

CONCEPTS

Core Content for Wilderness Medicine Training: Development of a Wilderness Medicine Track Within an Emergency Medicine Residency

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Wilderness medicine training has become increasingly popular among medical professionals with numerous educational opportunities nationwide. Curricula for fellowship programs and for medical student education have previously been developed and published, but a specific curriculum for wilderness medicine education during emergency medicine (EM) residency has not. The objective of this study is to create a longitudinal wilderness medicine curriculum that can be incorporated into an EM residency program. Interest-specific tracks are becoming increasingly common in EM training. We chose this model to develop our curriculum specific to wilderness medicine. Outlined in the article is a 3-year longitudinal course of study that includes a core didactic curriculum and a plan for graduated level of responsibility. The core content is specifically related to the required EM core content for residency training with additions specific to wilderness medicine for the residents who pursue the track. The wilderness medicine curriculum would give residencies a framework that can be used to foster learning for residents interested in wilderness medicine. It would enhance the coverage of wilderness and environmental core content education for all EM residents in the program. It would provide wilderness-specific education and experience for interested residents, allowing them to align their residency program requirements through a focused area of study and enhancing their curriculum vitae at graduation. Finally, given the popularity of wilderness medicine, the presence of a wilderness medicine track may improve recruitment for the residency program.

Keywords: wilderness medicine curriculum, curriculum, emergency medicine residency academic track, academic track, education

Introduction

Wilderness medicine-specific education is an intuitive and beneficial addition to any residency training curriculum, with its emphasis on improvisational skills and the ability to provide emergent interventions and

stabilization in a resource-poor environment. Through the study of wilderness medicine, medical practitioners gain the ability to assess, stabilize, and initiate treatment in an ill or injured person within an austere environment, while also considering scene safety and available resources. In this article, we introduce a wilderness medicine track that residency training programs can implement to engage interested residents in studying topics of wilderness medicine. This longitudinal track program provides the residency program with a group of knowledgeable and skilled residents in a particular niche of emergency medicine (EM), making the resident a more focused and skilled peer educator.

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Wilderness medicine is well established as a subspecialty field among several different specialties—EM, family medicine, and internal medicine. The publication of Paul Auerbach's first edition of *Wilderness Medicine* along with the formation of the Wilderness Medical Society (WMS) by Paul Auerbach, Ed Geehr, and Ken Kizer in 1983 brought forth an academic body that would promote the study of illness and injury occurring in the wilderness. The WMS received continuing medical education accreditation by the Accreditation Council of Continuing Medical Education in 1990 and has since developed a comprehensive array of programming geared toward educating medical professionals in all aspects of wilderness medicine. Since then, wilderness medicine sections have been established in the American College of Emergency Medicine (ACEP) and the Society of Academic Emergency Medicine (SAEM) in addition to wilderness medicine sections in a number of university and academic institutions.

Many opportunities for wilderness medicine education in medical schools exist through dedicated electives and selectives. Wilderness medicine interest groups among medical schools allow medical students to foster their desire to learn more about the field of wilderness medicine before entering residency. Currently, 8 intensive elective courses in wilderness medicine, ranging in length from 2 weeks to 1 month, are offered via the Visiting Student Application Service. Emergency Medicine Residents' Association (EMRA) lists other opportunities for medical student electives in wilderness medicine offered independently through wilderness medicine organizations and residency programs.

Many medical students are exposed to interest groups and teaching programs in wilderness medicine; some would hope to continue such training during their residency training. The current opportunities offered to EM residents to study wilderness medicine during residency are varied. Of 104 EM residency programs in the United States that responded to a survey, 44% noted that they include wilderness medicine content in their required curricula, whereas 75% of the responding programs offered optional wilderness medicine opportunities but lacked details and curricula.¹ Baddorf notes that wilderness medicine is among the top 3 most highly ranked electives within EM residency programs.² Postresidency education exists with 14 wilderness medicine fellowships in the United States, with plans for additional programs in the next few years.

