Blacktail Magazine

TACTICAL CASUALTY CARE

Medic Skills for Tactical Situations

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First Edition Ⓐ May 2024

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Tactical Casualty Care: Medic Skills for Tactical Situations
brought to you by your friends The Blacktails

The Blacktails' namesakes:
a black bandana kept in a back pocket; Black-tailed deer (one subspecies of *Odocoileus hemionus*); the black-tailed bumblebee (*Bombus melanopygus*).

If it matters to you, this was written and illustrated by a licensed EMT. It is a set of best practices, behaviors, and treatments for trauma care in dynamic high-threat environments. It ranges from basic to intermediate, nothing too crazy. This was made with good intentions and thorough research, but if you notice something you think is wrong, contact us. It is missing a crucial component, which is mental support and psychological care. Take care of yourselves and your comrades before, during, and after an action, and seek more information on psychological care elsewhere.

While the information here is valuable to anyone, it's really only intended to be paired with training, which we encourage you to seek out (from us or from elsewhere). Bleeding control classes are pretty widely available, and if you can't find anything near you consider just getting friends together to practice the carries and putting tourniquets on. Having some practice really saves you in a pinch.

Good luck!

from your friends
The Blacktails
First Edition Ⓐ May 2024
theblacktails@pm.me

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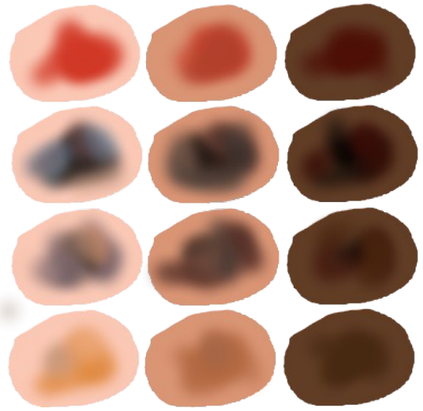
Discoloration presents differently on different skin tones. See the progression of bruises approximated here, shown on three skin tones, progressing over time from top to bottom. Shown here because the cover sheet is the only one being printed in color.



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all tyrants die, all walls fall

Good luck! Ⓐ

As of this printing, this is the first complete edition of this work and no updates have been made since its original version. Once changes have occurred, they will be listed here. May 2024.

This is a great start, but you should definitely read more.
Please consider reading *Riot Medicine* by Håkan Geijer, available at riotmedicine.net

SOURCES

TECC: Tactical Emergency Casualty Care, Jones and Bartlett Learning, June 24, 2019

Emergency Care and Transportation of the Sick and Injured, Twelfth Edition, AAOS

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Battle casualty survival with emergency tourniquet use to stop limb bleeding. J Emerg Med. 2009 August 28. Kragh Jr, J.F., Littrel M.L., Jones J.A., Walters T.J., Baer D.G., Wade C.E. et al.

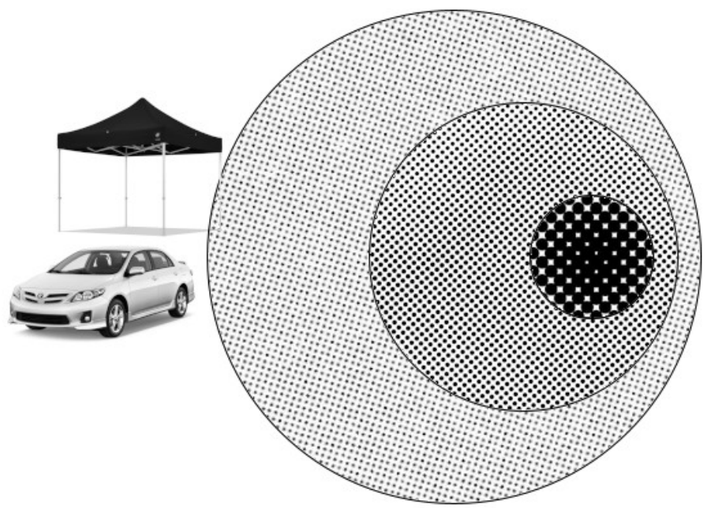
TACTICAL CARE SITUATIONS

It's not a secret that the temperature is going up. Learning how to deal with dynamic, high-threat situations and get you and your friends out safely is something we've all been learning little by little already. While it is adapted from a military setting, the tactical care lens can be applied to more than just shootings and war - anyone that has seen a tear gas canister burst onto a crowd knows what a "hot zone" is and that patients need to be removed from it.
An important term not explained elsewhere is "casualty": it just means somebody injured or killed in an incident. For our purposes, we almost only use it to describe people who are injured and need treatment.

"RESUSCITATION ZONES": THREE PHASES OF CARE

For our purposes, we will be dividing patient care into three zones related to patient and caregiver risk. Each zone has its own goals and skills. There is a medical problem and a tactical problem here. We'll go deeper into them in a second, but the premise is this:

- The **hot zone** ("direct threat care" zone) represents the greatest threat to patients and caregivers: threat suppression, casualty prevention, stopping life-threatening hemorrhage (extreme bleeding), and extrication (getting patients out).
- The **warm zone** ("indirect threat care" zone) is around the hot zone where threat is still relevant to you, and the hot zone could be moving to include you, but for now you have a chance to catch your breath and provide patient care.
- The **cold zone** ("evacuation care" or "support" zone) is where no significant threat is reasonably anticipated. It's where you stage your resources, if you have them, and where you can bring people to get further treatment.
- Outside of the cold zone is where you can set up stationary resources. Typically communications and coordination is happening outside of the cold zone. You want this to be upwind from the hot zone if there is a risk of contamination like extreme dust, chemical irritants, radiation, or poisons.



PREPARATION & SCENE ASSESSMENT

If you are reading this, you may already be somewhat familiar with this step.

Preparation is very important. If you find yourself in a tactical situation, you need to be able to improvise, but it is much better to have the skills and gear you need when you need them. We recommend preparing for things to get worse than you expect them to.
Being prepared isn't just bringing the right gear. Knowledge and skills are the most important preparation, which is what you're doing by reading this. Think about what you've been through before and how dynamic situations have evolved for you. Study situations you weren't in, too. If you can plan specifically around the place you know you're going, that's even better. Where is it? What's around it? If I need to get myself or somebody else to somewhere safe enough to treat them, where would that be? What threats do I expect? Proud boys, a lone gunman, and a troop of shield-carrying nazis are all threats, but they are very different ones. Prepare your mind emotionally and practically to the idea that you could have to treat someone, maybe yourself or someone you love, who is in very bad shape.
If you expect there to be no pepper spray, bring your eye wipes anyways. If you expect no gun violence, you should still have your IFAK (individual first aid kit). No matter what you bring, you will find yourself wishing for something, but you can prevent that by being as prepared as you reasonably and comfortably can.

Scene assessment starts before you arrive and it doesn't end until you are out of there. Before you're on scene, you've hopefully seen maps of the area or maybe you've even walked around the space. You've considered what threats may be present and how they could unfold. This is also a good time to remind you to call in additional resources if you need them and to put on personal protective equipment (PPE).

You need to be constantly observing and thinking critically about your surroundings. As soon as you look away from an area, your knowledge of it becomes stale. Don't panic, but you need to be alert. Stay on your toes and keep your head on a swivel. Always have an exit, and hopefully more than just one. If something feels off, trust yourself. Communicate and make a note of things that could be useful to you, like cover or concealment. If your friend went down right now, where would you treat them? How would you get there?

★ These situations require a change in priorities.
Good medicine can sometimes be bad tactics, and bad tactics can get everyone killed. If your friend gets shot, and you run to them and get shot too, you're both gone… often, the most important next step for a good patient outcome is to eliminate the threat. It is impossible to not have an emotional response to a situation like this but it is incredibly important that you keep your wits about you.

HEAT RELATED ILLNESS

This guide focuses heavily on traumatic injury, but the black bloc takes its toll on a hot summer day. Heat related illnesses can come on quickly and they are worth understanding. Heat related illness falls in three basic progressive categories:
Heat cramps are painful muscle spasms that happen after exercise. They can happen to anyone and it doesn't have to be hot out. They're not well understood, but we do know that the sweat produced during exertion causes the body to lose electrolytes. Dehydration may also play a role. Be sure to drink water and eat salty foods.
Heat exhaustion, also called heat collapse, is an emergency. It is caused by heat exposure, stress, fatigue, loss of electrolytes, and hypovolemia (lack of fluid) caused by sweating. For sweat to cool the body, it has to evaporate, so there is a particular risk for people wearing layers of clothing or who are in humid environments. Expect dizziness, weakness, or fainting, signals that the person's level of consciousness is changing, accompanied with nausea, vomiting, and headache. Their skin should be cool and clammy, though their internal body temperature is elevated (consider feeling for the temperature of the skin on their stomach, near their core). This person needs water, shade, rest, and cooling. Remove excess clothing and cool them down.
Heatstroke is the least common but most threatening heat related illness. The body is unable to deal with the high temperatures it's being subjected to and it begins to shut down. As it shuts down, it is less and less able to deal with the temperature, and the body temperature spikes – the brain is literally going to cook if it doesn't cool down. The really telltale sign here is hot, dry skin, because the body is no longer sweating, but a person can have heatstroke and still be plenty sweaty. The person will be confused, altered, and may lose consciousness or have a seizure. Don't waste any time cooling this person down. No harm will come from cooling them "too quickly," their brain is cooking. Dump ice water over them, place them in the shade, put them in an air conditioned car or building, do what you can with what you have.

BURNS

Burns are injuries caused when soft tissue is injured by one of four mechanisms: thermal (heat), chemical, electrical, and radiation. There are three severities of burn based on the thickness the damage reached. First degree burns are superficial, surface level, with redness and pain. Second degree burns are partial thickness, and they have blisters. Third degree burns are full thickness; the tissue is dead, charred, and the nerves are destroyed.
The general treatment for burns is: 1) stop the burning process, as with pouring cool water on a thermal burn. 2) remove burned or hot clothing, cutting around clothing that is stuck to the wound. 3) cover the wound with a burn dressing. This isn't a dressing with burn cream or something, it's just nonstick so it can be removed later. It's dry and sterile. 4) thermally protect them. Skin is what we use to regulate temperature, and when it is damaged or gone we get cold. 5) treat for shock!

