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Operational medicine and mine action: theoretical essay and experience in the Republic of Colombia

Medicina operativa y acción contra minas: ensayo teórico y experiencia en la República de Colombia

Abstract: Humanitarian demining is one of the activities of peace and assistance missions that involve, even with the preparations, risks in their execution. Since the enhancement during the Civil War in the United States, landmines have been a part of virtually every conflict. The lifespan of an anti-personnel mine can be up to 30 years, which poses a long-term threat and the ongoing conflict makes it almost impossible to identify all mined areas. Operational medicine is the integrated and comprehensive medical care, consultation and management of medical information in tactical operations, which contributes to the security and success of a mission that is primarily military. This study shows the need to expand knowledge of injuries caused by explosives, especially for members of Humanitarian Demining missions, reducing mortality and loss of limbs.

Keywords: mine action; humanitarian demining; medic corps; military medicine; traumatic amputation.

Resumen: El desminado humanitario es una de las actividades de las misiones de paz y asistencia militar que implican, incluso con precauciones, riesgos en su ejecución. Desde su perfeccionamiento durante la Guerra de Secesión en Estados Unidos, las minas terrestres han formado parte de casi todos los conflictos. La vida útil de una mina antipersonal puede ser de hasta 30 años, lo que supone una amenaza duradera y, con los conflictos en curso, resulta casi imposible identificar todas las zonas minadas. La medicina operativa es la atención médica integrada y completa, la consulta y la administración de información médica en operaciones tácticas, que contribuyen a la seguridad y al éxito de una misión esencialmente militar. Este estudio muestra la necesidad de ampliar el conocimiento de las lesiones por explosivos, especialmente para aquellos en misiones de desminado humanitario, disminuyendo la mortalidad y la pérdida de miembros.

Palabras Clave: acción contra minas; desminado humanitario; apoyo sanitario; medicina militar; amputación traumática.

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1 INTRODUCTION

Mines, particularly anti-personnel mines, are a danger to human life and an impeding factor to the free movement of people and goods, hindering national reconstruction in the post-war period.

The Brazilian Armed Forces have extensive experience in humanitarian demining. Since 1993, within the scope of multilateral organizations, Brazil has collaborated in *Ação contra Minas na Missão de Assistência à Remoção de Minas na América Central* (Marminca – Mine Action with the Assistance Mission for Mine Clearance in Central America); the *Missão de Assistência para a Remoção de Minas na América do Sul* (Marminas – Assistance Mission for Mine Clearance in South America); and currently with the *Grupo de Monitores Interamericanos na Colômbia* (GMI-CO – Group of Inter-American Monitors in Colombia), as well as with the *Grupos de Assessores Técnicos Interamericanos na Colômbia* (GATI-CO – Group of Inter-American Technical Advisors in Colombia), providing specialists for programs linked to the *Junta Interamericana de Defesa* (JID – Inter-American Defense Junta), in addition to missions in Benin and Angola. It is noteworthy that Marminca pioneered the development of techniques and operational procedures, forming the basis for international standards on humanitarian demining (DA CÁS, 2018). In the documents generated by the missions mentioned, there is no presentation of an objective and efficient health support plan.

In a civilian environment, the recommendation is that pre-hospital care be given within ten minutes (platinum minutes) at the most. In addition, the recommendation is that the injured person receive hospital care within one hour (golden hour) (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017). Because of the geographical difficulty of demining areas, the transportation time (medical evacuation) often exceeds the above recommendation. However, according to international protocols (INTERNATIONAL MINE ACTION STANDARDS – Imas), medical evacuation from the accident area to a hospital with surgical capability should not exceed three hours. If this is not possible in the emergency process, the humanitarian demining organization should have an additional health care structure in place to stabilize the injured person before the medical evacuation to a higher level of care place.

Humanitarian demining is one of the activities of peace and assistance missions involving, even with all the preparations and precautions, risks in its execution. To reduce the consequences of accidents or incidents in these activities, we have to worry about health support in several stages: technical study; victim assistance; and, especially, minefield clearance.

Most undergraduate and graduate health and trauma care courses have little or no content for explosives injuries. Health professionals, doctors, nurses, nursing technicians and assistants need specific training on the effects of explosives on the human body, especially if they are going to work as health support in humanitarian demining operations and in primary care in conflict areas.

Therefore, it is necessary to increase the knowledge about explosives injuries and to train the members of the demining missions so that, in case of an accident, they can provide the best possible health care, reducing mortality and loss of limbs.

