



A study on capabilities required in military medicine to develop modular training courses: a qualitative study

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Abstract

Introduction: The main mission of military medicine in the world is to support the health and treatment of the military in relation to issues, risks, injuries and diseases that arise due to the specific occupational conditions. The current study was carried out with the aim of determining the required skills of military physicians to define and determine the required training modules.

Methods: The study was a qualitative research. Semi-structured interviews were used to collect the data and qualitative content analysis was used to analyze the data. The study population included all the professors and experts in the field of military medicine and medical sciences at the medical universities of Tehran. Snowball sampling technique was used to sample the study participants.

Results: Based on the results, the required skills of military physicians in 5 categories and 29 sub- categories were identified; then based on the identified skills, 60 training modules at two introductory and advanced levels were determined including 39 introductory levels and 21 advanced levels.

Conclusion: We can conclude that some of the important skills that military physicians need and can achieved through training have not been provided in any educational program and to achieve such skills and capabilities, other programs should be developed and modular training can be one of them.

Keywords: Medical education; Military medicine; Qualitative research

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Introduction

Iran is one of the accident-prone countries in the world, and according to the statistics published by the relevant organizations, it is one of the ten accident-prone countries and in terms of the diversity of events it is one of the five countries in the world. The accident-prone areas are regions influenced by natural events like, earthquakes, floods, and hurricanes, and man-made events like war and terrorism. Out of 41 known events in the world, 31 to 33 are common in Iran and the largest and the most common types are earthquakes and floods among natural disasters and fires and

accidents among man-made disasters (1).

In addition to being an accident-prone country, Iran also has a unique geopolitical situation (2). Having a special geopolitical position, the country has always been an appropriate arena for political and military tensions, and its endangered national security (3). Hence, the country is constantly threatened by various military enemies and terrorists (4).

Because in the time of war and natural disasters, large-scale and complex problems occur, massive participation is necessary in most cases. In today's world, organizations which

are generally active in such events are military organizations as well as forces subordinate to them. These forces are flexible because of their special properties and readiness and they can appear and act in diverse roles. One of these roles is to help in rescue operations, medical treatment and transfer of victims, the wounded and the people in need of health. This is done by the military health care. The military health care carries out these activities using medical staff (at various levels) and medical equipment, fixed and mobile medical centers, transport equipment and other facilities (5).

On the other hand, with the increasing power of countries in producing nuclear, biological and chemical weapons and considering the possibility of upcoming wars, it is necessary that physicians and medical staff of the military be ready to deal with such events and disasters (6).

Naturally, military forces of every country play a key role in defending and maintaining its stability and security. These people, based on their responsibilities, missions and the type of job they have, are subjected to certain injuries and illnesses (7). Military Health System is a combination of military and civilian personnel responsible for providing health services to military personnel, their families and retirees. This system not only supports the provision of services in times of peace but also is responsible to keep the military personnel ready in military operations in terms of capabilities needed (8).

In fact, military medicine is one of the important areas in medical sciences. Military medicine plays a key role in maintaining the health of the military and also in preventing the accidents and diseases related to them. It also has the military power in war times (9). In the new millennium, military forces have been engaged in other activities such as intervention in emergency public health crises, natural disasters, conflicts and anti-terrorist campaigns in peace. Thus, military medicine is faced with new and needed challenges of military developments. These requirements include medical services in natural disasters, accidents, terrorist incidents and epidemiological diseases (10). On the other hand, simultaneously with the changes that occur in military equipment, military medicine also needs to be changed. As the weapons used in battles become more destructive and deadly, medical care should be changed in accordance with these developments and changes (11). When weapons become more destructive, injuries become more serious and so it necessitates the change in taking care of casualties and victims (12).

With regard to the growing trend of terrorism

and war events in today's world, varied modern weapons and their impacts and the incidence of unexpected disasters and the role of the military in these matters, a change in military medicine and the development of educational programs and curriculum are necessary. Also, with regard to the role and importance of military medicine, lack of attention to this need can deteriorate military medical systems to pave the way for supporting the military and using the highest, and the most specialized preventive measures when facing health threatening conditions and complex problems of today's world (4).

One of the most important ways to improve the capacity and improve the human resources is to design and provide specialized and in-service training programs (13). Several researches have addressed the effectiveness of modular training in improving medical students' learning (14-16). In the field of designing and providing organizational and in-service training, several approaches exist, one of which is modular approach. Modular training is a form of in-service training given to employees independently in order to train them in the framework of job specialization approach. Each modular creates special skills and competencies and along with other modules will lead to a new and more comprehensive skill. Modular training is not a new topic and several studies have shown the effectiveness of this method (17-19).

With reference to the above mentioned facts, it is necessary for a military physician to acquire the new skills. Developing policies, strategies, programs and methods are essential for the military physicians to achieve these skills. Also, in the current study we seek to answer the questions: 1) what skills a military physician needs to have to perform in war and crisis conditions? 2) What are the educational modules required for military medicine?

