The training of the military health corps in biological, nuclear, chemical and radiological defense in the Brazilian Air Force

El entrenamiento de los cuerpos militares de salud en defensa biológica, nuclear, química y radiológica en la Fuerza Aérea Brasileña

A capacitação do corpo de militares da saúde em Defesa Química, Biológica, Radiológica e Nuclear na Força Aérea Brasileira

Débora Fernanda Haberland[I]

Fábio José de Almeida Guilherme[II]

Alexandre Barbosa de Oliveira[III]

ABSTRACT

Introduction: Among the missions of the Brazilian Air Force (FAB) is the prompt and effective response related to the care of victims of events related to Chemical, Biological, Radiological or Nuclear Defense (DQBRN). During the COVID-19 operation, many aeromedical evacuations of patients between the states of the country were carried out. Faced with scenarios that involve situations of this nature, it is imperative that the health team is able to act. The Air Force Command Directive 1-6 (DCA 1-6) deals with the Doctrine of Preparation and Employment of the FAB in Transport Missions for DQBRN, recommends that, in case of events with CBRN agents, it is up to the Air Force Command (COMAER) transporting specialized personnel and material to act in the events resulting from the attacks or accidents, as well as the transport of radio victims and/or contaminated persons, emphasizes the obligation to constitute Medical Control Teams (ECM), with technically prepared personnel and assigns responsibilities to EMAER (BRASIL, 2014). Currently, the training of the health team is carried out by the Institute of Aerospace Medicine (IMAE). The Health Training Course in Chemical, Biological, Radiological and Nuclear Defense (CCS-DQBRN) aims to provide trainees with knowledge about the procedures used in the care and aeromedical transport of victims of CBRN attacks. It is given to military doctors, nurses and nursing technicians from FAB or friendly institutions. Objective: To describe how the current training of the health team in Chemical, Biological, Radiological and Nuclear (CBRN) defense occurs at FAB. Method: Documentary research, through data collection from the IMAE Teaching and Research Advisory Department database. Results: The number of graduates of the CCS-DQBRN from 2013 to 2021 was raised. The first course took place in November 2013, totaling 10 classes and training of 231 soldiers in the area. Of the graduated students, we identified 106 doctors (46%), 34 nurses (15%), 51 nursing technicians (22%) and 40 from other specialties (17%). Discussions: The 40-hour immersion course is aimed at the interaction of students who make up the health team. The teaching method involves

I. Instituto de Medicina Aeroespacial Brigadeiro Roberto Teixeira (IMAE) – Rio de Janeiro/RJ – Brazil. 1º Tenente QOCON Enfermeira. Post Doctorate in Nursing from the Federal University of Rio de Janeiro. E-mail: deboradfh@fab.mil.br

II. Instituto de Medicina Aeroespacial Brigadeiro Roberto Teixeira (IMAE) – Rio de Janeiro/RJ – Brazil. 1º Tenente QOCON Enfermeiro. Master in Nursing from the Federal University of Rio de Janeiro. E-mail: fabioguilhermefjag@fab.mil.br

III. Universidade Federal do Rio de Janeiro / Escola de Enfermagem Anna Nery (UFRJ/EEAN) – Rio de Janeiro/RJ – Brazil. PhD in Nursing from the Federal University of the State of Rio de Janeiro. E-mail: alexbaroli@gmail.com

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The acronyms and abbreviations contained in this article correspond to the ones used in the original article in Portuguese.

expository theoretical classes, workshops, practical assembly and decontamination activities and simulation of DQBRN events, as well as attendance victims and boarding the aircraft for Aeromedical Evacuation simulation. According to BRASIL (2012), IMAE is responsible for air transport for the benefit of CBRN defense, employing Air Force means to move personnel and material that have been subjected to the action of CBRN agents, and to transport personnel and material specialized in the resulting activities. of these events. Conclusion: The training of the military with this theme has been shown to be effective in order to build knowledge and correlate theory with practice, being able to act in a real situation in favor of society.

Keywords: Professional training; air ambulances; healthpersonnel; disasters.

RESUMEN

Introducción: Entre las misiones de la Fuerza Aérea Brasileña (FAB) está la respuesta rápida y eficaz relacionada con la atención de víctimas de eventos relacionados con la Defensa Química, Biológica, Radiológica o Nuclear (DQBRN). Durante el operativo COVID-19 se realizaron numerosas evacuaciones aeromédicas de pacientes entre los estados del país. Ante escenarios que involucran situaciones de esta naturaleza, es imperativo que el equipo de salud pueda actuar. La Directiva de Comando de la Fuerza Aérea 1-6 (DCA 1-6) trata sobre la Doctrina de Preparación y Empleo de la FAB en Misiones de Transporte para DQBRN, recomienda que, en caso de eventos con agentes QBRN, quede a cargo del Comando de la Fuerza Aérea (COMAER) transportando personal y material especializado para actuar en los eventos derivados de los ataques o accidentes, así como el transporte de radio-víctimas y/o contaminados, enfatiza la obligación de constituir Equipos de Control Médico (ECM), con personal técnicamente preparado y asigna responsabilidades a la EMAER (BRASIL, 2014). Actualmente, el entrenamiento del equipo de salud lo lleva a cabo el Instituto de Medicina Aeroespacial (IMAE). El Curso de Formación Sanitaria en Defensa Química, Biológica, Radiológica y Nuclear (CCS-DQBRN) tiene como objetivo dotar a los alumnos de conocimientos sobre los procedimientos utilizados en la atención y transporte aeromédico de víctimas de ataques QBRN. Se entrega a médicos militares, enfermeros y técnicos de enfermería de la FAB o instituciones amigas. Objetivo: Describir cómo se da la formación actual del equipo de salud en defensa Química, Biológica, Radiológica y Nuclear (QBRN) en la FAB. Método: Investigación documental, a través de la recogida de datos de la base de datos de la Asesoría de Docencia e Investigación del IMAE. Resultados: Se elevó el número de egresados de la CCS-DQBRN de 2013 a 2021. El primer curso se realizó en noviembre de 2013, totalizando 10 clases y formación de 231 militares en el área. De los egresados, identificamos 106 médicos (46%), 34 enfermeros (15%), 51 técnicos de enfermería (22%) y 40 de otras especialidades (17%). Discusiones: El curso de inmersión de 40 horas está dirigido a la interacción de los estudiantes que integran el equipo de salud. El método de enseñanza involucra clases teóricas expositivas, talleres, actividades prácticas de montaje y descontaminación y simulación de eventos DQBRN, así como atención de víctimas y abordaje. la aeronave para simulación de Evacuación Aeromédica. Según BRASIL (2012), el IMAE es responsable del transporte aéreo en beneficio de la defensa QBRN, empleando medios de la Fuerza Aérea para mover personal y material que haya sido sometido a la acción de agentes QBRN, y para transportar personal y material especializado en la resultante actividades de estos eventos. Conclusión: La formación de militares con esta temática se ha mostrado eficaz para construir conocimientos y correlacionar la teoría con la práctica, pudiendo actuar en una situación real a favor de la sociedad.

