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Wisma Atlet Kemayoran COVID-19 Hospital as the Biggest COVID-19 Hospital in the World. A Lesson Learned in the COVID-19 Pandemic Response in the Greater Jakarta (Indonesia)


B. Yura Rimba¹, T. Nurrobi². INDONESIA

Abstract

Background: Before the pandemic, Indonesia, especially the Indonesia Defense Force or TNI, actively participated in international activities (prevent, detect and response) as well as pandemic TTX and FTX simulations. This makes Indonesia more prepared to face COVID-19. One manifestation of the TNI’s role in facing the pandemic is the operationalization of the Wisma Atlet Kemayoran COVID-19 Hospital. The hospital, which is under the control of the TNI Surgeon General, is a civilian-military collaboration.

Objective: to describe the government’s strategy, preparations for opening the hospital, bed capacity, bed occupancy rate (BOR), characteristics of patients and health workers, logistical support, as well as training and research at the Wisma Atlet Kemayoran COVID-19 hospital in Indonesia.

Methods: Primary and secondary data were collected and presented descriptively.

Data and Results: Preparations were made through the conversion of the apartment into a COVID-19 hospital by adding decontamination room facilities, ER, ICU, HCU, IMCU, central oxygen system, negative pressure system and oxygen generator system. The preparation time is 5 days since the President of the Republic of Indonesia orders. Initial bed capacity (n=9,162), changed until it reached its peak after the Delta variant period (n=12,619). It was recorded that there were three waves of attacks with varying numbers of patients. Where there were 5,080 patients (BOR=55.4%) in the first wave, 7,167 patients (BOR=90.8%) in the second wave and 6,092 patients (BOR=48.3%) in the third wave. 11,758 volunteers were recorded, coming from the TNI (n=2,017) and civilians (n=9,741). And a total of 132,586 patients were registered during the pandemic with the following characteristics: 131,195 hospitalizations (98.95%), 1,391 outpatients (1.05%), 127,476 confirmed (97.17%), 127,476 confirmed (97.17%), 3,100 suspects (2.36%), 619 close contacts (0.47%), 126,350 recovered (96.31%), and 475 died (CFR 0.36%). Besides, this hospital also has 518 types of training attended by 30,232 participants and 129 studies related to COVID-19. Currently the TNI, the Ministry of Health, the National Disaster Management Agency and the Presidential Executive Office working together in the process of designing Wisma Atlet Kemayoran COVID-19 hospital as a future hospital with CBRNE capabilities.

Conclusion: Indonesia, especially the TNI, has prepared itself to face a pandemic, long before there was a pandemic. COVID-19 as a manifestation of the transformation of future threats. One of the reflection roles of the TNI in the operation of the Wisma Atlet Hospital COVID-19 which is a form of civilmilitary collaboration in Indonesia. Based on total bed capacity (n=12,619), Wisma Atlet Kemayoran COVID-19 Hospital is the largest COVID-19 hospital ever in Indonesia and in the world.

Key words: Wisma Atlet, COVID-19, Hospital

Résumé


L’une des concrétisations du rôle des forces armées dans la lutte contre la pandémie a été la mise en place de l’hôpital Wisma Atlet Kemayoran. Cet hôpital, sous la direction du chirurgien général de la TNI est le fruit d’une collaboration civilo militaire.

Objectif : L’objectif de cet article est de décrire la stratégie gouvernementale, les modalités de mise en place et de soutien logistique de cet hôpital, la formation des professionnels affectés sur cet établissement, les patients accueillis ainsi que travaux de recherche menés.

Méthode : Les différentes données collectées sont présentées de manière descriptive. Données et résultats
1. Background

1.1. Indonesian National Defense Forces (TNI) Readiness in Facing the Pandemic

Prior to the COVID-19 pandemic, Indonesia, including TNI, had actively participated several times in international forums on the Global Health Security Agenda (GHSA) which included prevent, detect and respond activities, such as becoming chairman of the GHSA Troika (2016), Lead Country for Action Package Zoonotic Disease (Prevent-2) and Contributing Country for Action Package Anti Microbial Resistance (Prevent-1) and Real-Time Surveillance (Detect-2). In addition, TNI was the chairman of the International Committee of Military Medicine (ICMM) in 2015-2017. Until finally in 2019 the government issued the National Action Plan for Health Security (NAPHS) and Presidential Instruction No. 4/2019 on Enhancing Capabilities in Preventing, Detecting and Responding to Disease Outbreaks, Global Pandemics and Nuclear, Biological and Chemical Emergencies.¹

Indonesia has also conducted several pandemic simulations in the form of Table Top Exercise (TTX) and Field Training Exercise (FTX) in several areas such as Bali (2008), Makassar (2009), Purwakarta (2014), Jakarta (2016), Tangerang (2017) and Jakarta (2017). Meanwhile, the Indonesian Medical Association (IDI) in 2017 declared doctors as Agents of Defense. With Indonesia’s participation in several international forums and pandemic simulations in several regions, Indonesia’s preparedness for the pandemic has increased.³

In addition, in order to meet the shortage of military doctors, the TNI has increased the recruitment portion to 200 health workers each year through the Regular and Special Career Officer Recruitment for Health Personnel route, so that the number of health workers has increased to 10 times the previous portion. In addition, since 2020 the Republic of Indonesian Defense University (RIDU) has opened Military Medicine and Military Pharmacy Faculties which accept 75 and 25 student cadets respectively each year.²³

1.2. Threat Transformation

COVID-19 pandemic is a global biological threat. It is also the worst pandemic in the last ten years after the influenza pand-

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³ Physician member of Indonesian Physician Association (IDI) declared themselves as the Agent of Defense.
demic due to H1N1 virus in 2009, which affects 210 countries. COVID-19 was categorized as one of the worst pandemics that have ever happened in the world. According to Anthony Fauci MD, the Director of National Institute of Allergy and Infectious Disease (NIADD), COVID-19 is the biggest pandemic in the United States in the last 100 years, even worse than Spanish Flu.

Modernization and globalization as an effect of the development of science and technology is a double-edged sword. Several science and technology advancements that greatly affected modernization and globalization including the founding of computer, internet, social media, digital technology, molecular biology technology, etc. Modernization and globalization may induce threat transformations both directly and indirectly. Indirectly, modernization and globalization may caused unusual events which will ultimately incite threat transformation. Examples of events happening in another countries including the attack of Anthrax mail (2001), the attack in 11th September (2001), and COVID-19 pandemic (2019). On the other hand, unusual events happening in Indonesia including Bali Bombing (2002) and Aceh Tsunami (2004). Threat transformation may trigger hypotheses of the next generation of science and technology development.

It cannot be denied that even though there are conventions for Chemical Weapons, Bioweapons and Nuclear Weapons, the use of biological agents has the potential for dual uses. On the one hand it is a welfare, but on the other hand it can also be a warfare which can become a bio-asymmetric threat or a bio-cyber threat leading to a 4th or 5th generation war.

1.3. COVID-19 Pandemic in Indonesia

COVID-19 has spread swiftly in 229 countries around the world since the end of 2019, including Indonesia. The World Health Organization (WHO) has declared this outbreak to be caused by a novel coronavirus in January 2020, followed by the naming of the disease COVID-19 (Coronavirus Disease 2019) on February 11th 2020, then WHO declared a Public Health Emergency of International Concern (PHEIC) on January 30th 2020, and finally declared a Pandemic on March 11th 2020. In Indonesia, the first cases of COVID-19 were reported in early March 2020. Since the COVID-19 pandemic began until early January 2023, there have been six waves of attacks in the world and five waves in Indonesia. However, in the same period, there were more than 670 million cases of COVID-19 globally, of which more than 6 million were reported in Indonesia. Of these, more than 6 million deaths were reported worldwide (CFR=1.003%) and more than 160,000 nationally (CFR=2.39%).

1.4. Indonesia’s Strategy to Fight COVID-19

Since the inception of COVID-19 pandemic in Indonesia, the Indonesian government declared a war against the pandemic and publicized three main strategies with the aim to reduce the spread of COVID-19. The strategy is a crystallization of the prevent, detect, and respond against the COVID-19, a concept of Global Health Security. The three strategies consisted of: (1) changing public behaviour so that public may do 3M on a regular basis, an Indonesian anecdote which stands for Memakai masker (facial mask wearing), Mencuci tangan (regular hand washing), and Menjaga jarak (social distancing); (2) prevent, detect, and respond by conducting 3T which stands for testing, tracing, and treating; and (3) achieving herd immunity by aiming to vaccinate at least 70% of the population. Geographically, the fights was in Indonesia’s favor since Indonesia is an archipelago, and thus the seas and water bodies may act as a physical barrier for social distancing. It was hypothesized as the basis of why COVID-19 cases in Indonesia were concentrated in Java and Bali, two of the islands with the highest population density in Indonesia, compared to other islands. On the other hand, Indonesia as a tropical country has a warmer temperature compared to other sub-tropical countries, aiding the reduction of COVID-19 spread. In addition, Indonesia governors have declared the limitation of mobility, known as Pemberlakuan Pembatasan Kegiatan Masyarakat (PPKM).
Indonesia’s government’s strategic implementation to the general public was based on the collaboration of five elements arranged and known as the Pentahelix Model. Collaboration in the Pentahelix Model was based on the cooperation between the government, private sector, academics, mass media, and public. The government was comprised of four pillars: the central government, military, police, and regional government. The commencement of events involving the pentahelix elements involved the military at the core and was thus coined as civil-military collaboration.

1.5. Civil-Military Collaboration in Fighting COVID-19
According to the Republic of Indonesia (RI) Law No. 34 Year 2004 about the TNI, the TNI is the main component of Indonesia’s defense. It is also responsible for protecting Indonesia’s integrity based on the Pancasila and Undang-Undang Dasar Negara Republhek Indonesia Tahun 1945. The TNI is also responsible for protecting the fundamental component from threats to the sovereignty of the Indonesian Republic. Thus, the military will respond to any threats, especially to the ones that immediately threaten Indonesia’s sovereignty. Based on Indonesia’s White Book of Defense 2014, there are three types of threats: 1) military, 2) non-military, and 3) hybrid. All threats may be classified as real or unreal threat. COVID-19, which was previously categorized as an unreal threat, is now categorized as a real biologic threat. In other words, a threat transformation from a non-biologic into a biological threat has happened.

According to the RI Law No. 24 Year 2007 about Disaster Reliefs, Badan Nasional Penanggulangan Bencana (BNPB) as a national disaster management agency was responsible for leading and coordinating disaster relief activities (for natural, nonnatural, and social disaster) at a national level. In every disaster, BNPB will be supported by the TNI. However, the TNI may also support BNPB in a local and regional disaster relief attempts. The Pentahelix Model involving the military as the governmental element has been long used in Indonesia’s disaster relief approach. In other words, civil-military combination has been present in every Indonesia’s disaster relief attempts, including the COVID-19 pandemic.

1.6. Role of the TNI in COVID-19 Pandemic in Indonesia
Since the COVID-19 pandemic in Indonesia, the TNI, in collaboration with the five elements of Pentahelix has played several roles: 1) to evacuate Indonesian citizens (WNI) or Indonesian citizens from Wuhan / foreign countries, 2) to limit community mobility through “micro” PKM, 3) to test and trace people who have a history of close contact with COVID-19 patients, 4) quarantine of foreign travelers, 5) centralization of COVID-19 patients, 6) distribution of nine necessities and COVID-19 medicines, 7) treating COVID-19 patients in 110 military hospitals and 3 COVID-19 emergency hospitals including Wisma Atlet COVID-19 Hospital, 8) vaccinating the public, 9) 42 TNI provided more than 27,000 Military Village Supervisory Officer (Babinsa) and 10,000 vaccinators.

1.7. The Wisma Atlet Kemayoran as a COVID-19 Hospital
The “Wisma Atlet Kemayoran” was initially built to accommodate the athletes of the 2018 Asian Games in Jakarta, Indonesia. It can accommodate 24,000 athletes. However, after the event, Wisma Atlet was no longer used. There are two Wisma Atlet located in Kemayoran and Pademangan sub-districts. The location of two buildings is very close to each other. There are a total of ten towers divided into seven towers in Kemayoran and three towers in Pademangan. However, the two Wisma Atlet are better known as Wisma Atlet Kemayoran. When the first case of COVID-19 was reported in Indonesia, the President of the Republic of Indonesia ordered the Wisma Atlet Kemayoran to function as a COVID-19 hospital. The project is an extraordinary project, many parties collaborated to renovate the apartment into a COVID-19 hospital by reorganizing several rooms functions become Decontamination Room (DR), Emergency Room (ER), Intensive Care Unit (ICU), High Care Unit (HCU), Intermediate Care Unit (IMCU), as well as adding several systems such as Central Oxygen System, Negative Pressure System, and Oxygen Generator System. Five days after the President’s order, on March 23rd, 2020, the Wisma Atlet Kemayoran COVID-19 Hospital was operating to treat COVID-19 cases from Greater Jakarta region (Jakarta-Bogor-Depok-Tangerang-Bekasi, or known as Jabodetabek). At the time of the Delta variant surge, the Bed Occupancy Rate (BOR) reached 90.8%. Consequently, the hospital management increased the bed capacity of Wisma Atlet Kemayoran to 12,493. This figure makes Wisma Atlet Kemayoran the largest COVID-19 hospital in the world.

2. Objectives
This article describes the preparation, bed capacity, Bed Occupancy Rate (BOR), patient characteristics, health workers, logistical support, training, research and future planning of the Wisma Atlet Kemayoran COVID-19 Hospital in Indonesia. Other roles of TNI in dealing with the COVID-19 pandemic, such as PKM and vaccination, will be discussed on another paper.

3. Methods
Primary and secondary data from March 2020 to December 2022 were collected from the Wisma Atlet Kemayoran COVID-19 Hospital and presented descriptively.

4. Data, Analysis, and Results
4.1. Preparation and Management
The preparation of Wisma Atlet Kemayoran COVID-19 Hospital is carried out by reorganizing the “Wisma Atlet Kemayoran” apartment building into a COVID-19 hospital by adding the following facilities: a decontamination room, ER and ICU, HCU, IMCU, Central Oxygen System, Negative Pressure System and Oxygen Generator System. There are seven buildings located in Kemayoran and three buildings located in Pademangan. The preparation time required was five days since the President of Indonesia ordered to do so. The Wisma Atlet Kemayoran COVID-19 Hospital, according to the Minister of Health of the Republic of Indonesia, is a field emergency hospital, meaning that the hospital comes
from a building that is converted into a hospital and operated during a disaster emergency response period.\textsuperscript{44} The President appointed the TNI Surgeon General (SG) as a coordinator of this COVID-19 hospital. Thirty coordinators are working under the control of the TNI SG. These coordinators oversee thousands of volunteers who work as a form of civilmilitary collaboration. A strategy is needed to unite the vision and mission of thousands of volunteers by making the volunteers united in one vision. That way, the spirit of esprit de corps and a sense of fellowship will be created between the volunteers.\textsuperscript{52}

4.2. Bed Capacity and BOR

The bed capacity developed from the beginning (n=9,162), then changed in the Delta variant period (n=7,394) and after the Delta variant period (n=12,493). There were three attack waves with variations in the number of patients treated. There were 5,080 patients admitted (BOR=55.4%) in the first wave, 7,167 patients (BOR=90.8%) in the second wave, and 6,092 patients (BOR=48.3%) in the third wave. The peak of COVID-19 cases at Wisma Atlet Kemayoran occurred in the second wave on June 30\textsuperscript{st}, 2021. Caused by the Delta variant. Most Delta variant cases are moderate and severe, so many deaths occurred during this period. Meanwhile, when the Omicron variant occurred in the third wave, although the number of cases in the population was higher than the Delta variant, the number received at Wisma Atlet Kemayoran was not too many. That is because most of the symptoms of Omicron variant cases are mild, and they only need to do self-isolation at home. Of the ten towers, only six towers (towers 4, 5, 6, 7, 8, and 9) are used to isolate COVID-19 patients. At the same time, the other four towers (towers 1, 2, 3, and 10) are used for volunteer accommodation. Of the six towers used for isolation, tower six was remodeled into an Emergency Room (ER), Intensive Care Unit (ICU), High Care Unit (HCU), and Intermediate Care Unit (IMCU). In addition, tower six is equipped with a Central Oxygen System, Negative Pressure System, and Oxygen Generator System. Details of the total bed capacity are described in Table 1.

Figure 6. Daily bed occupancy graphic of the Wisma Atlet Kemayoran COVID-19 Hospital from March 2020 to December 2022.

Table 1. Bed capacity of Wisma Atlet Kemayoran COVID-19 Hospital

<table>
<thead>
<tr>
<th>No</th>
<th>Location</th>
<th>Bed Capacity</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Room (IGD)</td>
<td>30</td>
<td>0.24</td>
</tr>
<tr>
<td>2</td>
<td>Intensive Care Unit (ICU)</td>
<td>39</td>
<td>0.31</td>
</tr>
<tr>
<td>3</td>
<td>High Care Unit (HCU)</td>
<td>44</td>
<td>0.35</td>
</tr>
<tr>
<td>4</td>
<td>Intermediate Care Unit (IMCU)</td>
<td>13</td>
<td>0.10</td>
</tr>
<tr>
<td>5</td>
<td>Tower 4</td>
<td>2,236</td>
<td>17.72</td>
</tr>
<tr>
<td>6</td>
<td>Tower 5</td>
<td>2,150</td>
<td>17.04</td>
</tr>
<tr>
<td>7</td>
<td>Tower 6</td>
<td>1,651</td>
<td>13.08</td>
</tr>
<tr>
<td>8</td>
<td>Tower 7</td>
<td>2,262</td>
<td>17.93</td>
</tr>
<tr>
<td>9</td>
<td>Tower 8</td>
<td>1,542</td>
<td>12.22</td>
</tr>
<tr>
<td>10</td>
<td>Tower 9</td>
<td>2,652</td>
<td>21.01</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>12,619</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 7. The corridor of ICU of the Wisma Atlet Kemayoran COVID-19 Hospital

Figure 8. Negative pressure ICU of the Wisma Atlet Kemayoran COVID-19 Hospital

Some countries have COVID-19 hospitals, but their bed capacity does not exceed bed capacity of Wisma Atlet Kemayoran COVID-19 Hospital.
4.3. Patient Characteristics

There were 132,586 patients treated from March 2020 - December 2022, consisting of 131,195 inpatients (n=98.95%) and 1,391 outpatients (n=1.05%). Wisma Atlet Kemayoran is mainly for treating mild COVID-19 cases. The ICU, HCU, and IMCU used for treating moderate and severe patients are only used as transitional ICUs or waiting to be transferred to other higher facilities. The characteristics of hospitalized patients are described in Table 2.

Table 2: Characteristics of patients admitted to the Wisma Atlet Kemayoran COVID-19 Hospital

<table>
<thead>
<tr>
<th>No</th>
<th>Patient Characteristic</th>
<th>Amount</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A. Based on Early Assessment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Confirmed</td>
<td>127,476</td>
<td>97.17</td>
</tr>
<tr>
<td>2</td>
<td>Suspected</td>
<td>3,100</td>
<td>2.38</td>
</tr>
<tr>
<td>3</td>
<td>Close Contact</td>
<td>619</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>131,195</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>B. Based on Discharge Status:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Cured</td>
<td>126,350</td>
<td>96.31</td>
</tr>
<tr>
<td>2</td>
<td>Referred</td>
<td>1,002</td>
<td>0.76</td>
</tr>
<tr>
<td>3</td>
<td>Independent isolation</td>
<td>3,368</td>
<td>2.57</td>
</tr>
<tr>
<td>4</td>
<td>Deceased</td>
<td>475</td>
<td>0.35</td>
</tr>
</tbody>
</table>

4.4 Healthcare Workers

A total of 11,758 health workers have been registered as volunteers (taking turns) at Wisma Atlet Kemayoran COVID-19 Hospital from March 2020 - December 2022, coming from TNI (n=2,017) and civilians (n=9,741). This collaboration is the largest and longest civil-military collaboration since Indonesian Independence. All volunteers receive incentives from the state budget paid by the Ministry of Health for medical volunteers and BNPB for non-medical volunteers.

Almost 82.01% of the personnel (n=9,643) were medical volunteers. They consist of general practitioners (n=2,653), specialists (n=166), pharmacists (n=189), nurses (n=4,382), assistant pharmacists (n=317), public health practitioners (n=444) and other health workers (n=1,492). General practitioners (22.56%) and nurses (37.27%) are the most volunteers in Wisma Atlet Kemayoran COVID-19 Hospital. In contrast, 17.99% of the total personnel (n=2,115) are non-medical volunteers who primarily work in administration.

Regarding the readiness of Health Workers to increase their capacity to deal with the surge in COVID-19 cases, Wisma Atlet Kemayoran COVID-19 Hospital has prepared a contingency plan by determining the number of personnel for each profession following the Workload Analysis (WLA) for each additional number of patients.

4.5 Logistics Support

Logistics are divided into general logistics and medical logistics. General logistics include food, stationery, and electronics. In comparison, medical logistics include medical equipment (ventilators, patient monitors, central oxygen, oxygen generators, etc.) and medical supplies (medicines, reagents, Personal Protective Equipment or PPE, etc.). General logistics are supported by BNPB, while BNPB and the Republic of Indonesian Ministry of Health support medical logistics. The budget for both lo-
4.6. Training and Research
In addition, there were 518 types of training attended by 30,232 participants from various backgrounds and 129 studies related to COVID-19 at Wisma Atlet Kemayoran COVID-19 Hospital. This training was initially intended for new volunteers who had just graduated from a bachelor’s or diploma program and had not received training before, but to date, not only new volunteers have participated in the training. Training for physician (57.53%) and patient safety topics (86.87%) were the most common.