SOURCES

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OPIOID OVERDOSE

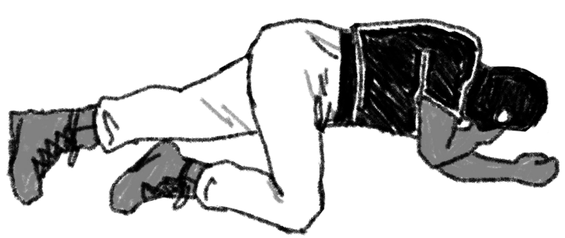
Narcotics are a type of drug that produces sleep or altered mental consciousness. An **opioid** is a type of narcotic used to relieve pain, and an **opiate** is a subset of the opioid family referring to natural, nonsynthetic opioids. Some opioids you may have heard of include morphine, heroin, oxycodone, hydrocodone, methadone, codeine, fentanyl, and oxycontin. We urge you to look to your local harm reduction groups for education and resources and to unlearn the prejudices you may have been taught to have against drug users.

These agents are central nervous system depressants and can cause severe respiratory depression. The most obvious sign that someone is high on an opioid is tiny, constricted pinpoint pupils (the black part of their eye). Other symptoms include slowed breathing, a decrease in the amount of air they're breathing in or out, nausea, vomiting, hypotension (low blood pressure), loss of consciousness, an though uncommon seizures may occur.

Naloxone (brand name "**Narcan**") is an antidote to opioid overdose. It's an opioid antagonist that works by binding to the opioid receptors, replacing the opioids. Naloxone does not treat overdoses of other medications or other poisonings and it has no effect on someone who is not having an opioid overdose. It can be given through almost any drug route, but the preferred route for ease and access is a spray into the nose. The most common form is the 4mg nasal spray with plastic delivery device (see bottom left for image). Simply place the tip into the nostril and press the plunger at the bottom. Naloxone should work within 1-3 minutes, so if it doesn't, give another dose, alternating nostrils (if you put a lot into just one nostril, it could drip down and become less effective). Depending on the circumstances, naloxone reverses opioid overdose for about 30-90 minutes – many opioids remain in the body longer than that, so monitor and redose as needed. Ideally the person is brought to medical care during that time. When narcan works, it sends the person directly into drug withdrawal. They may be very, very uncomfortable and in pain.

Respirations

What usually kills an opioid overdose victim is respiratory depression, a lack of oxygen caused by severely decreased breathing rate and quality. Healthy adults breathe about 18 times a minute and if someone isn't breathing enough or often enough, you need to help them breathe. You can use a head tilt, chin lift maneuver to open their airway. Because opioid users may vomit, you should lay them on their side in the **recovery position** (see below), letting vomit flow out of their mouth instead of back down into their lungs. If someone isn't breathing or isn't breathing enough, you can force air into their lungs with "rescue breaths" – read the "airway" and "respirations" sections for more on this. If someone has no pulse, isn't breathing, and is unresponsive, administer narcan and begin CPR.



"IFAK": INDIVIDUAL FIRST AID KIT

An **Individual First Aid Kit** ("**IFAK**") is a small first aid kit that contains basic life saving supplies. Everyone should carry an IFAK. The expectation is that a person carries an IFAK and if they are injured, the medic will use the injured person's IFAK to treat them, keeping the medic's supplies from being depleted. Plan for your IFAK to be used on you (carry *your* size of airway adjuncts, for example). IFAKs should be carried in a visible location, like at the hip, and clearly labeled if possible. With violence possible anywhere in the U.S. at nearly all times, it is a good idea to have one on you whether or not you expect to be in a violent situation.

IFAKs contain short-term interventions for serious injuries. We recommend packing…:

- Nitrile gloves
- Trauma shears (for cutting away clothing to expose injuries)
- A foldable CPR mask
- An emergency blanket ("mylar" or "space" blanket)
- Tourniquet, preferably at least two
- Combat dressing
- Two packs of z-fold hemostatic gauze
- A pair of chest seals (always expect an entrance and exit wound)
- Occlusive dressing / vaseline gauze
- Oropharyngeal or nasopharyngeal airway (in your size!)
- Any relevant personal medications you have (anticonvulsants, epinephrine, your inhaler…) with dosage and instructions.
- Narcan nasal spray, which is an antidote to opioid overdose.

We also recommend keeping around some of those eye wipes described in the Treating Chemical Irritant Exposure section (baby wipes soaked in a solution of water and baby shampoo).

If you are packing a bag to fill the role of medic, here are some broad recommendations:
Taking care of yourself is critical. 1) Pack yourself food, water, sunblock, extra clothing… whatever will keep you in fighting shape to maintain your role. Have an eyewash and eye wipe kit in an easily accessible spot you could access and use without your sight, in case you get sprayed by pepper spray. 2) be realistic with what you are willing and able to carry while keeping up with a dynamic environment. 3) bring what you know how to use and feel comfortable with, not equipment you brought because it's cool. 4) prioritize for the most common injuries: chemical irritant exposure, dehydration, low blood sugar, and simple cuts and scrapes. 5) coordinate. Not every team needs a kitted out medic that has every obscure diagnostic tool; coordinate and work together to help meet needs while packing light.

THE HOT ZONE: DIRECT THREAT CARE

The hot zone could be an active shooter, firefight, crumbling building, the blast range of an explosive device, or being near a hazardous material. There is an immediate threat of additional injury or death to caregivers and patients. Here is where we emphasize threat suppression, casualty prevention, stopping life-threatening hemorrhage (extreme bleeding), and extrication (getting patients out). The only medical care given in the hot zone is the recovery position and tourniquets.

Get Off the X! An immediate objective for you as a person in the hot zone is to "get off the X," meaning leaving the place where you are currently standing, sitting, walking, or working that might be a target. That could mean mitigating the cause of the threat or moving yourself and your patients out of the hot zone. This is something that you might have to think about: the X is usually moving… a team of riot police, a militia squad, you name it. Being in an armored vehicle might sound like the safest option, but it puts an X on your back, and ducking into a building might take it off.

Mitigation of Direct Threats The goal of a tactical casualty situation is to accomplish your mission (mitigating the threat) with minimal casualties and preventing current casualties from getting more injuries. You can't provide in-depth patient care if you and your patient are getting shot… you'll both die. The best thing to do for your patient outcome is to eliminate the threat.

Medical Interventions in the Hot Zone
Only two things are done for medical care in the hot zone: **tourniquet application** (pg. 5-6) and the **recovery position**, which allows blood, vomit, and secretions to flow out of the upper airway (see *"drag and carry options*" pg. 7-8 for photo).

~

Unnecessary Rescue & Instructing Self Aid
There are two types of unnecessary rescue: when the casualty can extract themselves on their own and when the casualty is already dead (more accurately called a body recovery than a rescue).
If you can instruct a casualty to care for themselves, or instruct them to come to you, it is in your best interest to do so. If you're behind cover, and there's someone who has been shot in the leg in an open area, running to them could get you both killed and instructing them to crawl to you could keep you both alive.

If communication is possible with the patient or with someone next to the patient, but accessing them is not, you must be able to ask questions and give instructions using simple and concise language. Three skills are crucial here: the ability to remain calm, avoiding the use of medical jargon that most people don't understand, and completing a head-to-toe patient assessment using somebody else's eyes, ears, and hands. Introduce yourself, provide calm reassurance, ask them for their name and whether or not they've ever had any medical training. Next, ask them how they're doing or how the person they're next to is doing. Think of **MARCH** (**M**assive hemorrhage control, **A**irway patency, **R**espiratory status, **C**irculatory status, and **H**ypothermia/**H**ead injury), which we will cover more later. Are they bleeding? Are they breathing? Do they have a pulse? Don't be afraid to instruct them on basic interventions like tourniquets, opening the airway, or occluding chest wounds. If you're afraid that you won't be able to instruct well enough, or that an untrained person shouldn't try to do anything, be reminded that the alternative is death.

PEPPER SPRAY AND TEAR GAS

Pepper spray is a lacrimator (tear gas) that uses the compound capsaicin to irritate your skin and mucous membranes (like your eyes, nose, and lungs). The spray uses an emulsifier (usually propylene glycol) to suspend the compound in water (or sometimes alcohol) and that mixture is held at pressure and released as an aerosol spray. Neat!
Picking a type is a matter of balancing your needs and abilities. Buy a practice spray that shoots water and train with it. Some brands of spray mark their target with a dye, colorant, or even UV-sensitive material that will show up later under a blacklight. "Bear spray" doesn't really mean "extra strength," it's more about the wide and fast dispersal.

For pepper spray deployment, consider the acronym **ICER:**
Identify target, **C**lose distance, **E**ngage, **R**e-evaluate. Identify your target, get within range, engage, and re-evaluate (was the target neutralized? Are more threats incoming? Do your comrades need help? Do you need to get out of there?).

Gel & Small Streams - precise, low blowback, harder to catch on camera or notice in person, gel can stick to you and be hell to get off. Harder to hit targets.
Big sprays, "foggers" - hit a crowd or knock back an advance easily. Blowback is a high risk for yourself and others, and wind can make you miss entirely. Extremely visible to the camera and eye.

A few notes on "CS" or "tear" gas (2-chlorobenzalmalononitrile): The kind that the state usually uses is actually a dispersed powder that's solid at room temperature and needs to be burned, which is why those flying canisters are so hot. It can come right back when you shake up your clothes or hair. The long and short term effects are not well studied. The symptoms are about the same as pepper spray but anecdotal evidence suggests it's more likely to have a more severe symptom like vomiting. Just like before, calm yourself. My best way to be calm is to have a plan. Prevent exposure; that failing, remove yourself from exposure, then remove exposure from you. Blink, spit, blow snot, wipe, wash, breathe more and do it again. Consider going overboard on covering your skin and wearing things that powder slips off of, like a rain poncho. Adults exposed to tear gas during the 2020 protests in Portland, OR also reported menstrual changes (899; 54.5% of 1650 respondents who menstruate) and it has been linked to miscarriage.