Palabras clave: *Capacitación de recursos humanos ensalud; ambulanciasaéreas; personal de salud; desastres.*

RESUMO

Introdução: Entre as missões da Força Aérea Brasileira (FAB) está a pronta resposta eficaz relacionadas ao atendimento de vítimas de desastres ou ataques com agentes Químicos, Biológicos, Radiológicos ou Nucleares (DQBRN). Durante a operação COVID-19, muitas evacuações aeromédicas de pacientes entre os estados do país foram realizadas. Diante de cenários que envolvem situações desta natureza é imperioso que a equipe de saúde esteja capacitada para atuar. A Diretriz do Comando da Aeronáutica 1-6 (DCA 1-6) versa sobre a Doutrina de Preparo e Emprego da FAB em Missões de Transporte para DQBRNe preconiza que, em caso de eventos com agentes QBRN, compete ao Comando da Aeronáutica (COMAER) realizar o transporte de pessoal e material especializados para atuar nos eventos decorrentes dos ataques ou acidentes, assim como o transporte de radioacidentados e/ou contaminados. Ressalta a obrigatoriedade de se constituírem Equipes de Controle Médico (ECM), com pessoal tecnicamente preparado e atribui responsabilidades ao EMAER (BRASIL, 2014). Atualmente a capacitação da equipe de

saúde é realizada pelo Instituto de Medicina Aeroespacial (IMAE). O Curso de Capacitação em Saúde em Defesa Química, Biológica, Radiológica e Nuclear (CCS-DQBRN) tem o objetivo de proporcionar aos instruendos conhecimentos sobre os procedimentos utilizados no atendimento e no transporte aeromédico de vítimas de ataques de natureza QBRN. É ministrado para militares médicos, enfermeiros e técnicos de enfermagem da FAB ou instituições amigas. Objetivo: Descrever a atual capacitação da equipe de saúde em defesa Química, Biológica, Radiológica e Nuclear (QBRN) na FABe propor aprimoramento da capacitação a partir dos achados. Método: Pesquisa documental para o levantamento de dados do banco de dados da seção de Assessoria de Ensino e Pesquisa do IMAE. Resultados: Foi levantado o número de concludentes do CCS-DQBRN de 2013 a 2021. O primeiro curso ocorreu em novembro de 2013, totalizando 10 turmas e a capacitação de 231militares na área. Dos alunos formados, identificamos 106 médicos (46%), 34 enfermeiros (15%), 51 técnicos de enfermagem (22%) e 40 de outras especialidades (17%). Discussões: O curso de imersão de 40 horas com vistas à interação dos alunos que compõem a equipe de saúde. O método de ensino envolve aulas teóricas expositivas dialogadas, oficinas, atividades práticas de montagem e descontaminação e simulação de eventos DQBRN, bem como atendimento às vítimas e embarque na aeronave para simulação de Evacuação Aeromédica. Conforme BRASIL (2012) é responsabilidade do IMAE a ação de transporte aéreo em proveito da defesa QBRN, com emprego de meios de Força Aérea para deslocamento de pessoal e material que tenham sido submetidos à ação de agentes QBRN, e para transportar pessoal e material especializados nas atividades decorrentes desses eventos. Conclusão: A capacitação dos militares à luz dessa temática tem sido de forma que construam o conhecimento e correlacionem teoria e prática, estando aptos a atuarem em uma situação real em prol da sociedade.

Palavras-chave: *Capacitação Profissional; resgate Aéreo; pessoal de saúde; desastres.*

1 INTRODUCTION

The concern with incidents involving Chemical, Biological, Radiological and Nuclear (CBRN) agents is an aspect to be considered in the area of Defense and Health. The growing participation of the Armed Forces in cooperation with the Civil Defense and Protection System in emergency and disaster situations has demonstrated the importance of deepening and improving studies on humanitarian logistics in the military field (OLIVEIRA NETTO, 2015). Among these situations, epidemics stand out, which affect the health of the population for generations, as was the case with the return of outbreaks of the Ebola virus on the African continent in 2013, with high lethality rates (THE LANCET, 2014).

According to Salem (2003), such agents have already been used as an instrument of war, but the current concern is with the possibility of accidental or intentional dissemination of CBRN agents that can generate panic, weaken economies or cause mass destruction. According to Vasconcelos (2018), this possibility reinforces the need to develop effective policies to deal with the removal of these threats. How was the preparation and integration of the Armed Forces (FFAA) and other institutions, military and civilian, during planning to prevent this type of event, when Brazil hosted major events, such as the World Cup in 2014 and the Olympic Games and Rio-2016 Paralympic Games.

Air Force Command Directive 1-6 (DCA 1-6), which deals with the Doctrine of Preparation and Employment of the Brazilian Air Force (FAB) in Transport Missions in Chemical, Biological, Radiological and Nuclear Defense (DQBRN), according to Medeiros (2020), recommends that, in the event of events with these agents, it is up to the Air Force Command (COMAER) to carry out the transport of specialized personnel and material for events resulting from attacks or accidents, as well as the transport of radioactive and/or contaminated persons. To this end, the Air Force Command Directive (DCA) 1-6/2014 provides that Medical Control Teams (ECM) will be constituted, with technically prepared personnel and assigns responsibilities to EMAER (BRASIL, 2014a).