Researchers can come from internal or external Wisma Atlet Kemayoran COVID-19 Hospital. Most research topics are about COVID-19 diagnosis (42.64%). However, most are still in progress (55.81%).

4.7. Future Planning
As the COVID-19 pandemic in Indonesia right now seems to move to the endemic phase, Wisma Atlet Kemayoran COVID-19 Hospital has prepared for entering the end state. Some activities have been provided since early of January 2023, such as work force reduction as well as reducing the use of towers from ten become one tower only (tower 6 only). In line with the analysis of the transformation of threat, that CBRNE threats will become more common in the future, currently the TNI, the Ministry of Health, the National Disaster Management Agency and the Presidential Executive Office working together in the process of designing tower 6 of Wisma Atlet Kemayoran COVID-19 Hospital as a future hospital with CBRNE capabilities and operated by TNI.

5. Conclusion
There is currently a threat transformation from non-biological threats to biological threats. Based on the number of bed capacity (n=12,619), Wisma Atlet Kemayoran COVID-19 Hospital is the largest COVID-19 hospital ever in Indonesia and the world. Staffed by 11,758 health workers from both military and civilian, it treated a cumulative 132,586 patients and reached a peak of 7,167 inpatients (BOR=90.8%) during the second wave. However, the CFR was very low (CFR=0.36%).

Conflict of Interest
There are no conflicts of interest declared by the authors, both financial and personal relationships, with any of the departments associated with this article.
Tabel 5. List of Trainings in Wisma Atlet Kemayoran COVID-19 Hospital based on Participant Backgrounds and Topics

<table>
<thead>
<tr>
<th>No</th>
<th>Training</th>
<th>Amount</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Physician</td>
<td>298</td>
<td>57.53</td>
</tr>
<tr>
<td>2</td>
<td>Nurse</td>
<td>82</td>
<td>15.83</td>
</tr>
<tr>
<td>3</td>
<td>Public Health Practitioner</td>
<td>71</td>
<td>13.12</td>
</tr>
<tr>
<td>4</td>
<td>Others</td>
<td>12</td>
<td>2.32</td>
</tr>
<tr>
<td>5</td>
<td>Multi-professional</td>
<td>105</td>
<td>20.27</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>518</td>
<td>100</td>
</tr>
</tbody>
</table>

Tabel 6. List of Research Conducted in Wisma Atlet Kemayoran COVID-19 Hospital Based On the Topics and Progress

<table>
<thead>
<tr>
<th>No</th>
<th>Research</th>
<th>Amount</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COVID-19 Diagnostic</td>
<td>55</td>
<td>42.64</td>
</tr>
<tr>
<td>2</td>
<td>COVID-19 Therapy</td>
<td>36</td>
<td>27.90</td>
</tr>
<tr>
<td>3</td>
<td>Hospital Management</td>
<td>36</td>
<td>28.46</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>129</td>
<td>100</td>
</tr>
</tbody>
</table>

Acknowledgments
The authors would like to thank the President of the Republic of Indonesia, the Minister of Health of the Republic of Indonesia, the Minister of Finance of the Republic of Indonesia, the Minister of Public Works and Housing of the Republic of Indonesia, the Minister of State-Owned Enterprises of the Republic of Indonesia, the Commander in Chief of the Indonesian Defence Forces, the Chief of the Indonesian National Police, and the TNI Surgeon General as the coordinator of the Wisma Atlet Kemayoran COVID-19 Hospital and his staff.

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MAJOR GENERAL (Ret.) Ben YURA RIMBA

Major General (Ret.) Dr. BEN YURA RIMBA, MD. MHA, former Surgeon General of the Indonesian Defense Force / TNI (2015-2019). He joined his first Officer Basic Training Course in 1988 after graduation as a Medical Doctor from North Sumatera University and received his initial appointment as a Battalion Doctor at the Army Strategic Command.
He served several years in the Army Strategic Command and in Special Force and finished his master degree in Hospital Administrative Management in 2000 from University of Indonesia and his Army Staff and Command Collage in 2004.
He joined number of missions as well as operations to East Timor, Irian Jaya, and as a peace keeper in Bosnia Herzegovina in 1994, also as the commander of the humanitarian assistance mission in Philippines in 2006 and in Shecuca, China, in 2008.
He finished his Scuba Diver, Airborne Courses, a course on Narcotics and Drugs, and a Strategic Leadership Course in the United States and so many seminars, workshops in many countries.
MG Ben’s awards include the Seroja, Rakasta Dharma and Santi Darma medals; Loyalty Medals of VIII, XVI, XXIV years in service; and the UN Medal. He also wears the Military Medical Qualification Tab, along with the Airborne and Indonesian Parachute as well as Scuba Diver Wings. He also awarded a Honorary Aviation Medicine Wing from Indonesian Air Force and parachutist Wing from Royal Thai Army.
MG Ben also one of the founder of the Indonesia Defense University. Before his appointment as a TNI General he was Director of Medical Service at Ministry of Defense. He was also as TNI Commander in Chief’s Special Staff for Health Security Affair (2019-2022) and Supervisor of Wisma Atlet Kemayoran Covid-19 Hospital (2020-2022).
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Validation of a typology for Civil-Military activities during the Covid-Pandemic

Validation d’une typologie des activités civilo-militaires pendant la Covid-Pandémie

M. C. M. Bricknell1, UNITED KINGDOM

Summary

The COVID pandemic has been the biggest threat to the health and security of the global population in the 21st Century. This caused a significant impact on military activities and required substantial changes to military health systems. Furthermore, armed forces played a major role in general support to governments’ responses to the crisis and made noticeable contributions to supporting national health and social care systems. This paper presents a typology for categorising these military activities based on multiple international case examples, including a review of papers from the International Review of Armed Forces Medical Services. This typology could be used to analyse the impact of COVID on military capability and the breadth of activities undertaken by an individual country’s armed forces in support of national crisis response. This would enable a detailed comparison between countries to facilitate lessons learned and the residual military requirements to mitigate future global health emergencies.

Key Words: Public health, Civil-military relations, Health emergencies

Résumé

La pandémie de COVID est la plus grande menace survenue au 21ème siècle pour la santé et la sécurité de la population du monde. Elle a eu un impact significatif sur les activités militaires et a conduit à d’importants changements dans l’organisation des systèmes de santé militaires. Par ailleurs, les forces armées ont joué un rôle majeur pour appuyer les réponses des gouvernements à la crise et ont apporté des contributions notables au soutien des systèmes nationaux de santé et de protection sociale. Cet article propose, à partir de nombreux exemples internationaux, y compris grâce à un examen des articles parus dans la Revue Internationale des Services de Santé des Forces Armées, une typologie permettant de catégoriser ces interventions militaires. Cette typologie pourrait permettre une analyse de l’impact de la COVID sur les capacités militaires et l’ensemble des activités assurées par les forces armées d’un pays donné pour soutenir la réponse nationale à une crise de ce type. Cela rendrait possible d’effectuer ainsi une comparaison détaillée selon les pays et ainsi de tirer les enseignements utiles concernant les besoins militaires nécessaires à l’atténuation de l’impact de futures urgences sanitaires mondiales.

Mots-clés : Santé publique, Relations civilo-militaires, Urgence sanitaires

Introduction

The West African Ebola crisis of 2014 has been widely cited as the transformative moment from which the role of militaries in global health emergencies could be considered as an integral part of mitigation rather than an option of last resort14. Countries’ armed forces have been a central component of government’s national responses to the COVID crisis since 20201. Roles for armed forces have evolved during the pandemic from supporting lockdowns, through testing and tracing of COVID cases, augmenting hospital capacity, to assisting national vaccination programmes. Civil-military relations during the COVID pandemic have varied between countries, including some concerns about the relationship between military and police forces in some countries in the imposition of restriction of movement measures on national populations55.

As countries return to pre-pandemic societal behaviours, the debate over lessons from the COVID pandemic is beginning to emerge. This includes a reflection on the impact of the COVID pandemic on armed forces and the implications of their role as part of the national response to mitigate future threats to global health security. It will be important to include international perspectives alongside national analyses that concentrate on the specific context of the crisis within their own countries5. The World Health Organisation has recently published a guidance document on civil-military health collaboration for strengthening health emergency preparedness7. This covers high-level suggestions for mechanisms of civil-military collaboration. It will also be important to examine the detail of the impact of the COVID crisis on armed forces, the means to mitigate health threats on military capability, and the potential capabilities of the military to augment civilian responses. This requires a common typology to classify such activities.

1Professor of Conflict, Health and Military Medicine
Conflict and Health Research Group
School of Security Studies King’s College London
A typology is an approach to classifying a set of multidimensional items based on conceptual differences and is widely used in social sciences research. Examples might be types of political systems or methods of education. This compares to the term, taxonomy, that classifies items based on observable and measurable characteristics and is widely used in biomedical sciences. Examples are the classification of species or types of diseases. For this research, the term typology is most appropriate as the types of military activities are derived from a conceptual understanding of military capabilities and then tested through observed evidence. The term and definition for each activity should cover each unique military task and discriminate between activities. The final typology can be used to classify the activities undertaken by a particular country and this can be compared to other countries. Such analysis can be used to determine the policy requirement for the range of military capabilities that could be used in the response to future health emergencies.

We conducted two of comparative analyses of the military contribution to national responses to the COVID crisis. Our first study looked at media reports in Spring 2020 from a small sample of European countries. The second study, conducted in Summer 2020, expanded the analysis to include key non-European countries. We published a theoretical typology civil-military medical co-operation during the COVID crisis in May 2021. This paper describes an expanded typology to cover all military activities in support of the response to the covid crisis and an assessment of its validity. The content of the paper was presented at the 44th World Congress of Military Medicine in Brussels in September 2022.

Method

This project was divided into 2 parts: the creation of a typology; and subsequent testing of the typology by collating activities reported by multiple countries' armed forces from a variety of sources. For the first part, we reviewed the academic literature, grey publications, and our previous classifications of military activities during the COVID crisis to create a working draft for the typology. This is divided into 4 high level groupings: maintaining military capability; protecting the health of the armed forces and beneficiaries of military health systems; generic military assistance to the national crisis response; and specific military assistance to the national health and social care response. The full typology with definitions is shown at Tables 1-4.

The first grouping, maintaining military capability, records the impact of COVID infections on military activities and the adoption of new ways of working to protect the health of members of the armed forces. It was inevitable that military personnel would become infected with COVID. Some aspects of military service might increase the risk; especially living in close barracks accommodation, field training exercises, or international duties working with partners from highly infected areas. There was an additional risk from exposure during COVID response duties. This grouping intended to record the impact of this risk through reductions in specific military activities and the mitigation measures taken to enable critical military activities to happen. The second grouping, protecting the health of the armed forces and beneficiaries of military health systems, captures the activities undertaken by military health services to provide advice to the military leadership, armed forces personnel and civilian beneficiaries of the military health system. Like changes in wider national health systems, it also records the adaptations in clinical services for these patients. The third grouping, generic military assistance to the national crisis response, lists military activities that supported general aspects of national crisis response that were not specifically in support of health services. These activities reflect the generic capabilities of the armed forces that might be used in support of the response to any civil emergency or disaster.

The fourth grouping, specific military assistance to the national health and social care response, covers all activities that were directed at supporting these services. These include supporting the leadership and management of the whole system, support to the logistics of health commodities, support to community care, and support to the hospital care. The latter two subgroups are organised according to the 'care pathway' approach described in our previous paper. Community care covers prevention (public health communication, testing, tracing, vaccination), community health and social services, medical transport (ambulances, aeromedical evacuation aircraft and rail movement of patients), and recovery or mortuary services. Hospital care covers all forms of assistance to the capacity of the civilian hospital system including personnel augmentation, temporary conversion of other buildings, and use of military field hospitals. It also looks at how the military might support specific areas of hospital services including diagnostics.

The second part of the project tested this typology by reviewing a range of reports on the activities of armed forces and military health services during the COVID pandemic and extracting each activity onto the typology. The purpose of this was to confirm that the typology listed an activity described in each report and to ensure that the typology covered every activity reported. We sought secondary information on the roles of a country's armed forces during the COVID crisis from sources that aggregated primary data from an authoritative range of data such as media reports or official information from a government institution (primarily the Ministry of Defence). Sources chosen included all those cited as references to this paper, our previous analyses, a search of papers from the International Review of the Armed Forces Medical Services, official reports, and briefings by senior military representatives at conferences or other public activities. The selection of sources was intended to provide information from a range of heterogeneous countries that spanned political and military culture, geographic region, size of population and armed forces, and approach to management of the COVID crisis. Only English language sources were used. The full list of sources and countries covered is shown at the end of the paper. Each source document was reviewed, and the country three letter abbreviation was added to the row in Tables 1-4 for each activity reported. This process also refined the content of the typology by adding new activities to the working draft. No activities were deleted from the theoretical construct of the typology.

Results

The purpose of this study was to validate the typology of civil-military activities during the COVID pandemic by detecting reports of activities undertaken by armed forces in response to the COVID crisis. The full typology with reported activities for each country is at Tables 1-4. The selection of countries was intended to provide the maximum chance of detecting any activity,
recognising the differences between countries on political and military culture, geographic region, size of population and armed forces, and approach to management of the COVID crisis. Overall, there is a record of at least one country undertaking an activity listed except for a small number of activities under the grouping ‘specific military assistance to the national health and social care response’ shown in Table 4. The tables show many activities that were undertaken by several countries. This provides confidence that these categories record actual activities. These tables are not an authoritative list of every activity undertaken by an individual country because no source was an assured compilation of formal records from a national Ministry of Defence. One source, the UK House of Commons Defence Committee review provides an example of the type of list that could be an authoritative national list. It cited the list of all activities undertaken by the UK Armed Forces provided by the UK Ministry of Defence but this information was provided in mid-2020 and therefore did include information up to the end of the military commitment in early 2022. It would be necessary to complete the tables using official data after the disbandment of national military COVID taskforces to ensure the record was complete for any individual country.

Maintaining Military Capability. Table 1 provides a list of military activities that were recorded as being affected by the COVID pandemic on military personnel, or measures taken to mitigate the impact. It was inevitable that the threat of COVID or actual cases would reduce military activity. There were attempts to hide the true impact on the grounds of national security with many countries and international alliances claiming that key military functions to maintain national security were unaffected. Very few countries provided public data on the number of COVID cases in their armed forces. Military operations were curtailed, rotations of forces delayed, individual training stopped, field exercises cancelled, recruiting halted and reaction forces reduced. There were significant outbreaks of COVID in military units. These were most public on naval ships or submarines but also occurred in military barracks and recruit training centres. Additionally the assignment of military personnel to COVID support tasks removed them from normal military training. Most armed forces adopted new ways of working that reflected changes in wider employment by maximising working remotely and introducing digital tools for collaboration.

Protecting the health of the Armed Forces. Table 2 shows the activities undertaken by military health services to support the protection of the health of armed forces personnel and the beneficiaries of the military health system (e.g. families and retirees). It was inevitable that there would be an additional demand on military medical personnel to provide advice to the ‘executive’ (military leadership at every level in the chain of command) and health communications to military personnel and wider groups supported by the military. In many countries this included new websites and smartphone applications. Some armed forces provided assistance to quarantined personnel or personnel infected with COVID in their homes, or designated specific military accommodation as ‘COVID’ hotels for personnel whose primary home was barracks. Some armed forces undertook COVID testing on military personnel, whilst others relied on the wider civilian system. All military health systems had to follow the same COVID control measures to reduce the risk of transmission to other patients or healthcare staff. Some countries vaccinated military personnel against COVID within the military system, giving them priority over the general population and making it a condition of employment. Other countries vaccinated military personnel within the civilian programme on a voluntary basis, prioritised on the civilian criteria. Several countries trialled COVID therapies on military populations, gave them higher priority for specific treatments, and developed specific care pathways for military COVID patients (including services to improve recovery from COVID infections).

Generic military assistance to the national crisis response. Table 3 shows the generic military assistance to the national crisis response that was not unique to the
health emergency. These activities cover general reinforcement to the emergency capacity of government including military liaison and assignment of military personnel to crisis management teams. The armed forces general transport and logistic services assisted with the movement of people and material by land, air and sea. In common with many international emergencies, one of the first activities was a global programme to repatriate citizens from COVID affected areas, firstly from China and then from docked cruise ships. Military personnel augmented national border security services both to control the movement of migrants and to manage COVID controls at international borders. There were similar roles for the armed forces in support of the police for internal security and control of internal movement. This category covers general augmentation of internal security (3.4 Internal Security) with specific enforcement of COVID control measures being covered in Table 4. Other components of the military and security services augmented civilian capabilities in cyber security, intelligence support of monitoring of the civilian population, and strategic communications to the civilian population. These are topics that have created debate about malign exploitation of the COVID pandemic, dis-information, civil-military relations, and the erosion of individual freedoms during the crisis. Finally some countries increased international military diplomacy to reinforce existing alliances including the specific use of military medical services to provide equipment or training in support of partners’ response to the COVID crisis.

Specific military assistance to the national health and social care response. Unsurprisingly, Table 4 has the largest range of activities under the category of specific military assistance to the national health and social care response. There is at least one example of an activity in every category except: 4.2.9 post-COVID recovery care at home for civilians, 4.3.3.2 non-COVID hospital diagnostic support for civilians, and specific types of military augmentation to hospital care for civilians (4.3.3.4 Respiratory Care, 4.3.3.6 Step-down Care, and 4.3.3.8 Other COVID clinical services). These types of clinical services were needed across the hospital care pathway but no record could be found of military personnel specifically assisting civilian services to provide these. In addition to general augmentation to the government crisis response system, military personnel and military medical personnel augmented the management of the national health system. Countries invested considerable efforts in the procurement, manufacture, and distribution of health commodities, starting with personal protective equipment (PPE), then oxygen and respiratory ventilators, followed by COVID testing systems and drugs, and finally vaccinations. There are examples of armed forces being involved across the whole process including the use of military industries to create sovereign manufacture capabilities. Many countries used their armed forces to assist enforcement of COVID control measures, administer vaccinations, undertake test and tracing, provide medical support to isolated or vulnerable populations, and augment essential community health services including transport and ambulance services. The armed forces provided similar support to expand the national hospital system. Many countries with military hospitals initially assigned them as COVID hospitals and then widened eligibility to all civilian patients alongside existing beneficiaries. Armed forces supported the creation of new hospitals by adapting other buildings, deploying military field hospitals, or deploying military hospital ships. Finally, many military health professionals were assigned to augment civilian hospitals in hard pressed areas across the full in-hospital pathway of care.