This article consists of a theoretical essay supported by bibliographic research on issues related to the historical evolution of mine action, humanitarian demining, and health support in these actions, in books, manuals and articles from a broad scope, including those provided by the web. We complemented the study with the experience in the mission of the *Grupo de Monitores Interamericanos na Colômbia* (Inter-American Monitors Group in Colombia), assuming, therefore, a qualitative and exploratory approach.

2 THE FIGHT AGAINST ANTI-PERSONNEL MINES

Since their enhancement in the American War of Secession in the American summer of 1862, landmines have been part of almost every major armed conflict, resulting in millions of victims. However, due to their nature as an insidious weapon hidden under the ground, mines continue to kill and maim for decades after conflicts have ended. When wars are over, the victims are no longer mostly military, but civilians. By blurring the distinction between civilian and military targets and causing damage disproportionate to the military objective, mines violate some of the most important principles of international humanitarian law and the Geneva Convention (ROMERO; GARCIA, 2017).

In October 1992, the Non-Governmental Organizations (NGO) Handicap International, Human Rights Watch, Medico International, Mines Advisory Group, Physicians for Human Rights, and Vietnam Veteran of America Foundation founded the International Campaign to Ban Landmines – ICBL. Four years later (1996), Canadian Foreign Minister Lloyd Axworthy makes a public challenge to governments and NGO to sign a definitive treaty banning the use of anti-personnel mines within one year. On December 3, 1997, in Canada, the first member states sign the Convention on the Prohibition of the Use, Stockpiling, Prohibition and Transfer of Anti-Personnel Mines and on their Destruction, which becomes known as the Ottawa Treaty. In addition to the duties expressed in its title, the treaty also provides for an obligation on the part of member states (currently 156 countries and territory) (Figure 1) to provide assistance to mine victims. The treaty initiative awarded the ICBL and its coordinator, Jody Williams, the 1997 Nobel Peace Prize (INTERNATIONAL CAMPAIGN TO BAN LANDMINES, 2020).

Figure 1 – Countries that ratified the Ottawa treaty

Source: INTERNATIONAL CAMPAIGN TO BAN LANDMINES, 2020

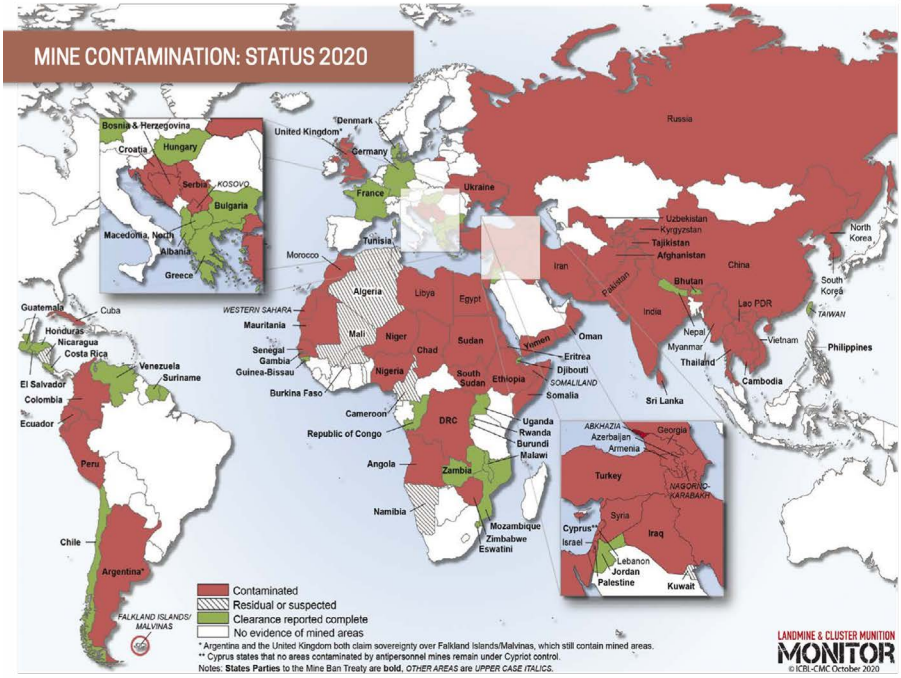
3 THE USE OF ANTI-PERSONNEL MINES

In Colombia, Law No. 759 of 2002 (COLOMBIA, 2002) defines Anti-Personnel Mine (APM) as one that has the potential to incapacitate, injure or kill one or more persons by presence, proximity or contact. It is estimated that there are more than 100,000 mines laid in Colombia (Figure 2) and close to residential, school, agricultural, business and military areas, with the majority of the affected territory being rural (ROMERO; GARCIA, 2017).