Educational objective and methods

Curricula for medical fellow³ and student⁴ education in wilderness medicine have been described in the

literature. There is no previously published curriculum for wilderness medicine education for residency training programs. This deficit was noted at the 2014 meeting of the Wilderness Medicine Section, American College of Emergency Physicians. Tasked to fill this gap, the authors, all with experience in wilderness medicine and residency education, endeavored to create an outline for such a curriculum, and the Residency Curriculum Subcommittee of the Education Committee was formed. The first 3 authors (WS, NB, JD) formed the original subcommittee. The fourth author (FM) joined afterward. The content of our subcommittee's work was presented to and endorsed by the ACEP Wilderness Medicine Section meeting the following year in 2015. All authors are members of the Wilderness Medicine Section of ACEP. This article is the finalization of that work. Although the authors all specialize in EM and therefore focus on this specialty, the work outlined in this paper can be utilized and translated to other specialties. We have outlined a longitudinal learning solution that can be used as a guideline for residency training programs looking to further cultivate this interest among their residents. This document is geared toward providing an opportunity for study of wilderness medicine in the framework of a residency program.

Several frameworks were considered when developing this curriculum. One option is to develop a wilderness medicine elective, which would typically occur over a 1-month period. This model is limited by time and the lack of continuity of knowledge. Residents often have clinical duties during their elective time, cutting away from immersive and intensive study within the subspecialty field. Wilderness medicine is a field in which training in the elements of various seasons influences the course of education, making training in a confined time frame limited. This model also limits the residents' ability to participate in and stay up to date with the current growing research of the field due to its lack of longitudinal nature by design.

Another approach would be to develop a curriculum that would be presented to a residency training program in its entirety to cover widely applicable core educational content. As an example, a considerable amount of wilderness medicine-based core content overlaps with and would be pertinent to the Model of Clinical Practice of Emergency Medicine.⁵ This method may not be advantageous to residents who do not have a specific interest in wilderness medicine or would prefer to focus on a different subspecialty.

To expose residents to various subspecialties, EM training programs have started developing scholarly tracks that encourage the trainee to develop an academic or clinical niche within EM. Examples include

administration, education, emergency imaging, emergency medical services, global health, public health, research, simulation, toxicology, ultrasound, and, of course, wilderness medicine.⁶ These scholarly tracks allow the interested resident to align his or her training and educational endeavors within a subspecialty interest of the residency training program. There are many benefits to the use of these scholarly tracks, including increased overall resident satisfaction, increased success at obtaining faculty and fellowship positions after residency, and increased production of scholarly work.⁶ The Residency Review Committee requires that residents show competence in a variety of areas outside of clinical expertise, such as education, teaching, research, and business aspects of medicine. Such tracks offer the opportunity for the resident to focus on a single area of expertise to fulfill his or her research, administrative, and teaching requirements within a niche of specific interest. Over a longitudinal curriculum, residents garner a graduated level of responsibility through the progression of training and would accumulate academic projects that build a body of work that reflects their interests. This would certainly have advantages for graduating residents who might be considering a career in academics or in the practice of wilderness medicine. In addition, such academic tracks allow for areas of specialty within the residency for faculty and residents to assist as experts when teaching the core content during residency didactics. In a survey sent to EM programs in the United States, 35% of 78 emergency programs with optional wilderness medicine opportunities noted they offer wilderness medicine as part of a scholarly track.¹

We chose the latter model to develop our residency curriculum to allow interested residents to focus required academic activities in the field of wilderness medicine. This track program benefits the field of wilderness medicine in further research and scholarly activities; it benefits the resident in allowing more time and focus to study in a niche field; and it benefits the residency program by training expert educators who can be more actively involved in required didactics. With an increase in time dedicated to the study of this subspecialty, this curriculum could allow the residency to graduate residents who are not only competent and knowledgeable in the core content, but also those who have the potential to have extensive hands-on experience in tangible, applicable skills in search and rescue, ski patrol, expedition medicine, or dive medicine.

This article has been compiled from the available literature on wilderness medicine education, as well as resident education, and focuses on resident education in EM as an example that can be translated to other specialties. We have researched programs that currently

offer such tracks and that have adapted a curriculum that could be offered as a guide for any residency program looking to provide a wilderness medicine track. Our curriculum is based on the American Board of Emergency Medicine Core Content⁵ relating to wilderness medicine, but it could easily be adapted to other specialties such as family medicine and internal medicine.^{7,8} Within the curriculum there is space for the resident to earn a designation as a Fellow in the Academy of Wilderness Medicine (FAWM) and/or to earn a Diploma in Mountain Medicine (DiMM). Both designations are achieved through the educational opportunities currently offered through the WMS.