Discussion

The list of activities undertaken by armed forces in Tables 1-4 show the breadth of military support to government’s response to the COVID crisis across multiple countries from different regions of the world. The data shows the value of a common typology to categorise these activities to enable comparisons between countries. It is unlikely that any specific activity is missing.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Countries</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Technical advice to the ‘executive’</td>
<td>AUS, BEL, BRA, CHN, FRA, GBR, ITA, NGA, RUS, TUN, USA,</td>
<td>Changes to routine role.</td>
</tr>
<tr>
<td>2.2 Health communication</td>
<td></td>
<td>Changes to routine role.</td>
</tr>
<tr>
<td>2.2.1 To military personnel</td>
<td>AUS, BEL, BRA, CHN, FRA, GBR, KOR, NGA, USA,</td>
<td>New messages/channels due to COVID.</td>
</tr>
<tr>
<td>2.2.2 To beneficiaries</td>
<td>BRA, FRA, KOR, NGA, USA,</td>
<td>Non-military audiences.</td>
</tr>
<tr>
<td>2.3 Self-care support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3.1 At home</td>
<td>ESP, FRA, TUN,</td>
<td>Support to self-management of COVID</td>
</tr>
<tr>
<td>2.3.2 ‘COVID’ hotels</td>
<td>BEL, ISR, TUN,</td>
<td>Designated military accommodation for COVID contacts or patients including quarantine.</td>
</tr>
<tr>
<td>2.4 COVID Testing (of beneficiaries)</td>
<td>CHN, FRA, NGA, RUS, TUN, USA,</td>
<td>Military involvement in COVID testing of military personnel of beneficiaries.</td>
</tr>
<tr>
<td>2.5 Changes to arrangements for garrison healthcare</td>
<td>AUS, ESP, FRA, NGA, GBR, TUN, USA,</td>
<td>Including video/remote consultation.</td>
</tr>
<tr>
<td>2.6 COVID Vaccinations</td>
<td>RUS, USA,</td>
<td>Administration by military to military personnel or beneficiaries.</td>
</tr>
<tr>
<td>2.7 Clinical Care</td>
<td>USA,</td>
<td>Specific COVID therapies for military cases</td>
</tr>
<tr>
<td>2.8 Recovery and Rehabilitation</td>
<td>GBR, USA,</td>
<td>Creation of clinical services to assess/treat ‘long-COVID’ patients.</td>
</tr>
</tbody>
</table>
Table 3 - Generic military assistance to the national crisis response

<table>
<thead>
<tr>
<th>Activity</th>
<th>Countries</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Government emergency management capability and capacity</td>
<td></td>
<td>Assignment of military personnel to augment non-health government command and control.</td>
</tr>
<tr>
<td>3.1.1 Military liaison</td>
<td>AUS, BRA, CAN, CHN, FRA, GBR, IDN, ITA, PAK, RUS, TUN, USA,</td>
<td>Advising on military capabilities in national crisis response.</td>
</tr>
<tr>
<td>3.1.2 Embedded personnel</td>
<td>AUS, BRA, CAN, CHN, FRA, GBR, IDN, ITA, PAK, RUS, USA,</td>
<td>Members of non-health COVID response management teams.</td>
</tr>
<tr>
<td>3.2 Augmentation of transport system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2.1 Global repatriation</td>
<td>AUS, BGD, BRA, BEL, CAN, ESP, FRA, GBR, ITA, IND, IDN, RUS, TUN, USA,</td>
<td>Military assistance to repatriation of citizens (including COVID cases)</td>
</tr>
<tr>
<td>3.2.2 Movement of people/material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2.2.1 Land</td>
<td>BRA, CHN, BEL, ESP, GBR, ITA, ROK, RUS, SWE, USA,</td>
<td>Generic use of military transport for non-clinical logistic movement.</td>
</tr>
<tr>
<td>3.2.2.2 Air</td>
<td>BRA, CHN, GBR, ITA, IND, RUS, SWE, TUN, USA,</td>
<td>Both collection of key commodities from overseas and internal distribution</td>
</tr>
<tr>
<td>3.2.2.3 Sea</td>
<td>BRA, GBR, USA,</td>
<td></td>
</tr>
<tr>
<td>3.3 Border security</td>
<td>AUS, BRA, CHN, KOR,</td>
<td>Border control including medical screening at points of entry or exit.</td>
</tr>
<tr>
<td>3.4 Internal security</td>
<td>BRA, CHN, ESP, FRA, ITA, KOR, PAK, RUS,</td>
<td>Direct support to general Civil Police duties – not specifically COVID</td>
</tr>
<tr>
<td>3.5 Environmental decontamination</td>
<td>BGD, BRA, CHN, ESP, ITA, KOR, RUS,</td>
<td>Use of military CBRN or other units to spray or other administration of viridical agents.</td>
</tr>
<tr>
<td>3.6 Other community support</td>
<td>BGD, BRA, CHN, KOR, IDN, RUS,</td>
<td>Non-health community support – provision of food/basic essentials.</td>
</tr>
<tr>
<td>3.7 Cyber security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.7.1 Military</td>
<td></td>
<td>Increased threat/response</td>
</tr>
<tr>
<td>3.7.2 Civilian/national</td>
<td>BGD, GBR,</td>
<td>Military assistance to protect wider government/civilian/commercial IT systems.</td>
</tr>
<tr>
<td>3.8 Intelligence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.8.1 Military</td>
<td>USA,</td>
<td>Additional tasks due to COVID.</td>
</tr>
<tr>
<td>3.8.2 Civilian/national</td>
<td>BGD, CHN, GBR, IND, ISR, KOR, PAk, SWE, TWN,</td>
<td>Likely to be classified.</td>
</tr>
<tr>
<td>3.9 Strategic communications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.9.1 Military</td>
<td>TUN, USA,</td>
<td>Military assistance to civilian internal security/policy.</td>
</tr>
<tr>
<td>3.9.2 Civilian/national</td>
<td>CHN, PAK, SWE,</td>
<td>Additional tasks due to COVID.</td>
</tr>
<tr>
<td>3.10 Diplomacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.10.1 Military diplomacy</td>
<td>CHN, GBR, RUS, USA,</td>
<td>Military assistance to government communications to national population.</td>
</tr>
<tr>
<td>3.11 Military health diplomacy</td>
<td>CHN, GBR, RUS, USA,</td>
<td>Increased military activities due to COVID.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specific health activities due to COVID.</td>
</tr>
</tbody>
</table>

from the list because of the wide number of sources and countries covered. There is variation in the number of activities reported per country which may be because the activity did not happen or due to under-reporting. However, it is also unlikely that every activity has been identified for any single country because the information has been derived from secondary sources rather than primary reports from government data. The lists identify any report of an activity and does not provide a measure of the volume of activities per country or their distribution over time.

**Maintaining Military Capability.** Table 1 provides insights that merit deeper analysis through more specific comparisons. It was inevitable that members of the armed forces would become infected by COVID and this would have an impact on military activities. It is also likely that the true impact of the COVID pandemic on overall military capability and sensitive activities (particularly those covering intelligence services) have remained secret. Table 1 provides an indication of the types of military activities that were affected, covering operations, training, and recruiting. It also highlights the inevitable vulnerability of military populations that live in close proximity to each other to infectious disease (embarked sailors, military barracks, deployed forces). This was particularly highlighted by the many reports of outbreaks on aircraft carriers and other naval vessels. It was also inevitable that the armed forces would rapidly adopt IT-based new ways of working, but this required considerable investment in infrastructure, new ‘business-processes’, and acceptance of cyber-risk. This table provides an indication of the impact of a biological attack on military capability and
<table>
<thead>
<tr>
<th>Activity</th>
<th>Countries</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 System Augmentation</td>
<td>AUS, BEL, BRA, CHN, FRA, GBR, ITA, NGA, PAK, RUS, SWE, TIN, USA, AUS, BRA, CHN, FRA, GBR, ITA, RUS, SWE, USA, AUS, BRA, CHN, FRA, GBR, ITA, RUS, SWE, USA,</td>
<td>Assignment of military personnel to civilian health management system. Assignment of personnel at the national level Assignment of personnel at the regional/local level Specific assignment of military health professionals to civilian health management agencies. Specific assistance for medical commodities. Military assistance to general government procurement of COVID material. Support to civilian industry, or use of military manufacture facilities. Support to civilian industry, or use of military manufacture facilities.</td>
</tr>
<tr>
<td>4.1.2 Regional/local command and control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.3 Medical personnel augmentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.4 Medical Logistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.4.1 Procurement</td>
<td>BRA, CHN, GBR, RUS, USA,</td>
<td></td>
</tr>
<tr>
<td>4.1.4.2 Manufacture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.4.2.1 PPE</td>
<td>AUS, BRA, FRA, GBR, KOR,</td>
<td>All forms of personal protective equipment.</td>
</tr>
<tr>
<td>4.1.4.2.2 Sanitizers</td>
<td>BRA, ESP, ITA,</td>
<td>All forms of viridical agents including hand sanitisers.</td>
</tr>
<tr>
<td>4.1.4.2.3 Drugs</td>
<td>BRA, ESP, USA,</td>
<td>Increased outputs or specific agents for COVID.</td>
</tr>
<tr>
<td>4.1.4.2.4 Oxygen</td>
<td>FRA, GBR,</td>
<td>Manufacture and/or distribution.</td>
</tr>
<tr>
<td>4.1.4.2.5 Ventilators</td>
<td>BRA, FRA, GBR, IND, USA,</td>
<td>Manufacture or other engineering support.</td>
</tr>
<tr>
<td>4.1.4.2.6 Vaccines</td>
<td>CHN, RUS, USA,</td>
<td>Vaccine research or manufacture.</td>
</tr>
<tr>
<td>4.1.4.2.7 Other health commodities</td>
<td>USA,</td>
<td></td>
</tr>
<tr>
<td>4.1.4.3 Warehousing</td>
<td>BRA, GBR, IND, KOR, PAK, USA,</td>
<td></td>
</tr>
<tr>
<td>4.1.4.4 Distribution</td>
<td>BGD, BRA, GBR, KOR, NGA, IND, PAK, USA,</td>
<td>For COVID commodities.</td>
</tr>
<tr>
<td>4.1.5 Medical research</td>
<td>BGD, BRA, GBR, IND, KOR, PAK, USA,</td>
<td>For COVID commodities.</td>
</tr>
<tr>
<td>4.1.5 Medical research</td>
<td>BGD, BRA, GBR, IND, KOR, RUS, TUN, USA,</td>
<td>For COVID commodities.</td>
</tr>
<tr>
<td>4.1.5 Medical research</td>
<td>BGD, BRA, GBR, IND, KOR, RUS, TUN, USA,</td>
<td>For COVID commodities.</td>
</tr>
<tr>
<td>4.1.5 Medical research</td>
<td>BGD, BRA, GBR, IND, KOR, RUS, TUN, USA,</td>
<td>For COVID commodities.</td>
</tr>
<tr>
<td>4.2 Community Care Pathway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2.1 Public health messaging</td>
<td>BGD, BRA, KOR, PAK,</td>
<td>Public awareness, including support to national call centres.</td>
</tr>
<tr>
<td>4.2.2 Internal enforcement of restriction of movement</td>
<td>BGD, BRA, CHN, ESP, IND, IDN, ITA, PAK,</td>
<td>Enforcing wearing of PPE, quarantine, restriction of movement, including control of internal borders</td>
</tr>
<tr>
<td>4.2.3 Management of quarantine facilities</td>
<td>BGD, BRA, CHN, GBR, IND, IDN, ITA, KOR, RUS, TUN, USA,</td>
<td>For civilians.</td>
</tr>
<tr>
<td>4.2.4 Support to vaccination services</td>
<td>BRA, CHN, FRA, GBR, IDN, USA,</td>
<td>For civilians.</td>
</tr>
<tr>
<td>4.2.5 Detection of COVID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2.5.1 Community Testing</td>
<td>BRA, CHN, BEL, GBR, IDN, NGA, RUS, SWE, TUN, USA,</td>
<td>Temperature checks and COVID testing.</td>
</tr>
<tr>
<td>4.2.5.2 Contact tracing</td>
<td>FRA, IDN, NGA, PAK, TUN,</td>
<td>Call centres and other measures.</td>
</tr>
<tr>
<td>4.2.6 Health support to isolated or vulnerable populations</td>
<td>BRA, CAN, CHN, ESP, FRA, GBR,</td>
<td>Overseas, rural, or quarantined communities specifically identified – general assistance covered by 3.6.</td>
</tr>
<tr>
<td>4.2.4 Out-of-hospital care</td>
<td>BRA, FRA,</td>
<td>Community health centres and home visiting.</td>
</tr>
<tr>
<td>4.2.5 Pre-hospital transport</td>
<td>BRA, CHN, BEL, FRA, GBR,</td>
<td>Transport to 'first contact' medical facilties.</td>
</tr>
<tr>
<td>4.2.6 Augmentation of ambulance services</td>
<td>AUS, BGD, BRA, CAN, CHN, BEL, ESP, FRA, GBR, ITA, NGA, SWE,</td>
<td>Transport between medical facilities – land, air and sea.</td>
</tr>
<tr>
<td>4.2.7 Nursing and Social Care</td>
<td>BRA, CAN, CHN, BEL, FRA, USA,</td>
<td>Support to nursing and elderly care homes.</td>
</tr>
<tr>
<td>4.2.8 Post-COVID recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2.9 Mortuary Services</td>
<td>CHN, ESP, GBR, ITA,</td>
<td></td>
</tr>
<tr>
<td>4.3 Hospital Care Pathway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3.1 Military Hospitals</td>
<td>CHN, BEL, ESP, GBR, IDN, RUS, SWE, USA,</td>
<td>Hospital administered under the Ministry of Defence.</td>
</tr>
<tr>
<td>4.3.1.1 Designated COVID hospitals</td>
<td>CHN, BEL, ESP, FRA, ITA, IDN, KOR,</td>
<td>Designation of military hospitals specifically for COVID patients.</td>
</tr>
<tr>
<td>4.3.1.2 General access for civilian patients</td>
<td>BRA, CHN, ESP, FRA, IDN, ITA, KOR,</td>
<td>Assignment of eligibility to general civilians.</td>
</tr>
<tr>
<td>4.3.1.3 Access for specific new populations</td>
<td>BEL, ESP,</td>
<td>Assignment of specific new clinical services for civilians.</td>
</tr>
<tr>
<td>4.3.2 New/temporary hospitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3.2.1 Temporary hospitals</td>
<td>BRA, CHN, ESP, GBR, IDN, RUS, SWE, USA,</td>
<td>Conversion of non-military buildings/infrastructure.</td>
</tr>
<tr>
<td>4.3.2.1.1 Build</td>
<td>BRA, CHN, ESP, GBR, IDN, RUS, SWE, USA,</td>
<td>Assignment of military personnel.</td>
</tr>
<tr>
<td>4.3.2.1.2 Staffing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
the importance of embedding measures to mitigate this risk through routine procedures and contingency planning⁶.

**Protecting the health of the Armed Forces.** Military medical services have two functions: to advise on the promotion of health and the prevention of disease; and the treatment of armed forces personnel and other beneficiaries. Table 2 provides an indication of how these were affected by COVID. The first requires the provision of medical advice to the military chain of command and the communication of public health messages to the supported population. Many countries reported an increase in these activities. This is a stark reminder of the importance of the basic principles of military hygiene that emerged during the late 19th and early 20th century to minimise the impact of disease on the armed forces in barracks and when deployed⁷. This includes basic education in preventive medicine, minimum standards for design of accommodation, pre-deployment isolation of forces to detect asymptomatic infectious disease, cohorting teams to minimise transmission of disease within groups, testing and contact tracing within the armed forces, and the community benefits of prophylactic measures (e.g. vaccinations)⁸.

Military health systems adopted similar measures to protect the health of their personnel as the wider civilian health sector, whilst maintaining access to healthcare for their dependent populations. Clearly military personnel needed access to COVID testing, tracing of contacts, and later in the pandemic, vaccinations. In some countries this was organised by the armed forces, in others these services were provided within the wider national system. This involved widespread adoption of telephone and video consultations, and asynchronous clinical communication via email and other messaging systems. Some non-urgent clinical activities were deferred such as routine occupational health assessments, vaccinations, and dental care. There are reports of some countries creating ‘COVID hotels’ for military personnel who were contacts of COVID cases or who had mild symptoms. This recognises that armed forces accommodation is the primary home for many military personnel. There are reports of armed forces personnel receiving specific treatment for COVID that was not routinely available for civilians, either within the context of medical research or for occupational reasons (such as the development of rehabilitation for long-COVID).

**Generic military assistance to the national crisis response.** In many countries the armed forces are an integral component of the national response to domestic emergencies, utilising specific military capabilities (helicopters and transport aircraft) and acting as a government-controlled source of a pool of manpower. Table 3 provides an indication of the breadth of these activities and their adoption by countries. It was therefore inevitable that military personnel would be seconded to the overall government command and control system either in a liaison or co-ordination role, or as augmentation to the capacity of the system. For many countries, the first component of the response was the global repatriation of citizens from China and other affected countries. Armed forces provided military aircraft, medical escorts, and quarantine centres. Subsequently, the armed forces supported most other components of the response in the security domains and in general support to the civilian community. There are reports of the armed forces being used to augment border security services, civilian police, IT services and cyber-security, intelligence (including monitoring the behaviours of domestic populations), strategic communications, and diplomacy. It is noticeable that some military chemical and biological units were used for environmental decontamination of the COVID virus; though it is difficult to understand the scientific evidence for the effectiveness of this intervention. Many countries used their armed forces in an additional diplomatic role to reinforce international relationships, especially by sharing knowledge on the management of COVID cases and by donating PPE, medical equipment, or vaccines.
Specific military assistance to the national health and social care response. Table 4 shows the range of activities undertaken by the armed forces to support the health and social care response to the pandemic. These cover: supporting the national and local command and control system; assistance to the procurement, manufacture, warehousing, and distribution of medical commodities; medical research; community care; and hospital care. The exact contribution by each country is likely to depend on pre-existing capabilities. For example, countries with military medical stockpiles, medical research institutions, military pharmaceutical manufacturing plants, and military hospitals will have focussed these towards the COVID crisis. Many countries utilised their armed forces to support new tasks such as the development of national test and trace services, expansion of hospital capacity, support to community social care services, and the creation of vaccination taskforces. There is considerable scope for international comparisons in this component of the analysis to determine areas of good practice, activities of limited impact, and areas where countries might wish to invest in military capability as a sovereign national resource.

Tables 1-4 do not provide sufficient reliable data on any single country to enable a direct comparison between any particular group of countries. It would be worthwhile to check the validity of the tables by analysing some non-English speaking countries that have not published information in the English language to be certain that no activities have been missed. The tables do provide a framework to enable such data to be collected and compared. Such data collection should be based on authoritative sources and possibly triangulated with interviews with key informants. Such comparisons might also consider the volume of each military activity as a proportion of the size of the armed forces and as a proportion of the size of the overall government response. It might also consider how these activities evolved across the duration of the pandemic, particularly if countries experienced clear waves of incidence of COVID.

Overall, it is suggested that international comparisons of the role of the armed forces in the response to the COVID pandemic are worthwhile to inform global and national policy. Whilst the recently published WHO guidance document on a national civil–military health collaboration framework for strengthening health emergency preparedness provides valuable high-level suggestions, it might benefit from practical case-examples and lessons from individual countries. Such comparisons would enable more detailed recommendations on policy choices on the role of national armed forces as part of the mitigation of health threats, including advising on those interventions that seemed to have limited success.

Conclusions

In many countries, the armed forces made a substantial contribution to the national response to the COVID crisis. This paper is the first published typology of civil–military activities during the COVID pandemic that provides a detailed hierarchical structure of individual activities undertaken by armed forces. It is suggested that this typology might be used to inform more detailed analyses of the role of the armed forces in the response to the future health emergencies under the following headings:

1. Maintaining Military Capability
2. Protecting the health of the Armed Forces and Beneficiaries of military health systems
3. Generic military assistance to the national crisis response
4. Specific military assistance to the national health and social care response

References


TYPOLGY OF MILITARY ACTIVITIES IN SUPPORT OF THE COVID RESPONSE - TABLES

Country Codes: (in alphabetic order of code)

Australia (AUS), Bangladesh (BGD), Belgium (BEL), Brazil (BRA), Canada (CAN), People's Republic of China (CHN), Spain (ESP), France (FRA), United Kingdom (GBR), Italy (ITA), India (IND), Indonesia (IDN), Israel (ISR), Republic of Korea (KOR), Nigeria (NGA), Pakistan (PAK), Russian Federation (RUS), Sweden (SWE), Taiwan (TWN), Tunisia (TUN), United States (USA),
Note: shaded cells did not have entries because the topic is sub-divided.

LIST OF SOURCES FOR ANALYSIS OF COUNTRY RESPONSES TO THE COVID CRISIS.

Academic publications


Non-academic Publications


Review of national briefings given at Military Medical Conferences:


2021 Pan-Magreb ICMM Regional Conference 09-10 Feb 2021 – TUN.

2022 AMSUS Virtual Meeting 22 – 25 Feb 2022 – CAN, FRA, GBR.

2022 ICMM World Congress on Military Medicine 5-9 Sep 2022 – miscellaneous countries

Competing Interests: None

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PROFESSOR Martin CM BRICKNELL

Professor BRICKNELL was appointed as Professor of Conflict, Health and Military Medicine at King’s College London in April 2019. Prior to this he served 34 years in the UK Defence Medical Services, culminating his service as the Surgeon General of the UK Armed Forces. He undertook operational tours in Afghanistan, Iraq, and the Balkans with multiple additional overseas assignments. In 2010 and 2006, he held senior Medical Adviser appointments in the NATO ISAF mission. He was awarded the Companion of the Order of Bath, the Order of St John and the US Bronze Star during his military service. He is an accredited specialist in General Practice, Public Health and Occupational Medicine. His multiple academic papers cover: how organisations learn, care pathways in military healthcare, military healthcare ethics, civil-military relations in health, and the political economy of health in conflict. He is also Deputy Director of the KCL Centre for Military Ethics, Veterans Adviser for the King Edward VII hospital, Editor-in-Chief of the Military Medical Corps Worldwide Almanac, a non-resident Fellow of the Centre for Global Development, and on the editorial boards for the Journal of Military and Veterans Health and BMJ Military Health.
Energy intake and energy expenditure during a military mission on a frigate (Leopold 1 Study)

Apport énergétique et dépense énergétique pendant une mission militaire sur une frégate (Étude Leopold 1)

P. Mullie¹, BELGIUM

Summary

Warships are special environments with higher prevalence of adiposity. The aims of the present study were to assess fat mass and to estimate energy intake from food diaries and from changes in fat mass during a military mission at sea. Food and beverages were recorded during three days, body fat mass was recorded before and after the mission. Physical activity was assessed using an accelerometer. Total energy intake was estimated from converting the food data in energy and from the differences in fat mass before and after the mission.

Mean (SD) fat mass difference between endpoint and baseline was 0.8 (1.45) kg. Mean (SD) energy intake as estimated by the food diary method was 2,629 (700.1) kcal.day⁻¹, this was using the fat mass method 3,544 (1133.8) kcal.day⁻¹.

Correction of energy intake estimated by food diaries are mandatory to increase the validity of the instrument.

Key words : Energy expenditure, Energy intake, Energy balance, Military nutrition, Navy

Résumé

Les navires de guerre sont des environnements spéciaux avec une prévalence plus élevée d’adiposité. Les objectifs de la présente étude étaient d’évaluer le tissu adipeux et d’estimer l’apport énergétique à partir des journaux alimentaires et de l’évolution du tissu adipeux lors d’une mission militaire en mer. L’alimentation et les boissons ont été enregistrées pendant trois jours, le tissu adipeux a été mesuré avant et après la mission. L’activité physique a été évaluée à l’aide d’un accéléromètre. L’apport énergétique total a été estimé à partir de la conversion des données alimentaires en énergie et des différences de tissu adipeux avant et après la mission.

La différence de tissu adipeux entre la fin et le début de l’étude était de 0.8 (1.45) kg. L’apport énergétique moyen (DS) estimé par les journaux alimentaires était de 2,629 (700.1) kcal.jour⁻¹, et de 3,544 (1133.8) kcal.jour⁻¹ pour la méthode tissu adipeux.

La correction des apports énergétiques estimés par les journaux alimentaires doit être corrigé pour augmenter la validité de l’instrument.