In the context of the missions undertaken by the FAB, it is important to obtain a prompt and effective response to the care of victims of emergencies and disasters involving this context. In January 2021, more than 1,443 flight hours were used in support of Operation COVID-19, and 593 patients were transferred from the North region to other states of the federation (BRASIL, 2021a).

According to the Air Force Agency (BRASIL, 2021b), in the fight against the pandemic, since 2020, the FAB has already logged around 6,000 flight hours in Operation COVID-19, launched on March 20, 2020. All operational activities were

maintained 24 hours a day, such as air operations, airspace defense and control, and logistical and security activities. In aid of the national health system, the FAB also promoted the transport of more than 5 thousand tons of cargo, including supplies and oxygen, to the northern region of the country, of hundreds of patients and millions of doses of vaccines against COVID-19.

For such action, it is important that the health team is able to deal with these events. There is the Training Course in Health in Chemical, Biological, Radiological and Nuclear Defense (CCS-DQBRN) is taught annually at the Instituto de Medicina Aeroespacial (IMAE) for students with the following profile: military doctors, nurses and nursing technicians from the FAB, the Brazilian Navy, the Brazilian Army, Civil and Military Police. According to the course's minimum curriculum, its objective is to provide students with knowledge about the procedures used in the care and air medical transport of victims of CBRN attacks.

Indeed, it is important for the country to invest in training its Armed Forces, each Force in its area of operation, so that the response to a CBRN event is organized and integrated with civilian agencies, usually the first responders, and carried out quickly and effectively, thus reducing the possible damages and the number of fatalities (BRASIL, 2014a).

In addition, it should be noted that excellence in training tends to generate flight and team safety, economy of resources to be mobilized and, above all, quality and adequate assistance for carrying out an Aeromedical Evacuation (EVAM) involving CBRN agents, in addition to minimizing response time.

Therefore, the training of health teams in the air environment is strategically relevant, since knowledge in the field of aerospace physiology involves thinking about risk management practices in emergencies, potential physiological changes, and the skills of the members of the teams that operate in the transport of patients using rotary and fixed wings.

Given the above, it is clear that the training of professionals working in this area involves not only specific care for air removal, but also care for the effects that CBRN agents can cause.

Thus, the objective of this article is to evaluate the training of the health team in CBRN defense, based on the course evaluation and propose improvement of training based on the findings.

2 LITERATURE REVIEW

2.1 The Armed Forces and CBRN Defense

Currently, there is a growing involvement, in cooperation with Civil Defense actions, of a variety of actors, such as volunteers, public agencies, companies and the military in response to natural disasters, with a large number of victims. (BANDEIRA *et al.*,2011).

In the context of the participation of the military, we highlight the participation of the Armed Forces, made up of the Brazilian Navy, the Brazilian Army and the Brazilian Air Force, which are essential to the execution of the national security policy and are intended to defend the Homeland and to guarantee the constituted powers, law and order (BRASIL, 1988).

The National Defense Policy (PND) (MEDEIROS, 2020) is the document that deals with the planning of actions aimed at the defense of the country. It presents an analysis of the international environment, strongly pointing out that the impacts caused by climate change or pandemics may have serious environmental, social, economic and political consequences, which will require a prompt response from the State (MEDEIROS, 2020). For Oliveira Neto (2015) the equipment of the FFAA is not only used for the defense of the homeland, but also for the benefit of society, in initiatives in partnership with Civil Defense bodies. Therefore, military forces need to be kept in good operating condition at all times.

As a result of events of this nature involving a significant number of victims in disastrous scenarios that deplete civilian means of control, there is a need for the participation of FFAA military personnel in DQBRN actions. In Brazil, in occurrences of this nature, the FFAA have constitutional support to act jointly, if triggered, following the guidelines of the Ministry of Defense, in subsidiary actions in support of Civil Defense (MEDEIROS, 2020).

The National Defense Strategy highlights the relevance of the theme in defense strategy actions:

> Increase the capabilities of the Armed Forces in their self-defense and to contribute to Civil Defense and Protection bodies, in the prevention, mitigation, preparation, response and recovery, in adverse events of a biological, chemical, radiological and nuclear nature (BRASIL, 2020, p. 65).

The Brazilian Army was the first Armed Force in the country to carry out instructions in this area, in 1943, with the objective of training the soldiers

who would make up the Brazilian Expeditionary Force. In 1953, the Chemical Warfare School Company was created, the first operational unit in DQBRN of the Armed Forces, which was deactivated and replaced by the CBRN Defense Company, in 1987. The Brazilian Army has been investing in the area of training and employment, through the creation of specific organizations for research in this area, updating of manuals, and improvement of specialization courses and creation of new (VASCONCELOS, 2018).

The Brazilian Navy has two training courses in CBRN Defense. The Special Course on Nuclear, Biological, Chemical and Radiological Defense (C-Esp-DNBQR) is taught by the Almirante Marques de Leão Training Center and aims to train military personnel to perform functions related to the subject of the course (MARINHA DO BRASIL, 2019). They recently created the Special Advanced Course on Nuclear, Biological, Chemical and Radiological Defense (C-Esp-Av-DefNBQR), which aims to train military personnel to perform Command and Control functions (BRASIL, 2018).

The Brazilian Air Force has already taught courses in the radiological and nuclear area since the early 2000s, but it was in 2010 that training in the area of CBRN Defense began, when IMAE soldiers participated in a basic internship at the Army Technological Center. In addition to the internship, the IMAE military participated in several other preparation courses to work in the instruction of the 1st Health Response Course in Nuclear and Radiological Emergencies, in 2012 (CAMERINI, 2014).

At FAB, Chemical, Biological, Radiological and Nuclear Defense is defined by the Air Force Command Directive (DCA 1-6/2014), as:

> Actions planned by the Brazilian Air Force aimed at preparing and employing when operating in an air or land environment subject to Chemical, Biological, Radiological or Nuclear events, and which guarantee the fulfillment of the mission assigned to COMAER, whether in national or international territory (BRASIL, 2014a, p. 10).

Air Force Command Directive 1-7, which deals with Biosafety, Bioprotection and Biological Defense of the Air Force, defined the objective of promoting personnel training, adding or improving content related to these topics and encourage the participation of its staff in courses and events related to biosafety, bioprotection and biological defense (BRASIL, 2019a).