The lifespan of an anti-personnel mine can be up to 30 years, which poses a long-lasting threat. Added to this, the ongoing conflict makes it almost impossible to identify all mined areas with complete certainty, so suspicion alone turns large territories into unusable zones and clearing these areas is a long, dangerous and expensive process (INTERNATIONAL CAMPAIGN TO BAN LANDMINES, 2020).

The problem with APM is more complex because it is possible to use any object to make an explosive artifact, making them more difficult to detect. For example, the *quiebrapatas* type mine, which is activated by pressure or pressure relief, is made of ammonium nitrate (80%), sawdust (15%) and aluminum powder (5%), that is, cheap materials that are easy to buy and can be added to batteries, wires, tubes, bags, nails. Thus, it is possible to camouflage a mine in inoffensive objects such as household appliances, toys and even food (ROMERO; GARCIA, 2017).

Figure 2 – Countries affected by anti-personnel mines



Source: INTERNATIONAL CAMPAIGN TO BAN LANDMINES, 2020

4 TYPES OF EXPLOSIVES INJURIES

Blast injuries are multi-systemic with life-threatening and caused by various types of disasters. Victims of this type of injury tend to suffer more traumatic damage in varying anatomical locations, as well as higher severity scores compared to other trauma victims. The predominant post-blast injuries among survivors involve conventional penetrating and blunt traumatic injuries (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

Explosions are physical, chemical or nuclear reactions that result in the almost instantaneous release of large amounts of energy in the form of heat and highly compressed gas, which expands violently, becoming capable of projecting fragments at very high velocities (FELICIANO; MATTOX; MOORE, 2021).

The static component (expansive overpressure) envelops the objects in the flow field of the explosion and charges them on all sides with a discontinuous increase in pressure called the shock front or shock wave, up to a peak overpressure value (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

The dynamic component (dynamic pressure) is directional and experienced as wind. The main importance of wind is that it propels fragments with velocities exceeding several thousand meters per second (faster than standard ballistic weapons such as bullets and warheads) (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

Although the effective range of static and dynamic pressures is measured in tens of feet, fragments accelerated by dynamic pressure will quickly overcome the shock wave to become the predominant cause of damage in ranges of thousands of feet (FELICIANO; MATTOX; MOORE, 2021).

There are five types of injuries in an explosion: primary, blast shock wave; secondary, projectiles (the most common source of blast injury); tertiary, propulsion of the body toward another object; quaternary, heat and flame; quinquennial, radiation, chemicals, bacteria (FELICIANO; MATTOX; MOORE, 2021; NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

4.1 Primary Blast Injury

Primary blast injuries result from the direct effect of the blast wave (traveling at supersonic speeds) on the body. They affect the organs that contain gas, such as, the lung, the ear, and the gastrointestinal tract. The most common lung injury is a pulmonary contusion. Other lung injuries range from pneumothorax/hemothorax to arteriovenous fistulas (source of air emboli). Abdominal blast injuries are a significant cause of mortality and morbidity. Abdominal blast injuries can be hidden and difficult to diagnose and vary from hemorrhage to mucosal ischemia, bowel necrosis, and perforations. The middle ear is particularly sensitive to blast injuries, and rupture of the tympanic membrane (eardrum) can be a useful marker for blast injuries. However, isolated rupture of the tympanic membranes without other symptoms is not a high risk marker for associated blast injuries (FELICIANO; MATTOX; MOORE, 2021).

4.2 Secondary Blast Injury

Secondary blast injuries are caused by debris in flight generated by the blast. A common practice in bombings is to pack an Improvised Explosive Device (IED) with screws, nuts, and other small sharp objects. Significant soft tissue trauma, internal and orthopedic trauma often occurs from propelled projectiles (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

4.3 Tertiary Blast Injury

Tertiary blast injuries are caused by the body being propelled by the shock wave into solid objects (for example, walls). Victims of tertiary blast injuries suffer great damage from blunt trauma, for example, traumatic brain injuries, solid organ injuries, and complex orthopedic injuries. Penetrating injuries are not uncommon, causing impaling victims on objects present in the environment (FELICIANO; MATTOX; MOORE, 2021).

4.4 Quaternary Blast Injury

Various blast injuries encompass all other blast injuries, including burns, crushing, compartmental syndromes, and toxic inhalations (carbon monoxide, dust, hot gases).