Mots clés : Dépenses énergétiques, Apports énergétiques, Équilibre énergétique, Nutrition militaire, Marine

Introduction

Military exercises and operations have to be performed in many conditions and environments, going from deserts to arctic, and in the air, on the ground and at sea [1]. Despite this, many military nutritional studies do not separate some specific operation conditions from other military environments [2]. Warships are specific operation conditions where isolation, confinement in limited spaces, occupational stressors, irregular mealtimes and homesickness during long periods can have a psychological and physiological impact on eating and drinking behavior [3].

To succeed in military operations, adequate energy supply by food and beverages is a prerequisite to increase the likelihood of success [4]. However, adequate energy supply does not only involve enough energy to perform, but also to prevent the negative health-related consequences of adiposity. Living and working on a warship has been described as an occupation with an increased risk of developing adiposity, a well-known risk factor for diabetes mellitus and cardiovascular disease [5, 6].

As first steps in prevention of adiposity, correct monitoring energy expenditure and energy intake are mandatory, together with assessing longitudinal evolution of body weight and body composition [6]. However, it is well-known in nutritional epidemiology that energy intake by food and beverages is usually under reported in food diaries and other reporting methods, with unreliable data as a possible consequence [7, 8].

The aims of the present study were to assess baseline and endpoint body weight and body composition during a ten day military operation on a frigate, to estimate energy intake from food diaries and from changes in fat mass, i.e., the food diary method (FDM) and the fat mass method (FMM), and to estimate the differences between the two methods.

Material and Methods

Participants

The study participants were military navy men during a mission of the Belgian frigate Leopold 1 in May 2021. We randomly selected ten consecutive days during the mission. The participants had permanent access to a military dining facility on board, and did not have to carry heavy loads during their normal navy duties. In total 51
persons out of 120 agreed to participate to the study and provided a signed informed consent after the informational briefing was done by a civilian researcher to emphasize the freedom to participate. This study was conducted according to the guidelines laid down in the Declaration of Helsinki and approved by the Ethics Committee of the University of Brussels (B.U.N. 143201836602).

Assessment of nutrition
A subgroup of 34 participants out of the 51 agreed to record during three non-consecutive days consumed foods and beverages in a structured food diary. The participants were instructed to estimate the amount of foods and drinks consumed during and between meals. If weight was not present, the participants were instructed to estimate the amount of foods and beverages they consumed by using standard household measures (e.g., a spoon, glass, cup, etc.). Food records were analysed with the Nubel Foodplanner (Nutrients Belgium, Brussels, Belgium). Total energy intake (in kcal/day)1 was derived from the frequency and quantity of reported foods and beverages by one trained nutritionist. Mean and standard deviation of energy intake was calculated from the three recorded days.

Body weight, height and fat mass
Trained staff measured participants barefoot and in minimal clothing. Body weight and body fat mass were recorded before and after the mission using bioelectrical impedance analysis (Omron BF-508, Omron, Osaka, Japan) and body height using a Hol- tain stadiometer (Holtain, Crymych, UK). Body Mass Index (BMI) was calculated using the following formula: BMI = body weight (kg)/(height (m))².

Assessment of rest metabolic rate and dietary induced thermogenesis
To estimate the rest metabolic rate in kcal/d, the Henry et al. equation was selected: rest metabolic rate in kcal/d = 14.4*weight (kg) + 313*height (m) + 113 [9]. Dietary induced thermogenesis, i.e., an increase in rest metabolic rate after food consumption, was estimated at 10% increase of the rest metabolic rate [10 11].

Assessment of physical activity
Physical activity was assessed with the triaxial accelerometer ActiGraph GT3X+ (ActiGraph LLC, Pensacola, FL, USA). The ActiLife software (version 6.11.0; ActiGraph LLC, Fort Walton Beach, FL, USA) was used to initialize accelerometers, to download activity data, and to determine activity parameters. Participants were instructed to wear the accelerometer on the right wrist throughout the study days. Energy expenditure by physical activity was not estimated using the acceleration data, influenced by the movement of the frigate, but by the type of activity as recorded by the accelerometer, i.e., light, moderate and intensive. The rest metabolic rate was multiplied by the physical activity levels given by James et al. [12]. As expected on a frigate, where the possibilities for physical activity are limited due to the limitations in space, almost 90% of the physical activity was light.

Assessment of total energy expenditure
Total energy expenditure (in kcal/d) was the sum of:

\[ TEE = RM + RM/10 + EE + EE/S, \]

as stated by Hills et al. [10].

TEE = total energy expenditure,
RM = rest metabolic rate,
RM/10 = dietary induced thermogenesis,
EE = energy expenditure by physical activity estimated by accelerometers.

Assessment of total energy intake
Total energy intake was estimated with two methods. The first food diary method (FDM) is based on the classic registration of food and beverages in diaries during three days, and converting the data in kcal/d. The second fat mass method (FMM) estimate the energy intake (in kcal/d) by the differences in fat mass in kilogram before and after the mission, by converting the difference in energy, i.e., fat mass in kilogram multiplied by 7.000 kcal and by summing up the result with the total energy requirement.

Statistics
The data were analyzed using IBM SPSS statistics for Windows Version 28.0 (Armonk, NY: IBM Corp). All descriptive data are presented as mean and standard deviation. Normality was assessed using the Kolmogorov-Smirnov Goodness of Fit Test. All data were calculated for 24 hours, expressed as d. Differences in characteristics in function of military rank was evaluated with One-Way Anova test for continuous data and with Pearson Chi-Square for categorical data. Differences between baseline and endpoint was estimated with Paired-Sample t-test. A Bland-Altman scatter plot was constructed, with as ordinate the difference between FDM and FMM, and with as ab-

| Table 1. Baseline characteristics of the 61 participants to the Leopold 1 Study. |
|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|
| **All** (n=51) | **Officers** (n=12) | **Non-commissioned Officers** (n=26) | **Sailors** (n=13) | *p* |
| | | | | |
| **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** |
| **Age (years)** | 32.0 | 8.85 | 35.7 | 9.68 | 31.2 | 8.30 | 30.2 | 7.40 | .219 |
| **Height (cm)** | 178.0 | 6.97 | 179.3 | 6.64 | 177.2 | 7.86 | 178.3 | 5.48 | .675 |
| **Body weight (kg)** | 80.1 | 12.65 | 86.6 | 11.12 | 78.8 | 12.43 | 76.5 | 13.13 | .105 |
| **Fat Mass (%)** | 22.7 | 5.88 | 24.3 | 4.91 | 23.0 | 6.02 | 20.9 | 6.34 | .352 |
| **Fat Mass (kg)** | 18.7 | 7.07 | 21.3 | 6.17 | 18.6 | 7.04 | 16.6 | 7.62 | .244 |
| **BMI (kg/m²)** | 25.3 | 3.65 | 26.9 | 3.39 | 25.1 | 3.40 | 24.1 | 4.04 | .132 |
| **BMI ≤ 24.9 kg/m²** | n | n | n | n | n | n | n | n | p* |
| **BMI ≥ 24.9 kg/m²** | 25 | 49 | 4 | 33 | 13 | 50 | 8 | 61 | .61 |
| **BMI 25.0 to 29.9 kg/m²** | 22 | 43 | 6 | 50 | 12 | 46 | 4 | 31 | .31 |
| **BMI ≥ 30.0 kg/m²** | 4 | 8 | 2 | 17 | 1 | 4 | 1 | 8 | .495 |

SD = standard deviation / BMI = Body Mass Index
* p-value between military ranks – One-way Anova test
** p-value between military ranks – Pearson Chi-Square test
Table 2. Weight-related changes between baseline and endpoint of the 51 participants to the Leopold 1 Study.

<table>
<thead>
<tr>
<th></th>
<th>All (n=51)</th>
<th>Officers (n=12)</th>
<th>Non-commissioned Officers (n=26)</th>
<th>Soldiers (n=13)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight baseline (kg)</td>
<td>80.1</td>
<td>86.7</td>
<td>78.8</td>
<td>76.5</td>
<td>.105</td>
</tr>
<tr>
<td>Body weight endpoint (kg)</td>
<td>81.3</td>
<td>87.7</td>
<td>80.2</td>
<td>78.0</td>
<td>.136</td>
</tr>
<tr>
<td>Body weight difference (kg)</td>
<td>1.2</td>
<td>1.1</td>
<td>1.2</td>
<td>1.5</td>
<td>.792</td>
</tr>
<tr>
<td>p**</td>
<td>&lt;.001</td>
<td>.028</td>
<td>.001</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>Fat Mass baseline (%)</td>
<td>22.7</td>
<td>24.3</td>
<td>23.0</td>
<td>20.9</td>
<td>.352</td>
</tr>
<tr>
<td>Fat Mass endpoint (%)</td>
<td>23.3</td>
<td>25.2</td>
<td>23.2</td>
<td>21.8</td>
<td>.357</td>
</tr>
<tr>
<td>Fat Mass difference (%)</td>
<td>0.6</td>
<td>1.0</td>
<td>0.3</td>
<td>0.9</td>
<td>.286</td>
</tr>
<tr>
<td>p**</td>
<td>.006</td>
<td>.064</td>
<td>.262</td>
<td>.093</td>
<td></td>
</tr>
<tr>
<td>Fat Mass baseline kg)</td>
<td>18.7</td>
<td>21.3</td>
<td>18.6</td>
<td>16.6</td>
<td>.244</td>
</tr>
<tr>
<td>Fat Mass endpoint (kg)</td>
<td>19.5</td>
<td>22.5</td>
<td>19.1</td>
<td>17.6</td>
<td>.232</td>
</tr>
<tr>
<td>Fat Mass difference (kg)</td>
<td>0.8</td>
<td>1.2</td>
<td>0.5</td>
<td>1.0</td>
<td>.334</td>
</tr>
<tr>
<td>p**</td>
<td>&lt;.001</td>
<td>.015</td>
<td>.070</td>
<td>.043</td>
<td></td>
</tr>
<tr>
<td>BMI baseline (kg/m²)</td>
<td>25.3</td>
<td>26.9</td>
<td>25.1</td>
<td>24.1</td>
<td>.132</td>
</tr>
<tr>
<td>BMI endpoint (kg/m²)</td>
<td>25.6</td>
<td>27.3</td>
<td>25.4</td>
<td>24.5</td>
<td>.160</td>
</tr>
<tr>
<td>BMI difference (kg/m²)</td>
<td>0.4</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>.813</td>
</tr>
<tr>
<td>p**</td>
<td>&lt;.001</td>
<td>.028</td>
<td>.001</td>
<td>.003</td>
<td></td>
</tr>
</tbody>
</table>

SD=standard deviation / BMI = Body Mass Index
*p-value between military ranks – One-way Anova test
**p-value between baseline and endpoint – Paired Sample t-test Student

Table 3. Energy expenditure, energy intake, and energy balance of the 51 participants to the Leopold 1 Study.

<table>
<thead>
<tr>
<th>N=51</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest metabolic rate (kcal.day⁻¹)¹</td>
<td>1,784</td>
<td>177.8</td>
</tr>
<tr>
<td>Dietary induced thermogenesis (kcal.day⁻¹)²</td>
<td>178</td>
<td>17.8</td>
</tr>
<tr>
<td>Energy expenditure by physical activity (kcal.day⁻¹)³</td>
<td>1,025</td>
<td>102.6</td>
</tr>
<tr>
<td>Total energy expenditure (kcal.day⁻¹)⁴</td>
<td>2,987</td>
<td>296.6</td>
</tr>
<tr>
<td>Total energy intake food diary method (kcal.day⁻¹)⁵</td>
<td>2,629</td>
<td>700.1</td>
</tr>
<tr>
<td>Daily energy balance (kcal.day⁻¹)⁶</td>
<td>-338</td>
<td>712.0</td>
</tr>
<tr>
<td>Total energy intake fat mass method (kcal.day⁻¹)⁷</td>
<td>3,544</td>
<td>1133.8</td>
</tr>
<tr>
<td>Difference in energy intake between food diary and fat mass method (kcal.day⁻¹)⁸, for total group (n=34)</td>
<td>-889</td>
<td>1264.3</td>
</tr>
<tr>
<td>Difference in energy intake between food diary and fat mass method (kcal.day⁻¹)⁹, for baseline BMI &lt; 25.0 kg.m⁻² (n=17)</td>
<td>-87</td>
<td>877.5</td>
</tr>
<tr>
<td>Difference in energy intake between food diary and fat mass method (kcal.day⁻¹)⁹, for baseline BMI ≥ 25.0 kg.m⁻² (n=17)</td>
<td>-1,691</td>
<td>1,076.3</td>
</tr>
<tr>
<td>Light physical activity (%)¹⁰</td>
<td>89.9</td>
<td>5.14</td>
</tr>
<tr>
<td>Moderate physical activity (%)¹⁰</td>
<td>9.8</td>
<td>5.31</td>
</tr>
<tr>
<td>Vigorous physical activity (%)¹⁰</td>
<td>0.3</td>
<td>1.07</td>
</tr>
</tbody>
</table>

¹ Rest metabolic rate estimated by Henry et al.
² Dietary induced thermogenesis estimated as 10% of rest metabolic rate
³ Mean energy expenditure by physical activity for the ten days estimated by accelerometer
⁴ Mean total energy expenditure for the ten days (≡ sum of rest metabolic rate + dietary induced thermogenesis + mean energy expenditure by physical activity)
⁵ Mean total energy intake (= energy meals + energy between meals + energy beverages, as estimated from food diary)
⁶ Mean daily energy balance (= mean energy intake from food diary – mean total energy expenditure)
⁷ Mean total energy intake (= total energy expenditure + energy from change in fat mass)
⁸ Difference between the mean energy intake estimated by food diary and fat mass method
⁹ Physical activity level as estimated by accelerometer

A scissa the average of FDM and FMM. To limit the multiple comparison problem, the level of significance was set at alpha=0.01.

Results

Mean (SD) age was 32.0 (8.85) years, percent fat mass 22.7 (5.88) % and BMI 25.3 (3.65) kg/m² (Table 1). Age, percent fat mass and BMI were slightly higher for officers compared to other military ranks, but this was statistically not significant. There was a significant difference in total fat mass (kg) between baseline (M = 18.7 kg, SD = 7.07) and endpoint (M = 19.5, SD = 7.33); t(50) = -0.39, p < .001 (Table 2).

Mean (SD) rest metabolic rate was 1,784 (177.8) kcal.day⁻¹ and energy expenditure by physical activity was 1,025 (102.6) kcal.day⁻¹, giving a total energy expenditure of 2,987 (296.6) kcal.day⁻¹ (Table 3). Mean (SD) energy intake was 2,629 (700.1) kcal.day⁻¹ for FDM, i.e., the energy intake estimated from food diaries, and 3,544 (1133.8) kcal.day⁻¹ for FMM, i.e., estimated from total energy expenditure and total fat mass differences. The mean difference in energy intake between FDM and FMM was -889 (1,264.3) kcal.day⁻¹. However, this was -87 (877.5) kcal.day⁻¹ for a baseline BMI < 25.0
kg.m\(^{-2}\), compared to \(-1,691 (1,076,3)\) kg.m\(^{-2}\) for a BMI \(\geq 25.0\) kg.m\(^{-2}\).

Figure 1 presents a Bland-Altman Plot between the average and the difference in total energy intake (in kcal.d\(^{-1}\)) for FDM and FMM. In an ideal model, the difference in total energy intake between both methods would be zero, but the mean difference is \(-889\) kcal.day\(^{-1}\), i.e., an underestimation of the total energy intake by FDM compared with FMM. The measurements are in the Limits of Agreement, i.e., beside two standard deviations of the mean. However, as indicated by the triangles in the figure, the estimates for a BMI < 25.0 kg.m\(^{-2}\) are closer to the zero results than the circles for BMI \(\geq 25.0\) kg.m\(^{-2}\).

**Discussion**

In the present study we found a mean (SD) total fat mass increase of 0.8 (1.45) kg during ten days at sea and the difference between two methods to estimate energy intake, i.e., FDM and FMM, was -889 (1,263.4) kcal.day\(^{-1}\). The mean (SD) total energy expenditure was 2,987 (296.6) kcal.day\(^{-1}\), with 95% of the population between 2,394 and 3,580 kcal.day\(^{-1}\). The high inter-individual difference in energy expenditure emphasizes that personalized nutrition to meet the daily energy requirements would be mandatory.

Comparing the results of the present study with other studies is difficult due to a lack of research and/or differences in study designs. Helmhout et al. tested 19 submarines at baseline and at endpoint of a military sea training of 14 weeks [13]. Body composition and energy expenditure were assessed with double-labelled water. Mean (SD) energy expenditure was 3,113 (560.1) kcal.d\(^{-1}\), comparable to 2,987 (296.6) kcal.day\(^{-1}\) of our study. Body fat percentage increased from 21.9 (3.2) % to 27.0 (6.1) %, and fat free mass decreased from 65.6 (8.3) kg to 61.6 (6.1) kg. The authors concluded that during operational deployment, there were significant changes in body composition. The mean increase in total fat mass was 5.1% in Helmhout et al., or 0.36% w.w\(^{-1}\), comparable to 0.42% w.w\(^{-1}\) in our study [13].

Comparing the two methods to estimate energy intake, i.e., FDM and FMM, underreporting for FDM was much more important for a baseline BMI \(\geq 25.0\) kg.m\(^{-2}\). This underreporting in function of BMI is in agreement with Trijsburg et al. [8]. They compared the food recorded by two duplicate methods (DM), 24 h recall (24hR) and food-frequency questionnaires (FFQ) with doubly labelled water in 197 adults. In a linear regression, an increase in BMI of 1 kg.m\(^{-2}\) led to an increase in under-reporting of energy by 67 kcal.d\(^{-1}\) for DP, 49 kcal.d\(^{-1}\) for 24hR and 65 kcal.d\(^{-1}\) for FFQ.

Our study emphasizes the great caveat of nutritional epidemiology, i.e., assessing energy intake with an acceptable validity. The energy intakes of the food diaries used in this study are implausible: a mean negative energy balance of -338 kcal.day\(^{-1}\) associated with a fat mass increase of 0.8 (1.45) kg is not realistic. During ten day, such a negative energy balance would be associated with a fat mass loss of 0.5 kilogram. Moreover, the underestimation of the energy intake will increase with increasing energy consumption. FMM, however also associated with measurements errors due to limitations of bioelectrical impedance analysis (BIA), is a much easier method to estimate past energy intake, with a low burden for the participants and for the researchers.

Limitations of the present study are mostly the results of the military operations implying to use low interfering assessment methods, with maximal respect for the internal and external validity. Doubly labeled water is seen as gold standard for estimating energy expenditure under free-living conditions, with a higher validity than accelerometry. However, doubly labeled water is an expensive method, interfering with the military activities and estimating only total energy expenditure for a long period, without being able to specifically assess energy expenditure induced by physical activity. Individual rest metabolic rate was estimated with the Henry et al. equation [9].

This equation showed a higher validity for estimating rest metabolic rate than the usually used Harris-Benedict equation. In this study, we selected BIA to assess body composition. This method enables a rapid
and safe assessment of body water, from which fat-free mass and body fat can be derived [14]. However, in an obese state, the amount of fat mass will be underestimated by BIA [14].

As conclusion to this study, and for a BMI < 25.0 kg.m⁻², there was a good agreement between FDM and FMM, but this was not the case for BMI ≥ 25.0 kg.m⁻², where FDM underreported energy intake compared to FMM. To limit increase in adiposity during naval military exercises and operations, adequate energy supply is mandatory after assessment of individual energy expenditure.

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Declaration of interest

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Profil épidémiologique des patients atteints de discopathie dégénérative douloureuse lombaire (notre expérience)

Epidemiological profile of patients with painful degenerative lumbar disc disease (our experience)

R.B.Ghoul¹, Y.Haddadi¹, A.Mahtout¹, R.Tradkhodja¹, B.Khelaifia¹. ALGERIE

Résumé

Contexte : La discopathie dégénérative est un processus de détérioration, prématuré et accéléré du disque intervertébral, elle est responsable de 40 % des lombalgies. 

 Patients et méthodes : Nous avons réalisé une étude prospective de 104 patients opérés d’une discopathie dégénérative douloureuse lombaire, durant une période de 25 mois. 

Les paramètres analysés ont été : l’âge, le sexe, l’Indice de Masse Corporelle (IMC), les comorbidités, les antécédents familiaux de lombalgie et la pénibilité de l’activité professionnelle. 

Résultats : L’âge moyen était de 43,3 ans, une nette prédominance masculine : 72 hommes pour 32 femmes, l’IMC moyen est de 26,80Kg/m², 63,5 % des patients avaient un surpoids. 

La survenue de la dégénérescence discale sur un terrain pathologique a été notée chez 14,4% des cas. La notion de lombalgie familiale a été retrouvée chez (49%) des cas. La majorité des patients exercent un travail plus ou moins pénible (51%) des cas. 

Conclusion : Dans notre série, la discopathie dégénérative douloureuse lombaire prédomine chez le sujet de sexe masculin, obèse actif qui exerce un travail plus ou moins pénible, chez qui on trouve des antécédents familiaux de lombalgie. 

Mots-clés : Disque intervertébral, Discopathie dégénérative douloureuse lombaire, Lombalgie, Indice de masse corporel (IMC).

Abstract

Overview: Degenerative disc disease is a process of deterioration, premature and accelerated of the intervertebral disc, it is responsible for 40% of low back pain. 

Patients and methods: We performed a prospective study of 104 patients operated for degenerative painful lumbar disc disease over a period of 25 months. 

The parameters analyzed were: age, sex, Body Mass Index (BMI), comorbidities, family history of low back pain and difficulty of professional activity. 