2.2 Health training in DQBRN

COMAER designated IMAE as the reference body for training personnel involved in CBRN actions. In addition to being responsible for this training in an FA context, the institute conducts courses on a regular basis and keeps instructions related to this topic up to date.

According to the IMAE Regulation, ROCA 21-11/2017, the Institute "aims to develop the study, research, improvement, training and instruction in the field of Aerospace Medicine and Operational Medicine" (BRASIL, 2017, p. 3). Among its competences are promoting training, specialization and improvement of human resources in the fields of Aerospace Medicine and Operational Medicine and participating in actions to prepare and employ the Brazilian Air Force to carry out transport missions in DQBRN.

With this scenario, the Training Course in Health in Chemical, Biological, Radiological and Nuclear Defense (CCS-DQBRN), created in 2013, aims to train doctors and nursing staff to work in pre-hospital care and aeromedical evacuation of victims of accidents with CBRN agents.

The CCS-DQBRN was regulated by Ordinance COMGEP nº 288-T/DCP, of February 27, 2019, which approved the edition of its Minimum Curriculum, with the publication of the Instruction of the Air Force Command - ICA 37-786/2019, which describes it as a post-training course in the area of Health Sciences, in the technical-specialized field of operational health (BRASIL, 2019b).

As provided for in its minimum curriculum, the course is designed to train doctors, nurses and nursing technicians in identifying the main DQBRN agents, in valuing the importance of the correct use of personal protective equipment (PPE), as well as in the care necessary for the air medical transport of patients who are victims of CBRN attacks or disasters.

The minimum curriculum provides for a single subject: operational health, which is divided into the following syllabus: Fundamentals and background in chemical biological radiological and nuclear defense; Terrorist threat; Crisis management; Personal Protective Equipment in DQBRN; Aeromedical Evacuation in DQBRN; Chemical Agents; Detection of Chemical Agents; Use of the ISOVAC capsule and ambiance; Biological Agents; Detection of Biological Agents; Initial Approach, Therapy and Screening; Radiological Agents; Detection of Radiological Agents; Radiopathology; Decontamination.

This type of preparation, involving practical and theoretical activities, structured in an immersion course, lasting four days and with a total workload of 40 class periods, offers trained military personnel the security to act in real events. A large part of the CCS-DQBRN workload is given to duly equipped military personnel, as they are subjected to adaptation to the use of masks, waterproof overalls, rubber boots, and all the attire necessary for the management of a patient who is contaminated or potentially has a CBRN.

This course stands out in DQBRN training for FAB health personnel, as it is structured to standardize care and transport procedures for victims of contamination by the CBR agent. It distinguishes the military health professional, since it adds knowledge and skills, including the use of some specific equipment (MEDEIROS, 2020).

For Araújo (2019) and Medeiros (2020), the need for qualified personnel throughout the country is highlighted, since knowledge may be required at any time and in any region of the country, since, in calamitous situations, the need for well-trained professionals will certainly make the difference in fulfilling the assigned mission.

In this way, the need to carry out research in this field is highlighted, as well as to discuss the importance of specialized training for FAB health professionals involved in this area. In particular, the health professionals who make up the staff capable of carrying out an air transport of a patient who is a victim of CBRN disasters, being imperative that they receive the necessary training to act safely and with a view to better patient care.

3 MATERIALS AND METHODS

The documentary survey method was used, through the IMAE course database. To this end, the evaluation carried out at the end of the course, entitled "course review", was used.

Such files are under the responsibility of the Teaching Section, where records of nine editions of the CCS-DQBRN and the training of a total of 231 military personnel were found. It should be noted that these are not just FAB soldiers, because, despite being a minority, there are also soldiers from other Forces.

The updated data of the courses were collected after requesting documentation and with the approval of the IMAE Command. Data were collected from the 2013 finalists until August 2021.

3.1 Results and discussions

According to table 1, we present the number of graduates according to the specialty and the year of conclusion of the course.

As previously described, due to the need to support the 2016 Olympic Games, in 2015 IMAE taught five editions of the CCS-DQBRN, which justifies that it was the year with the most conclusive course results. According to Medeiros (2020), the Institute also carried out several trainings of an eminently practical nature in this area, in addition to teaching the courses.

After the period of major events, there was a decrease in demand for the course, as shown in the table. A fact that lasted until 2019, however, in the years 2020 and 2021, the demand for the course had a significant increase due to the COVID-19 pandemic and the increase in EVAM CBRN missions carried out by the Force.

Table 1 - Number of students completing the CCS-DQBRN course.

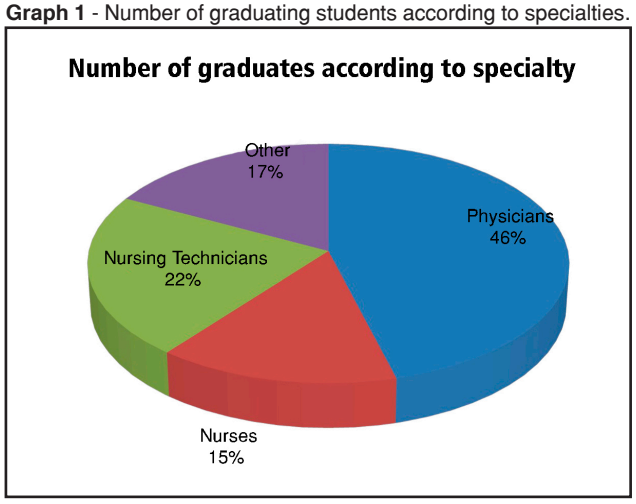
YEAR	DOCTORS	NURSING	NURSING TECHNICIAN	OTHER	TOTAL
2013	8	3	7	0	18
2014	7	3	4	20	34
2015	22	15	23	18	78
2016	19	7	2	0	28
2017	2	1	3	1	7
2018	0	0	0	0	0
2019	2	2	2	1	7
2020	5	3	10	0	18
2021	41	0	0	0	41
TOTAL	106	34	51	40	231

Source: Authors.