PREVENTING EXPOSURE

An ounce of prevention is worth a pound of cure. Preventing exposure to your mucus membranes (like your eyes, nose, and lungs) is the most important. Try out different goggles (science class, paintball store- shatter-resistant where you can!). Irritants will become trapped between contacts and your eyes, so do not wear them. You can see if goggles are airtight by chopping an onion and seeing if you tear up. There are lots of bulky, expensive masks but the best mask is the one you will actually wear. See if your mask is for filtering oils (like paint or most pepper spray) and/or for particulates (like dust or what most people call "tear gas"). Always bring spares. If you are sprayed you will be dumping snot and spit into whatever mask you brought. If I know I'll be sprayed, I wear a half or full-face gas mask. If I'm just risking exposure, I pack a pocket full of N95s and wipes. Prevent exposure to skin and hair with rain ponchos, hats, gloves, and pants. Where you can't eliminate harm, reduce it.

TREATING CHEMICAL IRRITANT EXPOSURE

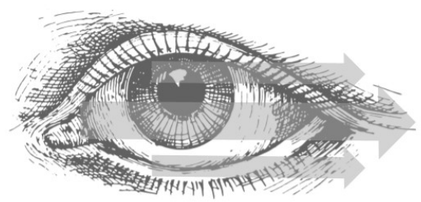
★ONE: Stay calm. Your wits are your greatest asset. If you were intentionally attacked, you need to get out of harm's way. Ask for help and leave the affected area.

★TWO: Either alone or with help, remove glasses/mask/etc and prepare for treatment.
Chances are you're in a situation where you want your identity protected: get your comrades to hold up umbrellas and jackets so your face doesn't get seen by your attackers. If you have resources, gather them. Get your treatment plan together: wipes, water, willpower.

★THREE: Treat. Spit, blink, blow your nose. Irrigate with water or saline. Use wipes from the tear duct (the side next to your nose) outward (shown below).
You're removing something nasty from your body and it has ways of doing it- trust your instincts a bit here.
Irrigate (pour liquid over them) with plain clean water or saline. Do not use milk or any other rumor-cure on eyes, you can do a lot more harm than good.
Use a wipe from the tear duct (the side with your nose) outward and toss them as you go: reusing a wipe just adds the irritant right back in. Repeat.

A big part of pepper spray is the mental effects. Getting someone to blink and breathe takes calm dedication. You can use the classic "smell the roses, blow out the candles" phrase to hopefully get a deep breath. Asthma is a real threat here, and if someone is getting worse or not improving over time with what you're doing seek more help and see if they have an inhaler.

★ The wipes I use are water-based baby wipes soaked in a mix of water and a squirt of baby shampoo (to break up any oils). Why baby shampoo? It's the same pH as your eyes, so it doesn't cause further irritation like other soaps would.



Wipe eyes from inside to outside, starting with the tear duct and moving outward away from the nose.

There are many methods of prevention.

COVER VS. CONCEALMENT

…and the **Integrated Survivability Onion,** Cont.

Cover and Concealment

Cover stops/resists incoming projectiles before they hit you. This means **tree trunks, steel, soil, sand, stone, concrete,** or **brick**, each in the appropriate thicknesses. The word "bulletproof" is never true in the way that things are never truly "waterproof," "fireproof," or "idiot proof". What stops some bullets may not stand a chance against others, and nearly anything will be pierced if hit enough.

Many things are bullet resistant and many things are not, and sometimes your feelings do not lead you the right way. Hiding behind a car door, a flipped table, or the frame and drywall walls of your house all sort of feel like cover: they are not. This is the reason hollow point rounds are so popular for defensive situations, as they are designed to break up when they hit something instead of passing through many things and hitting something you don't want to.

Concealment can be your clothing, a shadow, anything that obscures you from view. Almost all walls in buildings and nearly 100% of furniture is not bullet resistant and is therefore concealment. Concealment is effective and easily deployed, such as curtains in windows, camouflage clothing, or simply staying above or below common line-of-sight.

To help explore these concepts, see the visual aid (below, right; note that the images are transparent to show that they can be passed through, but may mingle and become confusing). If you were taking *cover*, you might choose to kneel behind the short concrete wall; if you were simply keeping yourself hidden, you might choose the taller wooden fence, even though it isn't bullet resistant. The engine block (front) of a car is *cover*, the rest of the car is simply *concealment*. If a target was behind the wooden privacy fence on the left, it wouldn't matter that you can shoot through the fence because you don't know what you're shooting. Never fire blind. You are responsible for what happens to your target and whatever is behind it.

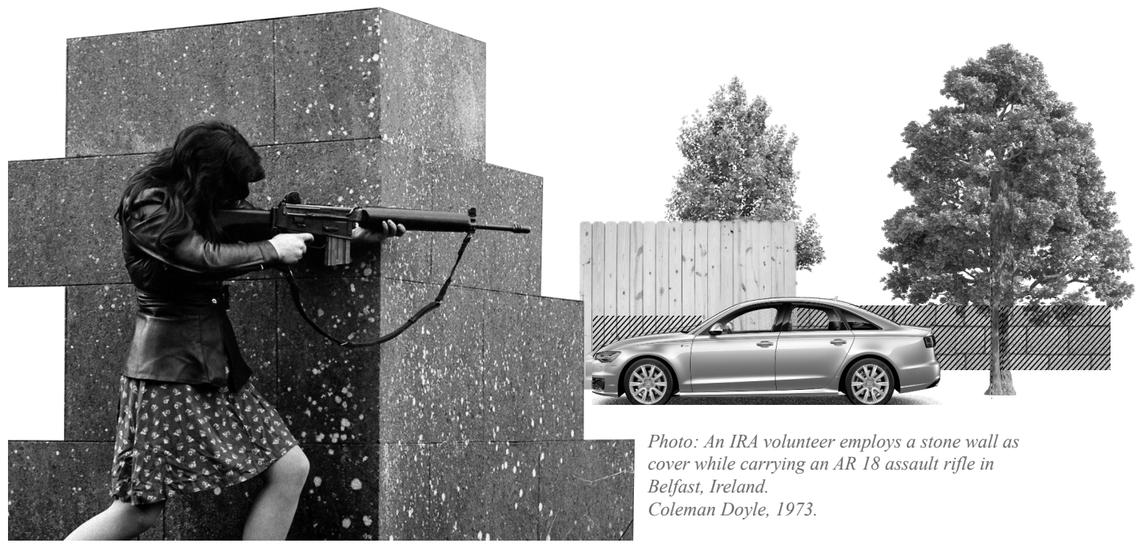


Photo: An IRA volunteer employs a stone wall as cover while carrying an AR 18 assault rifle in Belfast, Ireland.
Coleman Doyle, 1973.

COVER VS. CONCEALMENT

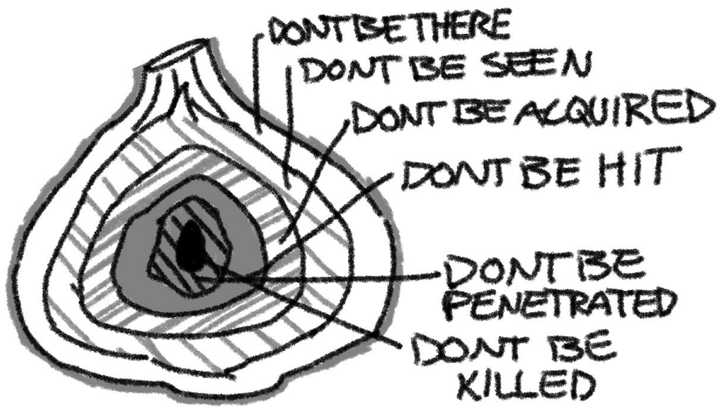
…and the **Integrated Survivability Onion**

Cover protects you from incoming fire and concealment protects you from being seen. The survivability onion is a perspective on combat that (rightfully) prioritizes your survival: don't be seen, and if you are seen, don't be acquired, and if they do engage, don't be hit, and if you are hit, don't be killed. The survivability onion concept and cover/concealment are intimately linked: to follow the goals of the onion, you need cover and concealment.

The Survivability Onion

Sometimes conceptualized as "detectability, susceptibility, vulnerability, and recoverability". Some find it necessary to note that you can avoid being seen by a threat by eliminating it before it sees you.

1) **Don't be there.** Avoid exposure.
2) **Don't be seen**. If a threat cannot detect the presence of potential target then it can't be engaged. *See "Concealment" Below*
3) **Don't be acquired.** The threat may choose not to engage with you. Deter the threat, possibly by de-escalation or possibly by making yourself look like more trouble than you're worth.
4) **Don't be hit.** The most effective way to not be hit is to end the engagement as soon as possible (close the engagement by eliminating the threat or by escaping it). *See "Cover" Below*
5) **Don't be penetrated.** All else has failed: perhaps you resist a knife swing with slash-resistant clothing, or a shot strikes your armor.
6) **Don't be killed.** As long as you can move, you can fight: to survive, you must win or evade. Once the threat is no longer relevant, do first aid (see: the rest of this handbook).



H: HYPOTHERMIA

Hypothermia is the third most serious condition in a trauma patient, after hypoxia (lack of oxygen) and hypovolemia (lack of fluid). It is the reason for the prevalence of the "shock blanket". Hypothermia, acidosis, and coagulopathy make up the "lethal triad," a vicious cycle that leads to death in trauma patients. When we're cold, our bodies are not as good at controlling bleeding or making clots. Patient mortality is consistently higher in hypothermic patients than other trauma patients. It is important to maintain your patient's body temperature: normal human body temperature is 98.6 degrees fahrenheit, 37 degrees celsius.

