A Practical Guide to
Prolonged Casualty Care

Edited by **Melissa Givens, MD, MPH**
with Carol M. Stockton

What you can do between first aid and delayed arrival of medical care in conflict areas or disaster zones

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FOREWORD

As a doctor of military emergency medicine, I have provided care in war, natural disasters, mass casualty incidents, and even in my local neighborhood, where I learned that life-saving medical care often starts with non-medical people who step in to help.

I have worked in more than 30 countries, where I witnessed the power of this human desire to care for others.

> Laypeople can have an immense effect in a medical crisis when given the right knowledge.

The idea for this book started with a visit in 2023 to Lithuania, where I learned about the Lithuanians' historical resistance efforts during periods of occupation and their current preparations to respond to a future threat. I had the unique opportunity to visit one family's cleverly hidden underground site on their property, which had been used as a resistance printing press. I was deeply moved as they described the real threat of being shot or beaten or imprisoned for their written ideas. As I walked through those dark and secret corridors, it was easy to imagine a time when casualties would need to be cared for in place, because the threat of moving to a medical facility was too great. This idea was reinforced when I met two young physicians leading an effort to train their community in Tactical Combat Casualty Care and Prolonged Casualty Care. Both were able to share stories of their relatives who had to live "underground" and how this emboldened them to educate and prepare their community medically. Clearly the restricted ability to move freely or access medical help was not only just a recent memory, but a real and imminent threat. My colleagues and I saw an opportunity to help when they asked for learning materials related to Prolonged Casualty Care (PCC).

The importance of providing care when medical professionals are not accessible was only underscored when I recently interviewed several medical providers currently engaged in the Ukraine conflict. Nearly all told stories of casualties who waited hours to days to reach medical facilities, noting wounds with infection due to delays in care and limbs lost due to tourniquets that were placed hastily but never reassessed to ensure they were needed. These examples illustrate situations that could be improved

upon by equipping the layperson to respond. Modern war shows us that everyone should be able to provide basic medical care to improve the chain of survival until professional medical care is accessible.

The stories in every conflict of local non-medical people who provided life-saving care outside of established medical channels have always resonated with me. On one of my trips to Sub-Saharan Africa, I met with a group of villagers who were often cut off from access to regional medical facilities when the risks of traveling on the local roads become too great. It was not uncommon for them to have to care for casualties with traumatic wounds and try to provide care with extremely limited resources. Even when they were able to travel, it could take several days to reach professional medical help. So, this imperative—knowing what to do in the interim—is the premise for this book.

As an avid reader of war history, and knowing that history is likely to repeat itself, I wanted to provide more than just a few teaching materials for the select group of people I could reach as a professor at a medical university. And as a university professor, I am acutely aware of the importance of high-quality reference materials that are also easy to use. My vision was to create a globally useful resource that can be used by anyone who wants to provide help. I hope to make it easier for those who want to help when access to professional medical help is restricted. This book is intended to be your companion in the worst of circumstances.

So, imagine this: There is conflict or disaster in the area where you live, leaving you stranded with injured colleagues or loved ones—even strangers—far from immediate help. Suddenly, you find yourself on the front lines of care, responsible for someone's well-being while you wait for professional medical help, which may take hours to days to arrive. This is the reality of prolonged casualty care—a situation where you may be the only person available to provide ongoing medical aid.

This book is your guide to navigating those critical moments. It is written for you, the layperson, the everyday individual with the courage to step up when medical help is delayed. Inside, you will discover practical, easy-to-understand techniques to manage injuries, stabilize conditions, and provide comfort until professional medical help arrives.

This book is intended to equip you with the essential knowledge and skills to:

- **Assess injuries effectively**. Learn how to quickly identify life-threatening conditions and prioritize care.
- **Control bleeding and manage wounds.** Learn techniques to stop bleeding, protect wounds, and prevent infection.
- **Support essential bodily functions.** Discover how to maintain airways, help with breathing, and monitor circulation.
- **Provide comfort.** Learn how to offer care and reduce suffering during a stressful ordeal.
- **Prepare for a safe handover.** Understand how to effectively communicate with arriving medical professionals for a seamless transition of care.

This book is not about replacing professional medical care. It is about empowering you to be a vital link in the chain of survival. It is about providing hope and increasing the chances of survival when faced with the unexpected. This book can give you the confidence to act, the knowledge to make a difference, and the peace of mind that comes with being ready to respond in times of crisis.

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ACKNOWLEDGEMENTS

This book is the result of over a decade of considering how to care for conflict and disaster casualties in the worst of circumstances. The concept of prolonged field care was forged in 2013 when members of U.S. Army 10th Special Forces Group, along with other Special Operations medical forces, were tasked to provide medical support in the most austere locations under my responsibility as Command Surgeon for Special Operations Command Africa. The reality of delayed evacuation demanded a thoughtful approach to ensuring the best medical outcomes in the worst of circumstances. Colonel (Retired) Sean Keenan, Sergeant Major (Retired) Justin Ball, Master Sergeant (Retired) Christopher Mohr, Sergeant First Class (Retired) Paul Loos, Colonel (Retired) Jamie Riesberg, Lieutenant Colonel Doug Powell (all U.S. Army), and a robust working group from the Special Operations Forces medical community, as well as (later) the Joint Trauma System (JTS) originated the concept of prolonged field care, later expanded and adapted to the conventional military with the Prolonged Casualty Care guidelines, adopted across the U.S. Department of Defense and applied to all levels of military responders.

The collective work of countless individuals formed the foundation for this book. I would like to acknowledge the members of the Prolonged Casualty Care Working Group (now sub-Committee of the Committee of Tactical Combat Casualty Care of JTS) and the authors of the *Joint Trauma System Prolonged Casualty Care Clinical Practice Guideline*. The concept for this book was the result of brainstorming with the "mother" of irregular warfare medicine, Lieutenant Colonel Regan Lyon, U.S. Air Force. LtCol Lyon is the author of *When the "Golden Hour" Is Dead: Preparing Indigenous Guerrilla Medical Networks for Unconventional Conflicts*.

This book would not be possible without the support of the Center for Global Health Engagement (CGHE). CGHE provided the administrative support to execute this project and will help distribute the book to partners across the globe. I am grateful to Alex Liu and Tala Farr for keeping myself and all the contributors organized and on task.

I would like to express my sincere gratitude to the Technical Editor, Carol Stockton, for her invaluable contributions that made this work a cohesive book. Her meticulous attention to detail and insightful suggestions significantly enhanced the accuracy, clarity, and overall quality of the work. Her dedication to ensuring the technical content is both precise and accessible to the intended lay audience is truly appreciated. Carol, I am grateful for our weekly calls and the "intermissions" from your borzoi, Vader.

I would like to highlight Christiane Minnick, the creative talent behind the graphics and layout of this book. Her ability to create clear and engaging illustrations and formatting has brought the text to life, enhancing both its readability and impact. Christy, thank you for your patience, your artistic vision, and your dedication to ensuring every image contributes to the reader's understanding. Your work is an integral part of this book's success.

All my work is intended to leave the world a little better place for my children. So to my three girls, you are always my priority even when I am halfway across the globe or buried in my work at home.

I would like to thank my Uniformed Services University "family," specifically Captain Sherri Rudinsky, Chair of the Department of Military and Emergency Medicine, for her support of this endeavor. And last but definitely not least, I am grateful to the students and their mentors who contributed to this book. You are the future of military medicine.

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Abbreviations:

BSA = Bachelor of Science and Arts;
DO = Doctor of Osteopathic Medicine;
MSC/MS/M.Sc. = Master of Science;
BSN = Bachelor of Science in Nursing;
CCRN = Critical Care Registered Nurse;
NRP = National Registry of Paramedics;
BMBS = Bachelor of Medicine, Bachelor of Surgery;
MscMed = Master of Science in Medicine;
MHPE = Master in Health Professions Education; MPH = Master of Public Health

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SECTION 1

Foundations of PCC

CHAPTER 1

An Introduction to Prolonged Casualty Care (PCC): Principles for the Layperson

A disaster happened, and people around you are hurt! You have helped those with serious injuries—stopped their bleeding and checked to make sure they are breathing—and then called for help. You learned that trained medical help cannot arrive for hours—maybe even days—and there is no medical facility available. **Now what do you do?** This book attempts to answer that question.

"Prolonged casualty care" (PCC) means taking care of an injured person (a casualty) for a long time when medical professionals—emergency medical technicians, paramedics, or other trained medical personnel—cannot come to help, or you cannot move the casualty to a facility with medical capability.

Why is it important for you to get involved? The aftermath of a disaster can be a hard thing to witness. Many people may be severely injured, and trained medical responders sometimes take a long time to arrive. If you do nothing to help, people who could be helped may die or become disabled. However, you can make a difference—even save the lives of casualties—through PCC.

The goal of this book is to provide guidelines—based on the best science and field experience available—so you do not have to make life-and-death decisions alone. It provides information for how you—even if you have no special medical training or knowledge—can give basic medical care to trauma casualties during many different scenarios that may occur in conflict or disaster. This book does not cover basic first aid, however, as that information can be found in many other resources.

HOW TO USE THIS BOOK

- Before you encounter a situation that needs PCC, read *Section 1: Foundations of PCC*, which includes this chapter and *Chapters 2–4,* to gain an understanding of how you can provide PCC, manage resources, and communicate and document your care, and who needs care most urgently when the situation calls for you to deal with multiple casualties. You may need to reread these chapters several times to be well prepared.

- ▹ Also read *Chapter 5: Nursing*, which provides an organized approach to the ongoing care that is needed for a casualty, so you can include this in your planning.
- ▹ It is a good idea to read the last chapter in the book—*Chapter 16: End of PCC*—in advance too. It tells you what to do when medical help arrives and how to transfer responsibility for a casualty. And it includes information on how to manage a dying or deceased casualty. Finally, it covers the possible mental and emotional impact of PCC on you, the lay responder.
- ▹ Look through *Section 2: Care of Injuries* (*Chapters 6–15*). These chapters provide information about various conditions, related supplies, and step-by-step instructions for how to manage specific conditions. These chapters are ordered so that they address the most life-threatening concerns first.
- ▹ Most chapters refer you to an appendix (sometimes more than one) for further information. These appendices are located at the end of the book because they relate to more than one chapter.
  - Some appendices provide information to help you understand the anatomy of certain conditions (*Appendix 9a* and *Appendix 9b*), while others provide "Advanced Practices" for those who may have some medical training or experience (*Appendix 10a*, *Appendix 10b*, and *Appendix 10c*).
- ▹ Many chapters also include an addendum with additional information relevant to a specific chapter.
  - For example, at the end of this chapter is a list of symbols and abbreviations (*Addendum A1*) used later in the book, for those who may not be familiar with some of them.
- ▹ Finally, this book is designed for you to add your own notes. Throughout, you will find pages and spaces to allow (and encourage) you to do this.

Going forward, every injured person will be referred to as a "casualty." You and others taking care of them will be called "lay responders."

The **10 guidelines** in this chapter are ones you can—and in some cases, must—follow even when you do not have fancy tools or technology, and

regardless of your knowledge or skills. These guidelines have been used by the U.S. military for many years because they work.

DO NOT become a casualty while you are helping casualties stay alive long enough to get care from trained medical personnel.

And remember, you do not have to be a doctor or a nurse to help someone with a medical problem. Just be willing to do what you can.

10 GUIDELINES FOR PCC

#1: Life-saving

Do everything you can to save a casualty's life.

- Life-threatening trauma in casualties due to conflict or disaster often involves massive bleeding, airway and respiration (breathing) problems, circulation (shock), head injuries, and/or hypothermia (low temperature).
- To help stay organized and address life threats in order of importance, remember "MARCH":

  M = Massive hemorrhage (bleeding – *Chapter 6*)

  A = Airway (*Chapter 7*)

  R = Respiration (breathing – *Chapter 7*)

  C = Circulation (shock – *Chapter 8*)

  H = Head Injury (*Chapter 9*) and Hypothermia (low temperature – *Chapter 10*)

Less life-threatening concerns can be addressed after the MARCH sequence. These concerns include pain management (*Chapter 11*), medications (*Chapter 12*), care of wounds and fractures (*Chapter 13*), burns (*Chapter 14*), and hyperthermia (heat injuries – *Chapter 15*), as well as ongoing nursing care (*Chapter 5*).

#2: Teamwork

Form a team with others willing to help, choose a Team Leader, and begin working together.

- ▹ DO NOT try to do everything alone! Get help when you can. This may include casualties who are not badly injured.
- ▹ You may not be able to choose the people on your team, but they will be all you have, so work together!
- ▹ Choose the person who is most experienced to be the Team Leader, or ask for a volunteer.
- ▹ The Team Leader must help explain what to do and find a way to motivate the other lay responders to keep helping.
  - For example, the Team Leader may need to ask their teammates to move casualties, get supplies, or check to see if others are injured.
- ▹ Teams help each other win, and winning PCC is getting out of PCC with as many surviving casualties as possible.
- ▹ *Chapter 4: Triage* provides details about how to put together an effective team during triage that can continue to be effective throughout PCC.

#3: Look and Sort ("Triage")

Look at all of the casualties, decide what to do, and decide who needs your help first.

- ▹ *Chapter 4: Triage* provides details about how to perform triage (sorting and prioritizing) in a PCC situation with multiple casualties.
- ▹ Work in order of the MARCH sequence and then address medications, wounds, fractures, and other nursing care after addressing all life threats.
- ▹ After you have helped all the serious casualties—stopped their bleeding, checked their airways, and called for help—check each casualty again to find anything you may have missed before. Smaller injuries and other issues that are not cared for may become big problems later.

#4: Measure and Record

Write down what you find and do, to keep track for when medical personnel can take over.

- Record details about each casualty, including identification, personal characteristics (age, gender, height, weight, and so on), and anything you know about the circumstances of their injury.
- Measure and write down each casualty's "vital signs," including heart rate, blood pressure, respiratory rate, mental status, temperature, and oxygen saturation. See *Appendix 2a–f* for how to do this.
- Record what goes into (food, water) and what comes out of (urine, feces) a casualty.
- Record all injuries and any associated care.
- Record all medications given to a casualty.
- *Chapter 3: Communication and Documentation* provides details about what and how to record information so you can pass it on at the end of PCC.

#5: Communicate

Talk to medical personnel over the phone or internet.

- Get help from an expert, if you can!
- Before you call for medical help, gather all the information you have about your casualty: how they got hurt, how badly they are hurt, what you have done to help them, and the "vital signs" you have written down.
- *Chapter 3: Communication and Documentation* provides details about communication during and at the end of PCC.

#6: Surroundings

Pay attention to the environment.

- The environment can quickly affect a casualty and the situation. When you are too cold, you can put on a jacket, and when you are too hot, you can move, but your casualty cannot always do that. They are

also more likely to be affected by sun, heat, or cold. Keep your casualty as safe and comfortable as your surroundings and situation allow.

- ▷ *Chapter 2: Planning and Managing Resources* has details about the PCC environment.

#7: Self-Care

Take care of your team.

- ▷ If you and your team are not healthy, you cannot save lives and succeed during PCC. Plan for when **you** sleep, wake up, eat food, drink water, and use a toilet.
- ▷ Someone should always be with a casualty while other lay responders are eating or resting.
- ▷ If you are alone, do not forget to do the same things for yourself. This may mean sleeping near a casualty and taking breaks to eat or drink.

 # 8: Watch

Check every casualty again and again.

- ▷ Keep an eye on each casualty and fix anything you think needs to be addressed. Pay close attention to the things that are hard to see, like vital signs, loose tourniquets, and body temperature.
- ▷ Go back over all the problems you wrote down during #3 and #4 above, and ask these questions:
  - How has this casualty changed from the last time I saw them? Is this casualty staying the same, getting better, or getting worse?
  - Is this casualty still sick or not? If they are healthy enough, they can help your team with others, or they can move to another safe place.
- ▷ *Chapter 5: Nursing* covers how to provide ongoing care for casualties.

 # 9: Moving

Be ready to move your casualties.

- ▷ Stay organized and be ready to move. Situations change quickly, and you may need to move to a new place.

- Look for items you can use to help move your casualties: doors, vehicles, wheeled platforms, and the like. Or use manual carrying techniques (see Figure 1.1) to move them.
- Remember: If you must drag or carry a casualty, the ground may be rough. Avoid letting a casualty hit obstacles like trees and walls.
- The ground may be wet or cold. Place coats, sleeping bags, or backpacks under casualties to insulate them as much as possible.

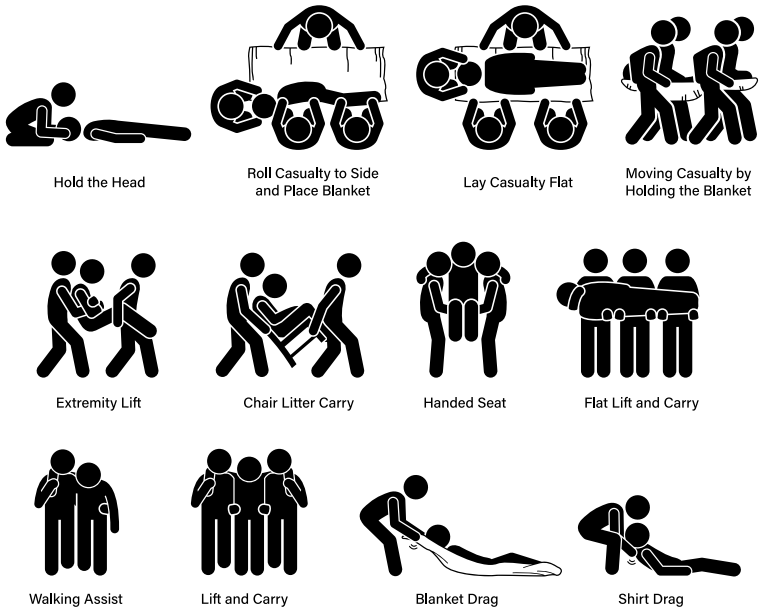


Figure 1.1. How to move an injured casualty

10: Transfer (End of PCC)

Give your notes to medical personnel when you transfer the casualty.

- Once you find someone who knows more about medical care than you do, it is time to share what you have written down, including how the casualty has responded to your care (see *Chapter 3: Communication and Documentation*). Tell them anything important that they may not be able to see, like medications you used for the casualty.
- If possible, continue helping the medical personnel. Lead them to the site of other casualties when the situation allows it.

- When it is possible and appropriate, praise your team, pause to recognize the fatalities, and reflect on doing your best to help others survive. If other priorities are more pressing at the moment, remember or write down praises to pass on later, when you can.
- When everything else is done, take care of yourself. PCC can be hard on the lay responder, both physically and emotionally. Read *Chapter 16: End of PCC* to learn more.

GOING FORWARD WITH PCC

We applaud you for choosing to prepare yourself. No one wants to be faced with a life-or-death situation that requires you to provide care—beyond your training or experience—for those around you. Reality sometimes has other plans, so you have chosen to prepare yourself for this grim task. We hope this book helps if you are ever faced with a situation in which you need to use this information.

We also recognize that each PCC situation will be unique and will require you to think on your feet. We cannot know your level of experience, and you likely will have limited access to supplies and equipment, so we have provided *Best*, *Better*, and *Good* approaches where possible.

This book is intended as a guideline for care during PCC. It is not a substitute for professional medical treatment.

FOR MORE INFORMATION

Prolonged casualty care is similar to tactical combat casualty care. For more information, you can read the U.S. Army's basic guide on how to approach casualties, *Tactical Combat Casualty Care Handbook* (https://api.army.mil/e2/c/downloads/2023/01/19/31e03488/17-13-tactical-casualty-combat-care-handbook-v5-may-17-distro-a.pdf).

At the end of this PCC book is a list of the references used in creating it, if you would like to learn even more.

ADDENDUM A1: ABBREVIATIONS AND SYMBOLS

Many abbreviations are used throughout this book for units of measure, both metric and English. For readers who are not familiar with any of these, we provide a list of abbreviations accompanied by their full spellings.

Abbreviation	Stands For	Abbreviation	Stands For
–	to (when between numbers)	L	liters
#	number	lb	pounds
+	plus	m	meters
×	by or multiply	M	male
<	less than	mg	milligrams
>	more than	mi	miles
cc	cubic centimeters	min	minutes
cm	centimeters	mL	milliliters
F	female	mL/h	milliliters per hour
fl oz	fluid ounces	mL/kg/h	milliliters per kilogram per hour
ft	feet	°	degrees
gal	gallons	°C	degrees Celsius
h	hours	°F	degrees Fahrenheit
in	inches	oz	ounces
kg	kilograms	tsp	teaspoons
km	kilometers	yd	yards

CHAPTER 2

Planning and Managing Resources

How you manage resources in a prolonged casualty care (PCC) situation depends on the situation, location, and resources available, so there is no one-size-fits-all guide to planning for PCC. You will need to adapt the information in this chapter to your situation.

This chapter covers "logistics"—that is, how to plan, organize, and coordinate resources to help you carry out the tasks needed for successful PCC. You can do this planning before, during, or after an event, but planning before is best. For logistical planning, follow the 5-step process of PAPER: Predict, Assess, Plan, Execute, and Recover (Figure 2.1).

Step 1: Predict possible situations, injuries, and illnesses to help predict what you may need to treat casualties' conditions. Where will medical care be provided? Who might be available to help? What supplies might be available? How long will PCC be needed? From the answers to these questions, you can create a plan to use when PCC is needed.

Step 2: Assess your resources. Think about what resources are available, and what resources may not be available. These resources include supplies and shelter, but also people with medical knowledge and training.

Step 3: Plan for the worst situation possible.

Step 4: Execute (carry out) your plan.

Step 5: Recover and rebuild when PCC is no longer needed.

Along with this 5-step process is the ongoing cycle of "**respond, reassess, and adapt**" as challenges come along. This is especially important during PCC. Each time you encounter a new problem, you will have to decide how to respond, then reassess your plans, and change those plans if needed to address new problems.

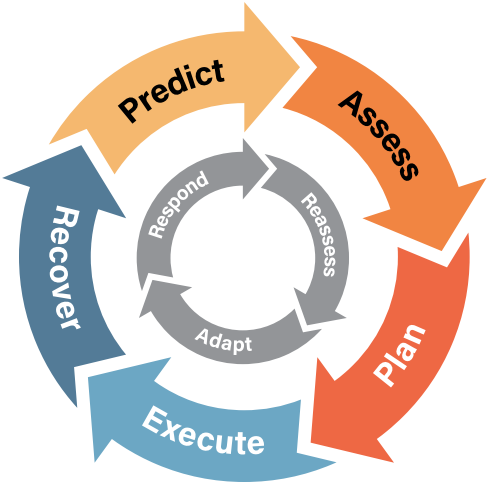


Figure 2.1. The logistics "PAPER" process

However, if you have not prepared *before* an event, most of what you do with regard to supplies during PCC should be done *after* triage (see *Chapter 4*) and *after* you have finished dealing with life-threatening injuries.

IN THIS CHAPTER

MEDICAL AND OTHER RESOURCES

The resources you will need in a PCC situation depend on the nature of the situation. The supplies and resources needed for PCC in general fall into four basic categories, but the very nature of PCC means that, most likely, you will not be able to obtain everything you need.

Medications

Medications include prescription drugs (those normally available only when ordered by a doctor) and over-the-counter medications. Details about medications and how to give them are provided in *Chapter 12: Medications*.

Medical Supplies

Medical supplies include disposable or consumable items used during the treatment of casualties. Common examples are bandages, gauze, gloves, needles, syringes, and masks. Most of these should be discarded after one use, especially if they come in contact with bodily fluids or are otherwise soiled. Details about medical supplies are provided in various chapters and appendices of this book, including alternatives for when you don't have certain supplies.

Medical Equipment

Medical equipment includes durable items such as stethoscopes, blood-pressure cuffs, pulse oximeters, thermometers, and oxygen concentrators. These can be cleaned and used repeatedly on multiple casualties. Specific medical equipment is described in various chapters and appendices of this book, including options for when you don't have a piece of equipment.

Sometimes medical equipment has disposable pieces that need to be replaced between uses. Usually these are the pieces that touch a casualty or their body fluids.

Other Important Supplies and Resources

Other items that help when providing medical care include clean water, electricity, personal care items like soap and toothpaste, batteries, portable lights, blankets, sheets, and dry clothing.

Common items such as pens, paper, tape, scissors, candles, matches, cleaning supplies, cooking implements, shovels, tables, and chairs are often taken for granted, but you will need these and other household and office items during a disaster situation to provide PCC. A complete list of the supplies (medical and other) mentioned in this book is available as *Addendum A2: PCC Supplies Shopping List* at the end of this chapter.

Resources also include people and their special knowledge and skills.

MANAGING RESOURCES

Assess Available Supplies and Resources

Once you have some idea of the medications, medical supplies, medical equipment, and resources you need to help provide medical care to casualties, consider how and where to get them, how to store them, how to use them without waste, how to track them, and how to get more of them.

When you know what medications, medical supplies, medical equipment, and other resources are available, then you can determine:

- what conditions you can treat
- what you cannot treat

Collect and Store Supplies and Equipment

First collect what is already on hand within your area. Then consider various places nearby where you can obtain what you need—both medical and non-medical supplies—such as pharmacies, medical supply stores, veterinary supply stores, and general stores. If you have other people available to help, send someone (or maybe even a team) to collect supplies and equipment after initial life-saving measures have been taken care of (see *Chapter 4: Triage*).

Store your supplies and equipment in a clean, dry location, preferably one where you can control the temperature, to maintain their effectiveness and conserve supplies as long as possible. Use sealable plastic bags or containers to reduce the risk of exposure to moisture. Medication especially is affected by temperature and moisture, which can reduce its effectiveness.

Organize your supplies and equipment using bags, boxes, shelves, or other means of organization so you can find what you need easily, as well as determine what and how much you have on hand. Use as few locations as possible, so you can find things easily. Use an inventory (see below) so you know where to find things, as well as when to restock items to avoid shortages.

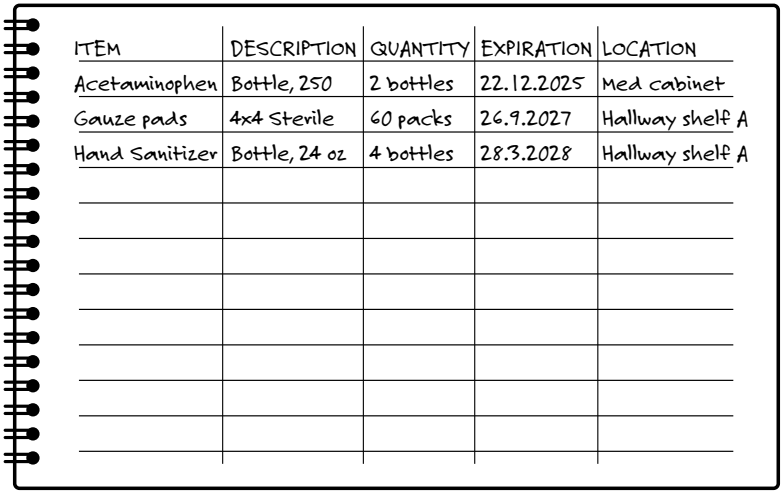
Label things clearly so you and others can find what you need quickly.

Create and Maintain an Inventory

Create an inventory of the supplies and equipment you have collected, and update it often. This can help you keep track of what is available, so you can use items carefully. Your inventory should include at least the following information: item name, description, amount available, and item location. Over time, you can add consumption rates, item expiration dates, and other details to control the use of potentially limited resources (Figure 2.2).

TIP

If resources are not stored together, create an inventory for each location to help you find items, as well as a master inventory with locations, to help with planning decisions.



ITEM	DESCRIPTION	QUANTITY	EXPIRATION	LOCATION
Acetaminophen	Bottle, 250	2 bottles	22.12.2025	Med cabinet
Gauze pads	4x4 Sterile	60 packs	26.9.2027	Hallway shelf A
Hand Sanitizer	Bottle, 24 oz	4 bottles	28.3.2028	Hallway shelf A

Figure 2.2. Sample inventory

Conserve Supplies

In a disaster, there will be supply shortages. Try to use items as sparingly as possible to stretch their availability. Even when you use items carefully, at some point you may have to ration medical supplies and withhold them from some casualties. These decisions may have life-and-death consequences and can be challenging, but the decisions still have to be made.

The specific situation (natural disaster, armed conflict, and so on), type and number of casualties, goals of care, amount of available supplies, and the chances of getting more supplies must all be considered when you make decisions about supply use.

The following guidelines can help you make such decisions, but you must use your judgment to decide which to use at any particular time.

- **Maximize benefit:** Save the most lives possible.
- **Distribute equally:** Use random selection (lottery) to allocate resources.
- **Recognize value:** Focus on those who may contribute to the greater good or those whose expertise cannot be replaced.
- **Prioritize those who are youngest:** Focus on those who have the most future years to contribute.
- **Prioritize those who are sickest:** Focus on casualties who are worst off.

Each principle has advantages and disadvantages, and in most situations you will use more than one of these principles together. Perhaps the most important factor is to make sure your decisions take into consideration the values of the community.

More suggestions for the use of medical supplies are:

- Use durable, reusable items before you use disposable alternatives.
- Make sure you understand how to handle, store, and inventory supplies.
- Make sure you use medical supplies and equipment correctly to prevent waste.
- Avoid contaminating or damaging medical supplies and equipment.
- Share supplies and equipment with others.
- Use medical supplies only when there is a medical need.
- Use medical supplies appropriately.
- Reuse disposable items on the same casualty when it is safe to do so.
- Reuse disposable items on multiple casualties if they can be cleaned or sterilized between uses.
- Find readily available alternative supplies.

Maintain Medical Equipment

Medical equipment often requires special skills, storage, maintenance, and cleaning, but you can maintain the equipment mentioned in this book if you have it, as follows:

- Keep user manuals, if you have them, in a convenient location, preferably with the equipment.
- Store equipment in clean, cool, dry locations.
- Keep equipment clean and sanitary.
- Follow equipment maintenance procedures as much as possible.
- If you must modify equipment, make sure it does not prevent normal use in the future.
- DO NOT use damaged equipment unless absolutely necessary.

Keep all information about a piece of equipment stored securely in one place. Note the location in your inventory.

Expired Medications and Supplies

Medications and supplies usually have an expiration date somewhere on their packaging or label. Note these dates in your inventory or otherwise keep track of them. Regularly check expiration dates to prevent the accidental use of expired items.

DO NOT use expired medications unless there is no alternative. However, in a disaster situation, the only medications available may be ones that have expired.

Expiration dates tell you that a medication is both safe AND effective. After its expiration date, a medication may not work as well. For example, many antibiotics lose their strength over time, so they may not fight infections as well after their expiration date.

Expired medications could also be unsafe or contaminated, but this is not common. Medications are more likely to be contaminated because the seals on their containers break down, or they have already been opened. Always check the seal of a container, as well as its expiration date. If a

medication is past its expiration date, look at the contents to see if they appear in good condition, and use it only if you have no other option.

Some medical supplies also have expiration dates because some of their materials can degrade over time. Glue that seals sterile items, rubber, and plastic can break down over time and make items less safe. Items such as alcohol pads and other cleaning solutions can dry out over time. If an item is past its expiration date, and you have no other option, examine it to make sure it will still function for your need.

DO NOT use a medication or other item if you think it may be unsafe or may not work.

Consider all other options before using expired items. Many medications have more than one use, so consider possible alternatives that have the same effects. If you must use expired medical items, carefully weigh the risks against the potential benefits. Get advice from a healthcare professional when possible.

Make expiration dates part of your inventory. Use those supplies that are closest to their expiration date first to reduce waste and reduce the risk of using expired items accidentally.

Improvising Supplies and Resources

In PCC, you may need to find alternatives to normal medical supplies, especially for items in short supply or used often. Sometimes a medical supply can be used for different purposes, and many ordinary household items can be used for improvised medical purposes, such as using a belt as a tourniquet, clean linen for bandages, or boards as a splint. Resourcefulness is important, but the risks of using improvised items must be considered carefully. For example, could an improvised item fail when it is needed? Could supplies be contaminated?

CHOOSING A PCC ENVIRONMENT

Creating an environment for PCC means finding, securing, and organizing a location for medical care, and then planning how to deliver care in that location as safely and effectively as possible. The factors below will help you provide medical care as easily and safely as possible, whether you are re-using a clinic or hospital that has been disrupted by disaster or creating a medical environment from any kind of shelter.

Location Near the Disaster Area

The PCC environment needs to be as close as possible to the disaster area, so casualties can get there in time for help. But you also must consider the safety of the casualties and lay responders. Whatever caused the initial disaster—warfare, riots, crime, structural collapse, fire, flooding, earthquake, contaminated water—can threaten you and the other people present. The facility should be far enough away from danger to limit ongoing risk.

Exposure to the Environment

Consider the climate, weather, and risk of exposure for lay responders, casualties, and supplies. Heat, cold, water, wind, blowing debris, ultraviolet light from the sun, and insects and other animals can all have negative effects on medical conditions. They can also damage supplies and equipment.

At best, a PCC facility should be inside the sturdiest building or structure available. This may be a damaged hospital, a house, an improvised shelter, or a cave. If possible it should:

- ▷ be sturdy and well built, with an intact roof
- ▷ be free of standing water
- ▷ have enough natural lighting, especially if artificial lighting is not available
- ▷ be protected from insects, rodents, and other pests
- ▷ be well ventilated
- ▷ have hard flooring and other surfaces that can be cleaned well

Some features may be more important than others, but you will have to consider all these factors when deciding what available facility will provide the best combination of features.

You can cover windows and other openings with plastic sheeting, tarps, and cardboard to provide protection from sun, wind, rain, cold, and insects.

Access to the Facility

Access to the PCC facility is an important consideration. Make sure that casualties can get there and that unauthorized people cannot enter. If possible, choose a facility with one entrance and one exit, to help control who enters and exits the facility. Find some way to lock or secure openings, if you can. You may need guards to control access and prevent looting or theft. Depending on the size of the facility, you may need to keep records of who enters and exits.

Number of Casualties

The type of disaster and how populated the local area is can help you estimate the number of casualties to expect. This affects how large your PCC facility needs to be, including space for storage and other support needs. In a prolonged disaster, the number and types of casualties also may change. For example, right after an earthquake most casualties will be due to injuries, but days to weeks later most new casualties will be due to infections caused by contaminated water and bad living conditions.

Water

Clean water is needed for drinking, washing casualties and their wounds, cooking, handwashing, bathing, and cleaning equipment. Clean running water is best, but normal water sources may not be available. If you know a disaster is coming, store clean water from normal sources while you can. Plan for 2 gallons of water per person per day just for drinking, cooking, and minimal bathing. Even more is needed for medical care.

Store clean water for future use. Save jugs, pitchers, and hoses to store and transfer water.

Water tanks that work without electricity are best for a PCC area. Other sources of clean water include water heaters and toilet tanks. Water from swimming pools can be used for purposes other than drinking, such as washing hands and supplies, or wound irrigation if no other water is available. You also can collect water during periods of rain, from bodies of water, or from condensation or transpiration from plants (Figure 2.3).

TIP

There are various ways to clean water. *First strain it through cloth to remove large debris. After straining, sterilize water for drinking by boiling it for 1 minute (or 3 minutes if you are above 2,000 meters [6,560 feet] elevation).*

You can also sterilize water for drinking by adding 8 drops (about 0.6 milliliters, or ⅛ teaspoon) of about 5–8% unscented household bleach to 4 liters (1 gallon) of clear water. You also can use a commercial water filter or water purification tablets (found online and at stores that sell camping and hiking supplies).

Figure 2.3. A plastic bag tied around a leafy branch with a small rock inside can collect relatively clean water for drinking.

Food

Food is very important for keeping energy and health during PCC. Plan for at least 2,000 calories per person each day, adjusting for individual needs and activity levels. Casualties may require more calories and more protein to heal. For example, casualties with large burns can need 3,000 calories or more per day.

Non-perishable food items are best: canned goods, dried fruits, nuts, seeds, grains, and ready-to-eat meals (MREs). Protein bars and powdered protein are valuable because they can be stored for a long time and are nutritious. The best choices are foods that require little preparation or that are ready to eat, because cooking facilities are likely to be limited.

Store food in cool, dry places using airtight containers to protect against pests and moisture. Clean and safe food handling is crucial to prevent foodborne illnesses. Ensure meats are fully cooked, especially poultry, pork, and shellfish.

Use fresh food and older items first before they spoil or expire.

DO NOT cook more food than you can use right away if refrigeration and proper storage for leftovers are not reliable.

Electricity, Heat, and Fire

Electricity may not function during and after a disaster. This will impact things such as lighting, heating, and some medical equipment. If normal electricity is not available or reliable, you can use portable generators that run on fuel, solar, or other sources of energy for essential tasks. Portable battery packs with or without solar panels can serve as temporary back-up electricity. However, conserve fuel because it may become scarce. Even sunlight is limited by weather or changing seasons.

Generators that burn fuel produce exhaust fumes that can be deadly if not ventilated. Only use them outdoors and keep them as far from inhabited structures as power cords and wiring will allow. They also produce a lot of noise, which can be a problem for communication and sleep.

You can use small portable stoves that run on propane, butane, or wood to heat food and water, but they pose a risk of fire, smoke inhalation, and burns. You also can use an open fire, but this poses even higher risks than stoves.

Have power sources that run on a variety of fuel types, for when one fuel type is no longer available.

MANAGING THE PCC ENVIRONMENT

Environment and Equipment Cleanliness

Carry out PCC in the cleanest environment possible. Clean surfaces and equipment between use. For medical instruments used only on a single casualty, clean them between uses. If you need to use a medical instrument on more than one casualty, you need to sterilize it before you use it on a different casualty. Do the best you can.

Have a pressure cooker or large metal pot on hand to sterilize water and instruments.

First clean any instrument of visible contamination with soap and water (or just water if you do not have soap) before sterilizing. You can sterilize some smaller equipment using a household pressure cooker for 40 minutes. Boiling instruments in clean water for 20 minutes is less effective, but it is a reasonable alternative. Both methods can be done without electricity.

Waste Management

Waste disposal is essential to prevent disease, contamination of water, attracting pests, and other problems. Waste includes solid trash, wastewater, food waste, human waste, and medical waste. Each kind needs different handling and disposal.

Solid trash (not including food waste, human waste, or medical waste) can potentially be reused. You can repurpose plastic, metal, and glass items for various uses. Items such as paper, cardboard, and lumber can be burned for fuel, but keep in mind the risks of open fires. Solid trash that you do not intend to reuse should be dumped at least a kilometer (0.6 miles) away from human activities.

Wastewater from washing ("greywater") is water that does not contain human waste. It can often be reused for watering plants, flushing toilets,

or cleaning outdoor areas. Otherwise, greywater can be poured onto absorbent ground at least 200 meters (about 220 yards) from human settlements.

Food waste can be used to feed animals or composted. Otherwise, it should be burned or buried.

Human waste. Urine carries less bacteria than feces, so isolated urine can be disposed of like greywater. Feces pose a serious health risk and should be disposed of with care. Some kinds of human waste are considered medical waste (see below).

When running water is not available, line toilets or other vessels with bags for easier disposal. Place the bags with waste in sealed containers for future disposal as described below.

A 20 liter (5 gallon) bucket with an improvised seat can serve as a temporary portable toilet. Line the bucket with a bag to make disposal easier. Add sodium hypochlorite (household bleach) diluted in water to a 1:10 solution or chlorinated lime to the bags after use.

When possible, collect urine separately from feces. Disposal of urine is easier.

For safe disposal of human waste outdoors, dig trenches or "catholes" for use as toilets and to dump human waste. Bury feces in a "cathole" 15–20 cm (6–8 in) deep and at least 200 meters (660 feet) from water sources and human activities. Shallow trench latrines can support more people. A trench latrine should be at least 20 cm (8 in) wide and at least 15 cm (6 in) deep, but 0.5 meters (20 inches) deep is better. The deeper the trench, the longer it can be used safely.

If you have it, calcium hypochlorite (chlorinated lime) can be used to control odors and kill some bacteria in human waste. Sprinkle a layer across the waste after each use of a latrine. Use personal protective equipment such as gloves, eye protection, and mask if possible when handling it. Cover the waste with dirt after each use or when the bottom of the trench is full.

Medical waste includes:

- blood or blood-soaked items
- human flesh
- materials drained from wounds or body cavities (excluding non-bloody urine)
- vomit
- protective equipment worn when treating a casualty with an infectious disease or infected wound (masks, gowns, gloves)
- disposable medical supplies contaminated with casualties' bodily fluids
- needles and scalpels (also known as "sharps")

Avoid contaminating other surfaces and materials when disposing of medical waste. Store medical waste in closed containers for future disposal. Before disposal, consider whether any of these materials can be cleaned and reused safely on the same casualty in order to conserve resources.

Store sharp waste materials such as needles and scalpels in hard-walled containers or dispose of them in some other way that will prevent future injury or exposure. Label their containers clearly with a warning such as "SHARPS."

Solid waste such as plastic or metal food containers can be used to store used or contaminated sharps such as needles and scalpels.

Managing Fatalities

Dead bodies can be very difficult to manage and can have an emotional impact on those responsible for handling them. When possible, honor cultural and religious beliefs. Keep records of names, dates of birth, and any other identifying information available. If a body cannot be reliably identified, note it as "believed to be." If identification is not possible, record the location found, note any possibly identifiable features like scars or tattoos, and keep personal effects labeled and stored securely to help future identification. Handle dismembered limbs and other body parts the same way if you cannot identify who they belong to.

You need to bury bodies as soon as possible, at least 1.5 to 3.0 meters (5 to 10 feet) below the surface to avoid attracting insects and animals. Decaying human remains pose health hazards, so locate grave sites at least 300 meters (1,000 feet) from water sources and human activities.

Burning of dead bodies (cremation) is another way to dispose of human remains, but it prevents later identification and requires a lot of fuel. Therefore, use cremation only when burial is not possible.

SUMMARY

Understanding and planning for PCC during a disaster can make an extremely difficult situation easier. When the normal healthcare system is overwhelmed or unavailable, you must be equipped to care for yourself and others—including medical care—using whatever supplies you can find.

Gather knowledge and resources in advance to make sure you have essential medical supplies and equipment when you need them. Develop a plan that outlines where you can get, store, and access supplies quickly and efficiently during an emergency. Create emergency kits or stockpile items in secure locations.

Overall, the success of PCC in a disaster situation depends greatly on how well you prepare. If you know and practice the key aspects of planning, storage, and inventory management, you can empower yourself and others to provide essential medical care and support in times of crisis. Remember: Being prepared saves lives.

FOR MORE INFORMATION

Water: Information about how to find clean water and how to make water safe in an emergency is available from the U.S. Centers for Disease Control and Prevention at https://www.cdc.gov/water-emergency/about/how-to-find-clean-water-in-an-emergency.html and https://www.cdc.gov/water-emergency/about.

Human waste management: Further details and suggested configurations can be found in the United Nations *Disaster Waste Management Guidelines* at https://eecentre.org/Modules/EECResources/UploadFile/Attachment/Disaster_Waste_Management_Guidelines.pdf.

Additional tips can be found through the Loma Linda University Emergency Sanitation web page at https://llu.edu/campus-spiritual-life/emergency/emergency-sanitation.

Managing dead bodies: Further details are available in the International Review of the Red Cross publication *Management of Dead Bodies after Disasters* at https://www.icrc.org/sites/default/files/external/doc/en/assets/files/other/icrc_002_0880.pdf.

ADDENDUM A2: PCC SUPPLIES SHOPPING LIST

This is an alphabetical list of supplies mentioned in this book for use during PCC, in case you want to put together your own collection for use in an emergency. Medications are listed separately in *Addendum A12* at the end of *Chapter 12*. (Book Section abbreviations: Ch. = Chapter, Add. = Addendum, App. = Appendix.)

Item	Alternate	Use (Book Section)
Adhesive bandage (sticking plaster)	Gauze and tape	▪ App. 4: Dressings
Antibiotic ointment (Neosporin, Bacitracin, mupirocin, Silvadene) *Note: Silvadene is for use with burns only*	Honey, petroleum jelly	▪ App. 4: Dressings ▪ Ch. 5: Nursing ▪ Ch. 13: Wounds
Baby or body powder	—	▪ Ch. 5: Nursing
Bag-valve mask (BVM)	—	▪ Ch. 7: Airway
Baking soda	—	▪ App. 5: Wound-cleansing solutions ▪ App. 6: ORS ▪ Ch. 5: Nursing
Bandage, cohesive roll (Coban, kling, vet wrap)	—	▪ App. 4: Dressings
Bandage, conforming roll (elastic bandage, ACE)	—	▪ App. 4: Dressings
Bandage, gauze	Bed sheeting, other clean fabric	▪ App. 4: Dressings

Item	Alternate	Use (Book Section)
Bandage, triangular	Bed sheeting, bandanna, scarf	▪ App. 4: Dressings ▪ Ch. 13: Wounds
Batteries, assorted	Solar panels	▪ Ch. 2: Resources ▪ Ch. 5: Nursing
Bed sheeting (linens)	Any clean fabric (curtains, clothing)	▪ Ch. 2: Resources ▪ Ch. 5: Nursing ▪ Ch. 8: Shock ▪ Ch. 10: Hypothermia ▪ Ch. 14: Burns ▪ Ch. 15: Hyperthermia
Blankets, emergency (space)	Any impermeable material (plastic wrap, foil, tarp, shower curtains, plastic trash bags)	▪ Ch. 2: Resources ▪ Ch. 5: Nursing ▪ Ch. 8: Shock ▪ Ch. 10: Hypothermia
Blankets, padding, pillows	Any insulating and cushioning material	▪ Ch. 2: Resources ▪ Ch. 5: Nursing ▪ Ch. 10: Hypothermia ▪ Ch. 11: Pain
Bleach, household (hypochlorite solution)	—	▪ App. 5: Wound-cleansing solutions
Blood-pressure cuff or device	—	▪ App. 2c: Blood Pressure ▪ Ch. 8: Shock
Bubble wrap	Plastic sheeting	▪ Ch. 10: Hypothermia
Buckets (some with lids) – 20 liters or 5 gallons, some smaller	—	▪ Ch. 2: Resources
Bulb syringe	—	▪ Ch. 5: Nursing ▪ Ch. 7: Airway ▪ Ch. 14: Burns
Burn Wound Calculation, Rule of Nines diagram *Note: Make copies in advance*	Paper or notebook	▪ Ch. 14: Burns, Add. B14
Calcium hypochlorite (chlorinated lime)	Calcium hydroxide (hydrated lime)	▪ Ch. 2: Resources

Item	Alternate	Use (Book Section)
Candles	—	▪ Ch. 2: Resources
Catheter, condom	Leakproof bucket	▪ App. 7: UO ▪ App. 8: Catheters ▪ Ch. 8: Shock
Chairs	Camp stools	▪ Ch. 2: Resources
Chest seals, vented and non-vented	Plastic sheeting	▪ Ch. 7: Airway
Chlorhexidine (Hibiclens)	Soap	▪ Ch. 14: Burns
Cleaning supplies	—	▪ Ch. 2: Resources
Clips (assorted sizes)	Tape, rubber bands	▪ App. 4: Dressings
Clothing, extra, various sizes	—	▪ Ch. 2: Resources ▪ Ch. 10: Hypothermia
Cold packs	Ice	▪ Ch. 11: Pain
Condoms	—	▪ App. 7: UO ▪ App. 8: Catheters
Containers, clear, graduated *Note: Graduated markings can be added to containers*	Water bottle, measuring cup, any watertight container with graduated markings	▪ App. 5: Wound-cleansing solutions ▪ Ch. 14: Burns
Containers, airtight and watertight (leakproof): various sizes	Sealable plastic bags	▪ App. 5: Wound-cleansing solutions ▪ App. 7: UO ▪ App. 8: Catheters ▪ Ch. 2: Resources
Container, waterproof, extra-large (plastic pool, animal trough) *Note: Must be large enough for an adult human body*	—	▪ Ch. 15: Hyperthermia
Cooking containers (pots, pans, bowls, other)	—	▪ Ch. 2: Resources ▪ Ch. 5: Nursing

Item	Alternate	Use (Book Section)
Cooking utensils, various	Any tableware	▪ Ch. 2: Resources
Cots	Mattresses, stretchers, yoga mats	▪ Ch. 5: Nursing ▪ Ch. 10: Hypothermia
Cups, paper	Any drinking container that can be washed	▪ Ch. 5: Nursing
Dakin's solution *Note: See App. 5 for recipe*	Saline solution, clean (potable/drinkable or boiled) water	▪ App. 4: Dressings ▪ App. 5: Wound-cleansing solutions
Dowels	Pens, pencils, chopsticks	▪ App. 3: Tourniquets
Dressings, miscellaneous	—	▪ App. 4: Dressings ▪ *Note: See App. 4 for additional special types and materials*
Drinks, alcoholic	Pain medications (see Ch. 12 and App. 10)	▪ Ch. 11: Pain
Drinks, oral rehydration solution (commercial ORS, electrolyte, sport): premixed or powdered *Note: See App. 6 for recipe*	Water with electrolytes	▪ App. 6: ORS ▪ Ch. 5: Nursing ▪ Ch. 13: Wounds ▪ Ch. 14: Burns ▪ Ch. 15: Hyperthermia
Drinks, warm (tea, hot chocolate, broth)	—	▪ Ch. 10: Hypothermia
Electric blanket *Note: Requires electricity*	Any active-heating blanket or pad	▪ Ch. 10: Hypothermia
Emergency contact lists	—	▪ Ch. 3: Communication
Eye ointment, eye drops	—	▪ Ch. 5: Nursing
Foil wrap	Emergency blankets	▪ Ch. 10: Hypothermia
Fuel: gasoline, propane, butane, firewood	Solar panels	▪ Ch. 2: Resources

Item	Alternate	Use (Book Section)
Gauze (2×2, 4×4, roll)	Sheeting or other clean fabric	▪ App. 4: Dressings ▪ Ch. 5: Nursing ▪ Ch. 6: Bleeding
Gauze, non-stick	Any clean fabric	▪ App. 4: Dressings
Gauze, hemostatic	—	▪ App. 4: Dressings
Generator, portable *Note: Requires fuel*	—	▪ Ch. 2: Resources
Gloves, disposable	—	▪ Ch. 2: Resources ▪ Ch. 5: Nursing ▪ Ch. 8: Shock ▪ Ch. 13: Wounds
Glow sticks	—	▪ Ch. 4: Triage
Gowns, medical	—	▪ Ch. 2: Resources
Hand sanitizer, alcohol-based	Soap	▪ Ch. 5: Nursing
Heat packs	Hand and foot warmers, other sources of heat	▪ Ch. 10: Hypothermia ▪ Ch. 11: Pain
Honey	—	▪ App. 4: Dressings
Hose, water	Buckets	▪ Ch. 2: Resources
Ice chests	—	▪ Ch. 15: Hyperthermia
Knives	Scissors	▪ App. 4: Dressings ▪ Ch. 2: Resources
Light, portable, battery operated (flashlight, penlight, lamp)	—	▪ Ch. 7: Airway ▪ Ch. 9: Head injury
Lubricant, water-based	—	▪ Ch. 5: Nursing
Markers, waterproof	—	▪ Ch. 4: Triage
Masks, disposable	—	▪ Ch. 2: Resources
Masks, breathing – simple or non-rebreather	—	▪ Ch. 7: Airway
Matches or lighters	—	▪ Ch. 2: Resources

Item	Alternate	Use (Book Section)
Mats, insulating: yoga, camping	Cots, mattresses, sleeping bags	▪ Ch. 5: Nursing
Measuring spoons, metric or English	Any scoop with volume markings	▪ App. 5: Wound-cleansing solutions
Medications	See Ch. 12 and Add. 12	▪ Ch. 12: Medications ▪ Add. A12: Medications list
Moisturizer, lip and mouth	—	▪ Ch. 5: Nursing
Mouthwash	—	▪ Ch. 5: Nursing
Nasal (breathing) cannula	—	▪ Ch. 7: Airway
Notepaper/notebooks	Any writing paper	▪ Ch. 2: Resources ▪ Ch. 3: Communication ▪ Ch. 4: Triage ▪ Ch. 11: Pain
Nursing Checklist *Note: Make copies in advance*	Paper or notebook	▪ Ch. 5: Nursing, Add. A5
Oral rehydration solution (ORS) tablets or packets	"Homemade" ORS solution *(Note: See App. 6 for recipe)*	▪ App. 6: ORS ▪ Ch. 8: Shock
Oxygen concentrators	Oxygen tanks	▪ Ch. 7: Airway
Paper, writing	—	▪ Ch. 2: Resources ▪ Ch. 3: Communication ▪ Ch. 4: Triage
PCC Casualty Card *Note: Make copies in advance*	Paper, notebook	▪ Ch. 3: Communication, Add. A3
Pelvic binder	Sheets	▪ Ch. 8: Shock
Pens, pencils, markers	—	▪ Ch. 2: Resources ▪ Ch. 3: Communication ▪ Ch. 4: Triage ▪ Ch. 11: Pain
Petroleum jelly	—	▪ App. 4: Dressings

Item	Alternate	Use (Book Section)
Phone, mobile (cellular) *Note: Will need the ability to recharge*	Computer, tablet, two-way radio	▪ Ch. 3: Communication
Phone charger, solar	—	▪ Ch. 3: Communication
Pillows	Blankets, clothing	▪ Ch. 5: Nursing
Plastic bottles with caps	Water bottles	▪ Ch. 5: Nursing
Plastic bags *Note: Preferably sealable (airtight) and waterproof*	—	▪ Ch. 2: Resources
Plastic trash bags	—	▪ Ch. 2: Resources ▪ Ch. 10: Hypothermia
Plastic sheeting	Shower curtains, plastic trash bags	▪ Ch. 10: Hypothermia
Plastic wrap	—	▪ Ch. 10: Hypothermia
Pressure cooker	Cookpot	▪ Ch. 2: Resources
Printer *Note: Requires electricity*	Paper, notebook	▪ Ch. 3: Communication
Protein, powder or shake	Any source of protein	▪ Ch. 5: Nursing
Pulse oximeters, portable	—	▪ App. 2b: Resp. Rate ▪ Ch. 7: Airway ▪ Ch. 8: Shock
Radios, portable, battery-operated	—	▪ Ch. 3: Communication
Rope, cord, string	—	▪ App. 3: Tourniquets ▪ App. 8: Catheters ▪ Ch. 3: Communication
Rubber bands	Tape, string	▪ App. 8: Catheters
Safety pins	Tape	▪ App. 4: Dressings
Saline solution *Note: See App. 5 for recipe*	Dakin's solution, clean (potable/drinkable or boiled) water	▪ App. 4: Dressings ▪ App. 5: Wound-cleansing solutions

Item	Alternate	Use (Book Section)
Salt (sodium)	—	▪ App. 5: Wound-cleansing solutions ▪ App. 6: ORS ▪ Ch. 5: Nursing
Sanitary napkins (female hygiene pads)	Disposable absorbent fabric or paper	▪ Ch. 5: Nursing
Scalpels	Knives	▪ Ch. 2: Resources
Scissors	Knives	▪ App. 4: Dressings ▪ Ch. 2: Resources
Shovels	—	▪ Ch. 2: Resources
Sleeping bags	Cots, mattresses	▪ Ch. 10: Hypothermia
Snacks, salty (pretzels, nuts, trail mix)	Other sources of sodium in food	▪ Ch. 15: Hyperthermia
Soap	—	▪ Ch. 2: Resources ▪ Ch. 5: Nursing ▪ Ch. 14: Burns
Splints (assorted, incl. SAM)	See Ch. 13 for make-shift splint supplies	▪ Ch. 13: Wounds
Stove, portable (propane, butane, wood)	Firewood	▪ Ch. 2: Resources
Sugar	—	▪ App. 6: ORS ▪ Ch. 5: Nursing
Tables	Makeshift	▪ Ch. 2: Resources
Tags: triage or write-on	Paper, notebook	▪ Ch. 4: Triage
Tape, medical	Any fabric or plastic tape	▪ App. 4: Dressings ▪ App. 8: Catheters
Tape: colored, masking, other	Marker, tags, paper	▪ Ch. 4: Triage
Tarps	Any waterproof sheeting (such as plastic shower curtains and trash bags)	▪ Ch. 4: Triage ▪ Ch. 10: Hypothermia

Item	Alternate	Use (Book Section)
Telemedical Consult Guide *Note: Make copies in advance*	Paper, notebook	▪ Ch. 3: Communication, Add. B3
Thermometers (oral and rectal)	Any thermometer	▪ App. 2d: Body Temp. ▪ Ch. 5: Nursing ▪ Ch. 8: Shock ▪ Ch. 10: Hypothermia ▪ Ch. 15: Hyperthermia
Tongue depressors	—	▪ Ch. 5: Nursing
Toothbrushes	Gauze	▪ Ch. 5: Nursing
Toothpaste	Baking soda	▪ Ch. 2: Resources ▪ Ch. 5: Nursing
Tourniquets	Strap, fabric, stick (makeshift TQ)	▪ App. 3: Tourniquets ▪ Ch. 6: Bleeding
Towels, washcloths: fabric	Other absorbent padding	▪ Ch. 5: Nursing ▪ Ch. 6: Bleeding ▪ Ch. 7: Airway ▪ Ch. 9: Head injury ▪ Ch. 10: Hypothermia ▪ Ch. 14: Burns ▪ Ch. 15: Hyperthermia
Traffic cones	—	▪ Ch. 4: Triage
Tubing: various sizes and lengths	—	▪ App. 7: UO ▪ App. 8: Catheters
Urinary diversion device, external	Leakproof bucket	▪ App. 7: UO ▪ App. 8: Catheters ▪ Ch. 8: Shock
Vital Signs Record *Note: Make copies in advance*	Paper, notebook	▪ App. 2f: Vital Signs Record
Watch/clock/timer	Phone	▪ App. 2a: Pulses ▪ Ch. 5: Nursing
Water, bottled	Drinking (boiled) water	▪ Ch. 2: Resources
Wipes, sanitary or baby	—	▪ Ch. 5: Nursing

CHAPTER 3

Communication and Documentation

Intensive-care units monitor their patients by recording trends in vital signs, physical exams, and fluid outputs to watch for changes that could be signs of problems. In the PCC environment, one of the easiest ways a lay responder can follow the methods used by hospitals and medical providers is to record key medical information. You can then pass on documented information effectively and efficiently when medical professionals eventually take over, to help improve casualty outcomes. Written information also can help you keep track of what you have done and need to do for a casualty in your care during PCC.