3.1.1 Concluding according to specialties

Regarding the specialties that performed the CCSDQBRN, there was a predominance of physicians (106, corresponding to 46% of students), followed by nursing technicians (51, corresponding to 22% of students), nurses (34, corresponding to 15% of students) in addition to other specialties (40, corresponding to 17% of students), as shown in Graph 1:

Graph 1 - Number of graduating students according to specialties.



Source: Authors.

The majority of those concluding are made up of professionals from the medical specialty and nursing technicians, due to the proportion of these staff in the Force and because this course is taught during the training of career doctors in the FAB, the importance of training for nurses in this activity stands out, considering that the nurse is one of the members of the health team for air transport in the area.

After 2015, the CCS-DQBRN started to be administered exclusively to medical officers, nursing officers and graduates of the nursing service (SEF), with a view to promoting continuous training and qualification of health professionals, designated for direct assistance to suspected military and civilians of contamination by CBRN agents. For military personnel who do not belong to the aforementioned specialties, the Training Course in Chemical, Biological, Radiological and Nuclear Defense (CC-DQBRN) began to be taught, aimed at others that do not involve patient care.

Such protocols require knowledge in DQBRN and EVAM so that air medical transport can be carried out safely for patients, health staff and crew. DCA 1-6/2014 (BRASIL, 2014b) identifies the need to form specialized teams, with technically prepared personnel to provide advice on the planning of CBRN missions, in order to minimize the risks of exposure of aircraft and crew to contaminating agents.

Knowing the profile and number of professionals who have carried out the training demonstrates great relevance, including for structuring a database with the mapping of possible military personnel, across the country, able to act in an event of this nature. According to Oliveira (2018), in a disaster situation, medical care must be conducted by qualified and trained professionals, following the protocols established by the Air Force Health Board. Requires the triage and preparation of sick and injured people for evacuation, with the correct classification of care priority according to the adopted protocols (BRASIL, 2012). Considering the peculiarities of EVAM, the relevance of the knowledge applied in this type of transport added to the knowledge in DQBRN is highlighted.

3.1.2 Evaluation of graduates and suggestions for improving the course

The institution has in its database the evaluation of professionals who took the course entitled "course review". In this questionnaire, the following items are evaluated, using a score from 1 to 5, where 1 = not important and 5 = very important: Degree of importance of the course for professional training, Degree of adequacy between the objectives proposed for the course and the contents addressed, Degree of satisfaction in relation to the course taken, Degree of evaluation of the course regarding your expectations, and also an open space for suggestions and any observation that the student considers relevant.

The survey carried out refers to the period from 2015 to August 2021, in which the responses of 150 conclusive ones were evaluated. The purpose of this analysis is to verify the evaluation of students who work in this area about the training offered in the CCS-DQBRN. At this stage, it is considered very important to observe the view of the soldier who is engaged in this type of mission, after all, the course needs to meet the needs and skills that this soldier must have to carry out the mission. Thus, collecting data and impressions from trained professionals about the acquired knowledge, so that the information collected presents the discrepancies between the predicted and the real need, which is why it will be possible to tabulate some needs and arrive at the revision of the course curriculum.

As a criterion for data inclusion, the student who successfully concluded the CCS-DQBRN was used;

as an exclusion criterion, we sought to remove data referring to students who were unable to complete the course or who were dismissed for any reason. The analysis of these data was carried out with the representation in graphic format, pointing out the possible gaps highlighted by the students for a rethink of possible adaptations in the course, whether in relation to the syllabus, workload, curriculum or teaching method. This choice will not only allow for a general view of the training, but will also guide the review of the proposed curriculum matrix.

The first item evaluated refers to the Degree of importance of the course for professional training, being: 1 = not important and 5 = very important, according to Graph 2.

In this item, 82% consider the course very important; 12%, important; 4%, relatively important; 1%, unimportant; and 1% do not consider it important.

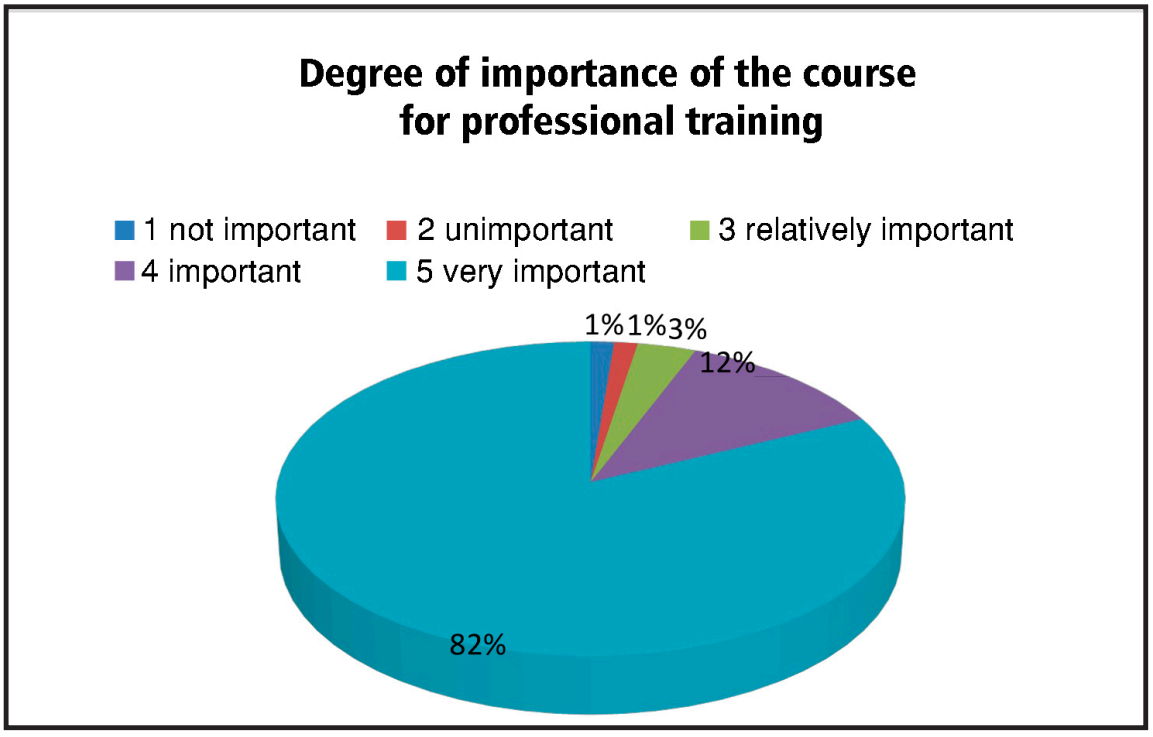
The data presented show that the course received good feedback from students over the years, in which it is believed that the opinions highlighted in the form can guide changes and adjustments based also on the opinion of those who carry out this activity.