The objectives of this study were: 1) to determine the skills required by military physicians and 2) to determine the required training modules for military medicine.

We can provide the officials with information needed in their planning to increase capabilities of military physicians.

Methods

The present research was qualitative, i.e., the researchers used a set of activities such as observation and interview which resulted in collecting first-hand data on the issue under study. Descriptive analysis and classification were done in accordance with the collected data (20). The study population consisted of

all teachers and experts working in the field of military medicine and crisis medicine in Tehran University of Medical Sciences. To select the sample size, snowball and purposeful sampling method was used. For data collection, 27 semi-structured interviews were individually conducted. The time and place for conducting interviews were determined based on the participants' preferences. The interviews lasted about 30-50 minutes, depending on the interaction between the participant and the interviewer. Data collection was continued until no new data was obtained, so that in the last two interviews, the participants pointed to similar issues. Meaningful units of data were recognized and coded with appropriate labels. These codes were clustered as categories and subcategories by comparative analysis according to their similarities and differences. The extracted codes, categories and subcategories were examined and revised by the researchers.

The participants were asked questions to determine the major and minor military physicians' abilities and responsibilities. These questions include:

1. What are the skills and knowledge required by a military physician?
2. What are the skills and knowledge required by an army physician?
3. What are the skills and knowledge required by an air force physician?
4. What are the skills and knowledge required by a navy physician?
5. Have you any experience as a physician in war or operations? If yes, what are the frequently needed skills?
6. According to your experience, what are the skills a military physician should have in this area?

The data were described and analyzed simultaneously using qualitative content analysis according to Graneheim and Landman (21). The following steps were followed in data analysis:

1. Implementing the entire interview immediately after each one.
2. Studying and reading the entire text for an overall understanding of its content.
3. Determining the meaning of units and the original codes.
4. Classifying primary codes similar to the

Table 1: Details of participants in the qualitative research

Number	Expertise and scope	Gender	Frequency
1	Nursing education specialist and military nurse	Male	2
		Female	1
2	Clinical psychology specialist (Military psychology)	Male	1
		Female	-
3	Physical medicine and rehabilitation specialist	Male	1
		Female	-
4	Emergency medicine specialist	Male	4
		Female	-
5	Aerospace medicine specialist	Male	4
		Female	-
6	Naval & subsurface medicine specialist	Male	1
		Female	-
7	Tropical and infectious diseases specialist	Male	1
		Female	-
8	Radiology specialist	Male	1
		Female	-
9	Neurosurgery specialist	Male	2
		Female	-
10	Trauma surgeon	Male	1
		Female	-
11	General surgeon	Male	1
		Female	-
12	Medical physiology specialist	Male	1
		Female	-
13	General physician (Military medicine and combat medicine)	Male	2
		Female	1
14	General physician (Crisis and disaster medicine)	Male	3
		Female	-
Total frequency		-	27

more comprehensive classes.

5. Determining the theme or main classes.

In this study, trustworthy findings were presented in terms of dependability and conformability, credibility and transferability. Accordingly, to increase the credibility of data, we used expert participants using purposive sampling, continuous reviewing of the data along with simultaneous data collection, data analysis immediately after the interviews, and using the results of an interview to modify and revise the questions of subsequent interviews. In addition, the data were checked by the participants. Also, due to the dependability of data in this study, the researchers tried to record all interviews and data very carefully and ensure their accuracy by sending the primary analysis with initial codes to some participants. Also, to increase the transferability, we tried to have maximum variation in sampling, to present a deep description of our findings and then

to compare them with other studies done in different settings.

Results

We interviewed 27 participants including 3 women and 24 men. After analyzing the interview transcripts several times, 650 codes were extracted.

Table 1 shows the details of participants in the qualitative research in terms of profession, gender and frequency.

The data were classified into 5 categories of General skills, Military skills, Paramedical skills, Clinical skills, and Complementary skills. These categories are explained using quotes derived from the data. The summary of the categories and subcategories obtained from the findings are presented in Table 2. It should be noted that this study is the second phase of the research by Mohammadi Mehr and Dana (22).