Even on a sunny day, you might find yourself shivering if you're lying on cold concrete. Keep them dry and wrap them in blankets as reasonably possible while treating them. If they are lying on the cold ground, log roll them and put warm dry material under them. Improvise. Every consideration has to be made to keep your patient warm.

THE COLD ZONE: EVACUATION CARE

Care in the cold zone is centered around reassessment. What did you miss? What has changed since this person was last treated? Are the things we're doing working? Critical trauma patients should be reassessed every five minutes.

Tourniquet Conversion: You Probably Shouldn't

Tourniquet conversion is the deliberate removal of a tourniquet which is substituted by a pressure dressing or hemostatic agent. Because tourniquets can cause some problems, especially poorly placed, improvised, or venous tourniquets, if hospital care is more than two hours away, you might consider replacing a tourniquet if you determine it is unnecessary. If you detect the onset of a venous tourniquet problem, tighten it without releasing the existing pressure. It is unlikely that you actually should remove a tourniquet. Do not remove a tourniquet if hospital level care is available within two hours, the patient exhibits any signs of shock, the tourniquet is applied to a partial or total amputation, or if the patient has multisystem injuries.

HEAD INJURY

When a medical professional says “head injury” they mean a traumatic injury to the brain. The central nervous system can’t regrow damaged tissue and is fragile. We assess a patient’s level of consciousness using the glasgow coma scale (lowest score is 3, highest score is 15):

GLASGOW COMA SCALE

Eyes		**Verbal**		**Muscle Control**	
Spontaneous, alert	4	Answers appropriately	5	Follows commands	6
Opens when told	3	Confused answers	4	Localizes pain	5
Opens to pain	2	Inappropriate speech	3	Withdraws from pain	4
No eye opening	1	Unintelligible noises	2	Abnormal flexion	3
		No verbal response	1	Abnormal extension	2
Clarifications				None	1

Confused speech is “where am I?”, inappropriate speech is random unrelated words. Batting someone's hand away when they pinch you is localizing pain, pulling your body away from the pinch is withdrawing from pain. Both abnormal muscle control symptoms usually involve one side only: abnormal flexion is someone curling up (decorticate posturing), abnormal extension is sticking out your arm and leg.

Bruising of the eyes that is not due to trauma to the eye is called “raccoon eyes” (see image). Bruising behind the ear and under the *mastoid process* is called a “battle sign”. Both of these bruises, if caused by a head injury, are indications of serious head trauma.

★ DO NOT ATTEMPT TO STOP BLEEDING FROM EARS, EYES, OR NOSE FROM A HEAD INJURY

If someone is bleeding out of their ears, nose, or eyes not because those parts are injured but because they got hit really hard in the head, then that bleeding is probably coming from inside the head, and it coming out is the best place it could be. The cranium is full of like 95% brain and 5% cerebrospinal fluid. When you add blood to that, the two fluids are incompressible so the brain is what compresses. This is a buildup of **intracranial pressure (ICP)**. ICP is associated with projectile vomiting, high blood pressure, and high pulse pressure (a big difference between systolic and diastolic blood pressures - normal BP is like 120/80, these patients could be like 280/100). They may have a variety of respiratory patterns: central neurogenic hyperventilation (rapid, deep respirations), cheyne stokes breathing (hyperventilation, then apnic (no breathing), then repeat… pt. is unconscious), or ataxic (irregular).

The meninges are the layers of tissue that surround and protect the central nervous system (brain and spinal cord). The outermost, thickest layer is the *dura mater*, then the *arachnoid*, then the innermost thinnest is the *pia*. A bleed between the dura mater and the cranium is epidural: it’s typically arterial. Someone gets knocked in the head, passes out, wakes up again, and then the bleed knocks them back out. Quick. A bleed between the dura mater and the arachnoid is subdural: comes on slow, over a day or so; common in older alcoholics and older people on blood thinners. Whacks head, fine for a day then show symptoms: a reason to not dismiss supposedly non-threatening head injury. Intracranial bleeds could be anywhere in the brain - stroke symptoms.

MEDICAL INTERVENTIONS IN THE HOT ZONE: COMBAT APPLICATION TOURNIQUET

It’s important to get a tourniquet on *fast*, especially here in the hot zone where it is only one of two medical interventions you will be performing, the other being the recovery position. TCCC Guidelines Change 14-02 citing Kragh et al. found that when a tourniquet is placed early in a combat casualty, before the onset of hemorrhagic shock, there is a 10% mortality (death) rate. When a tourniquet is placed after the signs of shock are present, there is a 90% mortality.

Ideally, you would only use a tourniquet if direct pressure alone isn’t working, but in high-threat situations you don’t have a few minutes to wait. Also, as broader advice, if you’re stuck wondering whether or not you need to use a tourniquet, you probably do need to. Place it high and tight. The tourniquet should eliminate distal pulse and stop bleeding. Use a second tourniquet if needed.

Caregivers need to do a head to toe reassessment on critical patients at least every five minutes and reassess the efficacy of a tourniquet after every time the patient is moved.

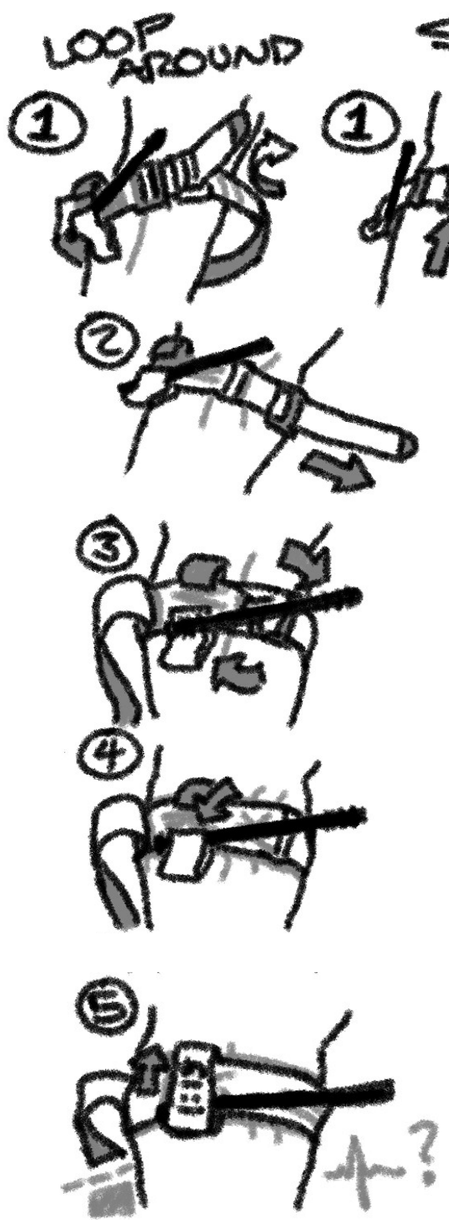
Tourniquets applied hastily over clothing may loosen and become ineffective, especially while casualties are being quickly transported in adverse conditions. Muscle spasms associated with broken long bones may also loosen tourniquets. Trauma interventions that fight the effects of decompensated shock hopefully raise blood pressure, which may result in renewed bleeding.

Why do I need to check for a pulse? If you tourniquet someone’s limb and there is still a pulse further down the limb (distal) than the tourniquet, then blood is entering the limb but might not be leaving it. This is called a “venous tourniquet” because you’re cutting off the flow through veins back to the heart, but not the arterial flow into the limb. This causes a buildup of blood, acids, and it can lead to compartment syndrome, where a limb is cut off from the blood supply by swelling.

Why “High and tight”? There is only one long bone in your upper arm, and there are two in your lower arm. The same is true of your legs. Because a tourniquet is meant for squeezing arteries (which run deep within the body), tourniquets are much more effective where one artery runs along one bone (approximately true of your upper arm and upper leg), rather than multiple bones and multiple arterioles (as in your forearm or lower leg).
It was once thought that wherever you place a tourniquet will be where the limb is amputated later, so TQs were placed only a few inches above a wound, no matter where it was. One appalling war on terror later and that has been disproven: the modern tourniquet is safe, fast, and effective, and when a TQ is indicated the reward outweighs the risk to the affected tissue.

Timing Tourniquets can reliably be kept on for 4-6 hours without harm and limbs have survived having a tourniquet on for 48 hours. It comes with risks, though; if you have the time to properly assess a wound (see “warm zone” for more), only apply a TQ if it’s necessary. Without blood flow, nobody is “taking out the trash” so the tissue is building up acids.

COMBAT APPLICATION TOURNIQUET



#1 Either loop the tourniquet around the limb or slide it on.
If you're doing self-rescue, you'll find sliding it on easier. If for some reason you can't slide it on (like if you don't want someone to move their hands while they apply life-saving pressure), loop it around.

#2 Pull the strap tight.
For North American Rescue Combat Application Tourniquets (which the kind we recommend), this strap has a red tip.
You'll do most of the tightening in step #3 with the windlass- just get it tight enough here that you can't fit your fingers between the limb and the tourniquet.

#3 Turn the windlass (the stick) until bleeding stops.
This is going to get very, very tight. If the person is conscious enough, they will feel pain. You need it to be tight enough to stop the bleeding, so tighten it until bleeding stops.

#4 Secure the windlass.
On the tourniquet there are two hookish pieces of plastic that you can use to secure the windlass.

#5 Place the velcro over the secured windlass.

- Write the time you applied the TQ.
- Assess the limb. Did the bleeding really stop? If you applied it on the arm, is there still a pulse at the wrist? There shouldn't be.
- Cut off (recommended) or otherwise secure the excess hanging strap material so it doesn't get caught and pull the velcro apart, releasing pressure.

CPR: CARDIOPULMONARY RESUSCITATION

Cardiopulmonary resuscitation is a method of manually performing a person's bodily functions. You are pumping their heart with chest compressions and delivering air with manual rescue breaths. Someone needs CPR if they are pulseless, not breathing, and unresponsive/unconscious. If they are all three of these, perform CPR. The hope is that this brings the person back enough that their heart resumes pumping and they start breathing on their own, but this outcome usually requires an AED and/or medication.