The constant evaluation of the quality and effectiveness of educational actions is fundamental to guarantee the achievement of the initially proposed objectives (ZERBINI; ABBAD, 2005). To this end, evaluating the matrix of the CCS-DQBRN course, with a view to complementing the knowledge that meets the formation of the necessary skills, is evidenced by the activities that have been carried out currently for the training of FAB health professionals, making them those capable of performing various actions in a disaster scenario of this nature, which enhances the rapid response.

In the second item, there is the assessment of the degree of adequacy between the objectives proposed for the course and the contents addressed during the course. According to Graph 3, 58% claim that the course is very suitable; 32%, adequate; 7% partially adequate; and 3%, not adequate.

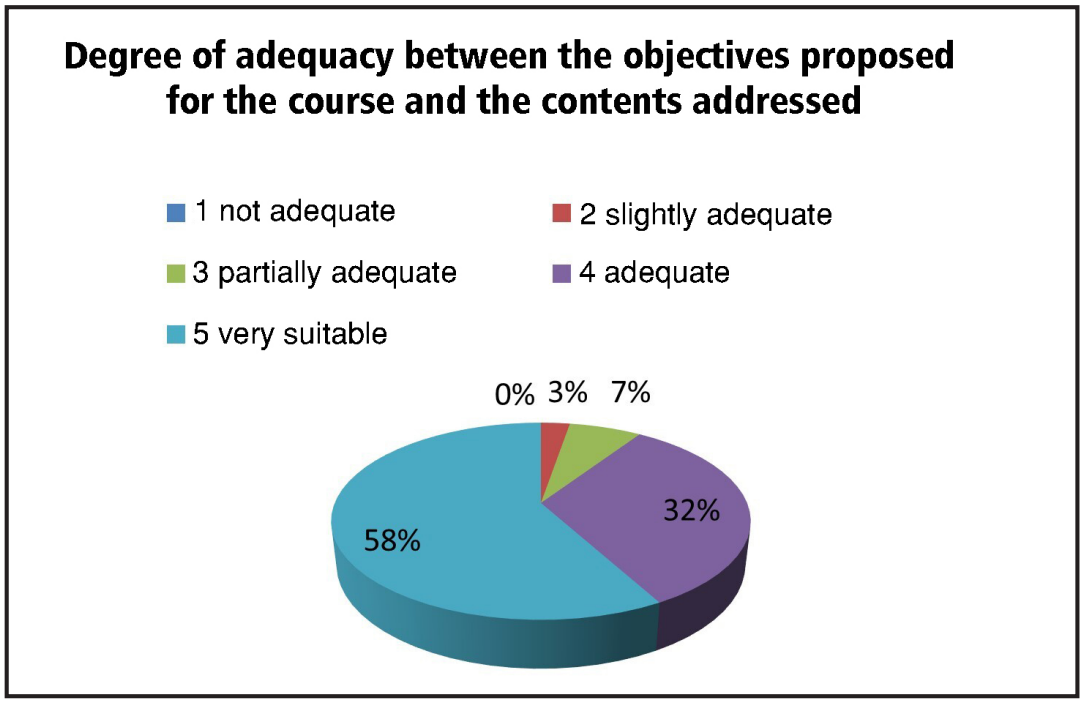
According to the Air Force Course Table (TCA) 37-14/2019, the general objective of the course is to provide students with basic theoretical knowledge and practical training, allowing them to work in the Chemical, Biological, Radiological and Nuclear Defense scenario. Its purpose is to train Junior and Intermediate Officers and Graduates of the Brazilian Air Force to provide pre-hospital care and Aeromedical Evacuation of victims, resulting from CBRN emergencies. (BRASIL, 2019b). According to these data, assessing the suitability of the course objective with professional training is of great importance.

Graph 2 - Degree of importance of the course for professional training.



Source: Authors.

Graph 3 - Degree of adequacy between the objectives proposed for the course and the contents addressed.

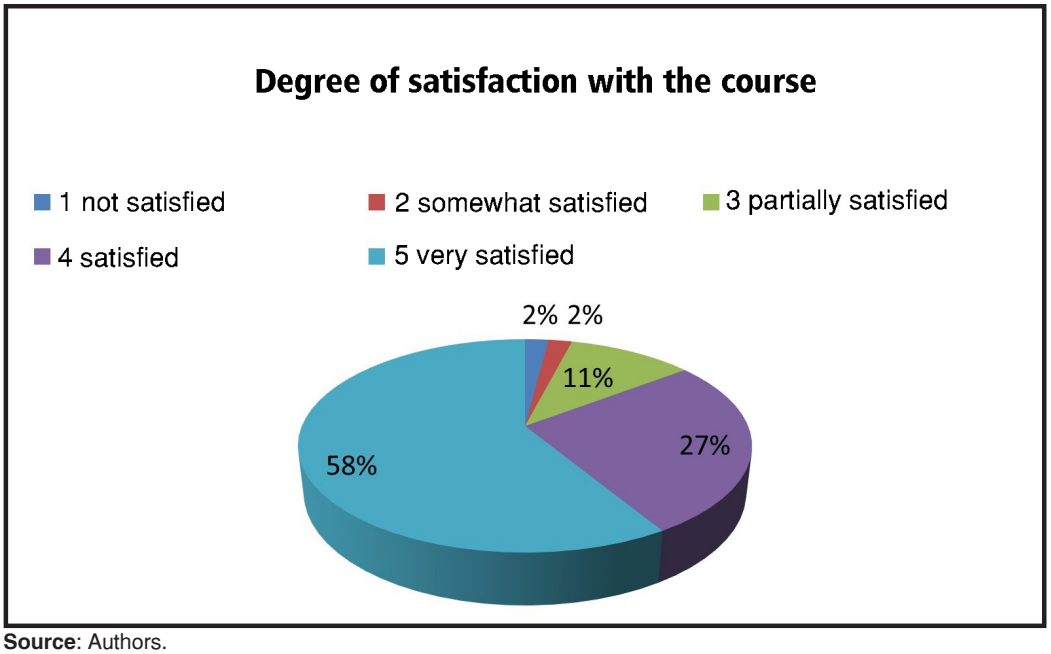


Source: Authors.

