
**APPALACHIAN**
**SEARCH AND RESCUE**
**CONFERENCE**

# Training Guide

# ASRC Training Guide
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## Approved by ASRC Board of Directors ?? ??? ????

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This document may be downloaded from
http://archive.asrc.net

# Preface

In the early 1970s, Rita Cloutier, Ray Cole, Gene Harrison and I, at the instigation of the Potomac Appalachian Trail Club's Council, organized the Appalachian Search and Rescue Conference. Ray, Gene and I put as much of the ASRC's history as we could remember in a document on the ASRC Archive called The Early History of the ASRC. Part of that bears repeating here, the two incidents that resulted in the ASRC's creation. I refer to this as the ASRC's founding myth.

The first incident: *one late fall, a boy scout troop was out for a hike along the Virginia/West Virginia border, on the west side of the Shenandoah Valley. The place is called Wolf Gap, and it's pretty wild compared to, say, Shenandoah National Park. As the crow flies, it's about twenty miles due west of Front Royal, Virginia, which is at the northern tip of Shenandoah National Park. The PATC maintains a cabin up the trail from the gap, and makes maps of the trails in the vicinity.*

*Wolf Gap is in the George Washington National Forest. I don't know if you know this, but the management and culture of National Forests and National Parks are as different as night and day. (Having been a summer-seasonal National Park Service Ranger for several years drilled this into me.) There are many differences, such as hunting being allowed in forests but not in parks. But for our purposes, the main difference is jurisdiction. National Park Rangers generally have "exclusive jurisdiction"—they are in charge of all search and rescue and other emergency services and law enforcement within a park. However, National Forest Rangers generally have "concurrent jurisdiction"—most emergency services within a national forest are handled by the local counties and other municipalities.*

*Anyway, the boy scout troop was on the trail from Wolf Gap to Big Schloss ("big fortress" in German, a reference to the big blocky cliffs). Actually, they were on the way back, and they were behind schedule. It got dark. And it started snowing; hard, and fast. When they straggled back to the cars in misery and disorder, a couple of the scouts were missing. So two of the adults set out back up the trail, in the dark, and in heavy snow.*

*Well, the two kids showed up at the cars, but they hadn't seen the adults. As it got later and later, there was no sign of the two adults. After waiting, and waiting, someone finally went to a pay phone (remember, this was long before cellphones) and called PATC headquarters in DC and asked for help. They said they needed people with headlamps and snowshoes to go out and look for the two adults. Now, in those days the PATC had no callout roster, nor any sort of emergency response plan. This was even before the days of the Trail Patrol, not that even to this day the Trail Patrol is any sort of response team, or patrols in this area. The people at PATC HQ suggested they call the local County Sheriff and the Forest Service District Office, which they did. Finally, the next morning the local county and forest service people managed to get some people out on the trail, and of course they just found two frozen bodies.*

The second incident: *It happened at Harper's Ferry. Harper's Ferry is where the Shenandoah River joins the Potomac River, and the greatly-enlarged Potomac pours through the Blue Ridge. It's an impressive gap, with some nice cliffs on either side. The cliffs on the northern side are about 300 feet high, and known as Maryland Heights. I've climbed there, and it's a real challenge. There are some overhangs, but the real interesting challenge is that there's a train tunnel through the bottom of the cliff. And this is for the B&O mainline, so quite frequently a big freight train barrels through the tunnel and the whole cliff shakes. The area is a popular National Historical Park, but unlike most NHPs, it has plenty of backcountry and trails and cliffs (and even John Brown's Cave).*

*Here's the story as we heard it. Now this was back before the National Park Service Rangers at Harper's Ferry had their own vertical rescue capability. They do now and have had for the past several decades. Well, there was this climber who was hurt and stuck halfway up the cliff (or halfway down, I don't know if he was climbing or rappelling or what). The Park Rangers had a mutual aid agreement with a local fire department (Bolivar?) to handle cliff rescues, so they called the fire department. And the way we heard it, this fire department lowered a wire-basket Stokes litter down to the guy, with a rope on the head of it, and a tag line on the bottom. And I guess someone rappelled down and strapped him in the litter. But then, instead of lowering with someone tending the litter, they just lowered on the top line while pulling on the bottom line from below. And as they guy got lowered down, the litter kept spinning around, crashing against the cliff face, smashing his face pretty bad, enough to keep him in the hospital for quite a while. The Park Service was not happy.*

Based on this narrative, true in all respects or not, the ASRC was founded with a primary charge of improving SAR training in the mid-Appalachian region, so that when things like this happened, there would be more trained individuals to respond. At first, the ASRC was not involved in response at all: it was all about training people in SAR skills, and only later did we organize local Groups to provide response organizations.

From the beginning, the ASRC was all about training and credentialing, and this Guide continues this emphasis, more than 40 years later.

— Keith Conover, July 2019

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# ASRC Training and Credentialing Overview

The ASRC training and credentialing system's documents fall into four parts.

First: we publish training curricula later in this ASRC *Training Guide*. These are what members are supposed to learn and be taught, including both knowledge and psychomotor skills. The curricula list teachable subject areas and topics, divided by subject and training level. Group Training Officers and instructors may use them to construct classes and training programs to get members to the levels established in the Training Standards

Second: we publish performance standards in the *ASRC Training Standards*, a separate document. These are what members are supposed to be able to *do* once they have completed the curricula.

Third: we publish a set of *Position Task Books (PTBs)*, one for each of the credentialing levels, which provide verifiable checklists of the performance standards and other requirements for each of the levels. Also known as "skills checkoffs," the PTBs include checkoffs for when a member demonstrates mastery of one of the skills of the Training Standards, to the satisfaction of the Group Training Officer (GTO) or someone designated by the GTO. They also provide a checklist for outside credentialing or other requirements, such as completing National Incident Management System (NIMS), Incident Command System (ICS) and aircraft safety online training.

Fourth: the semi-independent ASRC Credentialing Board establishes *test methods* based on the performance standards in the form of written and practical tests. Written and practical tests challenge members to demonstrate mastery of a representative sample of the knowledge and skills of the curricula, in accordance with the performance standards in the *ASRC Training Standards.*

The first three are filed in the ASRC Archive (archive.asrc.net) and linked on the ASRC website (asrc.net); instructions on applying to take written and practical tests are available at asrc.net as well.

## The ASRC Training Guide

This is *not* the *ASRC Training Standards*; those are in a separate document. The *ASRC Training Standards* are *performance standards* to which ASRC members of various levels are held.

This *ASRC Training Guide* explains the why and the what for *training* members (or from a members' perspective, what they need to *learn*), and has two parts.

This first part is an overview of the ASRC's system for training and credentialing individual members. This lays out the discussions that led to the current training levels, why they contain what they do, and why the levels are as they are.

The second part lays out detailed curricula for the different credentialing levels. It is an authoritative reference for content we think should be taught to members, and learned by members. It's what we want members to know, and what psychomotor and interpersonal leadership skills to practice, to do what we expect of them safely and effectively.

Most important is what the training curricula are *not*. The curricula are *not* required sequences in which topics must be taught. They are *not* lesson plans, though they certainly make it easier to create your own lesson plans. They are *not* required classroom material, as members can get this information in many different ways, or may know some of it already. It is *not* a list of what's going to be on the written and practical test, though we suspect the ASRC Credentialing Board will look carefully at the *Training Guide* and *Training Standards* in crafting their written and practical tests. It is *not* a list of requirements imposed by outside agencies; it does not say anything about required clearances, or required ICS online classes, except where they relate directly to what we want them to know. For example, some of the IS-100 (ICS-100) online FEMA course is relevant to what we expect of members, but some of it is not; we note in the curriculum which parts we think are useful at a particular level and which we think or not. This is a guide to the Credentialing Board in creating tests. And, while FEMA expects field members at a particular level to have completed the online IS-700 class, there is nothing in IS-700 we think is necessary for our members to be able to do their jobs in the field, so nothing from IS-700 appears in the Field curricula. It is *not* a list of what equipment members need to show they possess when they undergo their required pack checks.

Where there is an "ASRC way" to do something, as with the ASRC Seat Harness, or nontechnical evac litter bearer rotation, the details are included or referenced. This does *not* mean that "The ASRC Way" is the only right way, and this does *not* mean that an instructor cannot teach other reasonable alternatives. This *does* mean that the way described is an acceptable technique, and that ASRC members are expected to be familiar with it.

## Training Revision Process

The ASRC training system originated circa 1972, even before the ASRC was incorporated in 1974. Since then we have revised our training system many times. Each time, we said that we needed a training curriculum. Finally, 45+ years later, it appears in this *Training Guide*, at the same time we were working on a major revision of the *Training Standards* (version 8.0). The question then arises: if there are conflicts between the Training Standards and the Training Guide, which should be authoritative? Or perhaps a better question is where should we start as we work on revising our training system?

A reasonable answer is that there are four parts to consider when we revise our training system; this is similar to the four parts of our documentation, with one difference.

First is a job description, a brief statement of what we expect someone at that credentialing level to be able to do. This includes both common tasks, such as leading a search team of local volunteers, as well as rare but important tasks such as dealing with a seriously ill or injured team member. These appear in the *ASRC Training Standards,* and are summarized in the grid on page 14 of this *Training Guide.*

Part two is a curriculum, a list of educational topics, which forms the bulk of this *Training Guide.*

Part three is the performance standards, which form the bulk of the *ASRC Training Standards.*

And part four consists of the test methods, which are the online written tests, PTBs (position task books) and practical tests created and administered by the ASRC Credentialing Board, following the policies in the ASRC Credentialing Policy Manual, and based on the performance standards in the *ASRC Training Standards.*

Changes to any of these four interrelated chunks of information should prompt an inspection of, and maybe changes in, the other three chunks. From a cognitive, how-easy-is-it-to-wrap-your-brain-around-it viewpoint, the easiest to review, critique and change is the job descriptions, but they're not very detailed.

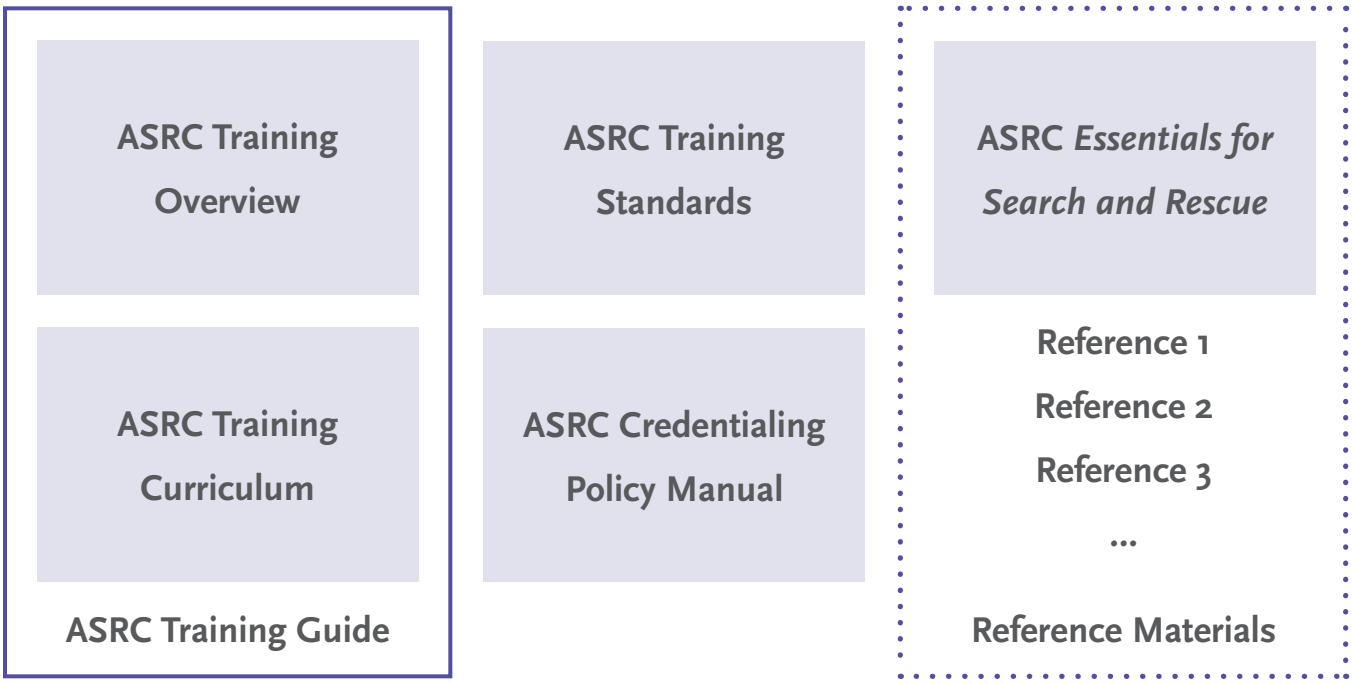
The next-easiest chunk to critique and revise is a curriculum. It's detailed enough that people can get a mental handle on it. And it's easier to create performance standards from a curriculum than to create a curriculum from performance standards.

Performance standards drive the ASRC Credentialing Board's test methods. But they need the details of a curriculum, and its references to the literature, to create test questions and criteria for passing practical tests.

This is illustrated in the diagram on the next page.

## History

When the ASRC's training started, in the early 1970s, there were no GPS units, no cellphones, no laptop computers, and topographic maps were only on paper. As the world changed, our training has had to change to keep up. Reviewing and updating our training, performance and credentialing is continuous. But certain issues tend to occur over and over, and this and the following sections lay out some of the reasoned



discussions about them and the resulting decisions about our training and credentialing system.

*Those who cannot remember the past are condemned to repeat it.* —George Santayana

Originally, we just offered certifications in certain skill areas, basically class-completion certificates. In the late 1970s when the ASRC started setting up local Groups with a response capability, one of the first things we did was to establish a set of training standards for individuals. In the decades since then, they have been tweaked many times, but the basic concept has stayed the same: a list of what someone needs to know and be able to do to be effective at doing wilderness search and rescue in the mid-Appalachian area.

At the time, there were no such standards anywhere in our mid-Appalachian area. We looked at the existing Mountain Rescue Association (MRA) standards, and modeled ours, in many ways, after the MRA's; that's where the Rescue level and name came from. In fact, we intended, and eventually succeeded at, getting the ASRC to be the MRA's eastern/Appalachian region, though the two are now separate entities.

The name of the standards has changed; at first it was the *ASRC Training Guide,* later renamed to *ASRC Training Standards*, and now we have this document taking up once again the title of *Training Guide.*

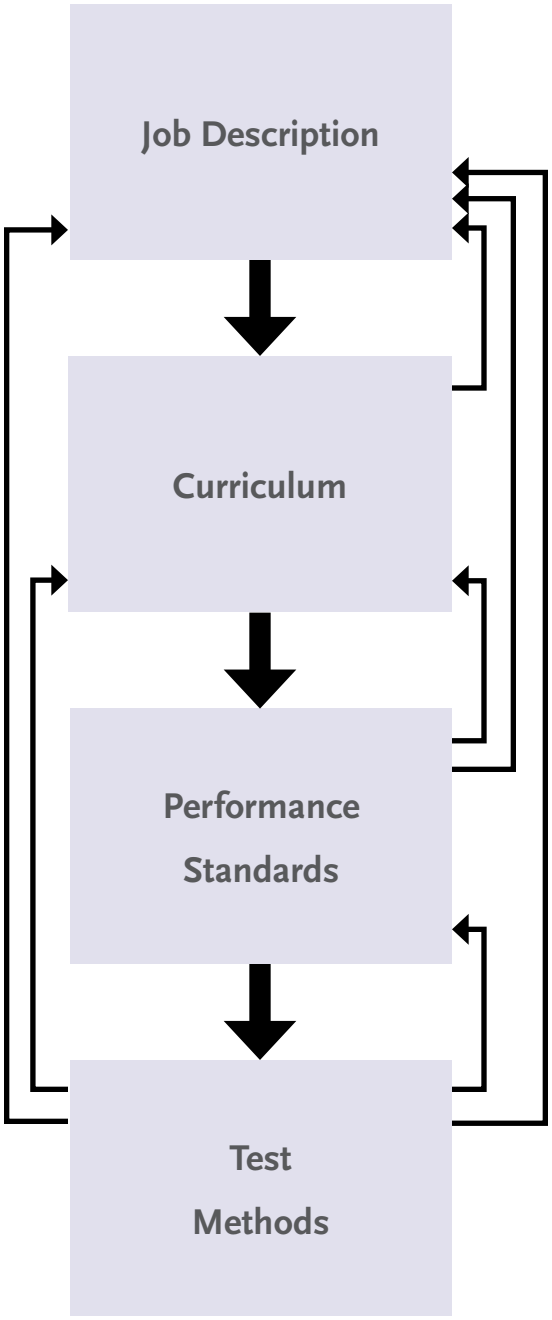
The names of the credentialing levels have also changed over the years. At first (1970s), we had Trainee, Basic and Rescue levels; Trainee was initially limited to 6 months. In 1988-89, we changed Basic and Rescue to Field Team Member (FTM) and Field Team Leader (FTL); we also added Base Radio Operator (BRO) which has been in the Training Standards ever since, but nobody has ever been credentialed as a BRO. We planned to add Rescue Specialist and Tracker but to this day have never developed these credentialing standards though we certainly have many experts in technical rescue and mantracking.

In 1988, we added Incident Staff (IS) and Incident Commander (IC) as credentials. There was much discussion of whether IS and IC credentials required prior or ongoing field certification, a discussion that continues to this day. The persistent consensus, though by no means a unanimous one, was that these "Base" credentials require prior field experience to be able to appreciate what you're sending members out to do, but that ongoing field credentialing is not necessary.

In 1993 we added Alert Officer (AO) as a credential (that was when the ASRC responded to missions as the ASRC as opposed to Groups responding), and in 1994, we added Callout Qualified (COQ or CQ) that replaced the Trainee level that we had long ago dropped.

In 2008, we added standards for Conference Dispatch Officer (CDO) for managing resource coordination during large operations.

In 2011-12, we renamed the Incident Staff (IS) level to Search Manager IV, and the three levels of IC we had developed to Search Manager III, II and I. This was a response to the idea that seldom would we be running an entire operation; generally a representative of the Agency Having Jurisdiction (AHJ)/Responsible Agency (RA) is in overall charge as the Incident Commander, and handles the ICS logistics and finance functions, whereas one of our Search Managers may manage



much of the Operations and perhaps Plans functions.

Old versions of the *ASRC Training Guide* and *ASRC Training Standards* are available at archive.asrc.net.

## Testing and Credentialing

For decades, there was sentiment in the ASRC for standardized written testing at the Conference (ASRC) level. Traditionally, written and practical tests were developed and administered by each individual Group Training Officer (GTO), based on the *ASRC Training Standards*. Conference-wide testing finally occurred in 2017, when we started moving the responsibility for credentialing from GTOs to a semi-independent ASRC Credentialing Board.

Why, after decades of discussion, did we finally move testing to the Conference level, and do it via a semi-independent Credentialing Board? The momentum to centralize testing had been there for decades, but another factor that finally made the change happen: "self-credentialing."

Some Agencies Having Jurisdiction/Responsible Agencies (AHJ/RAs)* were becoming concerned about the validity of teams credentialing their own members by testing by other members of the same team. They were concerned about the "old boy" network, where members would pass other members based on friendships rather than competence.

The AHJs/RAs started expecting teams to use external credentialing for their teams. We wanted to make it clear that ASRC's credentialing was not done internally by ASRC Groups, and that it was at least as rigorous as the testing and credentialing done by other organizations.

The ASRC Credentialing Board consists of a single member appointed by each ASRC Group. The Credentialing Board reports to the ASRC Chair/President, but is independent in terms of the creation, administration and scoring of tests.

Written tests are online, and practical tests are scheduled by the Credentialing Board, ensuring that the evaluators for any practical test include evaluators from ASRC Groups other than the Group of the member being tested. Details are provided in the *ASRC Credentialing Policy Manual*, available in the ASRC Archive and linked at asrc.net.

## Reasons for the Credentialing Levels

It is worth examining *why* we have standards for credentialing levels, and why we have credentialing levels at all.

Originally the ASRC just offered course completion certificates, but soon moved to having named *levels* of credentialing, each including a wide range of topics including survival, land navigation, communications, search skills, first aid/medical skills and rescue. There were plenty of arguments about the specific knowledge and skills for each the levels, but almost no introspection about why we needed levels at all.

So, why do we need such levels? Why not just let everyone to train as they desire and use them based on whatever abilities and training they have? That actually might be a semi-reasonable approach, but there are some solid reasons to have a set of training levels.

### External Forces

The Federal Emergency Management Agency (FEMA) sometime around 2005, started *typing* emergency response resources, so that those requesting resources and those sending them know they are talking about the same thing. A resource can be an aircraft, an ambulance, or a team of people. In each case, the FEMA typing depends on the capabilities of the resource.

The current draft/revised FEMA typing describes a "Land Search and Rescue Team" thus: *A Land Search and Rescue (SAR) Team conducts search, rescue, and recovery in one or more of the environments of land or wilderness, in response to natural and human-caused events.* In the FEMA typing, Land SAR Team has two Types, Type 1 and Type 2. A Type 1 team consists of at least 9 people, one Type 1 Land Strike Team/Task Force Leader, two Type 1 Land SAR Team Leaders, and six Type 1 Land SAR Technicians, all of whom are further defined as far as their individual capabilities. The Type 1 team's environment is specified as "wilderness." A Type 2 team's environment is specified as "land." A Type 2 team has six members.

FEMA further defines the roles and capabilities of Type 1 and 2 Land Search and Rescue Technicians, including such arbitrary stipulations as:

*Performs search, rescue, and recovery in:*

*a. Land environments: Areas located within, or immediately next to, urban boundaries, no further than 0.5 miles (0.8 kilometers) from a road readily accessible by emergency personnel, and which may include parks, wild areas, private, state, and municipal lands*

*b. Weather conditions not including snow or slippery ice conditions*

* AHJs/RAs: we tend to use the terms interchangeably: agencies with responsibility for search and rescue who call the ASRC for search and rescue help.

*c. Yosemite Decimal System ( YDS ) classes 1 -2 terrain*

There are corresponding requirements for a Type 1 Land Search and Rescue Technician.

While FEMA insists this is just "typing" and not setting standards for training and credentialing, pretty much everyone else sees this as FEMA setting standards for training of individuals. This seems to be more prevalent in urban search and rescue, where the FEMA typing is taken very seriously. However, we are aware of no requests of an ASRC Group, ever, specifically for a FEMA Type 1 or Type 2 Land Search and Rescue Team, and few within the ASRC argue that there is a need to prepare for such an eventuality.

However, the idea that we should take the FEMA typing of individuals into account is real, and a consideration whenever a search and rescue organization is creating standards for credentialing individuals. The FEMA typing for wilderness search and rescue individuals are short and vague, except that they specifically require that certain FEMA online National Incident Management System/Incident Command System classes be completed.

Too, some states such as Virginia and Pennsylvania set their own standards for training and credentialing of SAR team members, though some states have accepted ASRC credentialing as the equivalent of the state credentialing.

In Pennsylvania, the standards are pretty much voluntary; Virginia is much more emphatic about the need for SAR team members to be credentialed by the state, and offers state-sponsored training called the GSAR College. The ASRC was instrumental in setting up the GSAR College in the first place; the ASRC's Keith Conover wrote the first GSAR textbook back in 1972 for Virginia Wing, Civil Air Patrol, but later this program was taken over by the state government.

The international standards-setting organization that started in 1898 as the as the American Society for Testing Materials, later the American Section of the International Association for Testing Materials, and now just known as ASTM, has a Committee F-32 on Search and Rescue. The fact that ASTM standards are based on a rigorous consensus process make them very credible. Many ASRC members have contributed to the work of ASTM F-32 over the years and continue to do so today. ASTM standards are entirely voluntary, as ASTM has no enforcement mechanism.

While ASTM standards for *things*, such as climbing helmets, are widely adopted by industry, ASTM standards for *services,* such as SAR, have had less penetration in the SAR community. Still, agencies and organizations looking to set their own SAR standards tend to look closely at the ASTM standards in crafting their own. If you hew to ASTM standards, it may offer you some protection if your agency or organizations ends up in court. ASTM standards have to be purchased; ASRC has purchased the relevant standards for use in crafting our own standards.

So, there is pressure from governments wanting us to credential our members to certain levels, and an international standards-setting organization that we should take seriously.

## Professionalism and Pride

Most any company or organization wants its employees or members do a good job of what they're supposed to do, and do it safely. Credentialing to certain training levels, and whenever possible assigning people jobs consistent with their credentialing level, certainly makes sense from this perspective.

But credentialing is also a matter of pride. Once you are credentialed in a profession, once you get your credentialing for EMT or paramedic or firefighter or law enforcement or welding or nuclear power plant operation or a college degree, you feel some pride in that accomplishment.

If on one side of the professionalism coin is *pride*, the other side is a desire to *protect* the profession. You don't want incompetent people giving the profession a bad name. You don't want them doing a bad job, or hurting themselves or others publicly. So once you've got your credentialing, you've got motivation to make sure that others doing the job are also credentialed.

This desire for professionalism isn't something new in the 21st century or even the 20th or the 19th. Guilds have restricted trade since at least mediæval times, and the profession of medicine since ancient Periclean Greece.

This is true not only of the trades but also the "learned professions," such as law and medicine, which usually have set a high bar to credentialing, for reasons such as:

- to improve the view of the trade or profession in the public's eye,
- to restrict membership to keep the income high for guild members,
- to protect the public from unscrupulous or incompetent practitioners, and
- to keep the government from stepping in and regulating the trade or profession.

Even if the "income" that our volunteers get is just recognition and pride, all these apply to the ASRC.

Pride sometimes gets a bad name, as with the "sin of pride" or, in ancient Greece, the overweening pride known as hubris (ὕβρις) that invited the wrath of the gods. And since ancient Greece, the literature is full of those with an overweening pride who met a bad end.

But it's hard to see unselfish pride in the profession

as a whole as a bad thing. And pride in a job well done is, by most accounts, morally superior, to be encouraged, and when that job is helping others, doubly to be encouraged.

### Guides and Recognition

Training topics and performance standards for a particular level serve as guides, but not only to what you need to learn or be able to do. It also encapsulates the expert advice of many people, quite a few of whom are smarter and more experienced than you, at least in terms of certain aspects of search and rescue, about *what* you need to know to be an all-around competent member of a SAR team.

New members don't only want to learn some SAR stuff, they want to learn *what* they should learn, and be confident that they have learned the right stuff.

And, once you have achieved the credential for a certain level, you feel a sense of accomplishment. Maintaining impetus in new member's training by moving from a three-level system to a four-level system was one of the motivations for the 2014-2019 restructuring of the field training standards. Slipping another merit badge into the middle of the system, if you will. And since recognition is one of the ways we "pay" our members, going from three levels of recognition to four means one more formal recognition of members' work. It's a pay raise.

### Interchangeable Parts

Assume you're in Base. Assume you're trying to put together a 2-person team for a fairly long hasty task along a stream, and the weather's threatening. There are two ASRC members from another Group, people you don't know, and you're thinking about sending them out as a Field Team on this task.

You'd feel a lot better about doing this if both of them were credentialed to ASRC Field I rather than if they're both just ASRC Field III. Everyone is different, with different outdoor experience, different aerobic condition, and different judgment and mental toughness. Still, the ASRC field credentialing levels give you a good estimate of someone's SAR competence.

If you're out in the field with people from other ASRC Groups, knowing the others' credentialing level gives you some idea of what minimum competence to expect from each of them. Yes, they may and probably do have expertise and credentialing in other specialties, such as medical or tracking or vertical rescue. But if you know their ASRC Field level, you know they meet certain minimum base competence in things like land navigation when you're going out on a backcountry task.

## 2014-2019 Restructuring

Starting in 2014, and extending for several years, we embarked on an ambitious restructuring of the ASRC training and credentialing.

### No Self-Credentialing

One impetus for this was that states were (to some degree, justly) suspicious of self-credentialing of SAR teams and other emergency responders. They looked for external credentials which they viewed as more trustworthy. Thus was born a semi-independent ASRC Credentialing Board that was responsible for developing and conducting Conference-wide testing to the various credentialing levels. This started in 2018 with the existing Training Standards 7.2 FTM level. IT started with PTBs (Position Task Books, the Federal acronym for what most call "skills checkoffs"). Then we established standardized online written testing. And then in-person practical testing, done in a way that involved at least some testers from outside the member's Group, to avoid any impression of Group self-credentialing.

### PTBs

Another impetus was driven by FEMA and aided and abetted by the standards-setting organization ASTM; it was the PTB: Position Task Book. While most ASRC Groups always used something similar called skills checkoff sheets, FEMA and ASTM were demanding a standardized format for these skills checkoffs, a process that specified who could sign off on a particular required accomplishment, and that we call it by the TLA (Three Letter Acronym) PTB.

Steve Weiss, the ASRC's first Credentialing Board Chair, was deeply involved in NIMS (the National Incident Management System) and the FEMA credentialing system; but he disclaims any responsibility for the FEMA PTB format and promised the ASRC PTBs would be much better. He went to the length of borrowing an out-of-print book on the scientific basis for effective forms design.

### Names and Content

Likely a more important impetus to the ASRC's credentialing restructuring, at least to us internally, was that our FTMs were leading teams of firefighters and spontaneous volunteers all the time. So, we really needed to change the name "Field Team Member" to something else.

And there was some dissatisfaction with what was required in the existing FTM and FTL standards.

*And* some Groups added lots of stuff to the base ASRC CQ level, and then people ended up sticking at CQ for a long time, at a level that was initially viewed as just the equivalent of the old time-limited Trainee membership.

***And*** the fact that we wanted the credentialing levels to be a bit more granular, so that it was easier, and therefore more attractive, for members to move up the credentialing ladder.

### Wilderness First Aid

Starting in the 1970s, the ASRC required members to complete a 16-hour Red Cross Standard First Aid course and a separate CPR course. There had been debates about the validity of CPR training, which is essentially useless in the backcountry. But, we often operate at a Base, where CPR might be of use, so the CPR requirement persisted. There was always some discussion of replacing the Red Cross course with a wilderness first aid (WFA) course requirement, but the lack of a national standard for WFA training and credentialing precluded this until more recently.

Back in the 1990s, ASRC members helped the Red Cross develop an add-on wilderness first aid module called *When Help is Delayed* (1996), and the cover of the text even featured two ASRC members from Shenandoah Mountain Rescue Group.

Despite having been one of the most popular American Red Cross training courses since the 1950s, though, the *Standard First Aid and Personal Safety* class died an ignominious death in the 1990s, being watered down to just a few hours of online training and covering no more than a tiny fraction of what it used to cover. The Red Cross also scrapped the *When Help is Delayed* module, and instead partnered with the Boy Scouts to offer a wilderness first aid course specifically slanted to the needs of the Scouts.

Back about 2010, the ASRC started talking about integrating wilderness first aid into our training standards. After much prodding and pushing by the Medical Committee, in 2016, version 7.2 of the Training Standards changed the Red Cross first aid and CPR requirement in the FTM standard to

*5. Hold a current First Aid certification, as outlined in the ASRC medical guidelines.*

*6. Hold a current CPR certification, as outlined in the ASRC medical guidelines.*

The medical guidelines in question were presumably the recommendations of the Medical Committee, which were to incorporate the wilderness first aid (WFA) educational objectives recommended by the Wilderness Medical Society (WMS) into our training standards; and indeed this was also done in Version 7.2 of the Training Standards, but it all went into the FTM standard (actually a fair bit of it was there before, as we long required FTMs to, for example, have a good understanding of hypothermia). The Medical Committee noted that Groups could (and should, when possible) integrate wilderness first aid training into Group training, but that also it would be possible for a Group to outsource this training by having members complete an external wilderness first aid course.

In 2013, the Wilderness Medical Society (WMS) published a pair of articles that arguably are the closest we have to a national wilderness first aid (WFA) standard.*

There was some feeling that the ASRC's wilderness first aid material should be spread throughout the various training levels. The Medical Committee also recommended that when the ASRC credentials a member at a level that includes all of the Wilderness Medical Society wilderness first aid (WMS WFA) objectives, the ASRC also include on this member's credential that the member has completed WFA training and is credentialed by the ASRC in WFA. Note that the WMS WFA standards also include basic CPR. The first draft of this document had a bit of WFA in Field IV, a bit in Field III, and the bulk in Field II, meaning that anyone newly-credentialed as Field II under the new system would also get an ASRC WFA credential, noting that it meets the guidelines published in the WMS's journal, Wilderness and Environment Medicine.

Those who are using this curriculum to organize training for ASRC members may, if they wish, "contract out" some of the training by having members attend an outside wilderness first aid class and perhaps a CPR class, and presume that the wilderness first aid and CPR portions of the Field curricula were thus accomplished. Or, it is a relatively simple matter to work the wilderness first aid topics into relevant search and rescue training, for instance, covering splinting when covering packaging in the litter. The Medical Committee unanimously recommended this type of integrated training as being optimal.

Regardless of whether this wilderness first aid and CPR material is covered internally or externally, members *are* expected to *know* the material covered in this *ASRC Training Guide* and to be able to perform the skills listed here and in the *ASRC Training Standards*.

As with the Field training in general, there was strong sentiment that the wilderness first aid component should be right-sized for our environment. Thus, no need to cover altitude illness. Our training should also be optimized for search and rescue team members

*Donelan, S. (2013). "Minimum Guidelines and Standards for Wilderness First Aid." Wilderness & Environmental Medicine 24(4): 454-455.
Johnson, D. E., et al. (2013). "Minimum Guidelines and Scope of Practice for Wilderness First Aid." Wilderness & Environmental Medicine 24(4): 456-462.

| | Field IV (trainee) | Field III | Field II | Field I |
|---|---|---|---|---|
| Timeframe | Can complete in one weekend (includes skill verification) | Can complete in 6 months | Can complete in 6 months | Can complete in 6 months |
| Old ASRC | CQ (Callout Qualified) | FTM (Field Team Member) part 1 | FTM part 2 | FTL (Field Team Leader) |
| Rough VDEM Equiv. | (Planned CQ equivalent) | Search Team Member | Search Team Leader | (no equivalent) |
| Rough MRA Equiv. | (no equivalent) | (no equivalent) | (no equivalent) | Operational Member |
| Rough NASAR Equiv. | (no equivalent) | SAR Tech III | SAR Tech II | SAR Tech I |
| Rough HazMat Equiv. | Awareness | Operations | Technician | Specialist |
| Survival | Basics of cold-weather and hot-weather survival | Knows how to find or build temporary shelter | Demonstrate ability to bivouac overnight personally | Can supervise team overnight bivouac and manage less-prepared members |
| Comms | Report USNG position over team radio. | Install batteries, install antenna, and change channels on team radio. Proficiency with ASRC communications protocols and prowords. | Proficiency with phonetic alphabet. Actions to improve radio or cellphone communications. Network discipline. | Understanding of mission-level communications issues and best practices. |
| Navigation | Report USNG position over team radio | Can use orienteering compass; basic understanding of topographic maps;<br>can navigate to point using GPS/compass/topo map. | Expert at reading topo maps; can complete 3-station basic orienteering course in daylight. | Complete 3-station orienteering course at night with retroreflective markers. |
| Operations | Knows how to be alerted, and how to sign in and out of a mission | Knows about staging operations at Base | Can get briefing and brief team; knows find management | Can brief and debrief field team leaders |
| Leadership | Directly supervised by (paired with) a Field-III or higher on all tasks | Can, if needed, lead team of unskilled searchers on simple tasks | Simple leadership skills (basic field team management) | More comprehensive leadership skills |
| Search | Best practices for conduct during SAR operations, hazard awareness | Member of search team ("Operations" level) | Leads search teams ("Technician" level) | Leads complex search tasks ("Specialist" level) |
| Knots | (None) | Tie-in for semi-tech evac:<br>• ASRC seat harness<br>• Barrel knot (double fisherman's)<br>• Water knot<br>• Overhand (backup) | Rig belays, lowering, hauling:<br>• Figure 8 family (bend, follow-through)<br>• Modified basket hitch, wrap-3-pull-2 | Supervise rigging, solve problems:<br>• Butterfly knot |
| Rescue | Nontechnical litter bearer | Semi-tech litter bearer ("Awareness" level) | Belayer or haul team supervisor for semi-tech evacuations ("Operations" level); can rig anchors and belay, lowering and haul systems. | Leads semi-tech evacuations ("Technician" level), supervises rigging. |
| Equipment | Personal equipment in a pack; know how to select appropriate personal gear and personal protective equipment (e.g., helmet, clothing, boots) | Webbing<br>2 carabiners<br>2 Prusiks | Helmet | (None) |
| Wilderness First Aid/ Medical | Beestings, including anaphylaxis; ticks; poison ivy; hypothermia; frostbite; dehydration and heat illness | Personal hygiene for disease prevention; fatigue, exhaustion and nutrition; bloodborne pathogens; confidentiality | Additional basic wilderness first aid, including wilderness specific CPR, to meet Wilderness Medical Society curriculum; improvised evacuations | (None) |

working in a system where first aiders will often be working with advanced medical providers of various levels, and often have physician medical direction. This is a much different context than Boy Scouts doing outdoor recreation.