Table 2: Data analysis results

Category	Subcategory	Codes	Meaning units
General skills	Individual skills	Personality traits	"I believe that one must have a good talent. That is, one who is going to enter a military system must have a high IQ".
		Physical fitness	"One who wants to be a military physician must have a high physical ability".
	Communication skills	Organizational communication	"A military physician must learn inter-organizational coordination and relations in order to coordinate and make relations with other involved organizations and sectors in the crisis and war conditions".
		Interpersonal communication	"Military physicians must be able to make relations with the wounded in crisis conditions".
		Intrapersonal communication	"A military physician must control and manage his behavior in difficult conditions and avoid behaviors caused by stress and emotions".
	Management skills	Crisis management	"Senior physicians may get management positions. Thus, they must learn about crisis management and be familiar with preliminary sciences, information and principles of crisis management in order to manage hospitals and desert centers in crisis conditions because management in such conditions will differ from the management of urban hospitals".
		Organizational management	"Since military physicians have a higher level of education and military position, they play the role of a commander in war conditions. Thus, they must have the knowledge and ability to manage the team and individuals".
		Modern wars management	"If the enemy is going to use one of the factors of modern wars, how should we cope with that in order to minimize the losses and damages due to these factors? In fact, the medical staff of the armed forces are those who must have the highest level of participation for management of modern wars in order to take the necessary interventions".
Military skills	Combat knowledge and skills	To know the weapons	"He must know how to work with different weapons and must also know the difference between the wounds caused by different weapons".
		The ability of self-defense	"In war conditions, physicians and medical staff must defend themselves and increase the military power of the involved forces".
	Passive defense	To reduce vulnerability in times of peace	"I think a military physician must know the issues related to passive defense well in order to minimize vulnerability".
		Survival in tough conditions	The ability of self-protection
			To supply water and food under difficult conditions

Paramedical skills	Military psychology	Psychological first aid	<i>"Since the medical teams are one of the first groups in war and crisis, they must have the necessary skills to calm down the wounded in order to start medical interventions".</i>
		Posttraumatic stress disorder (PTSD)	<i>"They must have the necessary skills in the fields of military psychology (like stress and anxiety that are common in war) , traumas after war and the resulting stresses".</i>
		Psychosocial support	<i>"The victims need mental-social supports more than medical measures in order to be treated in the short time. This difficult task is done by medical staff that visit the wounded individuals earlier than anyone else".</i>
		Stress management	<i>"They must possess stress management skills to cope with problems encountered by themselves and the others including the victims, nursing personnel and medical staff".</i>
		Malingering	<i>"Sometimes there are conditions in which some pilots hide some of their diseases due to the fear of losing their jobs so that the physicians who examine them every year would not find their problems. Thus, these physicians must know some psychological skills to figure out if someone is hiding something through their behaviors and distinguish between the person who only shows off and malingers and the person who really has a problem".</i>
	Military health	Personal health	<i>"Under the conditions of war and crisis, observing health principles becomes more important. If these principles are neglected, some infectious and contagious diseases may spread out and deteriorate the condition. Thus military physicians must have the ability to monitor health".</i>
		Professional health	<i>"In fact, the physicians working in military organizations must be familiar with the problems and dangers threatening soldiers and militarists and know the diseases relate to militarism".</i>
		Environmental health	<i>"Military physicians must be familiar with the pollution of military places and the contamination made out of body due to weapons".</i>
		Mother and child health	<i>"Whenever health services are provided, mothers and children are the major consumers of these services because not only they are a high-population group but also they are exposed to irreparable damages due to age, physical, physiological and psychological conditions. Thus, military physicians must learn enough knowledge and skill in this field in order to play their role in the best way".</i>
		Preventive medicine	<i>"The first principle of medical science is prevention. Thus, a military physician must know how to examine, diagnose the disease and do the necessary measures in the field of prevention. Thus, if this physician is going to be successful, the initial principle is to take the necessary measures for prevention".</i>
Nutrition of troops		<i>"A military physician must know, for example, how much calorie does the ration of a soldier have? Or what time at the last night of war should he drink water? How many hours before the operations, should he drink water to have a better performance on the day of operation?"</i>	
Military basic science skills	Military toxicology	<i>"A military physician must be able to rehabilitate snakebite, poisonous insects bite and prepare the transfer".</i>	
	Microorganisms	<i>"Considering the modern weapons available today and the possibility to be used as a military unit like biological weapons, the bacteriology of these factors must be considered".</i>	
	Physiology in unusual conditions	<i>"A military physician must know if a person went 100 m under water, what will happen to the physiology of his /her body?"</i>	
	Recognition of modern war agents	<i>"If a military physician does not have enough knowledge about microbial and chemical weapons or if he does not know what depleted uranium is and what are its consequences, how can he deal with this issue?"</i>	
Pre-hospital skills	Triage management	<i>"A military physician must classify the wounded according to certain criteria".</i>	
	First aid	<i>"A military physician must dominate the issues of cardiovascular rehabilitation, artificial respiration, and cardiac massage".</i>	
	Rescue and transport of the victims	<i>"The principles of rescue and transportation of a wounded person in wars and natural disasters are very different from an ordinary person in hospital".</i>	
	Evacuation of the victims	<i>"Military physicians must monitor and control the evacuation principles and priorities of the wounded at the time of evacuation and transferring them to medical centers".</i>	
	Military Nursing	<i>"Due to the shortage of staff under the war and crisis conditions, a military physician, in addition to his medical duties, must have a high ability in nursing especially nursing in war".</i>	
Modern wars	Familiarity with protective equipment	<i>"At the time of a modern war, the knowledge of military physicians on a variety of protective tools is of great importance. So, the physicians must protect themselves against these factors and then give service to the other wounded".</i>	
	CBRNE and decontamination	<i>"Decontamination in any chemical, microbial, nuclear and radioactive attack or disaster while having common goals has its own principles and instructions. So that, military physicians must have enough knowledge about all these principles and they must gain enough knowledge".</i>	