This chapter provides documentation forms to track important medical information. Good documentation helps good communication, both during and after PCC.

IN THIS CHAPTER

KEY POINTS

- One goal of documenting information is to provide a picture for future providers.
- Another goal is to help you keep track of what you have done and need to do for a casualty during PCC.
- When you assess your casualty from head to toe in detail, record everything you find that isn't normal, so that all important information can be passed on to medical providers later.

- Record any information you think may be helpful to medical professionals, especially times, injury patterns, symptoms, care provided, vital signs, and drugs given.
- Have all of a casualty's documentation in one place and securely attached to the casualty, so you can quickly transfer information without losing anything.
- Make sure the medical professional you are communicating with understands what you told them.
- You will need a phone to make calls. A mobile phone is likely the best option, since it is portable and can also send and receive text messages, but keep in mind that you will also need the ability to recharge it. Since electricity may not be available, one good option is a solar phone charger.
- A two-way radio can also help, especially if you do not have mobile phone service in your area.
- A receiving radio can help keep you informed about ongoing events in your area. Keep in mind that you will need some source of power, and electricity may not be available, so consider a battery-operated or solar-powered radio.

Do Not:

- DO NOT give a casualty to someone else without any verbal or written information.
- DO NOT document a casualty's information in more than one place.
- DO NOT assume that others understand what you said unless they repeat it back to you.

SUPPLIES

- Paper
- Printer
- Copies of PCC Casualty Card
- Copies of Telemedical Consult Guide
- Pens and/or pencils
- Waterproof markers
- Cord, twine, string, or similar to use as a tie
- Mobile phone and charger
- Radio – receiving or two-way
- Batteries (for radio and/or printer)

DOCUMENTING CARE DURING PCC

Documentation helps you keep track of important casualty information. Your records will pass on information about a casualty's condition to the medical providers who will provide the next level of care, as well as help you keep track of what you have done and what you need to do for a casualty during PCC. A record of even the simplest of information is vital to a casualty's outcome.

Find out (if you can) the 5 Ws: Who, What, Where, When, and What.

- **Who** is this casualty?
- **What** happened to them? (Example: Were they shot or in a blast? Did they fall?)
- **Where** were they injured? (Example: arm, leg, head, and so on)
- **When** did this happen?
- **What** has already been done for the casualty, if anything?

Write down the 5 Ws on paper or on a PCC Casualty Card (see *Addendum A3*).

- Refer to *Addendum A3* for a reminder of additional information you need to gather.
- Securely attach this piece of paper to the casualty, so the information is not lost.
- Update this document as you learn new information or as you notice changes during PCC.

If you cannot write down the 5 Ws, make an effort to remember this information so you can pass it on to someone else later.

See *Chapter 5: Nursing* and *Appendix 2f: Vital Signs Record* for additional information you need to document during PCC. Keep these records with the PCC Casualty Card until you are able to transfer the casualty to the next level of medical care.

COMMUNICATING WITH MEDICAL PERSONNEL

If possible, **plan in advance** and make lists of who to call (see Tables 3.1 and 3.2) and the medical facilities to which you may be able to take a casualty (see Table 3.3). Include enough information to help you decide which contact or facility will best meet your needs, as well as which is closest and most likely to be available.

Table 3.1. Example list of emergency medical contacts

Emergency Medical Contacts			
Name	Phone/ text number	Location	Notes (services, staff, facilities)
Emergency medical services	911 (USA), 112 (EU) – others by country	No physical address	Dispatchers for emergency medical services
Local non-government organization	+0 123-456-7890	Building #, Street, City, State/Province, Country	Medical technicians, nurses, physicians, medical supply specialists
Hospital #1	+0 123-456-7890	Building #, Street, City, State/Province, Country	Medical professionals of all levels of training
Hospital #2	+0 123-456-7890	Building #, Street, City, State/Province, Country	Medical professionals of all levels of training

Table 3.2. Example list of telemedicine contacts

Telemedicine Contacts			
Name	Phone/ text number	E-mail	Services
Global Medical Support Organization	+0 123-456-7890	No email	Physicians and nurses who speak multiple languages
Regional Burn Center	+0 123-456-7890	burncenter@xyz.org	Physicians and other healthcare providers who specialize in burn care
Regional Emergency Medicine System	+0 123-456-7890	telemedicine@EMS.org	Local EMS or EMT director

Table 3.3. Example list of available facilities

Facilities			
Name	Phone/ text number	Location	Notes (services, limitations, other)
Local Pharmacy	+0 123-456-7890	Building #, Street, City, State/Province, Country	▪ Pharmacist with limited antibiotics and medical supplies ▪ No patient care
Local Clinic	+0 123-456-7890	Building #, Street, City, State/Province, Country	▪ One physician and one nurse on staff 24 hours a day
Local Emergency Medicine Facility	+0 123-456-7890	Building #, Street, City, State/Province, Country	▪ Call for patient pick-up ▪ Four paramedics with two vehicles ▪ Always on call
Local Hospital	+0 123-456-7890	Building #, Street, City, State/Province, Country	▪ 6 surgeons with 3 operating rooms ▪ Always open ▪ Has a helipad

Contact an emergency medical or telemedicine provider via phone, tablet, or computer. (If you do not have cellular service available, consider having a two-way radio and appropriate contact information.) Telecommunication allows you to connect with healthcare experts who can help you deliver the best care to your casualty. Get specific information on your next steps to care for a casualty while you wait to get them to the next level of medical care. It can improve your ability to care, guide you on what to do next, and reassure you that you are doing the right things. And it may be crucial to a casualty's outcome.

Before you call, fill out the Telemedical Consult Guide (see *Addendum B3*) or otherwise write down the information you will need.

When you call, first state the 5 Ws. Read the information from the PCC Casualty Card and Telemedical Consult Guide (see *Addendum A3* and *Addendum B3*).

NOTE

Whenever you communicate with another person—such as a medical professional or another lay responder—make sure you "close the loop" to ensure information has been transferred accurately. Have the other person repeat back what you said, to make sure they heard and understood.

TRANSFERRING A CASUALTY'S RECORDS

Transferring a casualty to a trained healthcare team is a key goal of PCC. Transferring their records at this time is crucial to the casualty's safety and recovery. Without key information from you, the medical providers who take over will not know what medical care has already been given, so they will have to start from the beginning. The most important thing you can do to help your casualty's future treatment is to pass on the information you have collected.

First report the 5 Ws: Who, What, Where, When, and What.

- **Who** the casualty is
- **What** happened to them (Example: They were shot, in a blast, fell, and so on)
- **Where** they were injured (Example: arm, leg, head, and so on)
- **When** this happened
- **What** you have done so far for the casualty

Read the information you have written down (to make sure the receivers understand), and then give the paper or PCC Casualty Card—and any other written information you have—to the medical team taking the casualty.

ADDENDUM A3: PCC CASUALTY CARD

Use the form on the next page to keep track of information about a casualty and to send with a casualty when they are transported. If you cannot copy the card, refer to the version here to remind you what to write down.

See *Chapter 5: Nursing* and *Appendix 2f*: *Vital Signs Record* for additional information you need to document during PCC. Keep these records with the PCC Casualty Card until you can transfer the casualty to the next level of medical care.

If you cannot make copies, use the form in this addendum as a guideline and reminder, and make your notes wherever you can.

PCC Casualty Card

WHO is this casualty?
NAME

GENDER	☐ M ☐ F	DATE	TIME

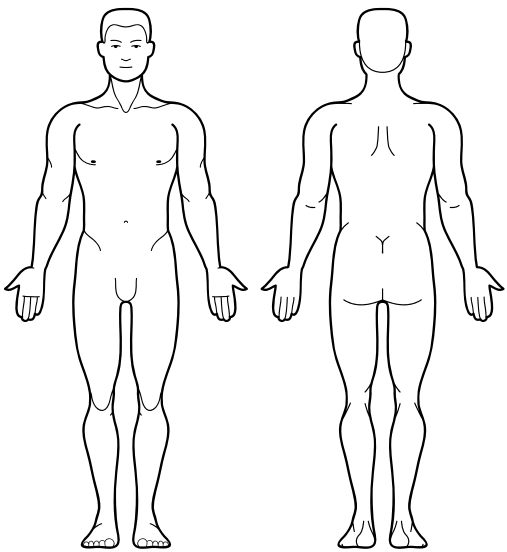
CONTACT NUMBER (Family, Friend)	

WHAT happened to them?
☐ Car crash ☐ Burn ☐ Fall ☐ Gunshot ☐ Landmine ☐ Explosion

Other

WHEN were they injured?	DATE	TIME

WHERE are their injuries? (Mark with X on diagram below)



WHAT have you done for the casualty? (Write below and on back, if needed. Also mark place(s) and time(s) above if any tourniquets were applied.)

ADDENDUM B3: PCC TELEMEDICAL CONSULT GUIDE

Use the guide on the next page to provide information to a medical provider and to send with a casualty when they are transported. If you cannot copy the guide, refer to the version here to remind you what to write down.

Keep this information with the PCC Casualty Card until you are able to transfer the casualty to the next level of medical care.

If you cannot make copies, use the form in this addendum as a guideline and reminder, and make your notes wherever you can.

Telemedical Consult Guide	
Before you call, gather the information you need and organize it using this guide. If your call is not answered, (1) call a secondary or alternate number or (2) call back in 5–10 minutes.	
Primary contact:	
Secondary contact:	
My name is	I ☐ **do** ☐ **do not** have medical training
MY best contact information is	
YOUR (telemedical consultant's)best contact information is	

—PAUSE to confirm contact information—			
I have a	_____ year-old	☐ male ☐ female, who has the following	
WHAT happened to them:			
The injury occurred	_____ hours ago	Care started	_____ hours ago
WHERE they were injured:			
WHAT you have done for them so far:			
They are currently (check one)	☐ getting better ☐ getting worse ☐ getting worse rapidly		
Known medication allergies, past medical history, past surgical history:			
I need help with (be as specific as you can):			

—PAUSE to confirm contact information—
WHAT to do next (this consultant's recommendations – use blank page):

CHAPTER 4

Triage—Where to Start

The focus of this book is on prolonged casualty care (PCC), but this chapter examines what often must take place before PCC begins. The process of triage is the very first step to treating ill or injured casualties in a mass casualty incident. It helps you to decide where to act first.

Mass Casualty Incident

A mass casualty incident (MCI) is any event where the number or severity of casualties overwhelms the available resources (including medical equipment and trained personnel). This usually means a situation with many casualties, but it could also mean a situation with just a few casualties and only one lay responder, or with only one casualty if you do not have enough equipment or training to care for them on your own. These guidelines for both PCC and triage can be applied to any situation where the needs of injured casualties are greater than the resources available. In an MCI, whether big or small, the first step is triage.

What is Triage?

Triage is the process of sorting casualties (injured people) into categories, depending on how severe (and treatable) their injuries are. This helps you make sure that limited medical resources go where they are most needed first. It means, ideally, doing the most good for the most people. This triage process tries to conserve resources and use them most effectively.

Why is it important for you to get involved? Depending on what happened or where you are, it may take trained medical professionals a long time to respond. However, anyone who is nearby and willing to help can make a huge difference for casualties who are ill or injured. In a disaster, many people may be severely injured. Others may not need immediate medical help, but they can die due to exposure to heat, cold, or debris. If you do nothing to help, people who could have been saved may die.

If you and others perform triage and make basic decisions about how resources should be used, you give the most people the best chance to survive. Your goal is to keep casualties with survivable injuries alive until they can get more advanced medical care, and to get them to that care in the right order by need. The guidelines in this book can help you avoid mistakes and give you the best chance to do the most good.

Emotional and Mental Responses to Triage

Accept that a disaster is an incredibly difficult situation. It can be a hard thing to witness, whether or not you were involved in the initial event or choose to help after it happened. The goal here is to provide guidelines—based upon the best science and experience available—so you can rely on them instead of having to make decisions in a vacuum, and you are not making life-and-death decisions alone.

You will have to make difficult decisions during triage. You will have to make difficult decisions with limited time, information, and training. It is normal to feel uncomfortable or even guilty after making these decisions. For more about the impact of PCC on the lay responder—you—read *Chapter 16: End of PCC*.

IN THIS CHAPTER

KEY POINTS

- ▹ Triage needs to be done quickly and repeated often.
  - The situation and the casualties will change over time. It is much more important to triage quickly and re-triage often than to make the perfect decision for every casualty.
- ▹ Your first considerations are major bleeding, mental status, and wrist pulse.
  - If a casualty has major bleeding, stop that first.
  - More than half of trauma casualties first found with no wrist pulse eventually die, even if they receive medical treatment.
  - Those who do not have a wrist pulse and cannot follow basic commands have a 92% death rate regardless of whether they get professional medical treatment.

- Those who do have a wrist pulse and can follow basic commands after a traumatic injury have a 95% chance of survival, regardless of medical treatment.
- So, by combining these two things—the ability to follow basic commands and the presence or absence of a wrist pulse—you can determine if a casualty is very likely to survive or very likely to die. In triage, this helps you separate casualties into groups to find those most likely to benefit from medical treatment.

▹ Do not be distracted by the amount of blood you see on someone or how loudly they yell. These are not reliable indicators for triage.

- The blood may not be their blood, or the bleeding may not be life-threatening, or they may not still be bleeding.
- And yelling does not tell you how injured someone is. They may just be afraid.
- However, do check to see if they are experiencing major bleeding. If not, move on.

▹ Do not perform any medical action that requires a lot of people, time, or resources.

- Things such as chest compressions or mouth-to-mouth breathing can use a lot of your resources on one casualty who may not survive.
- Focus on people who are more likely to live.
- Some non-life-threatening injuries may look bad (sometimes called "distracting injuries"), but ignore them during triage. Most splinting and minor bandaging can be done later for some injuries, but should never be done before triage. Treatment of bruises, minor cuts, and stable bone fractures can wait.

▹ Remember: You have limited time, energy, and supplies to save lives.

SUPPLIES

▹ Permanent (waterproof) markers
▹ Notebook or other paper
▹ Pens or pencils
▹ Colored tape, or tape you can write on
▹ Commercial triage tape or tags
▹ Large colored tarps, traffic cones, glow sticks, posters

STEPS TO TRIAGE

If you need more resources (people, medical supplies, ambulances, security) than you have to control the medical situation, even if you are trained in medical care, your needs exceed your resources! Begin the triage process.

For a Short Guide to Triage, go to Addendum A4 at the end of this chapter. Triage must go quickly, so you need to be prepared. Read the detailed explanation that follows here before you experience a mass casualty incident! Then, when you need to perform triage, you can use the short guide to help you move quickly.

Step 1: Get Help

- ▹ Call for help!
  - Ideally, contact local emergency help (such as 911 in the U.S.) or military command in combat zones.
  - Use your lists of contacts and facilities (see *Chapter 3: Communication and Documentation*) for other sources of help.
- ▹ Ask others nearby to get help.
- ▹ Ask others nearby to help you start triaging.

Step 2: Assess Scene Safety

- ▹ Pause and look at the situation. Then ask: If you help, will it increase your risk of becoming another casualty? If you are not sure, do not get involved until you are in a safer situation.
- ▹ If it is not safe to work with a casualty where they are, ask them to come to you or move them to a safer location.
- ▹ Scene safety is an ongoing consideration. Situations and threats can change over time. Take breaks now and then to think about your safety. If you become a casualty, you cannot help others.

Step 3: Gather Supplies and Form a Triage Team

Gather Supplies

If medical supplies are available, collect them, or send another person to collect and bring them back.

DO NOT delay triage more than several minutes to gather supplies. See *Chapter 2: Planning and Managing Resources* for more information.

Form a Triage Team

If you have other lay responders available, you can form a triage team by assigning individuals to these roles:

- Team Leader
- Triager(s)
- Tourniquet Applier(s)

You may have to take on more than one of these roles yourself, depending upon how many people are available to help. But as soon as you recognize that a triage situation needs a team, assign these roles.

- **Team Leader.** If two or more people are available to conduct triage, one should be the Team Leader.
  - This is the main contact person for lay responders who are already helping and those who may arrive later.
  - If you have only a few lay responders, the Team Leader may also have to be a Triager.
  - If there are enough people to help, you can be in charge of this role to talk to emergency dispatchers and military or professional medical personnel when they arrive.
  - The Team Leader should know who is helping and what they are doing.
  - The Team Leader should have a general understanding of how many casualties there are and in which categories (discussed below).

- They are also responsible for thinking about safety on the scene (collapsing buildings, flooding, explosions, and such) and where to physically locate lay responders and casualties to keep them as safe as possible.
- Triagers (see below) report to the Team Leader.

▹ **Triager(s).** Everyone (except possibly the Team Leader) is a Triager.

- A Triager reports to the Team Leader to tell them how many casualties they found in each category (discussed below).
- A Triager should have a mental or physical list that puts their casualties in order of who needs treatment or evacuation first.
- Check casualties at least every 15 minutes to determine if their condition has changed and you need to change their priority.
- If you have only a few lay responders, Triagers may also have to be Tourniquet Appliers.

▹ **Tourniquet Applier(s).** This is an optional role. Only fill it if you already have a Team Leader and at least one Triager, and if there are bleeding casualties.

- The most time-sensitive life-saving measure is to stop major bleeding. See *Appendix 3: Tourniquets* for how to use a tourniquet to stop major bleeding.
- This role can be one person with many tourniquets, or several people with tourniquets.
- If possible, refer to *Appendix 3: Tourniquets* on how to create and apply a tourniquet.
- The Team Leader or a Triager will tell the Tourniquet Applier, "Go to each casualty who is alive and stop any major bleeding you see. Then move on to the next casualty. If there is squirting or pooling blood, do what you can to stop it, and then move on to the next person. Do not worry about minor bleeding or any other injuries. Come back to me when you are done."
- The Tourniquet Applier's goal is to find every casualty with major bleeding as quickly as possible, stop their major bleeding (with a tourniquet or other device), and move on to the next casualty.

- Use a commercial tourniquet or anything else you might have (fabric, belt, or strap) to stop major bleeding.
- Re-examine each casualty for major bleeding, especially after moving a casualty.
- When you can, report to the Team Leader, and help the triage team as needed.

Step 4: Triage of Casualties

You must check every casualty quickly during triage, so just start somewhere that makes sense to you.

▷ Look at each casualty for obvious signs of death. If you see any of the signs below, immediately move on to the next casualty. Do not dwell on what you saw. There is nothing you can do for this person.

Obvious Signs of Death or Fatal Injury

- Head is not attached to the body
- Body is in multiple pieces
- Most or all of the body is charred or burned
- Massive open head wound where the brain is visible
- Massive open wound to the torso where lungs, intestines, and/or multiple bones are visible or outside of the body
- Casualty is not moving on their own and is not visibly breathing

▷ If there are no obvious signs of death, check the casualty for any major bleeding. If there is major bleeding, stop it the best you can. Do not worry about or treat any other injuries, just **stop major bleeding**.

▷ For each casualty, ask: "Does this casualty have a wrist pulse?" and "Can this casualty follow commands?" See *Appendix 2a* for how to check their wrist pulse and *Appendix 2e* for how to check mental status. Then assign them to a "Green," "Red," or "Black" triage category as described in Table 4.1, and label each individual with whatever you have available (marker, tape, or other method – see below).

Table 4.1. Casualty Triage Categories

RED: Immediate Need	
Does this casualty have a wrist pulse?	YES
Can this casualty follow commands?	NO
OR	
Does this casualty have a wrist pulse?	NO
Can this casualty follow commands?	YES

These casualties are categorized as badly hurt. Give them medical attention first. They are the ones for whom you can make the biggest difference. If they cannot move on their own, place them in the Recovery Position if they are not agitated, thrashing around, or seem otherwise unable to stay in that position. If they cannot or will not stay in the Recovery Position, leave them as they are.

GREEN: Delayed Care	
Does this casualty have a wrist pulse?	YES
Can this casualty follow commands?	YES

These casualties appear uninjured or mildly injured. Leave them without help for now. They are not likely to get much worse in the first minutes to, possibly, hours. They can care for themselves for now. Tell them to stay warm and out of harm's way as much as possible. If they seem able to help, consider giving them a role or task to help with other casualties.

BLACK: Likely Fatal	
Does this casualty have a wrist pulse?	NO
Can this casualty follow commands?	NO

These casualties are either dead or likely to die before medical help can reach them.

If a casualty in this category does not show any of the obvious signs of death (see above), place them in the Recovery Position if you can. When you repeat triage later, you can reassess these casualties, but they should be your last priority.

DEAD
Obvious signs of death (see above). Move to the next casualty.

- ▷ Use the Recovery Position (see *Appendix 1a*) to help keep someone's airway open even if they are unconscious. The Recovery Position does not require any special equipment, and a casualty usually stays in this position even when left alone.
- ▷ Keep track of which casualty is in which triage category—in your head, on a piece of paper, with markings on the casualties themselves, or by physically moving them into groups.

The best choice is to mark people physically (such as with a permanent marker or pen), and the best place to do this is on the casualty's forehead, where a mark is most likely to be seen. The best place for a tag or ribbon is around a casualty's wrist. You can also use tape to label casualties.

If you don't have a tool to mark casualties, you can sort them physically, which also can help you manage the situation. The goal is to know which casualties need help first.

If you can move casualties around, put them where they are relatively protected from further harm. Use blankets, shade, or shelter to protect them (and anyone helping to care for them) from extreme temperatures, water (rain, snow, or flooding), and sunlight.

If you physically sort casualties, put the RED group in the most obvious place, where they are safe and easiest for incoming help to transport them.

Repeat these steps until you have completed triage for all of the casualties.

Step 5: Repeat Triage

Triage is most effective when it is repeated. Casualties, the situation, you, and the environment change over time, meaning that casualties may change triage categories. The goal of triage is to do it often—not perfectly. You also may find or receive more casualties as time goes on, and these new casualties will need to be included in your triage.

- ▹ Timing
  - If it takes you a long time to complete your triage, start again as soon as you finish.
  - Consider repeating the process at least every hour, depending on what is realistic for your situation.
- ▹ If more casualties arrive, triage them before you repeat triage on the other casualties.

END OF TRIAGE

As soon as you can, begin to provide care (beyond stopping major bleeding), as discussed in the rest of this book. Work with your team members to ensure the safety of responders and casualties. You may need to ask someone to gather supplies. *Chapter 2: Planning and Managing Resources* provides details of how to establish and maintain a PCC facility, including resources and supplies.

Work as if professional medical help could arrive in the next 30–60 minutes. You are working towards one of three possible ends:

- ▹ A medical professional (or someone with more training than you) arrives to take care of casualties. Direct them to the RED group first.
- ▹ Someone comes who can transport casualties to medical care. Again, direct them to the RED group first for transport.
- ▹ You can no longer help. The situation may become unsafe, or you may become too tired or overwhelmed to continue. Pause, collect yourself (get water, food, shade, warmth, rest, and time for a silent moment or prayer), and start again if and when you can.

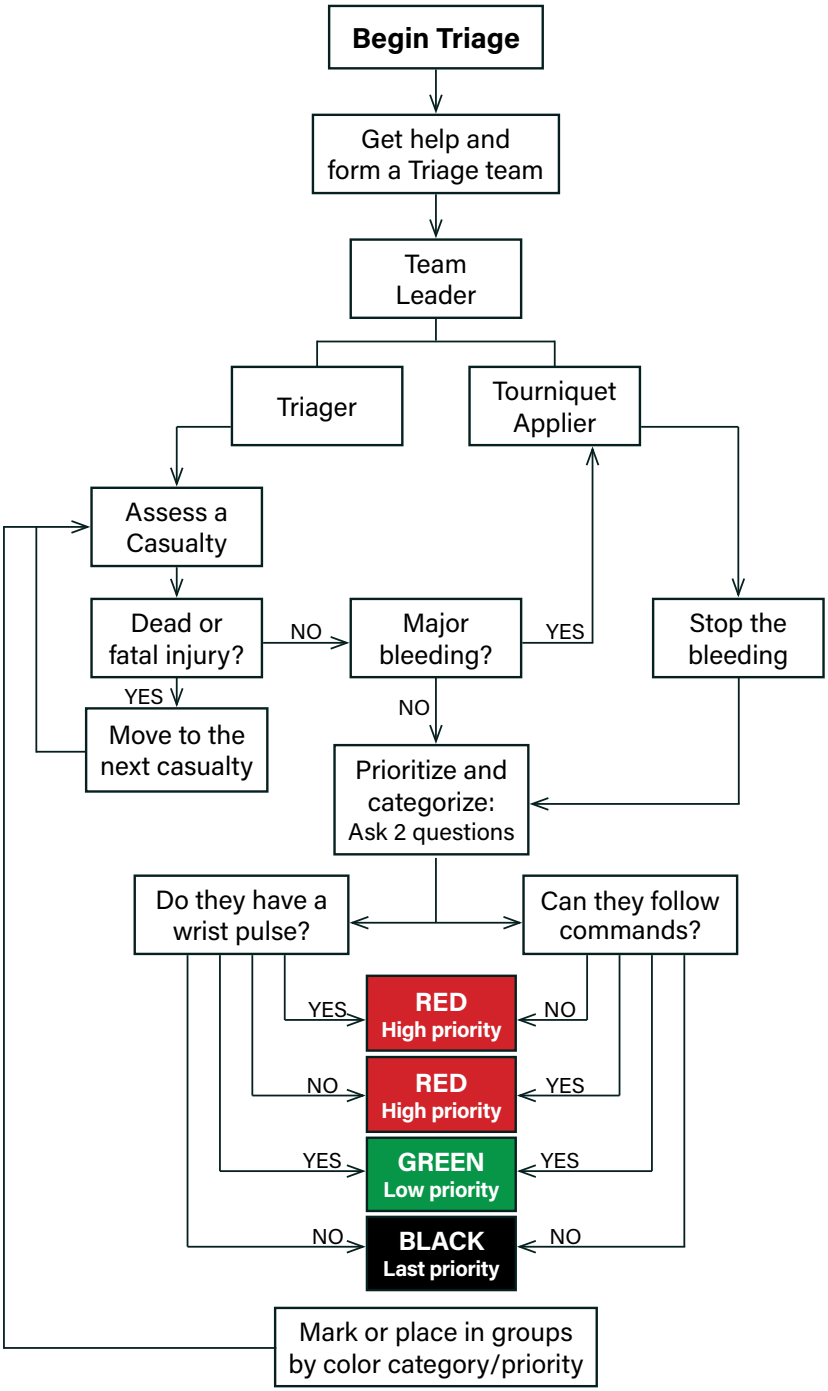
Transition to Prolonged Casualty Care

- If you have finished triage and help still has not arrived, or if you have learned that help isn't going to come soon, begin treating casualties in the order of triage priority (see Table 4.2).
- If you or others present have any medical skills or knowledge, use them here. If not, the rest of this book is a basic guide for how to provide some medical help.
- Make sure you and other lay responders do not also become casualties. Find water, shelter, and a safe place to stay for yourselves and the casualties. (For more information about safe locations for PCC, see *Chapter 2: Planning and Managing Resources*.)

Table 4.2. Transition of Triaged Casualties to PCC

Triage Category	"Wrist pulse?" and "Able to follow commands?"	Post-triage Care
RED Immediate Need	YES and NO or NO and YES	▪ First priority to receive medical treatment and/or transport when available. ▪ Begin care as described in this book.
GREEN Delayed Care	YES and YES	▪ No immediate treatment needed. ▪ Assign these casualties a role to help if they can.
BLACK Likely Fatal	NO and NO	▪ Place in Recovery Position. ▪ Re-triage and re-categorize.
DEAD	Obvious signs of death	▪ After care of all other casualties is complete, see "Managing Fatalities" in Chapter 2.

ADDENDUM A4: SHORT GUIDE TO TRIAGE



CHAPTER 5

Nursing During PCC

In the context of PCC, "nursing" refers to the ongoing care of casualties who have received initial care or who have injuries that cannot be treated without professional medical care. These casualties need continued attention to manage their conditions and, if needed, their pain until medical care becomes available. This can include providing comfort for casualties who may die.

Nursing is one of the most important parts of care you can provide for a casualty. Injured and ill casualties are at high risk for complications that can lead to poor outcomes. Nursing can be provided without special equipment or training and can reduce the risk of complications.

In PCC, a casualty's basic activities of daily living can be impaired. Simple tasks such as oral hygiene, breathing deeply, hydration, coughing, bathing, moving limbs, and repositioning may become impossible. This chapter is mostly a checklist to help you organize tasks for the daily care of casualties during PCC.

This chapter on nursing comes before the initial Care of Injuries chapters in Section Two of this book. Nursing activities usually follow initial care, but you need to be aware in advance of how to transition from initial care to nursing and what that transition means.

IN THIS CHAPTER

Not all of the tasks covered in this chapter may be possible in a PCC setting. Do the best you can with the resources you have.

KEY POINTS

- Keep your casualties aware of the date, time, and any outside events, especially if they cannot see the sun or go outside.
- Always assume your casualty can hear you, even if they are unconscious.
- If possible, help your casualties to walk a few times throughout the day. This helps their strength, lungs, bowels, and mental state.
- Stay close to casualties who are at a high risk of falling (that is, those who are weak, have injured legs, or are elderly).
- During the day, help your casualties to sit up as much as they can.
- Turn lights on during the day and off at night to help casualties maintain a normal sleep-wake cycle.
- Talk to your casualty or their family or friends about their medical history, allergies, and what is "normal" for them. No one knows themselves better than the casualty.
- Seemingly little things like oral care, clean bedding, and repositioning can make a huge difference to your casualty and their ability to heal.
- Consider each casualty's history, if you know it. For example, a casualty who is an avid runner or is very fit may have a normal resting heart rate in the 40s. Always ask a casualty if they know what "normal" is for them.
- When a casualty is sleeping or very relaxed, it is normal for their blood pressure, heart rate, and respiratory rate to be at the low end of normal.
- When a casualty is in pain or anxious, their blood pressure, heart rate, and respiratory rate may be high.
- Everyone is different, and what is "normal" for one person may not be normal for someone else or by medical standards. For example, if someone has lived with high blood pressure for a long time, a blood pressure of 140/90 may be normal for them, even though it

is considered high for someone with no blood pressure issues. The normal adult vital signs are:

- Mental status: Alert and aware of person, place, and time
- Blood pressure: 110–130/60–80 (systolic/diastolic)
- Heart rate: 60–100 beats per minute
- Temperature: 37.0°C (98.6°F)
- Oxygen level: >93%
- Respiratory rate: 12–20 breaths per minute
- Pain level: 0

▷ Practice standard precautions to prevent infection, including:

- Hand hygiene and the use of personal protective equipment such as gloves and masks, when available.
- Maintain a clean environment as much as possible.
- Educate a casualty on how to prevent infection, such as hand-washing and personal hygiene.
- Dispose of contaminated materials properly.

SUPPLIES

▷ Multiple uses
- Water bottles
- Watch or other timepiece
- Batteries
- Disposable gloves
- Bowl or basin
- Paper cups

▷ Medical
- Bulb syringe
- Thermometer
- Gauze (pads and rolls)
- Dressings supplies (see *Appendix 4*)
- Antibiotic ointment
- Acetaminophen

▷ Hygiene
- Soap
- Alcohol-based hand rub
- Sanitary wipes or baby wipes
- Female hygiene pads
- Washcloths

▷ Oral Care
- Toothbrushes
- Mouthwash
- Toothpaste
- Lip moisturizer
- Tongue depressor

- ▹ Comfort
  - Clean linens
  - Blankets
  - Pillows
  - Moisturizing eye drops
  - Insulating mats (yoga or camping), cots, mattresses
- ▹ Fluids and Nutrition
  - Baking soda
  - Table salt
  - Sugar
  - Electrolyte drinks or mixes
  - Protein shake or powder mix

See *Appendix 2: Vital Signs* for additional supplies.

ESSENTIALS OF NURSING CARE

Hand Hygiene

Keep your hands clean before you touch a casualty to prevent the spread of disease and infection. Infection is a massive risk during PCC, which often involves a dirty environment. In addition, supplies may be extremely limited, in which case you will have to determine how to manage washing or disinfecting your hands. See Figure 5.1 for the best way to wash your hands.

Use an alcohol-based hand rub or wash your hands with soap and water for the following:

- ▹ Immediately before you touch a casualty.
- ▹ Before you handle medical devices or supplies.
- ▹ After you come into contact with blood, body fluids, or contaminated surfaces.
- ▹ After you have worked with a soiled part of a casualty's body, and before you handle a clean part of their body. For example, between cleaning a casualty after they have a bowel movement and changing a dressing, wash your hands.
- ▹ After you touch a casualty or anything around them, such as their bedding.

Wear disposable gloves if you can when caring for casualties, and change them as often as you can.

NOTE

Always clean your hands and change gloves between casualties if possible to prevent cross-contamination!

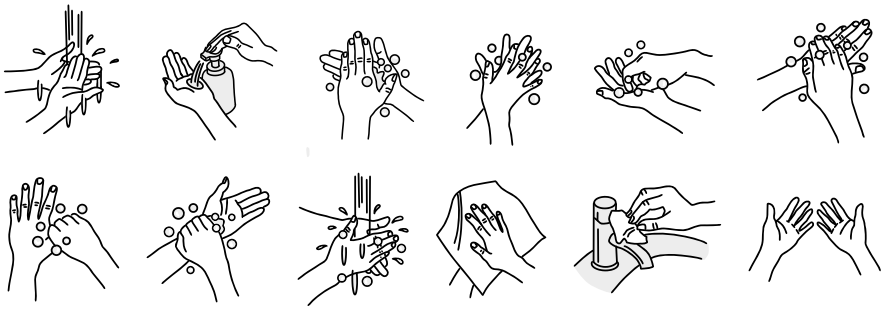


Figure 5.1. Best way to wash your hands

Communication with Casualties

Before you do anything with a casualty, tell them who you are and what you want to do. It can be as simple as, "Hello, my name is Mary. I am not a medical provider, but I want to help you. I am going to wash my hands and help you get in a more comfortable position, if that is okay with you."

Explain what you plan to do before you do it, even simple movements like adjusting a pillow. Never assume consent, and always ask before you do any new task.

If the casualty is unconscious, talk to them the whole time you are working on them, and explain what you are doing in case they can hear you.

Position Casualties for Ongoing Care

There are a few things to keep in mind when determining the best place to keep casualties during PCC, including available space, supplies, number of casualties, and gender of casualties. If you have multiple casualties and if space allows, it may be better to separate genders or to keep families together. The best bedding should be given to those who will be in bed longest, such as unconscious casualties, who are at greatest risk for pressure points that can cause sores.

1. ***Best:*** A mattress with blankets and pillows to help shift casualty weight from side to side
2. ***Better:*** A cot with blankets and pillows
3. ***Good:*** A mat on the ground with extra clothing or blankets used to protect bony body parts (back of the head, tailbone, elbows, and heels)

If you need to move a casualty from one location to another, see guideline #9 in *Chapter 1: Introduction to PCC*.

ASSESSMENT AND MONITORING

After you have stabilized a casualty, you must **assess** them regularly to **monitor** their condition.

"Assessment" means you must regularly collect, document, and analyze information about a casualty's health, so you can keep track of changes, determine their needs, and plan for their care.

"Monitoring" involves collecting information over time to help you determine how well your efforts are working, if you need to do something different, and how a casualty is handling their injury or illness.

Complete an entire assessment for each casualty at least once a day. However, you may need to stop in the middle of an assessment more than once to deal with something you find before you finish. You can use the 12-hour Nursing Checklist in Addendum A5 *to help you keep track. After assessment, continue with Ongoing PCC Care (see below).*

Write down everything you see and do during PCC. You can use copies of the 12-hour Nursing Checklist in *Addendum A5* and the Vital Signs Record in *Appendix 2f*, or just write down the same information somewhere. You also need to give this documentation to medical personnel when they arrive or when you can transport a casualty. Refer to *Chapter 3:*

Communication and Documentation for detailed guidelines to record and keep track of a casualty's condition and ongoing care.

For assessment, you may need to remove a casualty's clothes so you can see all of their skin, fix any problems you find, and document (see below) what you saw or did. Then put their clothes back on or, if doing so could cause harm, find something else to cover them.

Begin by following the MARCH sequence (Massive Bleeding, Airway, Respiration, Circulation, and Hypothermia/Head Trauma) described in *Chapter 1* to keep your assessment organized:

Massive Bleeding

- ▷ Make sure severe bleeding has been controlled. Refer to *Chapter 6: Severe Bleeding* for details.

Airway

- ▷ Make sure the casualty's airway remains clear. Check their mouth and throat. Refer to *Chapter 7: Airway and Breathing* for details.
- ▷ Check their oxygen level
  - See *Appendix 2b* for how to measure a casualty's oxygen saturation.
  - Look at the color of the casualty's gums and inside of their mouth. If it is pink, their oxygen level is probably good enough. If it is pale or dusky grayish or slightly blue, their oxygen level may be low.

Respiration (Breathing)

- ▷ Make sure the casualty can still breathe comfortably. Watch their chest movement for even rise and fall, and measure their breathing rate. Refer to *Chapter 7: Airway and Breathing* for details.
  - They may breathe faster if they know their breaths are being counted, so start counting without saying anything.
- ▷ If their breathing is slower than 10 breaths per minute while they are asleep, wake them up if you can.

Circulation

- ▹ Check for pale, cool, or sweaty skin—signs of shock. See *Chapter 8: Shock, Circ*ulation, and Resuscitation and *Appendix 9b: Understanding Shock* for more detailed information.
- ▹ Check for skin tenting to help you determine if they are hydrated. Pinch and lift the skin on the back of the casualty's hand for a few seconds and then release (Figure 5.2). If they are well hydrated, the skin should return to normal quickly. If the skin remains raised temporarily, the casualty may be dehydrated.

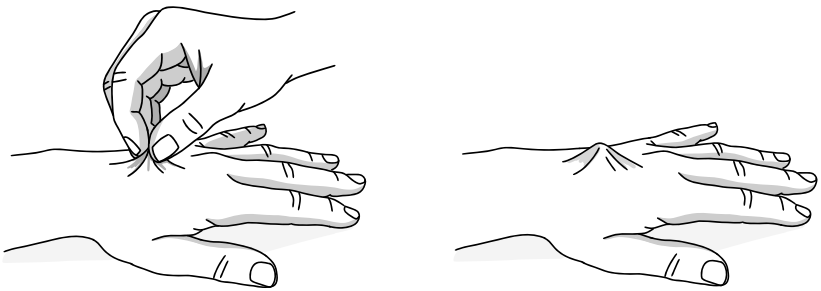


Figure 5.2. Skin tenting is an indicator of dehydration

- ▹ Measure their heart rate. See *Appendix 2a* for how to find and measure a pulse.
  - The normal rate for adults is 60–100 beats per minute. Anything above 100 beats per minute (tachycardia) is too fast. See *Chapter 8: Shock* for how to manage rapid heart rate.
- ▹ Blood pressure. See *Appendix 2c* for how to measure blood pressure.
  - If the casualty has a pulse at their wrist, you can assume that their systolic blood pressure (the first/higher number) is at least 90.
  - If they are talking to you and aware, you can assume their blood pressure is good enough for oxygen to reach their brain.

Hypothermia, Hyperthermia, and Fever

- ▹ Measure the casualty's temperature. See *Appendix 2d* for how to measure or estimate their body temperature.
- ▹ Manage the casualty's temperature.

Prevent hypothermia

1. ***Best:*** Keep the casualty in a bed with clean, dry bedding.
2. ***Better:*** Get the casualty off the ground, with padding under them. Keep them covered, warm, and dry.
3. ***Good:*** Put an insulation barrier between the ground and the casualty. This can be as simple as cardboard or a yoga mat or a mattress. Keep them covered, warm, and dry as much as possible.

See *Chapter 10: Hypothermia* for more information, especially if a casualty is already experiencing this condition.

Treat fever if present

- A fever is defined as a body temperature greater than 38°C (100.4°F), typically due to an infection or sickness.
- Give the casualty up to 1000 mg paracetamol (acetaminophen) every 6 hours.
- Remove excess blankets or coverings, but it is okay to keep a thin blanket or sheet on a casualty with a fever.
- Use a cool, wet cloth on their forehead or neck for comfort.
- Fever is a sign of infection, so look for signs of infection in their wounds. Also consider causes such as pneumonia or urinary tract infection. See *Chapter 12: Medications* for how to manage infection.
- See *Chapter 15: Hyperthermia* for high temperature due to heat exposure, which is not the same as a fever due to injury or illness.

Mental Status and Head Injury

- See *Chapter 9: Head Injury* for detailed guidelines on how to assess mental status and how to manage a casualty with possible traumatic brain injury.
- Declining mental status can be an important indicator of shock (see *Chapter 8*).
- Keep them calm and relaxed, with as little exposure to light and noise as possible.

After you have worked all the way through the MARCH sequence, and you have addressed all of a casualty's life-threatening injuries, you can move on to control their pain, give them additional medications if needed, and care for their other injuries (see following).

Pain Control

- ▹ See *Chapter 11: Pain* for detailed guidelines to assess and manage pain, including medications.
- ▹ It is not always possible to get a casualty's pain level to zero. Aim for 4 out of 10 or better on the pain scale (see *Addendum A11* at the end of *Chapter 11*). Ask them what they can tolerate to help you decide how much pain medication to give them.

Good: Reposition the casualty so they are comfortable, and make sure all injuries are protected.

Best/Better: In addition, give them an over-the-counter oral pain medication if they are conscious and can swallow safely.

Additional Medications

- ▹ Ask the casualty (or a family member or friend if they are unable to answer) what medications they have taken and what they normally take, if anything.
- ▹ Also ask if they are allergic to any medications.

Wounds and Fractures

- ▹ See *Chapter 13: Wounds and Fractures* for detailed guidelines.
- ▹ Check for and record all open skin wounds and bruises.
- ▹ If a dressing or splint is already in place, look under the dressing to see the extent of damage and if further care is needed, such as a dressing change. For example, check to see if the dressing is covering a cut, bruise, or large wound. Move the casualty as little as possible to avoid causing pain or dislodging clots from wounds.

- If a dressing or splint is not in place, or if one needs to be replaced, refer to *Chapter 13: Wounds and Fractures* for guidelines.

ONGOING PCC CARE

As with assessment, the tasks below need to be done for each casualty in your care at least once a day. And again, you can use the 12-hour Nursing Checklist in *Addendum A5* to help you keep track. When you finish everything in the checklist, if you have time and energy, start over. But just do what you are able to do.

Hydration and Nutrition

Start oral hydration (fluids) and nutrition (food) as soon as possible for any conscious casualty who can tolerate them. If you can, judge hydration by the amount of urine the casualty is making. See *Appendix 7* for how to measure urine output.

If you cannot measure urine output, you can use urine color. When a casualty is well hydrated, their urine should be light yellow to clear in color. If it is darker, they need fluids. See the color chart in *Appendix 7* for comparison.

Fluid Output and Intake

Monitoring

Record the fluids that a casualty takes in and puts out to help you track their progress and the effects of your efforts. Recording their intake helps you make sure they are getting the right amount to replace lost fluid. Recording output helps you determine how much urine they are producing (see *Appendix 7: Urine Output*).

In general, intake of fluid should match output, but several factors can influence this. For example, if a casualty is dehydrated or has suffered large burns, their intake may need to be much greater than their output until their condition has improved. (See *Chapter 14: Burns* for more information on the fluid needs of burn casualties.)

Output

A casualty loses fluid from wounds, urine, bowel movements, and sweat. However, the only practical way to measure fluid loss is through urine output. See *Appendix 7: Urine Output* for various methods you can use to do this. For critically ill or injured casualties, check their output every 1–2 hours. For others, check their output throughout the day as needed. Record their total amount every 24 hours.

Intake

If a casualty is conscious and able to swallow, you can give them fluids by mouth. See *Appendix 6: Oral Rehydration Solutions (ORS)* for how to make a suitable fluid, determine the amount needed for fluid loss, and record what and how much they drink.

- For mild to moderate dehydration, give 5 mL ORS every 1–2 minutes, up to 100 mL per kg of body weight (about 1.5 fluid ounces, or 3 tbsp, per pound).
- Slow, steady rehydration (redosing small amounts every few minutes over 1–4 hours) is more effective than rapid consumption of a large volume, which is more likely to cause vomiting
- Continue to replace fluids lost due to diarrhea or vomiting.
- Adjust fluids according to urine output (see *Appendix 7: Urine Output*).
- DO NOT give fluids to casualties with altered mental status, as they may choke.

If you have some medical training or experience, you can consider using rectal infusion to give fluids to a casualty who cannot take in fluids by mouth. See Appendix 10a: Advanced Practices – Rectal Infusion*.*

*If you have the necessary supplies, and if you can contact a medical provider, you also can consider using intravenous access (*Appendix 10c: Advanced Practices – Intravenous Access*) to give fluids to a casualty.*

Nutrition

1. ***Best:*** If the casualty is able to eat, give them full, balanced meals with protein, carbohydrate, vegetables, and fruit.

2. ***Better:*** If the casualty is able to eat, and you have access to solid food, give them what is available, even if meals may not be balanced.

3. ***Good:*** If the casualty is able to eat, give them food or a protein shake every 4–6 hours while they are awake.

Try to give a casualty at least 2200 calories a day of food once they are able to eat, and make sure they get plenty of protein. The greater their injuries, the more calories and protein they need to recover.

Monitoring for Infection

Trauma compromises the integrity of the skin and mucous membranes, which act as primary barriers against the pathogens that cause disease. Contamination can occur at the time of injury or later, even during care. Trauma also can impair the immune system, making casualties more susceptible to infection.

Monitor a casualty closely for signs and symptoms of infection. Provide ongoing appropriate wound care and dressing changes (see *Appendix 4: Dressings*). If you see signs of an infection, closely monitor the casualty for signs of septic shock, such as fever, low blood pressure, and/or rapid heart rate (see *Chapter 8: Shock, Circulation, and Resuscitation* and *Appendix 9b: Understanding Shock*). Provide appropriate pain management and nutritional support to promote healing (see *Chapter 11: Pain*).

Infections range from localized wound infections to severe systemic conditions like sepsis (infection of the bloodstream), which can be life-threatening. Common infections include:

Wound infections. Redness in and around a wound, swelling, or purulent (yellow/green, thick, or odorous) discharge (pus) indicate localized infection.