Results: The average age was 43.3 years, a clear predominance of men: 72 men for 32 women, the average BMI is 26.80Kg / m², 63.5% of the patients were overweight. 

The occurrence of disc degeneration in pathological conditions was noted in 14.4% of cases. The notion of familial low back pain was found in 49% of cases. The majority of patients, perform more or less arduous work, (51%) of the cases. 

Conclusion: In our series, degenerative painful lumbar disc disease predominates in the male subject, active obese who performs more or less painful work, in whom we find a family history of low back pain. 

Key words: Intervertebral disc, Lumbar painful degenerative disc disease, Low back pain, Body mass index (BMI).

Introduction

Le mal de dos constitue un véritable problème de santé publique, huit individus sur dix souffrent ou souffriront de lombalgie au cours de leur vie [1], c’est parmi les premiers motifs de consultation, avec un impact socio-économique important. 

C’est la manifestation clinique d’une dégénérescence du disque intervertébral lombaire (DIV) dans environ 40 % des cas. Cette dernière est due à un processus de détérioration prématuré et accéléré du disque intervertébral.

¹Service de Neurochirurgie - Hôpital Militaire Régional Universitaire d’Oran, Algérie

Objectif

Déterminer un profil épidémiologique des patients atteints de discopathie dégénérative douloureuse lombaire. 

Patients et méthodes

Nous avons réalisé une étude prospective de 104 patients opérés d’une discopathie dégénérative douloureuse lombaire (DDDLo), au service de Neurochirurgie de l’Hôpital central de l’Armée, durant une période de 25 mois comprise entre août 2017 et septembre 2019.

Résultats

Sur une période de 25 mois, 104 patients ont été opérés d’une discopathie dégénérative douloureuse lombaire :

- L’âge moyen était de 43,3 ± 10,26 ans, avec des extrêmes compris entre 21 et 59 ans. La tranche d’âge la plus affecte correspond à la 4 décennie (Fig. 1).
- Cette affection touche les deux sexes avec une nette prédominance masculine : 72 hommes pour 32 femmes, soit un sexe ratio de 2,25. (Fig. 2).
L’indice de masse corporelle (IMC) moyen est de 26,8 ± 4,25 Kg/m² avec un minimum de 18,50 Kg/m² et un maximum 43,70 Kg/m². Au cours de notre étude nous avons remarqué que 63,5 % des patients avaient un surpoids (Fig. 3).

- Le recueil des antécédents médicaux a permis d’évaluer l’état général des malaides et de rechercher les pathologies considérées comme un facteur de risque. Dans notre série, la survenue de la dégénérescence discale sur un terrain pathologique a été notée chez 15 patients, soit (14,4%) des cas (Fig. 4).
- La notion de lombalgie chronique chez un membre de la famille a été retrouvée chez 51 patients, soit (49%) des cas.
- Dans notre série les militaires représentent 51% dont la majorité des patients exercent un travail plus ou moins pénible (Fig. 5).

**Discussion**

**Age, sexe et IMC** :
- L’âge moyen était de 43,28 ans ; avec une prédominance masculine.
- La prédominance du jeune âge de nos patients et de sexe masculin s’explique par la fonction de ces derniers (militaire).
- L’IMC moyen dans notre étude est de 26,8 Kg/m², 63,6 % des patients ont un IMC supérieur à 25 Kg/m² (surpoids ou obèses).

Comparativement à la littérature (Tab. 1).


Divers mécanismes ont été décrits par lesquels l’obésité peut contribuer à la dégénérescence discale lombaire : La contrainte biomécanique due à l’excès des forces axiales, entraine une surcharge sur les disques lombaires du patient obèse.

**Les antécédents médicaux (comorbidités)** :
Dans notre étude, la survenue de la dégénérescence discale sur un terrain pathologique a été notée chez 14,4% des patients
- Jakov AM, et coll. [4], ont rapporté que le diabète est un facteur de risque de dégénérescence discale. L’accumulation de produits terminaux de glycation telle que l’hémoglobine glyquée (HgbA1c) dans le disque intervertébral, la micro angiopathie bien rapporté chez les diabétiques entraîne une diminution de flux sanguin et des nutriments. Tous ces facteurs provoquent une augmentation de la rigidité et la fragilité du disque intervertébral, qui devient plus sensibles aux contraintes mécaniques.

Divers mécanismes ont été décrits par lesquels l’obésité peut contribuer à la dégénérescence discale lombaire : La
contrainte biomécanique due à l’excès des forces axiales, entraine une surcharge sur les disques lombaires du patient obèse.
- Schoenfeld, AJ and c, et col [9] ont constaté que le travail dans les branches d’armes de combat augmentait de manière significative le risque de dégénérescence discale lombaire. Cela peut s’expliquer par le stress physique accru subi par ces individus ainsi que le chargement axial de la colonne vertébrale lors du transport des équipements de combat qui sont très lourds.
- Les militaires en activité (unité opérationnelle) subissent un entraînement physique intense pour la préparation au combat dans un environnement tactique contraignant et souvent dans des conditions climatiques difficiles.

**Conclusion**

Dans notre série, la discopathie dégénérative douloureuse lombaire prédomine chez le sujet de sexe masculin, obèse actif qui exerce un travail plus ou moins pénible, chez qui on trouve des antécédents familiaux de lombalgie.

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**LIEUTENANT-COLONEL Rachid Brahim GHOUL**

Le lieutenant-colonel docteur GHOUL est né le 28/05/1978. Diplômé de médecine générale en 2003, il s’engage à l’école des services de santé militaire algérienne la même année. Il a effectué son cursus de résident en neurochirurgie et titulaire de diplôme de spécialiste en 2012 de la faculté de médecine d’Alger.

Dr GHOUL est l’auteur d’une thèse de médecine sur « la place de la chirurgie dans le traitement des discopathies dégénératives douleurs lombaires ».

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Developing a spiritual care concept and a spiritual fitness program for the Belgian Defence?

Développer un concept de soins et un programme d’entraînement spirituel pour la Défense belge ?

T. Letovaltseva¹, A. Vandenhoeck², D. Alexander³. BELGIUM

Summary

Considering that the Belgian Defence has chosen to use the Total Force Fitness model as a reference paradigm for its Health and Well-Being policy, a reflection on the development of a concept of the spiritual fitness - one of the eight components of the model but having received little attention so far - is unavoidable. Furthermore, a need to define new specific spiritual-existential needs has emerged with the reform project of the Belgian military chaplaincies. Namely, there are unique and measurable spiritual fitness attributes that impact readiness, and correlative studies have revealed that changes in spiritual attributes are likely to affect many other aspects of well-being and performance (Alexander, Abulhawa, & Kazman, 2020). Recognizing and monitoring such changes is an important part of military leadership, and military chaplains, when present, can help both leaders and service members develop strategies to support these and other positive spiritual traits throughout the deployment cycle (Alexander, 2020).

Key Words: Spiritual fitness, Spiritual care, Military chaplaincies, Belgian Defence

Résumé

Considérant que la Défense belge ait choisi d’utiliser le modèle Total Force Fitness comme paradigme de référence pour sa politique de Santé et de Bien-être, une réflexion sur le développement d’un concept du spiritual fitness - une des huit composantes du modèle, mais ayant reçu peu d’attention jusqu’ici -, est incontournable. De plus, un besoin de définir les nouveaux besoins spirituels-existentiels spécifiques est apparu avec le projet de réforme des aumônieries militaires belges. A savoir qu’il existe des attributs d’aptitude spirituelle uniques et mesurables qui ont un impact sur l’état de préparation opérationnelle, et des études corrélatives ont révélé que les changements dans les attributs spirituels sont susceptibles d’affecter de nombreux autres aspects du bien-être et de la performance (Alexander, Abulhawa, & Kazman, 2020). Reconnaître et surveiller de tels changements est une partie importante du leadership militaire, et les aumôniers militaires, lorsqu’ils sont présents, peuvent aider à la fois les leaders et les membres du service à développer des stratégies pour soutenir ces traits spirituels positifs et d’autres tout au long du cycle de déploiement (Alexander, 2020).

Mots clés : Entraînement spirituelle, Soins spirituels, Aumônieries militaires, Défense belge

Background

Several years ago, the Belgian Defence decided upon a holistic approach of the operational healthcare continuum and occupational health and safety policy¹, linking the physical, mental, and social dimensions of well-being, as defined by the World Health Organization². This chosen approach took shape through the implementation of the American Total Force Fitness framework (Jonas et al., 2010) (1) as one of the reference paradigms for the Belgian Health and Well-Being (H&WB) policy. The Total Force Fitness³ framework is a holistic guide for supporting and optimizing human performance throughout the deployment cycle (Alexander, 2020a; Lunasco, Chamberlain, & Deuster, 2020) (2) (3) and connects eight dimensions of fitness: Physical Fitness, Environmental Fitness, Medical and Dental Preventive Care Fitness, Nutritional Fitness, Spiritual Fitness, Psychological Fitness, Social Fitness, and Financial Fitness. In concrete terms, this choice has led to the development of the integrated, interdisciplinary and multidisciplinary⁴ mental fitness concept⁵ bringing together mental health professionals around the so-called national and regional Psychosocial Moral and Religious platforms⁶, including chaplains, social workers, and psychosocial prevention counsellors. The development of a Human Performance Optimization⁷ Program concept⁸ for the Belgian Special Forces is another evidence of the choice for this holistic approach. In addition, the Total Force Fitness³ model now serves as a reference and inspiration for the work of redesigning the H&WB Staff Directorate-Gen-

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eral and rethinking the risks analysis throughout Quality Health Security Environment (QHSE) integrated core processes.

Since spiritual fitness has been recognized as "essential" (Worthington & Deuster, 2018) (4) and "key component" (Sweeney et al., 2012) (5) of the TFF model and as "vital aspect" (Pargament & Sweeney, 2011) (6) of the HPO, it is therefore relevant to consider, in the same way as for the other components, the need to develop an underlying ad-hoc concept of the spiritual fitness/care component for the Belgian Defence. There are unique and measurable spiritual fitness attributes which impact readiness. Correlative studies have found that changes in spiritual attributes are likely to affect many other aspects of wellness and performance (Alexander, Abulhawa, & Kazer, 2020) (7). Recognizing and monitoring such changes is an important part of military leadership, and military chaplains, when present, can aid both leaders and Service Members in developing strategies to support these and other positive spiritual traits throughout the deployment cycle (Alexander, 2020) (3).

This contribution aims to present the current framework of reflection - originated in the process of reforming the Division of Religious and Moral Assistance (SARM) - on developing a Belgian spiritual fitness/care concept.

In the first section, we begin by briefly describing the principles and phases of the reform. We devote the second part of the article to defining spiritual fitness, placing it also in a broader context of the spiritual dimension of health and presenting one of the assessment models that could serve as a further reference for the Belgian Defence. Finally, we conclude with some general considerations on the development of a specific Belgian spiritual fitness/care concept.

Reform of the Belgian military chaplaincies

Since 2016, the SARM division - composed of Catholic, Protestant and Jewish chaplains and Humanist moral counsellors - has been undergoing a profound reform, launched by the Director H&WB Major - General MD Geert Laire and based upon the ministerial dossier of 18 May 2016. This document recommended, among other things, the revision of the legal status of chaplains and moral counsellors. The reform process was launched at the division’s solemn inauguration at the Military Hospital Queen Astrid, on 17 September 2019. This event was closed with the signing of the Mission Statement (see Figure 1), specifying a common mission, joint vision, and shared values of the work of religious and humanist chaplains, as well as the "faith-specific" tasks of each of the convictions represented. The inaugural event was also an opportunity to present the principles of the reform, which are based on interfaith and integrated approaches, also with a desire to give the project an international scope and a solid academic anchor.

In concrete terms, the reform of the SARM division is conceptualized through three lines of modernization: standardization of the legal status, development of a shared vision, creation of a common concept. On the other hand, this reform should follow the four-step transformation process: integration, substantialization, formalization and operationalization. The first transformation mechanism, supervised by the Brigade - General MD Erwin D'Hondt, encouraged the chaplains to integrate into the military system in a functional and administrative way. The SARM division started in October 2021 with the substantialization phase. In contrast to the integration phase, substantialization requires a critical and thorough analysis of the relevance and coherence of each project aspect of the SARM reform in the light of current academic research and the opinions of various experts. This phase's tangible objective is to draw the outlines of a common spiritual fitness/care concept for the SARM division of the future. The stage aims also to better define the status and identity of a Belgian military chaplain and to mark his/her work in the military organization, in agreement with the heads of the Belgian confessional and non-confessional denominations. That embodies the respect of two general principles: double loyalty and hierarchical autonomy of the military chaplaincy.

In addition, the participation of members of the SARM division in different NATO research task groups (RTG) increased interaction in this framework with research institutions such as the Royal High Institute for Defence Studies (RHICD), the Royal Military Academy (RMA) and the Queen Astrid Military Hospital.

Finally, the doctoral research on the reform of the Belgian military chaplaincies, in collaboration with the Royal Military Academy and the KU Leuven, will contribute to the development of a spiritual fitness concept that considers the specific spiritual needs of the Belgian military organization. These needs will be defined by empirical research, while also paying attention to general ethical considerations. Moreover, the new concept will consider a more global operational and managerial perspective.

The formalization and operationalization steps, conducted under the specific guidance of the new Director-General H&WB, Lieutenant-General SG MD Pierre Neirinck, have also already started concurrently with writing specific operational procedures and

Figure 1: Mission Statement of the division Services Moral and Religious Assistance.
implementing the spiritual dimension and the work of the military chaplaincies into the correlated policies, concepts, models, and projects.

Spiritual fitness

Spiritual dimension of health
There are an infinite number of definitions of spirituality. Purely semantically, the word “spirit” is derived from the Latin word “spir-itus” (meaning breath, courage, strength, or soul) and the word “spirare” (meaning to breathe). Moreover, descriptions change over time and according to the purposes for which the term is used. As Professor M.D. Harold Koenig - one of the leading experts in research on spirituality and health - emphasizes in his many books: the significant difference will be between “clinical” and “traditional” definitions of spirituality. The “clinical” approach will produce a pluralistic and overarching definition - seeking a practical application in the field facilitating the establishment of interprofessional healthcare collaboration to achieve clinical goals. The “traditional” and historical definitions will place spirituality within a religion. While the more traditional definition tends to exclude non-religious people, the clinical definition is difficult to use for research purposes (H. Koenig et al., 2011) (8). Koenig suggests defining spirituality as “connection to that which is sacred, the transcendent” (H. Koenig et al., 2011) (8); referring not to a Supreme Being and thus proposes: to divide people into three categories: those with a deep religious faith and practice, those who are spiritual but not religious, and finally those who are neither religious nor spiritual.

Another leading expert, Dr Christina Puchalski, has formulated one of the most consensual academic definitions of spirituality:

“Spirituality is a dynamic and intrinsic aspect of humanity through which persons seek ultimate meaning, purpose, and transcendence, and experience relationship to self, family, others, community, society, nature, and the significant sacred. Spirituality is expressed through beliefs, values, traditions, and practices.” (Puchalski et al., 2014) (9)

Researchers and health professionals have started to consider the spiritual dimension and include it in new holistic and interdisciplinary health models, such as the Allied Health Practice (MacKenzie, 2019) (10). This model proposes a three-dimensional approach to health: mind, body, and spirit where the notion of spiritual care allows covering specific spiritual needs, following specific indicators and evaluation tools (Buchter, 2018) (11) and contributing to the overall well-being of the patient. Some even argue for the recognition of spirituality as the fourth dimension of health (Dhar et al., 2013) (12), a concept introduced as early as 1983 by the then director of WHO, Hafdaan Mahler (Peng-keller et al., 2022) (13). It is worth mentioning here that WHO’s ‘International Classification of Functioning, Disability and Health (WHO 2001) recognizes religion and spirituality as categories and spiritual care interventions are part of the International Classification of Diseases and Health-related Illnesses (ICD-10-AM, WHO 2017). It should be noted, however, that few physicians are aware of their existence and use these coding tools (MacKenzie, 2019, p. 40) (10).

In its relationship to mental and physical health, the concept of spirituality has also changed significantly over time, before becoming a fully- fledged dimension in the clinical context today. Recently, there has been a lot of research showing the positive role of spirituality and spiritual practices in developing desirable outcomes for mental health (depression, suicide prevention, addictions, etc.) (Lüdeckens et al., 2021) (14). In the context of the holistic approach to health, wellbeing and performance in military organizations, traditional definitions of spirituality, especially those from the point of view of different faiths, will have little relevance. Nevertheless, the theological definition of Paul Tillich (see Figure 3), an existentialist philosopher and Lutheran Protestant theologian (1886 - 1965), is the one that is most inclusive, thus joining other types of definitions of spirit and spirituality, which are of a universal type. In models in which the spiritual dimension is an integral part of the concept of religion, it is almost impossible to conceive a holistic health concept like TFF and develop integrative programs based for example on HPO including spiritual aspects. This is because each religious and ideological discourse has its own value system and references, which may be in contradiction to the basic principles underlying the current concepts of health. The definitions used in the studies on the holistic model of health and spiritual fitness in the context of military organizations refer to the common denominators that, on the one hand, connect all forms of spiritual practices (functional definition) and, on the other hand, define the specific features of the spiritual dimension of everyone’s life (substantial definition).

Spiritual care in the healthcare

Spiritual care is focused on the spiritual dimension of human beings and aims to support its development. The notion of spiritual care, in terms of definitions, concepts and outcomes, has also evolved, particularly in the 20th century. Historically, this concept has been strongly linked to the paradigm

Figure 2: Modern understanding - Clinical version (H. Koenig et al, 2011, p. 40) (8)
shifts in the work of chaplains in the healthcare sector, and it has evolved over time from a particularistic pastoral and theological approach to an evidence-based, pluralistic, outcome-oriented, and interdisciplinary approach, which emphasizes the importance of research-based information and considers the positive outcomes and needs of an organization (Fitchett & Nolan, n.d.) (16).

Spiritual care in hospitals consists of spiritual counselling directed towards the patients:

“..."The goal of spiritual care in healthcare settings is for the person—the patient, the client—to bring together the disconnected aspects of new experiences and the fragmented understandings produced by the disruptive impact of injury or illness. Ultimately it is up to the person to reassemble those pieces and restore some coherence to the story of their lives. Spiritual care comprises strategies to elicit resources, point to options, remind people of their previous capabilities to transcend, set up reflective spaces, or protect territory in which people can have" (MacKenzie, 2019, p. 14.) (10)

Three factors can positively influence the integration of spiritual resources and needs and the development of the concept of spiritual care: the use of a universalist definition of spirituality while safeguarding its specific features, a context of a pluralistic society and the interfaith dialogue between faiths and beliefs recognized by the state, and finally a multidisciplinary and interprofessional environment. Several conceptual and modelling constructs of spiritual care exist today in the pluralistic healthcare settings (Grung, 2022) (17) that allow this integrative approach to whole patient care, which is also integrated into different specific educational programs. These evidence-based models and metrics enable the chaplains to demonstrate their professionalism through their ability to map the spiritual needs of patients and to share relevant related information with other health professionals (Vandenhoek et al., 2022) (18), expanding the bio-psycho-social understanding of health to include the spiritual dimension.

Spiritual care in the military setting

Within the military organizations, spiritual care must be directed as much towards the Defence community, as towards the organization and its structures: its decision-making processes, the legal and ethical frameworks, and its training programs. The provided spiritual care can be thus shaped by the specific military environment and its needs (Pleizier & Schuhmann, 2022) (19).

The spiritual component of the TFF, chosen as the starting point for the definition of the concept of spiritual care specific to the Belgian societal context and military professional environment, has been defined as follows in the United States:

“..."Spiritual fitness includes an individual’s or group’s ability to maintain beliefs, principles, and values needed to provide support in times of stress. Spiritual fitness includes the development of personal qualities needed to sustain a person in times of stress, hardship, and tragedy. These personal qualities may come from religious, philosophical, or human values and form the basis for character, disposition, decision-making, and integrity. Human spirit development provides people with an understanding of who they are in terms of core values and identity. This awareness contributes to consistent behavior in accordance with one’s values and identity and living with integrity." (Chairman’s Total Force Fitness Framework (CJCSI 3405.01).2011) (20)

In different NATO countries, there are several examples of success stories of using the spiritual fitness component, demonstrating a good integration of spiritual aspects into H&WB policies. Spiritual fitness, however, is underdeveloped in countries that have not structurally implemented models of a holistic approach to health and operational readiness, with or without additionally including the chaplain’s role in it. Nevertheless, several research efforts to conceptualize chaplaincy care in the military environment are underway: for example, in Germany (Peuckmann, 2022) (21), Sweden (Grimell, 2022) (22) and Netherlands (Walton & Korver, 2017) (23). Aspects related to
the spiritual dimension of military work and the related role of military chaplains, especially around phenomena such as moral injury, are also the subject of interdisciplinary research (Molendijk et al., 2022) (24). The numerous studies, research, and publications on spiritual fitness point to different positive outcomes from its practical and operational application. Although these vary depending on the context in which spiritual fitness is defined, several attempts at outcome-based conceptualization have emerged. Some conceptual constructs are trying to anchor the spiritual fitness component in a broader scope, by defining, for example, the domain of “Human Spirit” (Sweeney et al., 2012) (25). Some models intend to implement and measure the spiritual fitness component, for example around commonly shared values**, as conceptualized, for example, by the VICTORS model (Gutierrez et al., 2021) (26).