New forms of evaluation are needed that make it possible to study the effectiveness of courses. The performance evaluation has a relevant effect in the sense of identifying to what extent the course is being effective (GOMES *et al.* 2020). Considering that the study aims to evaluate the opinion of the student who took the course and who, according to the results, will be able to assist in the curricular review of the training course that will instruct the adequate care of the population in scenarios of emergencies and disasters in collective health in the DQBR airline and can be used to support important safety factors and protocols for transporting patients who are victims of these agents.

Graph 4 shows the degree of satisfaction with the course taken, with 1 = not satisfied and 5 = very satisfied.

Graph 4 - Degree of satisfaction with the course.



Source: Authors.

A total of 58% of students consider themselves very satisfied with the course they took; 27% are satisfied; 11% partially satisfied; 2%, somewhat satisfied; and 2%, not satisfied. Although the majority declared satisfaction with the course, it is up to the assessment of the dissatisfaction factors of these students and a better structuring of the course, seeking excellence in this type of training.

For Bordin *et al.*, 2016, the evaluation of students' satisfaction with the course is a fundamental element for institutional effectiveness, as it allows the institution to understand its interaction with students and also helps in the restructuring of its curricular matrix, always with a view to adapting to students' needs.

In a study carried out with students, questions related to instructor training, content layout, use of appropriate and didactic methodologies led to greater satisfaction or dissatisfaction (HIRSCH *et al.* 2015). In view of this, the importance of investing in training and technical disciplines is evident, as well as thinking about educational processes, revising the curriculum and preparing instructors as a contribution to satisfactory preparation. With the intention of using these data to guide changes to improve the course, the findings were analyzed and forwarded to the teaching section for evaluation of proposals for course adjustments.

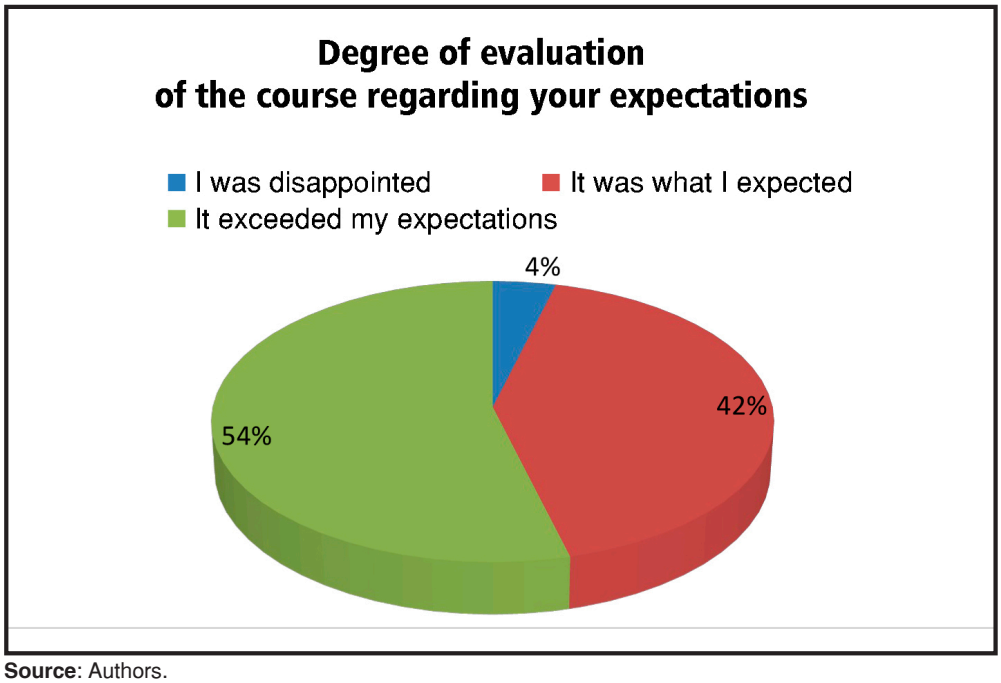
Graph 5 shows the degree of evaluation of the course in terms of expectations, with the options I was disappointed, it was what I expected or it exceeded my expectations.

Those who concluded the course had their expectations met, as this may be related to the dissemination of a good reference for the course in other units and reflect on the demand for other military personnel to take the course. Equally relevant, other data will be collected to evaluate the cases in which students were disappointed with the course.

For Hirsch *et al.*(2015), satisfaction with the course comprises the student's perception of meeting their expectations. In several studies, the investigation of course satisfaction is presented as a fundamental element in the evaluation of institutional effectiveness (Bordin *et al.*, 2016). Data like this provide, at the institute, an understanding of student-instructor interaction, which favors curricular or didactic restructuring, given the adequacy to the needs of students who will effectively participate in missions of this nature.

After the questionnaire with answers expressed by numerical values, there is an open space for suggestions and any observation that the student considers relevant. To the detriment of the importance of this space for students' suggestions and perceptions, open responses related to the development of course skills were selected and separated into groups for this research. On the other hand, responses related to praise, breaks, food or physical structure of the unit were excluded.

Graph 5 - Degree of evaluation of the course regarding your expectations.



Source: Authors.

