly onto bleeding source
- More than one gauze may be required to stem blood flow
- Combat Gauze maybe re-packed or adjusted into the wound to ensure proper placement




Wound Packing

- Pack the wound
 - Don't release Pressure
 - Swapping fingers or Side by each
 - Pack all voids


Add, Add,
Add and then
Add some more




Wound Packing

- Pack the wound
 - Pack all voids
 - Remaining bandage can remain over the wound


Add, Add, Add
and then Add
some more





Apply Direct Pressure

- Quickly apply pressure until bleeding stops
- Suggested time is 2 to 3 minutes of continuous contact
- Reassess for proper and effective placement
- Combat Gauze may be repacked if initial use fails to provide hemostasis





Apply Direct Pressure





Bandage Over Wound

- Leave Combat Gauze in place
- Wrap to effectively secure the dressing in the wound



Bandage Over Wound



Hemostatic Agents



Mechanisms of Actions

- Mucoadhesives
 - Hemcon bandage, Chitogauze, Celox gauze
- They become sticky, the shrimp shell based products, primarily chitosan based, and work by cross-linking cellular blood components to form a mucoadhesive barrier.

Mechanisms of Actions

- Factor Concentrators
 - Quick Clot
- Rapidly absorb water from the blood at the injury site, which concentrates platelets and other intrinsic clotting factors resulting in faster clot formation.


Mechanisms of Actions

- Procoagulant supplements
 - Combat Gauze
- Procoagulant supplements deliver additional clotting factors to the wound which then combine with clotting factors already present. Together, these clotting factors increase the rate of blood clot formation.

Mechanisms of Actions

- A side-by side comparison of four hemostatic dressings
 - in an animal model of arterial hemorrhage
- demonstrated survival superiority associated with the use of Combat Gauze™

(Kheirabadi, Scherer, Estep, Dubick, & Holcomb, 2009).



***** NOTES *****

- Combat Gauze
- Quick Clot
- Wound Sat (Granules)
- Celox
- Hem Con
- Chitosan vs kaolin
- Pro-coagulant actually causes the blood to clot




What do you need?

Create a Go Bag

- Cat Tourniquets
- Chest Seals
- Pressure Dressings
- Clotting Agents

Can I improvise

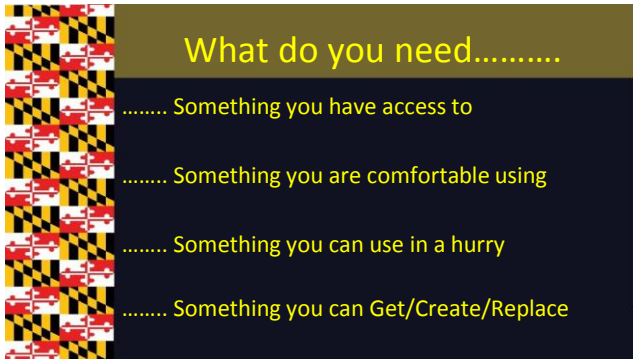
- Tourniquets
 - Exercise Bands
 - Wide “string”
- Chest Seals
 - Plastic Bags
 - Ice Bags
 - Saran Wrap
 - Tape
- Pressure Dressings
 - ABD Pads and Elastic Wraps



At Minimum, kit should contain:

Tourniquet- Commercial or Improvised
Pressure Bandage (Ace and Gauze)
Plastic patch or zip lock bag for use
with Tension pneumothorax
Tape of some kind
Gloves















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