Clinical skills	Anesthesia in war and crisis	Intubation for anesthesia	<i>"A military physician must know about intubation for anesthesia under difficult conditions. For example, if we have a wounded person that has been poisoned by chemical or nuclear materials and has wounds on his neck and chest, how should we do intubation for anesthesia? Do we have any technique in this field?"</i>
	Surgery in war and crisis	Lifesaving surgery	<i>"Another skill that a military physician must have is the lifesaving surgeries. He must be able to operate outpatient surgeries like spleen, appendicitis and the like".</i>
	Knowledge and management of trauma	War trauma	<i>"A military physician must be familiar with a variety of war weapons in order to do the necessary measures".</i>
	Military epidemiology	To prevent the prevalence of diseases	<i>"Military physicians must be able to recognize common and prevalent diseases in the region in order to provide the necessary equipment and facilities to cope with this disease".</i>
		To control the prevalence of war factors	<i>"In modern wars, military physicians must be able to identify and control the epidemic microbes and viruses".</i>
	Annual monitoring and evaluation skills	To study the applicants	<i>"A military physician must do the necessary examinations with a perfect skill and completely dominate the examinations in order to select healthy people among the applicants".</i>
	Environmental diseases and injuries		<i>"A military physician must be able to rehabilitate the soldiers suffering from heat exhaustion or chilblain. Also, he must be able to rehabilitate snakebite, and poisonous insect bite and prepare the operations of transfer".</i>
	Infectious diseases	To control the infectious diseases	<i>"Epidemic of infectious diseases especially bacterial and parasitic infections always impose many losses on military forces during different wars and sometimes lead to the stop of military operations. Thus, military physicians must know about the management of infectious diseases".</i>
	Combat medicine	To recognize the combat environment	<i>"A military physician must know about the combat environment because we have to know the conditions that cause diseases if we want to treat them".</i>
	Crisis medicine	To know the variety of disasters and their loss and damages	<i>"The first knowledge that a physician must have is to recognize the disasters. Thus, a physician must know the disasters well whether they are natural disasters or human-made disasters. Then, a military physician must be familiar with the nature of these disasters, risks and threats that can be made for human".</i>
	Sea and the subsurface medicine	To recognize the marine-related diseases	<i>"The physicians who work in the navy must have the necessary skills to identify and treat the diseases caused by presence in submarines".</i>
	Aerospace medicine	To recognize the diseases of low-pressure environment	<i>"A military physician must know all parts of the body that suffer from disease under low-pressure conditions and must know the necessary pathologies".</i>
	Telemedicine	To use telecommunication facilities in medicine	<i>"A military physician must handle the patient through medicine and if necessary, he must use the telecommunication medicine equipment and facilities to receive any advice".</i>
	Wilderness medicine	Wilderness medicine	<i>"A military physician must learn how to present medical measures with the least possible devices or tools in a tact nature. Thus, he must learn wilderness medicine".</i>
Complementary skills	Tactical medicine	Medicine with the ability of special forces	<i>"In an ideal case, a military physician must be a special police officer in addition to being a physician. For example, he must learn how to fly with helicopter, skydive, dive, and climb, etc.."</i>
	Legal medicine	The ability of identifying unidentified people	<i>"Military physicians must achieve the necessary skills to identify and discover the identity of unidentified people through genetic tests, autopsies and the like in order to identify unidentified people".</i>
	Physical and rehabilitation medicine	Physical medicine	<i>"Some problems may be the physical problems of soldiers. Thus, the other important issues that a military physician must know are physical medicine, rehabilitation and sport medicine".</i>
	Education and research	Futures studies	<i>"One of the new debates on military medicine is to cope with the effects of modern weapons and wars that have been less considered and necessary studies on this subject must be carried out in the future".</i>
		Self-aid and buddy-aid education	<i>"A military physician must play his role effectively as a trainer in medical team especially in training the others (training self-aid and buddy-aid)".</i>
		Health education	<i>"Military physicians must train the wounded how to observe health and use food and drugs under critical conditions in order to prevent the increased crisis".</i>
	Professional ethics	Professional ethics in crisis	<i>"Military physicians must be committed to protect the properties and documents of the wounded, respect the privacy of individuals especially women, keep all scenes of accident to adjust and complete all medical documents and follow-ups".</i>
Professional ethics in war		<i>"Military physicians must perform their medical commitments, that is, saving the life of people without paying attention whether the wounded is enemy or not".</i>	

1. General skills

Individual skills

Perhaps the first things needed for everyone to be able to play a role in success achievement are features embedded in his personality. Therefore, it is necessary that one enjoys certain characteristics and personality to be a successful military doctor. *"I think a military physician must have a good talent. That is, he who is going to enter a military system must enjoy higher IQ"* (Participant 17).