Pneumonia. Fever, cough, shortness of breath, fatigue, and chest pain with coughing or difficulty breathing are signs of lung infection.

Urinary tract infections. Pain or burning with urination, frequent urination, cloudy, dark or foul-smelling urine, and lower abdominal pain, nausea, or vomiting are all signs of UTI.

Minimizing the risk of infection and promptly treating infection is crucial in PCC. See *Chapter 12* for medications you can use to treat infections.

Wound Care and Dressing Changes

Critically ill and injured casualties are at high risk for complications, so give priority to wound care and dressing changes. Good wound care can reduce the risk of complications such as pressure sores, wound infections, and urinary tract infections.

Conduct dressing changes regularly and keep wounds clean. See *Appendix 4: Dressings* for how and when to change dressings, as well as *Appendix 5: Wound-cleansing Solutions*.

Pain management is crucial during wound care and dressing changes. Ideally, give a casualty an oral pain medication at least 60 minutes before you begin any wound care. See *Chapter 11: Pain* for recommendations. If you are in a situation where pain medication is limited, try to distract the casualty and take breaks during wound care.

Wound Infection Management

When you apply or change dressings, thoroughly examine each wound for contamination or debris. Clean all wounds meticulously, and remove debris (see *Chapter 13: Wounds and Fractures*). Irrigate the wound (see *Addendum A13* at the end of *Chapter 13*). Apply or replace appropriate wound dressings to promote healing and prevent contamination (see *Appendix 4: Dressings*).

Splint Management

If a splint was placed previously, make sure it is still in place and not causing additional pain. Also make sure that the splint and dressing

are not too tight, which could cause poor blood flow. If the dressing or splint is too tight, the skin below that area may be cool or dusky, or the patient may even be able to tell you it feels too tight. Also check for a pulse in the hand or foot below the splint. See *Chapter 13: Wounds and Fractures* for more information on splints and fractures, including how to adjust a splint that is too tight.

Casualty Comfort

A casualty should move or be moved often to prevent tissue injury due to lack of blood flow where their skin presses against the surface they are lying on. The most vulnerable areas include the back of the head, elbows, heels, and bottom of the spine (tailbone area).

Encourage a casualty to reposition themselves every 2 hours if they can. If possible, raise their head and upper torso to about 30 degrees to help reduce the risk of pneumonia.

For casualties who cannot reposition themselves or have difficulty doing so, reposition them and check their padding at least every 2 hours. If the casualty is lying on a hard surface, they may need to be repositioned as often as every hour. In other words, a casualty lying directly on the floor or on a thin mat will need to be turned more often than a casualty lying on a mattress.

Unconscious Casualties (including those unable to move)

Best/Better: Use pillows and wedges as described below to relieve pressure, and turn the casualty every 1–2 hours. Keep their legs aligned using pillows or blankets.

Good: Use extra clothing, blankets, and other soft items to pad bony areas of a casualty's body, and create a wedge under them, rolling them to one or the other side every 1–2 hours.

Steps to Reposition a Casualty

Get at least one other person to help you, if possible. Some "walking wounded" casualties may be able to help too.

Step 1: Roll the casualty onto one side.

- ▹ If you are concerned about neck or spine injury, carefully stabilize their neck, and keep their head, neck, and spine in line as you roll them. See *Appendix 1b* for how to stabilize a casualty's head and neck before you move them.
- ▹ Make sure there is enough slack in lines (such as IV or catheter) or cords attached to the casualty, if any, before you roll them.

Step 2: Remove pillows, blankets, and other soft items being used for positioning, and gently guide the casualty onto their back again.

Step 3: Using the same method as in Step 1, gently roll the casualty onto their other side.

Step 4: Place pillows, blankets, or other soft items under the casualty for positioning, and guide them onto their back again.

- ▹ Position the padding so that the casualty's ankles, knees, and elbows are not resting on top of each other and their arms are not resting on their abdomen.

Step 5: If the casualty is unconscious, make sure their head and neck are in line with their spine, not twisted to one side.

Step 6: Use extra padding between bony areas and hard surfaces. For example, place pillows or other soft items under the casualty's calves to prevent pressure on their heels.

Step 7: Smooth out any creases and bumps in clothing, sheets, and blankets under the casualty.

Step 8: Press on any areas of the casualty's skin that appear red. If they do not lighten in color when you release the pressure, outline those areas with a marker and position the casualty so there is no pressure on the affected areas until they recover. Discoloration can be one of the first signs that a bed sore is forming.

Step 9: Elevate and slightly flex burned and injured arms and/or legs so blood can circulate to maintain good pulses in wrists and ankles.

Oral Care

Casualties who are conscious and able should brush their teeth at least every 12 hours, preferably after each meal. For unconscious casualties, perform oral care for them at least 2 times a day.

Follow the oral cleaning with mouthwash and mouth moisturizer, and then apply lip moisturizer (such as Chapstick or petroleum jelly), if you have these supplies.

For Conscious Casualties

Give them a moistened toothbrush with toothpaste and/or baking soda, and tell them to brush for at least 1 minute. When they are done, rinse the toothbrush with potable water and put it in a bag with the casualty's name, so they can reuse it.

For Unconscious Casualties

Perform oral care twice per day for an unconscious casualty or any casualty who is not able to do it themselves.

Best: Use a padded tongue depressor to keep the casualty's mouth open and a soft toothbrush to cleanse their teeth and mouth.

- ▹ To make a padded tongue depressor, wrap gauze around one end of a wooden tongue depressor, and secure the gauze with tape.
- ▹ Use a soft toothbrush dipped in mouthwash (or water if mouthwash is not available).
  - Do not oversaturate the toothbrush, so the casualty does not inhale fluid.
- ▹ Clean the casualty's teeth and oral cavity for about 1 minute.

Better: Use a 2×2 gauze pad and follow the *Good* steps (see below). You may need more than one gauze pad.

- ▹ Wrap the pad around your finger (wear a glove if you have one) and hold it firmly with the rest of your hand.
  - You may need to use multiple gauze swabs if the casualty's mouth is badly contaminated.
- ▹ Moisten the gauze with mouthwash or water (again, do not oversaturate).

- ▹ Clean the casualty's teeth and oral cavity for about 1 minute.

Good: Use a rolled washcloth to keep the casualty's mouth open and a washcloth or towel to clean their teeth and mouth.

- ▹ Wrap the washcloth around your finger (wear a glove if you have one) and hold it firmly with the rest of your hand.
  - You may need to use different areas of the washcloth if the casualty's mouth is badly contaminated.
- ▹ Moisten the washcloth with mouthwash or water.
  - Do not oversaturate, so the casualty does not inhale fluid.
- ▹ Clean the casualty's teeth and oral cavity for about 1 minute.

Eye Protection

If a casualty is unconscious, close their eyelids to protect their eyes. If their eyes will not remain completely closed, use eye ointment or moisturizing eye drops (if you have it) to keep their eyes moist.

Skin Care

If a casualty is awake and can walk, they can use a shower if one is available. However, if they do, make sure they do not get water into their dressings. Cover these areas for them with plastic (you can use plastic bags of any kind) and tape before they shower.

If a casualty cannot use a shower, bathe them at least once every 24 hours. This includes a complete wipe-down of all uninjured areas using one of the methods described below.

Best/Better: Give the casualty a full "bed bath" with soap, gauze, or washcloths and warm water (see *Addendum B5*).

- ▹ Change the bed linens while they are bathing.
- ▹ Afterward, reposition them (see above) with padding as needed.

Good: Use "baby" wipes or skin wipes rinsed with water to cleanse a casualty's skin folds, armpits, and groin. Once these are clean, pat them dry, paying special attention to skin folds, such as under breasts, arms, and groin.

Caution! *If you use baby wipes or skin wipes, rinse them thoroughly with water first, because most of them contain alcohol and residues that can irritate skin.*

Use spot cleaning as needed between full baths (see *Good* above). Check an unconscious casualty every 2 hours in case they have emptied their bladder or bowels and need extra cleaning.

Cleaning a casualty's skin also gives you a chance to evaluate their injuries and skin condition.

Blood Clot Prevention

When a person doesn't move for a long time, they can develop blood clots in their veins, especially in their legs. These clots can lead to blockage of blood flow in the lungs that can be fatal.

Recognizing and treating these blood clots requires special medical training and is beyond what you can do. However, you can help prevent such blood clots by helping a casualty move often. If possible, a casualty should walk around multiple times per day. If they cannot walk, they can do range-of-motion exercises (see below). If they are unconscious, you can do range-of-motion exercises with them.

The exercises below may be done by a casualty with burned legs or open wounds, but avoid them for any casualty with fractured arms or legs or other severe injuries.

Range-of-motion (ROM) Exercises

At least every 6 hours, perform range-of-motion exercises on all movable joints—such as ankles, knees, hips, wrists, fingers, elbows, and shoulders—except where joint movement is not possible due to injury. Move each joint 5 to 10 times through a full range of motion. Have the casualty do this without your help if possible.

ROM Exercises for Conscious Casualties

Casualties who are conscious and able should perform each exercise below every hour while they are awake:

- **Foot pumps**. Have the casualty stretch their toes up and back, flexing their feet, and hold for a few seconds. Then point their toes and hold. Repeat 10 times.
- **Ankle circles**. Have the casualty raise one foot at a time, and trace a circle with the toes of each foot 10 times.
- **Leg raises**. With their left leg straight, have the casualty raise their left foot off the bed or floor, and then lower it. Repeat with the right leg and alternate 10 times.
  - For a less strenuous alternative, they can slowly lift their left knee up to their chest, and then bring that foot back to the bed or floor. Repeat with the right leg, and alternate 10 times.
- **Hamstring stretches**. While the casualty is lying on their back with their legs straight, have them raise one leg to 90°, pull that leg gently toward their head with one or both hands, and hold it there for up to 30 seconds. Slowly bring that leg back down to a flat position. Repeat with the other leg, and alternate 10 times.
- **Shoulder rolls**. Have the casualty raise (shrug) their shoulders and circle them back and down 5 times. Then reverse direction for 5 more circles. This is easier to do in a seated position, but it can be done while lying down.

ROM Exercises for Unconscious Casualties

Place compression stockings or elastic bandages (wrapped starting from the toes upward) on the legs of an immobile or unconscious casualty. Make sure their toes remain exposed, so you can check blood flow.

For casualties who are unconscious or cannot exercise on their own, perform the following exercises on them every 2 hours.

- ▹ **Ankle flexes**. Hold the ankle and heel of one of the casualty's feet. Bend the foot forward, and hold it there for 5–10 seconds. Then pull the foot upward and hold for 5–10 seconds.
  - Repeat 10 times, and then perform the same exercise with the other foot.
- ▹ **Lower-leg massage**. Use both your hands and start at the ankle. Apply consistent pressure, massaging the leg in an upward motion, finishing with the thigh.
  - You also may use an item such as a plastic bottle to roll their leg's skin upward.
  - Avoid deep pressure when massaging behind the knee or over bony areas.
  - Alternate and massage each leg 5 times, to simulate walking.

Pneumonia Prevention

To help prevent pneumonia, encourage a conscious casualty to take deep breaths (see below) every hour while they are awake. If they have phlegm in their throat, also encourage them to cough and clear their airway hourly.

Deep Breathing Exercise

1. Have the casualty breathe in deeply and slowly through their nose, expanding their lower rib cage and abdomen.
2. Hold their breath for 3 to 5 seconds.
3. Breathe out slowly and completely through pursed lips.
4. Have the casualty rest and repeat steps 1–3 10 times every hour.

Managing a Dying or Deceased Casualty

Casualties who appear to be dying still require your attention and care. You never know if someone may recover. Those who are deceased also require your care and respect. The steps for such care are outlined in *Chapter 16: End of Prolonged Casualty Care*.

SUMMARY

Nursing care is a lot of work. Get help with tasks when you can. Use the information in this chapter to make a schedule for yourself. Follow the steps outlined above and in *Addendum A5* to stay organized. Document each step to keep track of your work. You can use the 12-day Nursing Checklist in *Addendum A5* and the Vital Signs Record in *Appendix 2f*, or just write down the same information somewhere. You need to give this documentation to medical personnel when they arrive or when you can transport a casualty.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to transfer responsibility for a casualty, see *Chapter 16: End of PCC* at the end of this book.

ADDENDUM A5: 12-HOUR NURSING CHECKLIST

Use a copy of the form on the following page for each casualty in your care. It will help you remember what to check on regularly, so you can monitor changes in a casualty's condition. It will also provide a record of care you can give to a medical professional when they arrive or when you can transport a casualty to advanced care.

In the box next to a task, note the date and time when you complete it. You can add notes below the table or on the back of the page if needed.

If you cannot make copies, use the checklist in this book as a guideline and reminder, and make your notes wherever you can.

12-Hour Nursing Checklist	Date/Time period:	
Name:	Age:	Gender:

Note the time(s) you performed each of the following tasks:

Hourly

Check to make sure casualty performs pneumonia prevention (deep breathing) when awake.											
Confirm that massive (severe) bleeding is still controlled.											
Check to see if casualty's skin is pale, cool, sweaty, or tenting.											
Check vital signs (see Appendix 2f: Vital Signs Record).											

Hourly if casualty has shock, or give fluids according to urine output (use Notes below for details).

Every 1 to 2 hours: Reposition casualty if unable to do so themselves.

3-6 times a day

Give nutrition if casualty is awake and able to eat.											
Perform oral care.											
Perform ROM exercises.											

Once a day (minimum): Check wounds, dressings, and splints.

Once a day

Perform eye protection.											
Shower or bath.											

Every time you give a medication: Record time(s), medication(s), and dose(s) given in Notes below, as well as reactions. Timing will depend on specific medications used and changes in casualty condition.

Notes: Use the back of this page as needed.

ADDENDUM B5: STEPS TO GIVE A FULL BED BATH

Step 1. Prepare a basin or bowl with warm water and a small amount of mild soap.

Step 2. Place several 4×4 gauze pads or clean washcloths in the soapy water.

Step 3. Expose the casualty's body parts to be washed, keeping the rest of them covered.

Step 4. Place a towel, extra sheet, or "puppy pad" under each area as you wash it to absorb water.

Step 5. Take one gauze pad or washcloth out of the basin and wring out the excess water. Wash the casualty's skin a little bit at a time, throwing away used gauze pads or washcloths until all their skin is clean.

a. DO NOT place contaminated gauze or washcloths back into the basin or bowl.

Step 6. Wash their face first and genital area last.

Step 7. Expose the genital area, maintaining the casualty's privacy as much as possible by covering all except the area of the body you are currently washing.

a. Female: Gently retract the labia fully and wipe from front to back in one smooth stroke. Use a separate section of the cloth or wipe for each stroke to prevent contamination from the rectum.
b. Male: Retract the foreskin if the casualty is not circumcised. Hold the penis at the shaft. Wipe from the tip of the penis down the shaft towards the main body.

Step 8. Thoroughly pat the casualty's skin dry, including all skin folds.

Step 9. Apply lotion or baby powder (or something similar) under skin folds such as the armpits, under breasts, groin, and elsewhere as needed.

If supplies are limited, you can wash the casualty using two rolls of gauze bandage. Dip both rolls into clean water. Dip one of the rolls into soapy water and wrap it around your gloved hand. Use your other hand to unroll the gauze as you clean the casualty's skin. Use the same method with the other gauze roll (without soap) to rinse the casualty.

SECTION 2

Care of Injuries

CHAPTER 6

Severe Bleeding

Identifying and stopping a casualty's bleeding is the most important thing you can do to help them survive. It is the first thing you should do when faced with a casualty, as emphasized in the Triage chapter.

When bleeding is severe, the blood loses its ability to deliver oxygen and form clots, which can quickly lead to death. In fact, uncontrolled bleeding is the leading cause of trauma-related death worldwide.

For this book, severe bleeding (or "massive hemorrhage") is defined as any bleeding that does not stop on its own after 5 minutes of direct pressure.

The purpose of this chapter is to help you identify and stop life-threatening bleeding.

Types of Bleeding Injuries

- **Compressible bleeding** usually involves penetrating wounds of the extremities. It refers to visible, external bleeding that can usually be stopped by applying pressure to the wound. Pressure stops the flow of blood, which prevents blood loss from the wound and gives the body a chance to create a clot.
- **Non-compressible bleeding** usually involves blunt and other penetrating wounds. It refers to bleeding in a place where you cannot identify or access the exact source (for example, bleeding into the chest from blunt trauma). This type of bleeding is much harder to control and often requires surgery, which is not usually possible in a PCC situation.

Sources of Bleeding

- **Arterial** bleeding results from damage to an artery. It is more dramatic than bleeding from a vein. Arteries contain blood with oxygen, and they have muscles designed to help push blood to the body, so arterial bleeding is usually a brighter red color, and it shoots or spurts to the rhythm of the heartbeat (Figure 6.1). This type of bleeding causes rapid loss of blood, so it must be controlled as quickly as possible.

- **Venous** bleeding results from damage to a vein. It tends to be a darker red color, and it oozes instead of spurts. Venous bleeding is still very serious, but it usually does not have serious consequences as quickly as arterial bleeding.

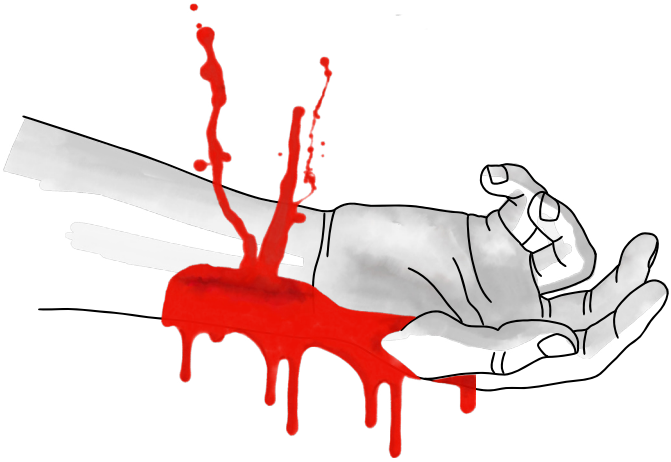


Figure 6.1. Arterial bleeding

If you would like to know more about bleeding and how it relates to the cardiovascular system, you can read *Appendix 9a: Understanding Bleeding and the Cardiovascular System*.

IN THIS CHAPTER

If you can identify the source of a casualty's severe bleeding, go to "Compressible Bleeding" below.

If you cannot see bleeding, or you have managed to stop the obvious bleeding with compression measures, then skip to "Blood Sweep" below to find other possible sources of less obvious bleeding.

KEY POINTS

- Severe bleeding is the number one cause of preventable death after injury.
- Severe bleeding can cause death within a few minutes, so it is the first type of injury you must manage!
- You can stop life-threatening compressible bleeding using the methods described in this chapter.
- Non-compressible bleeding (including internal) can be controlled only by surgery.
- Severe bleeding usually causes dangerously low body temperature—or hypothermia. Keep casualties warm!
- If a casualty has a high-impact injury to their chest, back, head, or torso, you can assume they have severe, non-compressible bleeding. Examples of high-impact injury are: the casualty was hit by a vehicle, was close to an explosion, or fell from a height of 2.5 to 3 meters.
- Wounds that are *not* bleeding severely are covered in *Chapter 13: Wounds and Fractures*. They should be addressed only after the more urgent, potentially life-threatening injuries and conditions in *Chapters 6 through 11*. (If in doubt, treat a bleeding wound as severe.)

Do Not:

- DO NOT leave a tourniquet on for more than 2 hours, if possible.
- DO NOT remove a tourniquet that has been in place for more than 6 hours.

COMPRESSIBLE BLEEDING

If you can see the wound from which bleeding is coming, it is probably compressible. That means you can stop the bleeding by applying pressure directly to the wound or, if it is on an arm or leg, by stopping blood flow above the wound with the tourniquet.

SYMPTOMS OF COMPRESSIBLE BLEEDING

Address bleeding in order of the following symptoms:

- Bright red, spurting blood visible (bleeding from an artery)
- Darker red, oozing blood visible (bleeding from a vein)

SUPPLIES

- Tourniquets (see *Appendix 3: Tourniquets*)
- Dressings (see *Appendix 4: Dressings*)
- Towels
- Gauze or other clean fabric

STEPS TO MANAGE COMPRESSIBLE BLEEDING

The methods presented here are for use on casualties with severe bleeding. All the methods described in this section involve compression, which is done fairly easily on arm and leg injuries. However, the task is slightly different for bleeding from the head, neck, and torso, where you cannot use a tourniquet. Instead, just follow Steps 1, 2, 6, and 9 below.

Step 1: Press on the wound for 3–5 minutes with a cloth, towel or even a bare hand.

Step 2: Slowly release pressure on the wound, and look to see if it has stopped bleeding.

- ▹ If the bleeding has stopped, skip to Step 9.

Step 3: If you cannot stop the bleeding with pressure, apply an *emergency* tourniquet (Figure 6.2).

- ▹ See *Appendix 3: Tourniquets* for how to apply an emergency tourniquet.

Figure 6.2. An emergency tourniquet placed over clothing

- ▹ Note the time that you applied the emergency tourniquet. Write it somewhere so the information stays with the casualty.

NOTE

Use a tourniquet ONLY for an arm or leg. DO NOT place a tourniquet around a casualty's neck!

Step 4: After the emergency tourniquet has stopped the bleeding, find the exact location of the wound.

- ▹ Remove the casualty's clothing around the area of the wound where you need to apply a spot tourniquet.

Step 5: Place a spot tourniquet as described in *Appendix 3: Tourniquets* (Figure 6.3).

- ▹ Slowly release the emergency tourniquet, but leave it in place in case the spot tourniquet fails.

Figure 6.3. Example of placement of a spot tourniquet

When you release the emergency tourniquet, ensure there is no bleeding from previously unidentified wounds above the spot tourniquet. If necessary, retighten the tourniquet until you have controlled all severe bleeding on that limb.

Step 6: Apply a pressure dressing to the wound.

- ▹ See *Appendix 4: Dressings* for what type of dressing to apply and how to do so.

Step 7: Slowly release the spot tourniquet.

- ▹ If you see no bleeding through the pressure dressing, skip to Step 9.
- ▹ If bleeding occurs, retighten the spot tourniquet and leave it in place.

Step 8: Within 2 hours of applying a tourniquet, convert to a pressure dressing if possible.

- ▹ See *Appendix 3: Tourniquets* for how to convert a tourniquet to a pressure dressing.

DO NOT release a tourniquet that has been in place for more than 6 hours.

Step 9: Repeat above steps as needed for each wound with obvious bleeding, in order according to severity of bleeding.

- ▹ Any wound with bleeding that was controlled in Step 2 can wait until other more urgent injuries have been managed. Such wounds are covered in *Chapter 13: Wounds and Fractures*.

Step 10: When you have controlled the bleeding of all obvious wounds, go to "Blood Sweep" below.

BLOOD SWEEP

To identify less obvious severe bleeding, perform a blood sweep. You need to remove the casualty's clothing so you don't overlook a potentially life-threatening injury. However, decreases in body temperature reduce the blood's ability to clot, so limit the amount of time that the casualty remains exposed and/or in contact with a cold surface (like the ground).

Examine the casualty's body by scanning with your eyes as you physically sweep their skin with your hands to look for uncontrolled bleeding. Follow with your eyes as you run your hands across the casualty's face, down their neck, down each arm, across both sides of their chest, across their belly, and down each leg to look for symptoms of bleeding.

Using your hands can help you find things you may not be able to see, especially when lighting is poor.

STEPS TO PERFORM A BLOOD SWEEP

Step 1: Remove the casualty's clothing.

- ▹ Minimize the amount of time the casualty is uncovered so they do not become cold.

Step 2: Run your fingers and hands through their hair and behind their head and neck.

- ▹ Check your hands for blood.

Step 3: Run your fingers and hands behind their shoulders and in/under their armpits.

- ▹ Check your hands for blood.

Step 4: Run your fingers and hands down the backside of each arm.

- ▹ Check your hands for blood.

Step 5: Run your fingers and hands down their torso, beginning with the upper back and moving down to the small of the back.

- ▹ Check your hands for blood.

Step 6: Run your hands under each leg, starting high in their groin and sweeping toward their feet.

▹ Check your hands for blood.

Step 7: Roll the casualty, or have them turn over, so you can inspect their other side.

▹ Begin again with Step 1.

For wounds with "severe" bleeding that you find during a blood sweep, return to the steps under "Compressible Bleeding" above. For others, go to *Chapter 13: Wounds and Fractures*, but only after you have controlled all wounds with severe bleeding and all other more urgent injuries.

CHECK VITAL SIGNS

Vital signs can provide valuable information about the potential presence and/or severity of bleeding. These measurements include pulse rate, blood pressure, breathing rate, oxygen levels, body temperature, and mental status. See *Appendix 2: Vital Signs* for how to measure each of these.

Do not try to do everything alone! Get someone to help when you can. This can include "walking wounded" casualties.

Abnormal vital signs can indicate shock related to bleeding, which is covered in *Chapter 8: Shock* and *Appendix 9b: Understanding Shock*.

▹ **Pulses.** Pulse rate and blood pressure are normal if their pulse is 60–100 beats per minute at the wrist. Any variation is abnormal.

- See Appendix 2a for how to find and measure pulses.

▹ **Breathing rate.** Breathing (respiration) rate is said to be normal if it is 12–20 breaths per minute. Any variation is abnormal.

- See Appendix 2b for how to measure breathing rate.

▹ **Oxygen saturation.** Blood oxygen level cannot be measured without the use of a specialized device—a pulse oximeter (see *Appendix 2b*).

- Bluish discoloration of the lips, gums, tongue, and/or fingers and toes may indicate low blood oxygen levels, but it does not tell you what a casualty's blood oxygen level is.

▹ **Body temperature.** If the loss of blood appears severe, or if you have any doubt, assume a casualty is cold.

- Cover them with blankets and/or add extra layers of clothing. Try to keep them dry, out of the wind, and not in direct contact with the ground.
- See *Chapter 10: Hypothermia* for more information.

▹ **Mental status.** You should repeatedly assess a casualty's mental status while helping them.

- If they are alert, gather information about their injury to help you determine where to control bleeding first.
- If they are not alert, this may give you some indication of how severe their blood loss is, or that there may be bleeding in their brain.
- For information about possible brain injury, go to *Chapter 9: Head Injury*.

NON-COMPRESSIBLE BLEEDING

Since most non-compressible bleeding is difficult to control well without surgery, the best thing to do is identify it rapidly and prioritize the casualty for evacuation to a hospital as soon as possible.

Some non-compressible bleeding due to fractures can be slowed with splinting, but it may still require surgery or advanced care. For information about bleeding associated with fractures (including fracture of the pelvis), see *Chapter 13: Wounds and Fractures*, but only after you have controlled all wounds with severe bleeding and all other more urgent injuries.

SYMPTOMS OF NON-COMPRESSIBLE BLEEDING

- Bruising behind the ears or around the eyes (Figure 6.4)

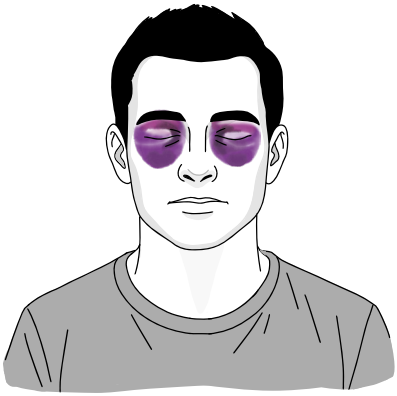


Figure 6.4. Bruising around the eyes as indication of non-compressible bleeding

- Coughing up or vomiting blood
- Bruising on or around the ribs, belly button, or low back (Figure 6.5)

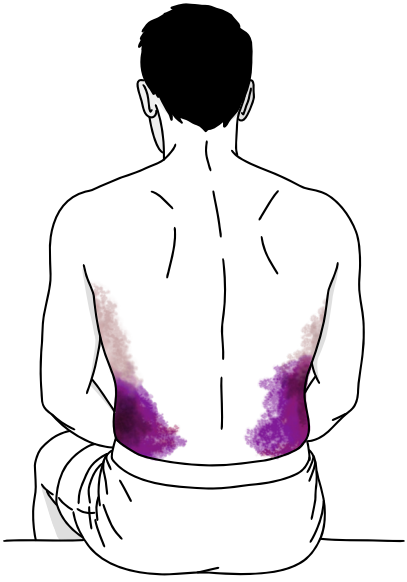


Figure 6.5. Bruising on the torso as indication of non-compressible bleeding

- Swelling or tightness of the abdomen
- Blood in the urine or feces

STEPS TO MANAGE NON-COMPRESSIBLE BLEEDING

Place a casualty with severe, non-compressible bleeding in a position they find comfortable until they can be transported, and continue to manage any other injuries they have.

Make every effort to get such a casualty to where they can get a blood transfusion and surgical care as soon as possible!

If you have some medical training or experience, if you have the necessary supplies, and if you can contact a medical provider, you can consider using intravenous access (Appendix 10c: Advanced Practices – Intravenous Access) to give blood to a casualty.

Such casualties are likely to be suffering from shock, so see *Chapter 8: Shock* for additional information about how to care for them.

PCC CONTINUED

Care and Monitoring

For additional information about how to monitor and continue care for a casualty who has had severe bleeding, see *Chapter 5: Nursing.*

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC.*

CHAPTER 7

Airway and Breathing

The airway is the path to a person's lungs. Air travels from the mouth and/or nose through the trachea (windpipe) to the lungs. Breathing (or "respiration") is the act of moving air into (to inhale oxygen) and out of (to exhale carbon dioxide) the lungs. **Problems with breathing**—or **"respiratory distress"**—can be due to:

- ▹ Problems with the chest wall and the body's means of breathing
- ▹ Direct damage to the lungs (for example, due to smoke or chemicals)
- ▹ Chest trauma, including:
  - Air trapped in the space between the lungs and chest wall
  - Broken ribs
  - Bruising of the lung tissue

You may not be able to determine the cause of a casualty's breathing problem, but these guidelines can help you **decide what to do** and then **do what you can** to help them until trained medical help arrives.

IN THIS CHAPTER

KEY POINTS

- ▹ Keep a casualty's airway clear so they can breathe as comfortably as possible.
- ▹ **DO NOT** move a casualty's neck if they could have a neck injury. See *Appendix 1b: Head and Neck Stabilization*.

SYMPTOMS

Refer to the "Assess" section below for details, but a summary list of symptoms includes:

- Casualty is conscious but cannot talk
- Unequal rise and fall of the chest
- Fast or slow breathing
- Blue color of the lips
- Use of neck or shoulder muscles to help breathing
- Leaning forward to breathe
- Wheezing or other sounds coming from the chest or throat

If a casualty has only mild symptoms (such as some coughing, but no respiratory distress), you can just monitor them without doing anything about their airway.

SUPPLIES

- Bulb syringe
- Portable pulse oximeter
- Oxygen concentrator
- Nasal cannula
- Simple or non-rebreather face mask
- Bag-valve mask (BVM)

Remember teleconsultation! When you cannot get your casualty to a higher level of medical care right away, you may be able to reach out for advice. If you can, make a telemedicine call. See Chapter 3: Communication and Documentation *for guidelines.*

STEPS TO MANAGE AIRWAY AND BREATHING

*For airway and breathing issues associated with **smoke inhalation or burn-induced swelling**, see* Chapter 14: Burns *for additional information.*

Step 1: Assess the Airway

- ▹ The quickest and easiest way to assess someone's airway is to find out if they can talk. **If they can talk, their airway is open.**
  - Let them stay in a comfortable position: leaning forward or backward, in a tripod position, or lying on their side. See *Appendix 1a: Recovery Position* for one useful position.
  - **DO NOT** move them unless their position seems to be affecting their breathing.
  - **DO NOT** move them if you think they may have a neck injury. See *Appendix 1b: Head and Neck Stabilization*.
  - If their airway is open, skip *Step 2*. Go to Step 3: Assess Breathing.
- ▹ **If they are unconscious or cannot talk**, look in their mouth for anything that could be blocking their airway, such as blood, vomit, or foreign objects such as broken teeth.
  - If you see something that appears to be in the way, go to Step 2: Clear the Airway.

An unconscious casualty cannot protect their own airway. If their airway is open, and they do not appear to have neck injuries, you can place them in the Recovery Position (see *Appendix 1a*). However, if a casualty has other injuries, they may affect how you can position them. The goal is to maintain their breathing without causing further injury.

TIP

*You can also put a casualty in the Recovery Position **after** you have cleared their airway and done the other steps below to help their breathing. This position helps prevent their tongue from falling back and obstructing their airway. It also helps prevent fluid getting into their airway.*

Step 2: Clear the Airway

- To clear a casualty's airway, first put them in the Recovery Position (see *Appendix 1a*) or on their back to open their airway.
  - **DO NOT** move them if you think they may have a neck injury. See *Appendix 1b: Head and Neck Stabilization*.
- **To remove fluids** in the casualty's mouth that could be blocking their airway, turn their head to the side to allow blood or vomit to drain (the Recovery Position often works for this), or use a suction device such as a bulb syringe (see Figure 7.1) as follows:

Figure 7.1. Bulb syringe

- Squeeze the bulb of a clean bulb syringe to collapse (empty) it, and hold it there.
- Place the tip in the bottom of the casualty's mouth or along their cheek.
- Slowly release your grip to draw fluid into the bulb.
- Remove the tip of the bulb from the casualty's mouth.
- Squeeze the bulb to empty it of the fluid. (See *Chapter 2: Managing Resources* for how to safely dispose of such waste.)

▹ **If you see loose foreign debris** that could affect their breathing, remove it if you can do so easily, but be careful not to push anything further back in their throat. And be careful you don't get injured (bitten) in the process.

▹ **To stop the casualty's tongue from blocking their airway**, reposition their head using either a head tilt/chin lift or a jaw thrust (see below). Both methods move the casualty's tongue out of the way to help open their airway. The following descriptions can help you decide which method will work best for your casualty.

- For some casualties, you will be able to clear their airway, and you can move on to other tasks.
- If their breathing problems continue or return when you release your hold, keep them in this position until they can breathe better and are more alert.
  - » Otherwise, do the best you can to keep them in a comfortable position (such as the Recovery Position) until medical help is available.

Head Tilt/Chin Lift

NOTE

Try this method first if your casualty does NOT seem to have a neck injury.

***DO NOT** use this with a casualty who may have a neck injury. Avoid moving their cervical spine! Use the jaw thrust method below instead.*

- Sit or kneel next to or behind the casualty's head, so you are looking towards their toes.
- Press down on their forehead and up beneath their chin to lift the tongue from the back of the mouth (Figure 7.2).
- You may need to maintain upward pressure on their chin and, possibly, pinch the underside of their chin and tongue as you pull upwards to keep their tongue from blocking the back of their throat.

Figure 7.2. Head tilt/Chin lift

Jaw Thrust

NOTE

This method does not require you to move the casualty's neck. Use this method if you think your casualty has a neck injury. Also use this method if they did NOT respond to the head tilt/chin lift method.

- Sit or kneel behind the casualty's head, so you are looking towards their toes.

Figure 7.3. Jaw thrust

- Hold their head in a neutral position, with no bend in their neck.
- Place your fingers beneath their jaw and gently lift the lower jawbone upward and forward so their lower teeth move in front of their upper teeth (Figure 7.3).
- In this position, the jaw pulls the tongue up and away from the back of the mouth, opening the airway.

Step 3: Assess Breathing

Once you have made sure your casualty's airway is not blocked, check for other breathing problems (respiratory distress). Look for the following signs:

- ▹ Fast or slow breathing (more than 20 or less than 12 breaths per minute)
- ▹ Unequal rise and fall of the chest (one side moves more than the other as they breathe)
- ▹ Blue color of the lips or skin
- ▹ Inability to speak in complete sentences
- ▹ Use of other muscles during breathing:
  - Neck muscles
  - Shrugging shoulders
  - Tripoding (leaning forward to breathe)
- ▹ Audible wheezing (musical or whistling sounds coming from the chest) or stridor (musical or whistling sounds coming from the throat)
- ▹ Oxygen saturation less than 90% (95% is normal)

*If you have a **portable pulse oximeter**, you can use it to assess the casualty's oxygen saturation (or "blood oxygenation"—the amount of oxygen being carried in the blood) and heart rate. See* Appendix 2b *for how to use one of these.*

If you identify any of these breathing problems, first consider the following:

- ▹ **Weather.** Extreme conditions (heat, cold, wind, dust, smoke, and so on) can irritate the airway and lungs, making respiratory distress worse. If you can, move the casualty to a more protected environment with fresh air to help them breathe better.

- **Exposure to chemicals.** See "Special Consideration" at the end of this chapter before you proceed further to manage breathing problems.
- **Pain and pain-management effects**
  - If a casualty has been given pain medications, be aware that some pain medications can make them sleepy or affect their breathing. If this occurs, provide manual breaths for the casualty with a bag-valve-mask (see below) until they begin breathing on their own.
  - A casualty may have fractured ribs that cause significant pain and discomfort when breathing. As they breathe in, their chest wall expands and presses against the injury, causing pain. To reduce this pain, give them a pillow or other object to squeeze against their chest as they inhale. This can minimize chest-wall movement and reduce the pain.

Step 4: Manage Breathing

A casualty's airway must be clear of fluids (such as mucous, saliva, vomit, blood) and foreign objects before you use assisted ventilation or rescue breaths.

Unequal Rise and Fall of Chest

If you see an unequal rise and fall of a casualty's chest (that is, one side moves more than the other side) and they have a chest or back wound, apply a chest seal as soon as possible to prevent air and debris from entering the wound. If a commercial chest seal product is not available, you can tape a clear sheet of plastic over the wound. Once you place the chest seal, position the casualty with their injured side closest to the ground.

If there is no open wound to the chest or back, and the casualty has unequal chest rise and fall, then they need more advanced care by a trained medical professional. Monitor their condition until advanced care is available (see *PCC Continued* below).

1. ***Best:* Vented chest seal.** This is a commercial product consisting of an adhesive plastic patch with a built-in, one-way valve that allows air to exit the chest cavity but not enter it (Figure 7.4).

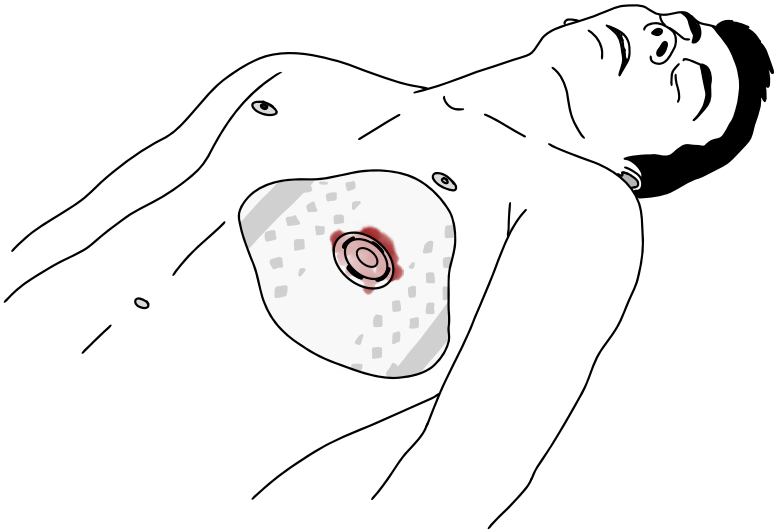


Figure 7.4. Vented chest seal

2. ***Better*: Non-vented chest seal.** This is a commercial product consisting of an adhesive plastic patch without a one-way valve. Air cannot exit or enter the chest cavity. If respiratory distress recurs after you apply a non-vented device, you may need to remove it temporarily or use "burping" (see *Good* below) to allow the trapped air to exit the chest. Reseal the patch after the air has been released.

3. ***Good:* Improvised chest seal.** You can create a chest seal using a clean plastic sheet that completely covers the wound. Tape the plastic sheet on three sides to allow air to exit the chest cavity. As the casualty inhales, the plastic should collapse and seal the wound. When they exhale, air should escape through the non-taped side. If a bubble forms under the plastic, you can provide temporary release (burping) by lifting up one side of the chest seal briefly and then resealing it at the end of the exhale.

Fast or Noisy Breathing, Low Oxygen, or Slow Breathing

Fast breathing. Fast breathing (more than 20 breaths per minute) can be due to any of the factors mentioned above. After you have addressed those factors, continue to assess the casualty and make sure they are in a comfortable position (such as the Recovery Position).

3 ***Good:*** Keep the casualty out of extreme weather conditions, follow decontamination recommendations if needed (see "Special Consideration" section below), and place them in a comfortable position. Continue to monitor them for other signs of respiratory distress.

½ ***Best/Better:*** In addition, give them oxygen, if you have it, to help ease the casualty's breathing (see "Low oxygen" below).

Noisy breathing. This could be a sign that the casualty's airway is not completely open. Go back to Step 2: Clear the Airway.

Low oxygen. If oxygen is available, you can give it to a casualty suffering from respiratory distress, especially if their lips and/or skin appear to be blue or their pulse oximeter measurements show oxygen saturation less than 90% (see *Appendix 2b: Respiratory Rate and Oxygen Saturation*).

Typically, oxygen for medical use is stored in pressurized gas tanks that can be a safety hazard. Instead, you can use an **oxygen concentrator** (Figure 7.5) to deliver small amounts of oxygen that may help a casualty breathe better. These devices are designed for use by non-medical personnel, but they do require electric or battery power.

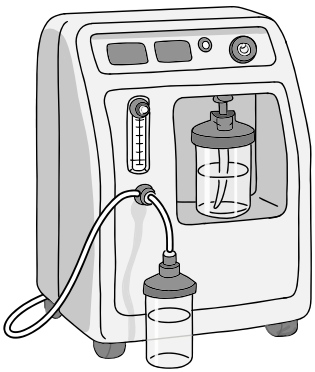


Figure 7.5. Oxygen concentrator

3 ***Good:*** Monitor patients with respiratory distress for signs of low oxygen in the blood: blue color of lips and/or skin or pulse oximeter measurements below 90% (see *Appendix 2b: Respiratory Rate and Oxygen Saturation*). Give priority to these casualties for medical treatment or evacuation. See *Chapter 5: Nursing* for how to monitor until then.

½ ***Best/Better*:** In addition, use any available oxygen-delivery device, such as a nasal cannula or face mask with an oxygen tank or concentrator, if available (Figures 7.5–7.8). Attach the tubing to the device and increase the flow of oxygen as needed to keep a casualty's pulse oximeter readings above 90%, or until they no longer appear to be blue or in distress. Keep the oxygen flow as low as possible to conserve resources.

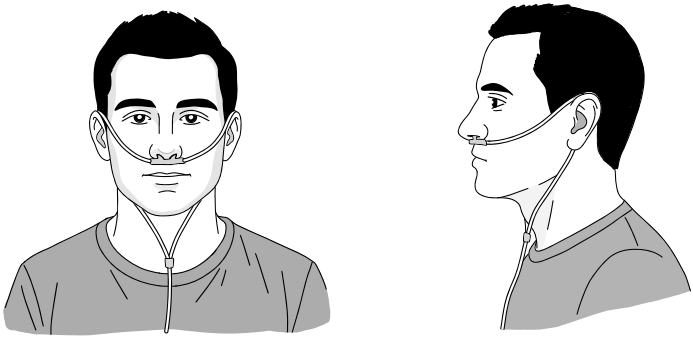


Figure 7.6. Nasal cannula

Figure 7.7. Simple face mask

Figure 7.8. Non-rebreather face mask

Slow respiration (less than 12 breaths per minute). Use a bag-valve mask (BVM; Figure 7.9) to help a casualty breathe, if you have one. It is a temporary measure meant to keep a casualty alive until they can get professional medical help.

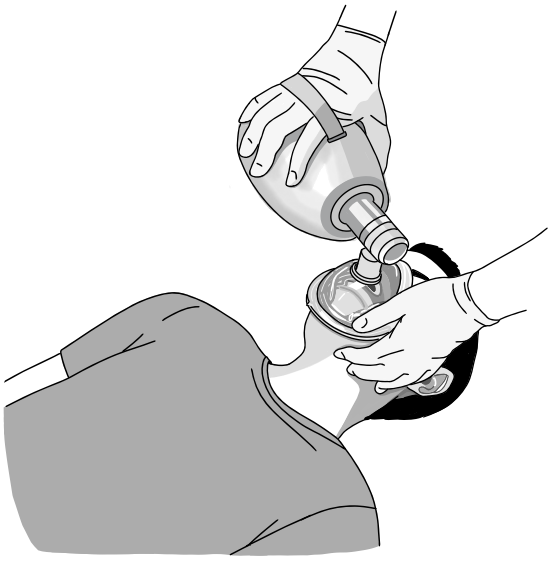


Figure 7.9: Bag-valve mask (BVM)

- A casualty who needs a BVM needs to be prioritized for more advanced medical care or immediate evacuation. BVM use cannot be continued for long periods of time.
- You must know how to use a BVM, but training is available for non-medical personnel.
- With a BVM, you can provide enough air for a casualty for prolonged periods of time. However, you need to use both hands, so you cannot do anything else while operating a BVM—until the casualty has improved or is evacuated, or until someone relieves you.

NOTE

***DO NOT** use mouth-to-mouth rescue breathing because it can transmit disease, and because it cannot be sustained for very long. If you need to provide assisted breathing, use a BVM.*

Best/Better: For slow (less than 12 breaths per minute) or no breathing (apnea), use a BVM to provide assisted breaths.

- ▹ Ensure the device is assembled correctly (mask attached to the bag).
- ▹ Place the mask over the casualty's mouth and nose. Make sure it has an airtight seal to their skin. No air should leak from the sides of the mask.
- ▹ Squeeze the bag to provide the rescue breaths. Count as the casualty's chest rises and falls, so you provide breaths at a rate of 10–12 breaths per minute (1 breath every 5–6 seconds).

Two people can operate a BVM to improve the mask-to-face seal and better deliver rescue breaths. One person uses two hands to seal the mask to the casualty's face while the second person squeezes the bag.

Good: If you do not have a BVM, help the casualty into a position where they can breathe as comfortably as possible: leaning forward or backward, in a tripod position, or lying on their side.

- ▹ See *Appendix 1a: Recovery Position* for one useful position.

Slow breathing is likely to result in low oxygen, so watch for signs of hypoxia (blue lips or skin and/or pulse oximeter measurements below 90%). If you have supplemental oxygen, you can use it with a BVM to improve oxygenation.

Step 5: Monitor Breathing

Once a casualty's airway is clear, and you have taken steps to help them breathe, you can place them in the Recovery Position (see *Appendix 1a*) and then check them periodically to make sure they are still breathing as comfortably as possible. The Recovery Position helps prevent their tongue from falling back and obstructing their airway. It also reduces the risk of fluid getting into their airway.

SPECIAL CONSIDERATION: RESPIRATORY DISTRESS FOLLOWING A CBRNE EVENT

Chemical, biological, radiological, nuclear, and explosive (CBRNE) incidents can result in large numbers of casualties with various injuries and illnesses, often with inhalation of chemicals and other materials that can cause respiratory distress or arrest. This includes smoke, nerve agents, cyanides, sulfur mustard, and opioids. The care of CBRNE casualties with respiratory distress is largely the same as above, with a few other considerations.

- Immediately remove casualties from the hazardous environment.
- Rapidly decontaminate casualties by removing their clothing and rinsing or showering them with water.
- Administer any antidotes recommended by public health officials.
- Manage airway and breathing issues as described above.

PCC CONTINUED

Care and Monitoring

For additional information about how to monitor and continue care for a casualty, see *Chapter 5: Nursing*.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC* at the end of this book.

CHAPTER 8

Shock, Circulation, and Resuscitation

Shock occurs when the body's circulatory system (also known as the "cardiovascular system") cannot deliver enough blood and nutrients to support vital organs such as the heart and brain. The result can be life-threatening.

Circulation is the body's process of delivering blood by way of its blood vessels—arteries and veins—to all parts of the body. The heart is the pump that keeps the blood moving through the blood vessels. (For more information, see *Appendix 9a: Understanding Bleeding and the Cardiovascular System*.)

Resuscitation is the process of dealing with shock by restoring healthy blood flow and/or helping the heart function properly.

There are different types of shock, depending on cause, but three types are important for the types of injuries that need to be managed during PCC: hypovolemic shock, hemorrhagic shock, and septic shock.

Hypovolemic Shock

Fluid loss (including blood loss) or not taking in enough fluids can cause dehydration and hypovolemic shock. In this case, fluid replacement is a high priority.

- "Hypovolemia" refers to the loss of water and electrolytes from the body due to dehydration, diarrhea, excess sweating, burns, bleeding, and other conditions, which can lead to hypovolemic shock.

Hemorrhagic Shock

Blood loss—one of the most common reasons for shock in a disaster—results in what is called "hemorrhagic shock." Stopping blood loss to prevent shock or replacing lost blood to treat shock is a high priority.

- Hemorrhagic shock is the result of massive blood loss, when not enough oxygen and nutrients reach the body's organs and tissues.
- Hemorrhagic shock is a specific type of hypovolemic shock, and the treatment of choice is replacement of blood with a transfusion, which is not usually possible during PCC (but see *Appendix 10c: Intravenous Access*).

Septic shock

Casualties with open wounds can have infection spread to their bloodstream and develop "septic shock." The infection in their bloodstream causes their blood vessels to work poorly, resulting in poor circulation to vital organs. Septic shock will not happen right away, but it may develop hours to days after an injury.

For more information about the causes and effects of the various types of shock, see *Appendix 9b: Understanding Shock*.

IN THIS CHAPTER

KEY POINTS

- ▹ Hemorrhagic, hypovolemic, and septic shock all mean that less oxygen and nutrients are getting to a casualty's internal organs and limbs due to poor circulation.
- ▹ Vital signs, especially heart rate and blood pressure, are **important indicators of shock**. You can accurately check heart rate and respiratory (breathing) rate and estimate blood pressure without any tools or training.
- ▹ Continue to watch for symptoms of shock the entire time a casualty is in your care. Hemorrhagic and hypovolemic shock usually occur near the time of initial injury, but septic shock can develop hours to days after injury.
- ▹ During a large-scale conflict or disaster, hypovolemic shock can be life-threatening due to a lack of clean water and an increase in diseases that can lead to dehydration.

Do Not:

- ▹ DO NOT leave a casualty in shock unattended. They are not getting enough blood flow to their brain and other vital organs, so they need as much attention as you can give them, as often as possible.
- ▹ DO NOT give fluids to a casualty who is unconscious.

SYMPTOMS

- ▹ Heart rate (pulse) over 100 beats per minute plus blood pressure below 90 systolic indicate that a casualty is in shock.
  - Respiratory rate is often high with shock, but there are other reasons for fast or slow breathing, so refer to *Chapter 7: Airway and Breathing*. A normal respiratory rate is 12–20 breaths per minute.
  - See *Appendix 2* for how to measure a heart rate (pulse), respiratory (breathing) rate, and blood pressure.
- ▹ Check the casualty's temperature. See *Appendix 2d* for how to measure body temperature.
  - Above-normal body temperature with both low blood pressure and high heart rate likely indicate **septic shock**.
  - Below-normal body temperature means a casualty is hypothermic. Hypothermia occurs with shock due to poor circulation and metabolism. See *Chapter 10: Hypothermia* for more information.
- ▹ Other signs of shock include decreased consciousness (anything other than alert on the AVPU chart in *Appendix 2e: Mental Status*) and pale, cool, or sweaty skin.

SUPPLIES

- ▹ Automatic blood pressure cuff (*Appendix 2c*)
- ▹ Pulse oximeter (*Appendix 2b*)
- ▹ Thermometers (*Appendix 2d*)
- ▹ Oral rehydration solution (*Appendix 6*)
- ▹ Emergency blankets
- ▹ Gloves

- ▹ Pelvic binders
- ▹ Bed sheets
- ▹ Urine collection system (*Appendix 7*)
- ▹ See also *Appendix 4: Dressings*

STEPS TO MANAGE SHOCK – RESUSCITATION

Resuscitation is the process of managing shock and restoring adequate circulation. You can help prevent and manage shock by controlling a casualty's bleeding, keeping them warm, and keeping them hydrated. For hemorrhagic shock, ideally, lost blood should be replaced with new blood (transfusion), but this is rarely possible in a PCC situation. The steps below are things you can do if transfusion of blood by medical professionals is not available.