Assessing spiritual fitness across the deployment cycle

Spiritual fitness can be supported in three distinct but interrelated phases within every deployment cycle: preparation, sustainment, and recovery (Alexander & Deuster, 2021) (27). In the preparation phase, leaders prepare Service Members for adversity by encouraging and strengthening their unique positive functions, qualities, attitudes, and relationships. In the sustainment phase, leaders aid Service Members in maintaining these positive traits even while under adverse conditions. This includes helping them recognize and mitigate the erosion of their positive traits during deployment and, when possible, noticing and supporting new positive traits being activated within adversity. In the recovery phase, leaders support Service Members in the aftermath of adversity through stabilization, which includes helping them to tolerate and adapt to the various new realities and conditions they are experiencing as they emerge from deployment. These new realities and conditions will neither be all positive nor all negative. However, they could be powerful enough in number and/or scope that they cause significant disorientation, and occasionally require specialist intervention.

During the recovery phase, leaders also begin to aid their Service Members in returning speedily to a state of poised preparation for the next deployment. This feeding back of leadership tasks from the recovery phase into the preparation phase creates a cyclical pattern of leadership support which matches the evolving needs of Service Members throughout the deployment cycle itself. Leaders might consider that transition points within the cycle (exiting preparation into deployment, exiting deployment into recovery, etc.) represent opportunities for special attention because of the elevated nature and number of the changes their Service Members are experiencing at those points.

Spiritual fitness assessment tools

The most effective health promotion activities begin by identifying specific behaviors, attitudes, and traits and approaching them via reliable assessments (McQueen & Jones, 2007; Simnett, Perkins & Wright, 1999) (28) (29). Promoting spiritual fitness is no different. Since the spiritual needs of Service Members can change in focus and scope throughout the deployment cycle, i.e., as they progress from preparation to deployment to recovery, assessment methods should support measurement in all three phases of the cycle. Beginning in the preparation phase, the SOCOM Spiritual Fitness Scale (SSFS) was created specifically for military populations in the readiness/preparation posture (Alexander, Abulhawa & Kazman, 2020) (7). It measures commitment to 3 factors: (a) Pursuit of Meaning, Purpose, and Values - PMPV, (b) Service and Sacrifice for the Greater Good - SSGG, and (c) Personal Connection a Higher Power - PCHP. The SSFS allows respondents to opt out of the PCHP questions if their worldview does not include a belief in God, Gods, or a Higher Power; in this case respondents will produce a two-factor baseline instead of a three-factor baseline.

Advancing to the sustainment phase of performance, The Spiritual Fortitude Scale (SFS-9) also measures 3 factors: (a) Spiritual Enterprise - ENT, (b) Redemptive Purpose - PUR, and (c) Spiritual Endurance - END (Van Tongeren et al., 2019) (30).** There is good reason to assume that Service Members will be likely to interpret the term ‘faith’ as referring to religious faith, and for this reason, allowing respondents to opt out of the END Subscale is accepted. Like those Service Members who opt out of the PCHP Subscale of the SSFS, Service Members opting out of the END Subscale of the SFS-9 will produce a two-factor baseline instead of a three-factor baseline. The attributes measured in the ENT, PUR, and END Subscals of the SFS-9 match well with those measured in the PMPV, SSGG, and PCHP Subscales of the SSFS, albeit within a different stance of performance.

For the recovery phase, three select subscales of the Religious and Spiritual Struggles Scale (R/SSS) measure factors which match well with those measured in the SSFS and SFS-9, albeit in the final stage of performance, which includes the potential for depletion or distress (Exline, et al., 2014) (31). Those selected factors are as follows: (a) Struggles Related to Morality and Conscience - MO, (b) Struggles Related to Ultimate Meaning - ME, and (c) Struggles Related to the Divine - DL.** Like the items related to the PCHP Subscale of the SSFS and the END Subscale of the SFS-9, the items related to the DI Subscale of the R/SSS represent religious questions, and respondents should therefore be allowed to opt out of completing this subscale. Once again, this would produce a two-factor instead of a three-factor baseline for those respondents who opt out.

Key spiritual fitness traits

Together the attributes measured by the subscales listed above form a coherent picture of three spiritual fitness traits: the ability to remain connected to meaning and purpose, the ability to integrate actions with core beliefs, and a commitment to people and relationships. These attributes are reflected in the findings of qualitative studies on spirituality, which have been accomplished with military populations (Searle & Vance, 2021; McCarthy, Alders, Alexander & Deuster, n.d.) (32). They are also reflected in the constructions of existing guidance and doctrine on spiritual fitness in publications on the topic by the American and Canadian Armed Forces (CJCSI 3405.01; CDT HFM-302) (20) (33). However, two other key traits are commonly found in both qualitative studies on spirituality in the military and existing guidance and doctrine on spiritual fitness: (1) the ability to maintain a hopeful outlook and (2) the ability to forgive oneself and others after moral failure (Searle & Vance, 2021; McCarthy, Alders, Alexander & Deuster, n.d., CDT HFM-302) (32) (33). These traits are also measurable, although more work needs to be done to strengthen assessment capability before, during, and after adversity, to match needs** of Service Members throughout the cycle of performance. Suggested metrics for use with Military Service Members are as follows. For
measuring hopeful outlook, Krafft, Krumm, and Fenouillet’s (34) Perceived Hope Scale – adapted from the Hope and Optimism Subscale of the World Health Organization Quality of Life Spirituality, Religion and Personal Beliefs Questionnaire – is a solid and concise option which may be employed in either the preparation or sustainment phase of performance (2019). For measuring forgiveness of self and others, the two subscales related to these factors in the Heartland Forgiveness Scale (Thompson et al., 2003) (35) have been used in many contexts and are moderately correlated with the PMPV Subscale of the SSFS (Alexander, Abulhawa & Kazman, 2020) (7). These Heartland subscales – Forgiveness of Self and Forgiveness of Others – are likely to achieve their best results in the sustainment and recovery phases.

To summarize, using evidence from quantitative and qualitative studies, it is possible to identify at least 5 measurable spiritual performance traits which fit well within existing frameworks for spiritual fitness in the American and Canadian Armed Forces: (a) connection with meaning and purpose, (b) integration of highest values and beliefs, (c) commitment to relationships with people and the common good, (d) a hopeful outlook, and (e) the ability to forgive/reconcile with self/others after moral failure. Figure (1) below tries to show how these traits may be associated with different needs among Service Members at distinct phases of the performance cycle.

**Bridging assessment to spiritual fitness coaching**

If supporting spiritual fitness starts by assessing identifiable traits, this still represents only half of the work. More than any other wellness effort, supporting spiritual fitness depends on tailored coaching that resists pre-packaged solutions or mechanical interventions. Spiritual fitness coaching requires a focus on the complexity, uniqueness, and totality of each Service Member, taking into consideration their individual combination of beliefs, attitudes, motivations, meaning structures, and history – along with rituals, expressions, and practices that may ground and drive the expression of spiritual fitness traits (Alexander, 2020b; Alexander, n.d.; Papadopoulos, 2020) (36) (37).

Once a representative number of Service Members in a population have completed a particular spiritual assessment, norming is possible, i.e., Service Members can compare their individual scores against their peers’ wider field. If Service Members determine that their scores are relatively “high” or “low” against a field of their peers, they can take this determination into a coaching encounter with a leader, chaplain, or other mentor, to develop strategies for either strengthening or maintaining the traits that have been assessed**. To aid such coaching encounters, a coaching tool may be useful, which empowers both the coach and Service Member to explore the widest context of the Service Member’s spiritual needs and strengths**.

As demonstrated in this vignette above, the process of assessment in spiritual fitness coaching provides structure by presenting identifiable spiritual traits for consideration (which are correlated with wider wellness traits), locating a Service Member’s responses to items loaded onto these traits (against a field of peers) for relative comparison, and guiding both Service Member and coach into focused, tailored conversation to optimize strengths and mitigate vulnerabilities. Assessments designed for the preparation or readiness phase of performance are quite versatile and likely to prove the most useful to leaders and chaplains seeking to bridge assessment into tailored coaching in any setting. However, assessments such as the SFS-9, designed for sustainment phase use, are useful during challenging deployments, as they are targeted on the resilience of positive spiritual traits. Similarly, assessments such as the R/SSS which are designed for use in the recovery phase are useful in the aftermath of challenging deployments, as they are targeted on identifying spiritual distress. Other work has demonstrated how chaplains and leaders can leverage group spiritual fitness profiles to discern larger trends.

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*Sergeant Lemieux arrived at a new unit in January, and while processing into the unit had the chance to sit down with Chaplain Durkheim. When Chaplain Durkheim began to discuss the concept of spiritual fitness, Sergeant Lemieux admitted knowing little about it. Chaplain Durkheim mentioned the 5 key spiritual fitness traits listed above and offered to help Sergeant Lemieux complete an assessment (the SSFS) which could help them explore 3 of these traits together. Sergeant Lemieux agreed, after completing the SSFS, together they compared his scores against the SSFS scores of 350 Service Members who served in similar units throughout the force. They realized that, while his scores for the SSFG Subscale of the SSFS were above the average, his scores for the PMPV were significantly lower than average. Chaplain Durkheim noted that this might warrant some attention, since PMPV is also correlated significantly with a number of wider wellness traits such as optimism, general resilience, and quality of life (Alexander, Abulhawa & Kazman, 2020) (7). She produced a copy of the Coaching Grid listed in Appendix 8 and used it to lead a conversation with Sergeant Lemieux during which he reported experiencing periodic aimlessness regarding his future, and occasional struggles to find meaning in his work. They agreed to meet weekly for a month, to explore these experiences more and to collaborate on unique strategies to support his spiritual fitness during a time of some instability.*
Towards a common concept?

Defining new spiritual - needs.

In a security context where the risk of mass casualties is back, potentially exposing Belgian soldiers to moral and/or spiritual dilemmas, distress and injuries, spiritual fitness assessment tools could be particularly relevant, especially if related to unjut war events (Kraus et al., 2021) (38).

On the other hand, from a managerial point of view, the Belgian Defence is facing new challenges in dealing with new needs, related to diversification of profiles. Confronted with the resurgence of religious and philosophical expression in the professional environment (Van Bellingen, 2022) (39), which can both enrich the organization and expose it to more cases of discrimination and radicalization, Belgian Defence is also led to integrate a spiritual dimension into the different areas of its management policy. By developing a more inclusive diversity policy and interfaith dialogue as the common denominator, writing a care policy for veterans (Alexander, 2022) (40) and implementing a new framework of values and specific norms, the Belgian Defence intends to rehumanize its management policy, where spirituality would have its place. In the field of mental health, a resolution of the parliament was recently signed allowing for multidisciplinary and interprofessional psychosocial support for military personnel and their families before, during and after operational deployment, by formalizing the establishment of a Third Location Decompression. Additionally, there are also prospecs for integrating spiritual aspects into work on suicide prevention, resilience and burn-out, as well as in research fields, such as “military ethics” and “geopolitics of faith”. Although overlaps are possible between the roles of chaplains and other health professionals (Cooper et al., 2022) (41), scientific research encourages the development of collaborative models between chaplains and other mental health professionals (Besterman-Dahan et al., 2012) (42), particularly around themes such as moral injury. The concept of spiritual fitness / care could therefore further support interprofessional collaboration among PSMR actors and exploit its opportunities. However, several obstacles still need to be overcome in the mental health approach to achieve active interaction between the various players in the field, such as the issue of shared professional confidentiality - which has already been the subject of a white paper (Liégeois, 2010) (43) - and constructive discussion.

Furthermore, the work and research underlining the reform of military chaplaincies provides input for the various Belgian Defence working groups™ and vice versa. Although the spiritual dimension transcends the different projects and areas of research, involving all kinds of actors and levels, the role and possible contribution of chaplains and moral advisors to the development of spiritual fitness programs remains at the center of the reflection. The development of such programs would be part of the elaboration of the ad hoc spiritual care concept based on the specific needs of the Belgian Defence and would follow the evolution of academic research, be evidence-based, and inspired by the best practices of the countries that have implemented it. Even it might be considered as potentially irrelevant (Pattyn et al., 2022) (44), the spiritual component of the current Belgian HPO program for special forces is so far poorly investigated, and he specific spiritual needs of special forces activities should be assessed as soon as possible. In any case, as we have presented in this article, it must be measurable and should be developed into practical tools and manuals.

To this point, the support provided by Top Management, the assistance of various academic experts and the active collaboration of chaplains/moral advisors allow us to hope for concrete progress on these topics. The current doctoral research, supporting the substantializing phase, aims to define spiritual needs by means of a mixed-method study and is characterized by three types of approaches: interfaith, multi/interdisciplinary, and multi/international.

Special attention will be paid throughout the project to legal aspects and ethical considerations underlining the implementation of a future new concept of spiritual fitness / care in the Belgian military setting and the related contribution of chaplains. Finally, research in healthcare chaplaincies contributes directly to ongoing research in military settings, as Belgian military chaplaincies are part of the Directorate General H&W.

Priority outcomes

One of the most desired outcomes of this project is to contribute to the drafting of SOPs for operational deployment of the Belgian mental health professionals, including chaplains and moral advisors, by developing specific spiritual readiness assessment tools. Those would allow on the one hand to integrate a global PSMR risk analysis and to formulate concrete advice to the command during the process of drafting operational orders, and on the other hand to contribute to Forward Mental Health care and to ensure a follow-up during and after operations, which remain the core business of the Belgian Defence. However, references to spiritual readiness, fitness or care remain few, and are even “neglected” (H. G. Koening, 2022) (45) in academic, scientific, or military research. The spiritual dimension and the chaplain’s role are almost absent from NATO doctrines, although efforts are currently being made to integrate the spiritual dimension into the different research groups of the HFM panel. Thinking about developing a conceptual framework for spiritual care around the four core values of Belgian Defence (integrity, respect, courage, cohesion) and a spiritual fitness program through the specific measurable traits and their assessment scales that have been presented in this article, are already emerging as vectors for the substantializing process. Upcoming academic research needs to validate these vectors, and in a second step, military authorities must evaluate and confirm the results.

References

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33. Canada Defence Team Total Health and Wellness Strategic Framework 302.


42. Besterman-Dahan, K., Gibbons, S. W., Barnett, S. D., & Hickling, E. J. (2012). The role of military chaplains in mental health care of the deployed service member. Military Medicine, 177(9). https://doi.org/10.7205/MILMED-D-12-00007


• I have a core of beliefs, ethics, and values that give my life a sense of meaning and purpose.

SSGG Subscale (Service and Sacrifice for the Greater Good):
- The greatest moral decision is doing the greatest good for human beings.
- Human value and respect should be the greatest social value.
- I believe strongly in humanity and the power of the people.
- Being of service to others is an important sense of meaning in my life.
- I often think about a “grand plan” or process that human beings are a part of.

PCHP Subscale (Personal Connection with a Higher Power):
- I look to God for strength, support, and guidance.
- God comforts and shelters me.
- I feel God’s love for me.
- I feel God’s presence.
- I am grateful to God for all the God has done for me.
- I have decided to place my life under God’s direction.
- Religious beliefs are what really lie behind my whole approach to life.

2. Sustainment Phase Assessment: Spiritual Fortitude Scale (SFS-9):

(ENT) Subscale (Spiritual Enterprise):
- I continue to do the right thing despite facing hardships.
- I am able to do the right thing even in the midst of hardship.
- I retain my will to live despite my hardship.

PUR Subscale (Redemptive Purpose):
- Hardships give me a sense of renewed purpose.
- My sense of purpose is strengthened through adversity.
- I find meaning in my struggles.

END Subscale (Spiritual Endurance):
- My faith helps push me to overcome difficult tasks in life.
- My faith helps me stand up for what is right during challenging times.
- My faith helps me withstand difficulties.

3. Recovery Phase Assessment: Religious/Spiritual Struggles Scale-Excerpted (R/SSS-E):

MO Subscale (Struggles Related to Morality and Conscience):
- Wrestled with attempts to follow my moral principles
- Worried that my actions were morally or spiritually wrong
- Felt torn between what I wanted and what I knew was morally right
- Felt guilty for not living up to my moral standards

ME Subscale (Struggles Related to Ultimate Meaning):
- Questioned whether life really matters
- Felt as though my life had no deeper meaning
- Questioned whether my life will really make any difference in the world
- Had concerns about whether there is any ultimate purpose to life or existence

DI Subscale (Struggles Related to the Divine):
- Felt as though God had let me down
- Felt angry at God
- Felt as though God had abandoned me
- Felt as though God was punishing me
- Questioned God’s love for me

Occupational Health & Safety (OHS) is the international term for what Belgian legislation calls ‘the welfare of workers in the performance of their work’ or simply ‘welfare at work’. This legislation applies to the Belgian Defence.

Constitution of the World Health Organization (WHO) (last accessed on 17 December 2022).

Further, the acronym H&W will be used.

Further, the acronym TF will be used.

Total Force Fitness (Health.Mil) (last accessed on 17 December 2022).

By “interprofessional”, we mean “engaging different health professionals into a dialogue and active collaboration”, By “multidisciplinary”, we mean “engaging several scientific disciplines into a shared expertise”.


Further, the acronym PSMR will be used.

Further, the acronym HPO will be used.

A concept doctrine of the Human Performance Program has been officially published in September 2022. (ACST-COD-BELSOF-ILX-007 E001 R000)

Further, the acronym TF will be used.

QHSE represents four interrelated areas, on which an integrated occupational risk management process can equally act.

In the article, we have chosen to use the words combination “spiritual fitness/care concept”

Appendix B: Sample Coaching Grid (Using SFS for Example)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Notes on Commitment &amp; Connection Related to the 3 Core Attributes</th>
<th>Goals to Maintain or Strengthen Spiritual Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How has my commitment to this attribute changed in the past 6-12 months?</td>
<td>Which factors might help me strengthen my commitment to this attribute?</td>
</tr>
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<td>PCHP</td>
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<td>SSSG</td>
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</tbody>
</table>

42 International Review of the Armed Forces Medical Services Vol. 36/1 Revue Internationale des Services de Santé des Forces Armées
to refer to a future Belgian concept, because the use of these two terms is not yet clearly determined within the Belgian Defence. However, a clear distinction will be here made between “spiritual fitness” and “spiritual care” when using these terms in their original contexts. A literature review is now ongoing to define these terms more concretely.

taxiv The functional and administrative entity of the Belgian military chaplaincies. Further, the acronym SARM will be used.

taxv A more detailed article “La réforme de la division Services d’assistance religieuse et morale de la Défense: vers une authentique renaissance?” can be found in the Belgian Military Review.

taxvi Retired in 2020.

taxvii Concept of interconvictionality has been defined by the think-tank G3 in the European Charter for Interconvictionality as follows: “the simultaneous recognition of convictional diversity, of their potential reciprocal contributions and of the possibility of overcoming their different purposes in order to act together.” Charter_interconvictionality_engl_V10c.pdf (en-re.eu) (Last assessed 17 December 2022).

taxviii As a part of holistic care approach, that comprises the eight components of the TFF model.

taxix Available in Dutch and French.

xx Retired in 2022.

taxi In Belgium, there are six officially recognized denominations, and one non-confessional denomination, ‘Laitéité Organisée’.

xxiv For this purpose, this phase was also modelled, based on a research report on spiritual fitness, written for the Senior Officer Candidate Course 2011-2022.

xxiii Human Factors and Medicine (HFM): 329 (psychological support to leaders during the deployment cycle), 347 (on radicalization of military personnel) and the 352 (on moral challenges).

xxiv The outlines of the doctoral thesis and the substantiation phase were presented at the International Congress of Military Medicine, which took place in Brussels in 2022.

xxv “Spiritual care is an active process of finding people who need spiritual care identifying the nature of the need and responding to the need through theological reflection and the share of the spiritual practices” (Swinton).

xxvi For example: Clinical Pastoral Education (CPE).

xxvii Charting by Chaplains in Healthcare - White Paper of the European Research Institute for Chaplains in HealthCare (ERICH) - Elisabeth - Pastoralereg.org.be.

xxviii Canada, United States, Greece.

xxix Selfless service, Integrity, Routine, Openness, Tolerance and Calling.

xxx Note: a list of the items for the 3 SSFS subscales may be found in Appendix A.

xxxi Note: a list of the items for the 3 SF-9 subscales may be found in Appendix A.

xxi Note: a list of the items for these 3 R/SSS subscales may be found in Appendix A.

xxxiii As the spiritual needs of the Belgian Service Members still need to be defined by research, it is here too early to say that strengthening assessment will match these needs.

xxxv Will it presuppose a high standard of every Service Member autonomy. We will have to find out if it will be applicable to the Belgian Defence community.

xxxv One such tool is included in Appendix B. Perhaps a vignette using the tool in Appendix B would be helpful to readers.


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Belgian Captain-Commander Tatiana LETOVALTSEVA, CBRN engineer officer, graduated from the Royal Military Academy. Six years in the 4th Engineer Battalion and two operational operational missions.

Coordinator of the Defence Religious and Moral Assistance Services Division (SARM) since September 2018 in the Directorate General Health and Well-being. Project leader for the SARM division reform throughout the development of interconvictional dialogue and spiritual fitness/care concept, and conceptual pilot for the revision of the legal status of chaplains and moral advisors. PhD student at the Royal Military Academy and KU Leuven since the end of 2021. Member of NATO RTG HFM 352 (moral challenges) and HFM 329 (psychological guide for military leaders across deployment cycle).
The Importance of Bioethics and Health Law in a Pharmacist’s Line of Duty

Importance de la bioéthique et du droit de la santé dans l'exercice des fonctions de pharmacien

P.P. Ncayiyana¹. SOUTH AFRICA

Summary

Background: Bioethics and Health Law form an integral part of what pharmacists do in all their spheres. Bioethics explores moral and ethical questions surrounding life, health, science, medicine, and the environment. The Bioethics and Health law are particularly more important to the pharmacists serving in the humanitarian crises. Pharmacists play a pivotal role in disasters, emergency situations, conflicts, wars and disease out breaks as part of humanitarian organizations. Hence, there is great need to emphasize education of and create awareness about Bioethics and Health Law amongst all health professionals and pharmacists in particular.