The curriculum outlined is intended to provide guidance for the development of a wilderness medicine scholarly track within an existing residency program. Each residency program will vary due to geography and local availability of wilderness medicine resources and training. The curriculum can be adapted to the program's available resources and needs. It is a toolkit that provides suggestions for integrating wilderness medicine into the administrative, research, teaching, and practice improvement requirements mandated by the residency review committee.

Curriculum design—model of wilderness medicine track

AMERICAN BOARD OF EMERGENCY MEDICINE CORE CONTENT RELATING TO WILDERNESS MEDICINE

Several topics listed within the American Board of Emergency Medicine Core Content⁵ can be directly related to the study of wilderness medicine and are routinely incorporated into residency didactics. Participants in the wilderness medicine track may be responsible for the didactic presentation of these topics. A group of resident educators with focused study in these topics would strengthen the educational program as it relates to the wilderness medicine–based core content. Didactics presented to all the EM residents within the program have the potential to improve in-service scores and EM board scores.⁹

The following presents a proposed 3-year curriculum. Based on the interest of the residents, the content can be covered in overview fashion—topics that would be tested in the EM boards—or in a more in-depth manner for those who are more interested in the field. Many residencies require at least 1 lecture given to peers on a topic related to the core content of EM. Participants in the wilderness medicine track would choose 1 of the following topics for their lecture (Table 1). We also encourage preparation and research in these topics for potential publication. Some suggestions for publication

Table 1. Core content area for model of the clinical practice of emergency medicine, which corresponds to the wilderness medicine topics of the curriculum

<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Dysbarism (6.2)	Envenomations (6.1)	Altitude illnesses (6.4)
– Air embolism (6.2.1)	– Insects (6.1.1.1) and allergic reactions (9.2.1)	– Acute mountain sickness (6.4.1)
– Barotrauma (6.2.2)	– Arachnida (6.1.1.2)	– Barotrauma of ascent (6.4.2)
– Decompression sickness (6.2.3)	– Mammal bites (6.1.2)	– High-altitude cerebral edema (6.4.3)
Submersion incidents (6.5)	– Reptile bites and envenomations (6.1.4)	– High-altitude pulmonary edema (6.4.4)
– Cold water immersion	Protozoan/Parasites (10.4)	Hypothermia (1.1.1, 6.6.2.2)
– Drowning	– Malaria (10.4.1)	Cold injuries/Frostbite (6.6.2.1)
Marine organisms (6.1.3)	– Toxoplasmosis (10.4.2)	Hyperthermia (6.6.1)
– Marine toxins (17.1.20)	– Tick-borne illnesses (10.5)	– Heat exhaustion
Environmental dermatology (4.3.2)	– Ehrlichiosis (10.5.1)	– Heat stroke
Approach to the injured person in the wilderness	– Lyme disease (10.5.2)	Wilderness toxicology (6.1, 18.1.3.2)
*Expedition medicine	– Rocky Mountain spotted fever (10.5.3)	Mushrooms/Poisonous plants (17.1.22)
*Wilderness survival	Emerging infections (10.7) and tropical medicine	*Avalanche preparedness and ski injuries
*Wilderness medical kits	Infectious disorders (gastrointestinal) (2.9.1)	
	Bacterial food poisoning (10.1.1)	
	Lightning injuries (6.3.1)	
	Wound management in the wilderness (18.1.3)	
	*Basics of search and rescue	

include local journals, the WMS newsletter, EMRA Wilderness Division Newsletter, ACEP Wilderness Section newsletter, or SAEM interest group newsletter.

CURRICULUM YEAR GOALS

Involvement in the wilderness medicine track will progress as the resident advances through his or her training, just as progressive levels of responsibility increase for other aspects of residency training. Residencies can discern between those projects that would be required and those that would be completed as an elective to tailor the wilderness medicine track for their residency program. Core responsibilities to finish the track would focus on involvement with the WMS, completion of the WMS designation of FAWM, and projects that are academically rigorous.