If a subject or team member has a condition that could benefit from an advanced technique, such as needling a chest for a tension pneumothorax, or having a fasciotomy for compartment syndrome, recognizing this need may be important even at the first aid level. During an ASRC operation, a paramedic, nurse or physician who knows how to decompress a slowly-developing tension pneumothorax may already be in the field and able to respond to the scene quickly enough to save a life. Realistically, this will most likely be an ASRC or other field team member who has fallen and cracked a rib causing a pneumothorax.

In the case of compartment syndrome, simply recognizing this early, and changing the method and urgency of evacuation, might save a limb. Those identifying the problem could contact Base and arrange for an urgent improvised evacuation to a LZ for a medical helicopter evacuation to a trauma center.

While these conditions are beyond the capacity of a wilderness first aider to *treat*, in the ASRC setting, they are important enough to be able to tentatively *identify* and take appropriate actions.

### Meeting Other Standards

As we worked on Version 8 of the Training Standards, we considered all the topics discussed above and other different and sometimes conflicting goals for this revision.

One was state standards. In the beginning, the ASRC was very Virginia-centric, and thus having the ASRC standards meet or exceed the Virginia SAR standards (which the ASRC was instrumental in developing) was very important. Now the ASRC has spread over many states, some with very different SAR standards, so direct correspondence with the Virginia standards is less important.

Being consistent with national SAR standards was also a pressure on the Version 8 development process. However, there really *aren't* national SAR standards.

FEMA has *types* for teams, which are not really standards. NASAR has its own credentialing program, but it's not a national standard in the ordinary sense of the word, it's a proprietary credentialing system of a non-governmental organization. True, the Mountain Rescue Association has standards on what individual members must know, but those are only applicable to member teams, and the MRA has no credentialing process for individual team members.

The closest to national SAR standards are the individual, very-granular, standards developed by the voluntary international standards-setting body ASTM. But few organizations or states adopt ASTM standards as-is, they tend to use them as models, which is also the approach the ASRC adopted in creating the Version 8 Training Standards.

### Right-Sizing; Frequency and Severity

Perhaps the most pressure on the Version 8 standards came from the idea that we need to make them meet our actual needs.

That "right-sizing" argument, however, is not as simple as it might seem. You can't just look at how often our members do something and use that to decide what to put in the curriculum. Particularly as far as safety, you not only need to consider how often we encounter the problem, but also:

- how *serious* the problem can be,
- whether there is something effective we can do to *prevent* the problem,
- whether there is something effective we can do to *deal with or treat* the problem once it occurs, and
- how much of a *hassle* it is to prevent or treat the problem, for example, how heavy, bulky or expensive something to prevent or treat the problem would be to carry around in your pack all day, or how hard it is to learn to deal with the problem.

A trivial example is ice-axe self-arrest. Many ASRC members are mountaineers who are quite proficient at ice-axe self-arrest on glaciers and snowfields. Ice-axe self-arrest is prominently covered in the NASAR *Fundamentals of Search and Rescue* textbook. But the opportunity to exercise this skill in the heavily forested mid-Appalachians are pretty much constrained to artificially-maintained ski areas, where being able to dodge out-of-control skiers is probably more important than ice-axe self-arrest.

The ASRC's Allegheny Mountain Rescue Group is a certified team of the Mountain Rescue Association, and for their team re-credentialing, they need to have members capable of ice-axe self-arrest and placing snow and ice anchors. This is in case they get called to assist another MRA team with a winter rescue, such as an above-timberline rescue in the Adirondacks. But for the rest of the ASRC, these skills are much less likely to be needed than the low likelihood that AMRG will need them.

Diagnosis and treatment of altitude illness in the mid-Appalachians – even the highest peaks are not high enough to make altitude illness other than an exceptionally-rare problem – is likewise not worth including in our curricula, however important they might be for

recreational mountaineering.

For another example, consider rattlesnake bites. Some people (probably those with a pathological fear of snakes) have suggested that our wilderness first aid kits should contain antivenin to give in case of a rattlesnake or copperhead bite. While these bites can be sometimes limb-threatening, they are very rarely life-threatening, and poisonous snakebite is exceedingly rare, especially for search and rescue personnel. So from that analysis alone, it's probably not appropriate to stock this in our wilderness first aid kits. And, antivenin is appropriate only in envenomated bites, which is just a fraction of defensive bites against humane. True, the antivenin is fairly light and small. But the clincher: it's about $500 or more a vial, you need 5 or more vials to treat someone with a snakebite, and it spoils if it's not kept at a controlled temperature.

For another and a bit more subtle example, there always have been arguments over the decades that we need to get rid of the CPR requirement, because (a) with rare exceptions, if you're in the backcountry and you think someone needs CPR then that person is dead and CPR is not going to fix it, and (b) in the 45+ years the ASRC has been around, with hundreds of members on hundreds of operations, nobody has ever used their CPR training. Nonetheless, in the right (rare) setting in Base or at a training, CPR can be lifesaving, and there is nothing that really can replace it when it is needed.

Same thing with helmets. The ASRC has never had a significant head injury, but we still expect people operating in a vertical environment or exposed to rockfall to wear helmets. If helmets cost $500 each, and people had to buy one to join, the decision might be different.

Another good example of "rare but important" might be the requirement to be able to bivouac overnight, which has never happened on an ASRC operation. Yes, we've sent some people out to do a camp-in with a tent, sleeping bag and pad, and stove, but never a forced overnight bivouac.

These type of calculations figured in selecting topics for Field IV, which is all about hazards and mitigating them. For some topics, it's obvious why they are in Field IV. Falling asleep while driving is a really big hazard, and caused the ASRC's only line-of-duty death. Ticks and Lyme disease and poison ivy are very common if non-lethal hazards. But why is litter handling, at least the book-learning part of it, in Field IV and *Essentials for Search and Rescue?* Picking up and carrying a litter improperly, or getting confused and doing the wrong thing during laddering or rotating litter bearers is a great way to do your back a big mischief. And what about the section on conduct? Making a big faux-pas because you didn't know what was expected of your is a great way to get yourself kicked out of a SAR team, which is certainly a hazard to your reputation and mental state.

Whatever we put in the curriculum and the Training Standards and equipment requirements needs to consider a mix of how commonly someone needs the knowledge or skill, how important that knowledge or skill might be, and the cost of dealing with it in terms of weight, bulk, training and money.

## Field Training

### Overview

For Version 8 of the *ASRC Training Standards,* we've moved from a three-level field credentialing system (Callout Qualified, Field Team Member, and Field Team Leader) to a four-level system (Field IV, Field III, Field II, and Field I). The table on page 14 lays out the new levels, compares with other ASRC and regional standards levels, and outlines the expected tasks and training for each level.

The ASRC Credentialing Board established a "grandfathering" process where those credentialed as an Field Team Leader are converted to a Field I, and those credentialed as a Field Team Member are converted to a Field II, unless the Group Training Officer has reservations about someone's skills and recommends converting to a Field III (ASRC Board of Directors meeting, 3/19).

Some of the principal goals of this restructuring were:

- Identify key skills based on 45+ years of ASRC experience, mostly search, some nontechnical evacuations, and rare semi-technical evacuations. High-angle rescues that are so rare that they should be left to specialized training beyond Field I.
- Remove non-essential skills.
- "Even out" the skills/time across the levels.
- Maintain a common approach to training and skills
- Use a linear approach easily understood by agencies having jurisdiction for SAR in our states.
- Avoid operational titles such as Field Team Member and Field Team Leader, which may not correspond with actual field duties.
- Ensure that the standards can be tested in a written or practical test, based on Mager's *Preparing Instructional Objectives* and similar texts.
- Include Wilderness Medical Society compliant wilderness first aid training into the various field levels, so that those who complete Field II receive, in addition to their ASRC Field II credential, an ASRC wilderness first aid credential.

This gets away from levels that are named after positions that are assigned during an operation, such as "Field

Team Leader" or "Field Team Member," or that are tied to particular levels in other fields, such as the HazMat "Awareness" and "Operations," which carry regulatory baggage, such as what someone at that level is permitted to do, which may not apply well to search and rescue training or operations.

Once we arrive at numbers rather than names for the levels, there is always the question of whether to number up or down. There is an excellent argument that when creating something, whether in industrial design or training standards, that you should look at existing standards. And for levels applied to people, there is an excellent argument that the number one should be at the top. "Second-class citizen." "Second-class" and "first class" on trains and airplanes, even if in the USA there is a move to change this to a more politically-correct but less-informative "coach" and "business" class.

And, the ASRC has used levels IV, III, II and I already, in Search Manager standards. When we set up the Search Manager levels, we used Roman numerals and nobody even suggested we use Arabic numerals instead, so Roman numerals it is.

Adopting this "first-class" approach means that it's hard to add on any levels above Level I. But for our purposes of having generalist levels of field competence and credentialing, including a bit of search, a bit of rescue, a bit of first aid, and a bit of management, a four-level system seems right. Anything above Level I can be specialist credentials, if we wish to add them. We already recognize medical credentials by having the external medical credential patch on the right shoulder of the ASRC uniform. (This means that if we offer wilderness first aid credentialing as part of the credentialing, we need to also offer ASRC wilderness first aid patches.) If we wish to add additional credentials as far as rescue, tracking, or the like, it still won't affect the field generalist levels IV, III, II and I.

### Field Credentialing

The ASRC Credentialing Board has delegated the credentialing for Field IV (Trainee) to the Group Training Officers, but with the Credentialing Board providing a standard written online test. In 2018, the ASRC Board of Directors decided to produce a short, free online textbook that provides all of the knowledge required for Field IV (Trainee) credentialing, called *Essentials for Search and Rescue.* It is available in the ASRC Archive.

Credentialing for Field III, Field II, and Field I is entirely under the purview of the ASRC Credentialing Board. Written testing is online, and practical testing is conducted by the Credentialing Board on a regular basis, ensuring that evaluators from outside the member's Group are involved in the evaluation. See the *ASRC Credentialing Policy Manual* for more details.

To be credentialed, members need to meet the minimum standards in the *ASRC Training Standards*. Classes that use the curricula in this *ASRC Training Guide* should do a good job of preparing members to meet those standards, as tested by the ASRC Credentialing Board.

The *ASRC Training Standards,* and the curricula in this document, are minimums. Groups may require more of their members at the various levels. For instance, a Group that is also a member of the Mountain Rescue Association can require members to meet the extra technical rescue requirements for MRA Operational Member when testing for Field II, and MRA Rescue Member for Field I. A Group that specializes in canine search can require an external search dog credential for members who are qualifying at Field III level. Groups may also layer additional specialty qualifications on top of the four standard ASRC Field levels. For example, Groups that do cave rescue might either require NCRC *Orientation to Cave Rescue,* or *NCRC Level I,* in addition to ASRC Field II, to participate underground during cave rescues. (Having non-cave-rescue-trained ASRC members provide the above-ground portion of a cave rescue is a 45+ year old tradition embedded in a cooperative agreement between the ASRC and Eastern Region, National Cave Rescue Commission.)

While there are many different SAR credentials available, our hope is that the ASRC credentials represent an attractive, respectable and fairly easily-achievable ladder of progressive credentialing, tied to high-quality training and testing suited specifically for search and rescue in the mid-Appalachian area. It is also free.

### Topic Organization

After a considerable amount of discussion, we agreed to organize the field curricula topics as follows:

- Safety, Health and First Aid
- Communications
- Land Navigation
- Operations, Management and Leadership
- Search
- Rescue

We chose this order based on importance. What is more important than safety and first aid? And communications is next, so that you can call for help when needed. And land navigation is next so you don't get lost. The operations, management and leadership section is next, so you don't make some terrible mistake that hurts you, your team, or the organization or operation as a whole. Next comes search and finally rescue. Search comes before rescue both in our list and in real

life.

Some topics, such as individual knots, pretty much stand alone, and it works well to divide them among the field levels fairly evenly, corresponding with the performance requirements for each level. But at least for some topics, it is better to "chunk" material into teachable and learnable blocks, rather than spread them out evenly among the four field levels. A good example of this is the radio section of the Field II curriculum.

### Guide for Training Sessions

If you are a Group Training Officer or an instructor, there are a few features of the *Training Guide* that you may find helpful.

If you are putting together a training schedule or a field training session, scan through the Table of Contents, which in the PDF version consists of clickable links, for topics that have the **Practice** annotation. These are all psychomotor skills that lend themselves to small-group indoor sessions or field training.

A few of the topics don't have a good printed or online reference. For the most part, though, print or online reference materials are given in footnotes, many with clickable links. These serve as resources for those working towards a particular credential, and for Group Training Officers and instructors preparing educational programs, classes and field training sessions.

Everything a trainee needs for Field IV credentialing is in *Essentials for Search and Rescue.* But footnotes to the Field IV topics show where some of the topics and the recommendations in *Essentials for SAR* come from. Those crafting a class for trainees may find this helpful, in case a trainee's questions go beyond the material in Essentials for SAR.

Regarding student questions, a quote from the Journal of the American Medical Association (JAMA) back in 1989 might be appropriate; the article is *The Art of Pimping,* and you can find it online.* It explains that Socratic questioning of medical students has been known as "pimping" at least since 1628. It is an art well worth knowing for teaching *anything* to others. This particular paragraph from the article encapsulates Dr. Brancati's sage advice to those facing questions from their students:

*On the surface, the aim of pimping appears to be Socratic instruction. The deeper motivation, however, is political. Proper pimping inculcates the intern with a profound and abiding respect for his attending physician while ridding the intern of needless self-esteem. Furthermore, after being pimped, he is drained of the desire to ask new questions— questions that his attending may be unable to answer. In the heat of the pimp, the young intern is hammered and wrought into the framework of the ward team. Pimping welds the hierarchy of academics in place, so the edifice of medicine may be erected securely, generation upon generation. Of course, being hammered, wrought, and welded may, at times, be somewhat unpleasant for the intern. Still, he enjoys the attention and comes to equate his initial anguish with the aches and pains an athlete suffers during a period of intense conditioning.*

### Work to Do

The end goal of the curricula is to have nothing but terse bullet points, with a footnote for each major section that references an authoritative and comprehensive free online text. Footnotes also may provide references as to why a topic is included, why a specific procedure was chosen, or how to perform a skill, perhaps a video or diagram. These help those studying the material and are reference materials for instructors preparing to teach a class.

For several sections, a single comprehensive reference is not yet available. An example is the section on GPS navigation. So, this section has many footnotes, each linking to a separate reference for an individual point.

For the first version, some bullet points provide detailed information because a free and high-quality online reference is simply not available. As more and better online information becomes available, we expect those bullet points to become shorter as well.

Future projects include

- Possibly adding Group- and Corps-specific material as a support to our members who are using the Training Guide to inform their progress towards credentialing
- Completing the Search Manager curricula

*Je n'ai fait celle-ci plus longue que parce que je n'ai pas eu le loisir de la faire plus courte.* (I have made this letter longer than usual because I lack the time to make it shorter).

—Blaise Pascal, in *Lettres Provinciales,* 1657

## Search Manager Training Overview

Search management is a task that can be done poorly, and, based on past experience, often is. People may die even during a very well-managed search, but a lot more people die from poorly managed searches. And in this day of ubiquitous cellphones and an ever-expanding network of cellphone towers, large backcountry

*Brancati, F. L. (1989). "The art of pimping." JAMA: The Journal of the American Medical Association 262(1): 89-90.
Detsky, A. S. (2009). "The art of pimping." JAMA: The Journal of the American Medical Association 301(13): 1379-1381.

lost-person searches occur less and less frequently. As a result, real-life opportunities to learn how to manage a large search are decreasing. Unless we do something,that means a smaller pool of expert search managers, which in turn means people who are lost in the backcountry have less of a chance of surviving.

### Skills of a Search Manager

Managing a large backcountry search well requires expertise, not just in incident management, but in a vast array of arcane and esoteric subjects. Incident management skills and intimate familiarity with the ins and outs of the Incident Command System (ICS) are an absolute requirement, but they only provide a foundation on which to build.

Search managers must have a detailed and deep-seated emotional understanding of what field teams and other search resources can and cannot do, and the stresses and risks they face in the field.

Search managers must be scientists and mathematicians, at least enough to be able to understand the equations that drive search planning, including the roles of sweep width calculations, and probability heat maps combining different models of lost-person behavior.

Search manager must be cartophiles—map-lovers—for whom a glance at a topographic map immediately conjures up a detailed mental image of the terrain of the search area.

Search managers must be tech-savvy, able to use—and help others use—the latest electronic gadgets and software to aid search operations and planning.

Search managers must be patient and expert teachers, as Base is full of opportunities—and demands—for on-the-job, just-in-time teaching.

Search managers must have, or quickly gain, a keen grasp of local politics, even to the point of knowing which officials are up for election and when, and the turf battles between local and regional emergency response agencies.

Search managers must have well-developed people skills, and the ability to get along with people of widely-differing personalities, though "leadership" in the macho-ish "win one for the Gipper" sense has little place in search management.

Becoming a search manager might sound like an impossible task. But many of those who join the ASRC have many of these talents. And their motivation is to leverage their existing skills to help others, and then learn new skills that then uniquely qualify them to help others. Search manager credentialing may not be for every ASRC members, but it's a logical extension of why people join the ASRC.

### Search Manager Levels and Requirements

Originally, we had four levels of related to search management: Incident Staff (IS) and three levels of Incident Commander (IC). While Incident Staff was not a bad name for someone who has expertise in serving in Base if not running the whole operation, the term IC was flawed. We never really had a member who truly served as IC in the ICS sense. Since we were all-volunteer, we never had to deal with the Finance section, and mostly depended on local expertise and resources for the Logistics section.

Some representative of the local Agency Having Jurisdiction (AHJ), which more commonly we used to call the Responsible Agency or Responsible Agent (RA), was usually *really* the IC. What we did is manage the search for the RA/AHJ. We provided services that comprised most of the Operations Section and parts of the Plans Section related to tactics and strategy, though not logistics or finance. That's why we changed the name to Search Manager (SM), which better fit our roles.

In the big update of the Training Standards to version 8, unlike the Field Levels, there was sentiment to consolidate the Search Manager levels from four to three, and this was unopposed. Why? Perhaps because advancement seemed to be less important to the Search Managers themselves, and simplifying the system might make it easier and more attractive for people to keep their Search Manager credentialing current.

Given the decrease over the years in the number of large searches, we decided to allow simulations that involve the ASRC and at least two other non-ASRC agencies to count the same as a real search; else, it might be impossible for Search Managers to keep up their credentials.

Related to this, we also moved to more continuing education and fewer required actual search management shifts at the higher levels. Managing a search is sort of like riding a bicycle; once you master it, it doesn't take that much practice to keep it up, and keeping up with the current thinking in search management is arguably more important.

We also decided to emphasize the role of mentoring for SM candidates.

Topic outlines for Search Manager training will be added after the Field portion of the Training Guide is completed and approved.

# Field IV (Trainee) Educational Goals

This curriculum is to ensure that those credentialed to Field Level IV achieve the following educational goals.

1. Learn the major life-safety and health hazards and risks for wilderness travel and wilderness search and rescue activities in the mid-Appalachian area, including subjective hazards and those from climate/weather, terrain, and flora and fauna, and how to compensate for them from planning, personal equipment, and basic wilderness first aid. These include

    a. Subjective hazards, including lapses in judgment such as in risk assessment and not compensating from the mental effects of sleep deprivation and physical stress,

    b. Hazards from the area's continental climate and changeable weather, including cold and heat exposure and lightning strikes,

    c. Hazards from the area's terrain, including slips and falls, rockfall, and streams and lakes,

    d. Hazards from pedestrian-vs-vehicle accidents, and from falling asleep at the wheel, and

    e. Hazards from bees and wasps, ticks and poison ivy.

2. Learn how to use the basic controls and functions of a team handheld radio, basic ASRC radio protocols, and enough of the phonetic alphabet and numerals to communicate standard field team status reports, including USNG/UTM location. Field IV credentialing requires only knowledge about how to effectively operate a radio, no actual radio experience required.

3. Learn enough about a personal GPS device or smartphone GPS app to be able to make sure the datum is set properly and determine WGS84 USNG/UTM location. Learn the concept of safety direction and when to use it.

4. Learn the basics of the Incident Command System (ICS), as applicable to wilderness search and rescue as practiced by the ASRC. This may be learned via the FEMA free online course Introduction to the Incident Command System, ICS-100.B: https://training.fema.gov/is/courseoverview.aspx-?code=IS-100.b Field Level IV members should have a working knowledge of critical ICS concepts, terms and principles, and how they may be modified slightly for wilderness search and rescue. While the ICS-100.B course incorporates additional material that may be helpful during a disaster response, it is not required for Field Level IV credentialing, and ICS-100.B or ICS-100.c material beyond what is covered in this curriculum will not be part of the test.

5. Learn the essentials of SAR operation procedures and good behavior.

6. Learn how to serve as a member of a litter team, carrying a litter on non-technical terrain (non-technical evacs), following standard ASRC procedures for litter team positions including litter team positions including Litter Captain, Medic, and speaker, and standard calls, lifting and setting down a litter, dealing with vomiting, load straps, laddering, toenailing, litter bearer rotation, paving, turtling and lap pass. Field IV credentialing requires only knowledge about how to safely carry a litter, no actual litter-carrying experience required.

# Field IV (Trainee) Curriculum

A free, online text for Field IV, called *Essentials for Search and Rescue*, is published by the ASRC and updated as needed. *Essentials* covers everything a new member needs to know to pass the short online test for Field IV.

As with any level of ASRC credentialing, Groups may add training material, requirements or more knowledge or skills. However, this is the minimum Field IV (Trainee) candidates are expected to be taught and which they are expected learn, and on which the online written test is based.

These curriculum topics are all knowledge-based; there is no expectation that Field IV qualification requires any demonstration or practice for any of these topics. We expect that as members progress through their Field III training, they will have opportunities to watch demonstrations and practice skills, including those listed as knowledge topics in the Field IV curriculum.

Those topics appear as knowledge topics here in the Field IV curriculum, and are repeated in the Field III curriculum with the annotation **Practice**. We don't expect any field or classroom practical training to achieve Field IV credentialing, as Field IV is the minimum credential to safely *participate* in field training. This is not to say that a new member cannot participate in classroom practical training en route to Field IV credentialing, but we strongly recommend that all new members read *Essentials for Search and Rescue* and take and pass the short, online test before participating in *field* training.

## A. Safety, Health and First Aid

### 1. Mid-Appalachian SAR Hazards and Risks

a. **Subjective vs Objective Hazards***

(1) Objective hazards: things in the environment such as cliffs or cold weather

(2) Subjective hazards: dangers from our own thinking, such as getting to a particular destination no matter the risk

(3) Search and rescue best practices help with both objective and subjective hazards by creating good habits that we still follow in bad situations

(4) Best practice to have knots and rigging, and other important decisions, **double-checked** by another member

(5) Best practice to **routinely practice** these checks during training to develop good habits

(6) Need to **assess risk vs. benefits** for a difficult task, including preplanning for injured field team member

b. **Climate and Weather Hazards**

(1) **Continental climate** – sudden changes in weather and extremes of weather

(2) **Lightning** strikes**
- i. High-danger and lower-danger areas
- ii. Step potential
- iii. 30/30 rule, and 20/30 rule for athletics
- iv. How fast thunderstorms may move
- v. Smartphone apps that track lightning strikes***
- vi. Environmental clues to an approaching thunderstorm
- vii. Safe to touch lightning strike victims
- viii. "Triage the dead": after lightning strike, if moving, will probably be OK; if appears dead, even with fixed and dilated pupils, may respond to short course of CPR

c. **Terrain Hazards****

(1) Falls down slopes or cliffs and "**safety zone**" near drops

(2) Falls from equipment failure and role of formal double-checks as a best practice

(3) Rockfall**,** helmets and **"ROCK!"**

(4) **Drowning** and PFDs for certain tasks near water

*Paulcke, W. and H. Dumler (1973). Hazards in mountaineering. New York, Oxford University Press.
**Zimmermann, C., et al. (2002). "Lightning safety guidelines." Annals of emergency medicine 39(6): 660-A661.
***https://www.weatherbug.com/
****http://www.conovers.org/ftp/SAR-Evacs.pdf

d. **Hazards from Vehicles**

(1) **Walking along roads** often most dangerous part of task

(2) Humans tend to discount danger

(3) Canines: poor awareness of traffic dangers

(4) Walk on left facing traffic if possible, safer

(5) Increase **visibility** with reflective gear or clothing

(6) Trains:
- i. Up to 80 mph (130 kph) in mid-Appalachians
- ii. High-visibility clothing of limited value: trains can't veer away or stop in time
- iii. One SAR team member killed by train
- iv. Look both ways before crossing tracks
- v. Do not walk on or near tracks

e. **Situational awareness**

(1) Whether walking along roads or in the woods, need to be aware of environment around you

(2) Must be alert to weather changes

(3) Must be alert to terrain hazards, such as dead trees when windy ("widowmakers") or slippery slopes

(4) Must be alert to slowly-changing situations
- i. Interaction of fatigue, exhaustion of energy, and dehydration or mild hypothermia may dull thinking
- ii. Need to keep eye on self and others

f. **Fatigue***

(1) **Falling asleep while driving** is the biggest life-safety hazard for SAR personnel

(2) Sleep is essential, both core sleep and non-core sleep

(3) Larks vs owls (morning vs night people)

(4) Circadian alertness rhythms and danger of driving at 0800 hours

(5) Caffeine may help temporarily but just postpones things

(6) Sleep deprivation makes people make mistakes, sometimes deadly mistakes

(7) Most common mistake not doing something wrong but forgetting to do something; why keeping a pocket notebook and writing things down essential when sleep-deprived

(8) Only **cure for fatigue** is:
- i. **Sleep**
- ii. Robert Koester recommends at least a half-hour nap to restore alertness

(9) **Mean Sleep Latency Test**: lay down in dark quiet place and keep eyes closed for 5 minutes
- i. If able to stay awake during this, likely OK to drive, at least right now
- ii. If fall asleep, get a nap, and then should be OK to drive right now

(10) Recognize **microsleep** ("nodding off for a second") as danger sign, especially if driving

(11) If very sleepy driving, *pull over and take nap*

(12) May nap at official highway **rest areas** in ASRC area as follows:
- i. Ohio: up to 3 hours
- ii. Pennsylvania: up to 2 hours
- iii. Maryland: up to 3 hours
- iv. Delaware: up to 4 hours
- v. West Virginia: unlimited but no overnight parking
- vi. Virginia: unlimited but no overnight parking

(13) Many WalMarts allow overnight parking; napping should not be a problem

(14) Even just pulling off side of road and napping for 15 minute preferable to maybe dying and killing others

(15) Sleep inertia (grogginess on waking up) happens, but not reason to not nap; just wait for it to go away

(16) Sleeping and napping best practices
- i. No caffeine for 6 hours prior to bedtime
- ii. No nicotine: mild withdrawal during sleep interferes with sleep middle of night

*Koester, R. J. (1997). Fatigue : sleep management during disasters and sustained operations. Charlottesville, Va., dbS Productions.

iii. No alcohol: rebound interferes with sleep last half of night
iv. Find comfortable, dark, quiet place; consider sleep mask and earplugs
v. Consider white noise, can use fan, can use app on cellphone or handheld radio tuned to unused frequency with squelch turned off
vi. No eating or reading in bed, especially on device with illuminated screen, even with blue filter on
vii. Easiest to nap at alertness minimum at 0800 and afternoon "sleep gate" 1400-1600.

g. **Hazards from Flora and Fauna**

(1) Problems not found in the mid-Appalachian region not covered

(2) Black bear, snake, mountain lion and wild boar attacks so rare that not covered

(3) **Bee and wasp and other insect stings**
i. Bees and wasps generally more aggressive in late summer and fall
ii. Removing stingers safely by scraping
iii. Immediate pain from stings: over-the-counter anti-itch or anaesthetic cream or liquid (e.g., pramoxine-menthol cream, Sting-Eeze) for pain, over-the-counter oral medications for pain
iv. Delayed local reaction, day or so later: red, swollen, itchy, use over-the-counter anti-itch cream, not associated with life-threatening immediate reactions
v. Mild generalized immediate reaction: hives alone
vi. Severe generalized reaction: anaphylaxis: usually hives first, then swelling of lips, tongue, airway (hoarseness), maybe wheezing causing shortness of breath, maybe low blood pressure
vii. Impending anaphylaxis (especially if visible lip or tongue swelling or hoarseness) means risk of death
viii. Immediate treatment of anaphylaxis: epinephrine intramuscular injection in lateral thigh, from autoinjector or drawn up from vial or ampule); lasts for ~ 15 minutes, may need second injection
ix. Ongoing treatment of anaphylaxis: over-the-counter H1-blocker antihistamine such as diphenhydramine (e.g., Benadryl) vs H2-blocker antihistamine such as famotidine (e.g., Pepcid; less sedating and equally if not more effective) for ongoing treatment of anaphylaxis; for *wilderness* first aid kit as important as epinephrine injection; also useful without epinephrine for hives

(4) **Ticks***
i. Blacklegged ticks as vector for Lyme disease, and how common Lyme disease is in area
ii. Insect repellents: DEET vs picaridin vs others
iii. Permethrin for treating clothing
iv. Checking for and removing ticks
v. Signs and symptoms of Lyme disease

(5) **Poison Ivy****
i. Poison ivy as a four-season hazard
ii. Urushiol
iii. Poison ivy as a delayed-hypersensitivity allergic reaction and differences with immediate hypersensitivity like beestings
iv. Human and great apes' unusual sensitivity to poison ivy allergy
v. Recognizing poison ivy
vi. Poison ivy decontamination, including crushed jewelweed as a field expedient
vii. Treatment of mild cases with over-the-counter medications
viii. Treatment of more severe cases with prescription steroid cream or oral steroids

## 2. Personal Equipment, Clothing and Survival***

a. Pack as wilderness life support system and "Don't get separated from your pack!"

b. Cheap sources for outdoor gear

(1) REI co-op

(2) Sierra Trading Post

(3) Pro deals

c. **The Ten Essentials****

(1) Background of The Ten Essentials

*http://www.conovers.org/ftp/Ticks.pdf
**http://www.conovers.org/ftp/Poison-Ivy.pdf
*** (2017). Mountaineering: Freedom of the Hills, Mountaineers Books.
****https://en.wikipedia.org/wiki/Ten_Essentials

(2) The Ten Essentials, Current Version
- i. Navigation
- ii. Sun Protection.
- iii. Insulation
- iv. Illumination
- v. First-aid
- vi. Fire
- vii. Repair kit and tools
- viii. Nutrition
- ix. Hydration
- x. Emergency Shelter
- xi. Water purification
- xii. Ice axe
- xiii. Signaling devices

d. **Personal Equipment and Supplies**

(1) Selecting equipment in general and for the specific task at hand
- i. Usefulness-to-weight and usefulness-to-bulk ratios
- ii. How likely you will need it
- iii. Even if unlikely you'll need it, how important it might be
- iv. Why we say ***don't get separated from your pack***
- v. Why always two leaf bags in your pocket
- vi. Learn from the experience of others to avoid mistakes
- vii. For extra clothing consider warmth to weight and warmth to bulk ratio
- viii. British hill-walking and climbing tradition of the "duvet in the pack"
- ix. Balaclava-style hood/hat
- x. Winter facemask as a rebreathe flap: high warmth-to-weight and warmth-to-bulk ratio, protects against frostbite
- xi. Thin breathable nylon windshirt with hood for very cold conditions, as breathes better than even "waterproof-breathable" parkas and prevents getting wet from sweat; waterproof garments not as important in deep winter

(2) Selecting a **pack**
- i. Suspension: hip belt and a sternum strap
- ii. Recommended capacity
- iii. Compression strap
- iv. Separate rain cover or rain liner

(3) Food and water
- i. Quick-energy food
- ii. Extra food
- iii. Standard *survival* times:

| | |
|---|---|
| **Food:** | **3 weeks** |
| **Water:** | **3 days** |
| **Shelter in the cold:** | **3 hours** |
| **Air:** | **3 minutes** |
| **Will to survive:** | **?** |

- iv. Needs for performance:
- v. Quick-energy food
- vi. Sustained energy
- vii. Essential amounts of fat and protein
- viii. 2000-4000 calories of food per day
- ix. Weight of food: fats most calories per unit weight, water has no calories: canned tuna in olive oil much more energy than canned tuna in water
- x. Freeze-dried food advantages and disadvantages
- xi. MREs
- xii. Water bottles, Gatorade mix, and duct tape around water bottle
- xiii. Water bladders, e.g., Camelbak
- xiv. Water purification tablets and filters

(4) **Gloves and mittens**
- i. Medical protective gloves
- ii. Leather, leather-palm or similar ropework gloves
- iii. Insulated gloves for spring and fall (touch-screen versions recommended)
- iv. Mittens for winter (touch-screen version or liner gloves that are touch-screen versions recommended)
- v. Importance of all gloves and mittens able to handle rope

(5) Climbing **helmet**

(6) **Visibility enhancements**
- i. Bright-color/reflective vests
- ii. Bright colors/reflective materials on packs and clothing
- iii. Bright reflective armbands

(7) **Eye protection** for day and night

(8) **Bivouac shelter** most survival gear
- i. Leaf bags and why five of them on ASRC pack list
- ii. Bothy bags
- iii. Sleeping-bag cover bivouac sacs

(9) **Smartphone Support**

i. Given importance of GPS and other smartphone apps, may want to have spare cellphone AC charger as tend to get lost during long searches
ii. May want DC charger in vehicle
iii. May want external cellphone charger in pack

e. **Personal First Aid Kit***

(1) Personal medications

(2) If history of anaphylactic reactions
i. Epinephrine autoinjector
ii. Primatene Mist; available over-the-counter again 2019 at $30, likely not as good as epinephrine autoinjector but cheap alternative treatment for anaphylaxis
iii. Chewable H2 antagonist antihistamine such as famotidine (e.g., Pepcid Complete) and/or a chewable H1 antagonist antihistamine such as diphenhydramine (e.g., Benadryl)

(3) Common over-the-counter medications, such as
i. Acetaminophen (generic Tylenol) for pain
ii. Diphenhydramine (generic Benadryl) for itching at nighttime
iii. Fexofenadine (generic Allegra) for itching during the day
iv. Famotidine (generic Pepcid) for acid indigestion
v. Loperamide (generic Imodium-AD) for diarrhea.
vi. Naproxen (generic Aleve) for pain
vii. Pramoxine-menthol cream for itching
viii. Sting-Eeze for beesting pain

(4) Minor injury supplies
i. Bandaids
ii. Moleskin and/or 3M micropore tape for blisters
iii. Ampules of tincture of benzoin to make bandages stick better

(5) Tick remover

f. Swiss Army knife or multitool

g. Compass suitable for orienteering-type navigation

h. GPS unit or smartphone with GPS app

i. Headlamp with LED bulb and lithium batteries

j. **Clothing****

(1) Selecting clothing suitable to the weather not just now but for tonight and tomorrow

(2) **Layer principle**
i. Traps air for insulation
ii. Flexible for changing conditions
iii. Baselayer
iv. Insulation layers
v. Shell garments
vi. Duvets

(3) **Clothing materials**
i. Polyester baselayer and fleece
ii. Wool
iii. Down
iv. "Artificial down"
v. "Cotton kills!"
vi. Nylon
vii. Softshell materials
viii. Waterproof-breathable shells
ix. Dri-Release

(4) **Blisters**
i. "Hamlet Socks"
ii. Terry-knit wool on outside of socks
iii. Merino wool

(5) **Boots**
i. "A pound on your foot is like ten pounds on your back"
ii. Well-fitting, broken-in boots
iii. Features for SAR boots: ankle support, protection against rock bruises, waterproof
iv. After-market insoles

(6) **Sun Protection**
i. Sunburn and second-degree sunburn
ii. Clothing and hats with brims
iii. Sunscreen
iv. Sunglasses

## 3. Hypothermia***

a. Hypothermia = low (hypo-) temperature (-therm-) condition (-ia)

*http://www.conovers.org/ftp/AMRG-Personal-Wilderness-Medkit30c.pdf
**http://www.conovers.org/ftp/Clothing-Materials.pdf
***Zafren, K., et al. (2014). "Wilderness Medical Society Practice Guidelines for the Out-of-Hospital Evaluation and Treatment of Accidental Hypothermia." Wilderness Environ Med 25(4): 425-445.

b. Getting chilled *deep inside:* not just the periphery (arms and legs), but the core, vital organs such as brain and heart

c. "Killer of the Unprepared"

d. **Heat Balance**

(1) Body producing heat continuously

(2) Heat production must equal heat loss to keep body temperature from going up or down

(3) Narrow range of body temperature needed for normal body processes to work

(4) Use clothing and knowledge to keep body core near 99°F=37°C

e. Lose heat from:

(1) Cold temperature
i. **Radiation**
ii. **Conduction**

(2) **Windchill**: convection

(3) **Wetchill**
i. Conduction into and through cold water in clothes
ii. Evaporation

f. **Hypothermia Weather**

(1) Temperatures around freezing (32°F=0°C) with wind and rain: cold temperature, windchill, and wetchill