Also, the military physical fitness plays an important role in success or failure. For each system, the degree of physical fitness is necessary, which can be achieved only by physical activities and it is no exception for military doctors. *"One who is going to be a military physician must have a high physical ability. Also, he must endure some difficulties such as long walks, and be able to carry heavy equipment"* (Participant 9).

Communication skills

Data obtained from interviews showed that the other important skill that a military doctor should have to be able to play an effective role in crisis and war is communication skill. In these circumstances, if a doctor fails to make an effective communication with associates, patients, superiors and subordinates, he cannot do the most and best in the fastest time and his efficiency and effectiveness will be reduced.

"A military physician must learn inter-organizational coordination and relations in order to coordinate and make relations with other involved organizations and sectors in the crisis and war conditions" (Participant 5).

"Military physicians must be able to make relations with their colleagues and manage crisis conditions well" (Participant 1).

Management skills

Managerial positions both in peacetime and in times of war and crisis are likely to be assigned to a military doctor. Therefore, a military doctor should have sufficient experience and management skills.

"Senior physicians may get management positions. Thus, they must learn on crisis management and be familiar with preliminary sciences, information and principles of crisis management in order to manage hospitals and desert centers in crisis conditions because management in such conditions will differ from the management of urban hospitals" (Participant 12).

"If the enemy resorts to modern warfare, how should they intervene to minimize losses caused by these factors? The medical staff of the

armed forces are those who should have the most preparation to manage modern warfare attacks and can carry out necessary interventions" (Participant 18).

2. Military skills

Combat knowledge and skills

Having knowledge and skill in combat and about function of weapons is important because all doctors and medical staff are inevitably involved in war. Knowing how the bullets work, how the body responds to them and basically how we can help our body to overcome the damage caused by weapons are of particular importance. *"He must know how to work with different weapons and must also know the type of the wounds caused by different weapons"* (Participant 14).

Passive defense

All organizations involved in war must be trained in order to reduce vulnerability, and military doctors as one of the most important human resources involved in wars and crises are no exception; even they are more important. *"I think a military physician must know the issues related to passive defense well in order to minimize vulnerability"* (Participant 5).

Survival in tough conditions

Surviving and liberation in harsh conditions are the skill sets by which a person can rescue himself in difficult situations. Learning different skills, making fire, dealing with wild animals, finding food, water and shelter, first aids, providing tools and weapons, fighting techniques and knowledge of plants and insects, for instance, are necessary for every military physician. Furthermore, military doctors should complete these courses to save their lives and their entourages' lives.

"A series of abilities are necessary for military doctors that are absent in an ordinary physician. For example, when you are in unusual conditions, first you must protect yourself, that is, you must have access to water, food, shelter, safety and settlement and then address and help patients and other people" (Participant 7).

3. Paramedical skills

Military psychology

Military psychology is the science that deals with people's minds. This science enhances ability and performance of the personnel of the armed forces and measures their ability in operational situations. Military psychology is even applied to destroy enemy forces' actions and decrease their ability in operating conditions.

“Since the medical teams are one of the first groups in war and crisis, they must have the necessary skills to calm down the wounded in order to start medical measures” (Participant 1).

“They must have the necessary skills in the fields of military psychology (like stress and anxiety that are common in war), traumas after war and the resulting stresses” (Participant 4).

“The victims need mental-social supports more than medical measures in order to be treated in a short time. This difficult task is done by the medical staff that come to the wounded earlier than anyone else” (Participant 20).

Military health

Hygiene is one of the principles to protect communities, especially human communities. Military health is important and necessary to protect the society in times of peace and war.

“Under the conditions of war and crisis in which observing health principles becomes more important and if neglected, some infectious and contagious diseases may become common among the wounded the deteriorate the condition, military physicians must have the ability to monitor health” (Participant 5).

“In fact, those who are the physicians of military organizations must be familiar with the problems and dangers of soldiers and militarists and know the diseases related to militarism” (Participant 4).

“The first principle of medical science is prevention. Thus, a military physician must know how to examine, diagnose the disease and do the necessary measures in the field of prevention. Thus, if this physician wants to be successful, the initial principle is to take the necessary measures for prevention” (Participant 13).

Military basic science skills

Usually in times of war and operations, military are placed in environments and situations where there is probability of toxicity by toxins. Therefore, it is important that military doctors learn skills in a field of natural and laboratory toxins in order to be prepared to take the appropriate action to heal the poisoned people and have timely diagnosis of the side effects of these poisons and take the necessary actions.