Year 1

- Join the WMS
 - The WMS was founded in 1983 and has since been a cornerstone in wilderness medicine education. It offers continuing medical education, medical student rotations, outdoor didactic programming, conferences, and its own fellowship program. The annual conference serves as a potential outlet for presentation of resident didactic projects. Other organizations that might be of interest to the resident include the Wilderness Medical Associates, National Outdoor Leadership School, International Climbing and Mountaineering Federation, International Commission for Alpine Rescue, and International Society for Mountain Medicine.
- Encourage enrollment in the WMS FAWM or DiMM program
 - The WMS sponsors a robust fellowship program. Members of the WMS may enroll. The fellowship involves accumulation of experiential and lecture-based credits. Some activities within the residency track would count toward fellowship credits. After completion of the academic study with a minimum of 55 required credits and 5 elective credits consisting of attending lectures or reading journal articles, and after completion of 20 experience credits outlined in the experience report, members will be awarded the designation of FAWM. This designation recognizes candidates' training and education in the field of wilderness medicine and could be obtained by year 3 of the residency.
 - The DiMM was developed in 1997 in cooperation among the International Climbing and Mountaineering Federation, the International Commission for Alpine Rescue, and the International Society for Mountain Medicine. It is a program designed to train advanced providers in the essentials of caring for patients in the technical mountain environment. A list of diploma courses is posted by the International Climbing and Mountaineering Federation.
- It is worth mentioning that both options incur some expense. FAWM candidacy incurs a one-time fee and yearly membership dues. Not included are the fees associated with attending conferences and travel. National conferences are often held in highly sought-after mountainous locations where travel can be quite expensive; however, numerous less expensive local conferences also exist. Several credits may be earned through reading journal articles, and credits can also be obtained through the purchase of online lectures.
- DiMM candidacy incurs a one-time fee plus tuition fees for each of 4 sessions. These fees also do not include travel expenses during 2 of the sessions to obtain hands-on experience. WMS membership is also a requirement.
- Attend residency didactics
 - Topics in wilderness medicine are an integral part of the core curriculum of EM residency. Involvement in residency didactics are required for all residents; however, residents participating in the wilderness medicine track should be encouraged to be present at all didactics involving wilderness medicine. Involvement in these didactics will help foster a track participant's knowledge in the core curriculum of wilderness medicine. In addition, the track mentor should provide specific didactics directed to the wilderness medicine track residents.
- Participate in the activities of the Wilderness Medicine Track group (20.3.4.3)
- Take a practical wilderness medicine training course
 - Participants in the track program are encouraged to take a practical training course in wilderness medicine. These courses provide hands-on didactics that introduce treatments for common illnesses and injuries in the wilderness environment. Examples of such courses include the Advanced Wilderness Medicine Life Support course and courses offered by the National Outdoor Leadership School or the Wilderness Medical Associates.
- Become involved with a local organization for which wilderness medicine is relevant.
 - Examples include a search and rescue team; even if the residency program is in an urban location, there is likely an urban search and rescue team or

referral team nearby. Residents can also participate in wilderness emergency medical services, ski patrol, or expedition medicine.

Year 2

- Continue working on FAWM candidacy
- Present wilderness medicine topics during residency didactics (20.3.2.2, 20.3.2.3)
 - Those in the wilderness medicine track will be encouraged to give a presentation to the residency program about a topic in the core curriculum. This is required during residency and gives the participant experience in education.
- Choose and present 1 or several wilderness medicine–based research papers at residency journal club (20.2.1)
- Maintain membership with the WMS
- Become an active mentor/participant in wilderness medicine organizations locally or nationally (20.1), such as
 - Wilderness Medicine Section ACEP
 - Wilderness Medicine Interest Group SAEM
 - Wilderness medicine interest group at local medical school
- Attend a wilderness medicine, high-altitude, expedition, marine, or tropical medicine disaster or tactical medicine conference. Examples include
 - Undersea and Hyperbaric Medical Society Annual Conference
 - International World Extreme Medicine Conference and Expo
 - American Society of Tropical Medicine and Hygiene
 - Special Operations Medical Association Scientific Assembly
 - World Association for Disaster and Emergency Medicine Conference
- Participate in a medical school lecture pertaining to wilderness medicine
- Become an instructor for Advanced Wilderness Life Support (AWLS) or a similar course
- Begin planning and implementation of a wilderness medicine related research or educational project (20.2.1)

Year 3

- Serve as a mentor/advisor for first-year residents entering the wilderness medicine track
- Work with faculty supervisor to plan activities and didactics for the track participants for the year
- Finalize research or educational project (20.2.1)
- Present research at wilderness medicine conference (20)

- Participants in the wilderness medicine track will be encouraged to present the research project at either a WMS-sponsored conference or the annual meeting of the wilderness medicine sections of ACEP, SAEM, or the International Society for Mountain Medicine, as examples.