Remember teleconsultation! When you cannot get your casualty to a higher level of medical care right away, you may be able to reach out for advice. If you can, make a telemedicine call. See Chapter 3: Communication & Documentation *for guidelines.*

Step 1: Track Vital Signs

- ▹ Reassess and document your casualty's vital signs every 30 to 60 minutes.
  - Ideally, record their vital signs on paper to help you to track changes. (See *Appendix 2f, Vital Signs Record*, for a useful form you can use. Examples of how to use it are in *Addendum A8* at the end of this chapter.) They should get closer to the normal range over time, whether they are increasing or decreasing.
- ▹ Check your casualty's mental status as described in *Appendix 2e: Mental Status*. If their mental status is getting worse, they may still be losing blood, or they may have other injuries, such as internal bleeding or head injury, requiring more advanced care.
  - See *Chapter 6: Severe Bleeding* for how to check for ongoing blood loss. If you find signs of bleeding wounds, proceed to Step 2.

- See *Chapter 9: Head Injury* for how to determine if a casualty has a head injury. If you think they do, stabilize their head and neck as described in *Appendix 1b: Head and Neck Stabilization*, and then continue with Step 2 below to manage shock before proceeding further with the head injury.

Step 2: Manage Bleeding

- ▹ If a casualty is bleeding, first see *Chapter 6: Severe Bleeding* for how to stop and control bleeding.
- ▹ If a casualty has no obvious bleeding, but you suspect injury to their pelvis, first apply a pelvic binder. See *Chapter 13: Wounds and Fractures* for more information.

Step 3: Manage Hydration

- ▹ Ideally, if a casualty has lost a lot of blood, it is best to give them blood through transfusion. However, transfusion is probably not possible in a PCC situation.

*If you have some medical training or experience, if you have the necessary supplies, and if you can contact a medical provider, you can consider using intravenous access (*Appendix 10c: Advanced Practices – Intravenous Access*) to give blood to a casualty.*

- ▹ When transfusion is not possible, give them fluids to drink. This will help increase the amount of fluid in their arteries and veins and improve circulation.
  - The fluid is absorbed from the stomach into the bloodstream (arteries and veins), helping to move blood and oxygen throughout their body.
  - Hydration also buys time for their body to start making new red blood cells (which carry oxygen) to replace the blood the lost.
- ▹ If a casualty is conscious, they can drink water and, if possible, an oral rehydration solution (ORS). Commercial ORS tablets can be

dissolved into 1 liter of clean drinking water. If a commercial ORS solution is not available, you can make one. See *Appendix 6: Oral Rehydration Solutions* for more information.

If you have some medical training or experience, you can consider using rectal infusion to give fluids to a casualty who cannot take in fluids by mouth. See Appendix 10a: Advanced Practices – Rectal Infusion*.*

*If you have the necessary supplies, and if you can contact a medical provider, you also can consider using intravenous access (*Appendix 10c: Advanced Practices – Intravenous Access*) to give fluids to a casualty.*

- Urine output (UOP) is the best way to ensure your casualty is well hydrated and getting enough blood to their internal organs. Kidneys that are getting enough blood will make urine at least every 6 hours. See *Appendix 7* for how to monitor urine output.

Step 4: Prevent Hypothermia (Low Body Temperature)

- Preventing hypothermia is crucial to help control bleeding. Maintaining normal body temperature allows the blood to clot and stops wounds from bleeding. This easily overlooked step can be of life-saving importance. Refer to the *Chapter 10: Hypothermia* for details.

Step 5: Give Antibiotics

- If the casualty has a high temperature and other signs of septic shock (fast heart rate and low blood pressure), give them an antibiotic. Refer to *Chapter 12: Medications* for information about which antibiotics can help.

PCC CONTINUED

Care and Monitoring

- A casualty in shock can easily fall or pass out, so always help them if they need to sit up, stand, or walk.
- Use the chart in *Appendix 2f: Vital Signs Record* to keep track of a casualty's vital signs. If you see any getting worse, repeat the steps above as needed.
- For casualties whose shock is severe and who cannot get out of bed for prolonged periods, refer to *Chapter 5: Nursing* for further guidelines.
- If the casualty's vital signs and mental status return to normal, the casualty is no longer in shock. But they will need additional rest, hydration, and nutrition to recover.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC*.

ADDENDUM A8: EXAMPLES OF VITAL SIGNS TRENDS ASSOCIATED WITH SHOCK

Keeping track of changes in a casualty's vital signs allows you to see how and when their condition is changing. A blank table is available in *Appendix 2f: Vital Signs Record* that you can use. Three examples of its use are provided below to show how you can follow trends in vital signs to assess shock.

Table A8.1. Vital signs trends that indicate development of septic shock.

Vital Signs Record						
Name:				Age:	Gender:	Weight:
Date & time	**Heart rate**	**Respiratory rate**	**Blood pressure**	**Body temperature**	**Mental status**	**Pain level**
01 JAN 0900	*105*	*16*	*105/60*	*98.9*	*A*	*4*
01 JAN 1000	*110*	*16*	*106/62*	*101.3*	*A*	*4*
01 JAN 1100	*107*	*18*	*108/67*	*101.1*	*A*	*4*
01 JAN1300	*115*	*20*	*105/59*	*101.1*	*A*	*4*
01 JAN 1400	*120*	*20*	*100/55*	*100.5*	*V*	*3*
01 JAN1500	*118*	*22*	*95/55*	*100.5*	*V*	*4*
01 JAN1600	*123*	*22*	*93/57*	*101.1*	*P*	*?*
01 JAN1600	*129*	*24*	*90/56*	*100.9*	*P*	*?*
Notes:						
Heart rate increasing and blood pressure going down. Probably means shock, especially since mental status is getting worse – maybe blood flow to the brain is bad. Could be hypovolemic shock so will check for bleeding and give plenty of fluids, but he also has a fever. Could be an infection, so this could be septic shock. Will need antibiotics, fluids, and close watch on his airway while mental status isn't good.						

Table A8.2. Vital signs trends that indicate improvement from hemorrhagic shock.

Vital Signs Record						
Name:				Age:	Gender:	Weight:
Date & time	**Heart rate**	**Respiratory rate**	**Blood pressure**	**Body temperature**	**Mental status**	**Pain level**
01 JAN 0900	*128*	*24*	*86/56*	*97.1*	*P*	*?*
01 JAN 1000	*125*	*22*	*85/59*	*97.6*	*P*	*?*
01 JAN 1200	*120*	*20*	*90/56*	*97.6*	*V*	*6*
01 JAN 1300	*112*	*18*	*96/60*	*97.6*	*V*	*4*
01 JAN 1400	*110*	*18*	*100/61*	*97.6*	*V*	*4*
01 JAN 1500	*110*	*16*	*100/60*	*98.0*	*A*	*5*
01 JAN 1600	*108*	*16*	*102/65*	*98.0*	*A*	*5*
Notes:						
Heart rate is decreasing and blood pressure is getting higher. Probably means shock is going away. No fever. Mental status is better. Ready for food and fluids. But check regularly to make sure she continues to get better.						

Table A8.3. Vital signs trends that indicate worsening hypovolemic shock.

Vital Signs Record						
Name:				Age:	Gender:	Weight:
Date & time	**Heart rate**	**Respiratory rate**	**Blood pressure**	**Body temperature**	**Mental status**	**Pain level**
01 JAN 0900	*100*	*18*	*120/76*	*98.2*	*A*	*5*
01 JAN 1000	*108*	*18*	*100/60*	*98.2*	*A*	*5*
01 JAN 1200	*120*	*22*	*88/58*	*98.0*	*V*	*4*
01 JAN 1300	*122*	*22*	*88/65*	*98.1*	*V*	*4*
01 JAN 1400	*125*	*22*	*86/58*	*98.0*	*V*	*4*
01 JAN 1500	*125*	*22*	*85/55*	*97.1*	*P*	*?*
01 JAN 1600	*128*	*20*	*86/52*	*97.1*	*P*	*?*
Notes:						
Heart rate is going up and the blood pressure is going down. Probably means shock, especially since their mental status is getting worse. Maybe blood flow to the brain is not good. No fever that would indicate septic shock, so most likely hypovolemic shock. Could also be due to hemorrhage so need to check for any bleeding. If no bleeding, the shock is likely from not enough fluids. Give plenty of fluids and watch their airway while their mental status is altered.						

CHAPTER 9

Head Injury – Traumatic Brain Injury

Traumatic brain injury (TBI) occurs when an outside force impacts your head, causing your brain to move forcefully within your skull. The skull provides a protective case for the brain, but it also limits room for the brain to move, so a forceful blow to the skull can overcome its protective features. The brain can actually collide with the inside of the hard skull, leading to bleeding inside the brain and damage to the brain tissue itself (Figure 9.1).

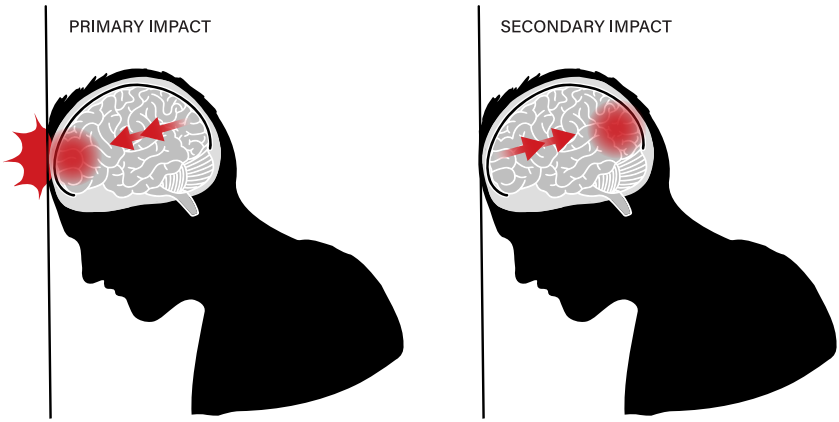


Figure 9.1. Cause of traumatic brain injury

Your body responds to any damage by increasing blood flow to the injured area, which results in swelling. Swelling is not often a major issue elsewhere in the body, but the skull cannot increase in size to allow for the brain to swell. Such swelling can result in greater-than-normal pressure inside the skull, known as "intracranial pressure." This can cause even more harm to the brain.

Most TBIs are mild and not immediately life-threatening, but multiple mild TBIs over time can lead to long-term consequences!

This chapter focuses on injury to the brain associated with head trauma. For information about how to manage wounds to the head, see *Chapter 13: Wounds and Fractures*.

IN THIS CHAPTER

SYMPTOMS

A casualty with suspected trauma to the head or neck region (such as from a bomb blast or vehicle crash) should be assessed for potential TBI. These are classified as mild, moderate, and severe, but this chapter groups the last two together because they are treated the same way during PCC.

Mild TBI. Also known as a concussion, mild TBI is the most common type, so you need to know how to recognize its signs and symptoms. Common symptoms are:

- Headache
- Nausea and/or vomiting
- Dizziness, vertigo (sense of spinning or movement while at rest), and/or lightheadedness (feeling faint)
- Sensitivity to light and sound
- Altered mood (behavior)
  - Anxiety, quicker to anger, and/or sadness
- Blurred vision
- Confusion

Moderate-to-severe TBI. Other symptoms indicate a more severe brain injury due to extreme swelling or bleeding in the brain that causes greater intracranial pressure. Such cases need immediate medical care.

The following symptoms are associated with moderate-to-severe TBI:

- Loss of consciousness (casualty faints or passes out)
- Repeated vomiting

- Worsening headache
- Slurred speech and/or unusual behavior
- One pupil larger or less responsive than the other
- Weakness, numbness, body shakes, and/or seizures

SUPPLIES

- Portable light (flashlight, penlight, mobile phone light)
- Towels or other padding

Remember teleconsultation! When you cannot get your casualty to a higher level of medical care right away, reach out for advice if you can. See Chapter 3: Communication and Documentation *for telemedicine guidelines.*

HOW TO EVALUATE TBI

Before you start to examine a casualty: If they are unconscious or cannot move their neck in all directions, assume that they have a neck injury, and stabilize their head and neck (Step 1 below). This can help prevent more damage if they have a neck injury, which is common in casualties with head injuries.

If they are conscious and can move their head in all directions, they do not need head and neck stabilization. Skip to Step 2.

Step 1: Stabilize the Head and Neck

If a casualty has a spinal injury, twisting of the head, neck, or body could damage the spine, including possible paralysis. Stabilizing keeps the head, neck, and body in line to help prevent further injury. See *Appendix 1b: Head and Neck Stabilization* for how to do this.

Step 2: Determine Consciousness

Next, determine how responsive the casualty is and if they are conscious.

You can use the AVPU scale (see *Appendix 2e*) to determine this, even if you have no medical training. Just talk to the patient (or, if needed, pinch them) and observe their response.

A casualty who has any other symptoms of TBI and who is "Alert" probably has mild TBI. Responses other than "Alert" are considered abnormal and likely indicate moderate-to-severe TBI.

Step 3: Serial Neurological Exams

If any of the symptoms mentioned above suggest that a casualty has TBI, you can do a series of neurological exams to help trace how well their brain is working. You can do this series every few hours during the first 24 hours after injury. If you find new abnormalities, or if existing ones get worse, the casualty may have a more severe TBI.

Step 3a: Mental Status Exam

Talk to the casualty. Ask them their name and their current location, date, and situation. Do they know what happened? What were they doing before the injury? If they cannot answer these questions accurately, this may indicate abnormal pressure inside the skull, but alone it is not enough to indicate whether the TBI is mild, moderate, or severe. Continue with the rest of the exam.

Step 3b: Language Exam

Pay attention to the casualty's speech as they reply in Step 3a. Are they having trouble speaking? Are they slurring their words? Are their responses appropriate to the situation? Trouble with speech is a sign of increased intracranial pressure, but again it is not enough to indicate mild or moderate-to-severe TBI. Continue with the rest of the exam.

Step 3c: Pupil (Eye) Exam

Normal response

1. Look at the pupils of the casualty's eyes. They should be equal and round (Figure 9.2 left).
2. If you have a flashlight, shine the light in one eye. It should only take 1–2 seconds for the pupils of both eyes to get smaller (Figure 9.2 center).

3. After about 3 seconds, swing the light to the other eye. The first pupil may dilate at first, but then it should constrict, so that both pupils are constricted (Figure 9.2 right).

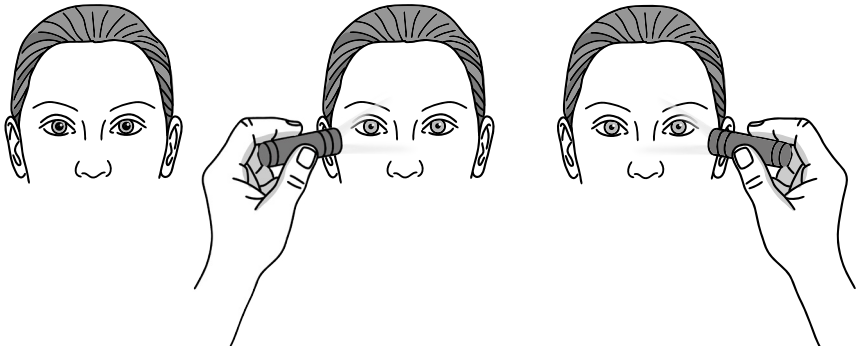


Figure 9.2. Normal reactions of the eye to light

Abnormal response

4. Look at the pupils of the casualty's eyes. They should be equal and round (Figure 9.3 left). Pupils that are not equal and round indicate potential brain injury.
5. If you have a flashlight, shine the light in one eye. The pupils of both eyes should get smaller (Figure 9.3 center). If one or both pupils do not get smaller (stay the same size), that is abnormal and could indicate brain damage.
6. After about 3 seconds, swing the light to the other eye. If one or both pupils do not get smaller (stay dilated) that is abnormal and could indicate brain damage (Figure 9.3 right).

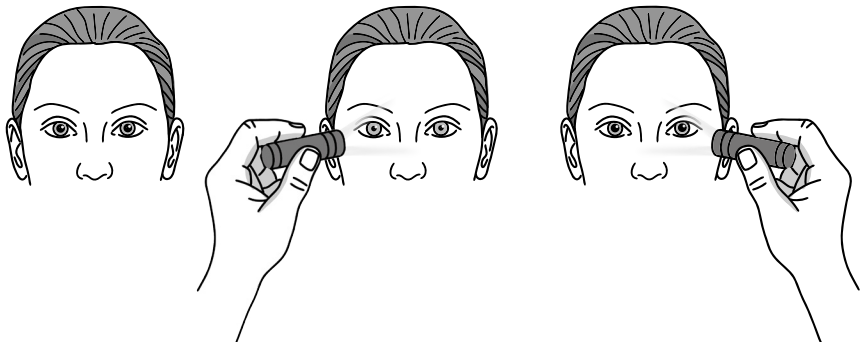


Figure 9.3. Abnormal reactions of the eyes to light

Step 4: Look for Other Symptoms

Does the casualty show any other symptoms that could help you determine whether they have mild or moderate-to-severe TBI?

Other symptoms of **mild TBI** include:

- ▹ Headache
- ▹ Nausea and/or vomiting
- ▹ Dizziness, vertigo (sense of spinning or moving while at rest), and/or lightheadedness (feeling faint)
- ▹ Sensitivity to light and sound
- ▹ Altered mood (behavior)
  - Anxiety, quick to anger, and/or sadness
- ▹ Blurred vision

Other symptoms of **moderate-to-severe TBI** include:

- ▹ Decreased responsiveness
- ▹ Repeated vomiting
- ▹ Worsening headache
- ▹ Loss of consciousness (casualty faints or passes out)
- ▹ Slurred speech and/or unusual behavior
- ▹ One pupil larger or less responsive than the other
- ▹ Weakness, numbness, body shakes, and/or seizures

STEPS TO MANAGE TBI

How you manage TBI depends to some extent on whether it is mild or moderate-to-severe. Once you have determined the level of TBI through the assessment above, you can help a casualty with a TBI by doing the following while you are waiting for professional medical help.

Do not try to do everything alone! Get someone to help when you can. This can include "walking wounded" casualties.

Step 1: Positioning

For mild TBI, the casualty can be in whatever position is most comfortable for them, depending on other injuries they may have.

For **moderate-to-severe TBI**, raise their head to 15–30 degrees if they are lying on a bed. Otherwise, keep their head raised above their heart. Keeping their head elevated helps reduce swelling of the brain by using gravity to drain fluid out. Make sure there is nothing tight-fitting around their neck that could prevent drainage and increase pressure in their head.

DO NOT reposition a casualty who has a neck injury without stabilizing their spine. They should remain lying flat with their head in line with their spine. If you must move the casualty, you will need an extra person to stabilize the casualty's head and neck as they are moved.

Step 2: Pain Control

Casualties with TBI may have a headache or other pain from the cause of their injury. Please refer to *Chapter 12: Medications* for information and guidelines for the use of pain-relief medication.

Step 3: Food and Fluid Intake

Casualties with **mild TBI** should be allowed to eat and drink, as they can, but if they start to feel nauseous and/or vomit, have them take a break from eating or drinking until the nausea goes away.

For casualties with **moderate-to-severe TBI**, give them small sips or drops of any fluids that they can tolerate by mouth. Again, if they feel nauseous and/or vomit, have them take a break before drinking anything else.

Step 4: Return to Activity or Remain Under Care?

Casualties with Mild TBI

In the absence of other injuries, a casualty with mild TBI should be rechecked once a day to determine if they can return to full activity. Table 9.1 outlines a step-by-step approach. Start at Step 1 and progress through each phase. DO NOT skip any phases. Before you move a casualty to the next phase, their symptoms must be the same or better, without new symptoms, for at least 24 hours. If their symptoms get worse or they have new symptoms, do not allow them to advance to the next phase, and re-evaluate them in 24 hours.

Table 9.1. Step-by-Step Return to Activity Following TBI

Step 1: Relative rest

DESCRIPTION	EXAMPLES OF ACTIVITY
Rest to promote recovery and avoid any activity that could make symptoms worse.	Spend both sleep and awake periods resting in a low-light, low-noise environment.
When there have been no symptoms of TBI for 24 hours, go to Step 2.	

Step 2: Limited activity

DESCRIPTION	EXAMPLES OF ACTIVITY
Practice only mild exertion.	▪ Take walks outside or visit a public area. ▪ Increase exposure to light and noise.
When there have been no symptoms of TBI for 24 hours, go to Step 3.	

Step 3: Light activity

DESCRIPTION	EXAMPLES OF ACTIVITY
Introduce light exertion and environmental distractions.	▪ Perform seated (such as desk) activities with normal light and background noise.
When there have been no symptoms of TBI for 24 hours, go to Step 4.	

Step 4: Moderate activity

DESCRIPTION	EXAMPLES OF ACTIVITY
Increase intensity and duration of activity.	▪ Similar to Step 3, except that symptom-free hours should increase. ▪ Add some gentle exercise, such as speed walking or jogging.
When there have been no symptoms of TBI for 24 hours, go to Step 5.	

Step 5: Intense activity

DESCRIPTION	EXAMPLES OF ACTIVITY
Introduce physical and mental activities similar to those before TBI.	▪ Return to normal physical activities, with breaks as needed. ▪ Return to medium-intensity personal activity (exercise) with longer-than-usual periods of rest.
When there have been no symptoms of TBI for 24 hours, go to Step 6.	

Step 6: Return to full activity

DESCRIPTION	EXAMPLES OF ACTIVITY
Return to all pre-TBI activities.	▪ Return to all pre-TBI work and activities at the same intensities and lengths of time as before TBI.

Casualties with Moderate-to-Severe TBI

These casualties must be transported to a higher level of medical care as soon as possible. DO NOT allow them to return to work or other activities while they are in your care awaiting medical attention. See *Chapter 5: Nursing* for monitoring and maintenance guidelines, in addition to keeping these casualties in a low-light, low-noise environment as much as you can.

PCC CONTINUED

Care and Monitoring

At least every 24 hours, check the status of a casualty with a head injury. Repeat the AVPU assessment (*Appendix 2e*) to figure out if their mental status is better or worse. Look for any changes in their appearance or behavior that suggest moderate-to-severe TBI, such as loss of consciousness or increased vomiting. Reassure them to the best of your ability.

Visit *Chapter 5: Nursing* for ongoing care of a casualty.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC* at the end of this book.

CHAPTER 10

Hypothermia—Cold Injury

"Hypothermia" is a condition in which a person's internal (core) temperature is below normal (35°C or 95°F) and has trouble getting back up to the normal range (36–37°C or 96.8–98.6°F). Hypothermia on its own can be life-threatening, but it is even more dangerous after serious injury, or "trauma." As core temperature decreases, a series of changes occur throughout the body that make survival even less likely. For instance, blood has more trouble clotting, so it becomes hard to stop a casualty's bleeding. Losing a lot of blood then makes the hypothermia worse, which creates a cycle that can make recovery and survival extremely difficult.

The effects of temperature are so powerful when combined with trauma that, if the body's temperature falls below 32°C (89.6°F) and you cannot raise the casualty's body temperature, death is almost inevitable.

Hypothermia can occur in any environment, at any temperature, if a patient has serious injuries or blood loss.

The most important thing to remember is that it is easier to prevent hypothermia than to treat it, so prevention is the best strategy for any casualty.

IN THIS CHAPTER

KEY POINTS

- ▹ Hypothermia is a common condition associated with serious injury and shock.
- ▹ If a casualty has lost a lot of blood or has a serious injury (such as an amputation or a heavily bleeding gunshot wound), assume they have or will develop hypothermia and take steps to prevent it.
- ▹ The best way to recognize hypothermia is to determine a casualty's body temperature.

Do Not:

- ▹ DO NOT wait for signs of hypothermia. Begin prevention as soon as possible, by eliminating anything that could make a casualty colder.

SYMPTOMS

- ▹ Body temperature less than 36°C (96.8°F)
  - See *Appendix 2d: Body Temperature* for how to measure temperature.
- ▹ Cool, pale skin
- ▹ Confusion
- ▹ Loss of consciousness

Other signs of hypothermia are listed in Table 10.1 according to levels of hypothermia from mild to severe.

Extreme blood loss can have many of the same effects as hypothermia, such as cool, pale skin, confusion, and loss of consciousness. If a casualty shows these signs, take steps to prevent hypothermia even if they have a normal temperature, but also check for a severe injury or source of bleeding.

Table 10.1. Levels of Hypothermia

Level	Symptoms	Steps to Manage
Mild	**Body temperature 36–34°C (96.8–93.2°F)** ▪ Vigorous shivering at first, will weaken as hypothermia gets worse. ▪ Skin color (especially exposed areas like the hands, feet, ears, and nose) will first be red, and then turn pale or blue-gray as hypothermia gets worse. ▪ Numbness in hands and feet. ▪ Lack of coordination. May appear clumsy due to muscle stiffness.	1. Hypothermia prevention 2. Passive warming 3. Active warming if passive warming is not effective
Moderate	**Body temperature 34–32°C (93.2–89.6°F)** ▪ Shivering may or may not occur, as the casualty loses the ability to generate body heat by shivering. ▪ Fatigue or sleepiness—abnormal tiredness—gets worse as hypothermia gets worse. ▪ Altered mental status, such as more confused, and may try to remove their clothing, even in a cold environment.	1. Hypothermia prevention 2. Passive warming 3. Active warming if casualty is no longer shivering or if passive warming is not effective
Severe	**Body temperature below 32°C (89.6°F)** ▪ Lack of shivering. No longer able to shiver to produce body heat. ▪ Decreased level of consciousness. May only respond to a loud shout or being shaken awake. Eventually, may pass out and no longer respond at all. ▪ Death. Ultimately, untreated hypothermia will result in death.	1. Hypothermia prevention 2. Passive AND active warming NOTE: If the casualty is unconscious and not breathing, provide rescue breaths if you can.

SUPPLIES

Impermeable layers

- Emergency or space blanket
- Plastic sheeting
- Plastic wrap
- Bubble wrap
- Foil wrap
- Tarps
- Plastic shower curtains
- Clean plastic trash bags

Insulating layers

- Extra clothing
- Blankets
- Sleeping bags
- Towels
- Spare fabric, such as curtains

Active warming sources

- Heat packs
- Hand and foot warmers
- Electric blanket or heating pad

Other

- Thermometer (oral or rectal)
- Stretcher or cot
- Warm fluids (tea, hot chocolate, broth)

STEPS TO MANAGE HYPOTHERMIA

The ABCs of Hypothermia Management

A - Assess the situation. Before you start, check out the surroundings and potential risks. Protect your own safety first and do not put yourself in harm's way.

B - Bring your casualty inside. If possible, move them to a warm, dry place immediately. Shelter them from wind and rain or snow to prevent further heat loss.

C - Change wet clothes. Wet clothes speed heat loss. Replace them with dry clothing, and cover the casualty with blankets or any other insulating material you can find.

Remember teleconsultation! When you cannot get your casualty to a higher level of medical care right away, reach out for advice if you can. See Chapter 3: Communication and Documentation *for telemedicine guidelines.*

Step 1: Prevention

Good: Reduce exposure to cold ground, wind, and air temperature.

- ▹ Get the casualty off the ground.
- ▹ Place insulation between the casualty and any cold surface.
- ▹ Keep the casualty's clothing (if dry) and any other body covering on, if possible.

Better: In addition to the *Good* steps…

- ▹ Replace wet clothing with dry clothing.
  - If you cannot replace wet clothing, wrap the casualty in a layer of something that can block water and wind until you can get to a warm environment. (See "impermeable layers" under Step 2: Passive Warming below.)

1 ***Best:*** In addition to the *Good* and *Better* steps…

▹ Remove the casualty from the cold. Seek shelter, such as a building or vehicle, preferably heated.

TIP

Do not try to do everything alone! Get someone to help when you can. This can include "walking wounded" casualties.

Step 2: Passive Warming

Use the casualty's own body for warmth. Use layers to hold on to heat. There are two basic types of layers:

▹ "**Impermeable layers**" (or "vapor barriers") prevent water or wind from getting through and cooling down a casualty. These materials help to retain the body's natural heat by reducing the convection and evaporation processes that contribute to heat loss.

- An impermeable layer can be bought ready-to-use, like an emergency or space blanket, but it can also be improvised from household materials such as plastic wrap, bubble wrap, tarps, plastic shower curtains, and clean plastic trash bags.
  - » When using plastic wrap, take care not to wrap too tightly, which could cut off circulation to hands and feet or make it difficult for the patient to breathe.
  - » If you use a plastic trash bag, cut a hole and pull it over the casualty's head to avoid placing their head inside the bag. Cut holes for the arms too if needed.
- If a casualty has a tourniquet on their arm or leg, leave it exposed outside the layer so you can see if bleeding starts again or continues.

▹ "**Insulating layers**" help keep body heat in.

- Insulating layers include blankets, sleeping bags, towels, extra clothing, any piece of available fabric such as a curtain, and so on.

1 ***Best:***

▹ Use a **three-layer technique** (Figure 10.1). Remove clothing if it is wet.

1. Wrap the casualty in an inner (closest to the skin) impermeable layer.
2. Cover with an insulating layer.
3. Finish with a second, outer impermeable layer.
   - Any impermeable material can be used, such as the vapor barrier noted above. Readily available items may also be used, such as foil or plastic wrap for the inner impermeable layer and a tarp or heavy-duty trash bag for the outer layer.

» This technique combines aspects of the *Good* and *Better* strategies below, and stands alone as the *Best* method, if possible.

Figure 10.1: Example of three-layer technique showing (1) space blanket (impermeable innermost layer), (2) blanket (insulating middle layer), and (3) heavy-duty tarp (impermeable outer layer)

2 ***Better:***

- ▷ In addition to dry clothing (see *Good* below), use blankets or sleeping bags to create a cocoon around the casualty, keeping in warmth.

3 ***Good:***

- ▷ If the casualty's clothing is dry, provide additional layers of dry clothing as further insulation, including a hat or head scarf. A lot of body heat is lost through the head.
- ▷ If the casualty's clothing is wet, remove it and replace with dry clothing or an insulating layer.

Step 3: Active Warming

Use an external heat source, such as a radiator, wood stove, fireplace, and/or heat packs.

1 ***Best:*** Use an active-heating source.

- ▷ Place an active-heating pad, such as an electric blanket, on the front of the casualty's torso, under their armpits, and on their neck and groin areas.
  - DO NOT place a heating coil—such as electric stoves, ovens, toasters, and electric heaters—directly on a casualty's skin or in areas under pressure (such as under their body)! This could burn the casualty.
- ▷ If the casualty is conscious, give them warm, non-alcoholic beverages such as tea or hot chocolate. Avoid caffeine and alcohol.

2 ***Better:*** Use a vehicle's air system for forced-air rewarming, if available.

- ▷ Place the casualty in the vehicle near the vents with the engine running and heat on. Set the heat to its maximum setting. To generate enough heat for the casualty, you should feel uncomfortably hot while in the vehicle with them.

Good: In addition to the Prevention (Step 1) and Passive Warming (Step 2) steps…

- ▹ Keep the casualty close to sources of external heat.
- ▹ Place heat packs on the casualty, preferably in the armpits or on the chest.
  - Never place heat packs directly on the skin. Instead, wrap heat packs in cloth or place over clothing to prevent burns.
- ▹ Regularly check skin for burns.
- ▹ If the casualty is conscious and able, encourage light exercise, which helps the body generate heat. Even gentle movements like wiggling fingers and toes can help.

SPECIAL CONSIDERATION

Children and pregnant women are more likely to develop hypothermia, so watch them carefully for signs of hypothermia.

PCC CONTINUED

Care and Monitoring

For additional information about how to monitor and continue care for a casualty, see *Chapter 5: Nursing*.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC* at the end of this book.

CHAPTER 11

Pain

Before you begin to manage a casualty's pain, first deal with immediate life-threatening injuries and/or situations—massive bleeding, airway, breathing, circulation, hypothermia, and head injury.

Pain by itself is not likely to be life-threatening, so it is not your first priority. However, without pain management, your casualties could face worse outcomes, including death.

Casualties who are in pain are sometimes aggressive, irrational, or even violent. Check them for weapons and remove any you find before proceeding, especially before you give them any medication.

IN THIS CHAPTER

KEY POINTS

- The goal of pain management is to relieve your casualty's pain. However, not every casualty needs pain medication, and some casualties need other kinds of attention more urgently (such as for major bleeding or trouble breathing).
  - Address pain when there is nothing else more important you can do to help your casualty.
- Good pain control does more than just make a casualty more comfortable. It helps them heal better, improves their vital signs, and increases their chance of survival.

- ▹ If a person complains of severe pain, but you cannot see the cause, look more closely for hidden injuries, such as damage to their internal organs. The source of a casualty's pain is not always visible.
- ▹ There are many pain medicines available, all with risks.
  - "Over-the-counter" medications are more readily available than prescription drugs and have lower risks.
  - If you need to use drugs, especially drugs that normally require a prescription, try to get help from someone with medical training.
  - See *Chapter 3: Communication* for how to contact someone for help during PCC.
- ▹ Combinations of pain-control drugs other than acetaminophen or NSAIDs can cause more problems than solutions.
  - They can multiply effects, possibly leading to side effects like respiratory depression and agitation.
  - Use extreme caution when combining drugs, except as noted in these guidelines.
- ▹ Approach pain management during PCC with long-term care in mind, with the goal of keeping your casualty comfortable.
  - Start with a low dose of whatever medication you want to use, and then increase the dose only as needed.
  - Keep in mind that what works for one casualty may not work for another.

SUPPLIES

- Blankets
- Cold packs
- Hot packs (or other sources of heat)
- Notebooks and pens (to document medications given)
- See also *Chapter 12: Medications*

STEPS TO MANAGE PAIN

Step 1: Assess Level of Pain

Before you can begin to relieve a casualty's pain, you need to know how much pain they feel. Here is how you can find out:

- If your casualty is awake and can talk, ask them to rank their pain from 1 (hardly noticeable) to 10 (unbearable). See *Addendum A11* for help to determine pain level.
  - Then you can decide if their pain can be managed without drugs or, if they need drugs, which medication to use, and how much to give them.
- If your casualty is not fully awake, DO NOT give them anything by mouth, including medications. Wait until your patient is awake and can tell you their level of pain. Until then, refer to Step 2 below for someone who is not alert and cannot swallow safely.
- If a casualty is truly in so much pain that they cannot explain, give them the highest dose of the strongest pain medication you have. Follow the guidelines in Step 3 below.

Step 2: Manage Pain Without Drugs

Some kinds of pain can be eased without medication. These include pain of fractures, burns, and tourniquets.

TIP

Do not try to do everything alone! Get someone to help when you can. This can include "walking wounded" casualties.

- **Repositioning** a person can help manage their pain.
  - Make sure your casualty is not in a position that might make their pain worse. For example, make sure a casualty with an injured foot is not standing or a casualty with a burn is not applying too much pressure to the burned area.
  - For most casualties, the Recovery Position is comfortable and helps protect their airway. See *Appendix 1a* for how to put a casualty into a Recovery Position.
  - Also, a casualty may have fractured ribs or some other torso or abdominal injury that causes significant pain and discomfort when breathing. As they breathe in, their chest wall expands and presses against the injury, causing pain. To reduce this pain, give them a pillow or other object to squeeze against their chest or abdomen as they inhale. This can minimize chest-wall movement and reduce the pain.
- **Hot and cold packs** can also help control pain, as outlined in Table 11.1 below.
  - DO NOT apply hot or cold packs directly to the skin. Use a cloth or towel between the skin and hot or cold packs to prevent skin damage.
  - DO NOT leave them on for more than 20 minutes at a time. A good rule is 15–20 minutes on and 15–20 minutes off. Repeat as needed.

Table 11.1. Use of hot and cold packs to relieve pain

	Cold packs	Hot packs
Preferred for	Joint and muscle injuries	Hypothermia
Okay for	Large bruises or fractures	Joint and muscle pain
DO NOT use for	Hypothermia or burns	Open wounds or burns

- **Splinting** of sprains, strains, and fractures reduces pain, improves comfort, helps healing, and decreases the effort a casualty must make to protect their injuries. See *Addendum B13: Splints* at the end of *Chapter 13: Wounds and Fractures* for how to do this correctly.

Step 3: Manage Pain With Drugs

For casualties whose pain cannot be well managed with the techniques described above, give them pain medications. Types and doses are described below according to their effectiveness and availability, as well as potential negative effects.

Use all medications sparingly, especially when resources are limited, as is likely during war or other disasters.

The pain medications that are available vary widely by country and depend on supply, so the information below provides several options. Find out what medications are available in your local area.

Responses to pain medications vary widely from person to person. Before you give a casualty any medication:

- Ask if they have any allergies. Then ask what their allergic reaction is.
  - DO NOT give them a medication to which they have a high risk of anaphylaxis, an allergic reaction that can bring on shock and can be fatal. The symptoms include trouble breathing, swelling of the throat, and/or loss of consciousness.
  - Patients who are allergic to a specific medication are often allergic to that entire class of medications, so avoid giving them similar medications from the same drug category (such as NSAIDs).
- Keep track of the drugs you give a casualty, so you do not give them too much or mix drugs.
- Check the package or label to make sure you are giving them the medication you think you are giving.

Step 4: How to Choose a Drug

Some readily available drug and non-drug options are presented below in order of *Best*, *Better*, and *Good* according to a combination of their effectiveness, their availability to a layperson, and potentially harmful side effects. For example, opioids are very effective at relieving pain, but they are not readily available to a layperson, and they have potentially extremely harmful—even fatal—side effects, so they are listed as *Good*.

See *Chapter 12: Medications* for details of the various drugs—prescription and over-the-counter—you can use to manage pain. What you use will depend on what you have or can find.

Remember teleconsultation! When you cannot get your casualty to a higher level of medical care right away, reach out for advice or even a prescription, if you can. See Chapter 3: Communication and Documentation *for guidelines.*

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1. ***Best:*** The best option (that is, most effective non-opioid) to relieve acute pain due to injury is a combination of meloxicam and paracetamol (acetaminophen).
   - ▹ Give 7.5–15 milligrams (mg) of meloxicam once a day, plus 500–1,000 mg of paracetamol every 6–8 hours (a maximum of 4,000 mg paracetamol per day).
   - ▹ Meloxicam is a prescription drug, but paracetamol is available over the counter.

2. ***Better:*** All non-steroidal anti-inflammatory drugs (NSAIDs) other than meloxicam go in this category and can be used safely in combination with paracetamol to increase their effect.
   - ▹ However, use **only one NSAID** for any given casualty, unless it is ineffective or you run out.
   - ▹ Some common NSAIDs include ibuprofen, naproxen sodium, celecoxib, and diclofenac, but other NSAIDs are available.

- ▹ Many NSAIDs are available over the counter, but some require prescription.
- ▹ Follow the package instructions for use, if you have them.

3 ***Good:*** **Opioids** work very well to control pain, but they are listed as *Good* because they have strong side effects and can quickly kill a casualty if used incorrectly.

- ▹ They are also prescription drugs and, in most countries, controlled substances.
- ▹ If you use opioids to manage pain, make sure to keep **naloxone** on hand to counteract the potential side effects of opioids, especially respiratory depression. See *Chapter 12: Medications* for information about naloxone.

3 ***Good:*** **Alcoholic beverages** (which contain ethyl alcohol, or ethanol) can be effective for pain control and have been used for centuries. Given the nature of supplies in a disaster situation, this may be all you can get.

NOTE

Alcohol is NOT a long-term pain-management solution. Use it only for acute pain when better options are not available.

NOTE

Any casualty given alcohol should be disarmed to prevent further injuries.

- ▹ Alcohol may be the best option for a casualty who is dying, especially when other drugs are limited.
- ▹ The effective dose of alcohol, as measured by *Blood Alcohol Content (BAC)*, depends on weight and sex. A BAC of 0.08–0.12 will relieve pain while avoiding unwanted side effects like vomiting. Table 11.2 below provides a rough guideline to how much to use.

Table 11.2. Number of alcoholic drinks needed to control pain, by weight and sex

Body weight in kg (lb)	First (loading) dose in number of drinks*	
	Male	Female
45 (100)	2	1.5
50 (110)	2	1.5
55 (120)	2.5	2
60 (130)	2.5	2
65 (145)	3	2
70 (155)	3	2.5
75 (165)	3	2.5
80 (175)	3.5	2.5
85 (185)	3.5	3
90 (200)	4	3
95 (210)	4	3
100 (220)	4.5	3.5
Maintenance dose (Male and Female)		
One-half the loading dose every 2 hours.**		

** One drink is 50 mL (1.7 fl oz) of 40% alcohol by volume (ABV) liquor, 500 mL (17 fl oz) of 4% ABV beer, or 150 mL (5 fl oz) 12–14% ABV wine.*

Abbreviations: mL = milliliters, fl oz = ounces, kg = kilograms, and lb = pounds

*** For example, a 90 kg (200 lb) man should have 4 drinks to start, and then 2 more drinks every 2 hours until his pain is reduced enough. Patients consuming alcohol to control pain will need monitoring more often than someone on NSAIDs.*

3 ***Good:*** In cases of very **localized pain**, you can use **lidocaine patches** or other medicated creams, gels, or patches. See the "Non-prescription Topical Medications for Pain" table in *Chapter 12: Medications*.

MONITORING PAIN

Reassess your casualty's pain 1–2 hours after they were given medication.

- ▹ If their pain has improved, continue giving them the same medication. Or you can stop the medication if the casualty feels they no longer need it.
- ▹ If their pain has gotten worse, you can:
  - Increase the amount of the medication you gave them before.
  - Add a medication of a different class.
  - Try a different drug.
- ▹ If their pain is the same, give them a different drug.
  - Increasing the amount of the same medication you gave them before probably will not help. The casualty just may not respond to that drug, but another drug may help.
- ▹ If their pain has improved only slightly, you can either:
  - Increase the amount of the medication you gave them before, or
  - Add another medication of a different class.

See *Chapter 12: Medications* for options.

If a casualty has been given pain medications, be aware that some pain medications can make them sleepy or affect their breathing. See *Chapter 7: Airway and Breathing* for how to assess breathing and how to help if necessary.

Acetaminophen (paracetamol) and NSAIDs are unlikely to make a casualty sleepy or interfere with their ability to think.

It may be hard to accept, but it is unrealistic to expect that a casualty's pain will go away completely. If it does, this may be a sign that you have given them too much pain medication. Also, the presence of some pain reminds a person that they are injured and should not be doing things that could cause further harm to their bodies.

ADDENDUM A11: HOW TO DETERMINE PAIN LEVEL

Before you can begin to relieve a casualty's pain, you need to know how much pain they feel.

- If your casualty is **awake and can talk**, ask them to rank their pain from 0 (no pain at all) to 10 (unbearable).
  - If they are not sure or cannot talk, show them the Defense and Veterans Pain Rating Scale chart (or DVPRS, from the U.S. Veterans Administration) provided below (Figure A11.1), and have them just point to the place that expresses what they feel.
- If your casualty is not fully awake, wait until they can communicate with you. If they are unconscious, they cannot safely take oral medications.
- If a casualty is awake but in **so much pain that they cannot explain**, assume their pain rating is 9 or 10 on the DVPRS scale.

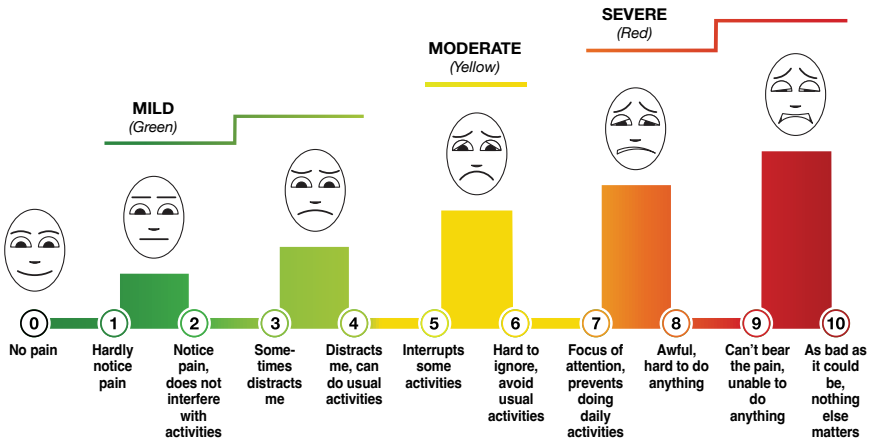


Figure A11.1. DVPRS Pain Rating Scale

If your casualty is seriously injured, check their pain level every 1–4 hours to see how they are responding to your help.

CHAPTER 12

Medications

This chapter focuses on medications for adults, with a specific emphasis on pain and infection prevention, during prolonged casualty care. These include medications that a layperson can access with relative ease and give to a casualty without use of intramuscular, intravenous, intraosseous, or other non-oral measures.

Medication management is complex and can differ from person to person based on medical history, allergies, and condition being treated. The aim is to reduce symptoms and help the casualty heal. This chapter can help you choose the best medication available for a specific need and use it as effectively and safely as possible without trained medical help.

Prescription medications should be given ONLY by a qualified medical provider. The information about prescription medications in this guide is provided for use only in the most extreme circumstances—such as disaster or war—when there is no access to medical professionals either in person or by telecommunications for a prolonged period of time.

IN THIS CHAPTER

KEY POINTS: MEDICATION MANAGEMENT

You can use available medications appropriately to manage casualties' symptoms and when medical providers and/or prescription medications are not available.

- ▹ There are many over-the-counter medications that can improve symptoms of pain, as well as stomach or intestinal upset, or allergic reactions. The information in this chapter will help you learn uses and side effects of medications, and when **not** to use a medication.
  - Information about some prescription medications is also included to address septic shock, infection, pain, and side effects from medications such as stomach upset or allergic reactions.
- ▹ Most medications are oral (taken by mouth), and some are topical (applied to the skin surface), but a few medications that are given by different methods (such as naloxone, EpiPen, and albuterol) can be life-saving in an emergency.
  - Follow the guidelines for using each medication carefully and appropriately.

*If you have some medical training or experience, you can consider using intramuscular injection (*Appendix 10b: Advanced Practices – Intramuscular Injections*) or intravenous access (*Appendix 10c: Advanced Practices – Intravenous Access*) to give some medications to a casualty who cannot take them by mouth. These include prescription antibiotics and prescription drugs for pain management and massive bleeding.*

- ▹ Each medication has a "generic" (non-brand) name, but some also go by a specific brand or trade name. For example, acetaminophen is sold in the U.S. as the brand Tylenol.
  - In various countries, the generic name can be different. For example, in Europe acetaminophen is called paracetamol.
  - Brand names also differ, such as Panadol (instead of Tylenol) as the brand name for acetaminophen in the UK.

- This chapter gives generic names for each non-prescription medication (with few exceptions), which you can find on the label of a brand-name medication.

▹ Many medications can cause allergic reactions in some casualties. Watch carefully for signs of allergy, as described throughout this chapter and in the Allergic Reactions section.

▹ If you do not have access to a pharmacy, or if your pharmacy has run out of a medication you need, check to see if it is available from a veterinary supply. Some medications are used for both humans and animals. Please note that veterinary medications do not go through the same safety standards as human medications and should only be considered for use in the most dire circumstances.

Use all medications sparingly, especially when resources are limited, as is likely during war or other disasters.

▹ **Abbreviations** used in this chapter (and others) include:

- mg = milligrams
- g = grams
- mL = milliliter
- tbsp = tablespoon
- tsp = teaspoon

Addendum A12: PCC Medications Shopping List at the end of this chapter provides an alphabetical list of the medications mentioned below.

PAIN MANAGEMENT

You can manage some types of pain with over-the-counter pain medications (see Tables 12.1–12.5). Oral over-the-counter options for pain control are acetaminophen (paracetamol) and non-steroidal anti-inflammatory (NSAID) medications such as ibuprofen and naproxen. They are generally considered safe and can be very effective for reducing most pain and fever.

KEY POINTS: PAIN

- The goal of pain management is to reduce pain to improve a casualty's comfort and functional status, as well as minimize long-term complications such as chronic pain and post-traumatic stress.
- Assess pain to determine its severity and manage and monitor treatment.
- Treating pain is unlikely to worsen a problem.
- Medications for pain can sometimes be used in combination (see Tables 12.1–12.5).
- If a casualty has taken an opioid, you need to know how to reverse its effects if necessary. See the Opioid Emergency section below.

Do Not:

- DO NOT give a casualty another dose of a medication if they show signs of an allergic reaction to it (such as rash, trouble breathing, nausea, vomiting or diarrhea, swelling of the lips or tongue).
- DO NOT combine different NSAID medications.

ASSESSING PAIN

Before you give a casualty any pain medication, you need to determine how much pain they are in and whether non-drug options can manage their pain. See *Chapter 11: Pain* for details of how to assess a casualty's pain level and potentially manage it without medication.

Reassess the pain level of seriously injured casualties every 1–4 hours to help determine how they are responding to your help.

MEDICATIONS TO MANAGE PAIN

Oral drugs are presented in tables below in order of *Best*, *Better*, and *Good* according to a combination of their effectiveness, their availability to a layperson, and potentially harmful side effects. For example, opioids are very effective at relieving pain, but they are not readily available to a layperson, and they have potentially extremely harmful—even fatal—side effects, so they appear in Table 12.4 with other *Good* oral pain-relief medications.

Begin by giving a casualty the lowest dose shown in Tables 12.1–12.5, and increase the amount as needed to manage their pain. In general, casualties with higher body weight require higher doses. The goal is for their pain to be tolerable. Do not expect to eliminate their pain completely.

DO NOT give more than the maximum dose shown for any medication. Going above the maximum recommended dose is unlikely to help with additional pain relief but may cause more side effects, and it will use your supplies faster.

Best/Better: Use the appropriate medications according to Tables 12.1–12.5 to reduce pain with minimal side effects.

- ▹ Some of these medications can be used in combination (such as acetaminophen plus one NSAID), with or without a topical medication, but DO NOT give a casualty multiple NSAID medications at the same time.

Good: Use *any* pain medication available to reduce pain.

Read the label on the container of each medication for additional information.

Table 12.1. BEST Oral Medications for Pain (most effective)

Medication	Dose	Notes
Meloxicam* (an NSAID)	▪ 7.5–15 milligrams (mg) once a day ▪ Maximum dose within 24 hours: 15 mg	▪ Effective alone, but more effective when combined with paracetamol/ acetaminophen (see below) DO NOT give if the casualty has: ▪ Kidney disease ▪ Digestive system sensitivity ▪ Allergy
Paracetamol (acetaminophen, Tylenol)	▪ 500–1,000 mg every 6–8 hours ▪ Maximum dose within 24 hours: 4,000 mg	▪ Effective alone, but more effective when combined with meloxicam (see below) or another NSAID (see Tables 12.2 and 12.3) DO NOT give if the casualty has: ▪ Allergy ▪ Liver disease
Meloxicam* + paracetamol	▪ Meloxicam: 7.5–15 mg once a day ▪ Paracetamol: 500–1,000 mg every 6–8 hours	See above
Meloxicam* + nefopam**	▪ Follow dose and schedule for each medication	▪ Nefopam may cause hallucinations. ▪ DO NOT give nefopam to a casualty with a history of seizures.
Paracetamol + nefopam**	▪ Follow dose and schedule for each medication	▪ See above

**Requires prescription in most countries.*
***Not approved for use in the U.S.*

Table 12.2. BETTER Oral Medications for Pain – Non-prescription NSAIDs

Medication	Dose	Notes
DO NOT give a casualty more than one type of NSAID!		
Ibuprofen (Advil)	▪ 400–800 mg every 6–8 hours ▪ Maximum dose within 24 hours: 3,200 mg	DO NOT give if the casualty has: ▪ Kidney disease ▪ Digestive system sensitivity ▪ Allergy
Naproxen sodium (Aleve) or naproxen base (Naprosyn)	▪ 220–550 mg 2 times a day ▪ Maximum dose within 24 hours: 1,375 mg	DO NOT give if the casualty has: ▪ Kidney disease ▪ Digestive system sensitivity ▪ Allergy
Aspirin (acetylsalicylic acid)	▪ 325–650 mg every 4–6 hours ▪ Maximum dose within 24 hours: 4,000 mg	DO NOT give if the casualty: ▪ is bleeding! ▪ has digestive system sensitivity

Table 12.3. BETTER Oral Medications for Pain – Prescription Drugs* and Combinations

Medication	Dose	Notes
Nefopam**	▪ 30–90 mg every 6–8 hours ▪ Maximum dose within 24 hours: 270 mg	▪ May cause hallucinations. ▪ DO NOT give to a casualty with a history of seizures. ▪ Less effective alone than when combined with an NSAID.
Non-steroidal anti-inflammatory drugs (NSAIDs):		**DO NOT give a casualty more than one type of NSAID!**
Ketorolac*	▪ 10 mg every 4–6 hours ▪ Maximum dose within 24 hours: 40 mg	DO NOT give if the casualty has: ▪ Kidney disease ▪ Digestive system sensitivity ▪ Allergy
Celecoxib*	▪ 100–200 mg every 12 hours ▪ Maximum dose within 24 hours: 400 mg	DO NOT give if the casualty has: ▪ Kidney disease ▪ Digestive system sensitivity ▪ Allergy
Diclofenac*	▪ 75 mg 2 times a day ▪ Maximum dose within 24 hours: 150 mg	DO NOT give if the casualty has: ▪ Kidney disease ▪ Digestive system sensitivity ▪ Allergy
Other NSAIDs	▪ Follow instructions on package	Examples: diflunisal*, piroxicam*
Nefopam** + NSAID	▪ Follow dose and schedule for each medication	See above
Nefopam** + paracetamol + NSAID	▪ Follow dose and schedule for each medication	See above

**Requires prescription in most countries.*
***Not approved for use in the U.S.*

Table 12.4. GOOD Oral Medications for Pain
(least recommended due to potentially harmful side effects)

Medication	Dose	Notes
Opioids* (Examples: hydrocodone, oxycodone, morphine, fentanyl)	▪ Follow instructions on package or as prescribed.	▪ DO NOT combine with any other drug! ▪ DO NOT use unless you have **naloxone** available in case of overdose. (See Opioid Emergency section below for information about naloxone.)
Alcoholic beverages (ethyl alcohol, ethanol)	▪ See *Chapter 11: Pain* for how to manage pain using alcohol.	▪ Expect typical symptoms and problems associated with drunkenness.