Check for a pulse at the carotid artery on the neck. You can do this while you watch the chest for rise and fall and listen at their mouth and nose for air movement. Give them a good pinch or sternal rub to see if they wake up to painful stimulus. If there's no pulse, no breathing, and they're unresponsive, they are clinically dead and they need CPR.

Every moment is critical. Compressions are the most essential part of CPR. Rapid, effective CPR at an adequate rate and depth with minimal interruptions can save a life. If you are worried about messing it up or hurting the person, remember that they are clinically dead, and it's hard to make things worse at that point.

1. Restore circulation with 30 chest compressions at a depth of two inches.
2. Open the airway with a head tilt, chin lift maneuver. Deliver two breaths, each over one second, and watch to see if the chest rises.

Repeat #1 and #2 until the person either revives and starts breathing and circulating on their own or until an AED becomes available (see facing page). If you aren't delivering a breath, analyzing with an AED, or shocking with an AED, you are doing compressions!

You can maintain this ratio of 30 compressions to 2 breaths by having one person on breathing and one person on compressions, switching as people get tired. If you're alone and switching back and forth from breaths to compressions is taking more than 30 seconds, or if you can't deliver breaths for some other reason, just do compressions. A person's blood has as much as 10 minutes worth of oxygen floating around and circulating that is the most important thing you can be doing.

How do you perform compressions?
1. Place your palm at the center of the chest (the lower half of the sternum – this is about at the "nipple line" for most masculine chests). Careful not to get too low, where the sternum ends and the soft abdomen begins because there's a little piece at the end of the sternum called the xiphoid process and you could break it off.
2. Place your other hand on top of the first one.
3. Straighten your arms and lock your elbows. Position your shoulders directly over your hands. Depress the sternum at a rate of 100 to 120 compressions per minute, at a depth of 2 to 2.4 inches deep (5-6cm) using a downward movement. If you use your arm muscles alone you'll tire quickly and your compressions will worsen. Use your body weight instead.
Compression and relaxation should each last the same amount of time. You have to allow time for the heart to refill - you can't pump what you never got back.

USING AN AED

Automatic External Defibrillators (AEDs)
When an adult heart stops beating, 95% of the time it is in one of two abnormal heart rhythms: ventricular tachycardia (V-tach, VT) or ventricular fibrillation (V-fib). This is why it is so critically important to get an AED to someone who is unresponsive, pulseless, and not breathing.

There is still electrical activity in the heart, it's just disorganized and scattered, no longer controlled by the SA node. The SA node just needs an opportunity to get back in shape. A *defibrillator* shocks the heart, stopping all activity for a moment and allowing normal control to resume. They do this by sending a shock through the heart using two sticky pads placed across the person's chest and side.

While training is helpful, AEDs are designed to be used by people who have not been trained to use them. All modern AEDs have pictures of where to put the pads and the unit will play voice instructions out loud telling you what to do and when.

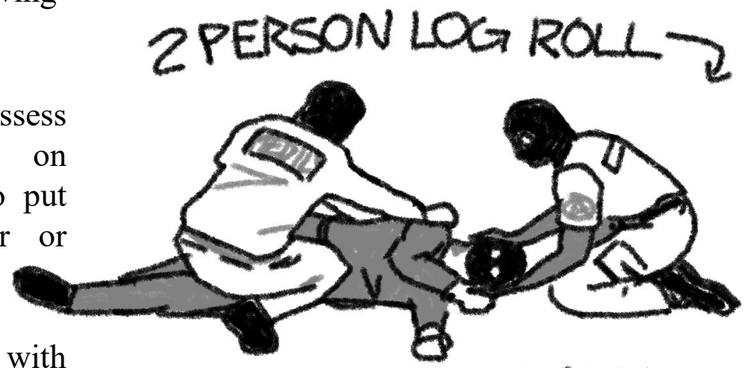
1. Power the unit on. It usually takes about 15 seconds for an AED to run a self check.
2. Place the pads following the images. The two pads are interchangeable, but one will have a picture for the upper placement and one will have a picture for the lower placement.

   If there is a medication patch where you need to place a pad, remove it and wipe away the medication. If there is a lump of an implanted pacemaker implant where you need to place a pad, place the pad near but not on top of it.
3. The AED will analyze the heart's rhythm. Stop compressions while this is happening. You may have to press "analyze" to initiate this.
4. The AED will either instruct you to continue compressions or say "shock advised… charging". Continue compressions while it charges and when the shock is available, make sure nobody is touching the patient, announce you're about to shock, and press the big red button. The AED will analyze again and instruct you to continue compressions when necessary.

What if they're wet?
Water and electricity are famously dangerous together… how much of a concern is that with AEDs? We don't care about snow or small puddles. You should only start to care if there's standing water, in which case you can move them to a drier area. You *should* dry the parts of their chest that the pads will go on.

What if they're really hairy?
Some AEDs come with a razor so that you can get a few crude hacks in to clear a spot for the pads. There may be an extra set of pads or a set of pediatric (childrens) pads that you could use like a wax strip to remove some hair. If neither of these options are available, proceed without them.

The **recovery position** allows blood or vomit to flow out of the mouth, helping maintain a clear airway. Propping them up on their arm and leg like this keeps you from having to hold them yourself.

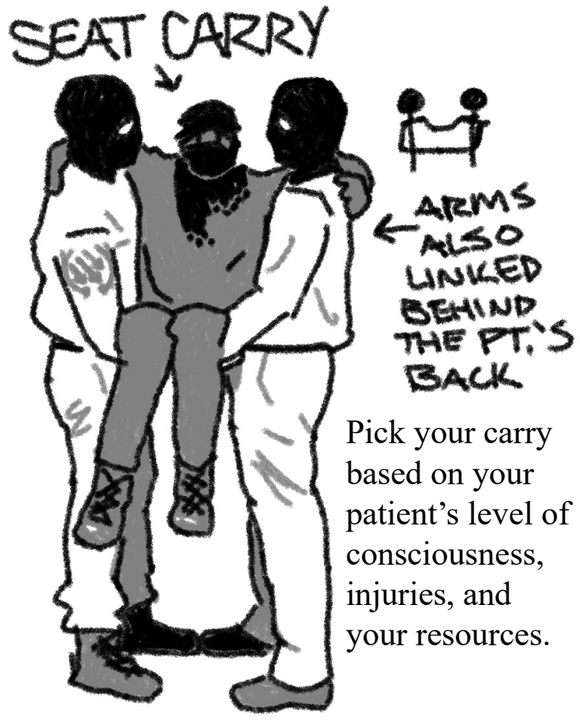


A **log roll** is used to assess and treat injury on someone's back or to put them on a stretcher or backboard for transport. Someone holds the head in line with the rest of the spine (preventing further spinal damage) and others rotate them.

Always roll towards yourself. If you have multiple people to roll someone, overlap them (see above). Grab the belt, not a belt loop (could tear off).

A **one person drag** is performed by supporting the head and dragging by the clothes, straps, or armpits (left).

These are all drawn wearing head coverings, but if you are trying to maintain someone's airway and breathing, do not leave their mouth and nose covered in cloth, and if you are assessing trauma you need to see that person's body bare - at very least the affected area.



Pick your carry based on your patient's level of consciousness, injuries, and your resources.

Don't use the **pack strap carry** if their arms or wrists are broken.

C: TREATING SHOCK

No matter what the cause of death, when people die, they die of hypoperfusion - shock. Forgetting shock or forgetting to treat for it is a critical failure. Remember, homeostasis (the balance of body systems) requires a functioning pump, intact vessels, the right amount of blood, and respiration. Air going in and out, blood going round and round. Pump, pipes, fluid, and oxygen. Maintaining these systems is treating shock.

Treating Shock

1. Stop all external bleeding. Every red blood cell counts.
2. Place the patient lying flat on their back (supine).
3. Give high flow supplemental oxygen.
4. Keep them warm!
5. Transport. We can't fix shock in the field, this person needs a medical facility.
    a. except psychogenic (resolves itself) and anaphylactic (treat with epinephrine)

Shock patients may be very thirsty. It is important that you do NOT let them drink because 1) they will probably throw it up, threatening their airway and 2) they are probably headed for surgery. If you're in a long term scenario, and the patient is conscious with a clear airway, you can moisten a gauze pad and allow them to put it in their mouth to keep their mouth from drying out.

#2 - place the patient lying flat on their back (supine) - is true, and an older treatment has been disproven, but the old treatment is still talked about and kept around so you should be aware of it. "Shock position" or "Trendelenburg" involves placing someone's legs up at an angle or leaning their whole body back. It was thought that this allows gravity to keep blood in its most important places, but it has been proven to not really have much of an effect beyond causing abdominal organs to rest on the diaphragm, somewhat impeding respiration.

#4 - keep them warm - is more important than it may seem. We normally run on aerobic metabolism - oxygen plus glucose equals energy for our body. When something is wrong, like we don't have enough oxygen or glucose, we go into anaerobic metabolism. This creates a ton of acidic waste (mainly CO_2). When a person is hypothermic, they enter anaerobic metabolism. Our body's ability to clot and control bleeding is also severely diminished while cold. Avoid this.

C: CIRCULATION... WHAT IS SHOCK?

The caregiver should now reassess the bleeding control measures and treat for shock.

Shock

Homeostasis (the balance of body systems) requires a functioning pump, intact vessels, the right amount of blood, and respiration. Air going in and out, blood going round and round. Pump, pipes, fluid, and oxygen. This is a system of perfusion; shock is hypoperfusion (underperfusion, lack of perfusion).

The symptoms of shock are different depending on the stage of shock the person is in. There are three stages of increasing severity: compensation, decompensation, and irreversible.

Compensated shock is the body compensating for the problem with adrenaline.

- Poor skin signs/pale, cool skin (alpha 1 receptors constrict peripheral vessels, conserving blood for more important purposes)
- Heart beats harder and faster (beta 1 receptors activated)
- Respiratory rate and depth increases (beta 2 receptors activated)
- Slightly altered mental status - restless, anxious, “off”. Not confused.