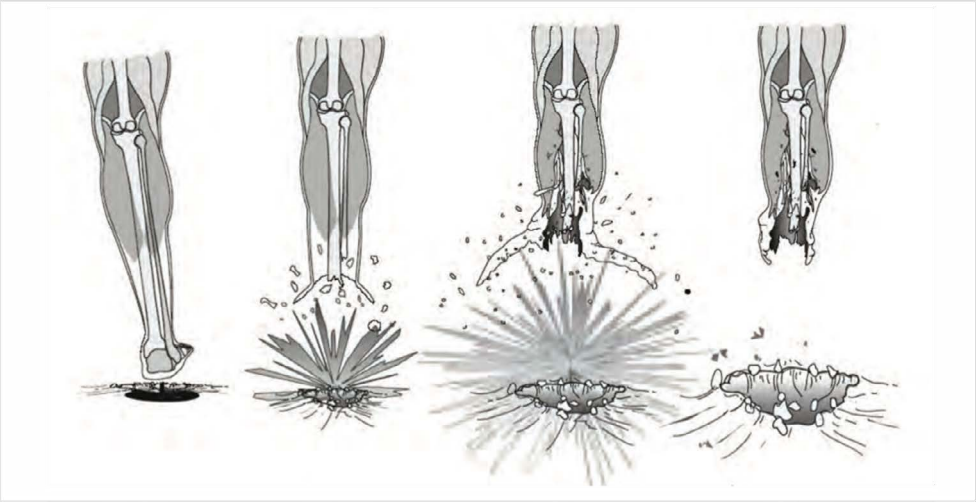
4.5 Quinary Blast Injury

Various blast injuries cover injuries caused by the blast in association with radiation, chemicals, and bacteria (GIANNOU; BALDAN, 2010).

4.6 Umbrella-type injury

In addition to the injuries mentioned, anti-personnel mines have a type of lower limb injury known as an *umbrella-type* injury. At the same time, the leg muscles are pushed up and outward in what can be described as the operation of an umbrella. The localized shockwave from the blast gases separates the periosteum and the attached muscles from the remaining bone: the umbrella opens. All muscles then fall away: the umbrella closes (Figure 3). The superficial muscles (gastrocnemius) are projected outward more and suffer less damage than the deeper muscle layers of the anterolateral compartment and the soleus muscle. The fascial planes are separated proximally causing irregular and variable skin loss (GIANNOU; BALDAN, 2010).

Figure 3 – Mechanism of Umbrella Blast Injury



Source: Giannou; Baldan, 2010

The surgeon should remember the pathology of the umbrella effect: the deeper muscle layers suffer greater damage than the more superficial ones, and the distal skin is still viable. Thus, a level of amputation based on knowledge of civil trauma would be too radical with respect to superficial tissues and not radical enough with respect to deeper tissues (Figure 4). In addition, the effects of the primary blast can produce tissue edema and compartment syndrome near the open injury (GIANNOU; BALDAN, 2010).

Figure 4 – Anti-personnel mine injury demonstrating the umbrella injury

Source: Giannou; Baldan, 2010

5 TRAUMATIC AMPUTATIONS

Traumatic amputations mainly affect adolescents and young adults, who are more exposed to accidents at work and in transportation. Armed conflicts and anti-personnel mines cause traumatic amputations in several countries (STARNES, 2006).

The second most common indication for amputation is trauma, and in adults under 50 years old it is the main indication. An acute injury is an indication for amputation when the blood supply to the limb is irreparably destroyed or when the limb is so badly injured that reasonable reconstruction is impossible. About 20% of all amputations are due to trauma, usually vehicle accidents, burns, explosions, and crush injuries from tools or machines, and they occur in men. These data are valid for countries without armed conflict (DÍAZ, 2010).

The prevalence of arterial extremity injury among contemporary war injuries is around 7% and extremity bleeding is the leading cause of preventable death in war. Special training of health care teams in conflicts after World War II resulted in improved management of massive hemorrhage with increased survival rates, as well as a substantial reduction in amputation rates. The use of the tourniquet, practically abolished in the civilian environment, can be an important tool for saving lives in the chaotic environment of war (SADAUSKAS, 2003).

Technical and doctrinal changes in the U.S. Army contributed to the decline in amputation rates after arterial wounding from 50% to 72% in World War II (1939-1945) to about 10% to 13% in the Korean (1951-1953) and Vietnam Wars (1964-1973), even with the increased destructive power of small arms (STARNES, 2006).

Fox *et al*. (2005) published a review of the wounded evacuees from the Iraq-Afghan conflict to an upper echelon hospital – Walter Reed Army Medical Center – and they found known or suspected vascular injury in 107 of 1524 war wounds, or a prevalence of 7%. Most of the injuries (64%) were due to explosives, including grenades, anti-personnel mines, mortars and improvised explosive devices. As for the anatomical distribution of injuries, 51% were located in the lower limbs, 39% in the upper limbs, 7% in the neck, and 3% in the pelvis.