“A military physician must be able to rehabilitate snakebites, poisonous insect bites and prepare the transfer” (Participant 15).

“A military physician must be familiar with psychological changes that occur at any altitude and weather and know the consequences of these changes in order to take the appropriate medical measures” (Participant 18).

Pre-hospital skills

Since crisis and wars are emergency situations, if the medical and rescue team can provide appropriate pre-hospital actions in the right time, the toll will decline.

“A military physician must classify the wounded according to certain criteria. Also, he must determine which victim is in priority” (Participant 11).

“A military physician must be able to do initial assessment of the wounded and monitor the vital signs” (Participant 16).

“The principles of rescue and transportation of a wounded person in wars and natural disasters are very different from those of an ordinary person who is in hospital” (Participant 5).

“Military physicians must monitor and control the evacuation principles and priorities of the wounded at the evacuation time and transferring them to medical centers” (Participant 19).

Modern wars

Due to progress that has been made in weapons and the introduction of new weapons, awareness of these modern weapons, recognition of their side effects and their management, and appropriate treatments are essential to deal with their devastating effects.

“In a modern war, the knowledge of military physicians on a variety of protective tools is of great importance. So, the physicians must protect themselves against these factors and then give service to the wounded” (Participant 19).

“Decontamination in any of the chemical, microbial, nuclear and radioactive attacks or disasters, while having common goals, has its own principles and instructions, so military physicians must have enough knowledge about all these principles and gain enough knowledge” (Participant 17).

4. Clinical skills

Anesthesia in war and crisis

“A military physician must know about intubation for anesthesia under difficult conditions. For example, if we have a wounded person that has been poisoned by chemical or nuclear materials and has wounds on his neck and chest, how should we do intubation for anesthesia? Do we have any technique in this field?” (Participant 14).

Surgery in war and crisis

“Another skill that a military physician must have is the lifesaving surgeries. He must be able to operate outpatient surgeries like spleen, appendicitis and the like” (Participant 15).

Knowledge and management of trauma

Warriors and armed forces may experience different types of traumas in due to the change and progress in the type of weapons used in war, so special care and treatments are required.

"A military physician must be familiar with a variety of war weapons in order to take the necessary measures" (Participant 11).

Military epidemiology

"Military physicians must be able to recognize common and prevalent diseases in the region in order to provide the necessary equipment and facilities to cope with these diseases" (Participant 21).

Annual monitoring and evaluation skills

"A military physician must do the necessary examinations perfectly and completely dominate the examinations in order to distinguish who is healthy and who is not." (Participant 23).

Environmental diseases and injuries

"A military physician must be able to rehabilitate the soldiers or those suffering from heat exhaustion. Also, he must be able to rehabilitate snakebites and poisonous insect bites, and prepare the operations of transfer" (Participant 15).

Infectious diseases

"Epidemic of infectious diseases, especially bacterial and parasitic infections, always impose many losses on military forces during wars and sometimes lead to the stop of military operations. Thus, military physicians must know about the management of infectious diseases"(Participant 6).

Combat medicine

"A military physician must know about the combat environment because we have to know the conditions that cause diseases if we are going to treat them" (Participant 7).

Crisis medicine

"The first knowledge that a physician must have is to recognize the disasters. Thus, a physician must know the disasters well whether they are natural disasters or man-made ones. Then, a military physician must be familiar with the nature of these disasters, risks and threats" (Participant 20).

Sea and the subsurface medicine

"The physicians who work in the navy must have the necessary skills to identify and treat

the diseases caused by presence in submarines" (Participant 12).

Aerospace medicine

"A military physician must know all parts of body suffering from disease under low-pressure conditions and must know the necessary pathologies" (Participant 13).

Telemedicine

"A military physician must handle the patient through medicine and if necessary, he must use the telecommunication medicine equipment and facilities to receive any advice" (Participant 15).

Wilderness medicine

"A military physician must learn how to present medical measures with the least possible devices or tools in a tact nature. Thus, he must learn wilderness medicine" (Participant 20).

Tactical medicine

"In an ideal case, a military physician must be a special police officer in addition to a physician. For example, he must learn how to fly with helicopter, skydive, dive, and climb, etc." (Participant 17).

Legal medicine

"Military physicians must achieve the necessary skills to identify and discover the identity of unidentified people through genetic tests, autopsies and the like to identify unidentified people" (Participant 6).

Physical and rehabilitation medicine

"Some problems may be the physical problems of soldiers. Thus, the other important issues that a military physician must know are physical medicine, rehabilitation and sports medicine" (Participant 6).