**Requires prescription in most countries.*

Table 12.5. Non-prescription Topical Medications for Pain

Medication	Dose	Notes
Lidocaine patches (4–5%)	▪ Apply to painful area and leave on for up to 12 hours. ▪ Then remove and leave off for at least 12 hours before reapplying.	▪ DO NOT apply more than 3 patches at one time. ▪ DO NOT apply to open wounds.
Diclofenac cream (Voltaren Gel)	▪ Apply up to 3 times a day as needed at or around the location of muscle or joint pain.	DO NOT use if the casualty has: ▪ Allergy ▪ Already been given an oral NSAID medication ▪ DO NOT apply to open wounds.
Capsaicin cream	▪ Apply up to 3–4 times a day as needed at or around the location of muscle or joint pain.	DO NOT use if the casualty has: ▪ Allergy ▪ DO NOT apply to open wounds.

OPIOID EMERGENCY

You can help reverse the effects of an opioid in the event of overdose.

Remember that a casualty may have been given an opioid before they came into your care.

SYMPTOMS OF OVERDOSE

- Slow, erratic, shallow, or no signs of breathing
- Droopy muscles or weakness
- Drowsy, not alert, or not responsive
- Slurred speech
- Bluish fingernails or lips

MEDICATION TO MANAGE OPIOID EFFECTS

The drug **naloxone** (Narcan) is a nasal spray that can reverse opioid overdose. It does not require a prescription, and it is **safe to use even if a casualty has not used an opioid**. It wears off within 2–3 hours. See steps below for how to use naloxone.

Step 1: If you see any of the signs of overdose listed above, give naloxone nasal spray.

- The casualty can be in any position, as long as you can reach their nose.
- Remove the nasal spray from its package only when you are ready to use it.
- Hold the container with your thumb on the bottom plunger and your index and middle finger on either side of the nozzle.
- Gently insert the tip of the nozzle into one nostril of the casualty's nose until your fingers touch the bottom of their nose.
- Press the plunger firmly to release one dose of the nasal spray.
- Remove the nozzle from the casualty's nose.
- The drug should take effect within 3 minutes.

Step 2: Monitor and support.

- ▷ Move the casualty to Recovery Position (see *Appendix 1a*).
- ▷ If the casualty wakes up, stay with them and watch for the return of symptoms.
- ▷ If the casualty does not wake up, or if symptoms return, give them another dose of naloxone.
- ▷ Give repeat doses every 2–3 minutes until they wake up.

Step 3: Monitor the casualty for at least 6 hours after naloxone use to ensure their symptoms do not come back. Some opioids can stay in the bloodstream longer than naloxone.

- ▷ If their overdose symptoms return, repeat naloxone use, beginning with Step 1 above.

INFECTION MANAGEMENT

The goal of infection management is to reduce serious infections using antibiotics. For basic methods to prevent and manage infections, see *Chapter 5: Nursing*.

KEY POINTS: INFECTION

- ▷ An otherwise healthy individual will often clear minor infections without antibiotics, but if the condition gets worse, they may need an antibiotic.
- ▷ Antibiotics can help reduce the length of symptoms and prevent complications and the spread of infection.
- ▷ Antibiotics can be life-saving for serious infections. Many of them can be ordered online, and in some countries, they can also be found over the counter.
  - However, antibiotics should be used only when needed, as they can have serious side effects and/or a user can develop resistance to their effectiveness.
- ▷ Most antibiotics target specific bacteria, which means they won't work on other types of bacteria or viruses.

- Tables 12.6–12.8 provide general recommendations for which antibiotic to use for each condition for adult casualties.

▹ Obtain professional medical advice about suitable antibiotics, if possible.

Do Not:

▹ DO NOT give antibiotics when they are not needed. A person can develop resistance, such that an antibiotic will not work.

▹ DO NOT give antibiotics to a casualty if they have a history of allergic reaction. If they start to show signs of allergic reaction (such as a rash or difficulty breathing), stop giving them the medication.

- See Tables 12.6–12.8 and the Allergic Reactions section below for more information.

SYMPTOMS OF INFECTION

▹ See Tables 12.6–12.8 for symptoms of the various types of infections and their symptoms.

MEDICATIONS TO MANAGE INFECTIONS

You can give a casualty the appropriate antibiotic for their type of infection, as shown in Tables 12.6–12.8. Some of the conditions in the tables relate specifically to fresh injuries (such as cuts), while others are conditions that can occur during prolonged casualty care due to lack of sanitary conditions or complications of traumatic injuries, such as pneumonia or urinary tract infection.

Any of these conditions can also lead to septic shock, so try to identify the underlying cause when choosing an antibiotic for septic shock, and then choose an antibiotic that is listed for the related cause in the tables below. See *Chapter 8: Shock, Circulation, and Resuscitation* and *Appendix 9b: Understanding Shock* for more detailed information.

Because there is such a wide variety of antibiotics, generic classes are provided in some cases in the tables for your reference. **Whenever possible, make an effort to discuss medication choices with a medical professional.** If you are unable to contact a medical professional, you can

try to look up any medications you have on hand either on the internet or in a drug reference book to determine its generic medication class.

NOTE

If a casualty shows signs of allergic reaction or other side effects after you give them an antibiotic, stop using that antibiotic and choose a different antibiotic drug, if possible.

Table 12.6. Common Antibiotics for Eye and Skin Infections
(All except antibiotic ointments such as Neosporin require a prescription in most countries.)

Symptoms	Medications	Side Effects
Eye infection and/or conjunctivitis		
Redness, itchiness, gritty feeling, discharge forming crusts overnight, tearing, and sensitivity to light	▪ **Ofloxacin 0.3%** —or— **ciprofloxacin (fluoroquinolone) 0.3%** ophthalmic solution (eye drops): 1–2 drops in the infected eye every 2 hours for 2 days, then every 4–8 hours for a total of 7 days ▪ **Erythromycin (macrolide) 0.5%** ointment: apply to infected eye every 4–8 hours for 7 days ▪ If you do not have any of these medications: Wash out the eye with cold or lukewarm running water for at least 5 minutes.	▪ Ofloxacin and ciprofloxacin: numbness in extremities, anxiety, heart rhythm abnormalities, and (rarely) severe tendon rupture – avoid strenuous physical activity while taking ▪ Erythromycin: redness, itching, stinging, or burning of the eye
Skin cuts and open wounds		
Mild redness or swelling	▪ **Antibiotic ointment** (such as Neosporin or Bacitracin): 1–3 times a day to the infected area —or— ▪ **Honey**: Apply to wound or dressing and change when dressing becomes wet from wound drainage.	▪ Allergic reaction (itching or swelling of the face, tongue, or throat, severe dizziness, trouble breathing) ▪ Contact dermatitis (skin rash)

Table 12.7. Common Antibiotics for Cellulitis

Symptoms	Medications	Side Effects
Cellulitis *without* pus		
Pain, redness, and swelling of skin, often associated with a wound, cut, or burn. May be hot and tender.	Give ONE of the following: ▪ **Cephalexin (first-generation cephalosporin)**: 500 mg orally every 6 hours for 5–7 days ▪ **Dicloxacillin (beta-lactam)**: 500 mg orally every 6 hours for 5–7 days ▪ **Moxifloxacin (fluoroquinolone)**: 400 mg orally once a day for 5–7 days	▪ Cephalexin: diarrhea, nausea, stomach pain, headache, fatigue, and vaginal yeast infection ▪ Dicloxacillin: diarrhea, vomiting, thrush, rash, irritation of the esophagus, loss of taste, and ringing in the ears ▪ Moxifloxacin: numbness in the legs or arms, anxiety, heart rhythm abnormalities, and (rarely) tendon rupture – avoid strenuous physical activity while taking.
Cellulitis *with* pus		
Pain, redness, and swelling of skin, often associated with a cut. May have a collection of pus (an abscess) or drainage of pus, and may have fluid beneath the skin.	Give ONE of the following: ▪ **Trimethoprim-sulfamethoxazole (TMP-SMX) double strength (DS) (sulfonamide)**: 800 mg + 160 mg, 1 tablet orally twice a day for 7–10 days ▪ **Clindamycin (lincomycin)**: 150–300 mg 3 times a day orally for 7–10 days ▪ **Amoxicillin-clavulanate (penicillin and beta lactam)**: 875 mg + 125 mg orally twice a day for 7–10 days	▪ TMP-SMX: diarrhea, nausea, stomach pain, rash ▪ Clindamycin: diarrhea, nausea, stomach pain ▪ Amoxicillin-clavulanate: stomach upset, diarrhea, rashes ▪ Amoxicillin-clavulanate is recommended for infected animal or human bite.

Table 12.8. Common Antibiotics for Pneumonia and Urinary Tract Infections

Symptoms	Medications	Side Effects
Pneumonia		
Fever, productive cough with mucus and/or yellow-green sputum, difficulty breathing	Give ONE of the following: ▪ **Amoxicillin-clavulanate + doxycycline (penicillin and tetracycline)**: 875 mg + 125 mg orally twice a day for 7–10 days ▪ **Doxycycline (beta lactam)**: 100 mg orally twice a day for 7–10 days ▪ **Azithromycin (macrolide)**: 500 mg orally one time, followed by 250 mg a day for the next 4 days	▪ Amoxicillin-clavulanate: stomach upset, diarrhea, rashes ▪ Doxycycline: DO NOT use it in children younger than 8 years. Side effects include photosensitivity, rashes, GI symptoms. ▪ Azithromycin: stomach upset, diarrhea, nausea, irregular heartbeat
Urinary tract infection		
Pain or discomfort urinating, urgency or frequency of urination, lower-abdomen pain	Give ONE of the following: ▪ **Nitrofurantoin (nitrofuran)**: 100 mg orally twice a day for 5 days ▪ **Trimethoprim-sulfamethoxazole (TMP-SMX) double strength (DS) (sulfonamide)**: 800 mg + 160 mg, 1 tablet orally twice a day for 3 days ▪ **Ciprofloxacin**: 500 mg orally twice a day for 5 days	▪ Nitrofurantoin: nausea, vomiting, diarrhea, loss of appetite, headaches, and dizziness ▪ TMP-SMX: diarrhea, nausea, stomach pain, and rash ▪ Ciprofloxacin: numbness in extremities, anxiety, heart rhythm abnormalities, and (rarely) severe tendon rupture. Avoid strenuous physical activity while taking.
Septic Shock		
Fever, low blood pressure, fast heart rate	Given ONE of the following ▪ **Ciprofloxacin (fluoroquinolone)**: 500 mg orally twice a day for 5 days ▪ **Amoxicillin-clavulanate (penicillin and beta lactam) + doxycycline (tetracycline)**: 875 mg + 125 mg orally twice a day for 7–10 days NOTE: Septic shock often requires intravenous antibiotics.	▪ Ciprofloxacin: numbness in extremities, anxiety, heart rhythm abnormalities, and (rarely) severe tendon rupture. Avoid strenuous physical activity while taking. ▪ Amoxicillin-clavulanate: stomach upset, diarrhea, rashes

GASTROINTESTINAL (DIGESTIVE SYSTEM, OR GI) ISSUES

You can give a casualty medications to manage minor disorders of the digestive (gastrointestinal, or GI) system to reduce the risk of dehydration and allow them to consume food and drink normally.

SYMPTOMS OF GI ISSUES

Common symptoms include stomach upset, heartburn, nausea, vomiting, diarrhea, and signs of dehydration (thirst and/or dark-colored urine).

MEDICATIONS TO MANAGE GI ISSUES

Use one or more of the medications in Table 12.9–12.11, as appropriate for specific GI issues.

Table 12.9a. Medications for Indigestion, Bloating, and Gas

Medication	Dosing	Notes and Side Effects
Bismuth subsalicylate (Original Pepto-Bismol)	▪ 30 mL (2 tbsp) orally every 30–60 minutes ▪ Maximum dose within 24 hours: 237 mL (16 tbsp)	▪ Do not give to casualties with aspirin allergy, bleeding disorders, ulcers, or those taking anticoagulants. ▪ Side effects: constipation, dark stools, or ringing in the ears
Simethicone (Gas-X)	▪ 125 mg orally up to 4 times a day ▪ Best taken after meals and at bedtime ▪ Maximum dose within 24 hours: 500 mg	▪ Side effects: rare allergic reactions such as rash or itching

Table 12.9b. Medications for Heartburn (acid reflux)

Medication	Dosing	Notes and Side Effects
Calcium carbonate (Tums)	▪ 500–1,000 mg (1 or 2 tablets) orally as symptoms occur ▪ Maximum dose within 24 hours: 2,000 mg	▪ Side effects: constipation, bloating, or gas (flatulence)
Famotidine (Pepcid)	▪ 20 mg (tablet or liquid) orally 1 or 2 times per day ▪ Maximum dose within 24 hours: 40 mg	▪ Use with caution in casualties with hypercalcemia (high blood calcium), kidney disease, or kidney stones. ▪ Rare side effects: dizziness, headache, or constipation
Omeprazole (Prilosec)	▪ 20 mg (capsule, tablet, or powder) orally once a day before a meal (for prevention) ▪ Maximum dose within 24 hours: 40 mg	▪ Do not give to casualties with kidney disease. ▪ Avoid in casualties less than 2 years old. ▪ Side effects: headache, nausea, diarrhea, or abdominal pain

Table 12.10. Medications for Nausea and Vomiting

Medication	Dosing	Notes and Side Effects
Ondansetron*	▪ Start with 4 mg (tablet or liquid) orally, and repeat (8 mg total) if no improvement in 20 minutes. ▪ Can re-dose every 8 hours. ▪ Maximum dose within 24 hours: 16 mg	▪ Side effects: headache, dizziness, constipation, or fatigue ▪ Rarely, severe tremors and cardiovascular arrhythmias
Dimenhydramine (Dramamine)	▪ 50 mg orally every 4–6 hours ▪ Maximum dose 400 mg in 24 hours	▪ Side effects: drowsiness, dry mouth, dizziness, headache
Diphenhydramine (Benadryl)	▪ 25 mg orally every 4–6 hours ▪ Maximum dose within 24 hours: 300 mg	▪ Side effects: drowsiness, dry mouth, dizziness, headache

**Available only by prescription in the U.S. and most other countries.*

Table 12.11. Medications for Constipation and Diarrhea

Medication	Dosing	Notes and Side Effects
Constipation		
Docusate sodium	▪ 100 mg orally twice a day ▪ Maximum dose within 24 hours: 400 mg	▪ Side effects: nausea, gas, stomach pain, diarrhea
Polyethylene glycol 3350 (MiraLax)	▪ 17 grams orally once a day ▪ Maximum dose within 24 hours: 100 grams	▪ Not recommend for longer than 7 days. ▪ Side effects: nausea, gas, stomach pain, diarrhea
Diarrhea		
Loperamide (Imodium)	▪ First give two 2 mg pills (4 mg) orally. ▪ Then give one 2 mg pill after each subsequent loose stool. ▪ Maximum dose within 24 hours: 16 mg	▪ Do not give to casualties with severe abdominal pain, bloody diarrhea, or fever. ▪ Side effects: constipation, abdominal discomfort, or drowsiness

ALLERGIC REACTIONS

Anaphylaxis (also called allergic shock or anaphylactic shock) is a severe allergic reaction. It can develop rapidly and can involve the whole body. It **can be life-threatening** if not treated immediately. See *Appendix 9b: Understanding Shock* for more detailed information. EpiPen is a life-saving medication for anaphylaxis.

You must recognize and use medication to manage an anaphylactic reaction quickly to prevent death.

Medications are also available to manage the symptoms of less severe allergic reactions.

SYMPTOMS OF ALLERGIC REACTION

Symptoms of Anaphylaxis

Examples are a combination of skin reactions (such as hives, swelling), respiratory issues (such as wheezing, shortness of breath), gastrointestinal symptoms (such as nausea, vomiting), and cardiovascular issues (such as low blood pressure, fainting).

Symptoms of Less Severe Allergic Reactions

Minor allergic reactions typically appear as a rash and do not cause significant distress such as fainting or trouble breathing.

MEDICATIONS TO MANAGE ANAPHYLAXIS

Epinephrine is the only medication that can treat anaphylaxis. It can be given with an EpiPen, a prepackaged injection device (auto-injector) that contains a single dose of epinephrine, or as a nasal spray (Neffy). Give multiple doses of epinephrine as needed (see Table 12.12).

Table 12.12. Medications for Managing Anaphylaxis

Medication	Dosing	Notes and Side Effects
Epinephrine*, EpiPen	▪ Inject one EpiPen (0.3 mg) into the outside of the upper thigh. ▪ If symptoms continue or come back, inject a second EpiPen.	▪ Use with caution in casualties with heart conditions. ▪ Common side effects: fast, irregular or "pounding" heartbeat, sweating, nausea or vomiting, breathing problems, paleness, dizziness, weakness, shakiness, headache, feelings of over-excitement, nervousness or anxiety. Side effects usually go away with rest.
Epinephrine*, Neffy	▪ One spray of Neffy (2 mg) into one nostril ▪ If no improvement after 5 minutes, repeat one time	▪ Same side effects as EpiPen

**Available only by prescription in the U.S. and most other countries.*

MEDICATIONS TO MANAGE SYMPTOMS OF OTHER ALLERGIC REACTIONS

The symptoms of other, less severe, allergic reactions can be treated with oral or inhaled medications, many of which do not require a prescription (see Table 12.13).

Table 12.13. Medications to Manage Symptoms of Allergic Reactions

Medication	Dosing	Notes and Side Effects
First-generation antihistamine (for skin or GI)	Diphenhydramine: 25–50 mg orally every 4–6 hours as needed for rash or itching	▪ DO NOT drink alcohol or drive while taking this medication. ▪ Side effects: dry mouth, nose, and throat, drowsiness, dizziness, nausea, vomiting, loss of appetite, constipation, chest congestion, headache, muscle weakness, nervousness
Second-generation antihistamine (for skin, GI, or respiratory symptoms)	Cetirizine (Zyrtec): 10 mg orally once a day	▪ Use as an alternative to first-generation antihistamines, which are generally more effective. ▪ Side effects: drowsiness, fatigue, dry mouth, stomach pain, diarrhea, vomiting
H2 blocker (for skin, GI, or respiratory symptoms)	Famotidine (Pepcid): 20 mg orally 1–2 times per day	▪ Use with caution in casualties with hypercalcemia (high blood calcium), kidney disease, or kidney stones. ▪ Rare side effects: dizziness, headache, or constipation
Inhaled, short-acting beta agonist* (for respiratory symptoms)	Albuterol*: 2.5 mg 3–4 times per day as needed ▪ See also below for use with asthma.	▪ Side effects: shakiness, headache, muscle aches, fast heart rate

**Available only by prescription in the U.S. and most other countries.*

ASTHMA

If you have a casualty who has asthma, you need to be ready to help them if they have an acute occurrence while they are in your care.

SYMPTOMS OF ASTHMA

- Wheezing or noisy breathing
- Using neck muscles to breath
- Retractions (muscles between the ribs pull in when breathing)

MEDICATIONS TO MANAGE ASTHMA

If a casualty has an acute event, promptly give them an inhaled short-acting beta-agonist (SABA) like albuterol if they need your help. It is likely they will have an inhaler with them, so ask them or search their belongings.

Albuterol can also be used to relieve burn-related airway difficulties. See Chapter 14: Burns *for more information.*

Steps to Use an Asthma Inhaler

Step 1: Shake the inhaler well before each use.

Step 2: Remove the cap and hold the inhaler upright.

Step 3: Have the casualty breathe out fully, away from the inhaler, to empty their lungs.

Step 4: Place the mouthpiece of the inhaler in the casualty's mouth, and have them make a tight seal with their lips.

Step 5: Ask the casualty to breathe in slowly and deeply through their mouth.

Step 6: As they start to breathe in, press down on the inhaler to release the medication.

Step 7: Ask the casualty to continue breathing in slowly and deeply to ensure the medication reaches their lungs.

Step 8: Remove the inhaler from the casualty's mouth.

Step 9: Have the casualty hold their breath for about 10 seconds, if possible, to allow the medication to settle in their lungs.

Step 10: Ask the casualty to breathe out slowly and gently away from the inhaler.

Step 11: If the casualty continues to have trouble breathing, wait for about 1 minute before you repeat the above steps.

Step 12: Replace the cap on the inhaler after each use to protect it from dust and debris.

Follow these steps carefully to make sure the medication reaches the casualty's lungs.

HYPOGLYCEMIA (LOW BLOOD SUGAR)

If a casualty has critically low (technically, less than 70 mg per deciliter) blood sugar, especially for a casualty who has diabetes and uses insulin or other oral medications, you can raise their blood sugar by giving them oral glucose. The casualty will also need carbohydrates to stabilize their blood sugar and prevent the return of hypoglycemia.

SYMPTOMS OF HYPOGLYCEMIA

Paleness, shakiness, sweating, headache, hunger or nausea, irregular or fast heartbeat, fatigue, and irritability or anxiety.

MEDICATIONS TO MANAGE HYPOGLYCEMIA

Give a single dose of 15–20 g of oral glucose. Repeat in 15 minutes if hypoglycemia symptoms persist.

- Oral glucose comes in many forms, including glucose tablets, half a cup of regular (not sugar-free) juice or regular (not diet) soda, 6 or 7 hard candies, or 15 grams (1 tbsp) of sugar.

After the first dose of glucose, have the casualty consume a meal or snack with carbohydrates to help maintain a good blood sugar level.

PCC CONTINUED

Monitoring

After you give a medication to a casualty, monitor them for 15–20 minutes for signs of negative reactions. Document their response to pain control or other symptoms to guide future adjustments in the dose and/or type of medication you give them.

For additional information about how to monitor and continue care for a casualty, see *Chapter 5: Nursing*.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC*.

ADDENDUM A12: PCC MEDICATIONS SHOPPING LIST

This is an alphabetical list of medications mentioned in this book for use during PCC, in case you want to put together your own collection for use in an emergency. It includes both prescription and non-prescription (over-the-counter) substances.

Medications that require a prescription in the U.S. are marked with an asterisk (*), but requirements may be different in other countries. Some medications in this list are not available in the U.S. and are marked with two asterisks (**).

Medication	Use
Albuterol (inhaled, short-acting beta agonist)*	▪ Allergic reactions (inhaled): Respiratory symptoms ▪ Asthma (inhaled)
Alcoholic beverages (ethyl alcohol, ethanol)	▪ Pain (oral)
Amoxicillin-clavulanate (penicillin and beta lactam)	▪ Antibiotic (oral): Cellulitis with pus ▪ Antibiotic (oral): Pneumonia ▪ Antibiotic (oral): Septic shock
Aspirin (acetylsalicylic acid) (NSAID)	▪ Pain (oral)
Azithromycin (macrolide)	▪ Antibiotic (oral): Pneumonia
Bismuth subsalicylate (Original Pepto-Bismol)	▪ Indigestion, bloating, gas (oral)
Calcium carbonate (Tums)	▪ Heartburn (acid reflux) (oral)
Capsaicin cream	▪ Pain (topical)
Celecoxib* (NSAID)	▪ Pain (oral)
Cephalexin (or other first-generation cephalosporin)	▪ Antibiotic (oral): Cellulitis without pus
Cetirizine (Zyrtec) (or other second-generation antihistamine)	▪ Allergic reactions (oral): Skin, GI, or respiratory symptoms

Medication	Use
Ciprofloxacin (fluoroquinolone)	▪ Antibiotic (oral): Urinary tract infection ▪ Antibiotic (oral): Septic shock
Ciprofloxacin (fluoroquinolone) 0.3% ophthalmic solution (eye drops)	▪ Antibiotic (ocular): Eye infection and/or conjunctivitis
Clindamycin (lincomycin)	▪ Antibiotic (oral): Cellulitis with pus
Diclofenac cream (Voltaren Gel) (NSAID)	▪ Pain (topical)
Diclofenac* (NSAID)	▪ Pain (oral)
Dicloxacillin (beta-lactam)	▪ Antibiotic (oral): Cellulitis without pus
Dimenhydramine (Dramamine)	▪ Nausea and vomiting (oral)
Diphenhydramine (Benadryl)	▪ Nausea and vomiting (oral)
Diphenhydramine (or other first-generation antihistamine)	▪ Allergic reactions (oral): Skin or GI
Docusate sodium	▪ Constipation (oral)
Doxycycline (beta lactam)	▪ Antibiotic (oral): Pneumonia
Epinephrine*, EpiPen	▪ Anaphylaxis (injected)
Epinephrine*, Neffy	▪ Anaphylaxis (nasal)
Erythromycin (macrolide) 0.5% ointment	▪ Antibiotic (ocular): Eye infection and/or conjunctivitis
Famotidine (Pepcid) (or other H2 blocker)	▪ Heartburn (acid reflux) (oral) ▪ Allergic reactions (oral): Skin, GI, or respiratory symptoms
Glucose, oral	▪ Hypoglycemia (low blood sugar) (oral)
Honey	▪ Antibiotic (topical): Skin cuts and open wounds

Medication	Use
Ibuprofen (Advil) (NSAID)	▪ Pain (oral)
Ketorolac* (NSAID)	▪ Pain (oral)
Lidocaine patches (4–5%)	▪ Pain (topical)
Loperamide (Imodium)	▪ Diarrhea (oral)
Meloxicam* (NSAID)	▪ Pain (oral)
Meloxicam* (NSAID) + nefopam**	▪ Pain (oral)
Meloxicam* (NSAID) + paracetamol	▪ Pain (oral)
Moxifloxacin (fluoroquinolone)	▪ Antibiotic (oral): Cellulitis without pus
Naloxone (Narcan)	▪ Opioid emergency (nasal)
Naproxen sodium (Aleve) or naproxen base (Naprosyn) (NSAID)	▪ Pain (oral)
Nefopam**	▪ Pain (oral)
Nefopam** + NSAID	▪ Pain (oral)
Nefopam** + paracetamol + NSAID	▪ Pain (oral)
Neomycin/polymyxin B/bacitracin (triple antibiotic, such as Neosporin), bacitracin, or mupirocin	▪ Antibiotic (topical): Skin cuts and open wounds
Nitrofurantoin (nitrofuran)	▪ Antibiotic (oral): Urinary tract infection
NSAIDs, other** (such as diflusinal or piroxicam)	▪ Pain (oral)
Ofloxacin 0.3% ophthalmic solution (eye drops)	▪ Antibiotic (ocular): Eye infection and/or conjunctivitis
Omeprazole (Prilosec)	▪ Heartburn (acid reflux) (oral)
Ondansetron*	▪ Nausea and vomiting (oral)

Medication	Use
Opioids* (Examples: hydrocodone, oxycodone, morphine, fentanyl)	▪ Pain (oral)
Paracetamol (acetaminophen, Tylenol)	▪ Pain (oral)
Paracetamol + nefopam**	▪ Pain (oral)
Polyethylene glycol 3350 (MiraLax)	▪ Constipation (oral)
Simethicone (Gas-X)	▪ Indigestion, bloating, gas (oral)
Trimethoprim-sulfamethoxazole (TMP-SMX) double strength (DS) (sulfonamide)	▪ Antibiotic (oral): Urinary tract infection ▪ Antibiotic (oral): Cellulitis with pus

**Requires prescription in most countries.*
***Not approved for use in the U.S.*

CHAPTER 13

Wounds and Fractures

A **"wound"** is an injury that breaks the skin. Internal wounds (that is, wounds you can't see) are generally beyond the care of a lay responder during PCC, and minor wounds can usually be cared for by the injured person themself, so this chapter focuses on the care of major wounds.

"Fracture" refers to a broken bone. Fractures can be either open or closed.

An **open fracture** means there is a break in the skin—a wound—related to the broken bone. Bleeding can be associated with an open fracture, but it does not always involve severe bleeding.

A **closed fracture** means the fracture occurred without breaking through the skin. No visible bleeding is associated with a closed fracture, but internal bleeding could exist.

Care of Wounds and Fractures

Because wounds—including wounds associated with open fractures—require the same initial treatment, they are addressed together in this chapter. Wounds are discussed first because they should be dealt with first, to ensure bleeding is controlled and the wound is cleaned, before treating fractures.

The latter part of this chapter then addresses care specific to fractures—both open and closed. This fracture-specific care is usually lower in priority than care of wounds, but the two are often related.

Managing major wounds and fractures can be complicated, so get the casualty to a higher level of care as soon as possible. In the meantime, the information in this chapter can help you care for casualties with major wounds and fractures.

IN THIS CHAPTER

The information about wounds and fractures provided in this chapter is organized as follows:

- Key Points
- Symptoms
- Supplies
- Steps for Managing Wounds
  - Special Wound Types: Head, Eye, Face, Neck, Chest, and Abdomen
  - Special Wound Types: Embedded Objects
- Steps for Managing Fractures
- PCC Continued
- Addendum A13: How to Irrigate a Wound
- Addendum B13: Splinting
- Addendum C13: Arm Sling

KEY POINTS

- Whether or not you suspect a fracture is present, **the first priority is to control bleeding**.
- A broken bone can be quite painful and serious, but it is not your first concern if other, more pressing, life-threatening conditions are present, including (in the following order):
  - Massive bleeding
  - Airway blockage
  - Other breathing problems
  - Shock
  - Head injury
  - Hypothermia
- When you have addressed these and other high-priority issues identified during your assessment, then you can focus on wounds and fractures without massive bleeding, as covered in this chapter.

- A wound may be associated with a fracture. However, with or without fracture, wounds are at risk of serious complications such as infections, which can lead to disability or death.

Do not try to do everything alone! Get someone to help when you can. This can include "walking wounded" casualties.

Do Not:

- DO NOT be distracted by fractures when other major injuries such as massive bleeding are present.
- DO NOT be distracted by dramatic-looking wounds—such as abdominal, chest, or eye wounds—not associated with massive bleeding if other major injuries are present.

SYMPTOMS

Wounds:

Refer to *Chapter 6: Severe Bleeding* for the symptoms of bleeding wounds.

Signs of **wound infection** include:

- Pus (thick, colored fluid) coming from the wound.
- Cellulitis, which includes redness, warmth, or swelling of the skin surrounding the wound.

Fractures:

You can identify a fracture if a casualty:

- Has pain at a specific location.
- If the shape of some part of a casualty's body does not look normal.

If you think a casualty may have one or more fractures, do a quick head-to-toe assessment. Put brief but firm pressure on the bones all over their

body and watch for any pain reaction or sounds of grating or scraping. These are signs of a fracture.

If you identify a possible fracture, look for any nearby wounds, bleeding, or a bone sticking out of the skin. These signs indicate an open fracture, which first requires wound care.

Open fractures increase the risk of infection of both skin and bone. Treat any fracture with a wound, bleeding, or a break in the skin nearby as an open fracture.

SUPPLIES

- SAM splints or other splinting materials such as boards, poles, or sticks
- Tourniquets
- Antibiotic ointment
- Oral antibiotics
- Gloves
- Triangular bandages
- See also *Appendix 4: Dressings*
- See also *Appendix 5: Wound-cleansing Solutions*

STEPS TO MANAGE WOUNDS

Locate a casualty's wounds and begin with the wound with the most severe bleeding.

If any of the wounds are the result of burns, go to Chapter 14: Burns*. The following is not for the care of burn wounds.*

See "Special Wound Types" below for wounds of the head, eye, face, neck, chest, and abdomen.

Step 1: Control Bleeding

- ▷ See "Steps to Manage Compressible Bleeding" in *Chapter 6: Severe Bleeding*. Severe bleeding of all wounds must be controlled before you proceed with the steps below for other wounds.
- ▷ Use a tourniquet only when absolutely necessary.

Step 2: Control Pain

If possible, give the casualty something for their pain. See *Chapter 11: Pain*.

Make a note of what pain medications you gave the casualty and when. (See *Chapter 3: Communication and Documentation* for how to keep track of what you do during PCC.)

Step 3: Clean the Wound

- ▷ Carefully remove debris such as wood, clothing, and loose pieces of bone.
  - Beware of sharp edges if you use your fingers. Use a piece of gauze if you have it.
  - If you use tweezers or a grasping device, be careful not to pinch or poke the surrounding tissue.
  - DO NOT remove metal fragments or anything deeply embedded that does not come out easily with irrigation or gentle brushing (See "Special Wound Types: Embedded Objects" below.).
- ▷ Rinse ("irrigate") a wound to clean it as soon as possible to reduce the risk of infection.
  - This involves pouring fluid into an open wound so that the fluid flows out again. See *Addendum A13* at the end of this chapter for how to irrigate a wound.

***DO NOT** use rubbing alcohol or hydrogen peroxide to clean a wound. Both will destroy healthy tissue.*

- ▹ If a pressure dressing was previously applied to control severe bleeding, and no further bleeding is visible, leave the dressing in place.
  - Get medical help, if possible, for further care of the wound.
  - If medical help is not available, clean around the wound with a clean cloth and potable (drinkable) water while leaving the dressing in place.
  - If you have time, you can replace the dressing, using a tourniquet if necessary, as described below.
  - If bleeding is not severe, you can remove a dressing and allow for some bleeding while you clean the wound.
- ▹ If a previously applied dressing has become saturated with blood, replace it with a clean pressure dressing. The priority is to control bleeding.
  - If the wound with the pressure dressing is on an arm or leg, you can place a spot tourniquet to control bleeding while you remove the dressing and clean the wound.
  - After you have rinsed the wound, determine if the tourniquet is still needed, or replace the dressing and remove the tourniquet.
  - Refer to *Appendix 3: Tourniquets* for how to place and then convert a tourniquet to a pressure dressing.
- ▹ The act of cleaning a wound might dislodge some clots and cause fresh bleeding. Non-severe bleeding is okay for a very brief time (less than 2 minutes).

Step 4: Dress the Wound

- ▹ See *Appendix 4: Dressings* for details of how and when to use different types of dressings.

1. ***Best:*** Apply an antibiotic ointment (for example, Bacitracin or Neosporin) to the skin. Then cover the wound with a sterile, non-stick dressing, and wrap with a sterile bandage.

2. ***Better:*** Apply any available sterile gauze (loose, soft dressing), preferably with an antibiotic ointment.

NOTE

Honey dressing is also an effective way to promote wound healing and prevent infection.

However, DO NOT use this method if the patient is allergic to honey (very rare).

Soak gauze or a clean piece of cloth in honey, fold it in at least 3 layers, and cover the wound.

Place another piece of clean gauze or cloth over the honey-soaked dressing, and hold in place with a bandage.

3 ***Good:*** Apply any available clean dressing (fabric of some kind).

- ▹ DO NOT wrap wounds with non-porous dressings such as plastic wrap.
- ▹ DO NOT close (stitch or tape together) the edges of wounds without consulting a medical professional.

Step 5: Check for Fractures

- ▹ If you find a wound with a visible (open) fracture or with bleeding or a break in the skin nearby, treat it as a fracture.
  - Follow "Steps to Manage Fractures" below as soon as you have completed dressing the associated wound.
- ▹ Does the casualty have pain at a specific location or does the shape of some part of their body not look normal?
- ▹ Put brief but firm pressure on the bones all over the casualty's body and watch for any pain reaction or sounds of grating or scraping.
- ▹ If any symptoms suggest there might be a fracture, go to "Steps to Manage Fractures" below to splint or otherwise stabilize the suspect area.

Step 6: Monitor the Wound

- ▹ Examine wounds at least once a day for signs of infection, including pus and cellulitis (see Symptoms section above).
- ▹ See *Appendix 4: Dressings* for guidance on when to change dressings.

SPECIAL WOUND TYPES: HEAD, EYE, FACE, NECK, CHEST, AND ABDOMEN

You can manage wounds of the head, face, eye, neck, chest, and abdomen the same way as for other wounds, with a few special considerations.

- **Head and face:**
  - Ensure that the casualty can breathe. See *Chapter 7: Airway and Breathing* for more information.
  - Scalp wounds may bleed a lot. A pressure dressing is the best way to control it (see *Appendix 4: Dressings*). Make sure the dressing does not affect blood flow in the casualty's neck, and try not to cover their eyes.
- **Eye:** Protect the damaged eyeball with an eye shield (such as a paper cup) that does not place pressure on the eye. Fasten the shield in place by wrapping tape or a bandage around the casualty's head.
- **Neck:** Do not apply a tourniquet! Use your hand over a dressing pad to control bleeding without wrapping anything around the casualty's neck. Once the bleeding has been controlled, you can tape the dressing in place, but tape only partway around their neck.
- **Chest:** Treat a chest wound like any other type of wound, except do not force packing into the chest cavity. See Step 10 of "Steps to Manage Fractures" below for information on rib fractures.
- **Abdomen:** Treat an abdominal wound like other type of wound, except do not force packing into the abdominal cavity.
  - If the abdominal contents are exposed, cover the wound with a layer of moist dressing and another, larger layer of dry dressing material. Then cover the dressing with a plastic bag or other plastic material to prevent loss of moisture and heat.

Best/Better: Use sterile dressing and sterile water or saline solution for the moist dressing. See *Appendix 5: Wound-cleansing Solutions* for how to make saline solution.

Good: Use the cleanest dressing available and the cleanest water available (ideally boiled, potable water) for the moist dressing.

***DO NOT** use non-potable water or soiled dressings! See* Addendum A13 *at the end of this chapter for how to make water potable.*

SPECIAL WOUND TYPES: EMBEDDED OBJECTS

Removing an embedded object may result in severe bleeding and injury to the surrounding structures. When you are dealing with a wound containing an embedded object, do not try to remove the object unless it falls out easily with gentle cleaning or irrigation. Focus on immobilizing the object and controlling bleeding. Apply pressure around the object, not directly over it. Use dressings to help stabilize the object so it does not move around and cause damage. Leave the object in place and work around it until you can obtain professional medical help.

STEPS TO MANAGE FRACTURES

The ends of broken bones can be sharp and can cut nerves and blood vessels, leading to permanent damage to an arm or leg, or even life-threatening loss of blood.

Splinting or otherwise immobilizing broken bones holds them in place to prevent this from happening.

Step 7: Fractured Limbs (Arms and Legs)

- ▹ Manually stabilize the fracture.
  - Get a partner to hold the broken bone in place until the splint is placed.
  - Check for a pulse beyond the fracture.
- ▹ See Appendix 2a for how to feel for a pulse.
  - Record what you find.

- ▹ Check for sensation in the arm or leg beyond the fracture.
  - Brush or tap an area farther down the limb and ask the casualty if they feel it. Document the presence or absence of feeling.
- ▹ Check for the casualty's ability to move something in their arm or leg beyond the fracture.
  - Ask the casualty to move something (fingers, wrist, toes, ankle) farther down the limb than the fracture. Document their ability or inability to move.
- ▹ Use a padded, stiff object (a splint) to stabilize the fracture (see *Addendum B13*). Wrap bandages or tie fabric to secure the splint to the injured area to keep the splint in place. Also immobilize the joints above and below the fracture using a sling or a splint long enough to go across multiple joints.

Best/Better: Use a commercial splinting device (such as a SAM splint).

Good: Use an improvised splint (such as a piece of wood).

If a casualty has a fracture in one leg, you can tie both their legs together to form a makeshift splint.

- ▹ After splinting, repeat the steps above to check for pulse, sensation, and the ability to move in areas farther down a limb than the fracture.
  - If any of these have been reduced, adjust the splint so it is not too tight.

If the fracture is in an arm, consider also placing the arm in a sling (see Addendum C13 *at the end of this chapter for details of how to create an arm sling).*

Step 8: Fractured Shoulder or Collarbone

- ▹ Manually stabilize the shoulder area.
  - Hold the upper arm against the casualty's body with their elbow flexed at a 90-degree angle, and their lower arm in front of their body.
- ▹ The following steps are easier if you can get another person to help hold the casualty's arm.
- ▹ Use a triangular bandage to stabilize the fracture with an arm sling. See *Addendum C13* at the end of this chapter for how to create an arm sling.

Best/Better: Use a commercially available triangular bandage.

Good: Create a triangular bandage by cutting a piece of cloth into a triangle about 100 × 100 × 142 cm (40 × 40 × 56 inches). You also can use a large kerchief folded in half diagonally.

If the casualty is wearing a shirt or jacket with buttons, you can create a makeshift splint by buttoning the cuff of the sleeve on the injured side to a buttonhole at the neck.

Step 9: Fractured Pelvis

The pelvis surrounds major arteries and veins that could tear and bleed around the bladder. If you think a casualty may have a broken pelvis (likely in the case of high-energy impact), you should stabilize their pelvis.

Best/Better: Commercial pelvic binder

- ▹ Empty the casualty's pockets, and remove any items attached to their waistband or belt.
- ▹ Remove the pelvic binder and unsecured straps from the packaging.
- ▹ Place the pelvic binder under the casualty and position it low across their hip joints, where the leg bends at the hip.

- Fasten the strap(s) in front using the buckle or other fastener, depending on the product type. Tighten the strap(s) until you hear a click. This indicates that the pelvic binder is secured correctly and is tight enough.

Good: Improvised pelvic binder

- Use a belt or bed sheet to stabilize a casualty's pelvis.
- Empty the casualty's pockets, and remove any items attached to their waistband or belt.
- Center the belt or sheet around the hip bones, at the level where the leg bends at the hip, and tighten it until it fits snugly.

Use straps or whatever other materials you have to hold the casualty's legs in place below the pelvic binder to prevent movement.

Step 10: Rib Fractures

- DO NOT splint a rib fracture! This type of fracture could cause lung damage by puncturing a lung. See *Chapter 7: Airway and Breathing* if the casualty has trouble breathing.
- Use pillows or other padding to support the casualty with their upper torso and head elevated at a 30-degree angle. This can help with breathing and pain.
- Casualties with rib fractures need pain control to ensure they can take deep breaths to prevent pneumonia. See *Chapter 11: Pain* for how to manage pain.

Step 11: Head Fractures

- If a casualty has a break in their skull bone with the brain exposed, cover with a simple dressing and protect that area.
- See *Chapter 9: Head Injury* for more information about head trauma.

PCC CONTINUED

Care and Monitoring

For additional information about how to monitor and continue care for a casualty, see *Chapter 5: Nursing*, including when and how to replace dressings.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC*.

ADDENDUM A13: HOW TO IRRIGATE A WOUND

Flow 4–8 liters (1–2 gallons) of fluid (or less, for a small wound) over the wound to irrigate it. More fluid is better than less, but DO NOT use too much pressure when you rinse a wound, such as a hose at full strength.

1. ***Best:*** Irrigate the wound with Dakin's solution (see *Appendix 5*).
2. ***Better:*** Irrigate the wound with saline solution (see *Appendix 5*) or clean, potable (drinkable) tap water.
   - ▹ If the quality of the available water is unknown, then treat it as non-potable (see *Good* below).
3. ***Good:*** Irrigate the wound with the cleanest water available. Boil non-potable water (including water of unknown quality) for at least 3 minutes, and then cool it to body temperature.
   - ▹ To determine if water is at body temperature, feel the outside of the container to make sure the container is lukewarm and not painful to the touch.
   - ▹ If you cannot boil water, and you think the water could be non-potable, DO NOT IRRIGATE.

TIPS

Some tips to help irrigate wounds and prevent infection include:

- ▹ *If you can, wash your hands and/or wear gloves to help keep the wound as clean as possible.*
- ▹ *Have the casualty shower, or wipe the casualty's entire body with a wet cloth to reduce the risk of infection.*
- ▹ *Use mild soap if available.*
- ▹ *If you have a clean bottle, puncture the top, fill the bottle with fluid, and tip it upside down to let the fluid flow over the wound.*
- ▹ *A sealable plastic bag with a hole works too.*
- ▹ *A syringe can produce higher pressure to dislodge debris.*
- ▹ *DO NOT allow a wound to soak in water for too long. Prolonged exposure to water can cause tissue damage.*

ADDENDUM B13: SPLINTING

The general principle of splinting is to prevent movement of the broken bone(s) in an arm or leg, which may also prevent movement of the joints above and below the fracture. If you aren't sure if a casualty has a fracture, go ahead and splint it. Splints can also be used to immobilize areas that may be sprained or that have wounds.

Best/Better: Commercial splints (such as SAM splints) made of foam and moldable aluminum are available. They can be used to create various shapes and sizes of splints (see Figure B13.1 for an example). You must mold and fold these splints to fit the size and shape of the casualty and their fracture.

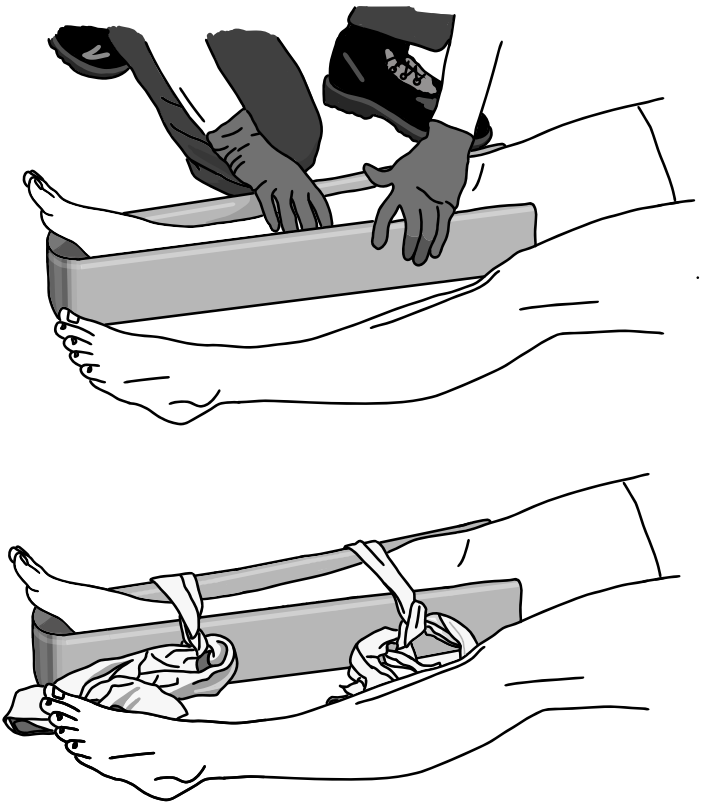


Figure B13.1. Example of how to use a commercial leg splint

3 ***Good:*** If you do not have a commercial splint, you can make a splint out of rolled-up magazines, wood planks, or other rigid objects. Use bandages, cloth strips, or rolled-up triangular bandages as ties. Be sure to choose materials of the right size for the casualty's body part and fracture. Figure B13.2 shows an example.

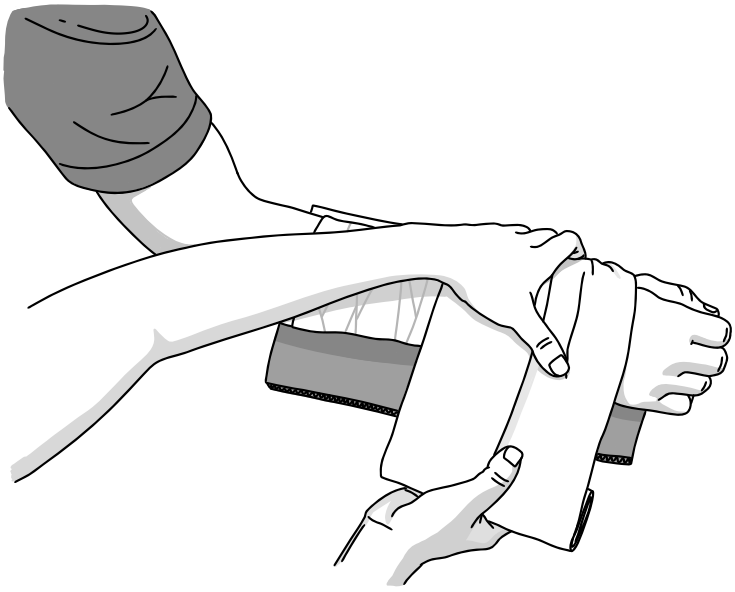


Figure B13.2. Example of how to create a makeshift arm splint

Steps for Applying a Splint

Step 1: Prepare the Area

- ▹ Clean and dress any wounds, and remove any clothing that cannot be removed after splinting.

Step 2: Select the Splint

- ▹ Measure the splinting material using an uninjured limb, and trim or bend the splint to the appropriate size.

Step 3: Position the Splint

- ▷ Place the splint on both sides of the injured limb, so it extends past the joints above and below the injury.

Step 4: Secure the Splint

- ▷ Use bandages, ties, or straps to secure the splint in place. Make sure the knots do not press on the injury.

Step 5: Reassess

- ▷ Check for circulation beyond the splint
  - See Appendix 2a for how to check for a pulse.
- ▷ Ensure the casualty can wiggle their toes or fingers and can feel your touch in the areas below the splint.
- ▷ If there is no pulse, or if the casualty cannot move or feel, below the splint, adjust the splint and loosen any ties that are too tight.
- ▷ If possible, elevate the splinted body part.

When you are splinting an entire leg, DO NOT lift the injured leg to move the fabric wraps to where you want them. Instead, position the loose fabric wraps below the knee, and then slide them along the floor under the leg and the pieces of splint to the where they need to be tied.

ADDENDUM C13: ARM SLING

- ▹ Tie two or three knots at the 90-degree corner of a triangular bandage. Keep the knot close to the corner, with a "tail" as short as possible (see Figure C13.1).
- ▹ Use the knotted triangular bandage to create a sling.
  - Place the casualty's elbow crook into the knotted corner.
  - Bring the other two corners around the casualty's neck so the injured arm rests at a 90-degree angle.
  - Finally, tie the two unknotted corners together behind the casualty's neck.

Figure C13.1. Arm sling with "tail"

CHAPTER 14

Burns

Burns can be caused by fire, hot water or steam, hot objects, electricity, the sun, or chemicals.

How you manage burns depends on their size and severity. **Burns can be life-threatening**, especially when they cover more than 20% of a casualty's total surface body area (TBSA) or when a casualty has smoke inhalation (with airway or breathing problems). However, they are not immediately life-threatening, so give your attention first to the other conditions covered earlier in this book.

During the first 24–48 hours after burn, a casualty loses plasma (the liquid part of their blood) into their body tissues. This can cause "hypovolemic shock," where not enough blood and oxygen gets to the body's organs. Therefore, it is important to replace these fluid losses as part of caring for a burn casualty.