Stannard *et al*. (2009) evaluated the experience in treating vascular injuries in British Armed Forces combatants in Iraq-Afghanistan war operations. In 1203 war injuries, 121 (9.9%) were direct injuries to medium or large caliber vessels. Of the 121 patients, 77 died before any opportunity for surgical treatment. All who had vascular lesions in the abdomen or chest died. Of 87 patients with extremity vascular injuries, 37 underwent surgery and two died postoperatively. Among the interventions for 38 extremities (of the 37 patients), they included 15 primary amputations, four ligatures, and 19 revascularizations resulting in 15 successes (limbs saved) and three late amputations.

The growth in the number of improvised explosives injuries in warfare is an observation reported by Fox *et al.* (2005) and reflects the modern predominance of urban guerrilla tactics. Included therein are elements of surprise against troops investing in the locality, such as defensive weapons in unpredictable locations, the employment of mines, traps, and prepared demolitions (SADAUSKAS,2003).

6 PRE-HOSPITAL CARE

Prehospital care (PHC) began in the late 18th century with Baron Dominique Jean Larrey, Napoleon Bonaparte's chief military surgeon. Larrey developed the flying ambulances because he noticed the need for quick removal of combatants acting at the battle front. This surgeon further noted that the men working in these ambulances should be trained in medical care to assist the victims at the scene of the incident and in transporting them to their final treatment. (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

Demands of war caused an evolution in military medical care, such as innovations in equipment. Lessons learned during the American Civil War, 1861-1865, were later applied in the civilian environment for pre-hospital care (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

Health support in tactical emergencies formally began in 1989, with the first formal course in medical support to special law enforcement operations, with a team from Swat (Special Weapons And Tactics), nos Estados Unidos (FELICIANO; MATTOX; MOORE, 2021).

7 OPERATIONAL MEDICINE

Operational medicine is the integrated and comprehensive medical care, consultation, and medical information management in tactical operations contributing to the safety and success of a primarily military mission (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

It is emergency medical support to tactical operations, such as, providing emergency medical service to military special operations, and providing comprehensive health care to members of tactical units on an ongoing basis, maintaining their physical and mental health to enhance tactical team performance (Figure 5).

Tactical emergency medicine is a rapidly expanding medical specialty that requires and utilizes a wide range of physician skills. It is medicine performed together with or in response to military operations, defined as a subspecialty of emergency medicine (FELICIANO; MATTOX; MOORE, 2021). Tactical combat victim care is a system of pre-hospital trauma care specifically designed, with all its particularities, for the tactical environment (TIEN *et al*., 2009).

Medical care generally did not occur during combat throughout most of history, so wounded soldiers were left to their own devices and waited until the end of combat to receive proper health care. It was only with Napoleon Bonaparte's French Army that this problem found a first solution (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

The concepts of quick evacuation from the battlefield and quick transport of the wounded to field hospitals emerged with the French army, and were widespread during the American Civil War. Nevertheless, in the early stages of the War of Secession, wounded soldiers

stayed up to five days on the battlefield waiting for help (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

Figure 5 – A soldier wounded by an anti-personnel mine in Colombia.

Source: Record made by the author, 2013

During the Vietnam War in the 1960s, military doctors began to provide first aid where combatants had been shot, that is, on the battlefield, and to quickly evacuate soldiers to trauma hospitals (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2017).

The support of the health teams to the tactical emergencies allows, besides an adequate and agile assistance to those who need it, a quick post-incident medical triage and the execution of small treatments (FELICIANO; MATTOX; MOORE, 2021). However, the potentially volatile and dangerous atmosphere surrounding tactical operations can cause serious injuries to those involved in the operation, whether they are officers, hostages, suspects, or even passersby. Given the particularity and dangerousness of these situations, a traditional Emergency Medical Services (EMS) approach can expose the PHC team to great risks, and even disrupt and/or interrupt the military mission. To meet these needs, the EMS must be specialized and trained to work together and provide support to the tactical teams (FELICIANO *et al*., 2021). In addition, they also warn that tactical medicine varies from ATLS (Advanced Trauma Life Support), in which the safety of the team is advocated and the means necessary for the initial and definitive care of the patient are presented.