(2) Danger in summer thunderstorms
i. Windchill
ii. Wetchill
iii. Cold upper-atmosphere air comes down in center of thunderstorm and drops temperature markedly, may have sleet or hail even is summer

g. **Clothing** as life-support system

(1) Waterproof raingear to prevent wetchill

(2) Condensation even in "waterproof-breathable" parkas and pit zips and other ventilation

(3) Wet clothing conducts heat like water

(4) Need *warm when wet* clothing

(5) Down flat and cold when wet

(6) Cotton useless as insulation when wet

(7) Only wool and some synthetics retain some warmth when wet

h. **The Three W's**

(1) **Waterproof Clothing**

(2) **Warm-when-Wet Clothing**

(3) **Windproof Clothing**

i. **Two large plastic leaf bags** as survival shelter standard survival teaching for anyone in the outdoors; ASRC says keep **five** in your pack so you have extras for others

j. **Hypothermia recognition**

(1) People may be cold on outside but still warm on the inside: "chilled"

(2) If in cold environment, chilled, and showing signs of poor mental and physical coordination, assume hypothermic

k. **Hypothermia treatment** (team member, not patient)

(1) Treatment depends on context

(2) In the field with hypothermic team member
i. Interrupt task, inform Base if possible
ii. Seek sheltered area, get out bivouac gear
iii. If have bothy bag for team, get it out and use it
iv. Share and *force food and water*, share clothing and shelter, huddle for warmth
v. Food *essential* to keeping warm; body burns it, creating warmth
vi. Building fire generally not worthwhile use of energy and time
vii. Plan for getting back to civilization; once warmer and fed, forced march may be best plan

## 4. Frostbite*

a. **Wind-chill temperature**

(1) Not good index of hypothermia danger

(2) Good index of frostbite danger for exposed skin

b. **Frostnip** = superficial frostbite = first-degree frostbite: freezing of the superficial tissues

(1) Usually fingers, toes, ear lobes, and noses
   i. Sudden blanching of nose, ear, or fingertip
   ii. Part pale or yellowish, but still soft to the touch
   iii. Numbness not a useful for diagnosing
   iv. Cold skin gets numb before frostnip

(2) Treatment of frostnip
   i. Warm hand over nose or ear, or placing frostnipped finger in mouth, armpit, or warm pocket
   ii. On rewarming affected part red, painful, possibly slightly swollen, but no permanent damage

(3) Face masks and goggles or sunglasses for protecting face from frostbite

(4) Team members should check each other's faces regularly for blanching

c. **Deep Frostbite**

(1) Deep tissues frozen

(2) Affected part feels hard, like wood or frozen meat

(3) Freezing causes great tissue damage; effects postponed until re~warmed

(4) Once rewarmed, excruciating pain and blistering

(5) Trauma to frozen tissue may push sharp ice crystals into cells, rupturing them

(6) "You can walk on frostbitten feet, but you can't walk on rewarmed feet" but walk on frostbitten feet only to save your life as much more damage

(7) Human body highly resistant to freezing but
   i. Too-tight boots, dehydration or hypothermia or exhaustion impair circulation, make frostbite more likely
   ii. Two pair of socks with pair of boots fitted for one pair of socks may cause ("two-sock frostbite")
   iii. When very cold and wind very strong can get frostbite of exposed skin even if healthy
   iv. Even if healthy can get frostbite by touching bare hand to supercooled metal, or by spilling sub-freezing stove fuel on a hand

(8) Secondary phase of damage after rewarming
   i. Thawed tissues inflamed, damage to blood vessels, small clots
   ii. Blood vessels leak, causing swelling
   iii. Blood vessels go into spasm, cutting off blood supply

(9) Definitive treatment of deep frostbite
   i. **Rapid rewarming** in hot water, 99-102° F (37-39°C)
   ii. If don't have thermometer, dip elbow in water; if feels hot but can keep elbow in, about right
   iii. Don't rewarm until no danger of re-freezing, refreezing causes severe damage
   iv. Frostbitten limbs numb: don't cook in too-hot water, or burn rewarming by fire
   v. Non-steroidal anti-inflammatory drugs (NSAIDs) ibuprofen (Motrin, Nuprin, Advil), naproxen (Aleve) and aspirin, if given early, prevent some tissue loss
   vi. Ibuprofen preferred

## 5. Heat-Related Illness**

a. **Heat Acclimatization**

(1) In winter, lose heat acclimatization

(2) Takes about 1-2 hours of exertion a day for 10-14 days to regain heat acclimatization

(3) Heat acclimatization lasts for about a month

*McIntosh, S. E., et al. (2011). "Wilderness Medical Society practice guidelines for the prevention and treatment of frostbite." Wilderness Environ Med 22(2): 156-166.
**

(4) Heat acclimatization: many changes to better tolerate heat exposure and lose heat better

(5) One change of heat acclimatization is to decrease amount of salt in sweat; when first exposed to heat in spring and not acclimatized, lost lots of salt, need to increase salt in diet for ~ 2 weeks

b. **Dehydration**

(1) Common even in winter
   i. Lose water by airways humidifying dry air
   ii. In winter "rebreathe flap" across mouth and nose decreases water loss, decreases the heat loss from evaporation

(2) Signs and symptoms
   i. Thirst may occur; but not necessarily
   ii. Lightheadedness, weakness, tunnel vision, or headache
   iii. No urine, or small amounts dark urine
   iv. May get so weak cannot continue with task
   v. Extreme cases: may not be able to stand without losing consciousness

(3) Mild dehydration decreases aerobic, muscular and mental performance

(4) Prevention: must bring enough water, especially in hot weather; single liter/quart water bottle not enough on hot day

(5) Water bladders (e.g., CamelBak) hold multiple liters of water and encourage frequent drinking and likely improve performance

(6) Monitor yourself and teammates for dehydration; team leaders may schedule pee stops, asking about amount and color of members' urine

(7) Treatment
   i. Drink more water
   ii. Dehydration from sweating: loss of water *and salt*
   iii. If not enough salt to hold water in body, water will pass right through
   iv. Salt depletion common at beginning of hot weather: people not acclimatized to heat
   v. Heat acclimatization includes producing less-salty sweat
   vi. About two weeks' moderate exercise for 1-2 hours/day in heat to acclimatize
   vii. Especially if not acclimatized, need to increase salt intake
   viii. Salty foods have much more salt than electrolyte drinks
   ix. Avoid salt tablets, cause stomach problems

c. **Heat Exhaustion**

(1) Very bad dehydration, feel faint

(2) No real dividing line between dehydration and heat exhaustion

(3) Dehydration raises body temperature mildly

(4) Skin should be slightly damp

(5) Treatment is rest in shady area and salt and water repletion

d. **Heatstroke**

(1) Qualitatively different from dehydration and heat exhaustion

(2) Certain medications make heatstroke more likely; those on them may get heatstroke in hot environment without major exertion

(3) Aerobically-fit people in a hot environment can create heat faster than they can get rid of it ("exertional heatstroke")

(4) Core body temperature rises high enough to damage vital organs

(5) May cause lifelong medical problems or death

(6) If right setting for heatstroke, skin hot and maybe dry and confused or comatose, assume heatstroke and treat for it

(7) Skin may be dry or wet, flushed (red) or pale

(8) Treatment: reduce the person's temperature to near-normal
   i. Immerse in cold water if available
   ii. Cold or even cool water on clothing. fan to increase evaporation
   iii. Do not over-cool, hypothermia is risk

(9) Don not give acetaminophen (Tylenol) or ibuprofen (Motrin, Advil, Nuprin) or naproxen (Aleve) as likely to make patient worse

## B. Communications*

1. Goal: accurate, clear, and effective reports over radio

   a. Before speaking:

      (1) Take time to organize thoughts

      (2) Rehearse under breath

      (3) Use ASRC radio standard operating procedures

   b. ASRC Radio SOP Crib Sheet has standard ASRC prowords and phonetic alphabet

      (1) Keep copy of crib sheet in SAR pack.

      (2) Field Level IV: may use Crib Sheet rather than having entire phonetic alphabet memorized

      (3) Essential prowords, their meanings and their appropriate use:
      This Is
      Over
      Go Ahead
      Roger
      Affirmative
      Negative
      Clear
      Clear the Net
      Secure the Net
      Status One
      Status Two
      Status Three

2. How to operate standard handheld radio controls and perform simple field maintenance tasks:

   a. Operate off/on switch

   b. Operate volume adjustment

   c. Operate push to talk

   d. Operate channel selector

   e. Attach and detach antenna (note that transmitting without an antenna properly attached may kill a radio)

   f. Replace battery

   g. Toggle keyboard/channel select lock if available

   h. Other buttons might accidentally hit and how to recover from it

3. Standard radio communications procedures:

   a. Push push-to-talk button

   b. Pause for a second

   c. Speak in normal tone

   d. Speak slowly and distinctly

   e. Use basic prowords

   f. Use "you, this is me," not "me to you"

   g. Break long transmission with "break… continuing" to allow priority radio traffic to break in; or say, "How copy so far?" then release push-to-talk

## C. Land Navigation**

### 1. UTM/USNG Grid System

   a. **Universal Transverse Mercator (UTM)** system commonly used for wilderness SAR

   b. At scale of wilderness SAR, UTM same as newer **United States National Grid (USNG)**

   c. Searches in mid-Appalachian area in USNG Zone 17S, 17T, 18S, or 18T

   d. Entire lost-person search in one zone, so do not report or record zone

   e. Numeric USNG/UTM grid coordinates may be to arbitrary precision, but standard to report your position to a 10 meter precision, **four digits east-west and four digits north-south**

   f. USNG/UTM grid coordinate is number of meters east of zone's western boundary, and number of meters north of zone's southern boundary

      (1) "Easting" (meters east of the zone's western edge) comes before "northing" (meters north of the zone's southern edge)

*http://archive.asrc.net/ASRC-Training/1977-01-00-Radio-Communications.pdf
**http://www.conovers.org/ftp/Land-Navigation.pdf
(2017). Mountaineering: Freedom of the Hills, Mountaineers Books.

(2) Standard mnemonic for this it "**read right, up**"

g. **UTM/USNG Example**

(1) If standing at Newcomb Hall Post Office at University of Virginia, ASRC's official mailing address:

(2) Look at GPS, GPS app, or USNG app (preferred) and see "17S QC 1880 1269."

(3) Ignore "17S QC" as same for everyone in vicinity

(4) Report position over the radio: "**Base, this is team Bravo. Our location is, figures, WUN, AIT, AIT, ZE RO, [pause] WUN, TOO, SIX, NIN er.**"

(5) Maps printed from SARTopo or similar usually have gridlines labeled with UTM coordinates

(6) On these maps may see gridlines labeled: **07188**00 on one of the gridlines at bottom, **42127**00 on one of the gridlines at the right

(7) These UTM coordinates to the meter, so to give coordinates to 10 meters, give ***two big numbers and then next two numbers:***
"**Base, this is team Bravo. Our location is, figures, WUN, AIT, AIT, ZE RO, [pause] WUN, TOO, SEV en, ZE RO, ZE RO.**"

(8) May see this format for GPS position on many GPS units and GPS apps, so may need to parse the numbers as for printed map

### 2. Safety Direction

a. Base or Field Team Leader may give compass safety direction such as northeast

b. If get separated from team and go this direction, should come to linear feature that leads back to civilization

c. Can look at the map and pick safety direction before starting out

## D. Operations, Management and Leadership

### 1. ICS as Adapted for SAR*

a. **ICS**

(1) National, mandated **Incident Command System** for all US inter-agency incidents

(2) Most emergency services workers learn some ICS

(3) ASRC members use ICS *regularly*

b. **ICS Functions and Positions**

(1) **Command**
i. **Incident Commander (IC)**
ii. On larger incident may also include additional **Command Staff**:
iii. **Public Information Officer**: handles interactions with press and public
iv. **Safety Officer**: in overall charge of safety
v. **Liaison Officer**: handles relations with supporting agencies (such as ASRC)

(2) **General Staff**
i. Broken into four functional parts who report to IC:
ii. **Operations**: **Operations Section Chief** ("**Ops**"): sometimes an Agency Having Jurisdiction/Responsible Agent will ask an ASRC Search Manager to take on this task
iii. **Planning**: **Planning Section Chief** ("**Plans**") (also sometimes combined with Ops: "**Plops**")
iv. **Logistics**: **Logistics Section Chief** ("**Logs**")
v. **Finance/Administration**: Finance/Administration Section Chief

c. **Standardization**

(1) Common terminology for:
i. Functions
ii. Facilities
iii. Resources
iv. Positions

(2) Standard for communications: no codes, use English and use functional position or last name

* https://training.fema.gov/emiweb/is/icsresource/assets/reviewmaterials.pdf

d. **Chain of Command**

(1) Starts with Incident Commander

(2) Down through levels to individual searcher

e. **Unity of Command**

(1) You report to only one supervisor

(2) You get instructions only from that supervisor

f. **Unified Command**

(1) When multiple Agencies Having Jurisdiction (AHJ)/Responsible Agents (RAs)
   i. Each AHJ/RA has own IC
   ii. ICs work together to command operation using single Command Staff and single General Staff
   iii. Co-located shared facilities
   iv. A single shared set of objectives, planning process, and IAP:

g. **Incident Action Plan**

(1) "**IAP**"

(2) The overall plan for the search or rescue

h. **Modular Organization**

(1) Jobs are chunked

(2) Use standard terms for the chunks, such as **Plans** or **Ops**

i. **Flexible**

(1) One person can assume more than one function, or all functions, for small incident

(2) Others can be assigned positions as incident and incident staff expands

j. **Manageable Span Of Control**

(1) Per ICS, 3–7 subordinates per position

(2) More than 7 just doesn't work

(3) Five is ideal maximum, except maybe in line search, but usually have assistant team leader on other end of line

k. **Sign-in and Sign-out**

(1) Important in ICS

(2) Critical for SAR

l. **Accountability**

(1) See separate section later on accountability

(2) Includes more details than in ICS-100

m. **Resource Tracking**

(1) Keeping track of "resources" (people, teams, vehicles)

(2) Whether need more resources

n. **Standard Location Terms**

(1) Standard ICS terms:
   i. **Incident Command Post** (**ICP**)
   ii. **Base**
   iii. **Camp**
   iv. **Helibase**
   v. **Helispot**
   vi. **Staging Area**

(2) For smaller SAR operations combined and called "**Base**"

(3) Standard map symbols for these places, Field Level IV not expected to memorize

o. **Communications**

(1) ICS says should only use plain English and position titles or last names

(2) Per ICS, don't use non-ICS abbreviations or 10-codes

(3) For ASRC, use standard radio prowords per ASRC Radio Crib Sheet including Status 1, Status 2, and Status 3 but everything else in plain English

p. **Task Assignment Form (TAF)**

(1) **TAF**: form similar to the ICS Assignment Form (ICS 204)

(2) ASRC originated TAF in 1970s

(3) Used in different variants nationwide for assigning tasks to search Field Teams

(4) TAF covered in detail for Field Level III

(5) Field Level IV: need to know that:
   i. TAF is wilderness search and rescue add-on to ICS
   ii. Commonly used
   iii. **Field Team Leader** (**FTL**) responsible for carrying out task specified on TAF

q. **Other ICS Positions**

(1) Field Level IV doesn't need to memorize:
   i. Names for ICS supervisory positions (Officer, Chief, Director, Supervisor, Leader)
   ii. Differences between Branches, Groups, or Divisions
   iii. Units that may be parts of a Section, Branch, Group or Division
   iv. Definitions or standard sizes of Strike Teams or Task Forces

(2) For wilderness search and rescue best practice to hand-craft variable-size Field Teams (term not used in standard ICS) for specific tasks

## 2. Operational Procedures

a. **Group Alerting Process**

(1) How process works

(2) How expected to respond when alerted

b. **Best Practices for Safety**

(1) **Double-checking** knots and rigging by a separate person

(2) **Wearing a helmet and gloves** when appropriate

(3) Carrying some semblance of
   i. **Ten Essentials**
   ii. ASRC required gear list
   iii. As adapted to task and weather and terrain

c. **Best Practices For Conduct**

(1) How to **sign in *and out***

(2) **Why** signing in and out so important
   i. Don't want people out searching for you when on way home
   ii. Has happened, many times

(3) **Staging area**
   i. Where you rest, eat, drink, and wait patiently for assignment
   ii. Why important *not to bother* incident staff

(4) **Chain Of Command**
   i. Why important to observe chain of command
   ii. Option to refuse unsafe task at any point

(5) **Accountability**
   i. **Personnel Accountability Report** or **PAR**
   ii. Phrase "**we have PAR**": everyone on our team is here or otherwise accounted for

d. **Personal Conduct**

(1) When **approached by the press**
   i. Give general information on what it's like be involved in SAR
   ii. Refer specific questions about operations up chain of command or to **Public Information Officer** (**PIO**)

(2) Observe **communications security**
   i. Turn down radio when near people other than team
   ii. Turn volume *way* down if hear **Secure the Net**.

(3) Interpersonal/interagency **conflicts**
   i. As dangerous to the mission as incompetence
   ii. Importance of trying to defuse them

(4) Avoid even *appearance* of **publicly criticizing other persons** or organizations involved in the mission
   i. If need to, do it **privately** one-on-one with superior in command chain or in secure debriefing
   ii. As mother used to say, "if you can't say anything nice about someone, don't say anything at all"

(5) Avoid even *appearance* of **freelancing/ self-deploying:**
   i. Responding to a situation without approval of Agency Having Jurisdiction/Responsible Agent, or
   ii. Responding to field or deviating from assigned task without coordinating with Base

iii. Freelancing/self-deploying can be by individuals, field teams, or SAR organizations
iv. Freelancing/self-deploying may disrupt search operations (e.g., not knowing another team is in segment being searched by an air-scenting dog)
v. Reputation for freelancing/self-deploying bad for people and for teams: don't get called
vi. Freelancing/self-deploying can be deadly: in 2010s, non-ASRC SAR team self-deployed to a search area after search officially concluded, without letting AHJ/RA) know; AHJ/RA told the railroad company to let trains start running through area again, and a train hit and killed SAR team member

## E. Rescue*

### 1. Lifting a Litter

a. Don't get hurt: avoid back injury

b. Person in driver's seat (front left, in current direction of litter movement) is **Litter Captain**

c. **Litter Captain** says "**Ready! [pause] Lift!**" (ASRC standard)

d. "**Prepare to Lift!**" or "**Ready to Lift!**" or "**One, Two, Three, Lift!**": acceptable but deprecated alternatives

e. **[pause]**: **Litter Captain** quickly scans all the litter bearers to assure they are ready

f. Litter bearers may respond to "**Ready!**" with "**Hang on a minute!**" or "**Wait!**" or "**Stop!**"

g. "Lift with your legs, not your back"

h. Face litter

i. Squat down on one knee, keep other knee up

j. Put both hands on litter rail

k. Lean away from litter, keeps your back straight and upright

l. Don't lift, pull *out*; pull directly away from litter bearer across from you

m. Only **Litter Captain** communicates with rope team if the litter being belayed

### 2. Putting Down a Litter

a. Reverse of picking up

b. Standard call is "**Ready! [pause] Down!**"

c. Lean out and keep head up and buttocks down as lower litter, to protect back

d. Might put the litter down on a rock or sharp object, so before putting litter down, visually check or sweep with feet to check for objects during **[pause]**

e. Also may need to secure litter from sliding

(1) Two litter bearers may hold onto litter

(2) If have a short rope may clip onto a tree or rock

### 3. Litter Positioning

a. Medic may tell team to

(1) Keep litter in slightly head-down position (perhaps blood loss, dehydration, or hypothermia), or

(2) Slightly head-up position (perhaps head injury, or breathing problem)

(3) May need to carry litter higher, strain on the arms

### 4. Vomiting

a. Litters designed to carry people on backs, traditional to package patients on back

b. If vomit when on back, vomit may get into lungs

c. If see litter patient on back vomiting, yell "**Stop! Vomiting!**" and rotate litter sideways away from **Litter Captain**

d. Rotate litter 90° or more

*http://www.conovers.org/ftp/SAR-Evacs.pdf

### 5. Carrying the Litter

a. **Stops**

(1) May need stop for medical reason

(2) May need stop to change litter rigging

(3) Patient may need to pee

(4) Otherwise, litter should never stop moving

b. **Litter Bearing**

(1) Standard for non-technical evacs (without rope belay): six litter bearers

(2) Load straps make carrying easier
- i. 2" or 1.5" flat nylon webbing, 10' long
- ii. Girth-hitch middle of load strap to litter rail behind your hand on the rail
- iii. Lift litter
- iv. With hand not used for litter rail, reach across in front and grab load strap next to litter rail, slide hand out along it until 2-3' stretched out from litter rail
- v. Lift hand up over head, flip strap backwards over head
- vi. Load strap now diagonally across upper back and forwards across shoulder
- vii. Bring hand down in front of chest
- viii. Wrap load strap few times around hand, pull down hard
- ix. Some litter load now on left shoulder
- x. 2"/1.5" webbing superior to 1" webbing, less pain in shoulder

### 6. Rotating Litter Bearers

a. ASRC protocol for rotating litter bearers from early 1970s to meet these principles:

(1) Litter should not stop

(2) Litter bearers alternate using right and left arms

(3) Litter bearers in pairs roughly matched by height

(4) Litter bearers ready to rotate in to carry litter whenever Litter Captain calls "Ready to Rotate!"

(5) Relief bearers do not have to pass litter

b. Based on this:

(1) Relief bearers *in front* of the litter

(2) When Litter Captain calls "Ready to Rotate!":
- i. Relief bearers step off trail on either side
- ii. Relief bearers set feet
- iii. As litter passes, relief bearers grab tail end of litter, move out into trail
- iv. Once both relief bearers have hand on litter, back left relief bearer calls "Rotate!" and both new back litter bearers use free hand to tap hand of litter bearer in front of them
- v. Litter bearers in front of relief bearers shift forward one position, use free hand to tap hand of litter bearer next towards head
- vi. Those litter bearers move forwards, tap hand of front litter bearers in front
- vii. Front litter bearers let go of litter, cross sides, walk ahead of litter, go to head of line of relief bearers on trail ahead

### 7. Obstacles: Laddering, Toenailing, Turtling

a. **Laddering**

(1) Laddering used to move litter past obstacles that prevent normal carrying

(2) Importance of not moving feet during laddering: decreases falls

(3) Starts as litter team slides head of litter onto or over obstacle in trail

(4) Litter Captain calls "Ready to Ladder!"

(5) Back two litter bearers:
- i. Let go of litter
- ii. Scramble forwards around obstacle to just in front of head of litter
- iii. Find secure footing
- iv. Grab top of litter with one hand
- v. New front left litter bearer is now new Litter Captain
- vi. If other new front litter bearer looks ready, new Litter Captain calls "Ladder!"

(6) *Without moving feet,* litter bearers shift litter forwards

(7) Sequence repeats, from (3) to (6), as long as needed to get over obstacle

b. **Toenailing**

(1) Can ladder up short, steep slope: "toenailing"

(2) Litter bearers not moving feet when laddering even more important on slopes, to decrease danger of slips and falls

(3) Starts as litter team pushes head of litter onto ground to secure it ("toenailing")

(4) Litter Captain calls "Ready to Ladder!"

(5) Back two litter bearers:
   i. Let go of litter
   ii. Scramble forwards around litter and uphill to just above head of litter
   iii. Find secure footing
   iv. Grab top of litter with one hand
   v. New front left litter bearer is now new Litter Captain
   vi. If other new front litter bearer looks ready, new Litter Captain calls "Ladder!"

(6) *Without moving feet,* team lifts litter a foot and moves it forwards and toenails into slope

(7) Sequence repeats, from (3) to (6), as long as needed to get up steep slope

(8) Can toenail down as well, but much easier to use a rope belay as simple semi-tech evac (covered in more advanced training)

# Field III Educational Goals

This curriculum is to ensure that those credentialed to Field Level III meet the following educational goals.

## A. Safety, Health and First Aid

1. Learn principles of personal hygiene during search and rescue operations, and their role in disease prevention.

2. Learn the confidentiality restrictions on ASRC members, both from ASRC best practices about protecting the personal information of search and rescue subjects, and from legal constraints on medical information related to HIPAA (the Health Insurance Portability and Accountability Act).

3. Learn standard principles and use of Personal Protective Equipment (PPE) and best practices related to bloodborne pathogens (BBP) as adapted for wilderness search and rescue.*

4. Learn the principles for a forced bivouac: siting and microclimate, improvising emergency shelter and insulation, and possible roles for fire-building during an emergency bivouac.

5. Learn about the reasons for backcountry water purification, current technology for backcountry water purification, and strategies for selecting water purification methods for a search and rescue pack.

## B. Communications

1. Learn the uses, advantages and disadvantages of signal mirrors and improvised mirrors, smoke, flares and chemical light sticks.

2. Learn how to use the entire phonetic alphabet and numerals, ASRC prowords, and ASRC radio protocols as outlined in the ASRC Radio SOP Cribsheet.

3. Learn best practices for using cellphones for wilderness search and rescue communications, including methods to improve communications, advantages of texting over voice communications, and using smartphone Bluetooth push-to-talk apps to provide intra-team communications.

4. Learn how to confidently and reliably use the major controls of handheld radios and to perform basic field maintenance tasks such as changing antennas or batteries.

5. Learn how to confidently and reliably use standard radio protocols and a radio to communicate.

## C. Land Navigation

1. Learn to use the UTM/USNG and ASRC grid systems to plot a location on a map, and to read and communicate the grid coordinates of a point on the map.

2. Learn about true north, grid (map) north, magnetic north, and magnetic declination, and be able to convert bearings from magnetic to grid and back.

3. Learn about the three map/GPS datums and how setting the datum wrong can affect GPS location accuracy.

4. Learn the basics of how the GPS system works, and basic GPS terms, including GPS, GPS receiver, GPS unit, APRS, vector and raster maps, the two types of digital USGS topographic maps, GPS fix, dilution of precision, multipath interference, GPS track, and GPS waypoint.

5. Learn that one can transfer .gpx files between a smartphone GPS app, a dedicated GPS unit to a laptop computer in Base and the advantages of this.

6. Learn common GPS problems and how to work around them.

7. Learn how to navigate using map, compass and GPS or GPS smartphone app, well enough to reliably complete basic-level orienteering courses during daylight.

*For most Groups, there are state requirements for bloodborne pathogen (BBP) training and completing that requirement will meet this requirement.

## D. Operations, Management and Leadership

### 1. System Operations

a. Learn how the ICS operates for a small incident through the free online course IS-200.B: ICS for Single Resources and Initial Action Incidents: https://training.fema.gov/is/courseoverview.aspx-?code=IS-100.c and how the ICS is adapted for search and rescue operations by the ASRC.

b. Learn the phases of a search and rescue operation and the major events in each phase.

### 2. Field Team Management

a. Learn the functions usually required of a field team, how those functions can be efficiently delegated by assigning a named position to a team member, and the field team position names traditionally used by the ASRC.

b. Learn why imbuing patience is an important team leader skill for leading teams of emergency services workers, but difficult.

c. Learn the advantages and limitations of the GAR (green-amber-red) model for assessing risk for search and rescue operations and methods for estimating search or rescue urgency.

d. Learn standard outdoor recreation trip leader skills, including assessing the extent and difficulty of the task, assessing the team members' capabilities and limitations, and measuring against the assigned task, promoting situational awareness, modeling good behavior, bringing extra gear for emergencies and for unprepared team members, and monitoring team members' condition.

## E. Search

1. Learn basic search terms and their definitions, including:

   a. Common search management terms,

   b. Common search resources,

   c. Common search strategies,

   d. Search tactics,

   e. Search Types I, II and III,

   f. The LAST mnemonic, and

   g. Common search tasks.

2. Learn best practices for finding clues, evaluating potential clues, and dealing with clues.

3. Learn the functions and procedures usually used to accompany a search dog and dog handler as a "flanker," also known as a "walker."

4. Learn best practices when dealing with a potential or actual crime scene in the backcountry.

5. Learn legal aspects relevant to search, including various types of trespass.

## F. Rescue

1. Field IV credentialing requires only knowledge about how to safely carry a litter, but those credentialed Field III are expected to practice this until competent.

2. Learn how to serve safely and effectively as a member of a litter team, including the following.

   a. Learn how to carry a litter on non-technical terrain or semi-technical terrain (non-technical and semi-tech evacs), including clipping into the litter.

   b. Learn how to follow standard ASRC procedures for litter team positions including: Litter Captain, Medic, Speaker, and standard litter team calls.

   c. Learn best practices for lifting and setting down a litter, dealing with vomiting, using load straps, laddering and toenailing, and litter bearer rotation.

# Field III Curriculum

The majority of the topics in this curriculum are knowledge-based, and for these, attend Group or ASRC training, and read the recommended references.

Some of the topics are psychomotor skills, for example, tying a knot. For psychomotor skill topics, we recommend that students observe a skill being performed and then practice it. Such psychomotor skills are indicated by the annotation **Practice**.

If you are a Group Training Officer planning your training schedule, or an instructor preparing to run a class, **Practice** is your key to cover these topics in practical sessions, either small groups in a classroom or during field training.

If you are using this curriculum to plan your personal learning and progress towards Field III credentialing, **Practice** indicates that you should either:

- Seek out someone more experienced to demonstrate a skill to you, such as how to tie a particular knot, and then have someone experienced observe one-on-one while you practice it.
- For a group skill like rotating litter bearers, get *several* experienced someones to demonstrate it to you, then practice it with them.

If you need to learn and practice a group skill, work with your Group Training Officer and training session instructors and request that they incorporate the skills you need into training sessions.

## A. Safety, Health and First Aid

### 1. Personal Hygiene

a. Role of handwashing/alcohol based hand cleaners in preventing diarrhea, colds, influenza

(1) Clean hands after pooping or peeing (skin in genital area covered with fecal bacteria)

(2) Clean hands before eating

b. Alcohol-based hand cleaner effective against most germs, but not those that cause norovirus infections ("24-hour stomach flu") or Clostridium difficile ("C diff") infections; more on handwashing under Bloodborne Pathogens

c. Using trowel or heel-dig cat-hole to bury your poop, and how far to dig in mid-Appalachian fields and forests

d. Be very suspicious of food served by local people to help feed searchers at Base: common cause of food poisoning as not being refrigerated or hot enough for several hours promotes bacterial growth, flies may contaminate food with fecal material

e. Toothbrush and toothpaste and flossers appropriate, especially on multi-day searches; think of teammates

### 2. Fatigue, Exhaustion and Nutrition

a. **Fatigue**

(1) Mental fatigue covered in Field IV curriculum

(2) Physical fatigue comes from buildup of waste products, such as lactic acid, in muscles and throughout the body; takes rest to clear waste products from muscles and rest of body

(3) Physical fatigue may be in specific muscle groups, such as arms and upper body after carrying litter; weight training will improve muscle endurance and allow longer use of those muscle groups

(4) Physical fatigue may be generalized; aerobic = "cardio" exercise will improve endurance in this respect

b. **Exhaustion**

(1) Physical exhaustion is when energy reserves, such as glycogen = "animal starch" in muscles and in liver is used up

(2) Good nutrition before heading into field will help prevent exhaustion, as will eating well in field, even if just snacking frequently

(3) Experienced outdoorspeople and SAR people stock belt pouches, pack hipbelt pockets and other pocket with snacks that may be eaten without stopping

c. **Nutrition**

(1) Quick-energy foods contain sugars, usually sucrose (table sugar) but often the more-rapidly-absorbed glucose

(2) Starches are long chains of sugars that provide a bit more sustained energy than sugars, but are a bit harder to digest

(3) Both sugars and starches are carbohydrates = "carbos"

(4) Carbohydrates are considered high-glycemic = high glycemic index:
   i. Carbos cause blood sugar to rapidly rise (good when need energy for strenuous exercise)
   ii. This high blood sugar causes body to increase level of hormone insulin, which pushes blood sugar into cells
   iii. Increased level of insulin tends to stay up and cause blood sugar to "crash" (become low = hypoglycemia) unless continue intake of carbos
   iv. Hypoglycemia may cause weakness or fainting
   v. Adding some fat to the carbohydrates slows digestion and release as blood sugar, so preventing blood sugar "crashes"
   vi. "Fiber" (long-chain carbohydrates that we cannot digest but the bacteria in our guts can digest) will also slow digestion and prevent hypoglycemia "crashes"

(5) Fats provide the most energy per unit weight, as well as some essential nutrients

(6) Damage to muscles and other parts of body from exertion or just normal wear and tear requires protein

(7) GORP is old traditional trail food
   i. GORP is one part raisins, one part Virginia peanuts, and one part M&Ms chocolate candy (by number according to an article in the Intercollegiate Outing Club Association newsletter)
   ii. Mixture of quick energy (glucose in raisins, sucrose in M&Ms), fat to slow digestion and provide ongoing energy (cocoa butter in M&Ms), protein (in peanuts) and fiber (in raisins)
   iii. Should consider this old traditional mix, at least it mix of food ingredients when picking snacks for SAR tasks

(8) Trail snacks should be supplemented with meals rich in fat and protein

(9) In warm weather, need salt in trail snacks and meals, especially in spring when not heat-acclimatized; salted peanuts in GORP provide some salt

## 3. Bloodborne Pathogens

a. **Bloodborne Pathogens**

(1) Microorganism (viruses, bacteria, protozoa) in many body fluids

(2) Some can cause serious disease in humans

(3) Those infected may transmit disease to those exposed to their body fluids

(4) Examples include Hepatitis A, B and C, and Human Immunodeficiency Virus (HIV)

b. **Hepatitis**

(1) Hepatitis A
   i. Most commonly transmitted by contaminated water or food
   ii. Also transmitted by body fluids
   iii. Not as serious as Hepatitis B or C but may make some people very sick

(2) Hepatitis B and C
   i. Transmitted through sex or "blood to blood" contact.
   ii. Hepatitis B and C very contagious from blood to blood exposure; virus particles (virions) may survive in dried blood up to a week

(3) Hepatitis, particularly Hepatitis B and C, may cause cirrhosis, liver cancer and death,

(4) Vaccines available for Hepatitis A and B, but not C

(5) Hepatitis A and B vaccines *strongly* recommended for all ASRC members even though bloodborne pathogen exposure rare in wilderness search and rescue

c. **Human Immunodeficiency Virus (HIV)**

(1) HIV attacks immune system, so cannot fight other infections

(2) Acquired Immune Deficiency Syndrome (AIDS) caused by untreated HIV

(3) HIV infection requires lifelong drug treatment with toxic drugs to prevent death from AIDS

(4) Although HIV infection can be managed, no cure for HIV infection yet

d. **Means of Transmission**

(1) Sexual contact

(2) Sharing contaminated needles

(3) From pregnant woman to fetus during or before birth

(4) Accidental puncture from contaminated needle, broken glass, or other "sharps"; if advanced medical providers using intramuscular needles or intravenous needles, need to ensure dirty needles get into protective case, either designed for indoor medical facilities or an austere alternative such as a small water bottle appropriately labeled, or a commercial container designed for prehospital use (e.g., Sharps Shuttle, Sharps Shaft, Porta Sharps)

(5) Intact skin impervious to bloodborne pathogens, but they may be transmitted by contact between body fluids and broken or damaged skin
   i. Open blisters or other open sores
   ii. Cuts
   iii. Abrasions

(6) Some pathogens may be transmitted when body fluids contact mucous membranes in eyes, nose or throat

e. **Universal Precautions and PPE**

(1) Treat all blood, body fluids and potentially contaminated materials as infectious

(2) Personal Protective Equipment (PPE): gloves
   i. Impermeable medical exam gloves when dealing with contaminated materials or examining patients who might have body fluids on them
   ii. Should have at least two pair of medical exam gloves in SAR pack, packaged to prevent damage in pack
   iii. No latex (natural rubber) gloves: some people have anaphylactic allergic reactions to latex
   iv. Nitrile stretchy plastic most common material for gloves
   v. Different brand gloves fit differently and some more sturdy than others; recommend textured thicker (4, 6 or 8 mil) nitrile gloves as more sturdy for search and rescue use*
   vi. Can wear nitrile exam gloves under outer cold-weather or rope-handling gloves or mittens, but should have spare pair of gloves or mittens in pack, as well as plastic bag (required leaf bag may be used) to isolate contaminated outer gloves or mittens; spare gloves or mittens and spare hat in pack should be standard in cold weather, as may need to use or lend to less-well-equipped team member
   vii. Cover cuts or open areas on hands with a bandage before putting on gloves
   viii. Inspect gloves for tears or punctures before putting on
   ix. Use proper procedure when taking gloves off; don't touch outside of gloves with ungloved skin**

(3) PPE: eyes and face
   i. If risk of contaminated fluids splashing, such as with high-pressure irrigation of contaminated wounds, protect eyes
   ii. Corrective-lens glasses provide some protection
   iii. Sunglasses provide some protection
   iv. Goggles used for helicopter operations, deep winter operations or night search provide better protection
   v. Swim goggles provide good protection as well as eye protection for night operations, and are smaller to pack than larger goggles
   vi. Face shields protect nose and throat as well as eyes; disposable lightweight medical procedure nose-mouth masks with attached clear upper-face plastic shield available cheaply, but require careful packaging to survive in a SAR pack; may be put in large zipper plastic

*At least one brand of textured nitrile glove, RESQ-Grip, marketed for medical use; similar industrial gloves also available
**https://www.cdc.gov/vhf/ebola/pdf/poster-how-to-remove-gloves.pdf

bag and put in pack water-bladder pouch or back-padding pouch to protect from breakage

f. **Hand-Washing**

(1) Hand-washing critical part of preventing transmission of bloodborne and other pathogens, particularly diarrhea and respiratory viruses

(2) Hand-washing recommended after taking off medical protective gloves, especially if visibly contaminated; gloves may have tiny holes that let invisible but potentially-infectious amounts of blood through.