*5. Complementary skills**Education and research*

Military doctors in the field of research and teaching are working during the peacetime which causes doctors to remain at an optimal level of information and knowledge. The quick developments in near future will expose armed forces an unreliable environment which is full of threats. Therefore, in this highly changeable and uncertain environment, theoretical and practical preparation for possible future wars, based on military evolution, tactics and advanced technology is a national and inevitable necessity.

“One of the new debates on military medicine is to cope with the effects of modern weapons and wars that have been less considered and necessary studies on this subject must be carried out in the future” (Participant 7).

“A military physician must play his role effectively as a trainer in medical team, especially in training the others (training self-aid and buddy-aid)” (Participant 3).

Professional ethics

“Military physicians must be committed to protecting the properties and documents of the wounded, respecting the privacy of individuals especially women, keeping all scenes of accident to adjust and completing all medical documents

and follow-up” (Participant 9).

“Military physicians must perform their medical commitment which is to save the life of people without paying attention to whether the wounded is enemy or not” (Participant 22).

To determine the modules needed for military medicine, first it was necessary to specify the main capabilities and tasks of military physicians so that appropriate modules could be identified. To do so, interviews with the experts of military medicine were carried out and the results are shown in Table 2. Later, to achieve these capabilities, educational modules in two introductory levels (39 modules) and advanced level (21 modules) were identified, which are shown in tables 3 and 4.

Table 3: Categories of modules specified at the introductory level

Module number	Module topic
First module	Physical fitness
Second module	Communication skill
Third module	Organizational management
Fourth module	Basic crises management (with the emphasis on natural disasters)
Fifth module	Survival in tough conditions
Sixth module	Basic passive defense
Seventh module	Familiarity with instructional methods
Eighth module	Basic professional ethics (with the emphasis on medical ethics)
Ninth module	Introduction to anesthesia
Tenth module	Introduction to surgery (with the emphasis on preserving life surgery)
Eleventh module	Introduction to traumatology
Twelfth module	Monitoring and evaluation of health
Thirteenth module	Basic military psychology (with the emphasis on self-management)
Fourteenth module	Environmental health (with the emphasis on the war and crisis)
Fifteenth module	Professional health
Sixteenth module	Preventive medicine (with the emphasis on war and crisis)
Seventeenth module	Troops nutrition (with the emphasis on war and crisis)
Eighteenth module	Mother and child health (with the emphasis on war and crisis)
Nineteenth module	Basic military toxicology
Twentieth module	Military microorganisms (with emphasis on war agents)
Twenty-first module	Physiology in the unusual conditions
Twenty-second module	Introduction to the sea and subsurface medicine
Twenty-third module	Introduction to aerospace medicine
Twenty-fourth module	Introduction to combat medicine
Twenty-fifth module	Introduction to crisis medicine
Twenty-sixth module	Introduction to infectious diseases
Twenty-seventh module	Introduction to environmental damage and disease
Twenty-eighth module	Introduction to triage management
Twenty-ninth module	Basic first aid (with an emphasis on CPR, BLS)
Thirtieth module	Basic rescue and transport
Thirty-first module	The evacuation of victims basic (with emphasis on the crisis and the different geographical areas)
Thirty-second module	Introduction to military nursing
Thirty-third module	Modern war (with an emphasis on a variety of modern warfare and understanding the factors)
Thirty-fourth module	Future studies of military medicine
Thirty-fifth module	Introduction to epidemiology military
Thirty-sixth module	Physical medicine and rehabilitation
Thirty-seventh module	ICT application in medicine (with an emphasis on telemedicine)
Thirty-eighth module	Legal medicine
Thirty-ninth module	Medicine in the wild

Table 4: Categories of modules specified at the advanced level

Module number	Module topic
Fortieth module	Advanced disaster management (with the emphasis on modern war)
Forty-first module	Advanced passive defense (with the emphasis on modern war)
Forty-second module	Advanced professional ethics (with the emphasis on war and natural disasters)
Forty-third module	Advanced anesthesia
Forty-fourth module	Advanced surgery (with the emphasis on combat trauma surgery)
Forty-fifth module	Traumatology (with the emphasis on exotic and multiple traumas)
Forty-sixth module	Advanced military psychology (with the emphasis on people management)
Forty-seventh module	Advanced military toxicology (with the emphasis on bioterrorism and laboratory toxins)
Forty-eighth module	Advanced sea and subsurface medicine
Forty-ninth module	Advanced aerospace medicine
Fiftieth module	Advanced combat medicine (with the emphasis on unconventional war)
Fifty-first module	Advanced crisis medicine
Fifty-second module	Advanced infectious diseases (with the emphasis on emerging infectious diseases caused by CBRNE)
Fifty-third module	Advanced environmental damage and disease
Fifty-fourth module	Advanced triage management (with the emphasis on triage in CBRNE)
Fifty-fifth module	Advanced first aid (with the emphasis on CPR, ALS and ATLS at modern war)
Fifty-sixth module	Advanced rescue and transport (with the emphasis on unconventional and CBRNE)
Fifty-seventh module	Advanced evacuation of victims (with the emphasis on CBRNE)
Fifty-eighth module	Advanced military nursing (with the emphasis on CBRNE)
Fifty-ninth module	Advanced modern war (with the emphasis on the equipment and decontamination)
Sixtieth module	Advanced military epidemiology (with the emphasis on CBRNE)