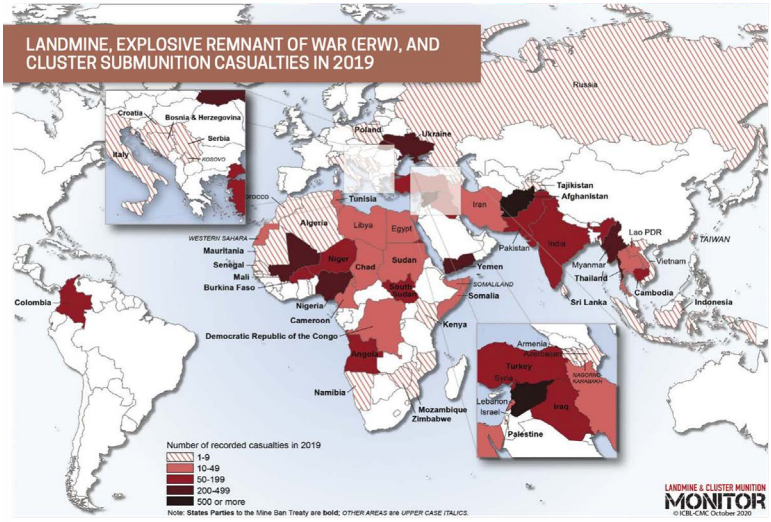
The primary role of the health support team is to provide the link between the site of injury and the appropriate admission of the patient to the health care system (NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS, 2007). The presence of

these teams on the scene decreases morbidity and mortality from injuries incurred during operations, contributing to the success of the mission and the safety and health of the tactical team (FELICIANO; MATTOX; MOORE, 2021).

8 THE ANTI-PERSONNEL MINE PROBLEM IN COLOMBIA

Colombia ranks second in the world, after Afghanistan, in the number of victims of APM and Explosive Remnants of War (ERW), as well as first in the number of victims in the Public Force due to these explosive artifacts (Figure 6). It is the only country in America where guerrillas use these weapons, despite the ban since 1992 by the Ottawa Convention under IHL (International Humanitarian Law). "Anti-personnel Mines do not distinguish between a combatant and someone who is not" (ROMERO; GARCIA, 2017, p. 20) and that is why their victimization is indiscriminate. The victims are not only the combatants, but also boys, girls and adolescents, women and men who live in the rural areas of the country.

Figure 6 – Countries affected by anti-personnel mines



Source: INTERNATIONAL CAMPAIGN TO BAN LANDMINES, 2020

9 HEALTH SUPPORT IN MINE ACTION

Imas 10.10 (INTERNATIONAL MINE ACTION STANDARDS, 2020) describes the responsibilities of the National Mine Action Authority (NMAA), employers and employees for providing and maintaining a safe working environment. This goal is achieved with the help of developing safe work practices and operating procedures, effective supervision and control, adequate education and training for men and women, safe equipment, and the provision of effective and appropriate personal protective equipment (PPE).

Developing a capability to provide an adequate response to a mine accident requires good planning, well-trained staff, and the availability of medical services capable of providing effective emergency treatment. Notwithstanding the legal and moral obligations placed on managers to provide the best possible medical support, particularly in the mine clearance workplace, planning must recognize the realities of field operations.

Table 1 – Types of Injuries Occurring in anti-personnel Mines Accidents with the Public Forces in Colombia

Lower limbs, abdomen, thorax and genitals	51%
Polytrauma	14%
Upper limbs and thorax	11%
Eye, face and neck injuries	5%
Superficial wounds and burns	4%
Amputation	31%

Source: Colombian National Army/AICMA, 2021

Health support in humanitarian demining operations is guided by Imas 10.40 (INTERNATIONAL MINE ACTION STANDARDS, 2014), which defines, in a generic way, the capabilities, attributions and minimum structure to develop the activities, especially the cleaning of the mined area. In this framework there is a request that each country affected by anti-personnel mines has its own protocol for health support, making this document more feasible given the realities of each country.

It is also mandatory for each organization, coordinated by IMAS 10.40, to submit its protocols for supporting humanitarian demining operations with details of the health conditions of each member of that organization, capabilities and training (especially of health professionals), techniques and forms of medical evacuation in the work area, and finally, the health plan and medical insurance.

Many countries, especially the poorest ones, which are the most affected by the anti-personnel mine problem, do not have a health structure that can adequately support humanitarian demining operations. Generally, because of the problems mentioned, these countries do not have a national protocol for health support to humanitarian demining operations and are subject to this standardization by Imas and the organization's mandatory humanitarian demining protocol.

Motivated by the lack of national protocols and the need for the standardization of health support, protocols have been developed by some humanitarian demining entities because of the importance of the subject. For example, we have the protocol in support of humanitarian demining operations of the JID and the protocol for Marminas operations – which guided preparations in health matters all the way to techniques and forms of evacuation in the clearance areas.

Therefore, the Mine Action Course was created at CCOPAB, which aims to prepare the military in humanitarian demining missions under the scope of international organizations. This center is a reference in the preparation of military personnel on an international level, and may be an opportunity to expand cooperation in this area by providing courses for participants in the many demining programs (DA CÁS, 2018).