(3) Handwashing critical if ungloved hands visibly contaminated with body fluids

(4) Washing with water and soap: may want liquid soap that works in cold water, Dr. Bronner's has been standard for backpackers for many decades; can put in Nalgene dropper bottle as less likely to leak

(5) In winter, alcohol-based hand cleaner may be better choice as has much lower freezing point than water, and small amounts unlikely to cause frostbite; may also put in Nalgene dropper-top bottle

(6) May wish to carry small, light microfiber towel for drying hands after soap and water or alcohol-based hand cleaner

(7) Nalgene or similar 15 mL (0.5 oz), 30 mL (1 oz) and 60 mL (2 oz) bottles more durable and less likely to leak than store-bought bottles, and can get with dropper tops or transfer dropper tops from other size bottles with similar sized tops

g. **Contaminated Gear**

(1) Contaminated hardware, rope and webbing may be washed in hot water or may be decontaminated with a 1:10 dilution of household chlorine bleach

(2) Clothing that might have been contaminated with body fluids should be isolated in a plastic leaf bag and washed with hot water and dried in a drier once home, unless needed for survival in the field

h. **Dealing with Exposure**

(1) Some exposures to body fluid have significant risk of catching a disease, some do not

(2) OSHA (US Occupational Safety and Health Administration) says: "If you are stuck by a needle or other sharp or get blood or other potentially infectious materials in your eyes, nose, mouth, or on broken skin, immediately flood the exposed area with water and clean any wound with soap and water or a skin disinfectant if available. Report this immediately to your employer and seek immediate medical attention."*

(3) US CDC (Centers for Disease Control and Prevention), NIOSH (National Institute for Occupational Safety and Health) says: "If you experienced a needlestick or sharps injury or were exposed to the blood or other body fluid of a patient during the course of your work, immediately follow these steps:**
   i. Wash needlesticks and cuts with soap and water
   ii. Flush splashes to the nose, mouth, or skin with water
   iii. Irrigate eyes with clean water, saline, or sterile irrigant
   iv. Report the incident to your supervisor
   v. Immediately seek medical treatment"

(4) Body fluids on intact skin should be cleaned off immediately but do not constitute a significant exposure that requires evaluation or treatment by a medical practitioner, nor does it need to be reported

(5) Should report significant exposures up the chain of command for the operation or training session

(6) If member has not had Hepatitis B vaccine, a dose is generally given in the ED, with follow-up to obtain two more doses of the vaccine

*https://www.osha.gov/SLTC/bloodbornepathogens/
**https://www.cdc.gov/niosh/topics/bbp/emergnedl.html

(7) If significant risk of HIV transmission, member will be generally started on HIV post-exposure prophylaxis (PEP), medications to help prevent contracting HIV

(8) If significant exposure, member must go urgently to the nearest hospital Emergency Department for evaluation and treatment (Urgent Cares and clinics generally do not provide Hepatitis B vaccine or PEP for HIV)

(9) If "donor" (the subject/patient/other team member whose body fluid responsible for exposure) has significant risks for having a bloodborne pathogen, or known bloodborne pathogens; if can obtain, confidentially record this information and should go with exposed member to Emergency Department

(10) Most states mandate "donors" submit to testing for bloodborne pathogens such as Hepatitis B and HIV, so if possible, information that "donor's" body fluids were responsible for exposure go with donor to Emergency Department where donor is taken

**4. Confidentiality***

a. ASRC best practices:

(1) Requests from press or public for information:
i. May give public or press information about what job is like, weather and terrain, kind of training you have, things that are or should be public record
ii. If request for specifics of this operation, refer up chain of command or to ICS Public Information Officer (PIO), don't give details

(2) HIPAA:
i. Search subject's medical condition is confidential information under Federal law, Health Insurance Portability and Accountability Act (HIPAA), and fines or legal action may result from violations
ii. Exception to HIPAA confidentiality for anything that might interfere with urgent patient care

**5. Emergency Bivouacs**

a. Picking location

(1) Microclimate

(2) Danger of flooding

(3) Natural shelters: caves, large downed trees, under coniferous trees (pines, spruces, firs, Eastern Hemlocks)

b. Building shelters, improving natural shelters such as caves or under large evergreen trees or beside large downed trees

c. Improvised insulation

(1) Dry leaves

(2) Bark sleeping pads

(3) Pine bough beds

d. Disadvantages and advantages of building a fire

(1) Jack London: "To Build a Fire"**

(2) Energy costs of building a fire

(3) Dangers of building a fire

(4) Use of heat reflectors

**6. Water Purification*****

a. Hazards in water

(1) Protozoa: Giardia, amebic dysentery: about 5 microns in size, removed by most filters,

(2) Bacteria: 0.1-1 micron in size, cause diarrhea, removed by most but not all filters

(3) Viruses: 0.01 microns, cause diarrhea, Hepatitis A: not removed by filters

(4) Pesticides: removed by carbon filters

(5) Heavy metals from mine drainage: hard to remove

b. Methods of purifying water

(1) Bringing water to a boil

*http://www.conovers.org/ftp/SAR-Legal.pdf,
** https://en.wikipedia.org/wiki/To_Build_a_Fire
*** https://en.wikipedia.org/wiki/Portable_water_purification

(2) Pumps, straws and gravity feed devices:
   i. Filters vs purifiers
   ii. Role of pore size
   iii. Role of iodine resins
   iv. Role of prefilters
   v. Role of activated carbon elements
   vi. Danger of freezing
   vii. Need to clean and store properly, and to have spare filter element

(3) Water purification tablets:
   i. **Chlorine**: not used much any more
   ii. **Iodine**: available, causes interaction with thyroid gland in those with thyroid problems (actually pretty common); may use thiosulfate tablets to remove iodine taste, but problems with thyroid remains
   iii. **Chlorine dioxide**: compared to chlorine or iodine tablets, does better job of killing bacteria and viruses at 30 minutes, and if leave for 4 hours, even kills cyptosporidium (but probably better to use a filter first to get rid of Giardia and Cryptosporidium); ~5 year shelf life, but need to protect tablets from being crushed in pack; contains chemicals such as sodium chlorite and sodium dichlorcyanurate that release chlorine dioxide when put in water

(4) Chlorine and iodine don't kill Giardia and particularly Cryptosporidium even after 4 hours

(5) UV light treatments (e.g., SteriPen)
   i. Need prefilter to remove turbidity
   ii. Effective with one-liter/quart water bottles
   iii. Not effective with bladders, e.g., Camelbak

(6) Mixed oxidants (e.g., Potable Aqua PURE Electrolytic Water Purifier): effective with water bottles or bladders, roughly equivalent to chlorine dioxide tablets, heavier and tend to be used for long-term trips with lots of people as can purify lots of water with just some salt and water and a little power

(7) Heaviest, most expensive, but best: filter combined with mixed oxidants (bladder or bottle) or chlorine dioxide tables (bladder or bottle) or UV light treatment (1-liter/quart water bottle only)

(8) For short cool-weather tasks, usually can carry enough water, so having some backup chlorine dioxide tablets reasonable

(9) For longer or hot-weather tasks, may use a lightweight filter like a MSR Hyperflow filter and then treat with mixed oxidants or chlorine dioxide tablets.

## B. Communications*

### 1. Alternative/Backup Communications Modes

Uses, advantages and disadvantages of

a. Signal mirrors and improvised mirrors (knifeblade, mirror on compass)

b. Smoke: danger of fire

c. Flares: danger of fire

d. Chemical luminescent light sticks

### 2. Phonetic Alphabet and Prowords Practice

a. Learn to use entire phonetic alphabet and common official ASRC prowords and radio protocols without reference to the ASRC Radio SOB Crib Sheet

b. Learn how to use standard ASRC whistle and hand signals *with* reference to the ASRC Radio SOP Crib Sheet

### 3. Radio Controls and Maintenance Practice

Learn to confidently and reliably operate standard handheld radio controls and perform simple field maintenance tasks

a. Operate off/on switch

b. Operate volume adjustment

c. Operate push to talk

d. Operate channel selector

e. Attach and detach antenna

*ASRC Radio SOP Crib Sheet Radio Communications.pdf

f. Replace battery

g. Toggle keyboard/channel select lock if available

h. Know other buttons might accidentally hit and how to recover from them

### 4. Radio Communications Procedures Practice

Learn to confidently and reliably:

a. Push push-to-talk button

b. Pause for a second

c. Speak in normal tone

d. Speak slowly and distinctly

e. Use basic prowords

f. Use "you, this is me," not "me to you"

g. If speaking long occasionally say, "How copy so far?" then release push-to-talk

## C. Land Navigation*

### 1. Topographic Maps

a. Interpreting contour lines, including index contours and reliably identifying:

(1) Ridges and summits

(2) Valleys and depressions

(3) Even, convex and concave slopes

(4) Saddles and knolls

(5) Index contours

(6) Supplementary contours

b. Identifying common USGS topographic map symbols:

(1) Boundaries

(2) Buildings, including schools and houses of worship

(3) Built-up areas

(4) Cemeteries

(5) Boundary monuments, benchmarks and spot elevations

(6) Railroads, roads and trails

(7) Bodies of water, rivers, streams and intermittent streams

(8) Woodland overprint

(9) Photorevisions

(10) Declination

(11) UTM edge ticks and grids

(12) Scale bars

c. North arrow declination indicators:
   i. True north
   ii. Grid north
   iii. Magnetic north

d. How to measure distance on topographic maps

(1) Using scale bars

(2) Knowing that UTM/USNG grids are 1 km

(3) Using transparent grid overlays

e. Determining UTM/USNG position on topographic maps

(1) Plotting a set of UTM/USNG coordinates on a map

(2) Reading off UTM/USNG coordinates from a point on the map

### 2. Datum

a. Three "datums"

b. Datum is zero,zero origin for grid

*http://www.conovers.org/ftp/Land-Navigation.pdf
(2017) Mountaineering: Freedom of the Hills, Mountaineers Books.

c. 1927 NAD27 datum on older US Geological Survey (USGS) topographic maps

d. Newer maps use 1983 NAD83 or 1984 WGS84 datum, basically same

e. Most GPS units GPS apps set for WGS84, though can change to NAD27

f. If give grid coordinate and GPS set to NAD27 and Base uses WGS84, 200 meters ( > 0.1 mile) off

**3. Grids***

a. Latitude and longitude**

b. UTM/MGRS

c. USNG

d. ASRC Grid System***

**4. GPS**

a. **GPS System Overview****

(1) GPS satellite network with highly-accurate clocks sending signals all the time; both US NavStar satellites and Russian GLONASS satellites

(2) GPS multi-satellite receivers in GPS units and smartphones

(3) Use tiny differences in timing from different satellites to determine position

(4) Precision of position determined by number of satellite "fixes"; fix on three satellites will give rough location, fix on four satellites will give more precise location including elevation

(5) If GPS has not been on for a while, or hasn't been on in area recently, will need to take several minutes to download data to start getting fixes: "cold start"

(6) If GPS has been on in area and only stopped for hour or two, only takes 1-2 minutes to get fixes: "warm start"

(7) Smartphone GPS apps also improve accuracy, particularly in urban areas with obstruction of GPS signals by tall buildings, by noting names of nearby WiFi routers

(8) Things that interfere with radio receiver view of satellites and thus GPS satellite signal*****
i. Large buildings
ii. Being inside a building or vehicle
iii. Sides of deep ravines or canyons
iv. Land over caves
v. Water between GPS satellites and GPS unit/app, including in leaves on trees in deep forest, in clouds or rain
vi. May interfere not only by blocking signals, but also sometimes by reflecting signals and making timing off "multipath reception" or "multipath interference" resulting in wrong location
vii. Military may simply flip switch and make GPS much less accurate for national security reasons
viii. Possible to "jam" GPS receiver, either deliberately to cause harm, or accidentally by transmitting with radio or cellphone right next to GPS unit

b. **GPS terminology**

(1) **GPS**: Global Positioning System a system for determining position using radio broadcasts from a network of 24 satellites, each with a computer, a clock, and a radio transmitter

(2) **GPS Receiver**: electronic circuitry that receives GPS satellite broadcasts, compares them, and uses this information to determine locations; GPS receivers are found in dedicated GPS devices, smartphones, cars, plans, ships, and in general anything that needs to track its location

(3) **GPS Device**: a device dedicated to providing GPS location; some devices may just record a *track* of GPS locations, or transmit GPS locations for APRS, but the most common GPS units for search and rescue display one's GPS position on a map

*http://www.conovers.org/ftp/Land-Navigation.pdf
**http://archive.asrc.net/ASRC-Training/1978-00-00-GSAR-Manual-Land-Navigation.pdf
***http://archive.asrc.net/ASRC-Operations/1997-04-13-ASRC-Grid-3-1.pdf
****https://www.maptoaster.com/maptoaster-topo-nz/articles/how-gps-works/how-gps-works.html
*****https://en.wikipedia.org/wiki/Error_analysis_for_the_Global_Positioning_System

(4) **APRS**: Automatic Position Report Systems remotely track the movements of a GPS device; this may be used to surreptitiously track a police suspect's vehicle, or to track a field team during a search

(5) **Vector Map**
- i. A vector map is a type of vector graphic
- ii. Vector graphics display curves ("paths") based on mathematical equations, which means smaller file sizes than bitmapped graphics
- iii. Examples of paths in a vector map include contour lines, trails, the outlines of buildings and the boundaries of areas of green woodland overprint
- iv. Raster graphics stay sharp no matter how much you enlarge or shrink them
- v. Topographic maps are quite suitable for vector formats, provided the vector data is available

(6) **Raster Map**
- i. Raster map is type of raster graphic, also known as bitmapped graphic
- ii. Raster graphic is made of a raster (rectangular grid) of dots of different color
- iii. Common raster graphic formats on computers are .jgp and .gif
- iv. Even with file compression, raster graphics (and maps) have much larger file sizes than vector graphics that show same area

(7) **USGS Digital Topographic Maps**
- i. USGS is United States Geological Survey
- ii. USGS 7.5 minute topographic map quadrangles were hand-drawn based on both aerial photographs and on-site inspection ("field checking") by cartographers; USGS quit updating the 7.5 minute topographic map quadrangles in 1992, so will not show changes since 1992
- iii. USGS 7.5 minute topographic map quadrangles are available only in bitmapped raster graphics format, scanned from printed maps
- iv. Starting in 2009, but only fully realized in 2012, free, online "US Topo" series maps are in vector format, but have only a fraction of information on raster bitmapped version of older USGS 7.5 minute topographic maps
- v. Some vector topographic maps have more information than US Topo vector map series, but usually not free
- vi. GPX (.gpx) Format: designed to be universal interchange formats; allows information including GPS tracks, GPS waypoints and search areas ("polygons") to be sent between GPS device or app and search-management computer program such as SARTopo

(8) **GPS Fix***
- i. When a GPS unit or app has determined its position
- ii. May take some time for a GPS unit or app to obtain a GPS fix
- iii. Time to obtain a GPS fix depends on many factors

(9) **Dilution of Precision (DOP)****
- i. Engineering term for the accuracy of the GPS fix
- ii. GPS units or apps may use DOP, or more specifically horizontal DOP (HDOP) or vertical DOP (HDOP) to describe how accurate of a fix the unit currently has
- iii. Ranges from 1 (ideal) to >20 (may be off by 300 meters)
- iv. With low DOP may get location fix but without elevation

(10) **Multipath Interference*****
- i. Precise timing of GPS signals needed for accurate fix
- ii. Distortions from atmospheric conditions (e.g., ionization in the troposphere) may slow signals
- iii. Reflections from cliffs, bodies of water, or buildings may be stronger than direct signal and make timing off
- iv. Explains why GPS fix may be wrong in canyons or urban areas between tall buildings

(11) **GPS Track**
- i. GPS units or apps generally may keep record of minute-by-minute GPS position
- ii. When plotted on a map, is a line, thus called GPS track
- iii. Usual to turn on GPS tracking when heading out for a search task
- iv. GPS units with map usually show tracks on a map; very helpful to see where you've been in case you need to retrace your tracks, or to download to computer at Base as a precise record of your search task

*https://en.wikipedia.org/wiki/Time_to_first_fix
**https://en.wikipedia.org/wiki/Dilution_of_precision_(navigation)
***http://gpsinformation.net/multipath.htm

v. GPS track may be included in a .gpx file for transfer between computers and GPS units/apps
vi. Common to use software on Base laptop to create "track" that is really polygon that describes search area and transfer to searcher's GPS unit or GPS smartphone app; allows searchers to view their search area on GPS map with precision and track their location relative to the search area boundaries
vii. At end of task, common to transfer track of where field team actually went to Base laptop to integrate into software such as SARTopo as a record of what was actually searched

(12) **GPS Waypoint***
i. GPS location saved in GPS unit/app's memory
ii. May be included in .gpx file and transferred to Base on return
iii. Commonly used in SAR tasks to mark clue locations, trail junctions or decision points not on map,
iv. Usually can be manually named to help recall reason for saving waypoint

c. **GPS Problems**
i. Datum set wrong on GPS unit/app
ii. Multipath interference may not just block signal but make GPS unit/app misjudge position
iii. More satellites visible means better position fix; if only three satellites visible (minimum to get fix) then precision less

d. **GPS Navigation Practice**
i. GPS can tell you where you are, either a set of numeric grid coordinates (e.g., USNG app) or with a dot on a map
ii. GPS will not plot the best backcountry route from A to B for you
iii. Details differ widely between GPS units/apps, but should learn to do the following with Group GPS units and personal GPS unit/app
iv. Determine the UTM and USNG coordinates for your current location
v. Mark your current location as a waypoint
vi. Locate a previously stored waypoint
vii. Input USNG coordinates to create a new waypoint (e.g., a find to which you must navigate)
viii. Change datum from NAD27 then back to WGS84/NAD83
ix. Set the position format to USNG (US National Grid), or, on older units, UTM
x. Clear the track log (if available on the unit being used)
xi. Determine the USNG coordinates for your current location

**5. Orienting a Map** Practice**

(1) By inspection (terrain association)

(2) By compass

**6. Land Navigation/Orienteering Concepts*****

(1) Handrail

(2) Catching feature

(3) Map simplification

(4) Comparing routes as far as difficulty of travel/hazards, elevation change, and difficulty of navigation/"safety" in terms of getting lost

(5) Attack point

(6) Aiming off

(7) Rough vs precision navigation

(8) Thumbing a map

**7. Compass Skills****** Practice**

a. Magnetic north, true north, and grid north; where the magnetic north pole is and how it is moving

b. Declination

(1) What declination is

(2) How declination varies over time and across globe

(3) Direction of declination throughout the mid-Appalachian region (5° west in western Ohio, and 12° west in eastern Maryland)

*http://www.gpsreview.net/waypoints/
**http://archive.asrc.net/ASRC-Training/1978-00-00-GSAR-Manual-Land-Navigation.pdf
***http://archive.asrc.net/ASRC-Training/1978-00-00-GSAR-Manual-Land-Navigation.pdf
****http://www.conovers.org/ftp/Land-Navigation.pdf
*****http://archive.asrc.net/ASRC-Training/1978-00-00-GSAR-Manual-Land-Navigation.pdf

c. How nearby ferromagnetic metal objects and bodies of iron ore may change declination

d. How to set declination (for adjustable compasses)

e. How to adjust for declination (nonadjustable compasses)

f. How to use a protractor, and points A and B on a map, to determine the true and magnetic bearing from A to B

g. How to use a compass, and points A and B on a map, determine the true and magnetic bearing from A to B

h. Given a true bearing, set the corresponding magnetic bearing on the compass

**8. Orienteering Practicum** Practice

Attempt basic-level orienteering courses until able to apply the above concepts to complete them safely and confidently

## D. Operations, Management and Leadership*

**1. ICS**

a. ICS national, mandated Incident Command System for all US inter-agency incidents

b. Used all the time by ASRC

**2. ICS functions and positions:**

a. **Command**: Incident Commander (IC), which on big incident may include additional **Command Staff**:

(1) **Public Information Officer**: handles interactions with press and public

(2) **Safety Officer**: in overall charge of safety

(3) **Liaison Officer**: handles relations with supporting agencies (such as ASRC Groups)

b. **General Staff**

(1) Broken into four functional parts and they report to the IC:

(2) **Operations Section Chief** ("**Ops**"): sometimes an Agency Having Jurisdiction/Responsible Agent will ask an ASRC Search Manager to take on this task

(3) **Planning Section Chief** ("Plans") (also sometimes combined with Ops resulting in a single person handling "Plops")

(4) **Logistics Section Chief** ("**Logs**")

(5) **Finance/Administration Section Chief** ("**Admin**")

**3. ICS Principles**

a. **Standardization**: common terminology for functions, facilities, resources and positions

b. **Chain of command**: from the Incident Commander to the General Staff, and down to individual searcher

c. **Unity of command**: you report to only one supervisor, and get instructions only from that supervisor

d. **Unified Command**: when there are multiple Agencies Having Jurisdiction (AHJ)/Responsible Agents (RAs), each with their own IC, who work together to command the operation using a single Command Staff and a single General Staff with a single integrated incident organization, co-located shared facilities, and a single shared set of objectives, planning process, and IAP

e. **Incident Action Plan** (IAP): the overall plan for the search or rescue

f. **Modular organization**: jobs are chunked and standard terms for chunks, such as Plans or Ops

g. **Flexible**: one person can assume more than one function, or all functions, for a small incident, others may be assigned positions as incident expands

* http://www.conovers.org/ftp/SAR-Leadership.pdf
ICX Review Materials

h. **Manageable span of control**

(1) per ICS, 3–7 subordinates per position: any more than 7 just doesn't work

(2) Five ideal maximum

(3) Except in a line search, and then usually have assistant team leader on other end of line

i. **Sign-in and Sign-out**: important in the ICS but critical for search and rescue

j. **Accountability**: see ASRC *Essentials for Search and Rescue* and Field IV (Trainee) curriculum

k. **Resource tracking**: which "resources" (people, teams, vehicles) are where, and whether need more

l. **ICS Geographic Terms**

(1) **Incident Command Post** (ICP)

(2) **Base**

(3) **Camp**

(4) **Helibase**

(5) **Helispot**

(6) **Staging Area**

(7) For most smaller SAR operations these are usually combined and just called "Base"

(8) Standard map symbols for these places exist

(9) Field Level III members not expected to memorize these symbols

## 4. System Operations

a. SAR phase/stage names and groupings arbitrary, depend on whether lumper or splitter and which words you like best: this is splitter's list with fairly-common names for educational value but not for testing

b. **Readiness**/standby/preplanning

c. **Alerting**/notification

d. **Response** to scene

e. **Initial on-scene actions** (done simultaneously if possible)

(1) Coordinate with **Agency Having Jurisdiction**/Responsible Agent

(2) Information gathering and start filling out **Missing Person Questionnaire**

(3) Send out **reflex tasks** (brief mention of **bike spoke model) such as**
   i. **Cutting for sign** around the **Initial Planning Point (IPP)**, which is either the **Point Last Seen (PLS)** or the **Last Known Position (LKP)**, with either **clue-conscious searchers** or **man-trackers**
   ii. **Hasty tasks** along travel routes, such as trails and streams, leading away from the IPP
   iii. Hasty tasks to **hazards** or **high-probability locations**
   iv. Canvass **campgrounds**
   v. **Containment**

(4) Start **Base staff** organization

(5) Set up **Base radio**

f. **Full-scale** search operations

(1) Establish **strategy**:
   i. On map, plot **planning areas**
   ii. Estimate **POA** (Probability of Area; estimated probability subject is in planning area) for each planning area
   iii. Segment area into **searchable segments**
   iv. **Create TAFs** for available resources and get them into the field to search high-priority segments

(2) **Evaluate** results and create more TAFs

(3) Request **additional resources** if needed

g. **Find management** or **suspension**

h. **After-action review** (now, later or both)

i. **Demobilization**

j. Ensuring everyone is **home safe**

k. **Readiness**/standby/preplanning/cleaning and repacking stuff

## 5. Field Team Management

a. **Leadership***

(1) FTLs must be ready to lead teams with members not only from their own Group but from other SAR teams or firefighters, medics and others with no SAR experience.

(2) More people skills included in Field II and I curricula

(3) Two main leadership styles: authoritative and relationship-oriented; some leaders use one more than another but usually a mix appropriate to the situation at hand

i. Authoritative style concentrates on getting the job done: delegating tasks, and instructing members how to accomplish those tasks
ii. Authoritative style needed when seconds count
iii. Relationship-oriented style means showing that you are interested in your team members, learning about them, consulting them on decisions, and building team cohesion and morale
iv. Relationship-oriented style requires crafting different interaction styles with team members with different personalities
v. Relationship-oriented leadership style should usually be default for most field team operations

b. **Delegation**

(1) Delegation of positions only as needed

(2) One member may fill multiple positions

(3) Not all functions needed on a particular task

c. **Field Team Positions and Functions**

(1) **Leading**: Field Team Leader

i. Place in chain of command
ii. Decision-making authority, limited by team members' right to refuse to do something they regard as unsafe
iii. Receive briefing from Base and brief team
iv. Review entire Task Assignment Form before leaving Base
v. Debrief team after task and provide debrief information to Base on return
vi. Responsibility for safety and well-being of team members, including those from other agencies and spontaneous volunteers, similar to that of an outdoor-recreation trip leader
vii. Complete task provided can be done safely
viii. Assess capacity of team, and individual members, for further tasks

(2) **Backup**: Assistant Team Leader

i. Sometimes predesignated in case something happens to FTL
ii. No other duties

(3) **Navigating**: Navigator

i. Carry task map
ii. Save track on GPS or GPS app
iii. Provide GPS position when requested by Base
iv. Save waypoints for clues, trail decision points not on map, and other important locations
v. Advise FTL as far as task completion on map

(4) **Communications**: Radio Operator

i. Obtain radio, spare battery from Base
ii. Obtain communications briefing from Base, including getting Base cellphone numbers and giving Base cellphone numbers of team members
iii. Check radio equipment to make sure it's functional and do radio check with Base prior to leaving Base
iv. Advise FTL of potential or known communication issues
v. Check in with Base as per TAF schedule

(5) **First Aid and/or Medical Care**: Medic

i. "Medic" just means person assigned to deal with first aid/medical issues
ii. may not be highest medical qualification on team as that person may have other duties
iii. may just have first aid training, but still is "The Medic"
iv. Decides what kind of first aid/medical kit/gear to bring on task

(6) **Rescue**: Rescue Specialist

i. Decides what rescue gear the team carries
ii. Manages rescue operations by the team until relieved by someone higher in the command chain specifically related to rescue

*http://www.conovers.org/ftp/SAR-Leadership.pdf

(7) **Safety**: Safety Officer
   i. FTL's job unless otherwise assigned
   ii. Specifically assigned in high-risk situations
   iii. Safety officer usually freed from other duties to concentrate solely on safety

d. **Patience**

(1) SAR team members and other emergency services workers generally go-getters, eager to get job done

(2) Field team leadership challenge is usually not to develop enthusiasm for task, but to encourage members to take the time to do the job right, such as adequately scanning for clues

(3) FTL must model patience with team members, especially given "hurry up and wait" nature of big SAR operations, perhaps with stories of "hurry up and wait" during past operations

(4) There is a saying in technical rescue, "Slow is smooth. Smooth is fast."

e. **Trip Leader Skills***

(1) Leading Field Team is like leading outdoor recreation trip: same skills needed by FTL

(2) Best-known mountaineering text** identifies following roles for trip leaders, also discussed in SAR textbook chapter:***
   i. Guardian of safety
   ii. Anticipator
   iii. Planner
   iv. Expert
   v. Teacher
   vi. Coach
   vii. Initiator
   viii. Arbiter
   ix. Guardian of the environment
   x. Delegator

(3) **Preparing for emergencies**: FTLs bring extra gear such as:
   i. A bit of oversized spare clothing
   ii. First aid kit suitable for larger group
   iii. Extra leaf bags
   iv. Spare map and compass
   v. Extra water and/or water purification system suitable for larger groups
   vi. In winter, a bothy bag survival shelter

(4) **Assess task** for aerobic and muscular difficulty, hazards, time to accomplish and available light, and compare with assessment of Field Team members

(5) Quick rules of thumb: fat = poor aerobic condition, slow uphill; skinny = poor resistance to hypothermia

(6) **Assess Field Team** members'
   i. Outdoor experience
   ii. Aerobic condition
   iii. Muscular strength
   iv. Mental strength
   v. Nutrition, hydration, fatigue
   vi. Any medical conditions that might affect team's function

(7) **Situational Awareness**
   i. Good definition: *Situational awareness or situation awareness is the perception of environmental elements and events with respect to time or space, the comprehension of their meaning, and the projection of their future status*.
   ii. FTLs need to assess for progress with task compared with expectations, note good bivouac sites or water sources along way, changes in weather
   iii. FTLs challenge members to be alert to clues but also changes in temperature, vegetation, terrain, weather, and hazards such as poison ivy, brambles, dead trees that might fall, trip hazards
   iv. FTLs need situational awareness of team members: hydration, nutrition, fatigue, aerobic condition, mental state

(8) **Modeling**: Team leaders consciously exhibit behavior they expect of team members: courtesy, concern for others' welfare, and not complaining

(9) **Point, Sweep, Stops, Pacing**
   i. **Point** selects route and navigates, good if familiar with area
   ii. **Sweep** makes sure nobody gets left behind; sweep may also have to deal with injury or illness so wilderness first aid/medical skills

*http://www.conovers.org/ftp/SAR-Leadership.pdf
**(2017) Mountaineering: Freedom of the Hills, Mountaineers Books.
***http://www.conovers.org/ftp/SAR-Leadership.pdf

helpful; sweep may have to speed up to catch up with the group after a stop so should be in fairly good aerobic condition
iii. For large team, point, sweep and leader may use radios smartphones and Bluetooth or WiFi "walkie-talkie" app to keep in touch
iv. Goals: keep group together, not lose anyone, keep moving
v. Young fit people tend to run ahead, but can only go as fast as slowest member, but slow people may go slow for a long time without stopping
vi. Members must know to stay behind point and in front of sweep
vii. May put fittest people at front and slowest at end, start off at medium speed, group spreads out; few minutes before next stop, start slowing down, so that group bunches together
viii. Dividing group dangerous, may take separate trails at decision point and become separated
ix. With larger groups may schedule stops, remind people to check bootlaces and adjust packs
x. At stop with large group, may have men head forwards and women stay behind to take toilet break; ready to go when all women catch up with the men
xi. May load down young, aerobically-fit members of the group from those in worse aerobic shape, or team equipment, or some of leader's extra emergency gear
xii. Splitting team dangerous in terms of the two halves of the team taking a different route at a fork in the trail
xiii. Best solution: nobody passes the point member, and point, even if very fit, moves slowly
xiv. May need to stop to tighten boots before heading down long hill, to take off a layer of clothing before heading up long hill, or for a toilet break, to eat, or because Base says to stop
xv. If cold or chilly, and stopping for more than few minutes, remind team members to put on warm clothes before get chilled

f. **Task Assignment**

(1) What a Task Assignment Form (TAF) is, and what each section means; on TAF, Base staff write down
i. *Where* you are supposed to search
ii. *How* you're supposed to search
iii. *Who* is on team, and positions
iv. With *what* you are supposed to communicate with base, on *what channel* or by *what cell-phone number,* and *how often,* and *when*
v. *What gear* you need

(2) Should have zip lock plastic bags for TAF and task map, with backup spare plastic bags

(3) Mission briefings: Base staff brief everyone who is at Base with what relevant information they have; should take notes in personal pocket-sized waterproof notebook

(4) Base briefing for Field Team Leader (varies based on information available and urgency of task; reflex task at beginning of search may get very little information); ideal briefing includes:
i. Expected duration of task
ii. Specific clues to seek
iii. Expected POD (Probability of Detection) for subject and clues
iv. Subject information
v. Teams nearby
vi. Hazards and safety information
vii. Terrain and weather to expect
viii. Plans for dealing with press and family
ix. Plans for a find and a rescue
x. Previous efforts in the area

(5) Field Team Leader briefing for team members: everything FTL got from briefer in Base; good time for introductions, if needed, and to assess team members' capabilities and limitations

(6) End-of-operation "briefings"
i. Critical Incident Stress Management type large debriefing not thought to be appropriate at end of psychologically-stressful operation, but leaders may give guidance for avenues for one-on-one assessment or counseling
ii. Leaders may gather personnel at Base to announce command staff decision to suspend mission, or outcome of mission with reasons for this decision
iii. Leaders may lead discussion with those present at Base to discuss what went right and what went wrong: "hot-wash" or "mission debriefing
iv. Leaders may be responsible for formal written After-Action Report (AAR) and may solicit information from personnel to put into AAR

## E. Search

### 1. Search Terminology and Theory*

a. **Term definitions**

(1) Point Last Seen (PLS)

(2) Last Known Position (LKP)

(3) Initial Planning Point (IPP)

(4) Active vs passive search

(5) Planning area

(6) Search segment

(7) Probability of Detection (POD)

(8) Probability of Area (POA), also known as Probability of Confinement (POC)

(9) Decision points

b. **Search resources**

(1) Human field teams

(2) Dogs

(3) Horses

(4) ATVs

(5) Mountain bikes

(6) Planes

(7) Helicopters

(8) Drones

(9) Others…

c. **Search strategies**

(1) Investigation

(2) Confinement

(3) Attraction/Passive

(4) Hasty search

(5) Area search

d. **Search tactics**

(1) Looking

(2) Listening (sometimes with shouting as attraction)

(3) Smelling (dogs and horses especially)

(4) Tracking/trailing (human *man-trackers* looking or *trailing dogs* smelling)

### 2. Search types

a. **Type I** (emphasizes speed more than thoroughness), such as *hasty* search of linear features; 45 years ago ASRC called this *scratch* search tasks

b. **Type II** (a balance of speed and thoroughness): *sweep* search tasks

c. **Type III** (emphasizes thoroughness more than speed): *line* or *saturation* search tasks

### 3. LAST Mnemonic (teaching tool, not tested)

a. **L**ocate

b. **A**ccess

c. **S**tabilize

d. **T**ransport

### 4. Common Search Tasks**

a. **Confinement patrol task** (foot, vehicle)

(1) Try to assure that subject doesn't leave the search area without being contacted

(2) Generally go slow and look for clues as on patrol

(3) When meet people along trail, ask if they have seen subject, give information about search

b. **Reflex tasks**

*Conover, K., et al. (2017). Technical Rescue Interface: Search and Rescue in the Non-Snow/Glacier/Mountaineering Environment. Wilderness EMS. S. C. Hawkins, Lippincott Williams & Wilkins.
**http://archive.asrc.net/ASRC-Training/1978-00-00-GSAR-Manual-Search-Tactics.pdf

(1) "Reflex" means get into field as soon as possible even if minimal information available for team briefing

(2) Example: field team hasty search along linear feature

(3) Example: field team hasty search of Point Last Seen (PLS), Last Known Position (LKP), Initial Planning Point (IPP), attractive hazards or other small high-probability locations

c. **Hasty (Type I) task**: small fast-moving team along linear feature such as trail or stream, or search of a point with high probability of find or clues; may be used as reflex task but also at later times in search

d. **Area tasks**

(1) **Sweep (Type II) task**: larger and slower-moving team, widely spaced (maybe voice but not visual contact); generally do not lay out flagging

(2) **Saturation/Line (Type III) task**: even larger and much slower-moving close-spaced "grid" search; generally lays out flagging to ensure complete coverage

e. **Man-tracking task**: needs tracker with specialized training

f. **Air-scenting dog task**: air-scenting dog and handler sweep back and forth through area, smelling for any human in area

g. **Trailing dog task**: trailing dog and handler try to follow the specific scent trail of the lost subject

h. **Flankers**: Man-tracking and dog tasks require accompanying human search team members, usually called *flankers* or *walkers*

(1) Flankers stay back behind mantracker or dog and handler

(2) Though dog handler or mantracker usually team leader, may ask flankers to handle communications and navigation to free handler to concentrate on communicating with dog

(3) Flankers try to avoid interrupting mantracker's or dog handler's concentration

i. Other kinds of tasks but these are most common

## 5. Clues and Man-tracking*

(1) Kinds of sign: being clue-conscious
- i. Obvious clues, such as piece of clothing with subject's name on it
- ii. Less-obvious clues, such as piece of clothing that might or might not belong to subject
- iii. More subtle clues, such as a bootprint that seems like the subject's in an area that has not been traveled by humans in a long time
- iv. Even more subtle clues, such as man-tracking type "sign"

(2) Step-by-Step Mantracking
- i. Tracking of humans and game done for thousands of years
- ii. Step-by-step method of mantracking brought to wilderness search and rescue teams by former US Border Patrol Ab Taylor in 1980s
- iii. Technique uses a tracking stick (usually a trekking pole with some "pony-tail" type rubber bands on it) to mark length of footprint and length of stride (usual length between subject's footprints)
- iv. Technique emphasizes looking for the imprint of a single step, and then and only then using the stride marked on the tracking stick to look for the next "sign" that indicates the subject's next step
- v. "Sign" may be actual footprint, but usually more subtle, such as bent grass, mud scuffmarks on rocks, "shine" (flattened vegetation or dirt that reflects the sunlight), dead leaves turned over, a rock that has been pushed slightly out of place or vegetation bruised where stepped on
- vi. "Sign-cutting": moving across an area perpendicular to the subject's expected line of travel, hoping to intersect and then follow the track
- vii. May also use sign-cutting in a circle or spiral around a point of interest
- viii. Tracking easiest in morning and evening when slanting light and its shadows bring out footprints
- ix. Can track at night with a flashlight

(3) Protecting a track

*https://skyaboveus.com/climbing-hiking/man-tracking-find-follow-tracks

i. Most important for clue-conscious searcher: if in rarely-traveled area and find sign, *protect it* from your and other's feet
ii. To further protect track, mark for others:

(4) Marking a track
i. There are different ways for a mantracking field team to mark the tracks they have found and their progress
ii. In desert areas, it's traditional to drag one's tracking stick so as to leave a line in the dirt
iii. One tradition is to, when unable to continue tracking, to mark the location of the last definite sign with a Popsicle stick in the dirt and/or a bit of plastic flagging tape with date, time and team designator on it with a laundry marker (e.g., Mini Sharpie)
iv. Used to be traditional to make a sketch of a good footprint; now more common to put a dressmaker's measuring tape or a disposable paper medical measuring tape next to the track and take a good-quality smartphone picture of it; may even be able to text it to Base
v. A fairly common but not universal way to mark individual footprints is to use the tip of the tracking stick to inscribe a semicircle behind the heel of the footprint, with a short line from the semicircle leading away from the semicircle to the outside of the track: to the right for a right heel, to the left from the left heel

## 6. Crime Scene Management

a. Military joke about "secure a building"*

b. Priorities:

(1) Assess scene safety (including firearms, weapons on military aircraft, fuel, sharp debris, booby traps)

(2) Consider any find site a possible crime scene

(3) Medic alone goes in to assess if alive or dead, and if alive to start first aid/medical assessment and treatment

(4) FTL notes path medic takes and marks it if needed, team follows this path only

(5) Establish safe area for team, away from find

(6) Mark off scene with flagging tape if possible; ask personnel to stay out of area

(7) Coordinate with local law enforcement, coroner or medical examiner via radio/cellphone

(8) Start documenting (cellphone pictures, notes, sketches)

(9) Post guards around crime scene or route into crime scene to warn incoming people away; cannot use force but can warn and do cellphone video of people entering crime scene

(10) Prepare list of team members and contact information to give to coroner/medical examiner/law enforcement

(11) If prolonged stay at site needed, think about maintaining Chain of Custody and ensure that anyone taking over security at site signs note to accept responsibility with date and time of transfer of Chain of Custody

## 7. Legal Aspects**

a. When SAR team members may, should and may not enter private property: trespassing and curtilage

(1) **Criminal trespass:** defined by state law, different in different states, but generally, intentionally entering or remaining on someone else's property without authorization

(2) **Innocent trespass:** common in SAR, when enter land marked "No Trespassing" but from uncommon direction where no signs posted; not a crime as long as leave as soon as landowner says to leave

(3) **Trespass to save a life:** may lawfully enter land posted No Trespassing in two conditions:
i. **Express consent:** the landowner, either verbally or writing, says can enter

*One reason the Armed Services have trouble operating jointly is that they have very different meanings for the same terms; The Joint Chiefs once told the Navy to "secure a building," to which they responded by turning off the lights and locking the doors. The Joint Chiefs then instructed Army personnel to "secure the building," and they occupied the building so no one could enter. Upon receiving the exact same order, the Marines assaulted the building, captured it, and set up defenses with suppressive fire and amphibious assault vehicles, established reconnaissance and communications channels, and prepared for close hand-to-hand combat if the situation arose. But the Air Force, on the other hand, acted most swiftly on the command, and took out a three-year lease with an option to buy.