Decompensated shock is the body failing to compensate for the problem. The line is drawn between compensated and decompensated when the blood pressure begins to fall.

- Blood pressure crashes down. Pulse may be weak or absent.
- Altered mental status, patient is confused.

Irreversible shock - vital signs fail as systems get less and less oxygen. Respiratory rate drops, heart rate drops, profoundly altered mental status… seizure, coma, death.

There are many types of shock, as we will list here soon, but the one you are most likely to encounter in a tactical trauma patient is *hypovolemic* (low volume) shock, specifically hemorrhagic shock (shock from blood loss). The other type of shock that could occur is psychogenic shock - the eyes see something the brain doesn’t like, vessels dilate, BP suddenly drops, and they faint. This is a very temporary problem and it resolves itself promptly.

Categories and Types of Shock

Hypovolemic shock: hemorrhagic (blood loss), metabolic (dehydration)
Cardiogenic shock: heart failure
Distributive shock: Psychogenic (eyes see something the brain doesn’t like, vasodilation, faint), neurogenic (severed spinal cord → vessels in an area have no boss, so they relax → the “pipes” are bigger than the fluid), anaphylactic (shock due to severe allergic reaction: vasodilation, bronchoconstriction, bronchospasms (wheezing)), septic shock (total system bacterial infection causes vessels to become permeable, fluid leaks throughout body).
Respiratory shock: Respiratory insufficiency, the #1 cause being opioid overdose, next most common being choking, and rarely it’s because someone is in a confined oxygen deprived space.
Obstructive shock: pulmonary embolism (clot in the vessels of the lungs), pericardial tapenade (fluid in the pericardial sac pushes on the heart), and tension pneumothorax.

THE WARM ZONE: INDIRECT THREAT CARE

Care in the warm zone is a constant risk-benefit analysis. The warm zone has been cleared but it is not secure - there is an unmitigated threat, it’s just not right here. The dynamic nature of tactical situations is such that the zones are not fixed, and can move and change; what is the warm zone now could become the hot zone at any time. Patients in the indirect threat care zone may be fleeing or have been evacuated from the hot zone.

Scene Safety and Asymmetrical Response Continue the same situational awareness described in the hot zone and constantly evaluate your situation. “Asymmetrical response” refers to the fact that the most direct and safe route may not be through conventional or obvious paths. A window might end up being more convenient and practical than a door, for instance. Look for extrication routes (ways to carry your patient out) wherever you go. The way you came might not be the best exit available to you. Coordinate your actions with other groups you’re with and keep people clearly updated to avoid accidentally identifying your friends as a threat or vice versa (friendly fire).

Injured members of your response team suffering from altered mental status should have their weapons and communications secured away from them. An armed injured person experiencing altered mental status and the fog of response may see medical treatment as someone attacking them.

Assessment and Intervention Priorities: MARCH

In the warm zone, you have more time to assess and treat a patient. The map we will be using for this is the acronym MARCH:

Massive hemorrhage	pg. 14
Airway	pg. 17
Respiratory	pg. 19
Circulation	pg. 22
Hypothermia/**H**ead injury.	pg. 27, 26

The goal of this protocol is to keep a casualty alive long enough to receive further care.

BASICS OF PATIENT ASSESSMENT

Patient assessment is a really complex skill, but most people can intuit a significant portion of it. You don't need to be able to name the tripod position or accurately identify secondary muscle use to know that someone leaned over with their chest heaving is having trouble breathing.

Before you see the patient
For EMS, patient assessment starts when you're dispatched. What did the caller say, what's the environment, how many people do you expect to treat, what additional resources (i.e. other people) do you have, is it a MOI (mechanism of injury) or NOI (nature of illness), what does egress/extraction look like (getting yourself and the patient out), do you need to be worried about a spinal injury ...
This can also be approximately true for someone who isn't going to be dispatched like EMS is. If you're at a protest, you might expect to treat multiple people for pepper spray exposure. You should have an idea of extrication considerations. When someone shouts for a medic, you might be getting information before you see the patient (like that everybody else is running away).

General Impression: 20-30 Feet Away
From 20-30 feet (6-9 meters) away, you can already get an idea of how someone is doing. Are they sitting, standing, lying down? Is there blood everywhere? Are they propped up and heaving their chest like they can't breathe? Are they watching you walk over or do they seem like they aren't paying attention to anything? What does their skin look like (pale or ashen, sweaty…)?

Primary Assessment (AVPU and ABCDE)
1) Assess the patient's level of consciousness.

Alert	(looks at you, responsive)	Go through ABCDE
Verbal	(only reacts when you start talking)	Go through ABCDE
Pain	(only reacts when you pinch them)	Go through ABCDE
Unresponsive	(does not respond to verbal or pain)	If not breathing and pulseless, CPR

2) Treat major hemorrhage if present.

3) Go through ABCDE. ABCDE is an algorithm for assessing and correcting immediate threats to a person's life. Assess and correct threats to the Airway, Breathing, and Circulation, identify the Disability (chief complaint), Expose as necessary, and protect them from the Environment.

Airway	★ Is it open and clear? ★ Are there any threats to it? ★ Take spinal precautions
Breathing	★ Rate and quality ★ Are there any threats? ★ Do they need supplemental oxygen?
Circulation	★ Rate and quality ★ Are there any threats? ★ Skin signs (temp, color, moisture)
Disability	★ What is their "chief complaint" (the main thing that's wrong)

Expose, protect from **Environment** ★ You can't treat what you can't see
After going through ABCDE, you know their chief complaint and their transport priority. Is this a load 'n' go (get them to a hospital now) or stay 'n' play (continue assessing and treating in the field).

Assess if someone is **Alert and Oriented** by seeing if they know where they are, who they are, what time it is, and what happened (scored out of four).

R: PNEUMOTHORAX

Lungs are covered by *pleura*, a thin airtight layer of tissue. The visceral pleura lines the lungs and the chest is lined with the parietal pleura. This layer is how the lungs maintain the pressure system required for breathing. The lungs are stuck to the pleura by surface tension. If that tension is broken, they separate and the lung collapses against the positive pressure of the outside environment. The lung can also collapse because of pressure caused by internal bleeding or an internal leak of air from the lung.

Normally, no space exists between the pleura and the lungs. A penetrating injury to the chest can disrupt this. **Air in the pleural space (pneumothorax)** disrupts the tension created by pleural fluid and the positive pressure of outside air can force itself against the affected lung. Injuries of the lung can also allow air to leak from the lung into the pleural space, rather than outside air leaking directly into the pleural space from an external wound. People with an open wound compromising the parietal pleura almost always also have a hole in the lung, allowing air to escape into the pleural space from both directions.
With the pressure system compromised, the lung collapses or begins to collapse. Penetrating wounds result in a pneumothorax only when the defect is large enough that surrounding tissue doesn't block the hole.

An open pneumothorax involves air entering the pleural space, causing the lung to collapse. An open injury that causes this include stabbings, impalement, or shootings, or - rarely - blunt trauma. When the patient attempts to inhale, air is pulled in through the wound, not through the normal airway. An audible noise is typical of this, which is why it is frequently called a "**sucking chest wound**".

Assessing and Treating Open Pneumothorax
Patient is in obvious respiratory distress, may have low SPO_2, is breathing rapidly and is anxious. If you listen with a stethoscope, you'll hear lung sounds on one side and either muffled sounds or no sound on the affected side. Examination of the chest wall reveals sucking chest wound, which may bubble on expiration. Give supplemental oxygen if available.

The primary treatment for open pneumothorax is an occlusive dressing. There are many things that serve this purpose. You can improvise one with the sterile plastic sheeting of your gauze pads (or any clean plastic - it could be a library card if that's what you have). You can also use petroleum jelly gauze, or specifically designed chest seals. Chest seals are specifically designed for this purpose and typically have a vent that allows pressure to be released but not re-enter through the wound. You may also be able to achieve this by taping your improvised seal on three sides, instead of all four. By allowing pressure to escape, you won't completely solve the problem, but you will significantly reduce the likelihood of tension pneumothorax. Petroleum jelly gauze is great because you can form it around an impaled object, like a knife.

Tension pneumothorax occurs when air continues to enter the pleural space without any exit or release. The affected lung completely collapses and the pressure pushes on the heart and the opposite lung; pressure on the vena cava prevents venous return and the heart can't pump what it isn't getting back. This distortion of the anatomy may even be visible in the neck with the trachea (windpipe) being pushed further to one side. The treatment for this is needle decompression; the insertion of a needle in the fifth intercostal space at the anterior axillary line of the injured side, that allows the air to escape. That is a procedure beyond us here.

R: MANUAL VENTILATION

If someone isn't breathing on their own, or isn't breathing *enough* on their own*, you can breathe for them. This can be performed using the air from your lungs or with a bag valve mask (BVM). If you're performing CPR, do two rescue breaths per 30 compressions. Normal respiratory rate (breaths per minute) for people over the age of thirteen is 12-20, for people ages six to twelve it's 14-30, for people under the age of six it's 20-40.

Manual Rescue Breathing

1. Open the airway using a head tilt, chin lift or jaw thrust maneuver.
2. If you have a rescue breathing mask to protect you from body substances, place it.
3. Form a seal between your mouth and theirs and force air into their lungs. Look for chest rise and fall.

But how does this help? Don't we just breathe out CO_2?

Air is 78% nitrogen, 21% oxygen, and 1% other gasses. We breathe out 78% nitrogen, 16% oxygen, 5% CO2, and 1% other gasses.

Using a Bag Valve Mask

1. Assemble the bag valve mask by attaching the mask to the valve.
2. Kneeling at the patient's head, open their airway using a head tilt, chin lift or jaw thrust maneuver.
3. Place the mask on the patient's face. The mask is tapered with the pointed end towards the nose and the rounded end towards the chin. It should form a seal from the bridge of the nose to the chin.
4. Hold the mask in place with a "C-E" clamp. That means holding your thumb and pointer finger around the mask in a "C" while your other three fingers hold tight to the jaw in an "E" shape.