This course also trains its members in the administrative issues of health support (need for ODH protocols, medical evacuation plans, and care in a hospital environment) and notions of basic explosives casualty care (Figure 7), with special focus during humanitarian demining (area clearance).

Figure 7 – Mine Action Course at CCOPAB – First Aid Instruction

Source: Record made by the author, 2017

10 HEALTH SUPPORT IN THE ACTIONS OF THE GMI-CO

In mine action, no work site, scenario or safety situation is identical, preventing the general use of established procedures and schedules. That said, Humanitarian Demining Organizations (HDO) have a responsibility to provide or ensure access to appropriate medical support for their staff. Imas 10.40 provides specifications and guidelines for the development of medical support for mine clearance operations. It identifies the minimum requirements for medical emergency preparation, including the planning necessary before the team mobilizes on mine clearance operations. In addition, it provides training for mine clearance and for the medical support of men and women teams.

Health support for humanitarian demining actions in Colombia, in the form of training, was provided by doctors from the Marminas mission until 2012 with training courses (first aid to the injured) for members of demining organizations, which until then was the responsibility of Bides – Colombian Army.

On March 1, 2011, the Organization of American States (OAS) requested the JID, through document GS/SMS/DPS/OHMA-017/11 (Mar. 1, 2011), the support of a medical monitor for the mission, with the following objectives:

- Objective 1: Strengthen the education, training or update needs in Pre Hospital Trauma Life Support (PHTLS) and Advanced Trauma Life Support (ATLS)

program standards to physicians and paramedics supporting humanitarian demining operations in remote areas of Colombia Programs.

- Objective 2: Promote in the teams the concept of trauma, combining the two main (independent and interdependent) trauma education programs, for paramedics who initiate the attention at the scene where the accident happened.
- Objective 3: Demonstrate to physicians and paramedics the roles, duties, and responsibilities of each of them.
- Objective 4: Determine how groups can work together to provide the best care for patients (doctors, paramedics, and deminers).
- Objective 5: To deliver a certificate, in the standards of the PHTLS and ATLS course, to the physicians and paramedics who pass the courses, according to the standards of the National Association of Emergency Medical Technicians (NAEMT).
- Objective 6: Conduct visits to observe medical procedures and medical evacuation in work areas and offer recommendations.

Figure 8 – Training Colombian military personnel for health support

Source: Record made by the author, 2014

10.1 Training course for health support to humanitarian demining actions in Colombia

The planning of the course for the training of the members of the civilian and military HDO followed the needs and requests of the AICMA-CO. The topics, subjects, and disciplines cover initial care of the injured, care of multiple victims, and medical evacuation. Accidents caused by anti-personnel mines and other explosives have their own characteristics, which were highlighted in the various levels of training offered. After approval of the content, focus, and target audience by JID and AICMA-CO, the GMI-CO began activities to structure and conduct the training course for health support in humanitarian demining operations.

The course is designed on the established PHTLS and ATLS frameworks with focus on the changes resulting from explosives injuries and the social, economic, and geographic characteristics of Colombia. At the beginning of the course, presentations of the Imas and current health support protocols are introduced, and the course ends with the current plans carried out in each region where the course is offered. The first training event took place in Bogotá, the Colombian capital, after which courses were held in Río Negro, Medellin, and in Nariño, in Antioquia state – one of the cities most affected by the armed conflict in Colombia.

10.2 Proposed Protocol for Health Support to Humanitarian Demining Operations for Colombia (General Notions)

This protocol provides the specifications and guidelines for the implementation of medical support techniques for humanitarian demining in the Colombian territory. Likewise, this protocol provides details on the responsibilities and obligations of the actors involved in the execution of the medical support.

Civilian Humanitarian Demining Organizations (CHDO) accredited by the National Government to conduct Humanitarian Demining activities must comply with the provisions of this standard; and implement their plans, programs, projects and operations in a coordinated manner with the Presidential Program of Comprehensive Action against Anti-Personnel Mines.

Medical care varies depending on where it is performed, the complexity of the situation, and its duration. However, in all cases, these general principles should be applied:

1. All medical support should be provided by the Humanitarian Demining Organization (HDO) accredited by the National Government and in coordination with the *Programa Presidencial de Ação Integral contra as Minas Antipessoal* (AICMA - Presidential Program for Comprehensive Action against Anti-Personnel Mines).
2. All medical support must be performed in accordance with a Standard Operating Procedure approved by the Inter-Institutional Humanitarian Demining Agency (IHD) and must be subject to quality assurance and quality control.
3. All information collected or developed (data, documents, etc.) during medical care must be sent to the President's Comprehensive Anti-Personnel Mine Action Program.