** http://www.conovers.org/ftp/SAR-Legal.pdf

ii. **Implied consent**: if landowner not present, but see situation where reasonable person would think entering land posted No Trespassing would save a life or prevent a serious injury, may assume that the landowner would give you consent if he or she were present, and enter onto the land

(4) If refused entry or No Trespassing signs posted, contact Base, refer to local law enforcement for guidance

b. **Curtilage**: in US common law, curtilage is house and nearby surroundings (with some complex legal definitions of what is included) reasonably considered to be protected from warrantless law enforcement searches under Fourth Amendment to Constitution; limits law enforcement's ability to search lands marked No Trespassing without warrant; does not apply to SAR team members who are not law enforcement

**8. Leadership Experience Practice**

a. Experience leading field teams, with a Field III, II or I assigned as mentor, either on simulations or actual searches, on simple linear hasty tasks

b. Self-evaluate performance of each phase of task

(1) Briefing by Base

(2) Assembling field team

(3) Assessing team members' capabilities and limitations and comparing with assigned task

(4) Briefing field team

(5) Delegating duties/positions as appropriate

(6) Acquiring the necessary equipment for task

(7) Completing Task Assignment Form (TAF)

(8) Performing task

(9) Assessing for completion of task

(10) Assessing team members' condition at end of task and arranging for rest and rehab or return to duty as appropriate

(11) Debriefing field team members

(12) Debriefing task with Base

## F. Rescue*

**1. Lifting a Litter Practice**

a. Don't get hurt: avoid back injury

b. Person in driver's seat (front left, in current direction of litter movement) is Litter Captain

c. Litter Captain says "Ready! [pause] Lift!" (ASRC standard)

d. "Prepare to Lift!" or "Ready to Lift!" or "One, Two, Three, Lift!": acceptable but deprecated alternatives

e. [pause]: Litter Captain quickly scans all the litter bearers to assure they are ready

f. Litter bearers may respond to "Ready!" with "Hang on a minute!" or "Wait!" or "Stop!"

g. "Lift with your legs, not your back"

h. Face litter

i. Squat down on one knee, keep other knee up

j. Put both hands on litter rail

k. Lean away from litter, keeps your back straight and upright

l. Don't lift, pull *out*; pull directly away from litter bearer across from you

m. Only Litter Captain communicates with rope team if the litter being belayed

**2. Putting Down a Litter Practice**

a. Reverse of picking up

b. Standard call is "Ready! [pause] Down!"

c. Lean out and keep head up and buttocks down as lower litter, to protect back

*http://www.conovers.org/ftp/SAR-Evacs.pdf

d. Might put the litter down on a rock or sharp object, so before putting litter down, visually check or sweep with feet to check for objects during [PAUSE]

e. Also may need to secure litter from sliding

(1) Two litter bearers may hold onto litter

(2) If have a short rope may clip onto a tree or rock

### 3. LITTER POSITIONING

a. Medic may tell team to

(1) Keep litter in slightly head-down position (perhaps blood loss, dehydration, or hypothermia), or

(2) Slightly head-up position (perhaps head injury, or breathing problem)

(3) May need to carry litter higher, strain on the arms

### 4. VOMITING PRACTICE

a. Litters designed to carry people on backs, traditional to package patients on back

b. If vomit when on back, vomit may get into lungs

c. If see litter patient on back vomiting, yell "STOP! VOMITING!" and rotate litter sideways away from LITTER CAPTAIN

d. Rotate litter 90° or more

### 5. CARRYING THE LITTER PRACTICE

a. **Stops**

(1) May need stop for medical reason

(2) May need stop to change litter rigging

(3) Patient may need to pee

(4) Otherwise, litter should never stop moving

b. **Litter Bearing**

(1) Standard for non-technical evacs (without rope belay): six litter bearers

(2) Load straps make carrying easier

i. 2" or 1.5" flat nylon webbing, 10' long
ii. Girth-hitch middle of load strap to litter rail behind your hand on the rail
iii. Lift litter
iv. With hand not used for litter rail, reach across in front and grab load strap next to litter rail, slide hand out along it until 2-3' stretched out from litter rail
v. Lift hand up over head, flip strap backwards over head
vi. Load strap now diagonally across upper back and forwards across shoulder
vii. Bring hand down in front of chest
viii. Wrap load strap few times around hand, pull down hard
ix. Some litter load now on left shoulder
x. 2"/1.5" webbing superior to 1" webbing, less pain in shoulder

c. **Semi-Tech Litter Bearing**

(1) Semi-tech evac when steep enough that rope needed for security of litter on slope

(2) As rope takes much of load, standard to have just 4 litter bearers

(3) When litter being hauled up with rope, litter bearers mostly keep litter up off ground more than move it up

(4) When litter being lowered by rope (more common), litter bearers also mostly keep litter up off ground, leaning back and letting rope take much of the load

(5) If steep enough that not just litter but litter bearers endangered by possible fall, litter bearers wear seat harnesses and clip seat harness into rail with Prusik or webbing loop and carabiner

d. **Semi-Tech Hauling**

(1) Setting up hauling systems discussed for higher level training; serving as rope team member expected of Field III

(2) Two main techniques for hauling

i. Stand in place and pull hand-over-hand
ii. Attach a Prusik loop to the rope, hold onto the loop, and walk backwards

(3) At some point, may need to stop hauling and then move up the rope and haul again

(4) Calls used during hauling
i. **Set!** Gradually release tension on haul line until ratchet Prusik is engaged; call from member best able to see that the team can make no more progress
ii. **Reset!** Drop the haul line and move the haul Prusik back toward the load; call from member who checked that ratchet Prusik has gripped rope to haul team
iii. **Slack!** Let out some rope; may be quantified as: Slack One Foot! The Belayer echoes (sometimes used instead of Reset! in cave rescue)
iv. **Haul!** Pull on haul line; call from member who just reset the haul Prusik to haul team; whistle equivalent: 2 short whistles (NCRC standard, ASTM rope rescue standard: "Up")
v. **Up Slow!** Haul the rope/load up slowly; usually from The Litter Captain to haul team; leader of haul team echoes
vi. **Up Fast!** Haul the rope/load up faster; usually from The Litter Captain to haul team; leader of haul team echoes
vii. **Stop!** Meaning 1: in the context of a technical rescue or semi-tech evac, from anyone to everyone: major safety issue, everyone stop, including stopping hauling; everyone echoes; whistle equivalent: 1 short whistle (NCRC standard, ASTM rope rescue standard); meaning 2: in the context of nontechnical litter carry, from The Litter Captain to litter team: stop walking

e. **Call Sequences Used in Semi-Tech Evacs**

(1) The Litter Captain (semi-tech lowering)
i. Ready! [pause] Lift!
ii. On Belay!
iii. Down Slow!
iv. Down Fast!
v. Stop!
vi. Off Belay!
vii. Ready! [pause] Down!

(2) The Belayer (semi-tech lowering)
i. Belay On!
ii. Down Slow!
iii. Down Fast!
iv. Stop!
v. Belay Off!
vi. Clear!

(3) The Litter Captain (semi-tech uphill with belay)
i. Ready! [pause] Lift!
ii. On Belay!
iii. Up Rope!
iv. Falling!
v. On Belay!
vi. Stop!
vii. Ready! [pause] Down!
viii. Off Belay!

(4) The Belayer (semi-tech uphill with belay)
i. Belay On!
ii. Up Rope!
iii. Falling!
iv. Belay On!
v. Up Rope!
vi. Belay Off!
vii. Clear!

(5) The Litter Captain (semi-tech uphill with haul system)
i. Ready! [pause] Lift!
ii. On Belay!
iii. Up Slow!
iv. Up Fast!
v. Stop!
vi. Ready! [pause] Down!
vii. Off Belay!

(6) The Belayer (semi-tech uphill with haul system)
i. Belay On!
ii. Up Rope!
iii. Falling!
iv. Belay On!
v. Up Rope!
vi. Belay Off!

## 6. Rotating Litter Bearers Practice

a. ASRC protocol for rotating litter bearers from early 1970s to meet these principles:

(1) Litter should not stop

(2) Litter bearers alternate using right and left arms

(3) Litter bearers in pairs roughly matched by height

(4) Litter bearers ready to rotate in to carry litter whenever **Litter Captain** calls "**Ready to Rotate!**"

(5) Relief bearers do not have to pass litter

b. Based on this:

(1) Relief bearers *in front* of the litter

(2) When **Litter Captain** calls "**Ready to Rotate!**":

i. Relief bearers step off trail on either side
ii. Relief bearers set feet
iii. As litter passes, relief bearers grab tail end of litter, move out into trail
iv. Once both relief bearers have hand on litter, back left relief bearer calls "**Rotate!**" and both new back litter bearers use free hand to tap hand of litter bearer in front of them
v. Litter bearers in front of relief bearers shift forward one position, use free hand to tap hand of litter bearer next towards head
vi. Those litter bearers move forwards, tap hand of front litter bearers in front
vii. Front litter bearers let go of litter, cross sides, walk ahead of litter, go to head of line of relief bearers on trail ahead

## 7. Rope and Knot Principles

a. Classification of ropes

(1) Kernmantel vs laid construction

(2) Static rope

(3) Dynamic rope

(4) Tubular webbing

b. Weld-abrasion of nylon rope

## 8. Ropehandling and Knot-Tying* Practice

a. Uncoiling, stacking, and inspecting rope

b. Characteristics of knots

(1) Strength

(2) Security

(3) Proneness to jamming

c. Anchoring: tensionless hitch to a tree or similar object

d. Specific knots

(1) Backup knots:
i. Overhand
ii. Barrel knot (double overhand)

(2) Joining lines
i. Overhand bend (water knot)
ii. Barrel knot (grapevine, double overhand bend)

(3) Climb or secure rope with another rope: 3-wrap Prusik knot

(4) Secure oneself to rope or rappel device: ASRC seat harness

*http://www.conovers.org/ftp/SAR-Evacs.pdf

# Field II Educational Goals

This curriculum is to ensure that those credentialed to Field Level III meet the following educational goals.

## A. Safety, Health and First Aid

1. Learn legal issues pertinent to wilderness first aid, including informed consent, implied consent, express consent, competence, restraint, duty to act, abandonment, negligence, medical licensure and practice of medicine vs first aid.

2. Learn standard wilderness first aid patient assessment, including scene safety survey; primary survey including recognition and management of cardiac arrest, airway management, respiratory arrest, tension pneumothorax, flail chest, bleeding, shock, determining Status 1, Status 2 or Status 3, including determining death; and secondary survey, including basic history-taking, assessing level of consciousness, pulse and respiration, inspection, palpation, percussion and auscultation.

3. Learn principles of human thermoregulation, including heat balance, physical modes of heat loss, and human compensatory mechanisms such as sweating,vasodilation and vasoconstriction, and shivering.

4. Learn more than covered in Field IV about heat illness, including dehydration, heat syncope, heat cramps, and particularly heatstroke, including pathophysiology, recognition, cooling methods, and coaling goals.

5. Learn more than covered in Field IV about field management of hypothermic team members and find subjects, including incipient hypothermia, signs and symptoms of bad hypothermia, diagnosing hypothermia without a thermometer, treating bad hypothermia in the field, including insulating and adding he does much as possible, not being concerned about rewarming shock in the field except for transporting the patient flat, avoiding bumps that might cause ventricular fibrillation, and dealing with severe hypothermia that might mimic death, including questions of whether to start external cardiac compressions or not and about the efficacy of extended CPR even if interrupted.

6. Learn standard wilderness first aid treatment of minor and major wounds, including blisters, burns including grading of burns and the rule of nines, and nosebleeds

7. Learn management and splinting of musculoskeletal injuries, including bruises/contusions, sprains and strains, twisting injuries of the ankle including the Ottawa criteria, closed and open fractures, joint dislocations including how to reduct digit and patella but not other dislocations, improvised splinting, understanding the pathophysiology of compartment syndrome and recognizing compartment syndrome.

8. Learn basic multisystem trauma recognition and management, including the concepts of the Golden hour in the golden day, and general principles for managing multisystem trauma in the backcountry.

9. Review lightning safety from Field IV, and learn common injury patterns from lightning strikes, and learn triage and immediate treatment for a group struck by lightning.

10. Learn search and rescue wilderness first aid level assessment of trauma including head (brain) trauma, pelvic fractures, possible spinal injury including the NEXUS criteria and the need to prevent decubiti, chest trauma including pneumothorax and hemothorax, broken ribs, flail chest, sucking chest wound, and submersion.

11. Learn recognition and treatment of "dry" and envenomated bites from local pit vipers.

12. Learn standard wilderness first aid for recognition and treatment of common or severe medical problems, including "red flags," specifically, hypoglycemia, chest pain, decreased level of consciousness, and seizures

13. Learn "red flags" for the following medical problems: abdominal pain; vomiting and diarrhea; urine problems including urinary tract infection and hematuria (blood in urine); cough; head and neck problems including persistent blurred vision, uncontrolled nasal or other bleeding; head injury with decreasing level of consciousness, and airway compromise; and fever.

14. Learn to recognize immediate stress reactions, and to provide psychological first aid.

15. Learn the factors that go into evacuation urgency decisions.

16. Learn basic improvised evacuation methods, including split-coil and sling piggyback carries, packstraps and pole carry, and poles-and-blanket and poles-and-parkas stretchers.

## B. Communications

1. Learn basic radio principles relevant to the ASRC, including the following.

    a. Learn about electromagnetic waves, wavelength and frequency, and effect of frequency on radio signal propagation.

    b. Learn the difference between AM and FM and how speaking loudly on FM decreases signal strength.

    c. Learn about radio bands and modes, simplex vs duplex, retransmitters (remote bases), repeaters, trunked systems, and ASRC and national interoperability channels.

    d. Learn antenna principles, including antenna radiation patterns and effective radiated power, the effect of ground planes and reflectors and how to improvise them in the field, and how to use other teams to relay to Base.

    e. Learn about carrier squelch, monitor buttons, and PL tone squelch.

    f. Learn the cost range of commercial radios.

    g. Learn basic principles of network discipline.

    h. Learn techniques for improving cellphone communications in the backcountry, including use of texting instead of voice, and ways to improve antenna effective radiated power.

## C. Land Navigation

1. Learn more detailed interpretation than Field III about topographic maps, including more symbols and edge information.

2. Learn more about coordinates and grids than in Field III, including both degree variants and UTM/USNG variants.

3. Learn how to transfer .gpx files between a smartphone GPS app, a dedicated GPS unit and a laptop computer in Base..

## D. Operations, Management and Leadership

1. Learn best practices for dealing with a search subject‘s or rescue patient’s friends and family including the role of the family liaison, how to tell of death, and how to deal with friends and family at Base and in the field.

2. Learn basic terminology and concepts related to team and group morale, including esprit de corps, employee/member engagement, human capital, recognition, trust, organizational prestige

3. Learn physical and emotional influences on individual morale and simple ways to improve individual morale

## E. Search

1. Practice leading teams in common search tasks

2. Formally self-evaluate all steps in leading search tasks

3. Practice using a tracking stick to do step-by-step mantracking

## F. Rescue

1. Learn to do paving, turtling and lap pass.

2. Learn basic care for nylon kernmantel rope.

3. Learn uncoiling and stacking, casting a rope, coiling and inspecting a rope

4. Learn wrap-3, pull-2 and modified basket hitch anchors.

5. Learn knots: figure 8, figure 8 on a bight, figure 8 follow-through loop, figure 8 bend, and a clove hitch,

6. Learn belaying a climber, bottom-belaying a rappeller, belaying and lowering a litter with tree wraps, lowering a litter with a mechanical device, belaying a litter with Prusik loops or a mechanical device, both uphill and downhill rope team rotations, and managing (but not rigging) a 3:1 haul system.
7. Learn standard litter packaging, tie-in and semi-tech rigging principles and practice them.

# Field II Curriculum

This curriculum is to ensure that those credentialed to Field Level II learn the following educational topics.

## A. Safety, Health and First Aid

### 1. Legal Issues*

a. **Consent Overview**

(1) Treating person without informed consent unlawful

(2) *Not* treating person, regardless of consent, when patient has impaired decision-making capacity and needs medical or first aid help, is unlawful

(3) Ordinarily-competent person may have impaired decision-making from alcohol or other intoxication, medication side effects, illness or injury

(4) Unconscious patient: implied consent

(5) Confused or intoxicated or psychotic patient: implied consent

(6) When in doubt, do what's best for person

(7) "Treat the patient the same way you would treat your mother – with concern for her Constitutional right to make her own decisions, even if it kills her, but when her decision-making is impaired, you make decisions for her."

b. **Consent Terms**

(1) Informed consent:

(2) Express consent:

(3) Implied consent:

c. **Principles for Consent Decisions**

(1) **Legal**: What do applicable laws and common-law principles say? Sometimes don't know, so you move to another level:

(2) **Ethical**: What will most reasonable people say is right thing to do, according to commonly-accepted ethical principles? May sometimes need to move to another level:

(3) **Moral**: What do *you* think is right thing to do?

d. **Competence and Capacity**

(1) Unless court declares person *incompetent* (legal term, must be determined by court) and assigns *power-of-attorney* (legal term, must be determined by court) to another person for making medical decisions, person is assumed to be *competent* (legal term) to make medical decisions

(2) Medical personnel (including ASRC members) may not determine *competence,* but may and if indicated must determine *capacity* for informed decision-making

(3) Four tests for capacity are:
   i. Does person *understand* relevant information?
   ii. Can person *process* the information?
   iii. Can person *make* a choice?
   iv. Can person put all these together to *appreciate* the situation and possible consequences of refusing car?

(4) Needed level of capacity varies with seriousness of decision

e. **Restraint**

(1) Courts give physicians (and, by extension, medical personnel, especially if supervised by a physician; includes ASRC members) very wide latitude in restraining people

(2) If think restraints needed to protect against harm to person or others, and have doubts about capacity of person to make informed decision to refuse treatment, restrain patient in least-restrictive manner possible

*http://www.conovers.org/ftp/SAR-Legal.pdf

(3) *Extremely* unlikely to face criminal charges or be sued for damages for restraining impaired person; much more likely to face charges of criminal negligence or be sued if do *not* restrain someone who should have been restrained

f. **Duty to Act**

(1) Different states have different laws about duty to help person in distress: *duty to act* (legal term)

(2) If you start going towards someone with intent to help, have duty to act

(3) If acting as public safety personnel, such as SAR team member on training or operation, especially if in uniform, have duty to act

(4) If have duty to act and do not help, may face criminal charges or be sued for damages

g. **Abandonment**

(1) If start to help person, have duty to continue help person

(2) If stop helping person, may be *abandonment* (legal term)

(3) If abandon person in need, may face criminal charges or be sued for damages

(4) Not abandonment if turn person over to person with similar or better capacity to help

h. **Negligence**

(1) Good Samaritan laws
  i. Different in every state
  ii. Generally say cannot be sued for damages if provide emergency care without compensation, in good faith, and without gross negligence
  iii. Not a defense against criminal charges, just against being sued for damages
  iv. Many lawyers say Good Samaritan laws are just a road bump to get past when suing someone for negligence
  v. In *good faith* (legal term): you really are trying to help, not to hurt
  vi. *Gross negligence* (legal term): harder for plaintiff lawyer to support than simple negligence, means average person would say that was incredibly stupid

(2) Civil suit
  i. Civil suit is when one person sues another for damages
  ii. Civil suit different from criminal prosecution, which is the government accusing person of crime
  iii. Suit may be for different reasons, but we are concerned with negligence

(3) Negligence claims require plaintiff (person suing) proving that chain of five elements occurred ("chain of negligence")
  i. You had duty to act on behalf of plaintiff
  ii. You committed unreasonable act or omission in context of this duty
  iii. An injury occurred to plaintiff,
  iv. Proximate cause (your act or omission caused injury)
  v. Foreseeability: you must have been able to foresee possibility of injury

(4) Prevent negligence suits by
  i. Documenting well
  ii. Being poor (lawyers prefer cases where they can sue people or organizations with lots of money)
  iii. Doing the right thing: meeting the *standard of care* (legal term)

(5) Standard of care is what a court decides it is in a particular instance; to establish standard of care courts look to
  i. Prior appellate (appeals court) decisions that *set precedent* (legal term): *case law* ≈ *common law* (legal terms)
  ii. Textbooks
  iii. Journal articles
  iv. Common practice for similar situations in the particular time the incident occurred
  v. The level of training/credentialing of the defendant

i. **Medical Licensure**

(1) Practicing medicine, including giving medications to people or telling people which medications to take, is *practice of medicine*

(2) Practice of medicine regulated by each state's *medical practice act*

(3) All states' medical practice act requires those practicing medicine to be licensed by state

(4) Practicing medicine without a license is a crime under state law in every state

(5) First aid is not considered medicine and mostly unregulated by states

(6) Giving medicine to someone and telling person to take it is not first aid, is practice of medicine

(7) Putting medicine on a stump or a rock where a person could pick it up and take it, for example two aspirin, and telling person that someone having a heart attack is less likely to die if take a couple of aspirin, is *not* the practice of medicine and is *not* a violation of state medical practice acts ("stump method")

**2. Primary Survey***

a. This material covers standard wilderness first aid and cardiopulmonary resuscitation for adults but not infants or children

b. **Safety, Patient Surveys**

(1) In EMS and emergency medicine, standard three-stage approach to an ill or injured person:
i. **Scene Safety**
ii. **Primary Survey**
iii. **Secondary Survey**

(2) Applies to teammates as well as search and rescue patients

c. **Scene Safety: ("A dead rescuer never did anyone any good")** start first aid only after ensuring safety of patient and team from hazards such as

(1) Falling

(2) Rockfall

(3) Flooding

(4) **Cold, Hungry and Thirsty**:
i. All backcountry patients are hypothermic, starving and dehydrated until proven otherwise; may need to address this during or right after primary survey
ii. Must consider hypothermia during the primary survey, covering and if needed moving patient to prevent heat loss *may* be high priority; need to insulate under as well as over patient
iii. Oral fluids and food important defenses against hypothermia, and should give to all backcountry patients unless some good reason not to, such as comatose; even patients with vomiting may be able to keep down some fluids

(5) Patient's blood and body fluids are hazards: may carry infectious diseases such as Hepatitis A, B and C, and HIV; covered in bloodborne pathogens section above

d. **Primary Survey**

(1) Primary survey looks for immediately life-threatening problems and to tries to correct as found, not moving on until problem fixed

(2) If patient talking to you without major respiratory distress and no major bleeding, ABC primary survey is done

(3) Primary survey often called "**ABCs**"
i. **A** for airway: assess; if needed, open airway
ii. **B** for breathing: assess; if needed, support ventilation with mouth-to-mouth or bag-valve-mask ventilation
iii. **C** for circulation: assess; if no pulse, begin cardiac compressions; in first aid/EMS, also includes bleeding control and shock treatment
iv. Some like to add D and E but not standardized

(4) ABCs most traditional and useful as general framework

* Auerbach, P. S., et al. (2013). Field guide to wilderness medicine. Philadelphia, PA, Elsevier/Mosby.
Backer, H. D., et al. (2015). Wilderness first aid : emergency care in remote locations. Burlington, MA, Jones & Bartlett Learning.
Thygerson, A. L., et al. (2017). First aid, CPR, and AED. Advanced. Burlington, MA, Jones & Bartlett Learning.

(5) American Heart Association now teaching **CAB** instead of ABC: starting external cardiac compression right away important for survival from sudden cardiac arrest in urban, safe environment*

(6) American Heart Association changed ABC to CAB because:
- i. For cardiac arrest (but not necessarily other medical emergencies) circulation (external cardiac compression) more important than breathing (artificial respiration)
- ii. External cardiac compression until can rapidly defibrillate heart may be lifesaving
- iii. External cardiac compression moves some air in and out of lungs, and passive diffusion of oxygen provides some oxygen to lungs
- iv. People think mouth-to-mouth artificial respiration yucky, and may prevent them from doing external cardiac compression

(7) US military now teaching **MARCH**** 
- i. **M** for **massive hemorrhage**: assess; if needed, apply **tourniquet**, then **direct pressure** with QuickClot Combat Gauze or similar **hemostatic dressing**
- ii. In combat, massive bleeding major preventable source of death and should be addressed first
- iii. Pressure points and elevation used to be recommended; military, based on research and experience, says not to use
- iv. **A** for **airway**: same as A in ABCs
- v. **R** for **respiratory**: same as B in ABCs, including quality of respiration and check for chest trauma such as sucking chest wound or tension pneumothorax
- vi. **C** for **circulation**: if pale, sweaty, rapid weak pulse, maybe altered level of consciousness, keep from chilling, elevate legs)
- vii. **H** for **head trauma:** prevent additional brain damage by monitoring airway and respirations, avoid any straps across neck; no need to elevate head
- viii. **H** also for **hypothermia**: assess and if needed place patient in **HPMK** (military **H**ypothermia **P**revention and **M**anagement **K**it) consisting of fiber-reinforced "space" blanket mummy-type sleeping bag with four iron heat packs on chest, or improvised equivalent

(8) **Primary survey: context-dependent**
- i. If shooting or explosion, military MARCH sequence probably best
- ii. If in building at Base and someone collapses, American Heart Association CAB sequence probably best
- iii. If in field on task and first aid emergency, have to use judgment as to which mnemonic/algorithm to use, ABC is usual default

e. **Alive** or **dead**?***

(1) May **assume dead** if:
- i. **Decapitation**
- ii. **Transection** of torso
- iii. Patient is **frozen** so hard that chest can't be compressed
- iv. Patient's **rectal temperature** very cold, and **same as environment**
- v. Well-progressed **decomposition** that is not frostbite

(2) **Probably dead** if:
- i. **Rigor Mortis**: postmortem rigidity, but similar rigidity seen in hypothermic semiconscious patients
- ii. **Dependent Lividity**: redness of lower portions of body common in corpses, but find pressure necrosis (bedsores) and frostbite in some live patients
- iii. **Decomposition**: odors of decomposition common in corpses, but live search subject may be very smelly; even maggots may be found growing in live patients
- iv. **Lack of Presumptive Signs of Life**: if dead, pulses not palpable, respirations undetectable, dilated and unreactive pupils and no signs of consciousness, but may also see in deep hypothermia

(3) Some medical conditions mimic death, **extended resuscitation attempts** may be appropriate:
- i. Hypothermia
- ii. Near-drowning

*Field, J. M., et al. (2010). "Part 1: executive summary: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care." Circulation 122(18 Suppl 3): S640-656.
Travers, A. H., et al. (2010). "Part 4: CPR overview: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care." Circulation 122(18 Suppl 3): S676-684.
Berg, R. A., et al. (2010). "Part 5: adult basic life support: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care." Circulation 122(18 Suppl 3): S685-705.
**Drew, B., et al. (2015). "Application of Current Hemorrhage Control Techniques for Backcountry Care: Part One, Tourniquets and Hemorrhage Control Adjuncts." Wilderness Environ Med.
***Pennsylvania Emergency Health Services Council Medical Advisory Committee Position Statement Standard Guide: Desisting from and Ceasing Prehospital Resuscitation

iii. Lightning strike
iv. Electrocution
v. Drug overdose
vi. Avalanche burial

(4) **Half an hour of resuscitation** maximum in wilderness unless signs of successful resuscitation

(5) No attempts at resuscitation of probably-dead if will put team at risk

f. **Status I vs Status II**

(1) Status I can walk out with assistance

(2) Status II needs litter evacuation

(3) Main determination of ability to walk made by subject/patient

(4) May not be able to walk initially, but with food, water, pain medication, or splinting or taping of ankle, may be able to walk out with assistance

(5) Should not try to bear weight on obvious lower extremity fracture, may cause damage, converting closed fracture to open fracture; much worse outcome for open fractures)

g. **Medical Resource Assessment**

(1) Based on assessment by person with highest medical training at site, may request specific medical equipment or medications be brought to patient

(2) May be for treatment or to make evacuation easier, for example
i. Aircast type ankle brace
ii. "Fiberglass" splinting material
iii. Pain medication

(3) FTL determines evac route, method and urgency, based on medical condition and available resources with input from medic

## 3. Airway Management* Practice

a. **Problem**: blood, vomit or acid reflux in airway/lungs

(1) Blood in airway may interfere with breathing

(2) Vomit in airway may interfere with breathing

(3) Vomiting or passive acid reflux in unconscious patient (may be no outward sign of this) may get stomach acid into lungs; may cause severe lung damage

b. Managing airway blood, vomit or acid reflux

(1) Turn litter patient when vomiting

(2) Position in coma position = recovery position, and package patient on side in litter using coma position

(3) Using portable suction device to clear airway

c. **Problem**: when on back and deeply unconscious tongue may fall back and obstruct airway; ways to manage:

(1) Coma position

(2) Head-tilt (but concern if possible cervical spine injury)

(3) Jaw thrust

(4) Chin lift

(5) Oral and nasal airways

d. Foreign body

(1) If making noise, allow to try to clear airway by self

(2) Abdominal thrusts may help; may use chest thrusts if abdomen thrusts not effective, less than 1 year old, or pregnant

(3) Remove foreign body with fingers if can see

## 4. Breathing Assessment and Management

a. Assess rate of breathing

(1) Too slow, too fast, or just right; normal depends on activity level, resting rate normally about 12-20

* Backer, H. D., et al. (2015). Wilderness first aid : emergency care in remote locations. Burlington, MA, Jones & Bartlett Learning, pp 32 et seq.
Thygerson, A. L., et al. (2017). First aid, CPR, and AED. Advanced. Burlington, MA, Jones & Bartlett Learning.

(2) While watching chest, traditional to measure for 30 seconds and multiply by 2

(3) Traditional to not tell patient when counting respirations to avoid conscious changes in breathing rate

b. Assess quality of breathing

(1) Shallow breaths? Deep breaths?

(2) Work of breathing: easy or hard?

(3) Signs of respiratory distress:
i. Nasal flaring
ii. Supraclavicular retractions (soft tissues above collarbone sucking in with deep breath in)
iii. Subcostal retractions (soft tissues below ribs sucking in with deep breath in)
iv. Using accessory muscles (neck muscles) to breathe

c. Assess for normal vs abnormal sounds
i. Stridor: upper airway obstruction
ii. Gurgling: secretions in upper airway
iii. Listening to lungs directly: wheezing (listening directly to lungs with ear against chest or stethoscope): asthma, chronic obstructive pulmonary disease or similar
iv. Listening to lungs directly: Crackles (râles): sounds like rubbing hair together near your ear, sign of pneumonia, blood clot in lung, or bruised lung
v. Listening to lungs directly: decreased breath sounds: maybe from air around lung (pneumothorax) or blood around lung (hemothorax)

d. If breathing absent or not adequate:

(1) Open airway

(2) Artificial respiration by mouth-to-mouth resuscitation

(3) Artificial respiration may be lifesaving by itself after lightning strike

(4) May wish to carry keychain-sized pocket mask to protect against communicable diseases when giving artificial respiration

e. Assess for rare but deadly chest injuries

(1) **Pneumothorax and Tension Pneumothorax**
i. May come from blunt or penetrating trauma
ii. Leak in lung leads to air around lung, causes lung, which works by suction from the rib cage, to collapse: simple pneumothorax, lung doesn't work as well as normal
iii. One-way valve leak in lung may lead to **lots of air around lung** with high pressure, leads to **complete long collapse** and **pushes heart into good lung**, may cause death: **tension pneumothorax**
iv. Signs and symptoms of tension pneumothorax: **decreased breath sounds on bad side, increased percussion tone on bad side,** trouble breathing, shock, death
v. Percussion, one of four classic modes of physical examination: inspection, palpation (feeling), percussion, auscultation (listening); done by pressing firmly on chest or distended abdomen with hand, then tapping middle finger knuckle with tip of other hand's middle finger straight-on, hard, and listening to the drum-like sound that results
vi. Treatment: stick large-bore long needle through chest wall to let excess air out
vii. Not a first aid skill but should be aware, as needling a tension pneumothorax may be lifesaving and nothing else works

(2) **Sucking chest wound**
i. Hole in chest wall that causes lung, which works by suction from the rib cage, to collapse
ii. Have patient breathe out to expel air from around the lung, then make airtight seal with whatever is handy; take off seal briefly if seems to be getting worse

(3) **Flail Chest**
i. Multiple ribs broken in multiple places
ii. Paradoxical movement of chest: part moves in and part moves out with each breath, preventing normal lung expansion
iii. Splint with soft bulky mass (e.g., fleece sweater) duct-taped to chest to stabilize; better to stabilize in than have moving in and out

**5. Circulation: Cardiac Arrest*** Practice

a. External cardiac compression wilderness-specific background

*Cardiac arrest management training may be accomplished through training at the Group or ASRC level, or by taking an external CPR course. If the external CPR course does not teach the coma

(1) External cardiac compression may provide about 1/3 of normal cardiac output, if done perfectly

(2) In ventricular fibrillation or similar cardiac arrest external cardiac compression may sustain life until can defibrillate with AED or defibrillator

(3) External cardiac compression may sustain life for hours if patient severely hypothermic; much less effective if patient warm

(4) If patient warm and no AED or defibrillator available, no point in continuing external cardiac compression for more than 30 minutes, especially in backcountry

(5) External cardiac compression not effective in traumatic arrest

(6) In cardiac arrest, external cardiac compression without ventilation may be adequate as it forces some air in and out of lungs, may be enough

b. External cardiac compression technique

(1) "Push hard and fast in center of chest" (American Heart Association = AHA)

(2) AHA recommendations 2015:
i. Minimize interruptions in chest compressions
ii. Provide compressions of adequate rate and depth
iii. Avoid leaning on the victim between compressions
iv. Ensure proper hand placement
v. Avoid excessive ventilation

(3) "The rescuer should place the heel of one hand on the center (middle) of the victim's chest (which is the lower half of the sternum) and the heel of the other hand on top of the first so that the hands are overlapped and parallel." (AHA 2015)

(4) Practice CPR on manikins until able to do it effectively and efficiently

c. AEDs

(1) AED usually not available in field but may be available at Base

(2) Steps to use AED (American Red Cross; video available*)
i. *These AED steps should be used when caring for a non-breathing child aged 8 or older who weighs more than 55 pounds, or an adult.*
ii. *After checking the scene and ensuring that the person needs help, you should ask a bystander to call 911 for help, then:*
iii. *Turn on the AED and follow the visual and/or audio prompts.*
iv. *Open the person's shirt and wipe his or her bare chest dry. If the person is wearing any medication patches, you should use a gloved (if possible) hand to remove the patches before wiping the person's chest.*
v. *Attach the AED pads, and plug in the connector (if necessary).*
vi. *Make sure no one is, including you, is touching the person. Tell everyone to "stand clear."*
vii. *Push the "analyze" button (if necessary) and allow the AED to analyze the person's heart rhythm.*
viii. *If the AED recommends that you deliver a shock to the person, make sure that no one, including you, is touching the person – and tell everyone to "stand clear." Once clear, press the "shock" button.*
ix. *Begin CPR after delivering the shock. Or, if no shock is advised, begin CPR. Perform 2 minutes (about 5 cycles) of CPR and continue to follow the AED's prompts. If you notice obvious signs of life, discontinue CPR and monitor breathing for any changes in condition.*

(3) Should practice with trainer AED or watch video referenced above until confident how to use AED

### 6. Circulation: Bleeding** Practice

a. If massive bleeding, apply tourniquet immediately

b. Direct pressure

(1) Direct pressure on bleeding area with fingers stops most bleeding

position (most CPR courses do not), this must be taught and learned via Group or ASRC training.