4. Ventilate by squeezing the bag. You only need to squeeze enough for your fingers to make contact with each other through the bag, you don't need to force it until the entire bag empty. Do this about every 6 seconds.
   ★ Doing this too fast, too often, or at too great of a quantity will force air into their stomach, and they will throw up, which is a major threat to their airway. Watch for chest rise and fall and also watch the stomach in case it appears to inflate.

Bag valve masks also have an attachment point for supplemental oxygen flow.

*if someone is breathing too infrequently (hypoventilation) as in for adults, ten or less breaths per minute, or is breathing irregularly, you should use manual ventilation to keep them alive.

SECONDARY PATIENT ASSESSMENT

Once you've completed your primary assessment (see previous page), you need to perform a more thorough exam of the patient. For our purposes we will continue to focus on trauma.

KILL ZONE EXAM

You should assess and correct problems with the "kill zones" - your head, neck, and torso. Because the only way a limb injury could kill someone here is through bleeding, and you treated major bleeding before doing your ABCs, we can focus solely on the kill zones using DCAP-BTLS. DCAP-BTLS stands for deformities, contusions, abrasions, punctures/penetrations, burns, tenderness, lacerations, and swelling. It's all the signs you might find of a problem in a trauma patient. This exam should last about one to two minutes. **Expose** the patient (cutting away or removing clothing) - you can't treat what you can't find.

Head Start with the top of the head and work down looking for DCAP-BTLS. Be hands-on and frequently check your gloves to see if they have blood on them. Blood can hide easily under hair and you may only notice it once it's on your gloves. Is there bruising around their eyes or behind the ears ("battle sign")? Could be a head injury (pg. 24). Smell for odors.

Neck If they're responsive, ask them if it hurts their spine/neck to be touched or to move. Look at the front of the neck for jugular vein distension (bulging veins - this means poor venous return (blood isn't flowing back into the heart well enough)).

Chest Check the collar bones. Hold your hand firmly on their sternum (front middle of the ribcage) and back and have them breathe in. Did it hurt? Is the chest rising and falling equally on both sides? Is there any paradoxical movement (part of the chest moves out when they breathe out or moves in when they breathe in) suggesting a flail chest? Perform the same firm hold on each of their sides while they breathe in again.

Abdomen Roll your hand palm to fingers over each quarter of the abdomen ("stomach"). Pay special attention to any rigidity/firmness, which could suggest internal bleeding.

Pelvis Perform a lateral squeeze (pushing on each of their sides) like you're closing a book. Do NOT push down or try to "open the book". A pelvis is one big bone, it should never have one side moving independently from another. While you're here, look for incontinence (did they pee or poop? Can they control their bladder?).

Femur you can assess the femur (the long bone in your thigh) using offset pressure. Apply offset pressure by pushing right at the top of the bone and left at the bottom of the bone (or vice versa). It should move as one piece.

Once the kill zones have been properly examined, you can examine the limbs. Check pulse, motor, and sensory (**PMS**). Is there a pulse, do they have motor control ("*wiggle your fingers*"), and do they have sensation ("*can you feel my hand? which finger am I touching?*").

MAJOR HEMORRHAGE: TREATING BLEEDING

Why start with bleeding? According to the American College of Surgeons, uncontrolled bleeding is the number one cause of preventable death from trauma. A person only has so much blood to lose (a 200lbs adult has about 6 liters (12 pints)), and we can't do much to fix it once it's gone. If someone has a major hemorrhage (like bleeding from a gunshot wound) and they just stopped breathing, the priority is to stop the bleeding - doesn't matter if they're breathing if there's no blood to carry the oxygen.

Bleeding Assessment
The first step in MARCH is to identify and treat a major hemorrhage (excessive bleeding). This assessment starts 20-30 feet before you reach your patient - is there blood everywhere?. Visually identify all hemorrhage sources. The patient may be lying on the source of the hemorrhage or it may be hidden by the patient's clothes. Remember that if there is a bullet entry wound that you should check for an exit wound. Wounds that damage major blood vessels can cause exsanguination ("bleeding out").

Blood Sweep and Rake A blood sweep is performed by sweeping both hands over the patient's entire body. Working from head to toe, stop every few inches to look at your gloves to see if they have blood on them.You will be able to locate injuries quickly and address the problems they present without missing anything important. Of course, this method only works with clean gloves, a major hemorrhage, and a well-lit space. A combination of raking and sweeping is more effective. Raking is an assessment done by spreading your fingers out and curving them in to resemble a rake, like the kind you use to remove leaves from grass. Your fingers will detect wounds that may be missed under bloody clothes. Expose and access each wound found. Cut, tear, or otherwise remove clothing: don't be shy, this is life or death. Literally go from the top of the head to the bottom of their toes - taking the time to be thorough here could save you a lot of grief later.

Aggressive Progressive Intervention: P.A.C.E
One planning tool you can use for care needs in a tactical situation is the four-step PACE method.

- ★ **P**rimary Plan: the preferred clinical care technique.
- ★ **Al**ternative plan: the clinical care technique that should produce the same outcome as the primary plan.
- ★ **C**ontingency plan: a backup technique that is not as effective as the primary or alternative.
- ★ **E**mergency plan: when the previous three plans fail, or there is a sudden change in the tactical situation that requires immediate evacuation. Used until more resources available.

For hemorrhage control, that could look like this: Primary plan: tourniquet, Alternative plan: direct pressure/pressure bandage, Contingency plan: wound packing, junctional tourniquet (if available), Emergency plan: manual direct pressure until patient gets to better care.

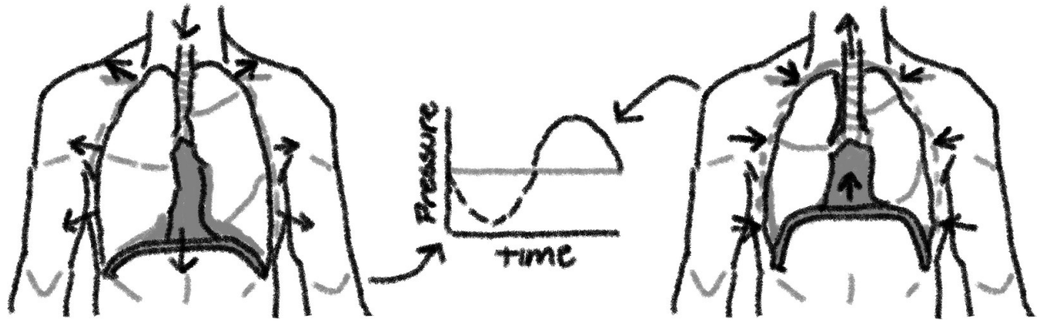
RESPIRATION

Once you have an open, patent airway, you need to make sure the person is breathing. First, let's talk about the anatomy and physiology of respiration. *Ventilation* is air moving in and out of the lungs, *Respiration* is the exchange of gasses. External respiration occurs when the tissue in our lungs exchanges waste CO_2 (a byproduct of our metabolism) with oxygen from the outside air. Internal respiration occurs when red blood cells deliver oxygen to cells and exchange it for CO_2, which flows back to the lungs for external respiration. Air is 78% nitrogen, 21% oxygen, and 1% other gasses. We breathe out 78% nitrogen, 16% oxygen, 5% CO_2, and 1% other gasses.

Normal respiratory rate (breaths per minute) for people over the age of thirteen is 12-20, for people ages six to twelve it's 14-30, for people under the age of six it's 20-40.

Structure The trachea ("windpipe") branches down into the left and right main stem bronchus; these structures have calcified rings that protect them from injury or spasm and they connect to the lungs. In the lungs, the main stems branch into bronchi, which branch into bronchioles, which connect to alveoli, semi-permeable pockets where respiration occurs.

Function The lung tissue is not muscular; it pulls and pushes air through a system of pressure (see image). The diaphragm is the major muscle at work, but intercostal (in between ribs) muscles help along the way. The diaphragm sits below the lungs and when it contracts, the lungs stretch and negative pressure is created. That negative pressure has to be filled by the positive pressure of the outside environment, air flows in and the lungs are filled. External respiration occurs in the alveoli. Muscles can only create force by contraction, so to push air out the lungs have to use their elasticity; the muscles relax and the elastic lung tissue comes back into place. The lungs are contained by the *pleura*, which keeps the system airtight- more on this on the next page.



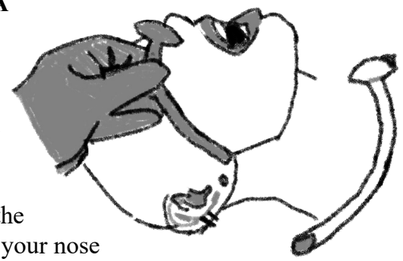
The body loves balance, and it runs on tight tolerances. The pH scale is a scale that measures how basic or acidic water is, going from 1 (very acidic) to 14 (very basic). Substances of either extreme will burn the body, which likes to sit between 7.35 and 7.45. CO_2 is acidic, so the body detects when to breathe by noticing an acidic change in pH. Central chemoreceptors detect an acidic pH and the brain tells the lungs to get to work. If someone *hyperventilates* (breathes too fast), they get rid of CO_2 faster than its being produced and their pH will rise (become more basic), causing cramping, curling of the fingers, and other symptoms - this is the reason you see people in movies breathe into a bag when they're hyperventilating, it's to take in CO_2. A rebreather bag is an intervention reserved for paramedics, if they aren't actually experiencing alkalosis you'll drop their oxygen levels and could kill them.

AIRWAY ADJUNCTS: NPA & OPA

Whether someone is breathing on their own or not, you can make sure that they have a clear airway with a manual airway adjunct. BLS (basic life support) adjuncts include a nasopharyngeal airway (NPA) and an oropharyngeal airway (OPA).