- Complete FAWM, if feasible
 - After completion of required credits, candidates will be awarded the FAWM designation and are encouraged to attend the WMS annual meeting for induction and medal of recognition
- Remain involved with local organizations for which wilderness medicine is relevant

ADDITIONAL AREAS TO GAIN EXPERIENCE

- Join a national committee interest group (20.3.1)
 - ACEP Wilderness Medicine Section
 - SAEM Wilderness Medicine Interest Group
 - EMRA Wilderness Medicine Division
 - WMS
- Join a search and rescue or disaster medical assistance team
- Take a class sponsored by the National Disaster Life Support Foundation, such as Basic or Advanced Disaster Life Support
- Participate or teach in medical student wilderness medicine electives or conferences
 - WMS medical student elective—in association with Virginia Tech Carillion School of Medicine—a 1-month elective near Roanoke, VA
 - St. Luke’s Wilderness Medicine Conference
 - Annual Wilderness Medicine and Survival Skills Conference in Hanover, PA
 - EMRA lists a variety of wilderness medicine electives for students on its web page.
 - Visiting Student Application Service also has a list of wilderness medicine electives

Program and faculty

Although an EM training program need not have a formal track system set up within its training structure, it would certainly be advantageous. The addition of a wilderness medicine track could then be more easily added into this pre-existing structure. On the other hand, an interested faculty could also start such a track de novo. This curricular outline serves as a general overview of similar track programs within residency programs. Key to the success of a wilderness medicine track program is having at least 1 faculty leader/champion of the program. This faculty member should have knowledge of the core content of the field of wilderness medicine. Ideally, this faculty member would be a

FAWM. He or she may be fellowship trained in wilderness medicine. The key component for such a faculty member is the drive to educate and knowledge in the field to share. For success, a minimum of 1 key physician faculty member would be necessary to run a wilderness medicine track. The support of the program, the program director, and the interest of the residents is also extremely important. Additional support for content and didactic training for the track might be sought by allied specialty-trained physicians at the institution. These might include faculty trained in toxicology, international medicine/global medicine, disaster relief, hyperbaric medicine, and EMS. The content areas covered by wilderness medicine in austere conditions and environmental exposures overlap with these specialty disciplines. Finally, the faculty member(s) providing direction for the track would be content experts for these allied specialty disciplines and could serve as mentors not only for residents within the program, but other allied health professionals and medical students interested in the field.

Summary

We present a core content model and curriculum for a wilderness medicine track within an EM residency training program. This curriculum can be adapted to other specialty training programs, and this model should be used by interested faculty and residents to develop such a track within their home residency programs. We believe that such a track would enhance recruitment to the EM program, as medical students often have a keen interest in the outdoors and the topic area. They often choose EM because they enjoy problem solving, creativity, and improvisation; these are all skills employed in wilderness medicine. The track would coalesce a group of interested faculty and residents, and their shared knowledge and expertise would enhance the didactics and experience of the residency as a whole. The track provides a framework for the resident with keen interest in wilderness medicine to synchronize the didactics, research, and administrative requirements of the residency around the subspecialty of interest. The completion of the FAWM enhances the resident's sense of accomplishment and is an accredited acknowledgement of expertise within the field of wilderness medicine. The resident completing the track will have residency credentials, which shows a synchronous and focused area of specialty interest and experience. This would place the graduating resident in a strong position to seek further training within a wilderness medicine fellowship program, take a leadership role early in his or her career in a wilderness or rescue organization, seek employment at an academic EM program or academic

medical center, or simply improve his or her chances for a successful emergency physician job search.

With regard to implications for future research, residency program and wilderness medicine track directors could consider evaluating this model curriculum, when put into practice, by following successful track graduates and their career or fellowship job choices. The impact of the wilderness medicine track within the residency could be examined by evaluation of in-service examination scores and knowledge based on wilderness and environmental topics covered by the track curriculum. Finally, our group hopes to continue further research on how and whether wilderness medicine tracks are implemented across US EM residencies and whether this model curriculum serves as a useful tool.

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