Research Question: Why Should Pharmacists Concern themselves with Bioethics and Health Law?

Aim: To create awareness regarding Bioethics and Health Law amongst Pharmacists.

Methodology: The study followed a strictly normative assessment and descriptive analysis of existing case studies and the application of the health law in line with the statutory bodies like the UN, WHO and the Constitution of South Africa. Questions asked included: How does one draw a line where ambiguities exist?

Results Observed from Clinical Practice: Lack of understanding of the ethical rules that guide practice, ignorance about how the law and courts work; and what the statutory bodies expect are the main contributors to poor service. The author has over the years observed these acts of omission that included poor application of the informed consent process, missing patient files and prescriptions. This contributed to increased successful litigation by patients and findings of unprofessional conduct by the professional bodies. The ambiguities were also observed in humanitarian crises deployments.

Conclusion: It is important to have a basic understanding of Bioethics and Health Law especially for pharmacists as they work very closely with medical doctors. Vigilance and working as a team could lead to reduced omissions and litigations locally or in UN led humanitarian crises abroad.

This in turn will guarantee that patients get the highest care possible. The paper highlights the importance of the role that can be played by pharmacists in both public and private sector in minimizing unnecessary litigation.

Key words: Bioethics, Health Law, Informed Consent, Medication Errors, Medical Ethics, Humanitarian Crises, Record Keeping

Résumé

Contexte: La bioéthique et le droit de la santé constituent des repères qui guident l’activité professionnelle des professionnels de santé et notamment des pharmaciens. L’une et l’autre conduisent à interroger les questions morales et éthiques que soulèvent la vie, la santé, la science, la médecine, l’environnement

La bioéthique et le droit de la santé ouvrent sur des questions d’une acuité particulière en situation de crise humanitaire, de guerre, de catastrophe ou d’épidémies.

Or la place du pharmacien est centrale en de telles circonstances, notamment au sein des organisations humanitaires, rendant indispensables des actions de sensibilisation et d’éducation à la bioéthique et aux lois sur la santé.

Objectif de l’étude: Sensibilisation des pharmaciens à la bioéthique et aux lois qui régissent le domaine de la santé.

Méthodologie: L’étude présente une évaluation normative et une analyse descriptive de cas rencontrés dans la réalité afin de les confronter cadre légal promu par les organismes internationaux tels que l’ONU, l’OMS mais aussi la Constitution Sud-Africaine.

Résultats observés dans la pratique clinique: Le manque d’appropriation des règles éthiques qui doivent guider une pratique professionnelle de pharmacien, l’ignorance du mode d’application de la loi par le système judiciaire mais aussi par les instances internationales, sont les principaux facteurs qui contribuent à des dysfonctionnements professionnels.

Au fil des ans, l’auteur a ainsi observé le manquement à certaines obligations concernant notamment la rédaction du dossier patient, le recueil du consentement éclairé ou des ordonnances manquantes conduisant à des litiges qui portés devant les tribunaux ont amené à la condamnation de leurs auteurs. Il va de soi que ces dysfonctionnements ont également été observées lors de déploiements en situation de crise humanitaire.
Background

Bioethics and Health Law form an integral part of what pharmacists do in all their spheres. Bioethics explores moral and ethical questions surrounding life, health, science, medicine, and the environment. With the rising levels of patient awareness about their consumer rights and recourse, it is fast becoming complex administering healthcare to patients. The laws exist to protect both the patients and the healthcare professionals. However, Health Law education has primarily focused on medical doctors even though pharmacists and other healthcare professionals are likely to face increased litigations in the future too. Hence, the need to create awareness about Bioethics and Health Law amongst pharmacists.

The aim of this article is to create awareness regarding Bioethics and Health Law amongst Pharmacists. This is because there is an increasing demand for knowledge and understanding of ethics by health care practitioners (HPC’s) but little emphasis is made and not enough attention is given to it in many healthcare institutions including military. In this article the author will give a brief overview of medical ethics, informed consent, definition of medical negligence, medication errors and recommendations. The Bioethics and Health law are particularly more important to the pharmacists serving in the humanitarian crises. Pharmacists play a pivotal role in disasters, emergency situations, conflicts, wars and disease out breaks as part of humanitarian organizations (Rasheed, et al, 2019). The International Federation of Pharmaceutical (FIP) has incorporated the Military and Emergency Pharmacy Section (MEPS), which was established in 1953 (FIP, 2023). Humanitarian deployments are far much more ethically challenging because of various health laws that converge and must work in unison. For example the United Nations (UN) peacekeeping mission like the ongoing United Nations Organisation Mission in Democratic Republic of the Congo (MONUSCO) where pharmacists from the South African Military Health Services are currently deployed (UN, 2010). The UN and World Health Organisation (WHO) laws may differ slightly from the host and donor countries. The role of pharmacists in conflicts go beyond just managing, dispensing pharmaceuticals and preventing misuse and abuse of medicines, it should also include bioethics because humanitarian aids are never without controversy.

Medical Ethics

Medical Ethics are moral principles that govern the practice of medicine. Morals are about what is right and wrong. Therefore, medical ethics deal with the rights and wrongs of decision making in clinical practice (Markose, et al, 2016). Medical Ethics are principles based Ethics, stemming from Principlism which is a foundation for ethical decision-making popularised by Tom Beauchamp and James Childress (2001). Principlism encompasses the following principles: Beneficence, Non-Maleficence, Autonomy andJustice, all are briefly explained below.

Beneficence: This principle refers to actions that promote the well-being of others and or performed to contribute to the welfare of others. In humanitarian crises HCPs strive to render the best care there is with very limited resources and often in the most remote areas.

Non-Maleficence: This principle asserts an obligation not to inflict harm intentionally and forms the framework for the standard of due care to be met by any HCP. However, there are plenty of examples of wrong doing by HCPs from literature e.g. Tuskegee Syphilis which is a trial that was carried out by the US Public Health Service from 1932 (Tynon, 2000). The trial was only stopped in 1972 when an advisory panel found it unethical (Tynon, 2000).

HCPs operating in humanitarian crises may be hindered by circumstances beyond their means to render the standard of due care. Therefore, harm may result as on omission because it may not be safe to render medical care or supplies may have run out or inferior products may have been procured locally.

Autonomy: This principle refers to the individual’s capacity for intentional action (Freedom to Choose). A common example is a Jehovah’s Witness who may refuse a blood transfusion on religious grounds. This may seem medically unwise, but the patient has a right to refuse this treatment.

Autonomy brings together many ethical challenges, including the areas of consent and capacity.

Justice: This is the principle of fairness. It refers to the equitable, and appropriate treatment in light of what is due or owed to person e.g. Universal Health Coverage seeks to address that.

Informed Consent

It is a process by which a patient voluntarily confirms his or her willingness for a particular treatment plan to be carried out after having been informed of the nature of the treatment, its alternatives, benefits, cost, risks and opportunity for questions and consultation with other family members provided. Informed Consent must be documented signed and dated. A consent process should also include the right to refuse treatment. However, one should make sure that the patient clearly understands risks associated with refusing treatment. To consent, patients also need to have the capacity. It is always assumed that patients have the capacity to consent (Melvin, 2020). To demonstrate capacity the patient should be able to understand what the medical treatment is, its intended purpose, consequences of not undergoing the procedure, retain this information, ask questions relating to the procedure and finally communicate their decision (Willac, 2021). Capacity can sometimes change over time, therefore, it should be assessed very closely.
Medical Negligence

In this paragraph the author briefly introduces medical negligence and its definition. Medical negligence is defined as an act or omission (failure to act) by a medical professional that deviates from the accepted medical standard of care (Goguen, 2018). This is also applicable to other healthcare professionals, like a prescription error from a pharmacist. However, it is the duty of the patient or his/her relatives to establish that (US Legal, 2018):

a. There was a duty which the medical practitioner owed to the patient;
b. There was a breach of duty;
c. The breach resulted in injury to the patient;
d. The injury resulted in causing damages.

In humanitarian crises medical negligence may come as a result of language barriers, poor quality of the medications and equipment donated. WHO has an updated guidelines on donated medical equipment including pharmaceuticals (WHO, 2011). The guidelines originated from questionable donations from the past that were deemed unethical e.g. donating expired stock or short dated stock, donating drugs not registered or banned from the donor's country (WHO, 2011). The packaging of donated stock sometimes, it arrives in various languages thus creating an ethical dilemma for the treating teams and patients. This may contribute to the medical negligence.

Medication Errors

This is an area of practice where pharmacists can play a pivotal role in minimising medication errors in their institutions. In literature the most occurring medical malpractice lawsuits involved misdiagnosis or delayed diagnosis followed by medication errors, childbirth injuries, surgical mistakes and anaesthesia errors (Loftsgordon, 2018). Medication errors places a duty more to the pharmacist than any other professional as the custodian of pharmaceuticals. This essentially means that if a pharmacist does surveillance and discovers that there might be a worrying trend of medication errors within their environment then they ought to act to mitigate against that.

A study conducted in 2006 showed that medication errors harm about 1.5 million people in the United States every year (Loftsgordon, 2018). The most commonly reported types of medication errors were prescribing errors, occurring in a median of 57.4% (Mekonnen, et al, 2018). Medication errors can occur in many ways for example from the initial prescription to the administration of the drug (Loftsgordon, 2018). The following are the most common medical malpractice lawsuits (Loftsgordon, 2018):

a. Prescribing wrong medicine
b. Prescribing for a misdiagnosed condition
c. Right drug wrong patient in the hospital setting
d. More Common: Dosage Errors e.g. the patient gets too little or too much of the prescribed drug
e. The doctor writes an incorrect dosage on the prescription.
f. The prescription is correct, but the nurse administers the incorrect amount.
g. Equipment that administers the drug malfunctions, causing a large dose of medication to be administered over a short period of time.
h. Pharmacist Errors

A pharmacist has an opportunity to get involved in all of the above. Below the author discusses the expected duties of a pharmacist.

Duties of a Pharmacist

The duties of a pharmacist to the patient include, confirming that it is the right patient, right diagnosis, right treatment and patient counselling for example. Duties also include, Drug Utilization Review, which looks at what medication has been prescribed, for what condition, how should it be taken, what side effects to expect and how to manage them, why is compliance important, what to do with excess medication, and checking for understanding and so forth. Any omission on the above mentioned steps may be considered as an "omission" and can place the patient at risk.
Observation from Clinical Practice

Lack of understanding of the ethical rules that guide practice and ignorance about how law and courts work; and what the professional body expects are the main contributors to omissions that are classified as “negligence”. The author holds a qualification in bioethics and health law; over the years of practice in both private and public institutions, she has observed these acts of omission that included poorly constructed informed consent, missing patient files and prescriptions. This contributed to increased successful litigation by patients and findings of unprofessional conduct by the professional bodies (Pharmacy and Medical Councils for example).

In humanitarian crises it’s not always possible to follow guidelines to the latter. This is because even teams rendering aid are not stationed together and pharmaceuticals require specialised storage. In some countries it is extremely hot and highly humid with poor or intermittent energy supply thus affecting the medication storage. This variability alone is of great concern. It has also been observed that through the application of bioethics, healthcare workers can improve professionalism in service delivery and can reduce the number of successful litigations.

Conclusion

It is important to have a basic understanding of Bioethics and Health Law especially for pharmacists as they work very closely with medical doctors. Vigilance and working as a team could lead to reduced omissions and litigations. This in turn will guarantee that patients get the highest care possible. The paper highlights the importance of the role that can be played by pharmacists in both public and private sector in minimizing unnecessary litigation.

Recommendations:

a. Pharmacists ought to create awareness amongst themselves, and their communities at home or in humanitarian crises.

b. Keep abreast with what is happening locally and internationally including pharmacovigilance activities against standard products especially in deployments.

c. Play an active role in keeping the Pharmacy Practice in line with the local and international guidelines where applicable.

d. Dispense and advice defensively (covering all aspects).

e. Keep accurate records of everything including: recording, signing, dating and timing every interaction with a patient or prescriber. This includes documenting your thoughts or line of thinking at the time you were helping the patient. This may help you prove credibility because you may be required to prove that you were not “Negligent”; you took time to consider issues.

g. Should consider electronic filing of original prescriptions.

Risk Management through continuous updating of Standard Operating Procedures and monthly meetings to review and close gaps.

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LIEUTENANT-COLONEL (Pharm) Precious NCAYIYANA

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Radiobotics: Artificial Intelligence (AI) in Military Dentistry

Radiobotique : L’intelligence artificielle (IA) dans la dentisterie militaire

T. VERHOFSTADT¹, H. WILLEMS², J. KROIS³. BELGIUM

Summary

Similar to other fields, dentistry is also moving forward toward a new era of data-driven medicine assisted by bots. Radiobotic dental assistance on two- and three-dimensional radiographs has the potential to be applied to different fields in dentistry, not only in effectively diagnose dental disease and plan treatments, but also in implant dentistry, prosthodontics, periodontics, orthodontics and many others.

In 2015, Ronneberger convolutional network achieved a 1% sensitivity hit rate on intra-oral radiographs. Today’s commercial certified artificial intelligence software for decay detection, achieves >90% sensitivity and 93.75% accuracy with only a 2.8% false positive rate by using intra-oral radiographs. On panoramic radiographs, AI algorithms score almost twice as high on sensitivity when comparing to military dentists and even three times that of accredited dentists.

However, AI is still unlikely to replace the dentist-patient relationship in the foreseeable future as humane elements are also of utmost importance in decision-making to manage dental care. The AI technology is intended to support dental clinicians in reducing misdiagnosis and work synergistically with the unique abilities of dentists to provide enhanced, accessible care by taking away routine parts of dentists’ work.

Key Words: Dentistry, Artificial Intelligence, Military Dentistry, Radiobotic

Résumé

À l’instar d’autres domaines de la médecine, la dentisterie entre dans une nouvelle ère fondée sur les données et assistée par des robots.

L’assistance radiobotique sur des radiographies dentaires réalisées en deux et trois dimensions va s’appliquer à différents domaines de la dentisterie, non seulement pour un diagnostic efficace des pathologies dentaires, pour l’orientation des traitements, mais aussi en ce qui concerne la dentisterie implantaire, la prosthodontie, la parodontologie, l’orthodontie et plus encore…

En 2015, le “Ronneberger convolutional network” a atteint un taux de sensibilité de 1 % en ce qui concerne les radiographies intra-orales. Aujourd’hui, à partir de radiographies intrabuccales, le logiciel d’intelligence artificielle (IA) commercial certifié pour la détection des caries atteint un sensibilité supérieure à 90 % et une précision de 93,75 % avec un taux de faux positifs limité à 2,8 %.

A partir des radiographies panoramiques, les algorithmes d’intelligence artificielle ont une sensibilité presque deux fois supérieure par rapport aux dentistes militaires et même trois fois par rapport aux dentistes agréés.

Cependant, il est peu probable que l’intelligence artificielle remplace un jour la relation dentiste-patient, car les aspects humains sont également de la plus haute importance dans la prise de décision ainsi que la gestion des soins dentaires. La technologie de l’IA est destinée à aider les cliniciens dentaires à réduire les erreurs de diagnostic et à travailler en synergie avec les dentistes pour des soins de meilleure qualité tout en supprimant les aspects routiniers du travail.

Mots clés : Dentisterie, Intelligence artificielle, Dentisterie militaire, Radiobotique

Introduction

Military dentists ensure that military personnel are “Dentally Fit” in order to fulfill their military duties to minimize loss of time and effectiveness due to dental or oral problems. In dentistry, the interpretation of data and carrying out proper diagnosis are crucial.

However, medical decision-making is cumbersome for doctors in a time-compressed environment. Thus, an intelligent tool is required to assist doctors in making accurate decisions. Deep learning is a new technology that can assist military dentists in both diagnostics (e.g., detection of lesions, forensic expertise) as well as in therapy (e.g., tooth extraction, implant placement and others), and thereby helps dentists in assuring military personnel dentally fit.

The power of Artificial Intelligence (AI)

Artificial Intelligence in dentistry surfs on three big trends: X-ray get more accurate; chips get more powerful and AI algorithms get smarter. This enables powerful AI applications for both diagnostics and therapy, with the ultimate goal of making dental services more efficient and effective. (3).
In diagnostics, AI can help with observations of caries, crowns, endo, apical lesions, but also with predictions of wisdom tooth eruption (4,5). In therapy, AI can help with planning difficult extractions, implant placements and predict the outcome of a maxillofacial surgery. The first step of planning is the accurate modelling of the anatomy of the facial structures (https://relu.eu/virtual-patient-creator) (11).

Comparing a certified artificial neural network (ANN) with military dentists In 2015, Ronneberger convolutional network achieved a 1% sensitivity hit rate on intra-oral radiographs (1). The first accepted experimental field studies to detect caries on dental X-rays were recently published by using deep learning with convolutional neural networks (CNNs) (8,9,10). Today’s commercial certified artificial intelligence software for decay detection, achieves >90% sensitivity and 93.75% accuracy (5) with only a 2.8% false positive rate (2) by using intra-oral radiographs. On panoramic radiographs, AI algorithms score almost twice as high on sensitivity when comparing to military dentists and even three times that of accredited dentists (5).

A present study (5) compared a German certified neural network software program (www.DentalXr.ai) with a group of four Belgian experienced dentists and found the AI model to show higher overall sensitivity and accuracy than dentists on bitewing and panoramic radiographs. The lowest sensitivity ratio to detect advanced and initial caries was found by the civilian accredited dentists. For initial caries lesions, the risk of under-detection by dentists was high. The neural network, in contrast, showed robust sensitivity regardless of the lesion depth.

Compared to a systematic review, where the sensitivity for detection initial and advanced caries was between 0.24 and 0.43 (6), the sensitivity for detecting caries on Bitewings in this study was twice as high at 0.86 for military dentists. Civil accredited dentists were in the normal average of 0.33. Apparently, you can train detection of caries.

The detection of caries on panoramic radiographs was poor in all three groups compared to bitewings. The AI certified software found 20% less caries than on bitewings. The dentists found approximal 50% less caries on panoramic radiographs than on bitewings.

Military and clinical significance

Caries detection is marred by limited and varying accuracy of individual examiners leading to inconsistent decisions and sub-optimal care. To date, deep learning has very rarely been employed to interpret bitewing radiographs (5,6), which are the main diagnostic source for caries detection. Artificial Intelligence having a higher sensitivity, facilitating effective arresting therapies. Notably, the difference in sensitivities (AI had a better sensitivity as the dentists) and the reversed specificity, in which the dentists showed a limited advantage. This demonstrates the effects false-positive di-

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Sensitivity in % (95 % CI)</th>
<th>Specificity in % (95 % CI)</th>
<th>Accuracy in % (95 % CI)</th>
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<tbody>
<tr>
<td>Values</td>
<td>All caries</td>
<td>Initial caries</td>
<td>All caries</td>
</tr>
<tr>
<td></td>
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<td>96.30 (81.03-99.91%)</td>
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<td></td>
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<td>93.75 (82.80-98.59%)</td>
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<td>Military</td>
<td>85.71 (71.46-94.57%)</td>
<td>83.33 (65.28-94.36%)</td>
<td>94.44 (84.61-98.84%)</td>
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<tr>
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<td></td>
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<td>90.62 (82.95-95.62%)</td>
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<tr>
<td>Civilian</td>
<td>33.33 (19.57-49.55%)</td>
<td>16.67 (5.64-34.72%)</td>
<td>98.08 (89.74-99.95%)</td>
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<td>69.15 (58.78-78.27%)</td>
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Tab. 1: Differences among the three groups (deep learning, military and civilian dentists on bitewing radiographs between sensitivity, specificity and accuracy for all caries (F1/D1), D2-D3, secondary caries) and enamel/dentin initial lesions (F1/D1).
A specific recommendation to the Belgian Army, according to STANAG 6544 annex E: when the patient comes to the military dentist for expertise, first a standardized panoramic X-ray with bitewing radiographs is taken to classify teeth or restorations for forensic purpose and identify various artefacts or pathologies of the mouth, i.e., caries, apical lesions, root canals, fillings, crowns or periodontitis (ALARA). Every two years you can take panoramic radiographs for patients with specific problems, i.e., periodontics problems, wisdom teeth, endodontic and apical lesions (ALADA) and every four years for patients with minor problems.

Second, bitewing radiographs were taken every two years by the accredited or military dentists. The military dentist controls with the deep learning program the radiographs taken by the accredited or military dentists. In this way, errors in sensitivity are largely avoided. At the end, the military dentist must take ultimate responsibility for a go or no-go of the military patient. The impact of using such DL models on decision-making in a military context should be more explored.

**References**


**SENIOR CAPTAIN (Dent) Tom VERHOFSTADT**

Senior Captain (Dent) VERHOFSTADT obtained his master's degree in dentistry at the Catholic University of Leuven in Belgium and the title of Doctor at the University des Saarlandes in Germany. He has been serving in the Belgian reserve since 1992. Since the year 2000 he has been working in a private office in Dentistry in Kiewalde (Germany) and in a private office in Orthodontics in Kortenberg (Belgium).
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Management of common osteopathies among military dogs in the South African national defence force

Gestion des ostéopathies fréquentes chez les chiens militaires de la défense nationale sud-africaine

C.E. Swanepoel¹. SOUTH AFRICA

Abstract

Military dogs are specialised working dogs that start their working career very young in life through socialisation and training for their specialized field in a military training facility. Detection dogs, patrol dogs and guard dogs each have unique duties that affect their bodies in different ways. Among adults the strain of heavy patrols often manifests as hip dysplasia, degenerate joint disease, arthritis and bone reformation secondary to ligament or tendon injury and strain (1). Common osteopathies in young, fast-growing dogs include: hypertrophic osteodystrophy, growth plate fractures and miscellaneous fractures due to the physical nature of the military.