*https://www.youtube.com/watch?v=BAWGjNAj_vA

**Drew, B., et al. (2015). "Application of Current Hemorrhage Control Techniques for Backcountry Care: Part One, Tourniquets and Hemorrhage Control Adjuncts." Wilderness Environ Med. Littlejohn, L., et al. (2015). "Application of Current Hemorrhage Control Techniques for Backcountry Care: Part Two, Hemostatic Dressings and Other Adjuncts." Wilderness Environ Med.Wou

(2) Gloves and eye protection to prevent blood-borne pathogen exposure

(3) Gauze pad or scrap of clean cloth on fingers will help prevent fingers from slipping

(4) Have to hold continuous pressure for usually at least 10 minutes to get significant bleeding to stop, sometimes longer; if starts bleeding again, need to hold pressure again for 10 or more minutes

(5) May have to quickly switch fingers to relieve pressure on fingertips

(6) If unable to control with direct pressure, apply tourniquet

c. Elevation (of arm or leg) may help slightly by decreasing blood pressure in the limb

d. Pressure points now thought to be essentially useless

e. Improvised tourniquet principles

(1) Place 2-3" (5-8 cm) proximal (higher on limb) than bleeding site

(2) Should be wide, at least an inch (2.5 cm) to avoid damage to underlying skin and muscle

(3) Tourniquet must be flexible to tighten with twisting with a strong stick, carabiner or similar object ("windlass")

(4) Non-stretchy webbing belt or pack or climbing webbing or strip of shirttail cut off and folded over multiple times may work

(5) Must be tight enough to cut off arterial flow; less-tight tourniquet may increase bleeding

(6) If possible, place flat relatively stiff object, such as cover of pocket notebook, under where windlass will be to prevent twisting and crushing of skin and muscle

(7) Tighten windlass until bleeding stops, then tighten another half-turn and secure windlass stick so does not loosen

(8) Monitor frequently for loosening and re-bleeding

(9) May use tourniquet along with elevation and direct pressure

f. Hemostatic gauze, such as Quick-Clot Combat Gauze, may help stop bleeding; some other brands effective, some not

**7. Circulation: Shock**

a. Shock is generalized state of poor perfusion of entire body

b. Perfusion is an adequate supply of blood to bring $O_2$ and glucose to the cells, and to take away $CO_2$ and other waste products

c. Hypovolemic shock (= low blood volume, most common type) may come from:

(1) Blood loss

(2) Dehydration from heat exposure

(3) Dehydration from vomiting and diarrhea

(4) Dehydration from lack of food and water

d. Other types of shock from heart (cardiogenic), from spinal damage (neurogenic) and from infection (septic) less common

e. Psychogenic shock (sometime grouped with spinal neurogenic shock): fainting from stress or bad news, causes blood vessels to dilate (get bigger) and blood rushes away from the head and towards the feet

f. Signs and symptoms of shock

(1) Increased pulse rate, weak and thready pulses; lose arm and leg pulses, then femoral pulse, finally carotid pulse

(2) Cool, clammy and maybe mottled skin

(3) Restlessness from adrenaline response early; later may become lethargic or unconscious

(4) May pass out if tries to stand, or with worse shock, sit up

g. Treatment for all kinds of shock:

(1) Keep from chilling (very predisposed to hypothermia)

(2) Lay flat with legs elevated slightly

(3) In backcountry context, if possible, give food, fluids, and adding salt to food as will help rehydrate patient

(4) If appropriate, consider asking for IV fluids and someone who can give them to come to patient

(5) Try to correct cause of shock (bleeding, diarrhea… )

**8. Warmth, Food and Drink**

a. Standard saying is that "in the backcountry, all patients are hypothermic, dehydrated and starving" (cold, thirsty and hungry)

b. At same time as primary or secondary survey should be insulating under and over patient and protecting from wind, rain and snow

c. First aid and Emergency Medical Services (EMS) in civilized places has rule to not give food or fluids to patient

d. In backcountry, rule is to *always* give food and fluid to patient unless unconscious

e. If patient has decreased level of consciousness or other concerns about eating or drinking, try small sips of water; if doesn't choke, give food and drink

**9. Secondary Survey Practice**

a. **Vital Signs**

(1) People argue about whether vital signs are part of secondary survey, or separate; and about what really are the vital signs (temperature? pulse oximetry? pain?); not worth wasting time on this

(2) **Pulse**[*]

i. Pulse points: artery close to skin, compressible against bone or trachea and can feel relatively easily

ii. Locations and technique of carotid, femoral, radial, dorsalis pedis and posterior tibial pulses, including for arm and leg pulses two fingers on pulse point and thumb on other side to allow better control of pressure level

iii. Quality: normal, full and bounding, weak and thready

iv. Pulse rate: normal resting pulse 50-90, may be higher with exertion, shock, dehydration, fever; may be lower if hypothermic

v. Count pulse for 15 seconds then multiply by 4

vi. Hard to feel pulse when your fingers are cold; if cold, warm them up first

vii. Cold, damage to arteries, or compression of arteries by too-tight splints or dressings or tie-ins may decrease or stop pulses in arms or legs

viii. With progressively worse dehydration, shock or hypothermia, will lose pulses in arms and legs, then femoral pulse, then carotid pulse (then death)

ix. May be helpful to know, for example, that at first could feel carotid and femoral pulses but now unable to feel femoral pulse.

b. **Modes of Examination**

(1) **Inspection** = looking for abnormalities such as deformities, bruises, cuts or scrapes, burns, swelling: (generally expose area of concern, if only briefly, considering danger of cold exposure)

(2) **Palpation** = pressing: firmly but gently with fingers or whole hand, checking for tenderness (pain with pressure), deformities, crepitance (crunching)

i. Palpating head and face, spine, chest and extremities: start with firm pressure with entire hand

ii. Best to do both sides at same time, one with each hand: helps compare bad side with good side for deformity and swelling

iii. If causes pain (pressure > pain = tenderness), use finger or couple of fingers to try to localize tenderness better

iv. Bony point tenderness (tender one place, but not an inch to either side) suggests fracture

v. Palpating abdomen: warm hands first (cold > patient tightens muscles); come in from side (less scary = patient less likely to tighten

[*] https://en.wikipedia.org/wiki/Pulse

muscles); one hand on top of other and press gently; when moving hand, slide across abdomen, don't pull away and then come back (scary)

(3) **Percussion** = tapping and listening for drum-like sound, but specifically holding fingers firmly against something like chest with suspected pneumothorax, then using other hand's straight finger, with a flipping of the wrist, as a hammer to tap on one of the knuckles; takes practice (check for hyperresonance of lung = more echo-y than normal may indicate pneumothorax)*

(4) **Auscultation** = listening, made easier by stethoscope but can be done with ear firmly against, for instance, bare chest

c. **Secondary Survey vs Directed Physical Exam**

(1) Directed physical exam is physical exam focusing on area of interest, such as ankle; may be appropriate if no concern about other injuries

(2) Secondary survey is head to toe survey for injuries for trauma patient

(3) For significant trauma best practice to do at least a brief head-to-toe secondary survey for injuries patient didn't notice

(4) To make it easier to tell normal from abnormal, humans mostly bilaterally symmetric, so can compare with other side

(5) Can also use exam of normal team member as comparison

(6) **AVPU** assessment of level of consciousness mnemonic:
i. **Alert**
ii. **Verbal**: opens eyes to your voice
iii. **Pain**: opens eyes to a painful stimulus (rubbing knuckles on chest, twisting skin on back of hand or pressing on nerve in groove towards middle of eyebrow traditional)
iv. **Unresponsive**: no response to pain

(7) **SAMPLE** history mnemonic
i. **Symptoms** (Symptoms are complaints related by patient; signs are what first-aider observes)
ii. **Allergies**
iii. **Medications**
iv. Pertinent **Past medical history**
v. **Last oral intake** (sometimes also Last menstrual cycle.)
vi. **Events Leading Up** to present illness/injury

(8) **DCAP-BTLS** mnemonic: traumatic findings to look and feel for (memorization not required)
i. **Deformities**
ii. **Contusions**
iii. **Abrasion**
iv. **Penetrations**
v. **Burn**
vi. **Tenderness**
vii. **Lacerations**
viii. **Swelling**

## 10. Thermal Regulation**

a. Heat Balance

(1) Body always producing and losing heat

(2) Heat production from muscular activity and digestion, and in an emergency, shivering

(3) Physiological methods to decrease heat loss
i. Piloerection (goose bumps) essentially useless in humans, not enough fur to fluff out to make a difference
ii. Vasoconstriction of superficial veins and shunting to deep veins with countercurrent heat exchange from deep arteries to deep veins (demonstrate by looking at superficial veins on arms and hands)

(4) Physiological methods to increase heat loss
i. Vasodilitation (vasodilation) of superficial veins (getting larger, bringing more blood to surface to cool)
ii. Sweating, including sweat salt concentration changes with adaptation, and how much exercise in the heat is needed for adaptation

(5) Effect of certain relatively-common drugs and diseases on heat regulation

b. Physical modes of heat loss from the body, with real-life examples of each, and methods for countering each

* https://www.youtube.com/watch?v=48nzLXnEHvg
**http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/06-Thermal-Regulation.pdf

(1) Conduction

(2) Convection

(3) Evaporation

(4) Radiation

(5) Respiration

c. Weather factors affecting heat loss, real-life examples of each, and methods to counteract each

(1) Windchill

(2) Wetchill

d. "Hypothermia weather" (sudden onset of wind and rain at temperatures just above freezing, combining windchill and wetchill) and how to manage a team that just got hit by it

e. Even on hot midsummer day, center of thunderstorm, with high wind, drenching rain, and cold air coming down from upper atmosphere, maybe with hail or sleet, may cause near-instant hypothermia

f. In cold, peripheral veins constrict to prevent heat loss from skin; this and direct effects of cold on kidneys leads chilled or hypothermic people to generate more urine ("cold diuresis") and thus cold exposure causes some dehydration directly

g. People in winter don't drink much water because it's inconvenient, even though losing fluid from cold diuresis and lots of evaporation from breathing cold, dry air ("seeing your breath steam" in the cold)

## 11. Heat Illness*

a. **Dehydration**

(1) Prevention of dehydration and heat acclimatization discussed in Field IV curriculum

(2) Suspect dehydration in appropriate setting (exertion in hot weather, especially if not heat-acclimatized; exertion in cold weather without adequate fluid intake) when person has some or all of:

i. Thirst
ii. Lightheadedness, weakness, tunnel vision, or headache
iii. No urine, or small amounts dark urine
iv. Weakness, sometimes so weak cannot continue with task
v. Extreme cases: may not be able to stand without losing consciousness
vi. Similar symptoms may occur with hypoglycemia and other conditions

(3) Treatment of dehydration is replacement of water and salt; Gatorade or similar drinks, salty bouillon in winter, or water and salty snacks recommended

(4) Since sometimes hard to tell if dehydration or hypoglycemia, best to treat for both with water, salt and sugar

b. **Heat Syncope**

(1) People exposed to heat may faint

(2) Heat causes vasodilation (expanding blood vessels)

i. May not have enough blood to fill expanded blood vessels
ii. If not enough blood and standing, not enough blood gets to brain
iii. Not enough blood to brain causes fainting

(3) As with other kinds of fainting (e.g., psychological shock), treatment is to lay person flat with legs elevated to return some blood from legs

(4) If patient still unconscious when laid flat, should turn on side into coma/recovery position

c. **Heat Cramps**

(1) Dehydration and salt loss may lead to cramps

(2) Treatment is rehydration, salt replacement and stretching

d. **Heat Exhaustion**

(1) Heat exhaustion just bad case of dehydration, maybe with mildly elevated core temperature which may occur with dehydration even without heat exposure

*https://www.wemjournal.org/article/S1080-6032(18)30199-6/fulltext

(2) Treatment same as for dehydration

e. **Heatstroke***

(1) Review of material from Field IV with more on treatment

(2) Qualitatively different from dehydration and heat exhaustion

(3) Certain medications make heatstroke more likely; those on them may get heatstroke in hot environment without major exertion; certain psychiatric medications in particular

(4) Aerobically-fit people in a hot environment can create heat faster than they can get rid of it ("exertional heatstroke")

(5) Core body temperature rises high enough to damage vital organs such as kidney, liver and brain

(6) May cause lifelong medical problems or death

(7) If right setting for heatstroke, skin hot and maybe dry and confused or comatose, assume heatstroke and treat for it.

(8) Skin may be dry or wet, flushed (red) or pale

(9) Treatment
i. Wilderness Medical Society (WMS) recommends immersing heatstroke patients in cold water
ii. WMS says *not* true that cold water immersion is bad due to causing shivering and vasoconstriction that limits heat loss; conduction of cold water overwhelms these effects even if they're real
iii. If immersion in cold water not possible, drench with water and fan

(10) If applying ice packs or water"
i. If enough, apply to whole body
ii. If don't have enough, don't apply to traditional neck, axilla (armpit) and groin; instead, apply to palms, soles and cheeks which have direct access to the central circulation via high-capacity blood flow subcutaneous arteriovenous anastomoses

(11) Don't give Tylenol (acetaminophen, paracetamol), ibuprofen (Motrin, Advil, Nuprin) or naproxen (Aleve); even though we tend to give them for fever they don't help with heatstroke and likely will cause worse organ damage

(12) If have thermometer, cool to 39°C (102.2° F) but no lower; heatstroke may damage brain thermal regulation circuitry, danger of cooling too far and causing hypothermia

(13) Arrange for urgent transportation to an Emergency Department; heatstroke may warrant medical air transport

## 12. Hypothermia

a. Hypothermia recognition and prevention, and treatment for mild hypothermia in team members, covered in Field IV

b. Additional background on hypothermia

(1) Incipient hypothermia, also known as pre-hypothermia
i. Hypothermia is specifically a low *core* temperature
ii. But, periphery (non-core: arms and legs and body fat on torso) may become chilled well before core temperature drops
iii. Rewarming the periphery when very chilled requires energy equivalent to a very large dinner

(2) Signs and symptoms suggesting bad hypothermia:
i. Uncontrollable shivering (but some don't do this even if very cold, or may stop shivering below a certain core temperature)
ii. Arms held close against body
iii. Clumsiness (but may be sign of many other conditions)
iv. Slow thinking; poor memory; as core temperature drops more, confusion then finally unconsciousness

(3) Diagnosing hypothermia without a thermometer:
i. If have reason to suspect hypothermia, place your warm hand in armpit
ii. If armpit feels cold, treat for hypothermia
iii. Might be just incipient hypothermia = pre-hypothermia, but treatment is same

*https://www.nejm.org/doi/full/10.1056/NEJMra1810762?query=featured_home

c. Treatment of patient with bad hypothermia in field

(1) Insulate from cold as much as possible

(2) Add as much heat as possible

(3) "Rewarming Shock"
   i. If put in tub of hot water to rewarm, may cause reflex dilation (expansion) of surface veins; combined with dehydration from cold exposure, may result in low blood pressure and fainting; hot water immersion of bad hypothermia appropriate only if giving IV or oral fluids with salt to prevent shock
   ii. Tubs of hot water not available in field, can't add enough heat to cause rewarming shock in field, so add as much heat as possible

d. Dehydration from bad hypothermia may cause fainting; if person tilted head-up, prolonged fainting may cause seizures and death; carry litter flat; when carrying, do not elevate the head as there are case reports of this causing death*

e. Hypothermia makes patient's heart more irritable, handle gently to avoid causing cardiac arrest

f. Exertion also reportedly causes sudden death in bad hypothermia; have patient rest while lying flat

g. CPR and very bad hypothermia:

(1) Severe hypothermia may mimic death; check for a full minute for a carotid pulse if suspect severe hypothermia

(2) If having hard time telling if patient dead or very hypothermic, check for any signs of life (such as movement of chest, fogging of cold object held near mouth and nose)

(3) If has signs of life, best not to do cardiac compressions, may cause ventricular fibrillation cardiac arrest as cold heart is irritable

(4) If patient with bad hypothermia goes into cardiac arrest, may perform CPR at normal rates

(5) If bad hypothermia and CPR in progress, some have survived lengthy pauses in CPR for evacuation, as requirements for perfusion decreased when bad hypothermia; if external cardiac compression needed, unlike warm patient, may survive hours of external cardiac compression

(6) If severely hypothermic patient with signs of life or with external cardiac compression in progress, may contact Base to discuss possible helicopter evacuation to facility with 24-hour core rewarming which might be lifesaving

## 13. Wounds and Burns**

a. Preventing infection

(1) Treating minor wounds (abrasions, scratches that don't require sutures)
   i. Cleanse with clean (doesn't need to be sterile) water
   ii. Dry
   iii. Apply antibiotic ointment and bandage, possibly with tincture of benzoin so adheres better
   iv. Cleanse with water, perhaps with soap, twice a day and reapply antibiotic ointment until healed

(2) Treating larger non-contaminated wounds (example: forehead laceration from someone's elbow)
   i. Rinse with clean (doesn't need to be sterile) water
   ii. Dry
   iii. Apply antibiotic ointment and bandage, possibly with tincture of benzoin so adheres better

(3) Irrigation for larger contaminated wounds
   i. Need for member to protect eyes
   ii. High-pressure irrigation for contaminated wounds only: reduces infection in contaminated but not clean wounds
   iii. Clean but not sterile water needed
   iv. May use plastic bag with small hole (and zipper folder over to prevent unexpected opening) to generate high pressure stream

*Pugh, L. G. C. E. (1966). "Accidental hypothermia in walkers, climbers, and campers: report to the medical commission on accident prevention." Br Med J: 123-129.

**Quinn, R. H., et al. (2014). "Wilderness medical society practice guidelines for basic wound management in the austere environment." Wilderness Environ Med 25(3): 295-310
http://www.conovers.org/ftp/WEMJ-Letter-Wound-Irrigation.pdf
Fisher, A. A. (1982). "Topical medicaments which are common sensitizers." Ann Allergy 49(2): 97-100
Edlich, R. F. and J. G. Thacker (1994). "Wound irrigation." Ann Emerg Med 24(1): 88-90
Quinn, J. V., et al. (2014). "Traumatic lacerations: what are the risks for infection and has the 'golden period' of laceration care disappeared?" Emerg Med J 31(2): 96-100
Prats, M., et al. (2013). "Fishhook removal: case reports and a review of the literature." J Emerg Med 44(6): e375-380.
Chan, C. and G. A. Salam (2003). "Splinter removal." Am Fam Physician 67(12): 2557-2562.

(4) Dangers from antiseptics (alcohol, peroxide) in wounds: damage tissue and increase risk of infection

(5) Dressings and bandages, including role of benzoin tincture to make bandages stick better

(6) Antibiotic ointment:
  i. Prevent about 1 in 10 traumatic wound infections
  ii. Bacitracin ointment recommended: high risk of blistering allergic reaction like poison ivy with neomycin-containing ointments such as Neosporin

(7) Re-cleansing and reapplying antibiotic ointment a few times a day will also help prevent infection

b. Deciding which wounds need to be treated in a medical facility: high-risk wounds needing exit or evacuation from field for immediate treatment to help avoid later problems:

(1) "Golden 8 hours" in which to primarily close laceration vs recent study contradicting this*

(2) Diabetes mellitus as a major risk for infection and may want to delay closure for wounds in diabetic patient

(3) Role of delayed primary closure 4 days after initial wounding: if not visibly infected then, can close just like brand-new with same results**

(4) High-risk wounds
  i. Large wounds that require suturing
  ii. Wounds with exposed bone or tendon (white in wound)
  iii. Wounds with extensive crushing of tissue
  iv. Deep puncture wounds if no tetanus shot within 10 years

c. Splinters and fishhooks

(1) May remove in field if comfortable doing so, not deep and not near vital structures such as tendons, bones or major blood vessels

(2) Techniques for removing***
  i. String and pressure method
  ii. 18 ga needle method
  iii. Advance and cut method

d. Larger impaled objects

(1) Standard "street" first aid management is to stabilize in place and transport

(2) In backcountry setting, remove impaled objects if unable to stabilize, will easily fall out, prevents transport, or unable to control bleeding because of the object

e. **Blisters******

(1) Wool socks with terry-knit on outside (e.g., Rohner, or SmartWool or Darn Tough worn inside out: as good as using separate liner socks

(2) Moleskin adhesive felt patches: traditional, but 3M paper tape may be better

(3) Vaseline or similar lubricants:
  i. Works for about an hour
  ii. 3-4 hours later makes blisters more likely

(4) Benzoin tincture on skin: no evidence it works

(5) 3M Micropore paper tape on hot spots
  i. Shown to be most effective in one marathon runner study*****
  ii. Tends not to stick that long
  iii. Can put benzoin tincture on skin first to help it stick

(6) After-market insoles not only help sore feet but help prevent blisters

(7) Closed blisters:
  i. Drain with clean needle or knife point

* Quinn, J. V., et al. (2014). "Traumatic lacerations: what are the risks for infection and has the 'golden period' of laceration care disappeared?" Emerg Med J 31(2): 96-100.
** Rosenfeld, L. (1947). "Delayed suture of war wounds." Surgery 21(2): 200.
*** Prats, M., et al. (2013). "Fishhook removal: case reports and a review of the literature." J Emerg Med 44(6): e375-380.
**** Quinn, R. H., et al. (2014). "Wilderness medical society practice guidelines for basic wound management in the austere environment." Wilderness Environ Med 25(3): 295-310. References:
www.conovers.org/ftp/Foot-Blisters-All.pdf
www.blisterprevention.com.au/blister-blog/how-to-use-hydrocolloid-dressings
www.wemjournal.org/article/S1080-6032(14)00379-2/fulltext
www.podiatrytoday.com/how-to-manage-friction-blisters
www.ingentaconnect.com/content/wk/jsm/2016/00000026/00000005/art00005
Vonhof, J. (2016). Fixing your feet : injury prevention and treatments for athletes. Birmingham, AL, Wilderness Press
***** Lipman, G. S., et al. (2016). "Paper Tape Prevents Foot Blisters: A Randomized Prevention Trial Assessing Paper Tape in Endurance Distances II (Pre-TAPED II)." Clin J Sport Med.

ii. Do not put hydrocolloid dressings on intact blisters
iii. Apply benzoin tincture widely around but not into open blister
iv. Apply donut of felt adhesive moleskin around blister but not directly on blister
v. Cover blister and moleskin with paper tape or moleskin

(8) Open blisters
i. Trim off dead skin
ii. Apply benzoin tincture widely around but not into open blister
iii. Apply hydrocolloid dressing (Compeed, Spenco, Band-aid Blister)
iv. Apply donut of moleskin around blister, on top of hydrocolloid dressing

f. **Thermal Burns***

(1) First degree: skin reddened, no blisters
i. Sunburn, although can have small blisters, is usually first degree
ii. Aloe containing creams on the skin help healing
iii. Creams containing pramoxine and menthol, local anaesthetics with low potential for allergy, available over-the-counter, usually as anti-itch creams; work well to control the pain**
iv. Pain control with over-the-counter analgesics appropriate: naproxen (generic Aleve) and extra-strength acetaminophen (generic extra-strength Tylenol) combination appropriate if no history of allergy to them, pregnancy or breastfeeding, peptic ulcer disease, or kidney impairment***

(2) Second degree (partial thickness of skin): blisters but sensation intact in middle of burn

(3) Third degree (full thickness of skin): blisters but numb in burn due to nerves and other deep tissues being burnt

(4) Recognize second degree (partial thickness) vs third degree (full-thickness) burns: check for sensation in burn

(5) Rule of 9s****

(6) Hand *including fingers* as 1% total body surface area (TBSA) (not just palm as previously taught)

(7) Large area burns cause large fluid loss and requires lots of hydration

(8) High-risk areas for complications:
i. Palms and soles
ii. Circumferential burns around fingers
iii. Face and airway
iv. Genitals

(9) Immediate treatment: if still hot, cool, but don't freeze

(10) Secondary treatment for second or third-degree burns
i. If ruptured blisters, debride (trim) dead skin with clean scissors or knife
ii. If open, protect with clean, slightly moist or non-adherent bandage
iii. First day standard basic hospital treatment is thick coat silver sulfadiazene (e.g., Silvadene; prescription-only) cream to cut down pain and protect from infection; shaving cream has been recommended as a field expedient; Silvadene only used for first day as later interferes with healing skin
iv. Bacitracin instead of Silvadene on face as Silvadene may cause permanent staining of skin
v. Second day on, standard basic hospital treatment is to gently clean with plain soap and water. and use bacitracin ointment (over-the-counter) twice a day; bacitracin in many personal wilderness first aid kits and Silvadene in some team kits
vi. Avoid Neosporin or triple-antibiotic ointment as neomycin is famous for causing blistering allergic reactions like poison ivy

(11) Evacuate or not?
i. First-degree burns require pain control but evacuation usually not needed
ii. Second-degree burns in high-risk areas should generally be evacuated
iii. Third-degree burns (no sensation in burn) should be evacuated and seen at a burn unit as take long time to heal, may require skin grafts

*http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/08-Burns-and-Lightning.pdf
**http://www.conovers.org/ftp/Poison-Ivy.pdf
***http://www.conovers.org/ftp/NOTEBOOK/PAIN.pdf
**** https://en.wikipedia.org/wiki/Wallace_rule_of_nines

iv. Burns not high-urgency for evacuation unless life- or limb-threatening complications

(12) Life- and limb-threatening complications*
i. Inhalation injury, usually from burns in enclosed space such as tent: hoarse, soot in sputum, soot in mouth and nose are clues
ii. Circumferential full-thickness limb burns, treated by *escharotomy: c*utting hard burned skin (eschar) with a scalpel or knife if needed to preserve circulation (advanced skill, physicians and flight nurses)
iii. Circumferential chest burns treated by escharotomy if needed to preserve breathing

g. **Nosebleed****

(1) Common problem, especially with dry air in winter; may also come from blow to nose or picking nose

(2) Most commonly anterior nosebleed; posterior nosebleed rare, but hard to control and rarely causes death, mostly in those on blood thinners

(3) To control anterior nosebleed, squeeze nostrils together firmly for 10 minutes by watch; lean forwards to prevent blood going down throat

(4) Afrin (oxymetazoline) or neosynephrine decongestant nasal sprays (in some wilderness first aid kits) stopped 2/3 of nosebleeds in an Emergency Department study***

(5) Tranexamic acid (TXA), carried in pill or IV form in some medical kits, very effective when used in nose to stop bleeding

(6) In rare cases, may need to pack anterior nose; QuickClot Combat Gauze best, don't use paper tissues that dissolve in blood as don't help

## 14. Musculoskeletal Injuries**** Practice

a. **Types of Injury**

(1) Bruise/Contusion

(2) Strain: stretching injury to muscle, or tendon that attaches muscle to bone

(3) Sprain: partial ripping of fibrous band that connects bone to bone

(4) Fracture: broken bone
i. Closed fracture: no break in skin connecting to fracture
ii. Open ("compound) fracture: break in skin connecting to fracture (significant risk of bone infection; bone does not resist infection well)

(5) Dislocation: separation at joint between bones

b. **Management of *Acute* Musculoskeletal Injury**

(1) **RICE** for immediate pain control:*****
i. **Rest**: decreases pain
ii. **Ice**: decreases pain
iii. **Compression** (elastic bandage): decreases swelling which decreases pain
iv. **Elevation**: decreases swelling which decreases pain

(2) RICE treatment not advised after first 6 hours, particularly ice;****** graded return to activity better than ongoing rest

(3) May also want to take pain medication, especially if needed to assist with exit/evacuation from field; naproxen and acetaminophen combined best over-the-counter choice unless reason not to take*******

c. **Ankle Twists**

(1) Most common injury in backcountry is twisting injury of ankle
i. Some injuries are obviously deformed and are fracture-dislocations: should be gently but firmly brought back to anatomic alignment and splinted that way, and patient evacuated without bearing any weight on affected ankle; should have splint ready before realigning as usually will not stay realigned without splint being immediately applied

* https://en.wikipedia.org/wiki/Escharotomy
** https://en.wikipedia.org/wiki/Nosebleed
*** Krempl, G. A. and A. D. Noorily (1995). "Use of oxymetazoline in the management of epistaxis." Ann Otol Rhinol Laryngol 104(9 Pt 1): 704-706.
**** http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/05-Wilderness-Surgical-Problems.pdf
*****http://www.drmirkin.com/fitness/why-ice-delays-recovery.html
******https://www.youtube.com/watch?v=7rbzuDDoloM
******* http://www.conovers.org/ftp/NOTEBOOK/PAIN.pdf

ii. Some not obviously deformed and might be fractures or sprains
iii. Validated, easy-to-use criteria for obtaining ankle X-rays or foot X-rays after twisting injury of ankle: Ottawa criteria (see reference*)
iv. If doesn't need X-rays, doesn't need urgent or even may non-urgent evacuation to Base, might be able to treat and have person walk (hobble) back to Base or continue with task

(2) Treatment
i. If available at Base or nearby, may ask for an aircast type brace to be sent in to patient
ii. May tape ankle with adhesive or duct tape to support anterior talofibular ligament**

d. **Open Fractures**

(1) Very important to prevent infection in bone, very hard to treat, may require weeks of intravenous (IV) antibiotics

(2) Gently clean off visible dirt

(3) High-pressure irrigation as described in wound section, but use twice as much irrigation as would use for simple flesh wound

(4) Sterile dressing

(5) Open fracture higher urgency for evacuation than closed fracture; time to definitive care affects likelihood of infection

(6) If person with open fracture has antibiotic in personal first aid or medical kit, should educate person that taking antibiotic early may decrease likelihood of bone infection

e. **Joint Dislocations**

(1) Some joint dislocations (finger, toe, patella = kneecap) may be easy to reduce, others harder

(2) For some closed finger injuries, without X-rays, hard to tell if dislocation, fracture-dislocation or fracture, but in backcountry, attempt at reduction may be appropriate, and realigning may help even with fractures

(3) For wilderness first aid level of training, may attempt to reduce finger, toe and patella dislocations; should not attempt to reduce other dislocations without more advanced training

(4) Reducing dislocations sooner decreases pain and joint damage

(5) Attempting to reduce dislocation will cause brief increase in pain but worth it to decrease longer-term pain and joint damage

(6) To attempt to reduce finger and toe dislocations, grasp firmly on either side of dislocation and pull firmly apart;

(7) To attempt to reduce patella dislocation, *not* knee joint location, (usually patella slides off laterally = outside of knee), gently straighten knee joint and patella usually spontaneously slips into position; if knee totally straight and does not reduce, may firmly try to push back into place

(8) For finger/toe/patella dislocations, if does not reduce or patient does not tolerate, splint it "as it lies" and evacuate to more definitive care or bring higher level of medical provider to patient to attempt reduction

(9) Reduced finger and toe dislocations generally splinted by taping to next finger or toe ("dynamic splinting") to prevent additional injury

(10) Those with reduced patella dislocations may walk on leg but should try to avoid full bending of knee as may dislocate again

(11) Those with reduced finger, toe or patella dislocations need medical follow-up with primary care physician or orthopedic surgeon but not urgently

(12) For other dislocations, either "splint it as it lies" and evacuate for more advanced medical evaluation and treatment, or arrange for more advanced medical provider to come to patient

*http://www.conovers.org/ftp/Ankle-Injury.pdf
**http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/Wilderness-EMT-Practical-Skills-Station-Manual.pdf

f. **Splinting Principles**

(1) On the street, principle is "splint it as it lies"; in backcountry, may realign bones to decrease internal bleeding and pain and make splinting more effective

(2) May attempt to realign long bone fractures with one or two people: grasping to either side of fracture and pulling firmly apart; stop if significant resistance

(3) For long bone fractures, splint (immobilize) joint above and joint below

(4) For fractures at a joint, immobilize long bone above and below

(5) Splints should be comfortable: no pressure points that might cause skin ulcers, use padding whenever possible

(6) Splints must prevent fracture from moving, which requires more than two sticks and two wraps

(7) A mat of thin sticks or reeds held together with duct tape and wrapped around a padded arm or leg makes an excellent splint

(8) Sleeping pads can make excellent splints

(9) Some packs have removable back-padding pads that serve well as splints

(10) May use scissors to cut rectangular section of plastic one-gallon milk, water or windshield washer fluid jug and keep in water bladder or back pad pouch of pack as a free lightweight splint; may combine such splints with duct tape to make longer or thicker splints

g. **Compartment Syndrome***

(1) Compartment syndrome caused by blunt trauma to muscle compartment or nearby bone fracture

(2) Muscle compartments: groups of muscles bounded by walls of tough fibrous tissue

(3) Most common compartment to develop compartment syndrome is anterior compartment of lower leg

(4) Usual way compartment syndrome develops (natural history):
- i. Swelling from trauma causes pressure in compartment to build up
- ii. Pressure finally gets to be more than the pressure inside the capillaries (smallest blood vessels) and they collapse; no blood getting to muscles, causes muscles to start dying, making muscles swell
- iii. Pressure in compartment gets greater than pressure in veins removing blood from compartment; veins collapse, blood can no longer leave the compartment so compartment swells
- iv. Increasing pressure damages sensory nerves traveling through the compartment, may find numbness in compartment and beyond it
- v. Increasing pressure next damages motor nerves, may find weakness beyond compartment
- vi. Increasing pressure next collapses arteries traversing compartment, cuts off blood supply to area beyond compartment
- vii. Entire part of leg or arm supplied by artery dies.