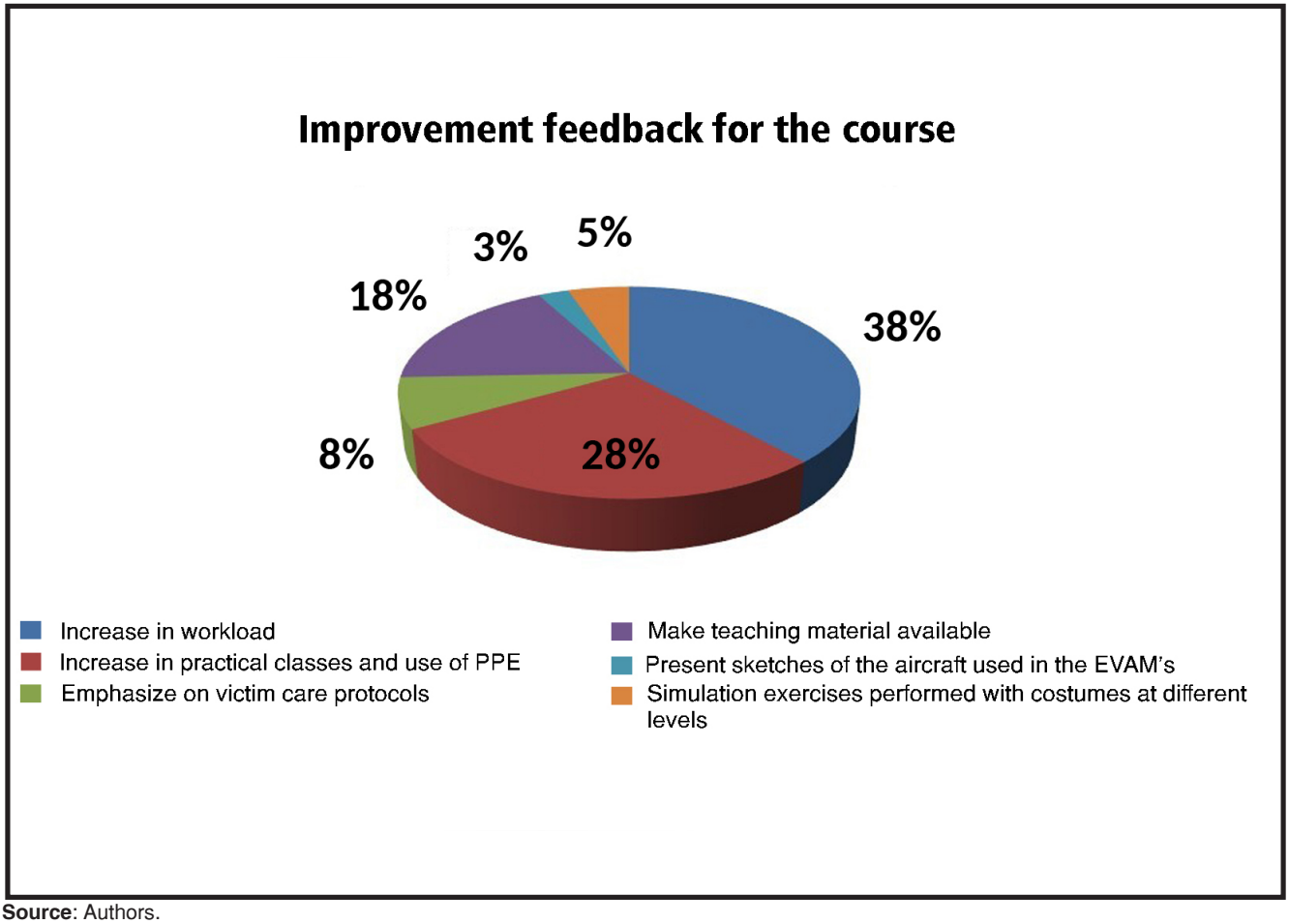
Finally, 41 suggestions for improvement and adaptations of the course were highlighted. These suggestions are divided into 6 subgroups, as shown in this Chart 6.

According to the notes for improvements, a majority of 38% requested an increase in the course load to better approach the themes, followed by the request for an increase in practical classes with complete clothing and undressing of clothing and PPE, with a total of 28%. The third most suggested item concerns the availability of didactic material, such as a handout or written material for consultation before the course or during the course, with a total of 18% of requests.

The three items that emerged emphasize care protocols for victims of disasters of this nature (8%), followed by simulation exercises with the use of different costumes (5%), allowing students to experience the use of different suits at different levels of contamination. In the least repeated item (3% of the suggestions), there was an indication to present the sketches of the aircraft used in EVAM.

Studies about the opinion of students about courses taken have provided important discoveries that aim to facilitate the process of curricular and didactic improvement, by pointing out weaknesses in teaching. Considering the specificities of training in CBRN, it is imperative to use the notes as a tool in the routine review of the course. These results were forwarded to the teaching section for evaluation of proposals for course adjustments and revision of the curriculum. The demands that arise from this interaction provide a better understanding and service to the needs of the military who act in situations of this nature. The data contained in graph 6 highlight that the practical approach is well accepted by students and the use of materials can contribute to the teaching and learning process. The proposal to increase the workload and reference materials, presented for due consideration, will guide the organization of goals for the teaching section.

Graph 6 - Suggestions for improvements and adaptations of the course.



Source: Authors.

3 CONCLUSION

This work aimed to describe how the current training of the health team in BNQR defense in the FAB takes place. The data found were tabulated and forwarded to the management section related to teaching at IMAE in order to propose the improvement of training. The training of the military with this theme has been shown to be effective, in order to provide these military with the construction of knowledge and the establishment of the correlation between theory and practice, therefore able to act in a real situation.

The mapping also identified emphasis on more robust qualification/training strategies, considering the students' perception after the course, during the evaluated period. It is believed that better teaching standards can be achieved based on the opinion of those who have experienced or who are obtaining training in the FAB, which will lead to adequate preparation for responses in emergency and disaster situations involving CBRN agents, especially in regard to the quality and safety of care, and also the safety of the members of the health teams involved.

As already discussed, in view of major events, it was determined that the FAB would act as a reference in the transport of victims of CBRN agents. Considering the aforementioned examples, we believe that the training of health squadrons, linked to the transport of patients and hospitals that are able to receive them, is of great interest for the effective performance of the Force in missions of this nature. To this end, the evaluation of the courses may help in the revision of the CCS-DQBRN curriculum, which is carried out by IMAE, thinking about complementing the knowledge that meets the formation of the necessary skills, as evidenced by the activities that have been carried out.

Preparing for the correct performance in a CBRN event preserves the lives of everyone involved in the mission - military personnel, teams that make up a disaster scenario, victims and the general population - and avoids the loss of resources. For this capacity to be achieved, it is necessary to invest in education and training of personnel for this scenario.

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