Remember teleconsultation! Managing burns is especially complex. When you cannot get your casualty to a higher level of medical care right away, reach out for advice if you can. See Chapter 3: Communication and Documentation *for telemedicine guidelines.*

IN THIS CHAPTER

KEY POINTS

- Burn wounds become infected easily, so they need cleaning and dressing to minimize the risk of infection.
- Fluid replacement is one of the first and most important steps in caring for a casualty with burns because of the loss of fluid (plasma) caused by burns and the associated risk of shock. (See *Chapter 8: Shock, Circulation, and Resuscitation* and *Appendix 9b: Understanding Shock* for more information about hypovolemic shock.)
- Burns reduce the ability of the skin to provide protection, so burn casualties are at high risk of hypothermia. See *Chapter 10: Hypothermia* for symptoms, how to measure temperature, and how to prevent and manage hypothermia.
- Assume that a casualty with burn wounds may also have airway problems caused by smoke inhalation or burn-induced swelling.

SYMPTOMS

Burns are categorized according to the depth of injury to the skin:

- **First-degree** (superficial) burns involve damage only to the top layer of the skin and look like a mild to moderate sunburn (Figure 14.1). They appear red, turn white immediately when you press on them, do not blister, and hurt when touched.

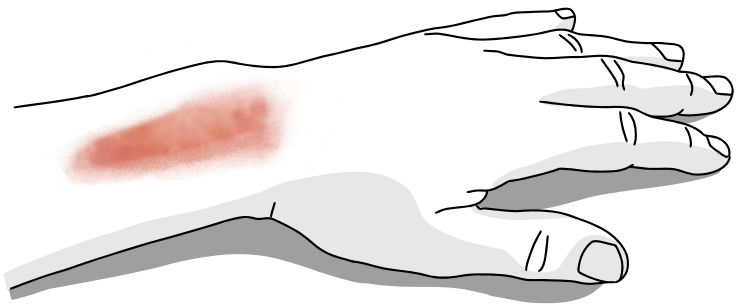


Figure 14.1. Example of first-degree (superficial) burn

- **Second-degree** (partial-thickness) burns involve the top two layers of skin (Figure 14.2). These burns are very painful, form blisters, and may seep fluid and turn white when you press on them.

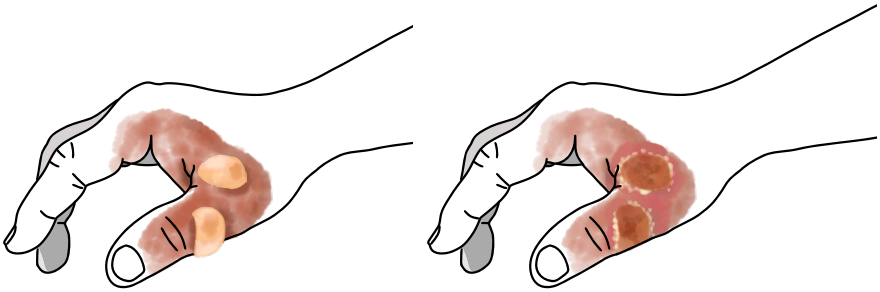


Figure 14.2. Examples of second-degree burns

- **Third-degree** (full-thickness) burns extend through all layers of the skin, completely destroying it (Figure 14.3). These burns can appear leathery, white, red, or black. Full-thickness burns are dry, do not change color when you push on them, do not hurt, and often contain clotted blood vessels that are visible.

Figure 14.3. Examples of third-degree burns

SUPPLIES

- Oral rehydration solution (see *Appendix 6*)
- Bulb syringes
- Clean sheets or other fabric
- Towels and washcloths
- Soap
- Containers with measurement markings (1 liter and smaller sizes)
- See also Supplies in other chapters and appendices mentioned in this chapter

STEPS TO MANAGE BURN WOUNDS

Step 1: Stop Any Possible Ongoing Burning

- Remove the casualty's clothing (but do not force removal if clothing is stuck or melted to their skin).
- Brush off any dirt or dry chemicals on their skin.
- Rinse the burns gently with cool water.
  - DO NOT rub dry. Just pat gently.

Step 2: Prioritize Injury Management

- Treat any other life-threatening injuries, such as massive bleeding.

Step 3: Burn-related Airway Management

- A casualty may arrive with a cricothyrotomy tube (an emergency surgical airway, or breathing tube) in their neck (Figure 14.4). This was done because their airway could close if they were exposed to smoke, burns on their face, or swelling due to extensive burns.
  - See *Addendum A14: Cricothyrotomy Management* at the end of this chapter for more information.

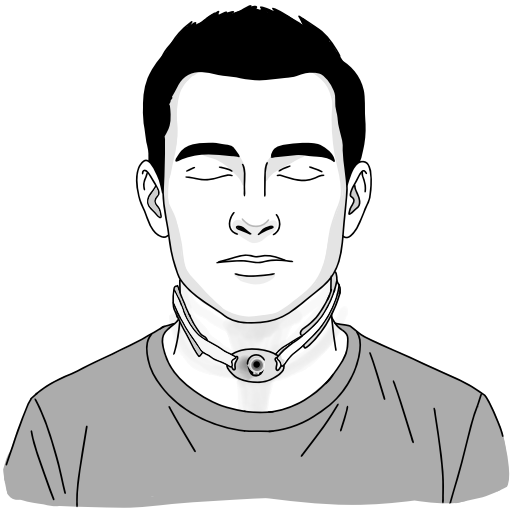


Figure 14.4. Cricothyrotomy Tube

- If a casualty is conscious, help them into a comfortable position (often sitting up and leaning forward). If they are unconscious, move them into the Recovery Position (see *Appendix 1a*).
- You can use a syringe or bulb suction if they have a secretions or debris in their mouth that make it difficult for them to breath.
- If the casualty is wheezing, you can use an albuterol inhaler, if you have one. See *Chapter 12: Medications* for more information.

Do Not:

- DO NOT force a casualty to lie down if they want to sit up or can breathe better when sitting up. Lying down (especially flat on their back) can cause fluid and tissue to collect in the back of the throat and make it harder to breathe.
- DO NOT give oral pain medication to a casualty with a cricothyrotomy tube. It could cause further airway blockage.

NOTE

If a burn casualty has only mild symptoms (such as some coughing but no respiratory distress), you can just monitor them without doing anything about their airway.

Step 4: Assess Burn Size

- ▹ You must determine the total body surface area (TBSA) of burn wounds so you know how much fluid to give a casualty.
  - TBSA includes only partial (second-degree) and full-thickness (third-degree) burns, so you also need to know how to tell the difference from superficial (first-degree) burns.
- ▹ It is difficult to estimate burn wound size, so get telecommunications help from a remote medical consultant as soon as possible, if you can.
  - See *Chapter 3: Communication and Documentation* for telemedicine guidelines.
- ▹ Gently clean the wounds with soap, water, and cloth to remove soot and dirt just enough so you can tell the size and degree of the burns.
  - If possible, send pictures of cleaned wounds to a remote consultant to help determine wound size and degree.
  - You will do a more thorough cleaning and dressing later (see the Infection section of this chapter).

Best/Better: Calculate TBSA of the burn(s) using an app like E-burn, Surface Burn Calculator, or Burn & Parkland Calculator if you have a smartphone available and can download one of these apps.

Good: For small wounds, use the casualty's hand size (including fingers) to represent 1% TBSA, and add up the number of "hand-size" burn wounds you see. For larger wounds, use the Rule of Nines (*Addendum B14*) to calculate the casualty's burn size.

***DO NOT** count first-degree burns (sunburn-like; see Figure 14.1) in your TBSA calculation.*

Step 5: Prevent Hypothermia

- Cover the casualty and keep them in a warm environment, if possible. See *Chapter 10: Hypothermia* for more information about how to prevent and manage hypothermia.

Do not try to do everything alone! Get someone to help when you can. This can include "walking wounded" casualties.

Step 6: Calculate Fluid Requirements and Give Fluids

- If a casualty is conscious and able to swallow, you can give them fluids by mouth.
  - See *Appendix 6: Oral Rehydration Solutions* for how to make a suitable fluid.
- Multiply TBSA by 10 to determine the initial oral fluid rate—that is, the amount to give each hour for the first 24 hours. (The burn apps mentioned above calculate fluid rate using a different formula. It is okay to use the amount determined by the app instead for initial fluid rates.)
  - For example, for a burn size of 30%, the starting rate is 30 × 10 = 300 milliliters per hour (mL/h).
  - For a casualty who weighs more than 80 kg (176 lb), add an extra 100 mL/h for each 10 kg.
    - » For example, for a 100 kg (200 lb) casualty with 30% burns, the starting rate is 300 mL/h + 200 mL/h = 500 mL/h.
  - Children: Use the formula (3 × TBSA × body weight in kg) for hourly amount of fluid to give in the first 24 hours.
- After the first 24 hours, adjust the fluid rate based on urine output (see Step 7: Monitoring below).

Do Not:

- DO NOT use regular water for rehydration. It does not have the right proportion of electrolytes and can make a casualty even more sick. See *Appendix 6: Oral Rehydration Solutions* for how to make a suitable fluid.

If you have some medical training or experience, you can consider using rectal infusion to give fluids to a casualty who cannot take in fluids by mouth. See Appendix 10a: Advanced Practices – Rectal Infusion*.*

*If you have the necessary supplies, and if you can contact a medical provider, you also can consider using intravenous access (*Appendix 10c: Advanced Practices – Intravenous Access*) to give fluids to a casualty.*

Step 7: Monitoring and Ongoing Fluid Intake

- Once a burn casualty is getting fluids, start monitoring their condition before you do anything else. Continue monitoring their vital signs (see *Appendix 2*) and urine output (see *Appendix 7*), as described below, during and after the other steps in burn management, until they stabilize.
- Document blood pressure (BP), heart rate (HR), urine output (UO), mental status, pain, pulse oximetry, and temperature, and record the data on a vital signs worksheet (*Appendix 2f*). Check the casualty's vital signs frequently (every 15 minutes at first, and then every 30–60 minutes once they have been stable for more than 2 hours).

***DO NOT** leave a burn casualty alone without monitoring vital signs.*

- ▹ Measure a burn casualty's urine output (UO) to determine the right amount of fluids you need to give them (see *Appendix 7: Urine Output*). Check hourly to see if they have urinated.
- ▹ Adjust their fluid intake until their UO has increased to 30–50 mL/h (1.0–1.7 fl oz/h).

1. ***Best:*** Use a direct-collection system that uses a catheter to measure UO. See *Appendix 7: Urine Output* and *Appendix 8: Catheters* for details.
   - ▹ If UO is too low (less than 30 mL per hour), increase the fluid intake rate by 25% every 1–2 hours until you reach the desired UO.
     - For example, if UO is 20 mL/h and fluid intake rate is 300 mL/h, increase fluid intake rate by 0.25 × 300 = 75 mL/h for a new rate of 375 mL/h.
   - ▹ If UO is too high (more than 50 mL/h or, for children, more than 1 mL/kg/h), decrease fluid intake rate by 25%.

2. ***Better:*** Collect and measure all spontaneously voided urine in an improvised system. See *Appendix 7: Urine Output* for how to do this.
   - ▹ More than 180 mL every 6 hours is enough for an adult.

3. ***Good:*** If you cannot measure UO, adjust the casualty's fluid intake to keep their heart rate at less than 140 beats per minute.
   - ▹ It is especially important to use a vital-signs tracking record for this method. See *Appendix 2f: Vital Signs Record* for an example of a record sheet you can use.

Do Not:

- ▹ DO NOT forget to adjust the amount of fluids you are giving based on a casualty's urine output or heart rate.

Step 8: Pain Management

Burns can be very painful. Give the casualty an oral pain medication before you dress their wounds. Refer to *Chapter 11: Pain* for information about medications you can give to a casualty to reduce their pain.

Step 9: Cleaning and Dressing Burn Wounds

- ▹ Burns are highly prone to infection, so it is important to do whatever you can to prevent infection as soon as possible.
  - If you expect evacuation to a higher level of care within 24 hours, simply cover burns with clean, dry gauze, secure with a bandage, and leave intact blisters in place.
  - If you do not expect evacuation for more than 24 hours, provide wound care as soon as possible after the injury, as described below.

Remove wet dressings, if any, from burn wounds and replace with dry ones if needed.

Best/Better: Clean the casualty's burn wounds and remove loose dead skin by scrubbing gently with gauze or a washcloth and chlorhexidine (such as Hibiclens) or soap and clean water.

- ▹ You can use any clean cloth if you do not have gauze or a washcloth.
- ▹ Do not try to pop any blisters, but if they do pop while you are cleaning them, apply a topical antibiotic cream (such as bacitracin or mupirocin), silver sulfadiazine (Silvadene), petroleum jelly (Vaseline), or honey, followed by gauze dressing.
- ▹ Areas that are dry after cleaning do not need dressings.

Good: Cover the casualty's burn wounds with clean sheet fabric or dry gauze. Leave any blisters intact (that is, do not pop them).

Do Not:

- ▹ DO NOT put any food items other than honey on burn wounds. Nothing else is safe to use and will likely make the wounds worse.
- ▹ DO NOT intentionally pop intact blisters.
- ▹ DO NOT continue using topical antibiotic cream if the casualty's wounds or surrounding skin starts to turn red, itches, and develops rash. These are signs they are allergic to the antibiotic.
- ▹ DO NOT use wet dressings on burn wounds.
- ▹ DO NOT dress burn wounds that are dry after cleaning.

Step 10: Oral Antibiotics

- ▹ Antibiotics are not normally needed if a burn casualty shows no visible signs of infection, unless they have other open wounds that require them.
- ▹ Drainage of clear liquid from a burn wound is normal (that is, not a sign of infection) and should be treated with dressings as described above, but not with oral antibiotics.
  - After several days, if a casualty develops cellulitis (spreading redness and warmth around the edges of a burn), use one of the antibiotics listed in *Chapter 12: Medications* for cellulitis without pus.
- ▹ A casualty can develop invasive burn wound infection. Signs include changes in the color of wounds, foul smell, and drainage of pus. This needs one of the stronger antibiotics listed in *Chapter 12: Medications* for cellulitis with pus.
- ▹ If you cannot get the antibiotics mentioned above, and you feel certain that a casualty's burn wound is infected (warm, draining pus, fever), give them any antibiotic you can get. It is likely better than nothing. See *Chapter 12: Medications* for options.

Do Not:

- ▹ DO NOT give antibiotics to a casualty if they show no signs of infection.
- ▹ DO NOT give an antibiotic if the casualty is allergic to it. If you do not know if a casualty is allergic to a certain antibiotic, give it to them, but stop if they show any signs of a reaction: rash, itching, worsened breathing, throat swelling, or vomiting.

PCC CONTINUED

Mental Health and Self-Care

Severe burn casualties are very sick and often die, even when they get the best possible medical care. Anything that you do gives them a better chance to live, but if they die, know that there is nothing more you could have done. It can be very difficult and even traumatizing just to see a burn casualty, and harder to care for one. It can help to talk with someone else (safely) about how you are doing and feeling. If you or anyone else on your PCC team can do mental health first aid, it can help everyone involved.

Care and Monitoring

For additional information about how to monitor and continue care for a casualty, see *Chapter 5: Nursing*.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to transfer responsibility for a casualty, see *Chapter 16: End of PCC*.

ADDENDUM A14: CRICOTHYROTOMY MANAGEMENT

Priority 1: Secure the tube. First make sure the tube stays in place. Movement or coughing can make the tube come out.

- ▷ Secure the tube around the back of the casualty's neck using cotton ties or something similar. Tape does not stick to skin well on a burn casualty.
- ▷ If the tube comes out, leave it out.

Priority 2: Suction. A cricothyrotomy tube can clog with mucus. If the casualty seems to have developed more trouble breathing, check their oxygen saturation (see *Appendix 2b*) if you can. If you see fluid in the tube, try using suction of some kind.

Priority 3: Bleeding from the tube. This bleeding is usually not from a major vessel and should stop with pressure.

- ▷ Use gauze or something similar—any cloth will do. Use one hand to put just enough pressure around the tube to stop the bleeding. Place your other hand above the opening of the tube to check for air moving through it. If you cannot feel air moving, you closed the tube by putting too much pressure on it. Reduce the pressure until you can feel air moving.
- ▷ Hold this position for 20 minutes.
- ▷ If the bleeding has not stopped after 20 minutes, keep pressure on the tube for another 20 minutes in the same way. Keep your other hand over the end of the tube to make sure air continues to move through it.

ADDENDUM B14: RULE OF NINES BURN WOUND CALCULATION

Use Figure B14.1 to estimate the percent of total body surface area (% TBSA) having second-degree and third-degree burn wounds. (DO NOT include first-degree wounds in this assessment.)

Example: Second- and third-degree wounds involving the entire (upper and lower) front torso and the front and back of the right arm would be 27% TBSA. If these have scattered areas of unburned skin and/or first-degree burns, adjust the % TBSA downward.

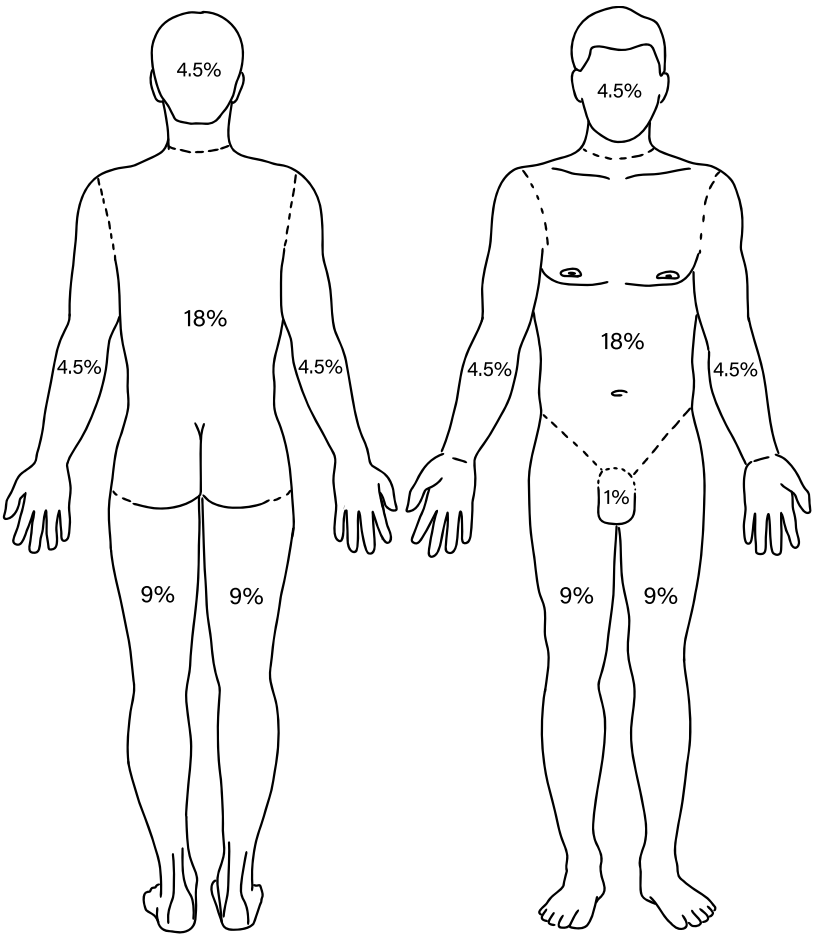


Figure B14.1. Rule of Nines Burn Wound Calculation Diagram

Chapter 15
Hyperthermia—Heat-Related Illness

"Hyperthermia"—heat-related illness—means a person's body cannot keep itself cool. Normally, the human body's temperature is between 36 and 37°C (97–99°F). In hot environments, the body uses methods such as sweating to help keep its temperature in this normal range. However, extreme heat, dehydration, poor nutrition, low physical fitness, or sickness can cause the body's natural temperature controls to fail.

There are two main types of hyperthermia. "Heat exhaustion" occurs when the body cannot keep cool in a hot environment. "Heat stroke" is more severe and happens when the body's temperature rises to more than 40°C (104°F). (This is not the same thing as a fever—a body temperature greater than 38°C [100.4°F]—which is typically due to an infection or disease.) The resulting increase in body temperature can lead to organ damage and even death. The risk of hyperthermia increases with higher environmental temperatures and activity, so it should always be considered in hot environments for casualties who show the symptoms below.

Hyperthermia (unlike hypothermia) usually occurs only in a hot environment, especially if it is humid and/or a person has been physically active.

IN THIS CHAPTER

KEY POINTS

- Heat-related illness is not the same as a fever. The first is related to environment and exertion, while the latter is due to infection or sickness. See *Chapter 5: Nursing* for care of a fever.
- A casualty with hyperthermia must be cooled as soon as possible.
- Monitor a casualty closely during cooling.
- It is possible to cool a casualty too much, which also can lead to injury.
- Remember to always document what you do for a casualty to inform the next team that cares for them.

Do Not:

- DO NOT give the medications typically used to reduce body temperature due to fever, such as paracetamol (acetaminophen), aspirin, or ibuprofen.
- DO NOT allow a hyperthermia casualty to return to normal activity after their body temperature has returned to normal until they have seen a medical practitioner.

SYMPTOMS

Heat exhaustion

- Weakness
- Nausea
- Vomiting
- Dizziness, but with a normal mental condition
- Sweating a lot
- Body temperature of 38.3°C (101°F) or higher

Heat stroke

- Confusion
- Possibly combative
- Difficulty following instructions or performing work
- Incorrectly answers simple questions (their name, date, or current location or situation)
- Loss of consciousness
- No sweating
- Body temperature of 40°C (104°F) or higher

Core temperature is measured with a rectal thermometer (see Appendix 2d*). If you measure temperature by any other means (oral, forehead, ear), it is probably about 0.5°C (1°F) lower than their core temperature.*

SUPPLIES

- Thermometer (rectal preferred)
- Water (and ice, if available)
- Container (such as a plastic bin, plastic pool, animal trough) large enough for an adult body
- Ice chests
- Towels, rags, old clothing, or other fabric
- Oral rehydration solution (see *Appendix 6*)
- Salty snacks (such as trail mix, nuts, pretzels)

Remember teleconsultation! When you cannot get your casualty to a higher level of medical care right away, reach out for advice if you can. See Chapter 3: Communication and Documentation *for telemedicine guidelines.*

STEPS TO MANAGE HYPERTHERMIA

Step 1: Relocate

- Move the casualty out of the heat to a cooler location (such as shade, an air-conditioned vehicle, or a building).

Step 2: Remove Layers

- Remove all heavy clothing and other equipment from the casualty. Leave on underwear and other layers of clothing closest to their skin (such as shirt and shorts or pants).

Step 3: Assess Condition

- ▹ Check the casualty's body temperature, preferably with a rectal thermometer.
- ▹ Check their mental status (see Symptoms above).
  - If their core temperature is 40°C (104°F), and their mental status is altered in any way, they have heat stroke and need to be given priority for transport to a medical facility, but in the meantime, begin cooling immediately (see below).

TIP

Do not try to do everything alone! Get someone to help when you can. This can include "walking wounded" casualties.

Step 4: Body Cooling

Best/Better

- ▹ For heat stroke, use ice-sheet cooling or immerse the casualty in cool water.
  - You will need at least one other person to help you with both these methods.
- ▹ **Ice-sheet Cooling.** Use this method if you have ice available, especially if a casualty has heat stroke.
  - Fill an ice chest or other insulated container with ⅓ cool water and ⅔ ice.
  - Immerse bed sheets (5 per casualty) in the ice water.
    - » You also can use shirts, blankets, or any other fabric.
  - Remove the casualty's clothing down to their undergarments.
  - Lay an ice sheet down on litter or stretcher.
  - Place the casualty on top of the ice sheet.
  - Place wadded or rolled ice sheets on the casualty's **groin**, under their **armpits**, and around their **neck** (see Figure 15.1).

- Drape an extra ice sheet over their torso and legs.
- Rewet and replace the sheets every **3 minutes**.
- Continue cooling (even if casualty is shivering) and monitor their vital signs every 2 to 5 minutes.

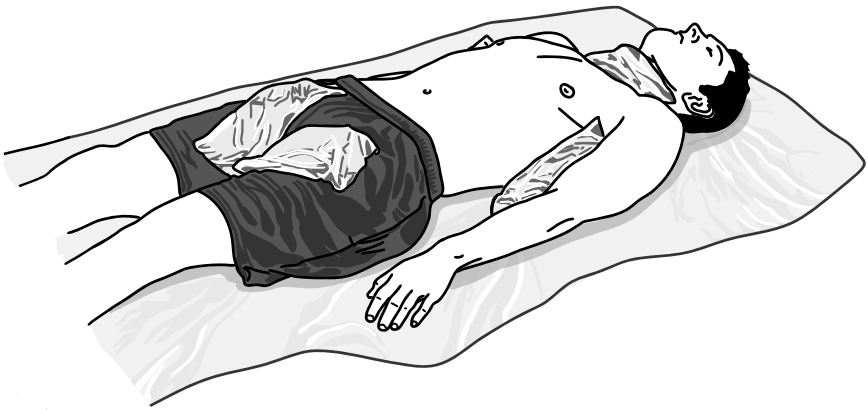


Figure 15.1: Ice-sheet Cooling for Heat Stroke

▹ **Cool-water Immersion.** Use a large container such as a bathtub, plastic bin, or animal trough. Ideally, the container should have enough water to cover the casualty up to their neck.

- Always watch the casualty because they may lose consciousness and drown.
- Immerse the casualty's body to the neck in the container of water.
- Cover as much of their body as possible with cool or cold water, with ice if you have it.
  - » If the container is not large enough for their entire body, cover as much of their torso as possible.
  - » To keep their head and neck above water, have a helper hold a towel or sheet wrapped across the casualty's chest and under their arms.
- To help make cooling happen faster, stir the water continuously.
- Monitor their vital signs every 2 to 5 minutes.

3 *Good*

- For both heat exhaustion and heat stroke, wet the casualty's remaining clothing with cool or cold water by pouring it onto them.
- Alternatively, apply towels or other fabric soaked in cool or cold water to the casualty.
- Fan the casualty after you wet their clothing.

NOTE

You can do cool-water immersion in an open body of water (lake, pond, stream), but there is a high risk of drowning.

Stop Cooling. When the casualty's rectal temperature lowers to 38.9–39.2°C (102.0–102.5°F), you can stop cooling them.

- Remove them from the immersion tub or remove ice sheets only after their core temperature reaches 39°C (102°F).
  - If you cannot measure their rectal temperature, cool them for 10–15 minutes, and then remove whatever you are using to cool them.
- If using immersion, use a bed sheet or other fabric around their chest (can be the same used to keep their head out of the water) to help the transfer.
- Transport them to a medical facility as soon as possible.

Step 5: Rehydration

If a casualty is semiconscious or unconscious, or if they are vomiting, DO NOT give them any fluids because they could choke easily.

Best

- ▹ If the casualty is conscious and not vomiting, give water or an ORS (see *Appendix 6*), electrolytes, and food. Salty snacks—such as trail mix, nuts, or pretzels—will help replace salt lost in sweat.
- ▹ Shivering may occur during the cooling process, but this does not mean that the casualty's body temperature is back to normal. Continue cooling the casualty until their core temperature is below 39°C (102°F).
  - If you do not have a thermometer, continue cooling the casualty for at least 10–15 minutes. Generally, body temperature will decrease by 1°C per 5 minutes in cold-water immersion.

Better

- ▹ If the casualty is conscious and not vomiting, give them fluids as described in *Appendix 6: Oral Rehydration Solutions*.

Good

- ▹ If the casualty is conscious and not vomiting, give them as much water as they will tolerate without worsening their nausea or causing them to vomit.

Step 6: Ongoing Care vs Return to Activity

- ▷ If you think a casualty has **heat exhaustion**, and they improve with care, DO NOT let them resume work or other normal activities immediately. If possible, let them "heat dump," which involves continuing to rest in as cool of an environment as possible for 8 hours.
  - If it is not possible to keep a casualty in a cool environment, or if they need to resume work, make sure they continue to hydrate and monitor themselves for returning symptoms.
  - Tell them to visit a medical provider within 24 hours, if they can.
- ▷ If you think a casualty has experienced heat stroke, get them to proper medical care as soon as possible, even if they show some signs of improvement.

PCC CONTINUED

Care and Monitoring

For additional information about how to monitor and continue care for a casualty, see *Chapter 5: Nursing*.

End of PCC

When you are able to transport a casualty, or when trained medical personnel arrive and can take over, your work is done. For details of how to "hand over" a casualty, see *Chapter 16: End of PCC* at the end of this book.

SECTION 3

End of PCC

CHAPTER 16

End of Prolonged Casualty Care

The end of prolonged casualty care (PCC) involves a complete transfer of responsibility for a casualty, passing on their information and their care to arriving medical professionals, to guarantee a safe and smooth transition to medical care.

After the transfer is complete, it is also important for you—the lay responder—to practice self-care, as PCC can be physically and emotionally stressful.

IN THIS CHAPTER

KEY POINTS

- The casualty's well-being is the primary focus throughout the transfer.
- A casualty may improve before professional medical help arrives. If they do, it is still important that they be evaluated by a medical professional when such care becomes available.
- A smooth and efficient transfer to medical professionals is crucial to ensure safety and continuity of care for a casualty.
- Even with the best professional medical care, some casualties may die.
- If a casualty experiences cardiac arrest (that is, their heart stops) with trauma, their chance of survival is very low, even with professional medical care. This means that, if you know CPR, do not attempt prolonged use if you cannot get the casualty to medical care soon.
- Treating the deceased with dignity is an essential act of compassion and respect, honoring their life and providing solace to those who grieve their loss, including their lay responders. Handle their body with care, respect their wishes, and preserve their memory with reverence.
- Self-care is an important part of ending PCC. Acting as a lay responder will affect you!

STEPS TO MANAGE CASUALTY TRANSFER

Step 1: Provide a Concise Summary

- Briefly describe to those taking over care of a casualty what happened, the casualty's major injuries, and provide a summary of what you did for them.

Step 2: Share Detailed Information

- Give complete documentation (see *Chapter 3*) and all information (such as nursing care and vital signs records—see *Chapter 5* and *Appendix 2f*) to the receiving medical team.

Step 3: Answer Questions Clearly

- Be prepared to answer questions about what you saw and what you did for each casualty. Refer to any documents or notes you have to make sure you give them accurate information.

Step 4: Gather Personal Belongings

- Before the casualty is transported to another location, collect their belongings—clothing, bags, contents of pockets, and whatever else they had with them—and give them to the medical team.

Step 5: Step Back And Follow Instructions

- Allow the medical professionals to take over, and follow any instructions they give you.

This collaborative approach ensures a seamless transition of care, maximizing the chances of a positive outcome for the casualty.

STEPS TO MANAGE A DYING OR DECEASED CASUALTY

Step 1: Check for Responsiveness

- Gently attempt to wake the casualty, and check for signs of breathing or a pulse (see *Appendix 2a* and *Appendix 2b*).

Step 2: Call for Help

- If there is no response, call emergency services (911 in the U.S.) immediately. Explain the situation clearly.

Step 3: Attempt Resuscitation

- If you are trained in CPR, you can provide chest compressions and rescue breathing.
- If breathing and pulses return, start at the beginning with MARCH for care (see *Chapter 1*).
- If you do not know CPR, assume the casualty is deceased and proceed to Step 5.

Step 4: Terminate Resuscitation

- If professional medical assistance is not available, you will not be able to continue CPR indefinitely. If there is no return of spontaneous breathing or a pulse after several minutes, it is likely the casualty is deceased, so you can stop CPR.

Step 5: Notify Authorities

- If you believe a casualty is deceased, try to notify local authorities and seek help from professionals who deal with the deceased.

Step 6: Care for the Body

- Treat the deceased casualty respectfully. Cover them with a sheet or other fabric.
- Try to keep them in a cool location until they can be retrieved by professionals.
- If they cannot be retrieved soon, see *Chapter 2: Planning and Managing Resources* for more information about how to manage fatalities.

Step 7: Gather Documents

- Collect all documents associated with a casualty, including the deceased's identification documents and all documents created during PCC.

Step 8: Respect the Deceased's Wishes

- If the deceased gave you specific instructions for their final arrangements, try to honor them.

Remember, these are general guidelines. Specific procedures may vary depending on local laws and circumstances.

POST-PCC SELF-CARE

Caring for a trauma casualty can be stressful, even for those with first-aid or other medical training. It is important to take care of yourself afterwards, both physically and emotionally.

Physical Self-Care

- **Check for injuries.** Examine yourself for any injuries you may have sustained during PCC, however minor. If minor, you can probably treat your own injuries. If in doubt, however, get professional medical care when you can.
- **Wash up.** Thoroughly wash your hands and any other exposed skin with soap and water to prevent infection. When it is possible, bathe thoroughly and wash your clothing.

- **Rest and replenish.** Get some rest, and rehydrate with water or electrolyte drinks. Eat a nourishing meal if you have not already.

Emotional Self-Care

- **Reflect on your actions.** Acknowledge that you did your best in a difficult situation. Focus on what you did well, and learn from the challenges.
- **Talk about it.** Process your emotions by talking to a friend, family member, spiritual counsellor, or mental-health professional about your experience. DO NOT keep your feelings to yourself!
- **Practice relaxation techniques.** Engage in activities that help you relax and de-stress, such as deep-breathing exercises, meditation, or spending time in nature.

Additional Tips

- **Get support.** Seek professional help if you are struggling to cope with the emotional impact of your experience.
- **Recognize signs of stress.** Be aware of possible signs of stress, such as having trouble sleeping, nightmares, changes in your appetite, irritability, or difficulty concentrating.
- **Connect with others.** Spend time with loved ones, and engage in activities that bring you joy and comfort.

It is crucial to take care of yourself after responding to a medical emergency. Be proud of what you did, and do not dwell on what you could not do. By addressing both your physical and emotional needs, you can recover from the experience and be better prepared for future challenges.

Praise Your Team

Finally, when everything else is done, remember to praise your team members who contributed to PCC. Reflect with them that you did your best to help others survive, and remind them of the self-care tips above.

Appendices

APPENDIX 1A

Recovery Position

Use the Recovery Position to help keep someone's airway open even if they are unconscious. The Recovery Position keeps them on their side with their airway open, because gravity keeps their tongue from blocking their airway. And if they do bleed or vomit, the fluid drains out of their mouth instead of blocking their airway.

NOTE

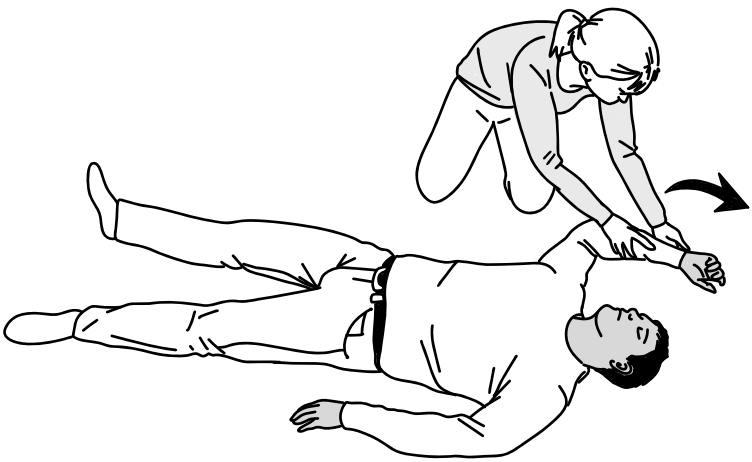
Before you move a casualty, check for neck injury. If they are unconscious or cannot move their neck in all directions, assume that they have a neck injury, and stabilize their head and neck. Go to Appendix 1b.

If they are conscious and can move their head in all directions, they do not need head and neck stabilization.

The Recovery Position does not require any special equipment, and a casualty usually stays in this position even when left alone. To put a casualty in this position, follow these steps:

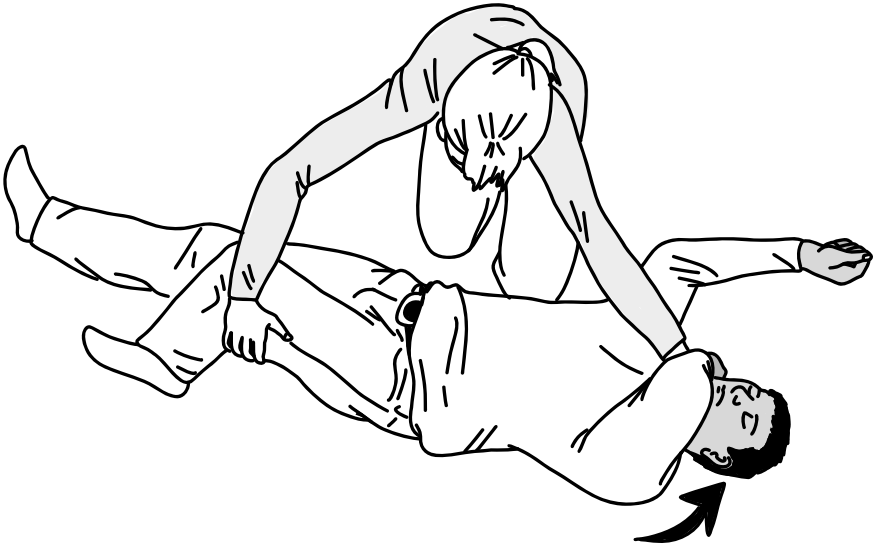
Step 1:

- With the person lying on their back, kneel on the floor at their side.
- Extend one arm at a right angle to their body with their palm facing up.



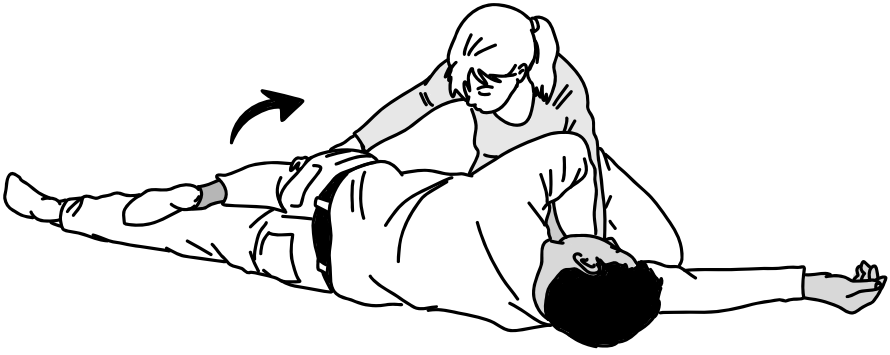
Step 2:

- Take their other arm and fold it so the back of their hand rests on their cheek. Hold it in place.
- Use your free hand to bend the person's knee to a right angle.



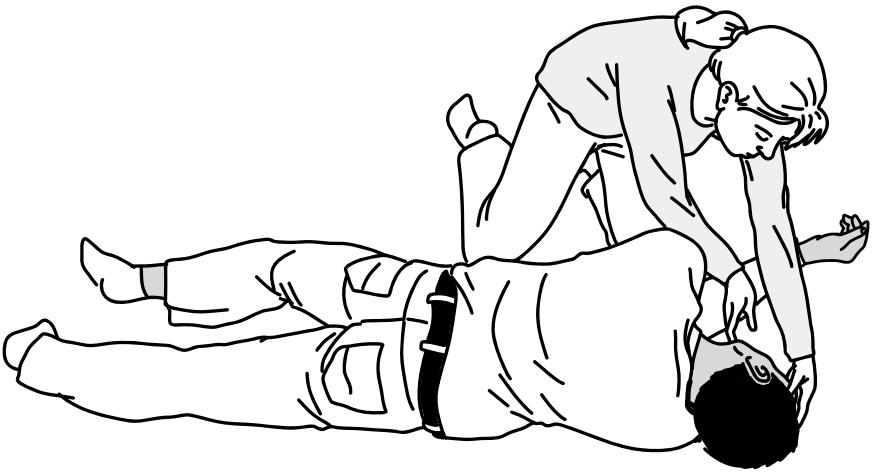
Step 3:

- Carefully roll the person onto their side by pulling on the bent knee towards you.
- Their bent arm should be supporting the head, and their extended arm will stop them rolling too far.



Step 4:

- Make sure their bent leg is at a right angle.
- Open their airway by gently tilting their head back and lifting their chin, and check that nothing is blocking their airway. (See *Chapter 7: Airway and Breathing* for details.)



APPENDIX 1B

Head and Neck Stabilization

Before you move a casualty: If they are unconscious or cannot move their neck in all directions, assume that they have a neck injury, and stabilize their head and neck. This can help prevent more damage if they have a neck injury, which is common in casualties with head injuries.

NOTE

If they are conscious and can move their head in all directions, they do not need head and neck stabilization.

If a casualty has a spinal injury, twisting of their head, neck, or body could damage their spine, including possible paralysis. Stabilizing keeps the head, neck, and body in line to help prevent further injury.

Imagine a straight line that runs along the casualty's spine. Keep their head in line with their spine, so this imaginary line runs through the center of their head (Figure A1b.1).

1. Kneel behind the casualty and place your hands firmly around the base of their skull on both sides.
2. Support their jaw with your index and middle fingers, and support their head with your palms.
3. Gently lift their head into a neutral, eyes-forward position, aligned with their torso.
4. DO NOT move their head or neck too much, with too much force, or too fast.

Place a cervical collar on the casualty, if you have one. An alternative is to put padding, such as a rolled towel, on either side of their head to hold it in place.

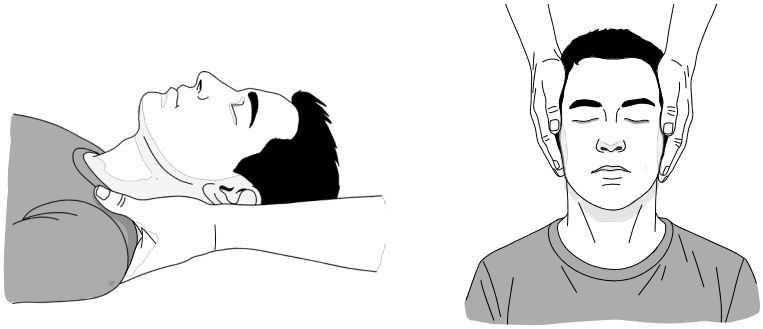


Figure A1b.1. Stabilizing a Casualty's Head and Neck

APPENDIX 2A

Vital Signs — Pulses

Pulses are caused by blood pumping through your arteries. A pulse feels like a light tapping beneath your fingertips. When you can feel a pulse, you know that blood is flowing to that part of the body.

When someone is in shock or has lost a lot of blood, their blood vessels may force blood back to their heart and brain. This means that a pulse further away from their heart—like on their hands and feet—may become weak or go away completely. So, the presence or absence of a pulse tells you how likely someone is to survive.

Sometimes you just need to find out if a person has a pulse or not, such as during triage. If this is the case, just feel the location (beginning with the wrist) for 5–10 seconds to determine if a pulse is present. If you don't feel a pulse at one location, try a different location.

Pulses can also help you assess circulation as it relates to shock. A casualty with a wrist pulse likely has adequate circulation. No wrist pulse (but neck pulse is present) indicates poor circulation and, probably, shock.

Pulses are also important when a casualty has an injury to their arm or leg. The absence of a pulse may mean blood vessels have been injured and need surgical care.

Finally, pulses are important to check after applying:

- a tourniquet, to ensure blood flow has been stopped.
- a bandage or splint, to ensure blood flow has NOT been reduced or stopped.

HOW TO MEASURE A PULSE

If you need to measure a pulse, count the taps for 15 seconds, and then multiply by 4 to get "beats per minute."

Pulse rate and blood pressure are normal if a person's wrist pulse is 60–100 beats per minute.

WHERE TO FIND A PULSE

You can check for pulses in four locations. In order of preference or importance, these are the:

1. wrist
2. neck
3. ankle
4. foot

Important notes:

- ▹ If you press too hard, it may be difficult to find a pulse. Apply firm but light pressure, but do not push too hard.
- ▹ Use two fingers—your index (1st) and middle (2nd) fingers, or your middle (2nd) and ring (3rd) fingers—to feel a pulse.
- ▹ DO NOT use your thumb to find a pulse. It has its own pulse, which can be confusing.

You can also measure a pulse using a pulse oximeter, if you have one (see Appendix 2b*).*

WRIST PULSE

This is the pulse you should check first. It is the easiest to find, and with just a little practice, you can become very good at detecting it.

- ▹ A normal wrist pulse is 60–100 beats per minute.
- ▹ A normal wrist pulse also indicates normal blood pressure (at least 90 systolic).

Step 1: With the casualty's palm facing up, gently touch the middle of the inside of their wrist about 3–5 cm (1½–2 inches) below the bottom edge of their palm with your index and middle finger.

Step 2: Slide your fingers toward the outer edge of the wrist and feel for a rhythmic bumping. Feel for 5–10 seconds to determine if a pulse is present.

NOTE

If you can find a wrist pulse, shock is not likely.

Step 3: Then, if you need to measure the pulse, count taps for 15 seconds and multiply by 4.

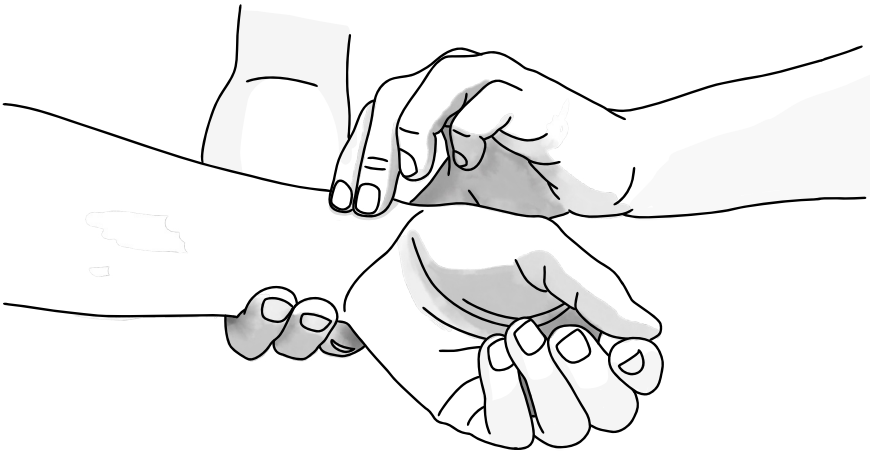


Figure A2a.1. Wrist pulse

NECK PULSE

If you cannot feel a wrist pulse, check for a pulse at the casualty's neck (the carotid artery).

Step 1: With the casualty's head relaxed, gently touch their windpipe in the middle of their throat with your two fingers.

Step 2: Slide your fingers to the left or right of their windpipe and up toward their head just below the jawline, and feel for a rhythmic tapping.

NOTE

If you can feel their pulse at this location, but not in the wrist, their blood pressure is just enough to deliver blood to their brain and organs. That is, they are alive but likely in shock.

Step 3: Then, if you need to measure the pulse, count taps for 15 seconds and multiply by 4.

Figure A2a.2. Neck pulse

ANKLE PULSE

Use this pulse only when you are trying to determine (1) if a tourniquet has been tightened enough or (2) if there is a fracture or injury to the leg, to ensure splints are not cutting off circulation.

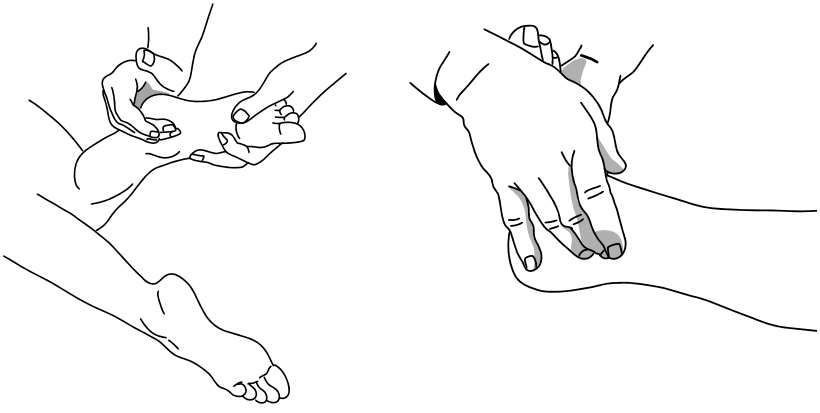


Figure A2a.3. Ankle pulse

The ankle pulse can be hard to find in some people, so you can also check for a foot pulse (see below).

Step 1: Locate the big bony bump on the inside of the casualty's ankle.

Step 2: Apply firm pressure with two fingers of your hand in the soft space right behind this bony bump and feel for a rhythmic tapping.

Step 3: Feel for 5–10 seconds to determine if a pulse is present. Then count taps for 15 seconds if you need to measure the pulse.

FOOT PULSE

If you have trouble finding an ankle pulse, check for a pulse in the foot. As with the ankle pulse, a foot pulse can help you to determine if a tourniquet has been tightened enough or to ensure splints are not cutting off circulation.

Step 1: To check for a pulse in the foot, look at the top of the foot.

Step 2: Gently place your two fingers in the space between the big and second toe, and slide your fingers toward the top of the foot and feel for a rhythmic tapping.

Step 3: Feel for 5–10 seconds to determine if a pulse is present. Then count taps for 15 seconds if you need to measure the pulse.

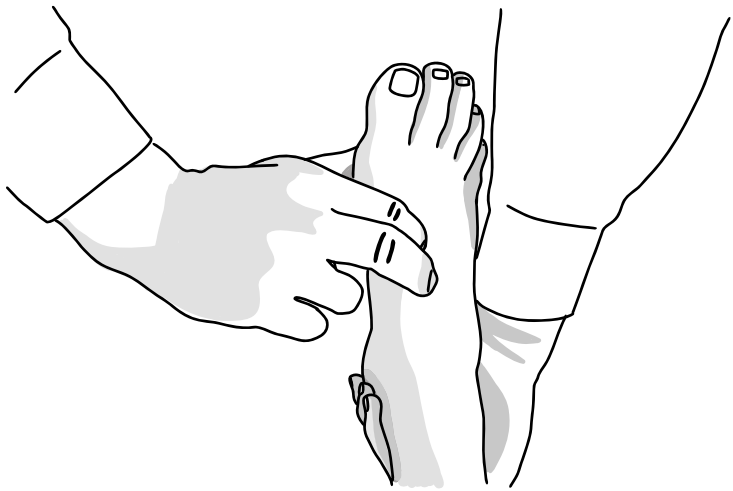


Figure A2a.4. Foot pulse

APPENDIX 2B

Vital Signs — Respiratory Rate and Oxygen Saturation

Two vital signs related to breathing are **respiratory rate** and **oxygen saturation**. Both are important signs of a casualty's condition.

RESPIRATORY (BREATHING) RATE

You do not need any special equipment to determine a casualty's rate of breathing.

The easiest way to observe and measure breathing is with the casualty lying face-up.

- ▹ Watch the casualty's chest rise and fall.
- ▹ Count their breaths for 15 seconds.
  - One "breath" is one chest rise (inhale) and one chest fall (exhale).
- ▹ Multiply by 4 to get "breaths per minute."

A normal breathing rate is 12–20 breaths per minute. If a casualty's breathing is slower than 12 breaths per minute, they may need help breathing (see *Chapter 7: Airway and Breathing*).

OXYGEN SATURATION (PULSE OXIMETER)

Oxygen saturation (also known as "blood oxygenation") is the amount of oxygen carried in the blood. Over 95% is normal. Oxygen saturation less than 90% indicates respiratory distress (see *Chapter 7: Airway and Breathing*).

You need a **portable pulse oximeter** to determine a casualty's oxygen saturation. It can also measure heart rate (pulse).

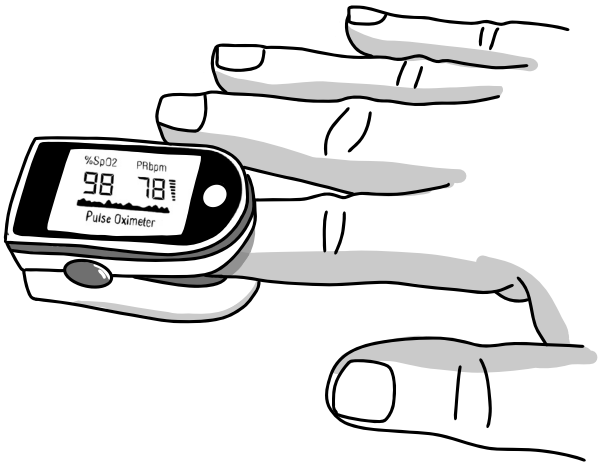


Figure A2b.1. Pulse oximeter

This device uses ultraviolet light to measure color changes beneath a fingernail that represent blood flowing through the tissue. Use it as follows:

- Make sure the device is clean. A dirty probe can produce incorrect readings.
- Make sure the casualty's hand is warm.
- Rest the casualty's hand on a flat surface or on their chest.