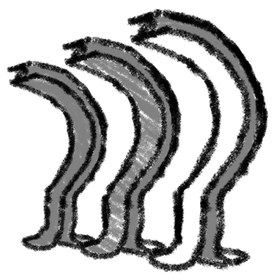
An NPA is just a flexible tube with a beveled cut on one end and a funnel-like opening on the other end. The bevel end goes into somebody's nose with the beveled end towards their septum. It's inserted into the nose and through the posterior pharynx, clearing the airway by displacing the posterior tongue and soft palate. You can use them on conscious and unconscious patients. They can be uncomfortable, but they have advantages over an OPA: they're less likely to cause a gag reflex, they're less likely to be dislodged in transport, and you can cut them to size. Evidence does not support the widespread myth that facial/basilar skull fractures are a contraindication for NPA placement.

PLACING AN NPA



1. Assess the airway for visible obstruction.
2. Open the airway using the head tilt/chin lift or jaw thrust maneuver.
3. Get an NPA of appropriate size. It should reach from the tip of their nose to their ear lobe (see photo).
4. Lubricate the NPA.
5. Insert the NPA at a 90-degree angle to the face with the bevel (cut) open towards the septum (the wall inside your nose that separates the two nostrils). Avoid aiming upward towards the top of the head. You can twist it or move it side to side to help get it in.
6. Insert it up to the flange (the funnel shaped piece at the end of the NPA). If one nostril doesn't work, try the other one.
7. Assess. Is air moving? Look, listen, feel. Tape it in place if you can.

An OPA is a piece of hard plastic shaped to fit into someone's mouth and hold their tongue in place. It has channels in the sides to help vomit flow away from the airway. They come in different sizes, usually color coded, and you can see if yours is the right size for the person by measuring it from the corner of their mouth to their earlobe (bottom right image). Too big or small and you risk occluding the airway. You can use them on anyone who doesn't have a gag reflex, but they're uncomfortable and it's unlikely they'll be both needed and useful to a conscious patient.



WHEN DIRECT PRESSURE FAILS...
TQ THE LIMBS, PACK THE JUNCTIONS, SEAL THE BOX

TOURNIQUET THE LIMBS

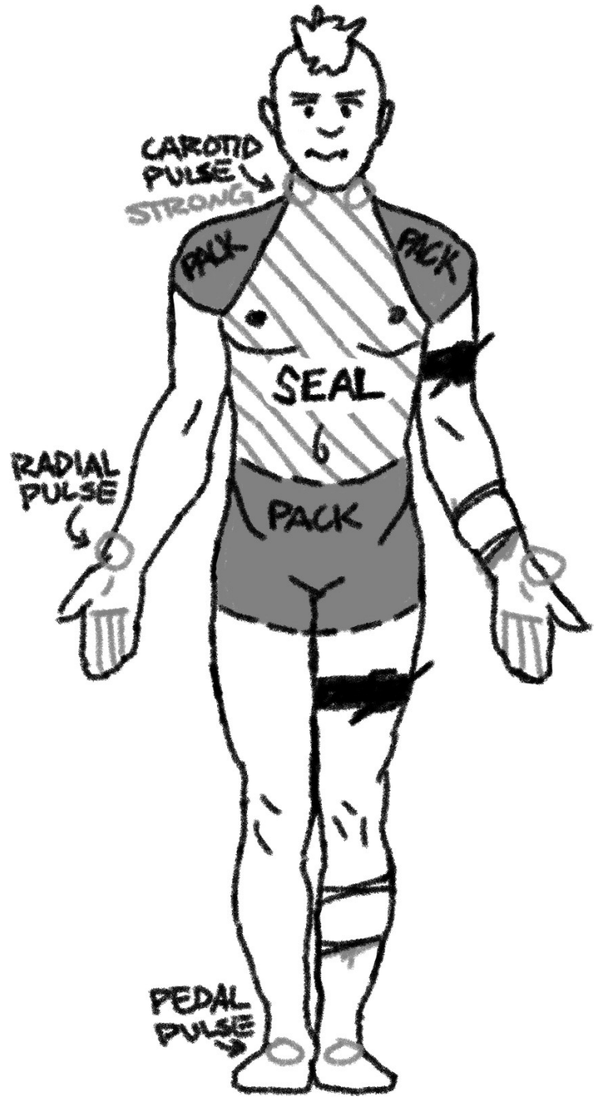
If direct pressure isn't enough to stop bleeding on a limb, t's easy and straightforward to cut blood flow off to a limb by applying a tourniquet. Pg. 6-7

PACK THE JUNCTIONS

If direct pressure isn't enough to stop bleeding on a junction, where a tourniquet can't be applied, you can pack the wound. Junctions include the pelvis ("hips") and shoulders, don't pack into someones neck because you can harm their airway. Don't pack someone's abdomen because it's a huge cavity you won't fill *and* you'd mess up a bunch of important stuff while trying. Some junctional hemorrhages can't be controlled by tourniquets, pressure dressings, or hemostatic agents. If the situation doesn't allow a caregiver to maintain direct pressure, a mechanical device called a "junctional tourniquet" can apply it for you, or an improvised version can be applied. Applying pressure by tying gauze or looping tourniquets to tightly wrap around a person with a sturdy water bottle tucked over the wound dressing to focus the pressure, for example.

SEAL THE BOX

You don't want air to be going in or out of the body in a way that it's not supposed to, so anywhere from the navel (belly button) to the neck, do not pack- seal with an occlusive dressing (discussed pg. 21)



M: DIRECT PRESSURE & HEMOSTATIC AGENTS

Direct pressure is something that can be applied by anyone with no equipment, but gloves are highly recommended. Don't be shy, you're trying to push hard enough to close vessels and stop bleeding. Pressure must be held for at least three minutes before determining if it is effective. Do not release direct pressure unless it is to control it by some other means (like a pressure dressing or tourniquet). Pressure dressings replace the pressure you are manually applying. This is achieved by wrapping a bandage around the limb or around the body. Before you wrap a limb, check the distal (further away from the heart than the wound is) pulse. If you can, have the person wiggle their fingers (motor control) and see if they can identify which finger you're touching (sensation). After checking this, you can wrap your pressure dressing and check it again: if you've cut off circulation, motor control, or circulation, you're going too tight. If direct pressure isn't working after three minutes, it's time to use a tourniquet.

HEMOSTATIC AGENTS

Hemostatic agents have physical properties that allow them to adhere to damaged tissue and vessels and enhance natural blood clotting mechanisms. This is particularly useful in areas where a tourniquet cannot be applied, like junctions (shoulders, hips…). This is achieved by one of two methods: 1) concentrating clotting elements in the blood by rapidly absorbing water out of the blood or 2) chemically react to stimulate the body's natural clotting ability.

Ideally, this agent stops bleeding within two minutes, can be easily applied with minimal or no training, and can be removed from the wound if it becomes necessary. The two most popular are kaolin (a type of soft white clay) and chitosan (a sugar extracted from the shells of crab, lobster, shrimp, and other shellfish). These agents are not intended for simple topical application (like powder, don't use it just as a powder) but rather as an additive in combat gauze.

WOUND PACKING WITH COMBAT GAUZE

- ★ Open the clothing around the wound.
- ★ Locate the source of the most active bleeding
- ★ Pack combat gauze tightly into the wound and directly onto the source of bleeding.
  - ☆ Multiple gauze packages may be required to adequately stem blood flow. Combat gauze may be repacked or adjusted in the wound to ensure proper placement.
- ★ Hold continuous pressure for 3 minutes.
- ★ Reassess to ensure the bleeding is controlled.
  - ☆ Combat gauze may be repacked or additional gauze used if the initial application fails to stop bleeding.
- ★ Leave combat gauze in place. Wrap to effectively secure the dressing and maintain pressure. Do not remove this bandage or combat gauze.
- ★ Reassess frequently (at least once every 5 minutes) to monitor for bleeding.

Some junctional hemorrhages can't be controlled by tourniquets, pressure dressings, or hemostatic agents. If the situation doesn't allow a caregiver to maintain direct pressure, a mechanical device called a "junctional tourniquet" can apply it for you, or an improvised version can be applied. Applying pressure by tying gauze or looping tourniquets to tightly wrap around a person with a sturdy water bottle tucked over the wound dressing to focus the pressure, for example.

AIRWAY

Your airway is made up of all of the organs that allow airflow during ventilation (breathing). For the purposes of this handbook, we won't go deeper than the trachea ("windpipe"). In the context of trauma, your job here is pretty much getting things out of the way- their tongue, vomit, blood, secretions, food, whatever's in their mouth that could keep them from breathing.

The level of intervention will depend on the patient's level of consciousness, the state of the airway, and the tactical aspects of the situation you're in. If the patient is conscious and breathing adequately, you shouldn't do anything to their airway. Normal respiratory rate (breaths per minute) for people over the age of thirteen is 12-20, for people ages six to twelve it's 14-30, for people under the age of six it's 20-40.

ASSESSING AND CORRECTING THE AIRWAY OF AN UNCONSCIOUS PERSON

1. Open their airway using a head tilt chin lift or, if spinal trauma is suspected, use the jaw thrust (see image right)
2. Assess their respirations by listening at the mouth and nose while watching their chest. Is air moving? Fast or slow? Lots of air or just a little? Do you hear anything? Snoring indicates the tongue is getting in the way (sit them up, use the recovery position, or place an OPA). If their chest is rising and falling, is it equal on both sides?
3. Clear mouth of any foreign bodies (food, gum, vomit, blood, broken teeth). If you have a medical suction device, use it. Never put your fingers or anything else past where you can see. Don't try and retrieve a blockage you can't see, you risk pushing it further down.
4. If available, consider placing an oropharyngeal airway (OPA). If the patient has a gag reflex, place a nasopharyngeal airway (NPA) instead. See next page.

The **recovery position** allows blood or vomit to flow out of the mouth, helping maintain a clear airway. It also prevents the tongue from covering the airway. Propping them up on their arm and leg like this keeps them from sliding into a supine (flat on their back) or prone (flat on their stomach) position.