(5) Suspect compartment syndrome when
- i. Severe pain, swelling, and tenderness in one compartment of leg or arm
- ii. Late signs and symptoms: beyond compartment, lose sensation, then lose motor strength, then lose pulse beyond compartment
- iii. Should suspect compartment syndrome before veins collapse and get to definitive care at trauma-center hospital where can measure pressure and compartment
- iv. Treatment is surgery called fasciotomy: cutting open skin and fascia (thick fibrous bands around compartment)
- v. Some suggest cold or elevation but no evidence they help and might hurt
- vi. If suspect compartment syndrome, increase urgency of evacuation or try to get surgeon to patient to perform fasciotomy
- vii. If suspect compartment syndrome, good to consult with someone with higher level of knowledge about this, ideally physician or surgeon

*http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/13-Wilderness-Trauma.pdf

## 15. Trauma

### a. Trauma Principles*

(1) "The Golden Hour"
- i. Catchy phrase that encapsulates the idea that major trauma is a surgical disease, and
- ii. Only place to get appropriate surgery is in a hospital, ideally a trauma-center hospital that specializes in multisystem trauma, and
- iii. Death rate a function of how long until you get trauma victim to hospital
- iv. In urban trauma, fixable problems often to kill trauma victims in the first hour, so
- v. Speed is essential to getting patient to hospital, and more important than most field treatments
- vi. Rare exception to this rule is reducing a tension pneumothorax in the field; other field interventions of limited or no benefit

(2) "The Golden Day"
- i. Catchy phrase that encapsulates the idea that those injured or lost in the backcountry, if not found and rescued in the first day, much more likely to die
- ii. The golden hour concept does not apply in the backcountry; almost impossible for backcountry trauma victim to get to the hospital within an hour
- iii. Those with things that can be fixed in severe urban multisystem trauma generally kill those in the backcountry before they can be found and rescued
- iv. Therefore other priorities in taking care of backcountry trauma patients than urban trauma patients

(3) Priorities for backcountry multisystem trauma patients include
- i. Prevent additional injury with splinting and protecting spine during loading into litter and during evacuation
- ii. Avoid decubitus ulcers (decuibiti, bedsores) by making sure that pressure on high-risk areas such as just above buttocks (sacrum) by: padding voids under neck, lower back, and knees; having thick soft padding under this area; keeping area dry, tilting the litter from side to side from time to time; and allowing patient to move if possible to reduce pressure on this area
- iii. Control slow bleeding with pressure bandages, ideally with hemostatic gauze dressing
- iv. Prevent infection by cleaning wounds and applying antibiotic ointment
- v. Maintain normal temperature (helps control bleeding)
- vi. Rehydrate (helps prevent kidney damage)
- vii. Feed (helps prevent hypothermia)
- viii. Prevent deep venous thrombosis and pulmonary embolism by allowing to move legs if possible and avoiding constricting tie-ins on legs
- ix. Prevent pneumonia and respiratory failure by encouraging alert patients to take deep breaths and cough, providing gentle firm pressure on injured ribs to protect them during deep breaths or coughs if needed
- x. Identify worsening pneumothorax; try to arrange for definitive field treatment ("needling the chest"; see )
- xi. Look for developing compartment syndrome and if found, increase urgency of evacuation to prevent permanent damage to leg or arm

### b. Lightning Strikes**

(1) Review lightning safety from Field IV curriculum

(2) Lightning strikes may cause
- i. Immediate death
- ii. Unconsciousness or decreased level of consciousness
- iii. Long bone or other fractures from the blast
- iv. Burns
- v. *Vasospasm:* cramping of muscles in walls of arteries, making it difficult or impossible to detect even a carotid pulse
- vi. Paralysis of respiratory muscles, stopping breathing

(3) Triage (sorting: deciding who to treat first) of group hit by lightning
- i. Those showing signs of life tend to recover without first aid
- ii. Those without signs of life might be dead or might be saved by simple first aid; go to them first
- iii. Those hit by lightning are not "electrified" and are safe to touch

*http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/13-Wilderness-Trauma.pdf
**http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/08-Burns-and-Lightning.pdf

iv. Even if unable to detect carotid pulse, heart may still be beating, give artificial respiration (mouth to mouth or

c. **Head Injury**

(1) Loss of consciousness or persistent confusion after a blow to the head is an indication to exit or be evacuated from the field for medical evaluation

(2) Worsening mental status after a head injury may be a sign of worsening brain injury; but keeping someone awake after a head injury will not improve outcome

(3) Most important first aid for severe head injuries is to check carefully for any constriction across or around the neck that might block veins draining blood from the brain and increase intracranial pressure

(4) Flat or coma position is acceptable for head-injured patient; up to 30° of head elevation may help slightly.

d. **Pelvic Fractures**[*]

(1) An "open-book" pelvic fracture can cause someone to bleed to death internally

(2) Open-book pelvic fractures require major force, such as a motor vehicle accident or fall from a significant height

(3) Splinting an open-book pelvic fracture with a binder around the top of the thighs (*not* on the pelvis itself, but at the level of the greater trochanter of the femur) may be lifesaving

(4) When doing a secondary survey on a major trauma patient, one and only one person should try to press the pelvis together; if it moves, that person should hold it in place until someone can apply a pelvic binder

(5) A pelvic binder can be improvised from a pack hipbelt; if a frame pack, may take hipbelt off of pack and use separately, if soft pack, may place empty pack on top or underneath patient to provide extra warmth and stabilization, using hipbelt as pelvic binder

e. **Possible Spinal Injury**

(1) Suspect spinal injury in alert patient with minor injury to back or neck and weakness, numbness or pain down arm or leg

(2) Suspect spinal injury with alert patient with major injury and pain in neck or back

(3) High-risk mechanisms for spinal injury:
i. Fall with loss of consciousness
ii. High-velocity impact (motor vehicle accident, climbing falls, high-speed skier or biker)
iii. Falls more than 1 m (3 feet)
iv. Landing on head or buttocks (axial compression of spine)

(4) If suspect spinal injury in alert patient:
i. Tell patient to hold spine still and not move it much
ii. Protect patient's spine from additional injury
iii. Do not need to "immobilize" patient
iv. Patient may move self with assistance

(5) May be able to use NEXUS rule with physician consult and oversight to rule out need for cervical spine protection
i. NEXUS rule ("NEXUS criteria") is an emergency physician using the following wording to examine a patient:
ii. *…ruling out cervical-spine injury in patients with blunt trauma: the absence of tenderness at the posterior midline of the cervical spine, the absence of a focal neurologic deficit, a normal level of alertness, no evidence of intoxication, and absence of clinically apparent pain that might distract the patient from the pain of a cervical-spine injury.* [**]

(6) If major injury and not alert, or unconscious, suspect spinal injury and "immobilize" spine

[*] https://en.wikipedia.org/wiki/Pelvic_fracture
https://en.wikipedia.org/wiki/Pelvic_binder

[**] Hoffman, J. R., et al. (2000). "Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma. National Emergency X- Radiography Utilization Study Group [see comments]." N Engl J Med 343(2): 94-99.

i. Do not use unpadded backboards, as dangerous and may cause permanent damage to skin on back; use full-body vacuum mattress or padding to restrict spinal movement in litter
ii. May apply cervical collar if not in full-body vacuum mattress, as long as collar fits well and does not torque neck or cause significant pain

(7) When moving patient with suspected spinal injury, do so slowly, carefully and gently, taking care to not torque the area of suspected spinal injury

f. **Chest Trauma**

(1) Pneumothorax and hemothorax
i. Review evaluation for and treatment of tension pneumothorax and sucking chest wounds from Breathing Assessment and Management section above
ii. May have non-tension pneumothorax that gradually develops into tension pneumothorax; rare
iii. May get bleeding into chest cavity: hemothorax; cause of decreased breath sounds on affected side; may be enough to cause shock or trouble breathing; rare

(2) Broken rib or bruised ribcage
i. Rib belt or strapping with tape only recommended while playing contact sports; otherwise do not help pain much and make pneumonia more likely by restricting breathing
ii. Pain medications appropriate if patient has them in personal first aid or medical kit
iii. Patient or assistant may hold pressure against broken or bruised ribs to protect them when taking a deep breath or coughing
iv. Taking a deep breath and coughing important to prevent pneumonia, especially if patient smokes or has asthma

(3) Review flail chest and sucking chest wounds from prior primary survey section

g. **Abdominal Trauma***

(1) Most dangerous abdominal injury is laceration and bleeding from injured solid organ: liver or spleen
i. Liver is under right side of ribcage; injury to this area or ribs above it should make you suspect liver injury
ii. Spleen is under left side of ribcage; injury to this area or ribs above it should make you suspect spleen injury
iii. Symptoms of liver or spleen laceration include increasing pain in this area, signs of shock (increasing pulse, sweaty, pale, anxious), and developing generalized abdominal pain and tenderness, or abdominal swelling
iv. Open book (bad) pelvic fractures may cause enough bleeding in abdomen to cause symptoms similar symptoms
v. If suspect internal bleeding, upgrade evacuation urgency and consider calling, or asking Base to call, for medical helicopter

(2) Other internal injuries (blunt trauma to pancreas, bowel) not as immediately threatening but need to be evaluated at trauma center

h. **Submersion (Near-Drowning)**

(1) If respiratory arrest, do artificial respiration with mouth-to-mouth or mouth-to-mask ventilation

(2) If cardiac arrest, follow guidelines in prior section on *Circulation: Cardiac Arrest*

(3) If might be trauma, protect the cervical spine

(4) If hypothermic, treat hypothermia

## 16. Snakebite**

a. **Background**

(1) Almost all injuries and deaths from wild venomous snakes in mid-Appalachians due to *Crotalidae* (pit vipers): various rattlesnakes, copperheads, and water moccasin (cottonmouths); rattlesnake bites most common

(2) Pit vipers have eyes with elliptical pupils; other mid-Appalachian snakes have round pupils and angular heads compared with local non-poisonous snakes

*http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/05-Wilderness-Surgical-Problems.pdf
** https://www.wemjournal.org/article/S1080-6032(15)00220-3/abstract

(3) Pit vipers not aggressive, most bites provoked by humans handling snakes, especially when intoxicated, but may occur if accidentally step on or near snake

(4) **Trying to catch or kill wild mid-Appalachian snake for identification dangerous and useless: treatment based on signs of envenomation, not species of snake**

(5) May take zoomed-in cellphone picture of snake from safe distance; if can identify as non-venomous, or send picture to someone who can identify as non-venomous, do not need to treat for venomous snakebite

b. **Pit viper venom**

(1) Venom may be injected when snake bites

(2) Venom used for hunting, many bites of humans and dogs *defensive* and no venom injected ("dry bite"; about 1/3 of bites)

(3) Venom has mix of poisons, most of which cause local tissue destruction, some of which less commonly cause body-wide illness; main problem is local tissue destruction unless multiple envenomated bites or bite to infant

(4) With multiple bites may see shock or generalized bleeding; very rare

c. **Signs and Symptoms of Envenomation**

(1) Signs: swelling, pain, and bruising at bite, usually within a few minutes to an hour, rarely delayed by

(2) Symptoms: coppery taste in mouth, anxiety (but may have this even if not envenomated), tingling in hands and feet (but may also occur from hyperventilation from anxiety with no envenomation)

d. **Treatment**

(1) Long list of things proposed for North American pit viper bites now know to be harmful by causing worse local tissue damage
   i. Do **not** apply a tourniquet or lymph constrictor
   ii. Do **not** apply ice, snow or dry ice
   iii. Do **not** shock with electric cattle prod
   iv. Do **not** incise with a knife or scalpel or apply suction
   v. Do **not** give alcohol to drink
   vi. Do **not** apply a compression bandage (Ace wrap)
   vii. Do **not** apply meat tenderizer
   viii. If evacuating in litter, do not elevate arm or leg or have it hang down, fine to keep at normal level next to body; best to keep in straight to neutral position in case of bad swelling

(2) Treatment
   i. Clean and bandage as for any wound
   ii. Do not cut open or force irrigation fluid into puncture wounds
   iii. Get person back to Base and then to a hospital as soon as possible as may need antivenin (antivenom); contact Base and have Base check for nearest hospital with access to antivenin (antivenom) and make sure person is transported there
   iv. If possible, splint limb for comfort (dubious benefit) but do not allow splinting to interfere with evacuation
   v. If no symptoms or signs of envenomation at first, have patient walk out to Base
   vi. If have symptoms of envenomation, consider a carry-out if resources available but person may walk if able

## 17. Medical Problems*

a. **Red Flags**

(1) Conditions that warrant evacuation from field or consultation with more medically knowledgeable person to discuss

(2) More medical knowledge = better able to evaluate such problems, recommend more advanced training such as Wilderness First Responder or Wilderness Emergency Medical Technician

b. **Hypoglycemia**

(1) Is low blood sugar

(2) Most common in diabetics on pills or insulin injections

*http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/12-Wilderness-Medical-Problems.pdf

(3) May occur in those exercising heavily, or not eating enough, or hour or two after eating sugary food

(4) Symptoms: similar to low blood pressure, lightheadedness, sweaty ("cold and clammy"), shaky, may even lose consciousness

(5) Treatment: lie flat, elevate leg (improves delivery of blood to head, which means delivery of blood glucose to head), give quick-energy food

(6) Low blood pressure makes hypoglycemia symptoms worse; if also dehydrated, give fluids and salty food

(7) If recovers completely, no need to evacuate, may continue with task

c. **Chest Pain**

(1) Red flags:
- i. Chest pains that last for more than a minute or two; usually not serious but might be serious problem
- ii. Chest pain with shortness of breath or sweating
- iii. Chest pain that comes on with exertion and goes away with rest, suggests narrowed artery to heart

(2) "Heart Attack": two meanings
- i. Sudden cardiac arrest from irregular heartbeat
- ii. Occlusion (complete clogging) of coronary artery ("crown" of arteries around heart that supply heart muscle) = myocardial infarction

(3) Classic chest pain of myocardial infarction:
- i. Pressure-like substernal pain (under breastbone)
- ii. Associated with nausea, sweating, shortness of breath, and radiation to left or right arm (left arm more common, right arm more diagnostic of myocardial infarction)
- iii. Many if not most myocardial infarctions do not show classic symptoms

(4) If person has myocardial infarction, taking aspirin decreases likelihood of death and may limit heart damage (note "stump method" under prior legal section)

(5) Aspirin
- i. Is blood thinner
- ii. Accounts for beneficial effects in myocardial infarction
- iii. Aspirin not appropriate if concern for increasing bleeding

(6) If faced with cardiac-sounding chest pain (or other medical conditions) in backcountry, a radio or telephone consult with a physician may help decide appropriate actions

d. **Decreased Level of Consciousness**

(1) Red flags: decreased level of consciousness that does not improve promptly such as simple fainting or heat syncope; or, recovering but serious cause such as heatstroke

(2) Long list of medical conditions that may cause confusion or decreased level of consciousness, including but not limited to
- i. Hypoglycemia (low blood sugar): if might be cause, give sugar or other sweets, will not hurt if not hypoglycemia; review section on nutrition in Field III curriculum
- ii. Simple fainting (review discussion above under heat syncope: lay flat and elevate legs)
- iii. Heatstroke: review separate section on heatstroke above
- iv. Hypothermia: review separate section on hypothermia above and in Field IV curriculum

(3) Coma (recovery) position appropriate whenever significantly decreased level of consciousness, to protect area from vomiting or reflux; review section earlier on airway management

e. **Seizures (Fits)**

(1) Many types of seizures, but most common is *generalized tonic-clonic seizure*
- i. May come from sleep deprivation, excess caffeine, stress, recreational drugs such as cocaine or methamphetamine, or alcohol or benzodiazepine (e.g., Xanax) withdrawal
- ii. May be from prior brain damage or abnormality: epilepsy
- iii. May be aura first: person

(2) Usually in those with history of seizures

(3) Main risk is from injury during seizure

(4) Protect patient having seizure from injury

(5) Do not try to force jaw open during seizure: may cause injury

(6) Most seizures stop in a minute or so

(7) After seizure, normal to have *postictal period:*
- i. Decreased level of consciousness, may last minutes or an hour or so
- ii. May be incontinent of urine or stool
- iii. May bite tongue but rarely serious lacerations
- iv. Care is supportive: keep appropriately warm or cool, protect airway, once conscious enough to tolerate, give food and fluids
- v. If recovered adequately may walk out under close supervision

f. **Other Red Flags**

(1) At wilderness first aid level, don't expect much knowledge of other medical problems

(2) Should know "red flags" that are reason to get someone out of field to more advanced medical personnel

(3) Abdominal Pain Red Flags
- i. Persistent localized tenderness
- ii. Fever
- iii. Persistent vomiting
- iv. Getting worse over 12 hours
- v. Known pregnancy

(4) Vomiting and Diarrhea Red Flags
- i. Blood in vomit or diarrhea
- ii. Fever
- iii. Ongoing abdominal pain with persistent tenderness
- iv. Significant dehydration

(5) Urine Red Flags
- i. Urinary tract infection symptoms (urinary frequency, urgency, and pain on urination = dysuria) with fever, chills or sweats (pyelonephritis = kidney infection) or vomiting
- ii. Blood in urine (hematuria)

(6) Cough Red Flags
- i. Shortness of breath
- ii. Fever
- iii. Coughing up lots of colored phlegm

(7) Head and Neck Red Flags
- i. Persistent blurred vision
- ii. Uncontrolled nosebleed or other bleeding
- iii. Head injury with decreasing level of consciousness
- iv. Airway compromise

(8) Fever Red Flags
- i. Confusion or decreased level of consciousness
- ii. Severe headache
- iii. Stiff neck
- iv. Vomiting

## 18. Psychological Issues*

a. **Immediate Stress Reactions**

(1) May include physical, emotional, cognitive, and behavioral components; signs and symptoms may be present

(2) Generally occurs at time of the incident or within 24 hours

(3) Immediate stress reaction is response of normal person to abnormal situation, not sign of psychological weakness or chronic psychiatric problems

(4) Physical symptoms may include:
- i. Profound fatigue and weakness
- ii. Fine tremor or muscle twitches
- iii. Diaphoresis (sweating)
- iv. Vasovagal orthostatic hypotension or vasovagal syncope (simple fainting)
- v. Nonspecific lightheadedness
- vi. Nonspecific headache
- vii. Difficulty focusing one's eyes
- viii. Nonspecific difficulty hearing
- ix. Palpitations (feeling of racing or irregular heartbeat
- x. Dyspnea (shortness of breath) and chest pain with or without hyperventilation
- xi. Nausea, vomiting, diarrhea, or abdominal pain
- xii. Sensation of lump in throat (globus hystericus)

(5) Emotional symptoms may include:
- i. Anticipatory or generalized anxiety (anxiety about the future, or unconnected with any present danger or fear)

*http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/19-Stress-Management.pdf

ii. Strong fear or even panic reactions
iii. Psychological shock (described later)
iv. Survivor guilt uncertainty (guilt over surviving when others have died)
v. Acute grief reactions
vi. Depression
vii. Intensified or inappropriate emotional reactions to normal occurrences

(6) Cognitive symptoms may include:
i. Blaming others (sometimes even those who are logically blameless) for the critical incident
ii. Generalized confusion
iii. Inability to concentrate
iv. Inability to perform simple calculations
v. Poor attention span
vi. Memory lapses
vii. Anomia (inability to find the right words)
viii. Inability to distinguish the difference between serious and trivial concerns
ix. Inability to make decisions; and
x. Greatly increased (or greatly decreased) alertness and awareness of surroundings

(7) Behavioral symptoms are relative to person's normal behavior, may vary widely; include:
i. Changes in normal activity patterns
ii. Changes in speech patterns
iii. Withdrawal
iv. Angry outbursts
v. Hypervigilance (increased suspicion and attention to one's environment or even outright paranoid behavior)
vi. Changes in interactions with others (i.e., spouse, friends, team members)
vii. Increase or decrease in appetite or alcohol consumption
viii. Sleep disturbances, including early morning awakening, early insomnia, hypersomnia, and generalized fatigue
ix. Visits to health professionals for seemingly minor or even nonexistent problems

b. **Psychological First Aid**

(1) May encounter search and rescue team members having immediate stress reactions, and may be person best qualified to deal with situation

(2) SAR team members may and should perform on-scene psychotherapeutic "first aid"

(3) Look for those showing signs of stress (even if not immediate stress reaction} and try to arrange rest breaks

(4) Look for those with immediate stress reactions: person walking about aimlessly, a person sitting and staring blankly (unless simply exhausted), or person behaving irrationally

(5) First step: isolate person from the sights, sounds, and smells of incident; have person
i. Face away from the incident
ii. Get on the other side of vehicle, boulder, hillside
iii. If smells prominent, move person upwind
iv. If person should not be moved, place object to block patient's view
v. When engaged in on-scene psychological "first aid," peers (SAR team members or similar} may ask "Hey, are you OK?" even if not acceptable coming from mental health worker who is not peer

(6) For psychological first aid, just need to lend a sympathetic ear
i. If need to prompt person to start talking, start asking about facts first, and only after developing rapport, start asking about feelings
ii. When SAR team member or other emergency services worker "breaks down" is important to validate the person's feelings ("hey, this is pretty hard for all of us to take") and back off, going to another person or another topic
iii. Monitor person and arrange extra help if seems necessary
iv. Group interventions never appropriate at a scene
v. A defusing session (without great emotional depth) at Base Camp at the end of each shift, led by a mental health professional, or when a particular Field Team returns to Base, might be appropriate for very stressful operations
vi. According to Dr. Mitchell, founder of Critical Incident Stress Management, more formal sessions should be held only completely away from hazards and distractions of a Base Camp during a search

## 19. Evacuation Urgency

a. "Haste Makes Waste" but in search and rescue, haste also causes injuries and may cause, and has caused, team members to become additional patients

b. Sense of urgency appropriate during rescue, as in somewhat to very hostile environment, and medical conditions may deteriorate during long evacuation

c. Urgency of evacuation should be determined by team leader based in part on **patient's medical condition**

(1) Certain conditions are very time-critical: bad things that might be fixable at a hospital but not in the backcountry; examples include
   i. Brain injury with decreasing level of consciousness
   ii. Internal bleeding with worsening signs of shock

(2) Certain conditions are not time-critical, examples include
   i. Closed long-bone fracture, adequately splinted, with intact distal neurovascular status (circulation/pulse, sensation, movement) intact
   ii. Possible isolated cervical spine injury with no neurological symptoms such as numbness, tingling or weakness of arms or legs

(3) The more medical knowledge and experience, the better can assess how time-critical patient is; may need to be reassessed during evacuation and have urgency increased if patient deteriorates

d. Urgency of evacuation should be determined by team leader based in part on **weather, terrain and team's condition**
   i. If team is exhausted or small, urgent evacuation makes team member injury more likely and may want to slow pace of evacuation
   ii. If storm approaching, may want to speed evacuation

e. Examples of urgency-based evacuation decisions:

(1) Call for a medical helicopter?
   i. Risk of crashing
   ii. Extremely expensive, tens of thousands of dollars)
   iii. May be appropriate for time-critical patients

(2) Use an ATV on a rough trail to evacuate patient?
   i. Risk of injury to patient high, best saved for time-critical patients
   ii. Bumpy ATV ride very dangerous for patient with bad hypothermia, might cause cardiac arrest
   iii. For stable patients, waiting to get litter team for carry-out to road likely better choice

(3) Start an evacuation with an improvised litter or carry rather than waiting for a Stokes litter?
   i. Hard on team
   ii. Hard on patient, especially if fractures
   iii. Increases risk of injury to patient and team
   iv. May be appropriate to get time-critical patient to helicopter landing zone or ambulance

(4) Bivouac and wait for team with litter and extra litter bearers to arrive?
   i. With stable patient and litter team arriving soon and nice day, makes sense to wait
   ii. With unstable patient and/or uncertain when litter team will arrive and/or deteriorating weather, may make sense to start improvised evacuation

f. More medical knowledge, experience and expertise means better decisions about evacuation urgency; might be able to use cellphone to contact someone with more medical knowledge and discuss case, preferably physician with wilderness EMS experience

### 20. Improvised Evacuations* Practice

a. Poles and blanket stretcher

b. Poles and parka stretcher

c. Poles and packstraps carry

d. Split coil piggyback carry

e. Sling piggyback carry

## Communications**

### Radio Basics

a. Electromagnetic waves

b. Wavelength and frequency

*http://www.conovers.org/ftp/SAR-Evacs.pdf
**http://www.conovers.org/ftp/ASRC-Commo.pdf

(1) Electromagnetic spectrum

(2) Effect of frequency on getting through steel stud grids in buildings (UHF better), and bending around and over hills (VHF better)

c. AM vs FM

(1) Speaking loudly on FM causes overmodulation that decreases transmitted signal strength

(2) How speaking loudly may cause audio distortion on any mode

## 2. Radio Bands and Modes

a. *Specific bands and frequencies provided for general background and personal reference but we do not members to memorize any bands or frequencies*

b. **AM**

(1) Aircraft band (~121 MHz)

(2) CB (26-27 MHz)

c. **FM**

(1) VHF low band (49-108 MHz: long car antennas, old sheriff/police/fire frequencies)

(2) VHF high band (150-216 MHz): ASRC Special Emergency shared frequencies 150-155 MHz; 2-meter Ham band 144 MHz, CAP VHF 148 MHz

(3) UHF low band (450-806 MHz): Family Radio Service (FRS) and EMS Med Channels frequencies ~460 MHz,

(4) UHF high band (900-952 MHz)

(5) Wide and narrow frequencies: older wide frequency radios not allowed to be used, all common

(6) Cellphones (800-2600 MHz)

d. **Simplex vs Duplex**

(1) Landline telephone or cellphone: duplex

(2) Push-to-talk radio: simplex

e. **Radio Extenders**

(1) Retransmitter = remote base

(2) Repeater

(3) Trunked systems*
i. How trunked systems operate: different than simple simplex or repeater systems
ii. "800 Mhz" trunked public-safety systems
iii. 800 MHz trunked systems may not compatible with standard public safety FM radio systems, but may be able to interconnect them
iv. Cellphone systems

f. **ASRC Frequencies**

(1) ASRC licensed by FCC to use certain 155-band VHF FM radio frequencies

(2) Public safety VHF "155" band
i. May only use for public safety operations and training; using for personal or routine business operations is forbidden
ii. Shared with other public safety agencies on a "don't interfere with others" basis
iii. **155.160 MHz: Alfa**; ASRC/MRA "national" frequency
iv. **155.280 MHz: Charlie**; was a Bravo but decided not to use any more
v. **155.205 MHz: Echo** (Virginia SAR interoperability channel)
vi. **155.220 MHz: Foxtrot**
vii. **155.175 MHz: Golf**
viii. **155.235 MHz: Hotel**
ix. **155.265 MHz: India**
x. **155.295 MHz: Juliet**
xi. May use two specific pairs of these frequencies for portable repeaters: some ASRC Groups have portable repeaters
xii. **150.775 MHz: Romeo**; may use simplex between handheld radios or as handheld transmit frequency, paired with repeater output on another ASRC frequency
xiii. **150.790 MHz: Sierra**, may also use simplex between handheld radios or as handheld transmit frequency, paired with repeater output on another ASRC frequency
xiv. Example of repeater pair: handhelds transmit on Romeo (150.775) and receive from repeater on Charlie (155.280)

(3) Business VHF "150" band:

*https://en.wikipedia.org/wiki/Trunked_radio_system

i. May use for ASRC, Group or Corps non-emergency business
ii. Shared with other business users
iii. 151.625 MHz: Lima-1

(4) National interoperability channels
i. National emergency channels on both VHF and UHF bands that common handhelds like Wouxun and Baofeng will operate on
ii. Most but not all newer public safety radios (fire, EMS, police) will operate on these channels
iii. Frequencies do not need to be licensed to ASRC to use for emergency operations and training
iv. 155.7525 MHz: VCALL10
v. 151.1375 MHz: VTAC11
vi. 154.4525 MHz: VTAC 12
vii. 158.7375 MHz: VTAC13

### 3. Antennas

a. Antenna radiation patterns and effective radiated power (ERP)

(1) Rubber duck antenna: radiates power most directions but not off tip of antenna: since radiates in many directions, lowest ERP

(2) 1/4 wave antenna: radiates power mostly perpendicular to antenna

(3) Base-loaded 5/8 wave antenna (Mag-mount, mobile antennas): radiates power very much perpendicular to antenna

(4) Stacked-element collinear antennas (Base antennas)radiates power extremely much perpendicular to antenna

(5) High-ERP antenna *receives* better as well as transmits better, but just perpendicular to antenna, very directional

b. Effect of ground plane on radiation pattern/ERP and use of cars, human bodies as improvised ground planes: put radio on your head

c. Effect of reflectors on radiation pattern/ERP and improvised reflectors of human body or metal; for VHF 155 MHz band (ASRC frequencies), optimum distance about 20" (1/4 of the ~2-meter wavelength, or about half a meter); need to aim at Base

d. Regardless of antenna design, works better with line of sight to other radio; may want to hold radio up (easier with speaker-microphone attached), climbing rock or tree, or walking up a hill

e. If your antenna and radio cannot reach Base, you may be able to reach another team that can relay to Base

### 4. Squelch

a. Turns off speaker until senses strong signal

b. Just avoids annoying background static hiss

c. On older radios, controlled by knob

d. On newer radios (e.g., Wouxun, Baofeng), controlled by menu option, but such radios usually have Monitor button that temporarily disables squelch (Woxun: second button below push-to-talk, BaoFeng: button right below push-to-talk, single click for flashlight, press and hold to monitor)

e. When trying to listen for a weak signal, turn squelch off by dial, menu or pressing monitor button

### 5. PL = CTCSS

a. "Private Line" = Continuous Tone Code Squelch System*

b. Turns on speaker only when signal is strong enough (standard "carrier squelch") *and* when hears a particular subaudible tone (like a particular musical note)

c. In shared frequencies in crowded urban areas, cuts down on having to listen to irrelevant radio traffic

*https://en.wikipedia.org/wiki/Continuous_Tone-Coded_Squelch_System

d. PL tone may be added to outgoing radio transmissions ("PL encode" or "PL transmit") and/or added to the existing carrier squelch ("PL decode" or "PL receive")

e. ASRC recommends, for ASRC frequencies, use particular PL code (3A = 127.3 Hz) to all radios *transmit only*

f. ASRC recommends *not* using PL decode on ASRC frequencies; not usually used in crowded urban areas; if program in PL decode for receiving, may not hear some radios that don't have a PL code, or the right PL code, set for transmit

**6. Cost of Radios**

a. High-end commercial handheld radios $3000-$8000 each

b. Cheap radios that are legal for ASRC VHF low-band frequencies, Interoperability VHF low-band and UHF high-band (Wouxun, Baofeng, others) $100-200 each; suitable for individual members to purchase and use, also may use on amateur (ham) 2-meter and UHF frequencies if get ham license

**7. Network Discipline**

a. Announcing FCC callsign: Base's job

b. For repeaters or remote base: press patient for a second before speaking

c. "You, this is me"

d. Elements of communication style
   i. ASRC Prowords
   ii. Phonetic spelling
   iii. Conciseness

e. Compose concise message before pressing push-to-talk*

f. Break long transmission with "break… continuing" to allow priority radio traffic to break in; or say, "How copy so far?" then release push-to-talk

g. "Base, this is Team Alfa, permission to go direct with Team Bravo?"

h. Clear the Net

i. Secure the Net

j. Mayday = French *m'aider* ('help me')

**8. Cellphones**

a. Cellphones are UHF radios with internal antennas, and may benefit from an improvised ground plane, but unless know where nearest tower is, reflector (holding few inches in front of your center of mass) less helpful

b. Texting may get through (only a few data packets) when cannot make voice contact *(lots* of data packets); may press Send and then hold cellphone on top of your head as will keep retrying the data packets for a minute or so

c. As with radios, climbing a rock or tree or walking uphill may help

## C. Land Navigation

**1. Topographic Maps**

a. Border information (scale, datum, declination, contour interval, adjacent maps)

b. Information conveyed by various colors

c. USGS symbols for
   i. Highways, roads, trails and bridges
   ii. Power lines, pipelines
   iii. Buildings, schools, churches and cemeteries
   iv. Storage tanks, wells, mines, caves, picnic areas and campsites
   v. Benchmarks (control stations) and spot elevations
   vi. Boundaries, fence and other landmark lines
   vii. Ponds, lakes, rivers,
   viii. Perennial and intermittent streams
   ix. Marshes & swamps

d. Photo revisions

**2. Grids and Coordinates**

a. **Latitude and Longitude Variants**

(1) Degrees, minutes and seconds (DD° MM' SS")

(2) Decimal degrees (DD.DDDDD)

*http://www.jlakes.org/ch/web/The-elements-of-style.pdf

(3) Degrees and decimal minutes (DD MM.MMM)

b. **UTM Variants**

(1) Universal Transverse Mercator (UTM)

(2) Military Grid Reference System (MGRS)

(3) US National Grid (USNG)

### 3. Orienteering Practice

a. Practice plotting routes between two points on a map, using orienteering concepts from Field III, and identify on map where plan to use each of the concepts

b. Practice basic-level orienteering courses during both day and night until able to accomplish them reliably and efficiently

### 4. GPS File Transfer Practice

a. How to transfer .gpx files between a smartphone GPS app or a dedicated GPS unit and a laptop computer in Base

(1) Transfer to Garmin GPS from SARTopo
i. SARTopo: "Export"
ii. SARTopo: "Download GPX File"
iii. SARTopo: Choose object to download
iv. SARTopo: "Export"
v. SARTopo: Save file
vi. Plug GPS into USB port
vii. Windows: Copy file to GARMIN/GPX folder on Garmin GPS

(2) Transfer to smartphone GPS app from SARTopo
i. SARTopo: "Export"
ii. SARTopo: "Download GPX File"
iii. SARTopo: Choose object to download
iv. SARTopo: "Export"
v. SARTopo: Save file
vi. Pair smartphone with laptop via Bluetooth (Windows 10: Start > Settings > Devices > Bluetooth & other devices)
vii. Windows 10: Start > Settings > Devices > Bluetooth & other devices
viii. Windows 10: Send or receive files via Bluetooth
ix. Windows 10: Send files > choose the device you want to share to > Next
x. Browse > the file or files to share > Open > Next to send it > Finish
xi. Smartphone: accept and put in proper file folder
xii. File folder varies with GPS smartphone apps

(3) Transfer from Garmin GPS to SARTopo
i. Plug GPS into USB port
ii. SARTopo: "Import"
iii. SARTopo: "Choose files"
iv. SARTopo: navigate to the GARMIN/GPX folder on the GPS
v. SARTopo: Select objects to import
vi. "Import"

(4) Transfer from smartphone GPS app
i. Pair smartphone with SARTopo laptop (Windows 10: Bluetooth: Start > Settings > Devices > Bluetooth & other devices)
ii. Windows 10: Start > Settings > Devices > Bluetooth & other devices > Send or receive files via Bluetooth > Receive files
iii. Send file from smartphone via Bluetooth
iv. Windows 10: Send or receive files via Bluetooth > Receive files

## D. Operations, Management and Leadership*

### 1. Team Morale

a. **Synonyms**

(1) Esprit de corps

(2) Employee/member engagement

b. **Human Capital**

c. **Engagement**

(1) Meaning

(2) Autonomy

(3) Growth

(4) Impact

(5) Connection

*http://www.conovers.org/ftp/SAR-Leadership.pdf

d. **Recognition**

(1) Recognition as salary for volunteers

(2) Need for positive reinforcement and support

(3) Negative effects of destructive criticism

e. **Trust**

(1) Technical competence

(2) Truthfulness, especially about bad things

f. **Organization or Team Prestige**

(1) Member pride in field team or SAR organization

(2) Prestige of SAR organization or field team

**2. Individual Morale**

a. Emotional condition and emotional support (reference prior section on Psychological First Aid)

b. Physical condition and physical support (food, drink, warmth)

c. Dealing with normal field team frustrations with Base and engaging sympathy for those in Base

d. Using members' first names

e. Developing other people skills

**3. Family, Death and Dying***

a. Role of the family liaison

b. Telling of death: using the "D" word

c. Not blathering

d. Being supportive

e. Keeping yourself mentally healthy

## Search** Practice

Experience leading field teams, with a Field II or I assigned as mentor, either on simulations or actual searches, in

Hasty tasks

Sweep tasks

Line search tasks

Serving as flanker for search dogs or mantrackers

Self-evaluate performance of each phase of task:

Briefing by Base

Assembling field team

Assessing team members' capabilities and limitations and comparing with assigned task

Briefing field team

Delegating duties/positions as appropriate

Acquiring the necessary equipment for task

Completing Task Assignment Form (TAF)

Performing task

Assessing for completion of task

Assessing team members' condition at end of task and arranging for rest and rehab or return to duty as appropriate

Debriefing field team members

Debriefing task with Base

3. Practice using a tracking stick to

a. Measure and mark footprint length

b. Measure and mark on tracking stick stride length

c. Use stride length on tracking stick to search for next sign

*http://archive.asrc.net/ASRC-CEM-WEMSI-WEMT/19-Stress-Management.pdf
**http://archive.asrc.net/ASRC-Training/1978-00-00-GSAR-Manual-Search-Tactics.pdf

d. Mark sign

e. Follow track over different track surfaces

4. Practice managing a large team doing a saturation/close-spaced line search placing and removing flagging at edges of strips of search segment as being searched

## Rescue

### 1. Litter Movement* Practice

a. Techniques mostly used in cave rescue, or areas of tumbled rock at base of cliff, or during a disaster in a collapsed structure

b. **Paving**

(1) When patient assisting with own rescue

(2) Put people in holes to prevent patient falling into hole, or to provide foothold

c. **Turtling**

(1) For narrow crevices: no room for litter bearers on sides

(2) Someone gets on hands and knees with litter on back and crawls, or litter slides over "turtle's" back

(3) Variant with person on stomach called snaking or low turtling

d. **Lap pass**

(1) Used in canyons and keyhole passages

(2) Line of rescuers sit crossways in passage with feet or knees on one side and buttocks on other

(3) Rescuers use hands to slide litter across laps

### 2. Ropehandling and Knot-Tying** Practice

a. Nylon rope care, including concerns about acid exposure, weld-abrasion and "don't step on the rope"

b. Uncoiling and stacking a rope

c. Casting a rope

d. Coiling and inspecting a rope

e. Single-point anchors

(1) Wrap-3, pull-2

(2) Modified basket hitch

f. Specific knots

(1) End of line
i. Simple figure 8 (stopper knot)
ii. Figure 8 on a bight (loop at end of rope)
iii. Figure 8 follow through (figure 8 loop tied around object

(2) Joining lines
i. Figure 8 bend (same as figure 8 follow through but tying two ropes together)