- ▷ Place the device on the casualty's index or middle finger.
  - Make sure the finger is clean and its fingernail has no nail polish or artificial nail.
  - The finger should touch the inside end of the device.
- ▷ Have the casualty remain still until you can get the readings.
- ▷ Observe the measurements on the oximeter's screen for 30–60 seconds, until the digital readings settle and give a consistent reading. (Some devices have bars that light up or a flashing light to tell you when the readings are done.)
  - One number will be for oxygen saturation (SpO2) and the other will be pulse in beats per minute (bpm).
  - Write down the readings for oxygen saturation and heart rate.

Only rely on measurements when the device shows a strong pulse signal (such as bars or a flashing light).

APPENDIX 2C

Vital Signs — Blood Pressure

Blood pressure is the result of blood circulating through a person's veins, and it is an indication of how well the circulatory system (heart, arteries, and veins) is working.

Normal blood pressure is 90–120/60–80 mmHg (systolic/diastolic).

To determine a casualty's blood pressure, you will need an automatic blood-pressure monitor.

If you would like to know more about blood pressure and the cardiovascular system, you can read *Appendix 9a: Understanding Bleeding and the Cardiovascular System*.

WITH A BLOOD PRESSURE CUFF

Step 1: Expose the casualty's upper arm, so the skin between the elbow and armpit is bare.

Step 2: Place a blood pressure cuff around the casualty's upper arm, about one inch above the elbow.

Figure A2c.1. Portable blood-pressure monitor

Step 3: Tighten the cuff so it is snug, but so you can still fit two fingers under the top edge.

Step 4: Turn on the monitor and press "start." The cuff will automatically inflate to the appropriate pressure.

Step 5: The cuff will then slowly deflate as it measures the pressure. Keep the casualty as motionless as possible during this time.

Step 6: Obtain both of the two readings displayed on the monitor, sometimes separated by a slash, or sometimes with one number above the other.

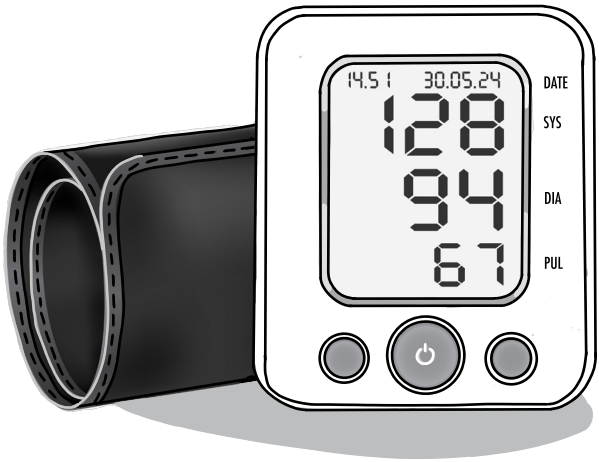


Figure A2c.2. Readings on a blood-pressure monitor screen

- For example, 128/94 mmHg.
- The first (or top) number is the systolic pressure, and the second (or bottom) is the diastolic pressure.

Step 7: Write down the readings with the other information you have for the casualty.

NOTE

If you have any question about the accuracy of the readings, repeat the process.

WITHOUT A BLOOD PRESSURE CUFF

If you do not have a blood pressure cuff, you can estimate a casualty's blood pressure using their wrist pulse.

A strong pulse at the wrist means the casualty likely has an acceptable blood pressure (at least 90 systolic).

If you cannot feel a pulse at the casualty's wrist, check their neck, where you should be able to feel a pulse even at very low blood pressure.

The presence of a neck pulse indicates that their blood pressure is just enough to deliver blood to their brain and organs, and they are likely in shock.

See *Appendix 2a* for how to take pulses.

APPENDIX 2D

Vital Signs — Body Temperature

Body temperature of 37°C (98.6°F) is the average ("normal") for adults.

Body temperature below 95°F (35°C) is too low. "Hypothermia" is a condition in which a person's internal (core) temperature is too low and has trouble getting back up to the normal range (36°C [96.8°F] or above).

If a casualty's temperature falls too low—below 32°C (89.6°F)—and you cannot raise their body temperature, death is almost inevitable. See *Chapter 10: Hypothermia* for more information.

Body temperature above 37.8°C (100.4°F) indicates fever, usually an indication of infection or illness. If a casualty's body temperature increases or remains high, it can lead to organ damage and even death.

"Heat injury" happens when body temperature is more than 40°C (104°F). See *Chapter 15: Hyperthermia* for high temperature due to heat exposure, which is not the same as a fever due to injury or illness.

To measure a casualty's temperature, use an oral or rectal thermometer if you have it (Figure 2d.1). Rectal temperature is preferred. Oral temperature can be lower than a casualty's actual core temperature. Body temperature can also be measured in other locations (such as forehead, armpit, or ear) if you have the right type of thermometer, but these are even less accurate.

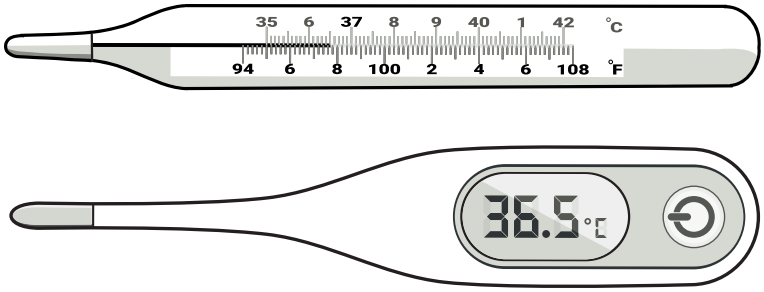


Figure A2d.1: Oral and rectal thermometers include mercury and digital types. They can show degrees in Celsius, Fahrenheit, or both.

1. ***Best:*** **Rectal thermometer.** Remove clothing from the casualty's lower body. Place petroleum jelly or a water-soluble lubricant on the bulb of a clean rectal thermometer. Spread the casualty's buttocks, and insert the probe about 1–2.5 centimeters (1/2–1 inch) into the anus. Remove the probe after 3 minutes (or until the thermometer beeps), and read the temperature.

2. ***Better:*** **Oral thermometer.** Place a clean oral thermometer under the casualty's tongue (use a disposable probe cover if you have one), and close their mouth. Keeping their mouth closed, wait 3 minutes (or until the thermometer beeps), remove the thermometer, and read the temperature.

3. ***Good:*** If you do not have a thermometer, you can look for the following symptoms of either higher-than-normal or lower-than-normal body temperature:

   - **Signs of above-normal temperature** include hot skin (feel their forehead or chest with the back of your hand), sweating, chills, nausea, vomiting, rapid breathing or heart rate, dizziness, fatigue, altered consciousness, and seizures.
   - **Signs of below-normal temperature** are shivering, numbness of fingers and toes, and altered consciousness.

If you have any doubt, assume a casualty is cold. Cover them with blankets and/or add extra layers of clothing. Try to keep them dry, out of the wind, and not in direct contact with the ground.

Chapter 5: Nursing has details of how to manage body temperature in general, including fever due to illness or injury.

Chapter 10: Hypothermia provides guidelines to manage low body temperature due to trauma.

Chapter 15: Hyperthermia covers how to manage above-normal body temperature due to heat exposure.

APPENDIX 2E

Vital Signs — Mental Status

A casualty's mental status—or how well their brain is functioning—can be a good indicator of how sick or injured they are.

A simple method to assess mental status is the **AVPU scale**. AVPU stands for **"Alert, Voice, Pain, Unresponsive."**

A – Alert: Is the casualty awake? If so, are they responsive? If their eyes are open (assuming their eyes are not damaged), and they can talk with you, ask:

- ▷ What is your name?
- ▷ Where are you?
- ▷ What is the date? (It is okay if they are off a day or two.)
- ▷ Do you know what happened to you?

V – Voice: Can the casualty follow simple requests? Without touching them, ask them to:

- ▷ Move your hand (or arm, or leg, or shoulder, or some other body part, depending on their injuries).
- ▷ Blink twice.
- ▷ Stick out your tongue.

P – Pain: Does the casualty respond to pain, or even touch?

- ▷ Pinch them gently somewhere, and watch to see if they react. Their response does not have to be verbal.

U – Unresponsive: Is the casualty unresponsive or unconscious (not awake)?

- ▷ If they did not respond to A, V, or P, then they are considered unresponsive (U).

Anything other than "Alert" is considered abnormal and means that your casualty needs your help. If they are confused, unconscious, or unable to follow basic commands, this is a sign of serious injury.

APPENDIX 2F

Vital Signs Record

Keeping track of changes in a casualty's vital signs allows you to see how and when their condition is changing.

For example, if a casualty has a high heart rate because they are in pain, trends in their vital signs can show you how their heart rate improves after pain control. Or if their heart rate is increasing over time, it may indicate the need for more pain medications.

Trends in vital signs indicate that you need to reassess a casualty to identify worsening or new problems that you need to manage. You can use the form on the next page to help you know where to focus your assessment based on trends.

If you cannot make copies, use the following page in the book as a guideline and a reminder, and make your notes wherever you can.

Vital Signs Record

Name:					Age:	Gender:	Weight:
Date & time	Heart rate	Respiratory rate	Blood pressure	Body temperature	Urine output	Mental status	Pain level
Notes:							

APPENDIX 3

Tourniquets

A **tourniquet** is a device placed around an arm or leg to stop the flow of blood for a period of time. Use it to control bleeding until the bleeding can be stopped in some other way, such as with a dressing. Commercially made tourniquets are best, as they are less likely to cause unintended injury, but tourniquets can be improvised.

Use a tourniquet **only** for massive bleeding (see *Chapter 6*), and leave it on for as little time as possible.

Where the tourniquet is placed is also important. A tourniquet placed close to a shoulder or hip cuts off blood flow to most of an arm or leg. Eventually, however, a tourniquet should be placed so the blood flow is cut off to the smallest amount of a limb possible.

There are two basic types of tourniquets:

- **"Emergency" tourniquet** (also known as "hasty")
  - Used first to stop bleeding from an arm or leg.
  - Gives you time to explore and find exactly where the bleeding is coming from.
  - It can even be placed over clothing.
  - Locate it as close as possible to an armpit or groin ("high and tight").
- **"Spot" tourniquet** (also known as "deliberate")
  - Used after you have located the source of bleeding.
  - Place it closer to the bleeding wound.
  - Minimizes the amount of a limb to which blood flow is cut off.
  - Think of it as "location-specific."

DO NOT leave a tourniquet on for more than 2 hours, except as noted below. Leaving a tourniquet on for more than 2 hours can have serious consequences, from permanent nerve damage to loss of a limb. However, it is better to lose a limb than to lose a life.

DO NOT release a tourniquet that has been in place for more than 6 hours.

DO NOT place a tourniquet around a casualty's neck!

NOTE

Applying a tourniquet is likely to be very painful for a casualty, but you must proceed if they have massive bleeding from an arm or leg.

SUPPLIES

Best/Better

- Commercial tourniquet

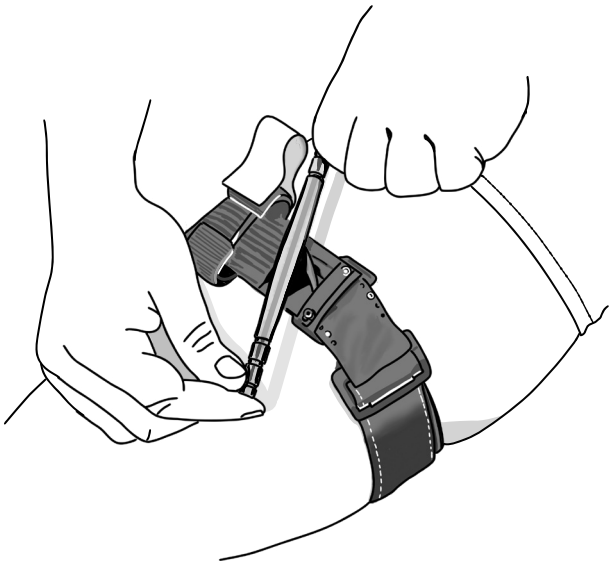


Figure A3.1. Example of a commercial tourniquet

Good

- Band: Belt or sturdy, thick cloth about 5–7.5 cm (2–3 inches) wide and thick enough to prevent injury to a limb, such as:
  - Scarf
  - Bandana
  - Torn sleeve
  - Torn pants leg

- ▹ Windlass: Rigid stick solid enough that it will not break easily under pressure, such as:
  - Part of a broom handle
  - Chopstick
  - Thick, strong ballpoint pen
- ▹ Cloth strips, kerchief, or triangular bandage to secure the windlass
- ▹ Permanent marker

See *Appendix 4: Dressings* for pressure dressing supplies.

STEPS TO TOURNIQUET USE

Step 1: Place an emergency tourniquet around the bleeding limb (arm or leg) as close to the groin (for a leg) or the armpit (for an arm) as possible.

- ▹ Place it over clothing if necessary to save time.

Figure A3.2. Emergency tourniquet placed over clothing.

- ▹ See **How to Apply a Tourniquet** below.

Step 2: Place a spot tourniquet after you have identified the location of the bleeding wound.

- Again, see below for **How to Apply a Tourniquet.**
- Remove clothing from part or all of the arm or leg before applying a spot tourniquet.
- Place the spot tourniquet 5–8 cm (2–3 inches) above the wound, but not on a joint.

Figure A3.3. Spot tourniquet placed above a wound

- If the wound is below but very close to a joint (such as an elbow or knee), place the tourniquet immediately above the joint.
- If one spot tourniquet does not control the bleeding, apply a second tourniquet directly next to the first one, and leave the first one in place.

Step 3: Release the pressure from the emergency tourniquet slowly, but leave it in place in case you need it later.

- See **How to Release and Convert a Tourniquet** below.

Step 4: Note the time when you first applied any tourniquet. Write it somewhere so the information stays with the casualty.

Step 5: Within 2 hours of first applying a tourniquet, apply a pressure dressing to the related wound so you can release the tourniquet, if possible.

▹ See **How to Release and Convert a Tourniquet** below.

Step 6: If you can control bleeding with a pressure dressing, release the tourniquet.

▹ Leave the loose tourniquet in place, in case you need it later.

NOTE

DO NOT release a tourniquet that has been in place for more than 6 hours.

HOW TO APPLY A TOURNIQUET

Best/Better

▹ Apply a commercial, purpose-made tourniquet according to the instructions on the package.

Good

▹ Create a makeshift tourniquet using:

- A band (see Supplies above for options)
- A dowel or similar rigid object to use as a windlass
- Extra fabric strips to secure the windlass

Step 1: Tie (or buckle) the band snugly around the bleeding limb.

▹ For a leg, position it as close as possible to the groin.

▹ For an arm, position it as close as possible to the armpit.

▹ It is important that the band be snug, but not tight.

Step 2: Slide the dowel between the band and skin.

Step 3: Twist the dowel to tighten the band around the limb until the bleeding stops.

Step 4: Secure the dowel in place with a strip of fabric.

Step 5: Check for a pulse in the wrist or the foot (see *Appendix 2a: Pulses*).

- ▹ You should NOT be able to find a pulse beyond the tourniquet.
- ▹ If you still feel a pulse, tighten the tourniquet more until you cannot find a pulse.

HOW TO RELEASE AND CONVERT A TOURNIQUET

Within 2 hours of applying a tourniquet, convert to a pressure dressing if possible.

Step 1: Apply a pressure dressing to the wound (see *Appendix 4: Dressings*).

Step 2: Slowly release the pressure of the tourniquet.

- ▹ Release the hold on the windlass.
- ▹ Then slowly turn the windlass in the opposite direction used when tightening the tourniquet.
- ▹ You may also need to loosen the strap at its buckle or original knot.
- ▹ This process should take only a few seconds.

The return of blood flow to the limb when you loosen a tourniquet may be painful for the casualty. You must still try to convert the tourniquet.

- ▹ After you release the tourniquet, hold the pressure dressing (with your hand or a bandage) in place for at least 3 minutes to control bleeding, and watch for bleeding through the dressing.
- ▹ **DO NOT delay Step 4** if severe bleeding returns and the pressure dressing becomes saturated with blood.

Step 3: **If there is no bleeding** through the dressing, or if you see minor bleeding that does not soak through the dressing, leave the tourniquet released, but keep it around the limb loosely to reuse if needed.

- **Stop here.** You have successfully "converted" to a pressure dressing. You do not need Steps 4–6. The pressure dressing can be left in place for 1–2 days (see *Appendix 4: Dressings* for more information).

Step 4: **If bleeding starts to soak** through the dressing again, **immediately** re-tighten the tourniquet until the bleeding stops, and leave the tourniquet and dressing in place.

Step 5: **Recheck in 2 hours** (4 hours since initial application) to try again to convert the tourniquet.

- If there is no bleeding, return to Step 3.
- If there is still bleeding, re-tighten the tourniquet again and go to Step 6.

Step 6: **Recheck again in another 2 hours** (6 hours from initial application).

- If there is no bleeding, return to Step 3.
- If bleeding still has not stopped after you release the tourniquet, re-tighten and **leave the tourniquet in place until medical help is available**.

DO NOT release a tourniquet that has been in place longer than 6 hours (that is, after Step 6).

APPENDIX 4

Dressings

A **"dressing"** is something placed directly on a wound to protect it from further harm and to promote healing. It is usually held in place by a **"bandage,"** which may consist of any strip of material (gauze, fabric, or anything else similar) that can be wrapped and secured in place. The term "combination dressing" refers to the combination of pad and wrapping.

There are different types of dressings for different uses, from a simple adhesive strip (such as a Band-Aid) used for minor cuts to more complex dressings for major wounds. Only dressings for major injuries that can be applied with easily available supplies are described here.

- Conduct dressing changes regularly (see tables below for general guidelines) and keep the wound clean.
- Make sure the dressing touching the wound is either non-adherent or has lubricant to prevent the dressing from sticking to the wound and causing damage during dressing changes. Potable (drinkable) water can be used to wet the dressing. The outer layer of the dressing can be dry.
- Make the environment as sterile as possible before starting any wound care and dressing changes.

Do not:

- DO NOT use rubbing alcohol or hydrogen peroxide, which will destroy healthy tissue.
- DO NOT wrap wounds with non-porous material such as plastic wrap.
- If a wound is so large that its sides cannot be easily brought together, DO NOT force the tissue together. Focus on stopping the bleeding and covering the area.
- DO NOT close wounds (that is, try to make the edges meet and hold together) without consulting a medical professional.

If you would like to know more about bleeding and how it relates to the cardiovascular system, you can read *Appendix 9a: Understanding Bleeding and the Cardiovascular System*.

SUPPLIES

Tables A4.1A–E below list supplies needed for different types of dressings (wound coverings) and bandages (materials used to hold dressings or splints in place) and other related items. There are more sophisticated types of dressings, but these tables include only the most readily available materials.

Table A4.1A. Common types of dressings

Dressing type	Use	When to change	Comments
Gauze	▪ Absorbs wetness from wounds, such as blood or pus ▪ Provide a protective barrier ▪ Pack an open or large wound	▪ 1–2 days, or sooner if it becomes wet or dirty ▪ Note: When used for a wet-to-dry dressing, change 3 or 4 times daily	▪ Can dry out and stick to wound, making it difficult to change or remove ▪ Comes as pads and rolls of various sizes
Non-adherent	▪ Good for fragile tissue ▪ Minimizes pain and difficulty of dressing changes	▪ Several days, or sooner if it becomes wet or dirty	▪ Can hold in moisture and increase risk of infection ▪ Comes as pads

Table A4.1B. Special types of dressings

Dressing type	Use	When to change	Comments
Hemostatic dressing	▪ Impregnated with a substance to help stop bleeding ▪ Used in pressure dressings and for wound packing	▪ Up to 24 hours, when bleeding stops ▪ Replace with gauze or non-adherent dressing after bleeding stops	▪ Do not use in eyes or mouth ▪ Comes as pads, rolls, and folded lengths ▪ Can be cut to size for small wounds
Foam	▪ Cushioning effects – protects a wound in areas prone to extra pressure ▪ Absorbs fluids	▪ 3–7 days (or sooner) depending on when it starts to peel or when drainage from a wound leaks from the dressing	▪ Comes in adhesive and non-adhesive forms
Hydrogel	▪ Creates a moist environment for wound healing ▪ For dry wounds with minimal drainage	▪ 1–4 days, or sooner if it becomes saturated with fluid	▪ Requires a secondary dressing such as gauze, nonadherent, or foam
Hydrocolloid	▪ Absorbent pad that forms a gel when it combines with moisture from a wound ▪ Keeps a wound moist to promote healing	▪ 3–7 days (or sooner) depending on when it starts to peel or when drainage from wound leaks from the dressing	▪ Do not use on infected wounds (with yellow, green, thick, or foul-smelling fluid)

Table A4.1C. Combination dressings

Dressing type	Use	When to change	Comments
Adhesive/ Sticking plasters	▪ Provides wound protection	▪ When wet or dirty	▪ Also known by the brand name "Band-Aid" ▪ No longer needed once a scab has formed
Combination dressing	▪ Consists of a gauze pad and an elastic bandage to cover a wound and hold the dressing in place	▪ 1–2 days, or sooner if it becomes wet or dirty	▪ Examples: Israeli dressing, trauma dressing, abdominal dressing

Table A4.1D. Types of bandages

Bandage type	Use	When to change	Notes
Roll – Gauze	▪ Holds dressing in place and/or applies pressure to a wound ▪ Absorbs fluids ▪ Also can be used for wound packing	▪ When wet or dirty	▪ Can stick to wounds ▪ Make sure it does not create a tourniquet-like effect, cutting off blood flow
Roll – Cohesive	▪ Holds dressing in place and/or applies pressure to a wound	▪ When wet or dirty	▪ Also known as Coban, kling, or vet wrap ▪ Sticks to itself but not to skin or hair ▪ Make sure it does not create a tourniquet-like effect, cutting off blood flow
Roll – Conforming	▪ Holds dressing in place and/or applies pressure to a wound ▪ Stretches to the shape of a body part	▪ When wet or dirty, or when it loses elasticity (stretchiness)	▪ Also known as elastic or ACE ▪ Needs adhesive or something else to hold it in place ▪ Make sure it does not create a tourniquet-like effect, cutting off blood flow ▪ Reusable if not soiled
Triangular	▪ To tie splints in place ▪ As a sling (see *Addendum C13* in *Chapter 13: Wounds and Fractures*) ▪ With a windlass for a tourniquet ▪ As padding ▪ To secure dressings or cover wounds	▪ When wet or dirty	▪ Available commercially for sling use ▪ Also can be made by cutting a piece of cloth into a triangle 100 × 100 × 142 cm (40 × 40 × 56 inches), or by folding a large kerchief

Table A4.1E. Additional supplies

Item	Use	Notes
Medical tape	▪ Secure bandages ▪ Usually comes in rolls	▪ Various widths are available
Safety pins and clips	▪ Secure bandages	▪ Especially useful for reusable bandages such as elastic
Clean, dry clothes, sheets, or other fabric	▪ Alternates for dressings and bandages, when medical supplies are not available or are limited	▪ Can be cut to shape or size as needed for dressings and bandages
Clean potable (drinkable) water	▪ Irrigate wounds ▪ Wet-to-dry dressings	▪ DO NOT use water that may not be clean ▪ See *Chapter 2: Managing Resources*
Saline solution	▪ Irrigate wounds ▪ Wet-to-dry dressings	▪ See *Appendix 5: Wound-cleansing Solutions*
Dakin's solution	▪ Irrigate wounds	▪ See *Appendix 5: Wound-cleansing Solutions*
Topical antibiotic ointment	▪ Prevent infection ▪ See *Chapter 12: Medications* for more information	▪ Such as Neosporin or Bacitracin ▪ For burn wounds only, Silvadene
Honey	▪ A substitute for topical antibiotic ointment	▪ See *Chapter 13: Wounds and Fractures*
Petroleum jelly	▪ Prevent dressings from sticking	▪ Such as Vaseline
Scissors, knife	▪ Cut dressings, bandages, tape	

TYPES OF DRESSINGS

Table A4.2. Types of dressings

Simple	Covers a wound to control bleeding and protect from further damage or infection.
Packing	Used to fill the cavity of a deep wound to control bleeding and protect from further damage or infection.
Pressure	Used to control bleeding of a new wound by applying pressure to tissue and blood vessels at the origin of the bleeding.
Wet-to-dry	Maintains a moist environment to promote healing of a dry wound.

HOW TO APPLY DRESSINGS

Do not attempt to clean a wound with massive bleeding. Control the bleeding first using a tourniquet, packing, or a pressure dressing. Cleaning the wound can be done when the dressing is changed after the bleeding is controlled.

Simple Dressing

Step 1: Clean the wound.

1. ***Best:*** Irrigate using slightly pressurized potable water, saline solution, or Dakin's solution for very dirty wounds (see *Appendix 5: Wound-cleansing Solutions*) in copious amounts until you have removed all debris.
2. ***Better:*** Use a syringe to flow potable water into the wound with higher pressure to dislodge debris when you rinse the wound.
3. ***Good:*** Rinse the wound by pouring potable water (cooled before use if boiled) into the wound.

Step 2: Place a dressing directly over the wound.

- ▹ If you do not have a non-stick pad, you can use gauze or fabric, but first apply a topical antibiotic ointment or petroleum jelly to the pad to prevent the pad from sticking to the wound.
- ▹ If you use hydrogel or hydrocolloid, place a non-adherent or gauze pad on top of the hydrogel or hydrocolloid dressing.

Step 3: Wrap gauze or an elastic bandage over the pad to hold it in place.

Step 4: Secure the end of the wrapping with tape, pins, or clips.

Step 5: Replace the entire dressing at least every 24–48 hours. See *"How to Change Dressings"* below.

Packing

Step 1: Find the source of the bleeding, and apply pressure directly to that bleeding artery or vein with your finger.

Step 2: Keep constant pressure on the bleed as you gradually replace your finger with packing material to minimize the time there is no direct pressure on the bleeding wound (Figure A4.1).

Step 3: Fill (pack) the wound space with gauze (or tissue or fabric, if you have nothing else) as tightly as possible.

Figure A4.1. Wound packing

Step 4: After the wound is packed tightly, apply direct pressure with your hand for 3–5 minutes (Figure A4.2).

Step 5: Remove your hand. If bleeding has stopped, cover the wound and its packing with a Simple (see above) or Pressure (see below) dressing and bandage. If bleeding has not stopped, repack the wound, beginning again at Step 1.

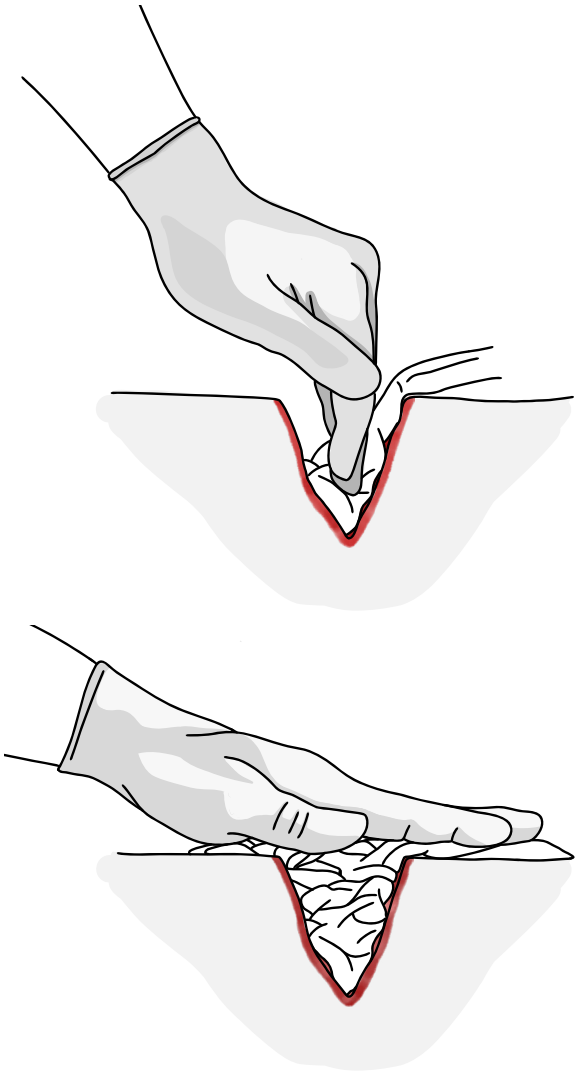


Figure A4.2. Apply pressure with your hand after packing

Pressure Dressing

Step 1: Place a bulky dressing such as multiple layers, rolls, or wads of gauze or fabric directly on the wound (and over packing, if any).

Step 2: Wrap gauze or a cohesive or conforming bandage over the bulky dressing to apply pressure and hold it in place. Keep direct pressure on the wound as you wrap the bandage tightly.

Step 3: Secure the end of the wrapping with tape, pins, or clips.

Step 4: Check to make sure the casualty still has good circulation to the hand or foot below the dressing.

Step 5: Replace the entire dressing when bleeding has completely stopped. This should be done in the first 24 hours after application. See "How to Change Dressings" below.

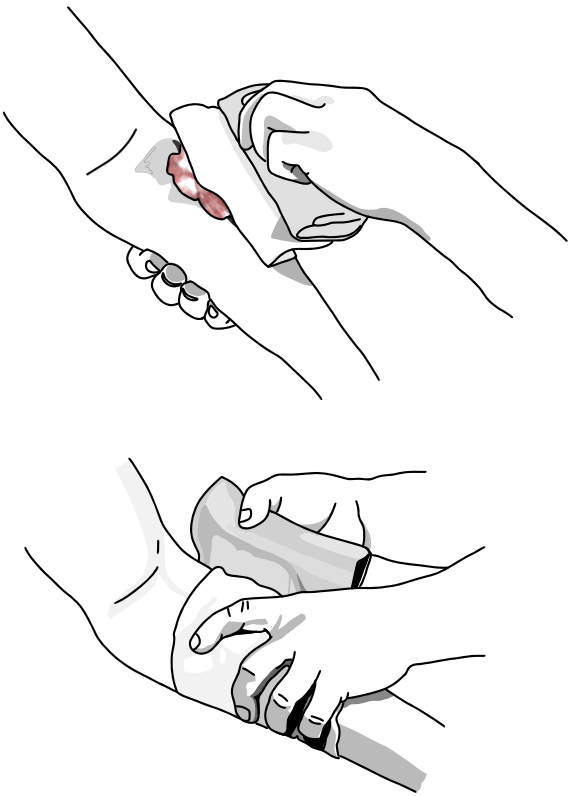


Figure A4.3. Pressure dressing

Wet-to-dry Dressing

Step 1: Moisten a clean fabric dressing pad (preferably gauze) with clean (boiled or sterile) water.

Step 2: Place the wet fabric loosely on top of the open wound.

Step 3: Place a dry, absorbent, clean pad (ideally gauze) over the wet pad to absorb extra water.

Step 4: Fasten the two pads securely over the wound by taping or wrapping, as for other types of dressings above.

- **DO NOT** use this type of dressing on a burn wound.

WOUND TYPES AND APPROPRIATE DRESSINGS

Different types of wounds need different types of dressings and bandages. The four types of wounds covered here are:

- New wounds with severe bleeding
- New and existing wounds without severe bleeding
- Wounds with fluid and/or pus drainage
- Wounds that are dry or have very little drainage

Some special types of dressings and bandages are described in detail elsewhere in the book, such as:

- Slings and splints (see *Addendum B13* and *Addendum C13* in *Chapter 13: Wounds and Fractures*)
- See "Special Wound Types" in *Chapter 13: Wounds and Fractures* for dressings to be used on wounds of the head, face, eye, neck, chest, and abdomen.

Table A4.3A. Appropriate dressings for a *new* wound with *severe bleeding*

	Packing Material	Dressing	Bandage
Simple *Use for new, bleeding wounds only when a tourniquet is still being used to control bleeding.*		Hemostatic dressing, sterile gauze, clean material such as gauze or fabric	Rolled gauze, conforming bandage, or tape
Packing	Hemostatic dressing, sterile gauze, clean material such as gauze or fabric	Gauze or non-adherent	Rolled gauze or conforming bandage
Pressure		Hemostatic dressing, sterile gauze (rolled gauze works best), combination dressing, or clean material such as gauze or fabric	Cohesive wrap (check to make sure it does not create a tourniquet effect), cohesive or conforming bandage, combination dressing, rolled gauze, or any material that can cover wounds and be wrapped around the wound area tightly
Wet-to-dry	DO NOT USE		

Table A4.3B. Dressings for a *new* or *existing* wound with bleeding that is *not severe*

	Packing Material	Dressing	Bandage
Simple		Combination dressings and adhesives/sticking plasters (come in various sizes, can be matched to wound, and can be combined with hemostatic gauze), sterile gauze, clean material such as gauze or fabric strips	Rolled gauze, conforming bandage, or tape
Packing	Hemostatic gauze, sterile gauze, or clean material such as gauze or fabric strips	Gauze or non-adherent	Rolled gauze or conforming bandage
Pressure	DO NOT USE		
Wet-to-dry		Sterile gauze with sterile saline or sterile water, sterile gauze with saline solution, or clean gauze or fabric with potable water	Rolled gauze or conforming bandage

Table A4.3C. Dressings for a wound with *fluid and/or pus drainage**

	Packing Material	Dressing	Bandage
Simple		Hydrocolloid covered with foam dressing, foam dressing, high-absorbent dressing, or non-adherent dressing	Rolled gauze, conforming bandage, or tape
Packing	Sterile gauze or clean material such as gauze or fabric strips	Gauze or non-adherent	Rolled gauze or conforming bandage
Pressure	DO NOT USE		
Wet-to-dry		Sterile gauze with sterile saline or sterile water, sterile gauze with saline solution, or clean gauze or fabric with potable water	Rolled gauze or conforming bandage

**Note:* *Wounds with yellow, green, thick, or foul smelling discharge are likely infected and require more frequent dressing changes (every 24–48 hours).*

Table A4.3D. Dressings for a wound that is very dry or has very little drainage

	Packing Material	Dressing	Bandage
Simple		Hydrogel dressing covered with non-adherent dressing, foam dressing covered by nonadherent dressing, or wet-to-dry gauze	Rolled gauze, conforming bandage, or tape
Packing	DO NOT USE		
Pressure	DO NOT USE		
Wet-to-dry		Sterile gauze with sterile saline or sterile water, sterile gauze with saline solution, or clean gauze or fabric with potable water	Rolled gauze or conforming bandage

HOW TO CHANGE DRESSINGS

Change a dressing every 24–48 hours, or sooner if it becomes soiled with blood or if the wound appears infected (pus in wound or redness of surrounding skin). Every time you touch a wound or change a wound dressing, inspect it for possible infection. If you can, wash your hands before and after changing a dressing, and wear gloves if you have them.

Steps for Changing a Dressing

Step 1: Remove the dressing.

Removal of dressings can be painful. It is best to do dressing changes after a dose of pain medication (see *Chapter 12: Medications*). The following are options to ease the removal of dressings.

- Soak the wound in potable water.
- Place a wet dressing over the old dressing to soften it.
- Gently and slowly peel the dressing off.

Step 2: Clean and irrigate the wound after removing the old dressing.

- Remove dead tissue and pus from the wound.
- Irrigate the wound.

1. ***Best:*** Irrigate using slightly pressurized potable water, saline solution, or Dakin's solution for a very dirty wound (see *Appendix 5: Wound-cleansing Solutions*) in generous amounts until you have removed all debris.

2. ***Better:*** Use a syringe to flow potable water into the wound with higher pressure to dislodge debris when you rinse the wound.

3. ***Good:*** Rinse the wound by pouring potable water (cooled before use if boiled) into the wound.

Step 3: Inspect the wound.

- ▹ Inspect the wound for signs of infection (redness of surrounding skin, warmth of surrounding skin, or thick, colored drainage from the wound).
- ▹ If the wound appears infected, give the casualty an oral antibiotic. Refer to *Chapter 12: Medications* for appropriate antibiotics.

Step 4: Replace the dressing.

Best: Apply a new dressing with sterile supplies.

Better: Apply a new dressing with clean supplies.

Good: Replace the old dressing if it is not soiled.

- ▹ If you have a topical antibiotic, apply it to the new or reused dressing. Refer to *Chapter 12: Medications* for options.

Step 5: Check the dressing.

- ▹ After replacing a dressing, make sure it is not too tightly wrapped, which can restrict blood flow.
  - Check for a pulse in the wrist or foot beyond the dressing (see *Appendix 2a*), and adjust the dressing if needed to restore blood flow.

Step 6: Document when you changed a dressing and the appearance of the wound when you did. See *Chapter 5: Nursing* for a checklist you can use.

APPENDIX 5

Wound-cleansing Solutions

You can make solutions to irrigate (rinse) wounds that are more effective than water alone to prevent infection. The first steps before making either solution are:

- ▹ Wash your hands.
- ▹ Sterilize containers and utensils by boiling them.
- ▹ Boil tap or potable (drinking) water for at least 20 minutes.

DAKIN'S SOLUTION

Dakin's solution is the most effective choice to irrigate (rinse) wounds. You can make a concentrated Dakin's solution from a few common ingredients, and then dilute it when you are ready to use it.

How to make concentrated *Dakin's solution*

- ▹ Combine and shake the following ingredients thoroughly.
  - 1 liter (¼ gallon) water, sterile or boiled (see above)
  - 5 mL (1 tsp) household bleach (5.25% hypochlorite solution, unscented)
  - 2.5 mL (½ tsp) baking soda (sodium bicarbonate)
- ▹ Let the solution cool to room temperature.
- ▹ Pour the solution into a clean, airtight container and label it with the date and time.
- ▹ You can store the solution for up to 48 hours.

How to use Dakin's solution

When you need Dakin's solution to rinse (irrigate) a wound, **dilute** one part *concentrated* Dakin's solution with 10 parts sterile or boiled water.

For example, mix 500 mL (16 oz) of concentrated Dakin's solution with 5 liters (1.3 gallons) of sterile/boiled water to make 5.5 liters (1.5 gallons) of solution to irrigate a wound.

SALINE SOLUTION

Saline solution can be used to irrigate (rinse) wounds when you don't have Dakin's solution. You can make it from a few common ingredients. You can also make a concentrated solution for future use (to save storage space) and then dilute it when you need it.

How to make a normal saline solution

- ▹ Add 10 mL (2 tsp) of table salt, preferably non-iodized, to 1 L (4 cups) of sterile or boiled water (see above).
- ▹ Stir until the salt is completely dissolved.
- ▹ Let the solution cool to room temperature.
- ▹ Pour the solution into a clean, airtight container and label it with the date and time.
- ▹ You can store it at room temperature for up to a week.

How to make and use concentrated *saline solution*

- ▹ Combine 20 mL (4 tsp) of baking soda with 60 mL (12 tsp) of salt to make a dry ingredient mixture.
- ▹ Store in an airtight container. If kept dry, it will keep indefinitely.
- ▹ When you need saline solution to rinse (irrigate) a wound, add 20 mL (4 tsp) of the dry mixture to 1 L (32 oz) of lukewarm (sterile or boiled) water.

APPENDIX 6

Oral Rehydration Solutions (ORS)

Casualties can lose fluids in various ways, especially with severe bleeding or large burns, and especially during the first 24–48 hours after injury. Various types of fluids are available to rehydrate a casualty, depending on their condition and the ways in which they can take in fluids. However, unless a trained medical provider is available, **oral fluids—that is, given by mouth—are most practical in a PCC situation.**

NOTE

If a casualty is semiconscious or unconscious, or if they are vomiting, DO NOT give them any fluids orally because they could choke easily. However, you can wet their lips.

Give a casualty enough oral fluids to maintain good hydration and replace their fluid losses, without giving them too much fluid. See *Chapter 14: Burns* for rehydration specific to burn casualties.

NOTE

If a casualty is able to eat a regular diet, then water is good enough for hydration. If they can only take in fluids, then they need an ORS to replace electrolytes.

The amount you need to get or make will vary, but 4–5 liters (about 1¼ gallons) a day is a good amount to have on hand.

The types of oral rehydration solutions (ORS) include:

1. ***Best:*** Commercial oral rehydration solution
   - ▹ Mix per package instructions into clean drinking water.
2. ***Better:*** Do-it-yourself oral rehydration solution made with the following recipe:
   - ▹ 30 mL (6 tsp) sugar (a carbohydrate)
   - ▹ 2.5 mL (½ tsp) salt
     - Or 1.25 mL (¼ tsp) salt + 1.25 mL (¼ tsp) baking soda
   - ▹ 1 liter (4¼ cups) clean drinking or boiled water (cool after boiling)
   - ▹ Mix until everything is completely dissolved.
3. ***Good:*** Commercial sports or electrolyte drink (as long as it contains salt, potassium, and 6–8% carbohydrates)

Water does not have the right proportion of electrolytes and can make a casualty even more sick. If it is all you have, then give water, but make an ORS if you can.

HOW TO ADJUST FLUID INTAKE BASED ON URINE OUTPUT

The best way to determine how much fluid to give a casualty is to measure their urine output (see *Appendix 7*). Then give them oral fluids according to the following guidelines.

- ▹ If UO is less than 30 mL (1 fl oz) per hour, increase the fluid intake rate by 25% every 1–2 hours.
  - For example, if UO = 20 mL/h (0.7 fl oz/h) and intake rate = 300 mL/h (10 fl oz/h), increase fluid intake rate by 0.25 × 300 = 75 mL/h (2.5 fl oz/h) for a new rate of 375 mL/h (12.7 fl oz/h).
- ▹ If UO is more than 1 mL/kg/h (0.015 fl oz/lb/h), decrease fluid intake rate by 25%.
- ▹ If you cannot measure UO, adjust the fluid rate to produce light yellow urine or maintain a **heart rate** less than 140.

APPENDIX 7

Urine Output (UO)

To accurately determine how much fluid you need to give a casualty after initial rehydration, you need to measure how much fluid they are losing regularly through urination. How you accomplish this depends on the casualty's condition and the supplies you have on hand.

The average adult should make at least 30–50 mL (1–1.7 fl oz) of urine per hour, or about 720–1,200 mL (24–40 fl oz) per day.

Intake and output of fluid are typically recorded in milliliters (mL) or fluid ounces (fl oz). It doesn't matter which you use, as long as you use the same one every time. For reference, a standard beverage can (such as soda or beer) is about 355 mL or 12 fl oz (1 fl oz = 30 mL).

The following methods are listed in order of *Best* through *Better* to *Good*, according to how accurate they are.

Direct-collection system with pre-made catheter or external urinary diversion device

- ▹ Condom catheters or external urinary diversion devices can be helpful for casualties with altered mental status, who are unconscious, or who have limited ability to move.
  - See *Appendix 8: Catheters* for examples.
- ▹ Commercial catheters can be connected to a collection device with volume markings.
- ▹ Monitor the collection device and empty it before it is full. Document the amount in the collection device before you empty it, and note the time you emptied it (see *Appendix 2f: Vital Signs Record* for documentation).

Direct-collection system with improvised catheter

- ▹ Combine material to form a sheath with any tubing you have available, and seal the connection to prevent leaks. See *Appendix 8: Catheters* for one method you can use for men.
  - There is no way to improvise an external catheter for women, so you will have to use one of the other methods below to measure urine output for a woman.
- ▹ Direct the tubing from the improvised catheter or improvised urinary diversion device into a container with volume markings.
- ▹ Monitor the collection device and empty it before it is full. Document the amount in the collection device before you empty it, and note the time you emptied it (see *Appendix 2f: Vital Signs Record*).

Collection with container

- ▹ If a casualty is able to move enough, they can urinate directly into a container, preferably with volume markings on it. (If not, you will have to transfer the urine to another container with markings.)
  - Any leakproof container with a large enough opening in the top is suitable. Women need a larger opening than men do.

Collection using saturated pads

- ▹ If a casualty is not able to urinate into a container (or you do not have a catheter), place an absorbent pad or cloth, like a towel, under them.
- ▹ Check periodically, and when the pad is saturated, remove it and note the length of time since you last replaced the pad.
- ▹ Wring out the pad over a container to collect the fluid so you can measure the urine.

These measurements are not exact, and urine will inevitably be lost to the pad and/or ground. That is okay. What is important is that the casualty continues to produce urine, and you get some idea of how much fluid they lost and need to replace.

Urine color

- Urine color can be a helpful indicator of hydration status. Generally, a pale-yellow color suggests adequate hydration, while a darker color indicates the need for more fluids. See Figure A7.1 for colors you can use for comparison.

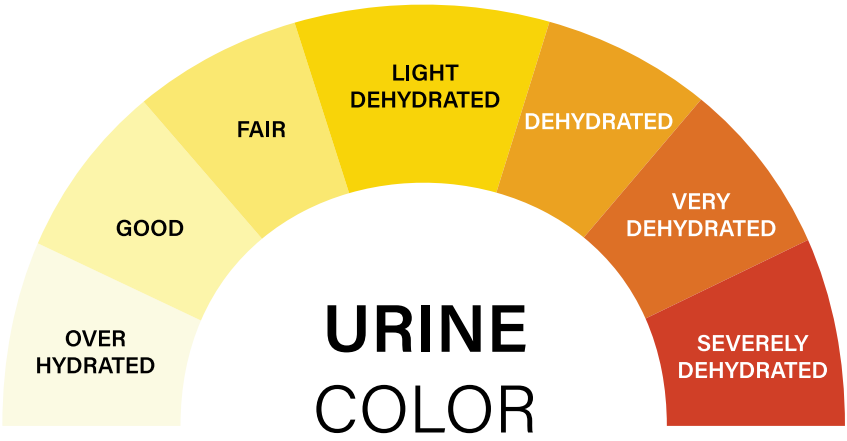


Figure A7.1. Urine color comparison diagram

ADJUST FLUID INTAKE BASED ON URINE OUTPUT

Remember to change the amount of fluids you are giving a casualty based on their urine output or heart rate. See *Appendix 6: Oral Rehydration Solutions* for suitable fluids and how to adjust their intake amount.

NOTE

If you have some medical training or experience, you can consider using rectal infusion to give fluids to a casualty who cannot take in fluids by mouth. See Appendix 10a: Advanced Practices – Rectal Infusion*.*

*If you have the necessary supplies, and if you can contact a medical provider, you also can consider using intravenous access (*Appendix 10c: Advanced Practices – Intravenous Access*) to give fluids to a casualty.*

APPENDIX 8
Catheters

Condom catheters for men (Figure A8.1) are available in pharmacies, and external urinary diversion devices for women (Figure A8.2) are available online.

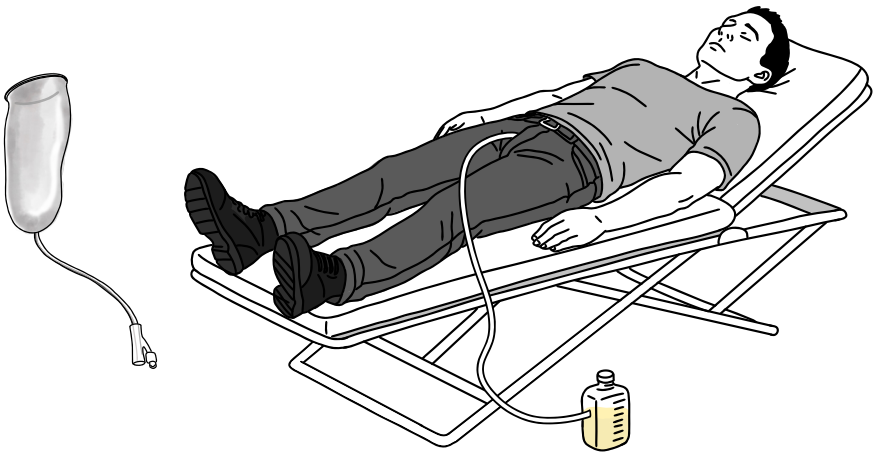


Figure A8.1. External catheter

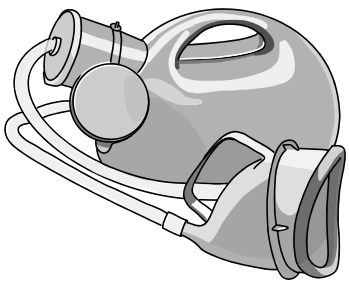


Figure A8.2. External urinary diversion device

If you do not have a pre-made catheter, you can create an external catheter for male use, as described below.

There is no way to improvise an external catheter for female use, so if you do not have a diversion device, you will have to use one of the other methods described in *Appendix 7* to measure urine output for a woman.

SUPPLIES

- Condoms
- Tubing (about 1 meter [3–4 feet])
- Bottle or bag with volume markings (milliliters or fluid ounces)
- Medical tape
- Rubber band, string, other ties

STEPS FOR MAKING AN EXTERNAL CATHETER FOR MALES

Step 1: Put one end of the tube all the way into the condom (Figure A8.3 left).

Step 2: Cut a small hole at the end of the condom and pass about ¼ inch of the tube through the hole.

- Do not put too much of the tube through, or its end may rub against the penis and cause irritation.

Step 3: Tie the end of the condom with the hole tightly around the end of the tube.

Step 4: Turn the condom inside out so the long part of the tube is outside the condom.

- Only the very tip of the tube should now be inside.

Step 5: Put the condom over the penis and secure it with tape (Figure A8.3 right).

Step 6: Insert the other end of the tube into a marked bottle or bag.

- Position the bottle or bag so it is lower than the casualty's hips.

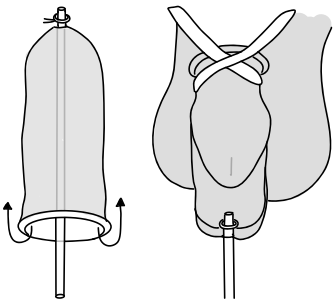


Figure A8.3: External catheter for male use

APPENDIX 9A

Understanding Bleeding and the Cardiovascular System

As mentioned in *Chapter 6: Severe Bleeding*, stopping major bleeding is the most important thing you can do to help a casualty survive. However, it also can help if you understand why this is so essential. This appendix explains in greater depth how and how and why bleeding affects an injured person.

Whole Blood

"Whole" blood refers to the blood as it normally circulates in your body. It is made of two basic components: cells and plasma (Figure A9a.1). The **cells** include red blood cells, white blood cells, and platelets. **Plasma** is the liquid that carries the cells. Plasma also contains water, sugar, salt, and proteins.

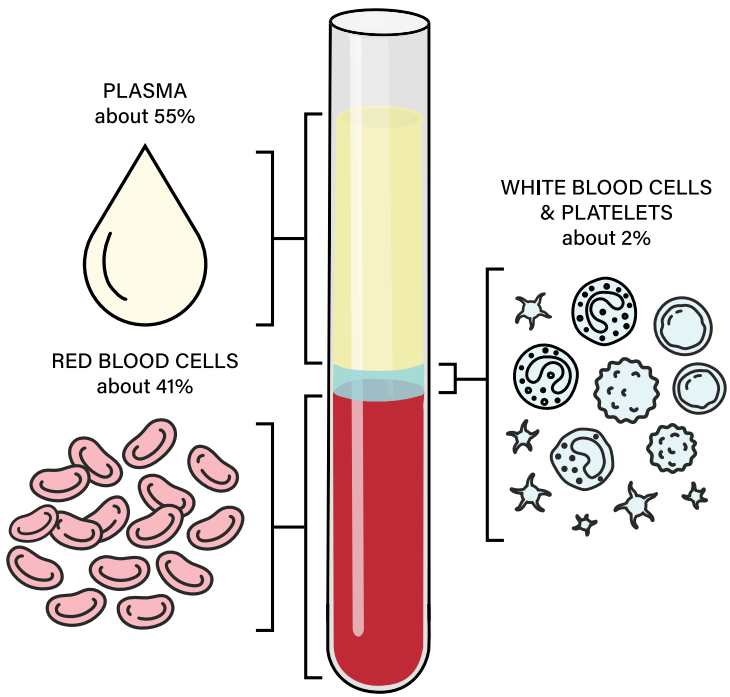


Figure A9a.1. Composition of whole blood

The Cardiovascular System

The **cardiovascular system** refers to the heart, blood, arteries, and veins (Figure A9a.2). Pressure gets the blood to where it is needed. The two primary factors that contribute to **blood pressure** are:

- how fast the heart beats, or pulse rate, and
- how much whole blood is in the cardiovascular system.