Discussion

Charles Boelen in the document published in the World Health Organization considers the major skills of a physician as care, decision making, communication skills, leadership and management (24). Different studies (e.g., studies by Fu (10), Rahmani (4), Panichkul et al. (25) and studies carried out at School of Military Medicine in Ireland (26) and the European Association of Aerospace Medicine (27) have been carried out in the field of designing the training programs and skills needed in the field of military medicine. Most of their results are consistent with those of the current study. The results of the current study pinpoint to the fact that a military physician in addition to having basic skills needed for a physician should have more complete skills to efficiently perform in military organizations and if necessary in times of war, unexpected events, natural disasters and unknown environments.

An important feature necessary for a military physician noted in most researches is physical readiness (28-29). This accords with the results of the present study. The result that has been led to the creation of management skills (such a crisis management and organizational management) is consistent with the result of researches done by Sauer et al. (30), Top et al. (31), Isakov (32) and Turkan (33). Indeed, these researches also confirmed the achieving management skills by military physicians.

The emergency and pre-hospital skills have been emphasized in the researches by Heldenberg

et al. (34), Rottenstreich et al. (35), Li et al. (36), Khoshdel et al. (37) and Al Shahrani (38). These researchers have also considered the skills in the field of triage management, first aid, relief and transferring victims for treatment cadre of military forces important and necessary.

Control of mental issues of victims and war victims in the required time is an important issue in which military physicians have to achieve skills. One of the results of this research was the importance of exiting military psychological skills that this finding is consistent with that of Malick et al. (39), Nelson et al. (40) and Jetly (41).

Also the finding related to the class of modern wars is congruent with that of Fu (10), Eaton et al. (42); findings related to the clinical skills are consistent with and confirmed by the findings of Jin et al. (43), Dwipayana (44), Nurrobi (45) and Nouri Nejad et al. (46).

In fact, determining, designing and developing the training modules included two main parts; each of these sections contained operational steps that were linked together. The first part as a prerequisite for designing and developing the training modules was the analysis of training needs which consisted of the following steps:

1. Identifying the occupation or profession
2. Identifying the main tasks of the occupation or profession
3. Identifying sub-tasks of the occupation or profession
4. Identifying the required capabilities of the occupation or profession

This section provided information about the needs of the occupations and profession. In other words, after these four-step components of occupations, the required main tasks, sub-tasks and skills were identified.

The second part of designing and developing the training modules was curriculum development for educational modules which converted the training needs identified in the first part into a teachable curriculum. This section also encompassed the following steps:

1. Developing the overall and behavioral objectives
2. Developing educational contents
3. Designing strategies, tools and educational media
4. Providing formative and summative evaluation tools
5. Designing educational modules (23).

Finally, the task of any organization is to provide professional competency and qualification of individuals engaged in providing services in the organization. Among the most important ways to achieve this goal is to provide the targeted and effective training. Universities of medical sciences, in addition to offering health services, have the important responsibility of training capable and qualified people with knowledge, attitudes and skills necessary to maintain and improve the health of the community. Therefore, the necessity is felt that more attention should be paid to the training dimension in the universities of medical sciences as organizations that deal with the lives of human beings. Considering the increasing changes in the weapons used in wars and war itself, military physicians should constantly receive appropriate training in accordance with such changes in order to efficiently maintain their knowledge and skills so that they can efficiently perform the tasks assigned to them. Considering the vastness of the topic of military medicine and diverse skills that military physicians should have, it seems that diverse professional and specialized courses are needed for physicians to achieve these skills. However, for some special reasons including the cost of providing training courses at these levels, lack of professionals to teach such courses and skills, the administrative and development complexity of creating new majors, the time-consuming nature of these courses and limitations in admitting students, etc., other measures should be taken to train military physicians. One of these measures is to provide professional in-service training in modular form to overcome the limitations mentioned.

Conclusion

Finally, it can be concluded that specialized training provided by different organizations has the objective of modifying or altering the scope of knowledge, skills, and attitudes and at last seeking to change the behavior of their staff and improve their performance. One of the most important, effective and infrastructural factors in professional and job training programs is to pay attention to the way such programs are designed and developed. Training programs that are in accordance with the real needs of the participants and are affordable and effective are considered important by all the experts in the field of education and learning. Thus, by following the rules of training design and implementation of appropriate approaches in the field of occupational and professional training, we can improve the quality of such training programs and achieve specified objectives.

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