During the medical care, the community of the intervention area and other stakeholders must be consulted and informed, in order to ensure the best health structure and medical evacuation routes in case of accident or incident with Anti-Personnel Mine / Improvised Explosive Device / Unexploded ordnance (APM/IED/UXO).

Medical care must be performed in accordance with the provisions of the other National Humanitarian Demining Standards and will always be a mandatory requirement for the removal of APM/IED/UXO.

There are no APM/IED/UXO release operations without an acceptable level of medical care and a casualty evacuation plan. Everyone involved must fully understand and practice a medical evacuation plan.

If the medical support provided in this national protocol was eliminated or is not available, the authorization will cease immediately until it is restored.

Demining teams should conduct victim evacuation training at least once a month and when changing work sites. These drills will be recorded in the authorization task log.

Each demining activity will provide adequate medical support and evacuation of the injured. Humanitarian demining organizations (HDO) need to define precisely what kind of support is provided at each demining work site.

In each work area, the demining organization will have an equipped nursing assistant capable of performing victim rescue and Advanced Life Support (ALS) within five minutes of the accident. Each nursing assistant should have up to 15 minutes access to an emergency vehicle and the driver, which, during working hours, will not be used for any other purpose. The vehicle must be adequate to transport the victim quickly and safely to the nearest medical center, heliport, or landing strip.

For the Non-Technical and Technical Study Teams, a nurse's aide must be available and the investigation team must maintain proper communications, regarding the removal operations of APM/IED/UXO.

Medical support should be sufficient to stabilize large scale shrapnel wounds, traumatic amputation and multiple wounds and administer saline solution within 15 minutes of the accident or incident caused by APM/IED/UXO.

Organizations are responsible for ensuring that a properly equipped hospital with qualified surgical and medical equipment is available within 60 minutes of the transfer of any removal team of APM/IED /UXO. All organizations must clearly indicate in their Operating Procedure the implementation plans and the means provided for the evacuation of the injured.

The method of evacuation of victims should always be specified and understood by everyone. The primary method of evacuation is overland to the nearest hospital with operating capability.

Medical support and evacuation should contribute to the following goal: rapid and effective response to any accident or incident related to APM/IED /UXO for humanitarian demining activities.

11 CONCLUSION

Health support in non-warfare area clearance operations is not yet supported by Brazilian Army manuals, but the initial methodology can be found in the International Mine Action Standards (Imas).

In line with the issues raised, there is a need to develop a doctrine for the use of the health service in actions against mines, especially in the area clearance operation in a non-war situation (humanitarian demining), aiming first to provide support for these activities and then evolve into a guideline in a war situation.

The long period of conflict motivated the indiscriminate use of mines, causing serious effects for 31 states of the 32 existing in Colombia. Today Colombia is one of the countries most afflicted by this evil. In addition, despite great efforts to clear mined

areas, new contaminations by landmines or improvised explosive devices, particularly those launched by non-state actors who disregard the international legislation prohibiting their use, have emerged.

By supporting Colombia in the solution of its intrinsic problems, in the field of humanitarian actions and peace missions, Brazil strengthens its diplomacy and increases its influence in its strategic environment. The expansion of multilateral relations and cooperation actions will favor the reduction of humanitarian problems, as well as demonstrate Brazil's capacity to help and support international security efforts, increasing the country's legitimacy to the principles of world peace, as mentioned by Borlina (2015) and Geraldo (2020). The participation of Brazilian military personnel in humanitarian demining is a relevant support to the integration processes being developed in South America, especially in Colombia, by promoting dialogue, trust, and military cooperation for mutual defense.

CCOPAB is a reference center for training military personnel on humanitarian demining in association with the Engineering Instruction Center, in the city of Araguari, Minas Gerais. These two structures are in tune with the most modern techniques and equipment in use, but we still need a doctrine for humanitarian demining in its various phases, in addition to the health support offered for these activities. At the CCOPAB, training in the area of health was structured for Brazilian and foreign military and auxiliary forces, which would act in the various humanitarian demining missions. The participants of these trainings were also presented with a proposed protocol for Colombia for health support to humanitarian demining, demonstrating the need to specify and detail this health support for each region, area, or country in which the actions against mines would be carried out.

Army Planning, at the strategic and sectoral levels, must be oriented towards the acquisition of land military capabilities and operational capabilities that will enable the Brazilian Army to fulfill its mission and achieve its vision of the future (BRASIL, 2015). There is a need for these health operational capabilities to support humanitarian demining activities, with future application in military demining.

This paper, therefore, aims to stimulate debate about the topic, as well as to raise the interest and importance of health support about the activities involved in mine action.

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