The body normally maintains enough pressure inside the system to push blood from the heart to the organs through the arteries, and back again through the veins.

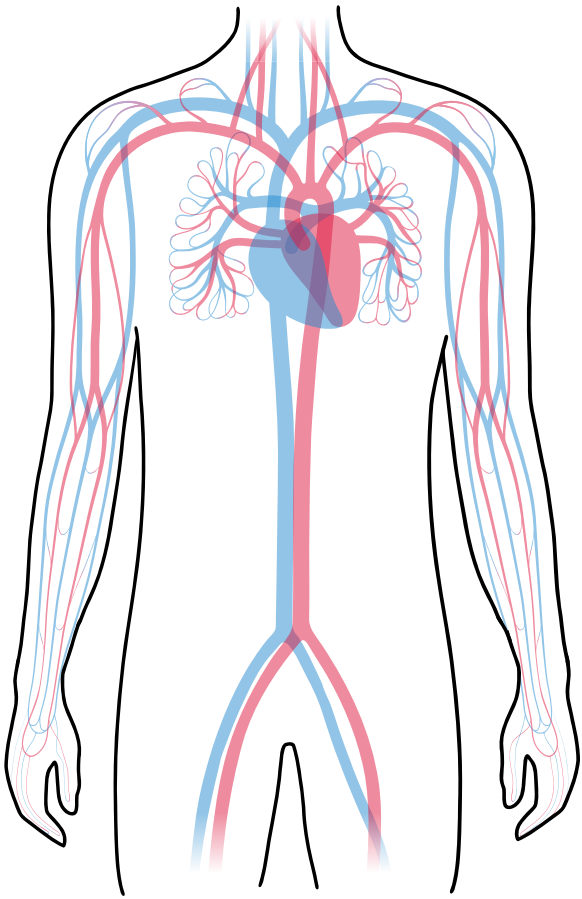


Figure A9a.2. The human cardiovascular (circulatory) system

Oxygen Delivery

When the heart squeezes ("beats"), it pushes blood through an artery to the lungs. In the lungs, oxygen attaches to red blood cells and is carried back to the heart through a vein. The heart then pumps this oxygen-rich blood through another artery (the aorta) to the rest of the body (Figure A9a.3).

Arteries throughout the body then squeeze to help push blood up to the head and down to the arms, legs, and torso (where your organs are). These arteries connect to smaller blood vessels called capillaries, where oxygen detaches from the red blood cells and goes into the muscles and organs.

After delivering oxygen, blood continues through the capillaries into veins and back to the heart to start the process over.

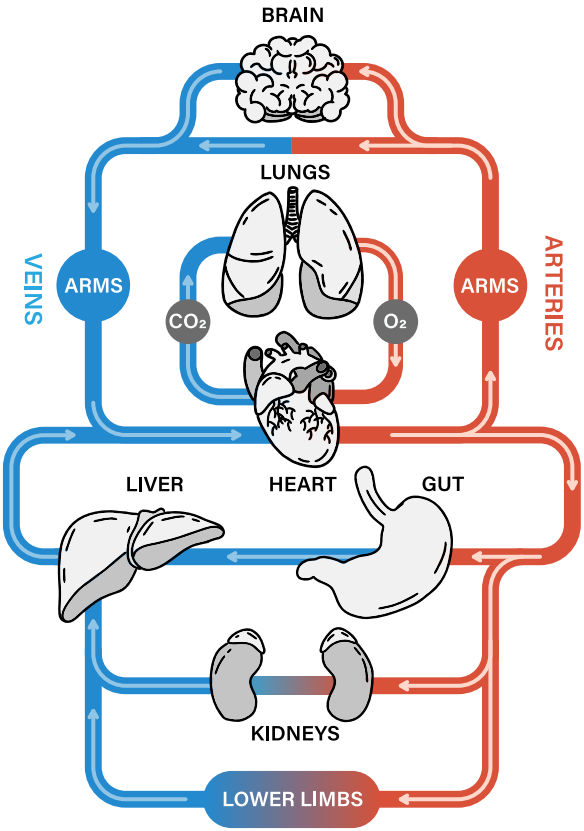


Figure A9a.3. The circulation of blood throughout the body

Clotting

Blood clotting is a normal process that controls blood loss from minor wounds. When your body senses that an artery, vein, or capillary has been opened, the platelets in the blood become glue-like and stick to the opening that is bleeding (Figure A9a.4). As they stick, they fill the hole, creating a plug—a clot—to stop the bleeding.

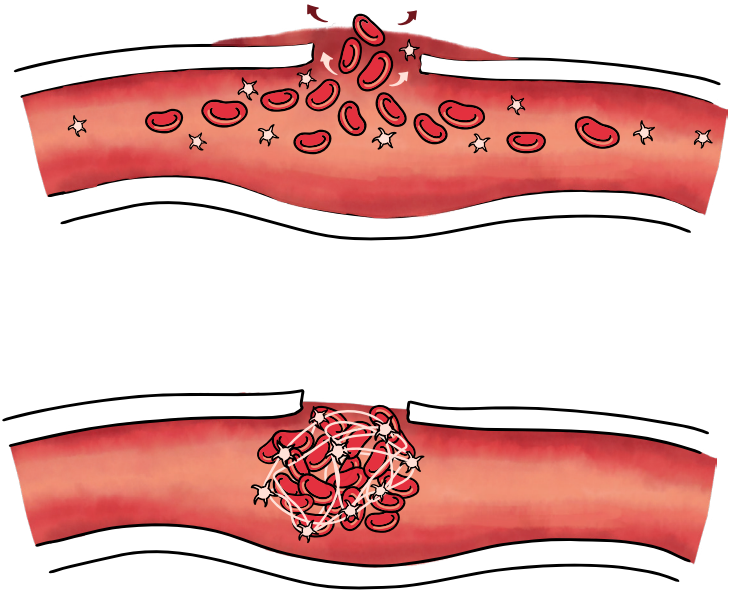


Figure A9a.4. When a blood vessel is opened (top), the blood forms a clot to stop the bleeding (bottom)

Effects of Uncontrolled Bleeding

Most bleeding is minor—from bumps, scrapes, and small cuts—and clotting stops the bleeding. Normally, the body does not need help to heal these small, everyday injuries. At most, a bit of antibiotic ointment and a small adhesive bandage is needed to promote healing and prevent infection. However, without help to stop it, severe bleeding from large wounds will likely lead to death. As mentioned elsewhere in this book, **uncontrolled bleeding is the leading cause of trauma-related death worldwide.**

Severe bleeding involves significant loss of both blood cells and plasma. As a result:

- The body loses its ability to deliver oxygen to vital organs.
- The platelets in the blood have trouble clotting to stop the bleeding.
- Heart rate and pulse speed up to try to make up for the loss of blood.
- Smaller arteries, especially in the fingers and toes, squeeze to try and help move blood to vital organs. This causes skin to look pale and feel cool and sweaty. Lips, tongue, and gums also become pale or white, instead of pink. These are signs that shock could be developing (see *Appendix 9b* and *Chapter 8*).
- The loss of red blood cells from bleeding reduces the amount of oxygen in the blood, which causes confusion and/or sleepiness. These also could be signs of shock.
- The brain recognizes that the body needs more oxygen, so it tells the lungs to breathe faster to bring in more oxygen.
- As blood leaves the body, heat also leaves, causing the body's temperature to drop (see *Chapter 10: Hypothermia*).
- The above changes make it more difficult for the remaining platelets to become sticky, further reducing blood's ability to clot.

These effects continue until the body dies, unless you or a medical provider stops the bleeding.

Types of Traumatic Injury Associated with Bleeding

"Traumatic injury" is a sudden and severe physical injury that requires immediate attention. There are two broad categories of traumatic injury—penetrating and blunt—and the approaches to manage the resulting bleeding are different.

Penetrating trauma occurs when an object physically enters the body. The object may enter and exit from the same wound (for example, a stab), enter and exit through two different wounds (for example, a bullet), or remain in the body (for example, impalement with a tree branch). If the object leaves the body, bleeding will likely occur. If the object remains where it entered, bleeding may not occur unless the object is removed from the body, so it should be left in place until it can be removed by a surgeon (see *Chapter 13: Wounds and Fractures, Special Wound Types: Embedded Objects*). Bleeding from penetrating trauma is usually easy to identify and falls into the category of **compressible bleeding**.

Blunt (sometimes referred to as *non-penetrating*) trauma occurs when an object strikes but does not enter the body—for example, hitting a steering wheel in a car crash or being struck with a baseball bat. Bleeding from blunt trauma usually happens inside the body, so it is difficult to identify. Such bleeding falls into the category of **non-compressible bleeding**. Blood from blunt trauma generally collects inside the chest and torso (Figure A9a.5), around internal organs, or in the upper arms and upper legs.

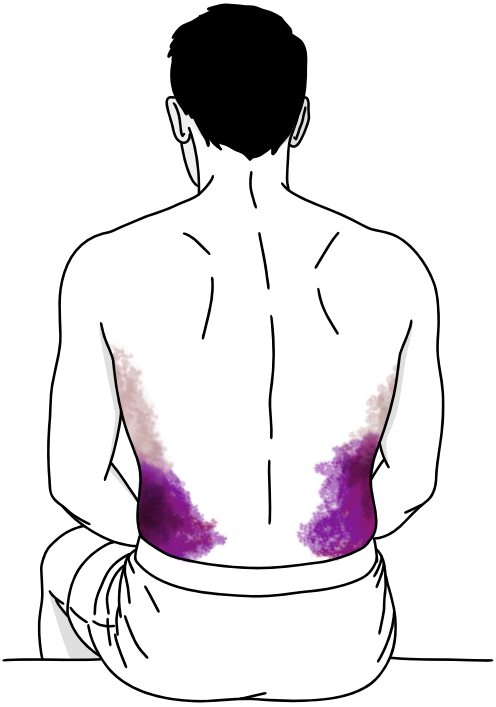


Figure A9a.5. Symptoms of internal (non-compressible) bleeding in the torso

Treatment of bleeding, whether from blunt or penetrating trauma, is the first and most important priority to prevent shock and death. Ideally, medical care can manage poor circulation due to blood loss by giving a blood transfusion intravenously (that is, with a needle inserted into a vein; see *Appendix 10c*). In addition, advanced medical imaging such as CT (computed tomography) or ultrasound is often needed to identify the locations of internal bleeding and determine the extent of injuries. Then, depending on where and how severe the bleeding is, the appropriate treatment is used, from simple procedures to major surgery. None of this is possible during PCC, so the goal for the lay provider is to support casualties until they can obtain advanced medical care, as described in this book. Massive bleeding is the focus of *Chapter 6*. The shock associated with bleeding is covered in *Chapter 8* and *Appendix 9b*.

APPENDIX 9B

Understanding Shock

"Shock" refers to a life-threatening condition that occurs when the body isn't getting enough blood flow. This lack of blood flow means that cells and organs aren't receiving enough oxygen and nutrients to function properly.

Here is a summary of what that means:

- Shock involves a failure of the circulatory system (see *Appendix 9a*). This system delivers oxygenated blood throughout the body.
- Not enough blood flow results in the body's tissues and organs not receiving the oxygen and nutrients they need to survive.
- This lack of oxygen and nutrients can trigger a cascade of problems, leading to organ damage and, if left untreated, death.

This book mainly addresses hypovolemic shock, hemorrhagic shock (a specific type of hypovolemic shock), and septic shock—the types of shock most common in a PCC situation. In addition, anaphylactic shock is briefly mentioned in *Chapter 12: Medications*. There are other causes of shock, but this appendix focuses on hypovolemic and hemorrhagic shock, septic shock, and anaphylactic shock.

Hypovolemic and Hemorrhagic Shock

Hypovolemic shock (including hemorrhagic shock) is a state of extremely low blood volume. When the amount of blood in the body decreases, the heart struggles to pump enough of it to supply vital organs like the brain, kidneys, and heart itself. These organs need a constant flow of oxygen and nutrients to function correctly. Without it, they start to fail. Low blood pressure is a sign of low blood volume.

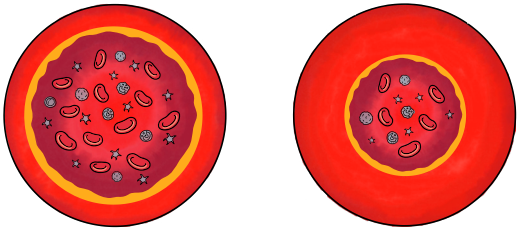


Figure A9b.1. Normal (left) and hypovolemic (right) blood vessels

When the body senses a drop in blood volume, it begins a series of mechanisms to compensate and try to maintain blood flow to vital organs. These include:

- **Increased heart rate.** The heart beats faster to try and circulate the remaining blood more quickly.
- **Constriction of blood vessels.** The blood vessels narrow to try and maintain blood pressure (Figure A9b.1). This helps to prioritize blood flow to the core organs, especially the brain and the heart, but also the liver, kidney, and gut.
- **Increased respiratory rate.** To address poor oxygen delivery to tissues, breathing rate increases. This rapid breathing helps to take in more oxygen and remove carbon dioxide.
- **Release of hormones.** The body releases hormones, including adrenaline, which further increases heart rate and constricts blood vessels.
- **Shunting blood.** Blood is diverted from less critical areas, like the skin and extremities, to the vital organs. This is why someone in shock may appear pale and cold.

However, this compensation is only temporary. If the blood volume isn't restored quickly, the body will enter a condition that leads to organ failure and, eventually, death.

Hypovolemic shock has a few different causes.

- **Hemorrhagic shock** is caused by significant bleeding, internal and/or external. The body's response is to try and stop the bleeding to maintain blood flow to vital organs. But without replacing the lost blood, the system will fail. When the body loses blood, it loses all the cells and other important ingredients in the blood that help the body function (see *Appendix 9a: Bleeding and the Circulatory System*). Giving a casualty other replacement fluids, as described in *Chapter 8*, is often not enough to restore body function. **Therefore, the priority in hemorrhagic shock is to replace the blood.**
- **Dehydration shock** occurs when the body loses too much fluid. In addition to blood loss, severe vomiting, diarrhea, sweating, and/or burns can lead to dehydration. When you lose too much fluid, the remaining blood becomes more concentrated, which decreases its overall volume. If the lost fluids are not replaced, the result is shock.

Septic Shock

Septic shock is caused by severe infection. In PCC, this is often due to a wound infection or complications from being injured, such as pneumonia or urinary tract infection (Figure A9b.2). The infection triggers an extreme immune response, leading to widespread inflammation and dilation of blood vessels. This dilation causes a relative drop in blood volume, meaning that the same amount of blood is present, but the vessels are so large that the blood pressure drops as if there was a loss of volume. Septic shock can also cause fluid to leak out of the blood vessels. Low blood pressure results and indicates shock.

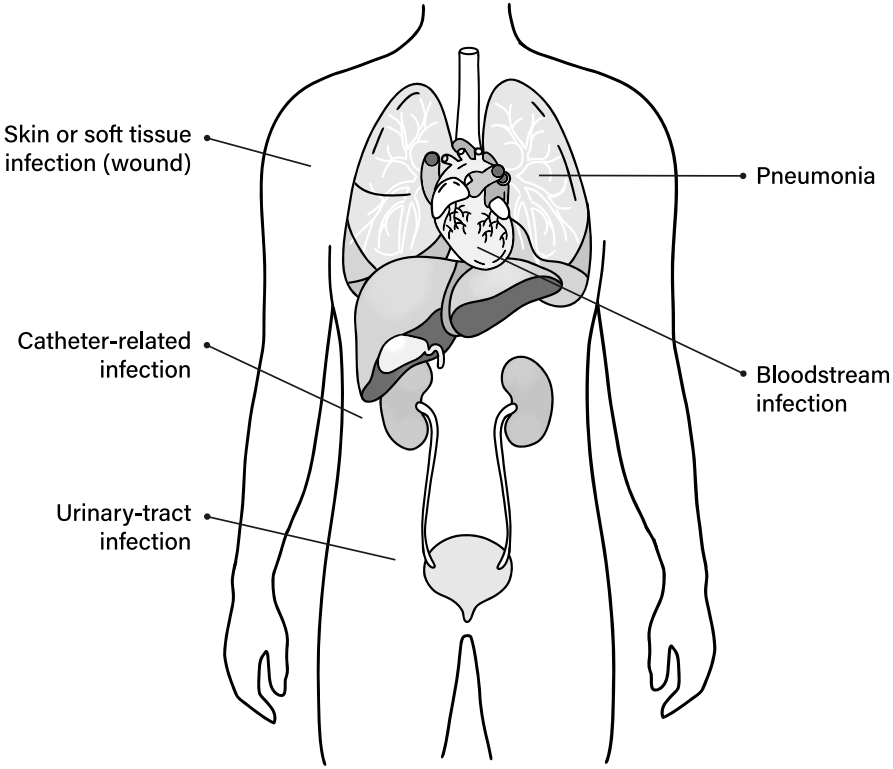


Figure A9b.2. Infections associated with septic shock

Much like hypovolemic shock, septic shock causes the body to begin the same compensatory mechanisms to try and maintain blood flow to vital organs:

- **Increased heart rate.** The heart beats faster to try and circulate the blood more quickly.
- **Constriction of blood vessels.** In early stages of septic shock, the blood vessels narrow to try and maintain blood pressure. This helps maintain blood flow to the core organs. However, in later stages, blood vessel dilation takes over.
- **Increased respiratory rate.** To address the possible decrease of oxygen delivery to tissues, the respiratory rate increases. This rapid breathing helps to take in more oxygen and expel carbon dioxide.
- **Release of hormones.** The body releases hormones, which further increases heart rate.
- **Shunting blood.** Blood is diverted from less critical areas, like the skin and extremities, to the vital organs. This is why someone in shock may appear pale and cold. However, in early septic shock, the skin may be warm due to the initial dilation of the blood vessels.

Like hypovolemic shock, these compensations are only temporary. Because the septic shock is caused by infection, it is necessary to treat the infection AND restore blood volume.

How to Manage Hypovolemic, Hemorrhagic, and Septic Shock

Chapter 8: Shock, Circulation, and Resuscitation addresses how to manage shock in a PCC situation. However, restoring blood volume requires transfusion of blood, which is likely not possible without professional medical personnel and supplies of blood or plasma. But oral, intravenous, or rectal fluids may help until blood transfusion is possible. See *Appendix 6* for oral rehydration solutions, *Appendix 10a* for how to perform rectal infusions, *Appendix 10c* for how to obtain IV access, and *Appendix 7* for how to adjust fluids based on urine output. *Chapter 12: Medications* includes information about some medications that may help manage septic shock, as well as many of its causes (infections).

Anaphylactic Shock

Anaphylactic shock is a severe, life-threatening allergic reaction that occurs rapidly. It is distinct from hypovolemic and septic shock because its primary trigger is an immune response, rather than fluid loss or infection. Anaphylactic shock is caused by exposure to an allergen (such as food, insect venom, or medication). It occurs rapidly, within minutes of exposure.

The exposure triggers the release of IgE antibodies, which cause a massive release of histamine and other chemicals in the body that cause inflammation (mediators). This leads to dilation of blood vessels and a rapid drop in blood pressure, along with fluid leaking from the vessels, further worsening the drop in blood volume. It also results in narrowing of airways, causing trouble with breathing, often with wheezing or other noises associated with narrowing of the airways.

Casualties with anaphylactic shock may also have swelling of the face, lips, tongue, or throat; hives, itching, or flushing; and nausea, vomiting, or abdominal cramps. Without treatment, it can lead to death. The treatment for anaphylaxis is epinephrine (see *Chapter 12: Medications*), which counteracts the effects of the inflammatory mediators.

APPENDIX 10A

Advanced Practices – Rectal Infusion

Rehydration by rectal infusion can be a valuable method in certain situations, particularly when you cannot use other routes (such as oral) to give fluids to a casualty. It is less common than oral or intravenous (IV) rehydration, but in a PCC situation it is more practical than IV. If you have some medical training or experience, it is relatively easy and has fewer risks than IV use. (For information about IV rehydration, see *Appendix 10c*.)

However, there are several **risks** to rectal infusion. You must weigh these risks against the severity of the casualty's condition:

- Intestinal perforation is a serious risk, especially if you insert the tube improperly or forcefully. Perforation can lead to severe infection and complications.
- Even with care, you can introduce bacteria into the rectum, leading to infection. This risk is even greater if you use non-sterile equipment or fluids.
- The wrong rehydration solution can disrupt the body's electrolyte balance, leading to potentially dangerous complications. This is why it is best to use an oral rehydration solution (ORS – see *Appendix 6*).
- The rectal lining is delicate, and improper technique or use of the wrong solutions can cause irritation, inflammation, or damage.
- The procedure can be uncomfortable and distressing for the casualty.

Rectal infusion should ideally be performed under the guidance of a medical professional. This appendix is a guide for use in extreme circumstances, and every effort should be made to consult with a medical professional. Unless you have some medical training or experience, **rectal infusion should not be attempted if you cannot contact a medical professional for guidance.**

Remember teleconsultation! When you cannot get your casualty to a higher level of medical care right away, reach out for advice if you can. See Chapter 3: Communication and Documentation *for telemedicine guidelines.*

SUPPLIES

- Backpack-type hydration system (Figure A10a.1)
- Water-based lubricant
- 1–2 liters clean water
- Bandage-type (medical) tape
- Oral rehydration solution (see the *Best* and *Better* options in *Appendix 6: ORS*)
- Sheets and/or blankets
- Water-based lubricant
- Gloves

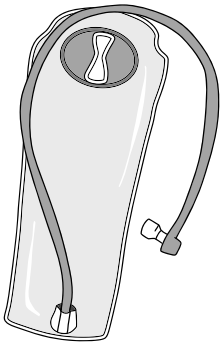


Figure A10a.1. Hydration system (reservoir and tube, with mouthpiece to be removed before insertion)

STEPS FOR RECTAL INFUSION

Step 1: Prepare for Infusion

- If the casualty is awake and can understand you, explain the procedure (including the reason for it) to them and make sure they agree to it.
- Screen the area around the casualty to maintain privacy, but have a witness present, if possible, given the sensitivity of the procedure.
- Prepare potable (drinkable) or clean (boiled or sterile) water as described in *Chapter 2: Planning and Managing Resources*.
- Prepare oral rehydration solution (ORS) as described in the *Best* and *Better* options in *Appendix 6: Oral Rehydration Solutions*. You will need enough to fill the reservoir of the hydration system—about 1–2 liters.

NOTE

Water by itself does not have the right proportion of electrolytes and can make a casualty even more sick. If it is all you have, then give water, but make an ORS if you can.

- Warm (or cool, if the water was boiled) the ORS to body temperature (as near as possible to 37°C [98.6°F]) and keep it warm.

- ▹ Mark the tube of a hydration system (Figure A10a.1) 7.5–10 cm (3–4 inches) from the end with tape so you can see the maximum depth to which you should insert the tube. This is an important safety step to prevent inserting the tube too far. It will also show you later if the tube has moved.
- ▹ Fill the reservoir of the hydration system with ORS.
- ▹ Turn the reservoir upside-down, open the mouthpiece of the drinking tube, and squeeze any air out from the reservoir and tube. Close the tube's mouthpiece after the air has been purged.
- ▹ Insulate the reservoir with clothing or some other material to keep the solution warm (close to body temperature).

Step 2: Position the Casualty

- ▹ Ask or help the casualty to remove their clothing below the waist, exposing their buttocks.
- ▹ Place the casualty in the Recovery Position (see *Appendix 1a* and Figure A10a.2), preferably on their left side. The lower colon (large intestine) bends to the casualty's left, so this position encourages fluid to drain into the colon.

Step 3: Insert and Secure the Infusion System

- ▹ Wash your hands with soap and water, or use alcohol gel (hand sanitizer), and dry your hands thoroughly.
- ▹ Wear protective gloves, if you have them.
- ▹ Bend the tube about 8–12 inches from the end to prevent flow, **remove the entire mouthpiece** from the drinking tube, and cover the open end of the tube with your gloved finger to prevent fluid from leaking out.
- ▹ If you have water-based lubricant or petroleum jelly, use it to lubricate the tube sparingly. If not, you can lubricate the tube with antiseptic ointment if you have that.
  - DO NOT use sun cream, moisturizer, or anything with fragrance.
  - DO NOT use too much lubricant, which increases the chance that the tube will either come out or go in too far.
- ▹ **Carefully and gently** insert the tube 7.5–10 cm (3–4 inches) into the rectum.

NOTE

The main risk is that you could perforate the intestinal wall when you insert the tube. Do not force the tube if you encounter resistance.

- Place a loop of tape around the hose close to the rectum, and anchor each end of the tape to each buttock (Figure A10a.2). This (a) brings the buttocks together to reduce fluid loss and (b) helps prevent the tube from moving.

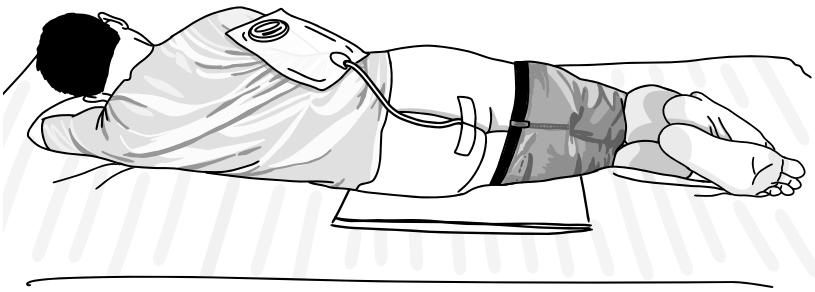


Figure A10a.2. Rectal infusion system anchored in place

Step 4: Begin Infusion

- Lay the reservoir on top of the casualty's body.
- With the infusion system in place, wrap and insulate the reservoir along with the casualty to keep the solution in the reservoir warm as long as possible.
- Release the bend in the tube to permit the fluid to flow.
- The system uses only gravity to get the fluid into the casualty, allowing their rectum to absorb only what they need. DO NOT force fluid into the rectum.

Step 5: Monitor the Casualty

- ▷ Reassess the casualty every 15 minutes and note their vital signs (see *Appendix 2f*). Record what you have given them (see *Addendum A5* of *Chapter 5*).
- ▷ When the reservoir is close to empty, refill it with warmed ORS to continue the infusion.
  - This can be done with the tube in place as long as the tube is secure. Take care not to pull on the tube while refilling the reservoir.
- ▷ You can discontinue the infusion when the casualty improves, if they can start taking fluids by mouth, or if IV access is obtained (see *Appendix 10c*).
  - Infusion can also be discontinued to give the casualty a rest, but the tube might need to be reinserted if they continue to require rehydration and still cannot take in fluids orally.
  - You can stop the flow by just clamping the tube and leaving it in place, or you can remove it, especially if you need to reposition the casualty.
- ▷ Discontinue the rectal infusion by first clamping the tube to stop the flow of ORS, and then withdraw the tube gently.

A rectal infusion may stimulate a bowel movement. Remove the tube while the casualty is defecating, and then clean and replace it.

Refer to *Chapter 5: Nursing During PCC* for guidance on fluid intake, and refer to *Appendix 6* for how to adjust fluids based on urine output. See *Appendix 7* for how to measure urine output. Guidelines specific to casualties with burn injuries (but also useful for other conditions) are provided in Steps 6 and 7 of *Chapter 14: Burns*.

APPENDIX 10B

Advanced Practices – Intramuscular Injections

Intramuscular (IM) injections deliver medication deep into muscle tissue, allowing for rapid absorption into the bloodstream. This route is preferred for medications that are not absorbed well orally or that require release over time.

Ideally, IM injection should be performed only under the guidance of a medical professional. This appendix is a guide for use in extreme circumstances, and every effort should be made to consult with a medical professional. **Unless you have some medical training or experience, you should not attempt IM injection if you cannot contact a medical professional for guidance.**

Remember teleconsultation! See Chapter 3: Communication and Documentation *for telemedicine guidelines.*

KEY POINTS

- **Absorption.** Drugs given by IM injection are absorbed faster than drugs given orally.
- **Site selection.** It is important to choose the correct muscle site for safety and effectiveness.
- **Needle length and gauge.** The appropriate needle (length and gauge) is vital to ensure medication reaches the muscle and to minimize a casualty's discomfort.
- **Aseptic technique.** It is essential to maintain strict aseptic (sterile) technique to prevent infection.
  - This means wash your hands and wear gloves if you have them, clean the injection site (and then do not touch the area where you will insert the needle after cleaning), and use a sterile, unused needle and syringe.

SUPPLIES

- ▹ Prescribed medication
- ▹ Syringe and needle of the appropriate size (gauge and length, as determined by medication, patient size, and injection site)
- ▹ Alcohol swabs
- ▹ Antiseptic solution (or rubbing alcohol)
- ▹ Gloves (non-sterile)
- ▹ Gauze pads
- ▹ Sharps container
- ▹ Bandage (optional)

COMMON IM MEDICATIONS

Medications given by IM injection require a prescription, so you must be able to contact a medical provider not only for a prescription but also to determine when to use one, the appropriate dosing (amount and times to be given), and the appropriate needle size. Common medications given IM include:

- ▹ Antibiotics: ertapenem and cefazolin
- ▹ Pain management: ketorolac, opioids, and ketamine
- ▹ Other: tranexamic acid (to control bleeding)

STEPS FOR IM INJECTION

Step 1: Prepare

- ▹ Determine the type and dose of medication needed, as mentioned above, by contacting a medical provider if you can.
  - Make sure you have the needed medication available, and have it nearby.

- ▹ Determine the gauge and length of needle needed, and prepare a syringe.
  - Always use a sterile, unused needle and syringe.
  - Have more than one on hand as backup.
- ▹ Explain the procedure to the casualty and reassure them that any pain associated with the needle stick will be brief.
- ▹ Wash your hands thoroughly and put on gloves, if you have them, to help prevent infection.
- ▹ Draw the correct dose of medication into the syringe, and make sure you remove all air bubbles.
  - Remove air bubbles by turning the syringe so the needle points upwards and pressing on the plunger to dispel air.

NOTE

Perform the triple check! Verify three times that you have the right casualty, right medication, right dose, and right reason:

1. *When you retrieve the medication*
2. *When you draw up the medication into the syringe*
3. *Before you administer the medication*

Step 2: Select and Prepare the Injection Site

- ▹ Select the appropriate injection site.
  - For small volumes (2 mL or less), use the deltoid muscle.
  - For volumes greater than 2 mL, use the ventrogluteal muscle.
- ▹ **Deltoid muscle (upper arm).** The casualty can be sitting or lying down. Locate the "acromion process" (the bony bump at the top of the shoulder), and find the injection site 2–3 finger widths below it (Figure A10b.1).

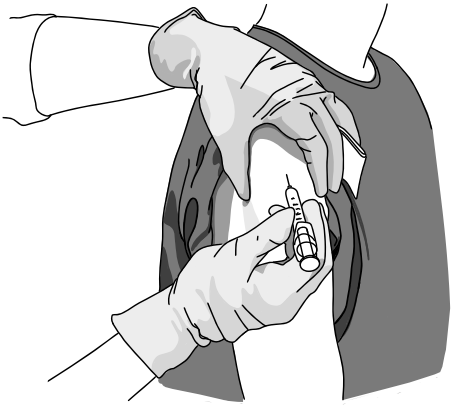


Figure A10b.1. IM injection in the upper arm

- **Ventrogluteal muscle (hip).** The casualty can be lying on their back or their side. Place your hand on their hip. For injection in their right hip, use your left hand, and vice versa, so your thumb points towards the person's crotch. Put the tip of your first finger on the "iliac crest" (the part of the hip that sticks out furthest). Then spread your middle finger to create a V. The injection goes at the bottom of the V where your fingers meet (Figure A10b.2).

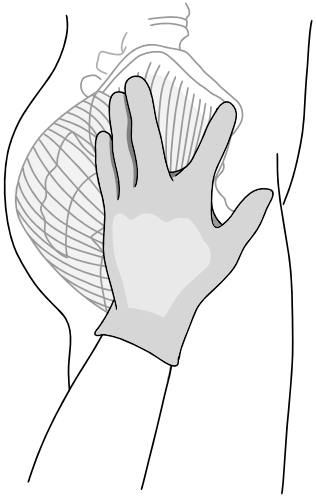


Figure A10b.2. IM injection in the hip

Step 3: Clean the Site

- ▹ Clean the injection site to help prevent infection. Gently rub the skin around the intended injection site with an alcohol swab using a circular motion, moving outward from the center.
  - If you do not have an alcohol swab, you can use a gauze pad soaked with antiseptic solution or rubbing alcohol.

Step 4: Injection

- ▹ Insert the needle 2.5–4 cm (1–1.5 inches) deep at a 90-degree angle, quickly and smoothly (Figure A10b.3).

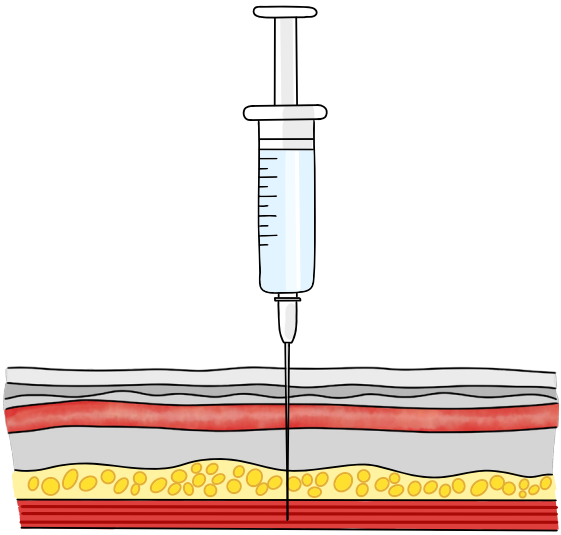


Figure A10b.3. Angle of needle insertion for IM injection

- ▹ Perform "aspiration": Pull back slightly on the plunger.
  - If blood appears, withdraw the needle, discard the needle and syringe, and prepare a new syringe and needle with medication.
  - If no blood appears, proceed with the injection.
  - Aspiration can help prevent unintentional injection into a vein.
- ▹ Inject the medication slowly and steadily by pressing on the plunger of the syringe.

- ▹ Withdraw the needle quickly when the plunger will no longer move or when you can see there is no medication left in the syringe.
- ▹ Apply gentle pressure to the injection site with a sterile gauze pad to stop any minor bleeding.
  - Hold the pad in place until bleeding stops. Then remove the pad and apply an adhesive bandage (Band-Aid, sticking plaster) if needed.

Step 5: Post-injection

- ▹ Engage the needle safety device, if present (Figure A10b.4).

Figure A10b.4. Syringe with needle safety device

- ▹ Dispose of the used needle and syringe in a sharps container (Figure A10b.5) or in a can or bottle that can be closed to prevent injury from needles when handling refuse.

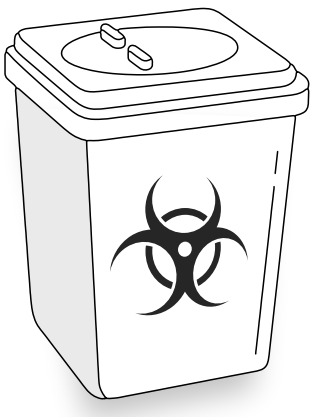


Figure A10b.5. Example of a sharps container

- ▷ Record the injection site, medication, dosage, and time (see *Addendum A5: 12-hour Nursing Checklist* at the end of *Chapter 5*).
- ▷ Monitor the casualty for any adverse reactions.
  - Report any reactions to the medical provider who originally prescribed or provided guidance on the medication, if you can.

PRECAUTIONS

- ▷ Rotate injection sites from one side of the body to the other to prevent tissue damage.
- ▷ **Avoid injecting into any area with signs of infection, edema (collection of fluid under the skin), or bruising.**
- ▷ **When giving any medication, be aware of a casualty's allergies.**
- ▷ **If the casualty complains of severe pain or numbness anywhere, stop giving the injection and record their reaction.**
  - Use a different injection site the next time you give them an injection.

APPENDIX 10C

Advanced Practices – Intravenous Access

Intravenous (IV) access is a method to administer fluids, medications, and blood products directly into a casualty's bloodstream. It provides rapid delivery of substances (without repeated injections) and can be extremely valuable in medical situations such as dehydration, massive blood loss, and shock.

Obtaining IV access should be done by someone with medical training or experience, and all IV fluids and medications should be given under the guidance of a medical professional. This appendix serves as a refresher for providers in a PCC situation who have been trained in obtaining IV access and administering IV fluids and medications. **If you do not have some medical training or experience, do not attempt IV access! If you cannot get professional medical help to determine a drug dose, do not attempt IV use!**

Remember teleconsultation! See Chapter 3: Communication and Documentation *for telemedicine guidelines.*

Giving fluids and medications intravenously has significant risks, so strict precautions must be followed. **Possible complications** include:

- Fluids or medications can leak into surrounding tissues, causing pain, swelling, and tissue damage.
- Inflammation of the vein (phlebitis) can occur, leading to redness, pain, and tenderness at the insertion site.
- Infection is a serious concern that requires meticulous aseptic (sterile) technique.
- Giving too much IV fluids can cause fluid to spill into the lungs.
- Adverse drug reactions, including allergies, are possible with IV medications, requiring careful monitoring.

KEY POINTS

- Fluids and medications given by IV take effect more rapidly than when given orally, and they can be given by this method when a casualty is unconscious or otherwise unable to swallow.
- **Aseptic technique**—a sterile environment—is crucial to prevent infections. This includes thorough handwashing, use of sterile equipment, and cleaning of the insertion site with an antiseptic solution.
- **Vein selection**—choosing an appropriate vein—is essential. The best veins to use are in the forearm, but they also must be palpable and visible (that is, you must be able to both feel and see the vein).
- **Cannulation** is the process of inserting a plastic tube (a catheter, or "cannula") into a person's vein to establish IV access.
- **Patency** is the process of making sure the IV line and catheter are functioning properly to allow for the free flow of fluids and medications.

Tips for Success

- **Practice.** Proficiency in IV cannulation (placing an IV catheter) requires practice.
- **Vein visualization.** Use techniques such as applying warm compresses or gently tapping or feeling ("palpating") the vein to make it easier to see and find a suitable site for placing an IV catheter.
- **Stabilization.** Before you insert the needle, stabilize the vein by applying gentle traction with your fingers to the skin below the insertion site to keep it from moving during insertion.
- **Angle of insertion.** Inserting the needle and catheter at a shallow angle (10–30 degrees) is crucial to avoid penetrating the opposite vein wall.
- **Slow advancement.** Advance the catheter slowly and smoothly to minimize the casualty's discomfort.

Complications such as infection and infiltration (that is, IV is not in the vein, so infused fluids go into the surrounding tissue) can occur. It is crucial to monitor the insertion site and take appropriate measures to prevent and manage these complications.

SUPPLIES

- IV catheter (needle with plastic catheter)
- Elastic tourniquet (an elastic band, not the type used for massive hemorrhage – Figure A10c.1)
- Antiseptic solution (such as betadine, chlorhexidine, or rubbing alcohol)
- Sterile gauze
- IV fluids and administration set (Figure A10c.2)
- Medical tape
- Medical gloves
- Syringes (5 cc and 10 cc)
- Injection needles
- Alcohol swabs
- Normal saline flush (either sterile prepackaged 10 cc flush or 10 cc of normal saline drawn from IV fluid bag)

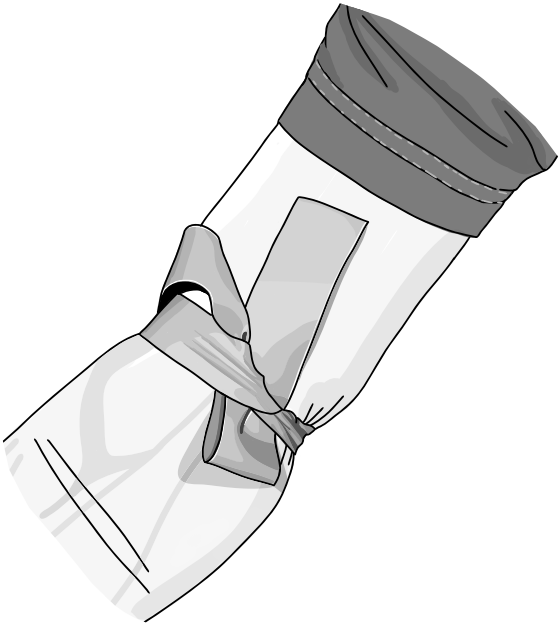


Figure A10c.1. Elastic tourniquet

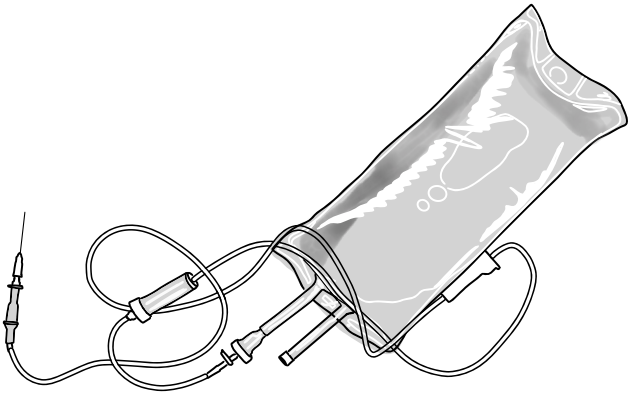


Figure A10c.2. IV fluids and medications administration set

COMMON IV MEDICATIONS AND FLUIDS

Medications and fluids given by IV access require a prescription, so you must be able to contact a medical provider not only for a prescription but also to determine when to use it, as well as the appropriate dosing (amount and times to be given). Common medications given by IV include:

- Antibiotics: many have both IV and oral forms, but IV tends to be more effective. Examples include ertapenem, azithromycin, and clindamycin.
- Pain management: opioids, ketamine, ketorolac, acetaminophen
- Other: tranexamic acid (to control bleeding)
- IV fluids: Common examples are listed in Table A10c.1.

Table A10c.1. Common fluids administered by IV

Type of Fluid	Description	Examples
Crystalloids	These are common aqueous solutions of mineral salts or other water-soluble molecules.	▪ Normal saline ▪ Lactated ringer's ▪ Dextrose solutions
Colloids	These solutions contain large molecules that cannot easily pass through capillary membranes, thus reducing the risk of leakage.	▪ Albumin ▪ Hydroxyethyl starch ▪ Dextran
Blood products	These are components of blood used to replace blood loss.	▪ Fresh whole blood ▪ Packed red blood cells ▪ Fresh frozen plasma ▪ Platelets

STEPS TO OBTAIN IV ACCESS

Step 1: Prepare

- ▹ Gather all necessary equipment (see Supplies above).
- ▹ Wash your hands thoroughly and put on gloves.
- ▹ Explain the procedure to the casualty.

Step 2: Select a Vein and Clean the Site

- ▹ Apply an elastic tourniquet on the upper arm (Figure A10c.1). This will increase the size of the vein below the tourniquet and make it easier to find.
- ▹ Palpate (tap) and visually examine the veins in the casualty's forearm to select an appropriate site to insert the IV catheter.
- ▹ Clean the skin at and around the insertion site by gently rubbing with a gauze pad soaked with an antiseptic solution. Use a circular motion, moving outward from the center.
- ▹ Allow the antiseptic solution to dry completely.

Step 3: Catheter Insertion

- ▹ Hold the catheter at a shallow angle (10–30 degrees; Figure A10c.3a) with the beveled side of the needle tip up (Figure A10c.3a inset).
- ▹ Insert the catheter into the vein (Figure A10c.3a), advancing it slightly until you see a flashback of blood in the catheter hub.
- ▹ Advance the catheter off the needle and into the vein (Figure A10c.3b).
- ▹ Release the tourniquet.

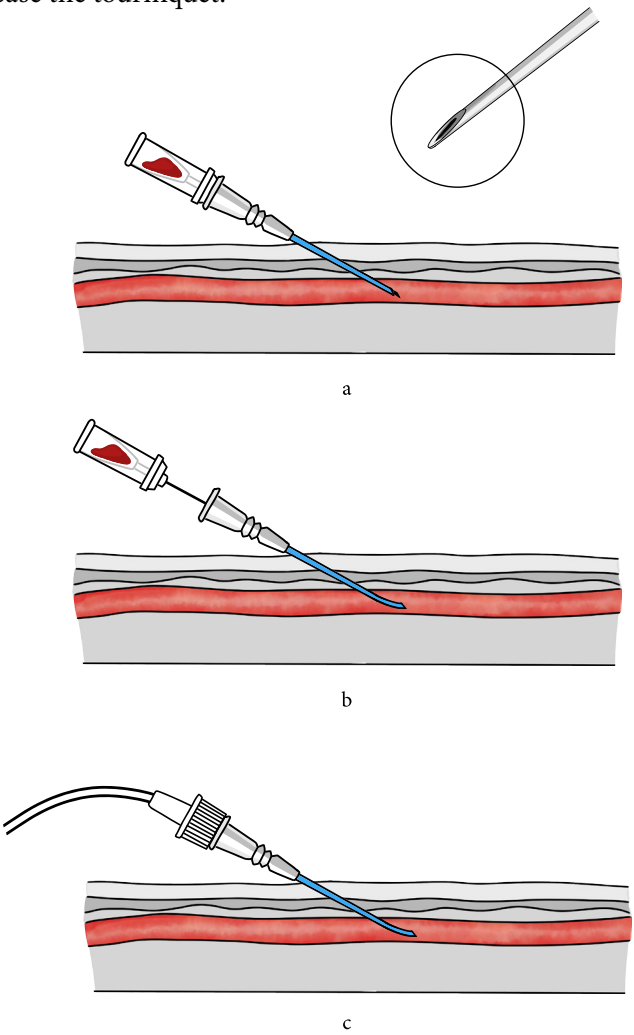


Figure A10c.3. IV catheter insertion steps

Step 4: Saline Lock

- ▷ Attach the saline lock to the catheter hub to connect the tubing (Figure A10c.3c).
- ▷ Flush the saline lock with normal saline to ensure patency.
- ▷ Secure the saline lock and catheter with tape or a dressing (Figure A10c.4).

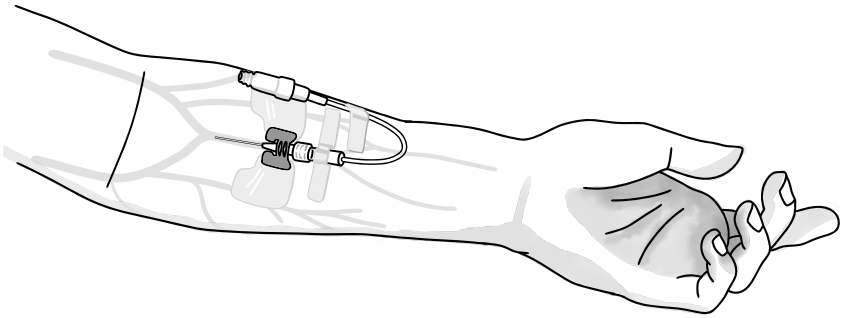


Figure A10c.4. IV catheter taped in place

Step 5: Post-insertion

- ▷ Dispose of the used needle and syringe in a sharps container (see Figure A10b.5 in *Appendix 10b*) or in a can or bottle that can be closed to prevent injury from needles when handling waste.
- ▷ Record the procedure, including the date, time, insertion site, catheter size, and type of fluid administered (see *Addendum A5: 12-hour Nursing Checklist* at the end of *Chapter 5*).
- ▷ After the IV catheter is placed, continuously monitor the IV site and the casualty for any adverse reactions.
  - Report any reactions to the medical provider who originally prescribed or provided guidance on the IV access and medication, if you can.
  - Every 72–96 hours, remove the catheter and place a new IV access in a different arm and vein.

STEPS TO GIVE IV FLUIDS

Step 1: Prepare the IV Tubing and Bag

- ▹ Select an IV fluid bag (Figure A10c.5) based on guidance from a medical professional.
- ▹ Remove the IV tubing from its packaging just before you need it, to maintain sterility.
- ▹ Ensure the roller clamp on the IV tubing is closed.
- ▹ Remove the protective covers from the spike on the IV tubing and the port on the IV fluid bag.
- ▹ Insert the spike into the port of the IV fluid bag by twisting it.
- ▹ Hang up the bag so the tubing is below the bag.
- ▹ Prime the tubing:
  - Squeeze the drip chamber to fill it approximately halfway with fluid from the bag.
  - Open the roller clamp and allow the fluid to flow through the tubing, making sure you remove all air bubbles.
  - Close the roller clamp.

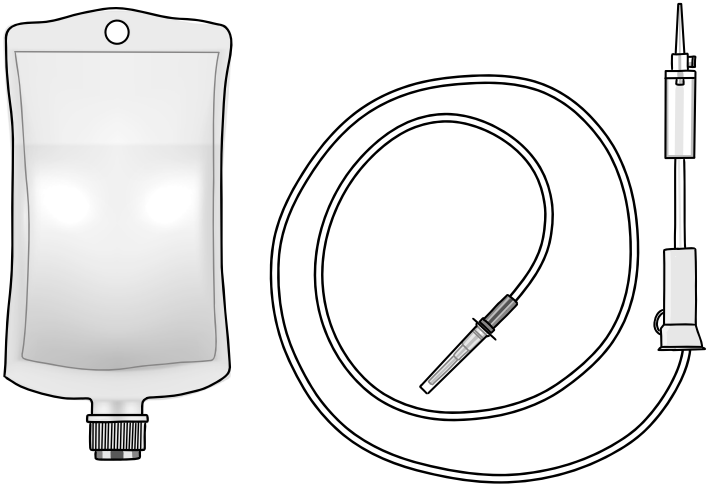


Figure A10c.5. IV fluid bag and tubing with roller clamp

Step 2: Connect to the Existing IV Access

- ▷ Check the existing IV access site for signs of infiltration, phlebitis, or other complications. Do not use the established site if you see any of these. If you do, prepare a new IV access in the casualty's other arm or hip.
- ▷ Using an alcohol swab or chlorhexidine swab, thoroughly clean the connection port on the existing (or new) IV line.
- ▷ Carefully connect the primed IV tubing to the cleaned connection port and twist into place, maintaining sterility as you do so.
- ▷ Make sure that the connection is tight and secure.

Step 3: Initiate the Infusion

- ▷ Adjust the roller clamp to achieve the drip rate specified by a medical professional.
- ▷ Closely monitor the IV site. Look for swelling around the IV site to ensure fluids are going into the vein instead of the surrounding tissue.

Step 4: Monitor and Document

- ▷ Regularly check the drip rate and ensure that the fluid is flowing properly.
- ▷ Watch for signs of fluid overload, such as difficulty breathing due to fluid in the lungs.
- ▷ Record the date, time, type, and amount of IV fluid administered, infusion rate, and patient's response (again, see *Addendum A5: 12-hour Nursing Checklist*).

STEPS TO GIVE IV MEDICATIONS

Step 1: Prepare the Medication

- ▷ Follow the manufacturer's instructions on the label or package insert for preparing the medication, including reconstituting or diluting it, if necessary.
- ▷ Draw up the correct dose of medication into a new sterile syringe, making sure that you remove all air bubbles.

Perform the triple check! Verify three times that you have the right casualty, right medication, right dose, and right reason:

1. *When you retrieve the medication*
2. *When you draw up the medication into the syringe*
3. *Before you administer the medication*

Step 2: Administer the Medication

- ▹ Check the existing IV site for patency.
  - Using an alcohol swab, thoroughly clean the IV access port.
  - Flush the IV line: Attach a 5 or 10 cc syringe filled with normal saline and push in the fluid to confirm patency.
- ▹ Connect the syringe containing the medication to the IV access port.
- ▹ Administer the medication at the rate prescribed by the medical professional you consulted.
- ▹ Flush the IV line with normal saline again after you administer the medication to ensure that the entire dose was delivered and to maintain patency.

Step 3: Monitor and Document

- ▹ Closely monitor the casualty for any adverse reactions to the medication. Discontinue the medication if you see signs of allergy or severe side effects.
- ▹ Record the medication name, dosage, route, time of administration, and casualty's response (again, see *Addendum A5: 12-hour Nursing Checklist* at the end of *Chapter 5*).

*Use medications **only** as directed by a medical professional. Make sure you select a proper vein, adhere to aseptic technique, monitor infusion rates, and closely observe the casualty for signs of complications. Regular assessment of the IV site and the casualty's response is crucial for early detection of adverse effects and intervention.*

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