(3) Anchoring to object such as top of litter: clove hitch

### 3. Belaying and Lowering*** Practice

a. **Overview of Belay Principles**

(1) When a belay is needed

(2) Trade-offs between belay redundancy vs efficiency of evacuation

b. **Belaying a Climber**

(1) Belay calls

(2) Sitting hip belay

(3) Mechanical belays
i. Münter hitch
ii. Dual Prusik knots and pulley

c. **Belaying a Rappeller (Bottom Belay)**

d. **Belaying a Litter for Semi-Tech Uphill**

(1) Tree belay uphill

* http://www.conovers.org/ftp/SAR-Evacs.pdf
** http://www.conovers.org/ftp/SAR-Evacs.pdf
*** http://www.conovers.org/ftp/SAR-Evacs.pdf

(2) Mechanical belay
i. Dual Prusik knots and pulley
ii. Petzl I'D or similar

e. **Rope Team Rotation Uphill**

f. **Lowering Devices**

(1) Tree belay downhill

(2) Mechanical devices
i. Figure 8 descender
ii. Rappel rack
iii. Petzl I'D or similar

g. **Rope Team Rotation Downhill**

h. **Hauling Systems**

(1) Standard calls

(2) Roles, including ratchet tender, haul team captain, rescue specialist (rigging boss)

4. **Packaging* Practice**

a. **NCRC Standard**

(1) National Cave Rescue Commission (NCRC) has standard patient packaging, patient tiein and litter rigging
i. For cave rescue, temperature essentially always the same
ii. One standard cave rescue litter: Ferno Model 71 plastic basket litter
iii. Makes standardization easy

b. **ASRC Best Practices**
i. Varying above-ground weather from very hot to very cold, from very dry to very rainy
ii. ASRC Groups use different litters and different packaging materials
iii. Not possible to be as standard as NCRC
iv. ASRC emphasizes principles and best practices

c. **"Immobilization"**

(1) Good to restrict motion of fractured bones to prevent additional damage and additional pain

(2) Good to prevent movement of unstable spinal injuries

(3) Bad to keep patient from moving, more likely to develop pressure sores on lumbar area that may be debilitating or fatal, especially if a spinal injury and cannot move self

(4) Bad to keep patient immobilized, as movement of legs, in particular, helps prevent blood clots (deep venous thrombosis) that may break off and go into lungs (pulmonary embolism), sometimes fatal; good general rule to have litter patients move as much as possible, and tighten and relax calf muscles regularly to keep blood circulating and prevent clots

(5) Full-body vacuum mattress
i. May be used simply as padding and insulation under patient
ii. If used without creating wrinkles, no pressure points to cause skin necrosis (bedsores)
iii. May be pumped out to serve as spinal immobilization or leg splinting
iv. No need for foot straps to keep patient from sliding out bottom of litter if pumped out, and distributes stress evenly so ideal for patient with multiple injuries
v. Easy to clean
vi. Bulky and heavy

(6) British say backboards may only be used to slide patient out of crashed vehicle, and patients must never be strapped to a backboard; if unconscious and unable to protect own spine, should be in full-body vacuum splint/mattress in backcountry, or on orthopedic scoop stretcher in city**

d. **The Elements**
i. Depends on litter and available materials and patient injuries if any
ii. Generally want insulation around patient with waterproof shell around insulation
iii. Want waterproof shell rigged so water does not accumulate on patient or drain into patient: opening on side
iv. Generally want easy access to patient: opening on side with monitoring equipment such as BP cuff
v. Many different packaging methods available in literature

* http://www.conovers.org/ftp/SAR-Evacs.pdf
**http://www.conovers.org/ftp/BMJ-Spinal-Immobilization.pdf

vi. Backs, helmets and packs of litter bearers as protection from rockfall when hear "ROCK!"

e. **Excretion**

(1) Medical blue pad under patient in case urinates or has a bowel movement

(2) Consider stopping evac for patient to urinate or defecate; better than the alternatives.

f. **Tiein**

(1) Falling out of litter on flat, grassy trail: not much of a problem, just needs a strap or two across patient if that

(2) Falling out of litter on steep slope that might require a belay for the litter and maybe have litter bearers clipped into litter:
i. More danger if falls out
ii. Needs to be well-secured with multiple straps
iii. Should be protected from sliding out bottom of tilted litter; straps under feet usual, may need to have strap just under one foot if broken leg, or seat harness if both broken legs or pelvic fracture

(3) Falling out of litter on vertical or very steep evac will probably kill patient, should have seat harness tied into main lowering or raising system

(4) Old ASRC standard packaging for metal Stokes basket from 1970s (see reference) still usable for most situations
i. May add seat harness for vertical or very steep evacuations
ii. May leave fairly loose for relatively flat carry-outs
iii. May need to modify for different litters
iv. Custom-built or commercial spider or other strap systems acceptable, but best if straps, buckles or other strap fastenings rated for life safety; Velcro or similar fastenings not recommended unless used with some other system to better secure patient in litter

(5) Support to keep patient from sliding down in litter or out of litter
i. Tie-in webbing under feet standard
ii. Need to ensure foot tie-in does not constrict around ankles and cut off circulation or cause pain
iii. Need to insure that patient's feet do not slide off of foot tie-in

(6) Depending on patient injuries, available litter and packaging supplies, may need to modify packaging and tie-in as needed
i. Head injury: nothing pressing or potentially pressing on neck
ii. Arm, leg or other fracture: minimal pressure on fractured area
iii. If injured leg, alternate means to keep from sliding out bottom of litter, such as seat harness suspended from rails at head, or support under only one foot

g. **Medical Considerations**

(1) For fractured arms or leg, especially if sticking up due to splinting, want to avoid tiein straps going across them and causing pain and maybe making injury worse

(2) For head injury, want to make absolutely sure no compression of neck with straps, cervical collar, or other packaging: this will make brain injury worse by impeding venous drainage from brain and increasing pressure in brain that interferes with blood flow there

(3) For chest injury or lung illness on one side, generally want bad side up with so that more blood goes to good side on bottom to pick up $O_2$

h. **Loading Patient**

(1) "Log roll" of potentially multiply-injured patient to place patient in litter no longer recommended; may cause increased damage to pelvic fracture and increase internal bleeding

(2) "Many hands" method best: have as many people as possible gather around patient, lift, and then slide litter under patient
i. May be on both sides of patient and slide litter in from one end
ii. If needed due to terrain, people may be on one side of patient if needed, and slide litter in from end or side
iii. If not enough room, such as in a crevice at bottom of cliff, may pass webbing straps under patient and have people standing on rocks above assist with lifting patient

## 5. Litter Rigging*

### a. Standards and Best Practices

(1) As with packaging, NCRC has standard for rigging the two most common cave rescue stretchers (Ferno 71 and Sked)

(2) ASRC Groups use many different litters so best practices rather than one standard method

### b. Litter Yoke

(1) At this level of training, do not cover rigging litters for vertical evacuations, only rigging to head of litter for semi-tech evacs

(2) Simply clipping rope to rail at head with carabiner, or tying single knot onto rail at head, not recommended
- i. If top rail breaks, system fails
- ii. Knot or carabiner slips back and forth, causing sudden shocks to litter, patient and litter bearers

(3) Need to attach a rope to one end of the litter for belay, lowering or hauling

(4) Generally not good for patient to hang upside down
- i. Abdomen presses on diaphragm and interferes with breathing
- ii. Blood rushes to head which may make head injury worse

(5) Sometimes want head down just a bit
- i. Dehydration
- ii. Shock
- iii. Bad hypothermia

(6) Benefits of head-up position generally outweigh risks, so standard is to attach to head of litter and have litter bearers to try to keep as flat as possible if patient condition indicates

(7) Some Groups attach a loop of rope or webbing to head of litter and leave there all the time
- i. Called a "yoke"
- ii. May clip rope into litter with figure 8 loop and steel locking carabiner
- iii. As with any rigging, yoke should be long enough that angle between two parts of the yoke where rope attaches should be acute and narrower than 90° (right angle); an angle wider than 90° multiplies the force in the yoke and may contribute to yoke failing if shock load
- iv. Do not want too long, as then knot at end of rope is too far away for litter bearers to reach if need to clear when stuck on an obstacle; ~60° angle about right

### c. Direct Rigging

(1) May tie rope directly into head of litter without separate yoke

(2) Traditional to use a bowline (easily adjusted) instead of figure 8 loop (hard to adjust)

(3) As with permanent yoke, goals of tie-in at head of litter are:
- i. Ensure rope is securely attached to head of litter by looping around top rail and perhaps tying clove hitches
- ii. Ensure that if top rail breaks, rope is still attached, by running rope around a couple of struts near the head
- iii. Having the rope in a "Y" shape, where the rope comes to a knot and then two branches of the rope go to either side of the head of the litter
- iv. Using bowline allows easy adjustment to get to optimum ~60° angle

* http://www.conovers.org/ftp/SAR-Evacs.pdf

# Field I Educational Goals

This curriculum is to ensure that those credentialed to Field Level I meet the following educational goals.

## A. Safety, Health and First Aid

1. Learn aspects of mid-Appalachian terrain, climate, weather, botany and zoology pertinent to SAR team members serving in the field.

   a. Learn basic mid-Appalachian geography, including the different geographic provinces.

   b. Learn the danger and likelihood of injury or illness from flora and fauna, including animal and insect attacks, and irritant plants.

   c. Learn the basic climate and weather of the mid-Appalachian region, including common seasonal weather patterns.

2. Learn about emergency stream crossings, as an individual and as a group.

## B. Communications

Learn how to set up and properly operate a radio station at Base, including siting the antenna, ground plane effects and dangers associated with Base antennas, and logging both equipment and communications.

## C. Land Navigation

Using a GPS or smartphone GPS app, learn how to ascertain and communicate DD MM.MMM coordinates of a given location to a helicopter as a landing zone (LZ)

## D. Operations, Management and Leadership

1. Learn aspects of personal characteristics relevant to search and rescue leadership, including characteristics of a good leader and the practice effect.

2. Learn what human task switching and multitasking are, and the implications for wilderness search and rescue.

3. Learn what modern science tells us about decision-making in emergencies, including the work of Gary Klein, the advantages and disadvantages of heuristics (rules of thumb), specifically including premature closure, attribution bias, and confirmation bias, and the interaction of Wilhelm Paulcke's objective and subjective hazards.

4. Learn about the different levels of situational awareness, including perception, comprehension and projection to the future, and how to support situational awareness through changing the environment, directly improving situational awareness of your team by sharing your comprehension and projection to the future, and monitoring for slow deterioration in situational awareness.

5. Learn about selective attention, including the work of Chabris and Simons ("the gorilla in the room" video) and Trafton Drew with radiologists, and how narrowing of attention due to stress may cause major errors in wilderness search and rescue.

6. Learn how to learn more about human nature, as reflected in the artes liberales of the medieval universities, and the lessons of Shakespeare and Machiavelli.

7. Learn how our genes affect us, as laid out in the work of Darwin *(The Origin of Species)* and Dawkins *(The Selfish Gene)* and E.O. Wilson *(Sociobiology),* especially as related to altruism and motivation and risk-taking of search and rescue group members and our search subjects and patients.

8. Learn about personality types, including charisma, contentiousness, specific personality characteristic of emergency services workers including SAR group members, and attempts at personality classification starting with the ancient "four humors" of sanguine, choleric, melancholic, and phlegmatic and more modern takes on trying to classify personality types, and psychopaths and sociopaths.

9. Learn about leadership strategies, including the writing of Francis Fukuyama *(The Origins of Political Order)* about the Mandate of Heaven, Stephen Covey's *7 Habits of Highly Effective People,* lessons from the Emergency Department about

how to interact briefly but effectively with people in time-constrained urgent interactions, and strategies for leadership succession.

10. Learn what a whacker is and why field team leader and other leaders need to know how to evaluate and manage whackers, including why we have heroes, why SAR teams are whacker-magnets, the beneficial effects of projecting confidence contrasted with the Dunning-Kruger effect, the ancient Greek concept of hubris, the dangers of dogmatism and Dale Carnegie's advice as to how to avoid it *(How to Win Friends and Influence People)*.

11. Learn best practices for leading volunteers, including how to avoid being an autocratic leader who drives away volunteers, understanding business leadership best practices as found in the writings of Frederick Winslow Taylor (The Principles of Scientific Management) and W. Edwards Deming *(Fourteen Points for Management)*.

12. Learn the basic principles of rhetoric, including the purposes for learning rhetoric, the basics of public speaking, and Aristotle's and Iszatt-White's principles.

13. Learn about different business and government management and leadership styles including management by exception, laissez-faire management, charismatic leadership, task-oriented leadership, autocratic command-and-control leadership, transformational leadership, the role of psychological safety in leadership, thought leadership (memes), the role of rules vs. best practices, and sources of authority for leaders.

14. Learn principles of good followership, including the role of experienced members as educators and mentors rather than assuming leadership roles, and the role of Socratic questioning in leadership, education and mentoring, adult learning principles and best practices for raising safety or other concerns with a leader.

## E. Search

1. Learn basic terminology and concepts used in search theory and planning, including areas of expertise/types of SAR, search strategy/planning terms and concepts including models for determining search area, bike spoke model for initial search planning, common types of search task, and canine-specific terms.

2. Learn how to fit the terms listed above into a mental model of the usual search management process for a medium-sized, including assigning reflex tasks, using models to establish a search area, using planning areas to assign Probability of Area (POA), segmenting the area into searchable segments, using clues to reassess plans, planning for a find, and concluding or suspending a search.

3. Learn best practices for setting up an attraction station.

4. Learn best practices for leading a large team in a saturation/line search task.

## F. Rescue

1. Learn how to tie and use a Münter hitch for belaying, rappelling and lowering; learn how to tie a butterfly knot (Alpine butterfly) and its uses; and learn how to tie and use a Radium load-releasing hitch.

2. Learn how to rig and manage lowering and raising systems including mechanical braking systems and 3:1 hauling systems for steep low angle steep semi-technical evacuations, including using a Radium load-releasing hitch and other rigging to switch from lower to raise and from raise to lower.

3. Learn the advantages and disadvantages of single-line systems, single-line systems with a separate backup, and dual-capability two-tensioned line systems.

4. Learn general principles for setting up a helicopter landing zone (LZ), and principles for those on the ground interacting with a helicopter crew, including essential elements of safety.

# Field I Curriculum

## A. Safety, Health and First Aid

### 1. Geography

a. Mid-Appalachian geographic provinces: Coastal Plain, Fall Line, Piedmont, Blue Ridge, Great Valley (Shenandoah Valley, Cumberland Valley), Ridge and Valley, Allegheny Front, and Allegheny Plateau

b. Elevation effects on precipitation

### 2. Botany and Zoology

a. Dangers from fauna

(1) Bears

(2) Mountain lions

(3) Coyotes

(4) Feral pigs

(5) Humans

(6) Bees and wasps (review from Field IV)

b. Dangers from flora

(1) Review poison ivy from Field IV

(2) Stinging nettles

(3) Thorns

(4) Giant hogweed

### 3. Meteorology

a. Climate vs weather

b. Continental vs. maritime climates

c. Elevation and latitude effects on temperature and flora

d. Climate change effects on the mid-Appalachians

e. Hadley cells

f. Prevailing westerlies, the Great Lakes, the Gulf of Mexico, and their effects on precipitation including the rain shadow effect

g. Hurricanes

h. Nor'easters

i. Polar vortexes and bomb cyclones

j. Summer weather and thunderstorm patterns

k. Using smartphone apps and reading the sky to predict very near-term weather

### 4. Emergency Stream Crossings*

a. Minor stream crossings that just require hopping from rock and pose no risk of drowning do not require PFDs

b. Cross large streams with swiftwater with PFDs unless don't have PFDs and safer to cross stream without PFDs than wait

c. If stream flow enough to cause hydraulic jumps (sudden changes in depth of water), best not to ford if deeper than mid-shin; may suddenly "jump" up to knee and knock over

d. Heavy rains may turn dry gully into stream difficult to cross on way back; may be best to make temporary bivouac and wait for water level to drop if no reasonable high-water alternate route

e. Best to spend some time looking for best crossing place

(1) Wide is generally best as water not as deep and water slower

(2) Best is often where stream breaks into multiple smaller stream braids

(3) Avoid stream crossings right above waterfall, rapids, or log jam (strainer): high danger of drowning if fall in water

* https://www.wonderlandguides.com/backpacking/how-to-ford-a-river

f. Best to have pack hipbelts off and shoulder straps a bit loose, but not so loose as to flop around an unbalance, so can abandon pack if fall into water

g. Walking stick as crossing aid for individual crossing

(1) Very helpful to use a walking stick, improvised from a sapling if needed

(2) Face upstream, so force of water presses walking stick into bottom, shuffle sideways

(3) Maintain two points of contact (both feet, or one foot and walking stick) at all times

(4) May also use two trekking sticks if have them, keeping three points of contact at all times

h. Group crossing

(1) Best is with a long wooden pole, long enough for group to all hold onto without crowding

(2) May link arms onto pole and go across as group

(3) Pole is oriented parallel to river

(4) Cross river with pole in front in direction of travel

(5) May also do this as a group without a pole if no pole; strongest person is upstream to break current

i. Triangle crossing

(1) Teams of three at a time cross

(2) Heaviest or strongest is upstream

(3) Three people get close, facing in

(4) Hold waist of person to right (or left)

(5) One person moves feet and then stands still while next person moves

j. Belayed crossing

(1) If use a rope for a belay for first person, set up belay above crossing point, preferably at curve in stream so that current will swing person to far side

(2) Belayed person in stream *not* tied in but holds onto loop at end of rope so can let go and swim if needed

(3) Once first person across, can tighten belay line as handline for others to use; stand downstream of handline

(4) Move belay line anchor to far side and upstream to make safer crossing belay for last person

## B. Communications

### 1. Equipment

a. Considerations for placing Base antennas with reference to communications efficacy, high points and ground planes, and dangers including wind and lightning

b. How to assemble handheld radios, and properly handle sign-in/sign-out of such radios

c. How to change handheld radio batteries

d. How to set up and use battery chargers

e. How to identify and prioritize batteries for charging or sign-out

f. How to determine when battery charging is complete

### 2. Radio Procedures and FCC Rules

a. FCC rules under which ASRC operates

b. Use and number of units allowed for each FCC licensed frequency used by ASRC

c. Concerns with interference with other channel users

d. Duties and responsibilities of Net Control

e. ASRC Communications SOP as on the ASRC Radio Crib Sheet

f. Using the Equipment Log to track radio equipment and the Communications Log to track radio traffic

## C. Land Navigation*

1. How to use a GPS or smartphone GPS app to ascertain and communicate DD MM.MMM coordinates of a given location to a helicopter as a landing zone (LZ)

   a. If LZ is to be at current position, GPS device or GPS smartphone app, center GPS map at current position and in menu, switch coordinates to DD MM.MMM (menu varies with different versions of device or app) and read off DD MM.MMM coordinates

   b. If LZ is not at current position, and given USNG or UTM coordinates, make sure GPS device or smartphone GPS app is set to USNG or UTM coordinates, create waypoint using given coordinates, then switch to DD MM.MMM coordinates and read off coordinates of waypoint

## D. Operations, Management and Leadership

### 1. Personal Characteristics

a. Characteristics of a good leader: are they inborn? Maybe

b. The practice effect: Malcolm Gladwell *(Outliers):* Genius is just lots of practice so can learn to be leader; maybe

c. True answer likely a bit of both

### 2. Multitasking

a. Difference between human task switching and multitasking

b. Requirement for much practice to be able to multitask, and only for very simple repetitive functions

c. Implications for volunteer wilderness search and rescue: not enough practice to multitask, and heavy task switching leading to forgetting some tasks

d. Some people much better at task switching than others, may not be able to change even with practice

### 3. Decision-Making

a. **Gary Klein**

(1) Work of Gary Klein *(Sources of Power):* Most psychological theories of decision-making just plain wrong

(2) When have time, as in Base, tend to use traditional methods of decision-making:
   i. Deductive logical thinking
   ii. Analysis of probabilities
   iii. Statistical methods

(3) Especially in time-sensitive, high-urgency situations, as during urgent field decision-making, instead use:
   i. Intuition
   ii. Mental simulation
   iii. Metaphor
   iv. Storytelling

(4) Role of experience, practice and having heard stories in emergent decision-making

b. **Heuristics**

(1) Heuristic = mental shortcut/rule of thumb, often unconscious

(2) Advantage of heuristics: fast, usually right

(3) Disadvantage of heuristics: sometimes wrong, causing bad outcomes; biases leading to heuristic error to be vigilant for:
   i. Premature closure and "wrong but strong" errors
   ii. Attribution bias and "satisfaction of search"
   iii. Confirmation bias and anchoring bias
   iv. Familiarity bias
   v. Social proof bias
   vi. Commitment bias
   vii. Scarcity bias

*http://www.conovers.org/ftp/Land-Navigation.pdf
(2017) Mountaineering: Freedom of the Hills, Mountaineers Books.

c. **Subjective vs Objective Hazards**

(1) Wilhelm Paulcke's *Hazards in Mountaineering*

(2) Objective hazards: in the environment such as
i. Rockfall
ii. Avalanches
iii. Slippery rocks or ice
iv. Steep slopes and cliffs
v. Swift-running streams
vi. Stinging nettles and poison ivy
vii. Sharp branches just waiting to poke out the eye of a nighttime searcher

(3) Subjective hazards: see heuristics above

**4. Situational Awareness**

a. Level 1 situational awareness: perception

b. Level 2 situational awareness: comprehension

c. Level 3 situational awareness: projection to the future

d. Supporting situational awareness
i. Changing the environment
ii. Directly improving situational awareness of team by sharing comprehension and projection to the future
iii. Monitoring for slow deterioration in situational awareness "bringing the water to a boil slowly so the lobster doesn't notice"

**5. Selective Attention**

a. Work of Chabris and Simons ("the gorilla in the room" video)

b. Work of Trafton Drew with radiologists

c. Narrowing of attention due to stress may cause major errors in wilderness search and rescue; role of practice in reducing stress and secondary narrowing of attention

**6. Learning Human Nature**

a. Liberal arts education based in the artes liberales of the medieval universities

b. Plays of Shakespeare

c. Machiavelli's "The Prince"

**7. Genetics and Human Behavior**

a. Darwin *(The Origin of Species)*

b. Dawkins *(The Selfish Gene)*

c. E. O. Wilson *(Sociobiology)*

d. Evolutionary psychology

e. Altruism and motivation

f. Risk-taking

**8. Personality Types**

a. Charisma

b. Contentiousness

c. Specific personality characteristic of emergency services workers including SAR group members

d. Attempts at personality classification

(1) Ancient "four humors"
i. Sanguine
ii. Choleric
iii. Melancholic
iv. Phlegmatic

(2) More modern takes on trying to classify personality types

e. Psychopaths and sociopaths

**9. Leadership Strategies**

a. Francis Fukuyama *(The Origins of Political Order)* and the Mandate of Heaven

b. Stephen Covey's *7 Habits of Highly Effective People*

c. Lessons from the Emergency Department about how to interact briefly but effectively with people in time-constrained urgent interactions

d. Strategies for leadership succession

**10. Whacker Management**

a. What a whacker is

b. Why field team leaders and other leaders need to know how to evaluate and manage whackers

c. Why we have heroes

d. Why SAR teams are whacker-magnets

e. The beneficial effects of projecting confidence

f. The Dunning-Kruger effect

g. Ancient Greek concept of hubris

h. Dangers of dogmatism and Dale Carnegie's advice as to how to avoid it *(How to Win Friends and Influence People)*

**11. Leading Volunteers**

a. How to avoid being an autocratic leader who drives away volunteers

b. Business leadership best practices

(1) Frederick Winslow Taylor *(The Principles of Scientific Management*)

(2) W. Edwards Deming *(Fourteen Points for Management)*

**12. Rhetoric**

a. **Uses Of Rhetoric**

(1) Learn how to persuade others

(2) Learn how not to be persuaded by others

(3) Essential for democracy and good group decision-making

b. **Public Speaking Basics**

(1) Essential for briefing large field team

(2) Project to entire audience: speak to person in back row

(3) Roving eye contact engages audience

(4) Don't let stress tighten vocal cords, keep pitch low

(5) Take deep breaths, push lots of air through vocal cords to project voice

(6) Pause regularly, don't rush

c. **Aristotle's *Rhetoric***

(1) Aristotle's definition of rhetoric: *the ability, in any particular case, to see the available means of persuasion*

(2) Types of rhetoric:
i. Deliberative
ii. Forensic
iii. Epideictic

(3) Methods of persuasion
i. Credibility (ethos)
ii. Emotions and psychology of audience (pathos)
iii. Patterns of reasoning (logos)

(4) Use ethos with
i. Wisdom (phronesis)
ii. Virtue (arete)
iii. Good will (eunoia)

d. **Iszatt-White's *Leadership***

(1) Communicate vision by adapting content to suit audience

(2) Highlight intrinsic value of vision by emphasizing how represents ideals worth pursuing

(3) Choose right language – words and symbols – to make motivating and inspiring

(4) Use inclusive language that links people to vision and makes them feel part of process

**13. Management Styles**

a. Management by exception

b. Laissez-faire management

c. Charismatic leadership

d. Task-oriented leadership

e. Autocratic command-and-control leadership

f. Transformational leadership

g. Psychological safety in leadership

h. Thought leadership (memes)

i. Rules vs. best practices

j. Daughenbaugh and groupthink: dangers of a cohesive in-group combined with an authoritarian, charismatic leader causing tunnel vision

k. Danger of leader asking question then proposing leader's own solution in stifling alternative

#### 14. Sources of Authority

a. **Jones, LaValla and Long**

(1) From place in change of command

(2) From expertise

(3) From charisma and past interpersonal relations

(4) From "referent authority": granted by team members (related to Mandate of Heaven)

b. **Iszatt-White**

(1) From being able to provide information

(2) From being able to reward or punish

(3) From subordinates granting

#### 15. Followership

a. Medical experts requesting to *not* be placed in leadership positions and why

b. Types of adult learning, Neil Fleming's VAK/VARK model

(1) Visual

(2) Auditory

(3) Read/write

(4) Kinesthetic

c. I hear and I forget, I see and I remember, I do and I understand

d. Malcolm Shepherd Knowles *(The Adult Learner);* adults are

(1) Autonomous and self-directed

(2) Have accumulated a foundation of expertise and knowledge

(3) Are goal oriented

(4) Are relevancy-oriented

(5) Are practical

(6) Need to be shown respect

e. Experienced members as educators and mentors

f. Experienced members supporting junior members rather than assuming leadership roles

g. Socratic questioning in small-group leadership, education and mentoring

h. Best practices for raising safety or other concerns with a leader

(1) International Association of Fire Chiefs *(Crew Resource Management)*
i. Opening or attention getter
ii. State your concern
iii. State the problem as you see it
iv. State a solution
v. Obtain agreement

(2) Graded assertiveness: PACE mnemonic
i. Probe
ii. Alert
iii. Challenge
iv. Emergency

## E. Search

#### 1. Search Management*

a. Terms used in SAR, their definitions, and their implications

(1) Areas of expertise/types of SAR
i. USAR: Urban Search and Rescue
ii. Urban Search

*Conover, K., et al. (2017). Technical Rescue Interface: Search and Rescue in the Non-Snow/Glacier/Mountaineering Environment. Wilderness EMS. S. C. Hawkins, Lippincott Williams & Wilkins. https://www.animatedknots.com/

iii. Wilderness Search and Rescue
iv. Rescue
v. Recovery

(2) Search Strategy/Planning Terms and Concepts
i. ICP: Incident Command Post
ii. Base
iii. LKP: Last Known Point
iv. PLS: Point Last Seen
v. IPP: Initial Planning Point
vi. Planning region
vii. Searchable segment
viii. POA: Probability of Area
ix. POD: Probability of Detection/POC: Probability of Containment
x. POS: Probability of Success
xi. MPQ: Missing Person Questionnaire
xii. GIS: Geographic Information System
xiii. Statistical model for determining POA
xiv. Travel-time model for determining POA
xv. Trail-based model for determining POA
xvi. Mattson consensus method for determining POA ("Mattson")
xvii. Shifting POA
xviii. Decision points
xix. Sweep width
xx. Bike wheel model
xxi. Axle
xxii. Rim
xxiii. Hub
xxiv. Spokes
xxv. Reflectors

(3) Common types of search task
i. Reflex search task
ii. Containment search task
iii. Hasty search task
iv. Sweep search task
v. Line (saturation) search task
vi. Mantracking search task
vii. Cutting for sign (signcutting) search task
viii. Airscenting dog search task
ix. Trailing dog search task
x. HRD (Human Remains Detection) search task
xi. UAV (unmanned aerial vehicle = drone) search task
xii. Manned aircraft search task

(4) Canine-specific terms
i. Field team vs Dog team
ii. Alert (dog team)
iii. Refind (dog team)

b. Search Theory and Strategy Overview

(1) Reflex tasks: get people into field ASAP

(2) Bike wheel model

(3) POS = POD × POA

(4) Picking an Initial Planning Point (IPP)
i. Point Last Seen (PLS)
ii. Last Known Position (LKP)

Establishing a search area
Past history of those lost in area
Statistical models of lost person behavior
Time-Travel models based on trails, roads, elevations
Trail-based POA
Looking for decision points where subject might have gone astray
"Heat map" combining above

Planning Areas and Segments
Creating *Planning Areas* and assigning POA to them
Mattson consensus method for assigning POA to Planning Areas
Creating searchable *Segments* and using them to create tasks using TAFs

Ongoing Planning
Using clues to revise POA of different planning areas and priority of tasks assigned to different segments (shifting POA)
Planning for find vs suspension

**2. Attraction Station**

a. Big difference from attraction station on road with vehicle vs backpacking into an area and staying for days at "camp-in"

b. Plan to have the attraction station last the duration of the search, or at least post waterproof directions to safety once members stationed there leave

c. Making sure that members assigned to station, especially if far from a road, have adequate food, water, gear and experience to stay there for allotted time

d. Make sure station has adequate communications, even if requires setting up remote base or repeater or relay

e. Make formal plan in case subject arrives at attraction station

f. Plan attraction methods

(1) Sound: whistles, megaphone, air horn, and listening

(2) Sight: string line and note system used in Pacific NW

(3) Smell: cook lots of good-smelling food on a stove

### 3. Saturation Search

a. Leading and managing a large team on a close-spaced saturation line search is much harder than leading a small hasty or sweep team and qualitatively different

b. Review technique for placing and removing flags from prior level curriculum

c. Review field team management from prior levels

d. Review "people skills" covered earlier in this curriculum

e. Role of a Field Team Leader for large field team

(1) FTL does no searching, does not take place in line, only does leading and managing

(2) Need to obey ICS guidelines on span of control (review) and delegate Assistant Team Leader for each end of line

(3) Need for communications equipment to support
i. Communications with Base
ii. Communications between Field Team Leader and both Assistant Team Leaders at ends of line

(4) Inexpensive Family Radio Service (FRS) radios may be used for internal Field Team communications; may also use Bluetooth communications between FTL and ATLs, but need to install app while have data connection before heading into field

f. Spacing

(1) May be specified by Base

(2) May be requested to adjust spacing based on amount and type of vegetation cover

(3) May be requested to do a Northumberland Rain Dance once get to assigned area to determine spacing

(4) During briefing in Base should discuss strategies for nearly-impenetrable areas of brush
i. Skip such areas, mark and leave for another team or search mode
ii. Stop team, mark progress, and collapse entire team to closer spacing to search brushy area

## F. Rescue Practice

### 1. Knots

a. Münter hitch

(1) Tying

(2) Using for belay

(3) Using for rappel

(4) Using for lower

b. Butterfly knot (Alpine butterfly knot): tying, uses

c. Radium load-releasing hitch: tying, uses, how to lower using it

### 2. Steep Semi-Tech

a. Definition of steep semi-technical evacuation: even if "low angle" by fire service, steep enough that litter bearers should be clipped into litter rail

b. Best practices for clipping litter bearers into rail, including length of Prusik loop tie-in

c. Rigging single-point anchors

(1) Tensionless hitch for static line (useful as handline)

(2) Anchor strap (may work with fire department that has these)

(3) Wrap-3 pull-2

(4) Basket hitch and modified basket hitch

d. Rigging and managing a simple lowering system

(1) Figure-8 descender

(2) Rappel rack

(3) Petzl I'D

e. Rigging and managing a simple raising system

(1) Why and how to rig with Radium load-releasing hitch if not using Petzl I'D

(2) How to lower with a Radium hitch

(3) How to rig a 3:1 mechanical advantage hauling system both with the main line and with a separate line (Z-haul), including a dual-Prusik safety on the main line and on a separate belay line

(4) How to manage a mechanical advantage hauling system including roles and calls

(5) How to switch from raise to lower and back again
i. Using Radium hitch
ii. Using Petzl I'D

**3. Helicopter Operations**

a. **LZ (Landing Zone) Principles**

(1) "What the pilot wants, the pilot gets"

(2) No (invisible to pilot) power or telephone wires or barbed-wire fences nearby to kill everyone on the aircraft and maybe those on the ground

(3) Nothing laying on the ground (tarps, tree branches, scene restriction "police line" tape, bottles or the like) that will fly up in the 60-80 mph (100-130 kph; hurricane-force) downdraft and kill someone on the ground or foul the rotors and kill those on the aircraft

(4) No loose material like dust or colored smoke that will fly up in the downdraft and interfere with the pilot's view of the LZ (if accessible by road, might ask local fire department to wet down loose soil)

(5) Nothing sticking up that will puncture the fuselage and kill someone on the aircraft (may need to cut off bushes and saplings)

(6) Flat and level

(7) Big enough that aircraft's rotors will not hit vertical things like trees or light poles and explode in a cloud of high-velocity shards that will kill everyone in the vicinity: 100 feet x 100 feet (30 x 30 meters) is good for medical helicopters, although some will accept 60' x 60' (18 x 18 m); may need bigger LZ for larger military aircraft

(8) Some indication of the wind direction and speed on the ground (either visual or by radio to the pilot)

(9) Clear approach and takeoff lanes aligned with the prevailing wind so aircraft can approach and most importantly take off into the wind

(10) During day, may mark corners of LZ with orange traffic safety cones

(11) At night, may mark corners of LZ with
i. Orange traffic safety cones with headlights or flashlights inside
ii. Reflective Scotchlite or similar reflective markers; parkas with reflective trim held down by heavy rocks work well
iii. Road flares
iv. Lights outlining the LZ but that will *not* glare into the pilot's eyes and blind him or her; also lights on any nearby obstructions if possible; NO flashing red lights or similar; bright personal headlights are fine; if use brighter vehicle headlights, traditional to use them to

mark X across center of LZ and have people in vehicles ready to turn off lights if pilot says "lights off"

v. Glaring light into eye of pilot of large heavy object overhead strongly discouraged

(12) Secure boundaries to keep people from walking into the LZ and having a helicopter land on them or get their heads chopped off by the main rotor or tail rotor but without yellow "police-line" scene restriction tape that will get sucked into rotors

(13) All nearby vehicles should have their windows, doors and hoods close so they don't get ripped off by the downdraft

(14) "What the pilot wants, the pilot gets"

b. **Interfacing with Helicopter**

(1) Vectoring in pilot or crew chief by radio:
i. Give coordinates in format pilot wants, often DD MM.MMM
ii. Give pilot helpful information on local features relative to LZ, such as lakes, streams, peaks, water/radio towers, schools or other large buildings, tennis courts, swimming pools, high power lines, or major road intersections

(2) Notify the flight crew when you:
i. Hear the aircraft
ii. See the aircraft

(3) Direct pilot to location using clock method: pilot is facing 12 o'clock ("We're about 2 o'clock from you")

(4) Give pilot other information about LZ:
i. Type of LZ (e.g., meadow, field, road, construction site)
ii. LZ surface (i.e., field, grass, concrete, gravel, dirt, snow covered)
iii. Boundaries of LZ (i.e., trees, houses, wires, fences, towers)
iv. Approach and departure pathways

(5) Approach aircraft only after crew chief or pilot signals or tells ground team members to do so

(6) Only those with business with helicopter crew approach helicopter
i. Litter team carrying patient;
ii. Team leader who needs to talk with aircrew
iii. Personnel getting on helicopter for transport to another location

(7) Difference between hot load and cold load

(8) Hot load principles:
i. Eye protection required
ii. All loose objects, long hair, lanyards or the like must be secured
iii. Rotating rotor well-known for chopping off heads; need to crouch as approaching aircraft, even if carrying litter
iv. Helmets no protection against rotors but may protect against flying debris (no fire helmets: duckbill on back tends to pull off in high winds)
v. Generally approach from downhill where more room under rotor unless crew chief or pilot says otherwise
vi. Stay away from tail rotor at rear of aircraft: pilot cannot see; watch *Indiana Jones: Raiders of the Lost Ark* as far as regards rotors and one's head
vii. Litter captain keeps eye contact with crew chief or pilot during approach

# Search Manager III Educational Goals

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# Search Manager III Curriculum

[reserved]

# Search Manager II Educational Goals

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# Search Manager II Curriculum

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# Search Manager I Educational Goals

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# Search Manager I Curriculum

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# Change History

Old versions are posted in the ASRC Archive at http://archive.asrc.net.

**??** **(Version 1.0)**