Key words: Osteopathy, Prevention, Management, Working dogs, Military dogs

Résumé

Les chiens militaires sont des chiens de travail spécialisés débutant leur carrière très tôt dans la vie par une socialisation et une formation dans un centre de formation militaire. Les chiens de détection, les chiens de patrouille et les chiens de garde ont chacun des tâches spécifiques qui affectent leur corps de manière différente. Chez les adultes, le stress des patrouilles lourdes se manifeste souvent par une dysplasie de la hanche, une maladie dégénérative des articulations, de l’arthrite et une reforma- tion osseuse secondaire à une blessure ou à une tension des ligaments ou des tendons (1). Les ostéopathies courantes chez les jeunes chiens à croissance rapide comprennent : l’ostéodystrophie hypertrophique, les fractures de la plaque de croissance et diverses fractures dues à la nature physique de la vie militaire.

Mots clés : Ostéopathie, Prévention, Prise en charge, Chiens de travail, Chiens militaires.

Introduction

The strain on the dogs’ skeletal system is often countered by using only the best breeding stock as working animals, but some osteopathies persist despite good breeding. Breeds utilised by the South African national defence force include: Rottweilers, German shepherds, Belgian shepherds, Dutch Shepherds and Labrador retrievers.

Dogs trained for detection duties require a strong focus and a good sense of smell. Dogs trained as guard dogs need to be strong, alert and fearless; having the ability to act on their own without a handler present is crucial to their function as guard dogs. Patrol dogs have the most physical requirements as they need fitness and drive to cover long distances and rough terrain. Sound bones and joints are essential for all working dogs (2).

Signs of osteopathies include lameness, pain, swelling, depression, joint crepitus and fever (3). Conditions such as hypertrophic osteodystrophy in puppies can be paired with concurrent pneumonia in more severe cases. Radiography is used to confirm diagnoses when physical examination and clinical signs indicate towards an underlyng osteopathy (4).

Management of specific conditions is done through diet (1), anti-inflammatory treatment, regular monitoring, exercise and physiotherapy. Recognising these conditions at an early stage can greatly improve the management prognosis and improve the quality of life of the animal (3).

Methodology

Veterinary encounters and causes for euthanasia at the military veterinary hospital were used as reference for this paper. This paper is a review on the current management of bone abnormalities in military working dogs in the SANDF.

Discussion

HIP DYSPLASIA refers to abnormalities and incongruency of the coxofemoral joint, otherwise known as the hip joint. Hip dysplasia is one of the most common musculoskeletal conditions that contributes to euthanasia of working dogs (2). Hip dysplasia presents as pain or sensitivity in the hip joints when manipulated during a physical exam or after the animal has exercised. In more severe cases the animal becomes lame or presents with a “bunny hopping” gait. The pain is caused by inflammation and subluxation.

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ation of the hip due to a laxity in the joint (3).

Prevention is done by phenotypic selection of breeding stock that does not present with hip dysplasia, or having a breeding pair where one of the two may present with mild hip dysplasia while the other presents with no hip dysplasia (5). Good nutrition practices are maintained for puppies and adult dogs in order to maintain healthy bones and joints. Young, skeletally immature dogs should not be overworked as the strain could lead to early development of hip dysplasia (1).

Conservative treatment focuses on alleviation of pain through non-steroidal anti-inflammatory drugs, management of weight, decrease in exercise, physiotherapy targeted at muscles around the joints for stabilization and strength, and chondroprotective drugs such as sodium Pentosan polysulfate (3) (6) (10).

**ELBOW DYSPLASIA** is a term that refers to a group of conditions including un-united anconeal process (UAP), osteochondrosis (OCD), fragmented medial coronoid process of the ulna (FMCP), and incongruence of the elbow joint; which causes early degenerative joint disease in large breed dogs (7). Patients normally present with unilateral or bilateral front limb lameness.

Prevention is done through good nutrition, chondroprotective agents, selective breeding and radiographic monitoring to catch early signs of inflammation and elbow instability (8) (9). Treatment involves correction of the underlying cause of the joint incongruity, usually through surgical means. These cases are referred to specialist surgeons (9).

**CANINE OSTEOARTHRITIS** can occur in any joint that takes abnormal strain, has been previously injured or has a genetic predisposition (10). The disease usually progresses slowly as inflammation results in cartilage degeneration, bone margin hypertrophy and synovial membrane changes; resulting in pain and stiffness (10).

Treatment is aimed at reducing inflammation and improving joint mobility; this is achieved through anti-inflammatory drugs, weight management, exercise, physiotherapy and antiarthritic drugs such as sodium pentosan polysulfate (10).

**SPONDYLOSIS** is a degenerative, non-inflammatory disease associated with new bone formation across spinal disc spaces.

This disease commonly occurs in aging dogs and is often subclinical with a breed predilection for German shepherds and boxers (11). In working dogs, the bony spurs can be associated with back pain and reduced spinal flexibility. Osteophytes may compress spinal nerve roots and cause lameness and stiffness of the spine. (11). In the SANDF prevention is done through selective breeding. The condition is managed with light exercise and nutrition until the pain becomes clinical and the animal is euthanised.

**GROWTH PLATE DAMAGE** can occur with working dogs when there is trauma to the growth plates, leading to inflammation and premature closure. Non-steroidal anti-inflammatory drugs or corticosteroids can be used to reduce the inflammation. If the injury to the growth plate is severe the prognosis remains guarded (12).

**Conclusions and recommendations**

For young, large breed dogs to mature into healthy adults they need balanced nutrition in order to develop strong bones and joints (6). Over or under nutrition can lead to skeletal abnormalities such as growth plate inflammation (13). Maintenance of healthy weight in adults is essential in order to reduce the strain on joints and bones (1). Physiotherapy and targeted exercises are a helpful tool to reduce pain in animals affected with osteopathy (6). The use of anti-inflammatory drugs with the anti-arthritic drug, sodium pentosan polysulfate, can help to improve the quality of life of working military dogs and extend their lives (3).

In the future of the SANDF, in order to advance beyond conservative treatment, we will need to advance the surgical training of our veterinarians through orthopaedic surgery internships.

**References**


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Qualified as a veterinary surgeon in January 2021 (University of Pretoria (South Africa), capable of working with small animals, equines, production animals, intensive production animals, wildlife and exotics. Extra experience in haematology from experimental research paper titled "A study on the increase in prevalence of Haemoproteus spp. in passerines" concluded in September 2020.
Impact des facteurs prédisposant les jeunes patients au développement d’un hématome sous-dural chronique intracrânien

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Summary

Background. Chronic subdural haematoma (CSDH) commonly occurs after traumatic brain injury (TBI). Although elderly patients with mild TBI are most often affected, young patients too can develop CSDH in rare cases. We present three cases and describe special anatomical and demographic factors in a group of young patients with CSDH.

Methods. We conducted a retrospective analysis that included 60 patients with CSDH (< 50 years of age) in order to explore the presence of predisposing factors (disorder of haemostasis, cerebrospinal fluid imbalance, cerebral malformation, drug/alcohol abuse). At least one of these predisposing factors was detected in 36 patients. We assessed the following parameters in patients with and without predisposing factors: TBI severity, time interval from TBI to diagnosis, duration of signs and symptoms, and main clinical signs and symptoms. In addition, we analysed haematoma size, recurrence and laterality, and the number of revision procedures.

Results. Headache was the most common clinical symptom, regardless of the presence or absence of a predisposing factor. The most common predisposing factors were cerebrospinal fluid hypotension (n = 13), disorders of haemostasis (n = 12), and anatomical malformations (n = 9). Patients with predisposing factors showed significantly less severe TBIs and significantly larger haematomas than patients without predisposing factors. In addition, the rates of bilateral and recurrent haematomas were higher in the group of patients with predisposing factors.

Discussion and conclusions. Young patients too can develop CSDH. Our results demonstrated some differences between patients with and patients without predisposing factors. If CSDH is detected in patients under 50 years of age, an investigation into the underlying causes and specific predisposing factors is recommended. In young patients with known predisposing factors, even trivial TBI must be thoroughly examined and patients must be made aware of the increased risk of delayed CSDH. The presence of factors predisposing to CSDH must be considered in medical tests used in deciding fitness for certain military duties.

Key words: Chronic subdural haematoma, Traumatic brain injury, Subdural haematoma, Fitness for military duties

Résumé

Contexte : L’hématome sous-dural chronique (HSDC) survient fréquemment après un traumatisme cérébral (TBI). Bien que les patients âgés ayant subi un TBI léger soient le plus souvent touchés, les jeunes patients peuvent eux aussi développer un hématome sous-dural chronique dans de rares cas. Nous présentons trois cas et décrivons les caractéristiques anatomiques et démographiques particulières relevées dans un groupe de jeunes patients atteints d’HSDC.

Méthodes : Nous avons mené une analyse rétrospective incluant 60 patients atteints d’HSDC (< 50 ans) afin d’explorer la présence de facteurs prédisposant (trouble de l’hémostase cérébrale, déséquilibre du liquide céphalo-rachidien, malformation cérébrale, abus de drogues/alcool). Au moins un de ces facteurs prédisposant a été détecté chez 36 patients. Nous avons évalué les paramètres suivants chez les patients avec et sans facteurs de prédisposition : sévérité du TBI, intervalle de temps d’intervalles entre le TBI et le diagnostic, les principaux signes et symptômes cliniques ainsi que leur durée. En outre, nous avons analysé la taille de l’hématome, la récurrence et la latéralité ainsi que le nombre de procédures de révision.

Résultats : La céphalée était le symptôme clinique le plus fréquent, indépendamment de la présence ou non d’un hématome ou d’un facteur prédisposant. Les facteurs prédisposant les plus fréquents étaient l’hypotension du liquide céphalorachidien (n = 13), les troubles de l’hémostase (n = 12) et les malformations anatomiques (n = 9). Les patients présentant des facteurs prédisposant ont présenté des TBI significativement moins graves et des hématomes significativement plus grands que les patients sans facteurs prédisposant. En outre, les taux d’hématomes bilatéraux et récurrents étaient plus élevés dans le groupe de patients présentant des facteurs prédisposant.

Discussion et conclusions : Les jeunes patients peuvent eux aussi développer un HSDC. Nos résultats ont démontré quelques différences entre les patients qui possèdent et ceux qui ne possèdent pas de facteurs prédisposant. Si un HSDC est détecté chez des patients de moins de 50 ans, une enquête sur les causes sous-jacentes et sur les facteurs de prédisposition spécifiques doit être menée. Chez les jeunes patients dont les facteurs de prédisposition sont connus, même un TBI anodin doit faire l’objet d’un examen approfondi et les patients doivent être informés du risque accru de HSDC tardif. La présence de facteurs prédisposant à un HSDC doit être prise en compte dans les examens médicaux utilisés pour décider de l’aptitude à certaines fonctions militaires.

Mots clés : Hématome sous-dural chronique, Lésion cérébrale traumatique, Hématome sous-dural, Aptitude aux fonctions militaires
Background

Subdural haematoma (SDH) can develop at different time points after traumatic brain injury (TBI). It is a type of bleeding that occurs between the dura mater and the arachnoid. SDHs are classified, for example, depending on the time of their onset after TBI. Acute SDHs develop over minutes to hours. Subacute SDHs appear within a few days of an injury. Subdural fluid collections that occur more than ten days after TBI are referred to as chronic subdural haematomas (CSDHs).

Chronic subdural haematoma

Pathophysiology

Inflammatory and fibrinolytic processes are suspected to be the reason why acute and subacute SDHs become chronic. A pseudomembrane forms around the haematoma, which continuously liquefies within this capsule. In many cases, the haematoma gradually enlarges (probably as a result of fluid that is drawn into the subdural space through osmosis and recurrent microbleeds from pathological vessels in the haematoma capsule [5]).

Prevalence/incidence

CSDHs are most commonly encountered in infants and the elderly (>65 years of age) with an incidence of approximately 5 per 100,000 population per year. [12, 17] Neurological signs and symptoms appear approximately 2–8 weeks after TBI. The underlying TBI is described as trivial in many cases and a history of trauma can be elicited in less than 50% of cases. [6]

Diagnosis and treatment

Computed tomography (CT) or magnetic resonance imaging (MRI) of the head usually detect subdural haematomas rapidly and safely. Small and asymptomatic haematomas can be managed conservatively. Indications for surgery are neurological deficits secondary to the haematoma and major bleeding with relevant mass effect (e.g., a width exceeding the thickness of the calvaria on axial images [10]). The surgical procedure of choice is burr-hole drainage (usually under local anaesthesia) and the optional placement of a subdural drain for a few days following surgery. [9] Mortality after surgery ranges from 0.5% to 8%, depending on patient age, concomitant diseases and treatment. [17, 24] Tranexamic acid can possibly reduce the rate of CSDH recurrence, which normally is approximately 15–25%; evidence from the literature, however, is inconclusive. [11, 23] Middle meningeal artery embolisation may also be an option in the management of recurrent CSDH. [3]

Rare cases of CSDH in young patients

The formation of haematoma in elderly patients is commonly associated with cerebral atrophy, which leads to a decrease in the pressure in the subdural spaces (especially in an upright position) and thus promotes bleeding. In rare cases, however, CSDH is also seen in young adults without cerebral atrophy. [4]

As a result of its low incidence and atypical presentation, CSDH in patients under 50 years of age presents a particular problem, and a high rate of misdiagnosis is well documented in small case series. [6, 13, 14, 15] Multiple authors have reported a number of factors predisposing young adults to the development of CSDH (e.g., impaired haemostasis, imbalance in CSF dynamics/pressure, cerebral or cerebrovascular malformations, and chronic drug and alcohol abuse). [2, 12, 14, 16, 22] Not all young patients with CSDH, however, show such risk factors. Whether or not there are differences in patient histories, clinical and imaging findings, and postoperative courses (depending on the presence or absence of predisposing factors) is still unclear. Possible differences and their consequences are described in this article.

Case presentations

Case 1: CSDH in a patient with platelet function inhibition

A 21-year-old male soldier was taking high-dose aspirin and ibuprofen for one week following dental treatment. During a military ceremony, he experienced an episode of syncope. He fell and hit the back of his head but did not appear to have sustained any major injury. Over the following days, the patient suffered not only from ongoing dental pain but also from headaches that increased despite his self-medicating with the aforementioned combination of analgesics. Approximately two weeks after the fall, he also experienced a tingling sensation (paraesthesia) in his right arm and on the right side of his face. On account of these symptoms, he presented to a military physician who referred the patient to the Department of Neurology at the Bundeswehr Hospital of Ulm. Unenhanced computed tomography (CT) of the head was performed immediately and demonstrated a left-sided frontotemporal CSDH (Fig. 1A). The patient had no memory of a relevant TBI. Preoperative diagnostic tests for assessing coagulation showed a suppression of platelet function consistent with the prolonged use of acetylsaliclyc acid. Burr-hole surgery was performed under local anaesthesia and the haematoma was completely drained (Fig. 1B). The patient fully recovered within a few days.

Case 2: CSDH in a patient with a temporal arachnoid cyst

A 43-year-old male patient with right-sided hemiparesis, aphasia, and decreased consciousness was admitted to the emergency department of the Bundeswehr Hospital of Ulm with a suspected diagnosis of cerebral ischaemia. A CT of the head demonstrated a large left-sided chronic subdural haematoma that caused the signs and symptoms (Fig. 2A). Neither a physical examination nor CT suggested a history of a significant head injury. Diagnostic blood coagulation tests, including platelet function tests, were normal. Burr-hole surgery was performed under local anaesthesia and the haematoma was removed. Imaging demonstrated decompression of the left cerebral hemisphere (Fig. 2B). The patient’s neurological signs and symptoms rapidly resolved. The patient had no memory of a relevant TBI. For this reason, a large arachnoid cyst that was detected by magnetic resonance imaging (MRI) in the region of the left temporal pole was assumed to be the cause of CSDH (Fig. 2C).

Case 3: CSDH after epidural anaesthesia

A 22-year-old refugee from Syria who was pregnant for the fourth time presented to a maternity hospital to give birth at full term. She had had three uncomplicated spontaneous deliveries in her homeland and an...
uneventful fourth pregnancy. The patient had a spontaneous delivery under epidural anaesthesia (which was documented to have led to a CSF leak). The delivery was described as normal.

The mother and her child had been staying on the maternity ward for three days when the young woman suddenly experienced severe positional headaches. The patient underwent diagnostic CT for suspected cerebral venous sinus thrombosis. CT, however, did not detect any abnormal findings and, above all, did not show any signs of intracranial vascular thrombosis (Fig. 3A). On the following days, the patient's headaches worsened and were treated with symptomatic medications.

Prior to discharge, the patient underwent MRI since her symptoms had not sufficiently improved. Again, imaging provided no evidence of venous thrombosis but demonstrated a small subdural haematoma (Fig. 3B), which was left untreated. Eight days after giving birth, the woman was allowed to return to her refugee accommodation.

Seven days after her discharge from hospital, she was found in a deep coma at the accommodation site and her left eye was dilated. She was immediately taken to the emergency department of the Bundeswehr Hospital of Ulm. A CT of the head demonstrated a large space-occupying CSDH (Fig. 3C), which was immediately drained surgically. Coagulation results were normal. Although the haematoma had been completely removed in an uncomplicated surgical procedure, the patient's state of consciousness did not improve after surgery. Postoperative MRI showed that the patient's condition was caused by extensive infarction in the left hemisphere (Fig. 3D) in the absence of vascular occlusion. For this reason, it was assumed that the patient had developed brain herniation and infarction, which led to infarct swelling a few days later (Fig. 3E). Decompressive craniectomy was proposed as a last resort but was rejected categorically by the patient’s family. The young woman died in vegetative state approximately five weeks after the birth of her fourth child.

**The role of CSDH in military medicine**

From the military medical perspective, CSDH is interesting in two respects. First, young people too can obviously develop chronic haematoma after TBI which must be detected at an early stage so that spontaneous resorption can be achieved with conservative management and surgery is not required. Second, the presence of a factor predisposing to CSDH may be a reason for excluding military personnel from certain military duties where training or service are associated with an increased likelihood of trauma that may only be trivial but which can (more) easily lead to the development of intracranial haematoma in these young adults (e.g. impact trauma in combat situations, activities involving acceleration and deceleration such as flying duties or parachute jumping).

The objective of this retrospective study was to identify factors that may predispose young patients to the development of CSDH.

**Methods**

**Patient population**

From January 2000 to June 2017, a total of 526 patients with CSDH underwent surgical treatment at the Bundeswehr Hospital in Ulm. Among them were 60 patients who were younger than 50 years of age. These cases were retrospectively reviewed for the presence of predisposing factors (disorder of haemostasis, cerebrospinal fluid imbalance, cerebral malformation, drug/alcohol abuse). Thirty-six patients showed at least one of these predisposing factors (Group A). Twenty-four patients had no predisposing factor (Group B).
Parameters

The following parameters were analysed for the two groups:

- Severity of the underlying TBI (according to the current guidelines of the German Society for Neurosurgery on the basis of the three GCS' categories);
- Time interval from TBI to diagnosis,
- Duration of signs and symptoms, and
- Main clinical signs and symptoms.

In addition, we also analysed available CT and MRI scans as well as operative reports and other medical records in order to obtain information on the size, laterality and recurrence of haematoma and on the number of revision procedures after treatment.

Data analysis

Demographic data as well as clinical and radiological results were examined using univariate descriptive analysis. Means and medians were provided as measures of central tendency, and minimum and maximum values and standard deviations (SD) as measures of dispersion. In addition, interval data were tested for normal distribution. All grouped data were analysed using inferential statistics for testing the hypothesis of difference.

Non-parametric tests were performed on discrete, at least ordinal data (for which a normal distribution cannot be assumed). The Mann-Whitney U test for independent samples was used to compare two groups. Pearson’s chi-squared test, Fisher’s exact test, and Kendall’s tau test were used for nominal variables. In addition, correlation tests were performed. The level of significance was set at p < 0.05 for all tests. Data were analysed using SPSS Statistics 21 (IBM).

Limitations

As a result of the retrospective nature of this study (based on given group sizes), a conventional a priori sample size calculation could not be performed. We therefore undertook a post-hoc calculation in order to assess whether the observed differences were not below a specific effect size threshold at a probability of a Type I error (alpha) of 0.05, a minimum power (1-beta, probability of a Type II error) of 0.8 and a given sample size. Calculations were performed using G*Power software (version 3.1.9.2; http://www.gpower.hhu.de). The study was approved by the ethics committee of the University of Ulm.

Results

Description of the patient population

The ratio between females and males was 20:40. The patients had a mean age of 34.5 years (median 36, minimum 5, maximum 50, SD 11.26). Fifteen patients did not remember any trauma (TBI Grade: 0). Twenty-one patients had a mild TBI (Grade 1, GCS score: 13–15). There were 17 patients with a moderate TBI (Grade 2, GCS 9–12), and 7 patients with a severe TBI (Grade 3, GCS 3–8).

Time interval from trauma to surgery

The time interval from TBI to surgical decompression was only assessable in patients who remembered their TBI (n = 45). It ranged from a minimum period of 1 week to a maximum period of 16 weeks (mean 6.53, median 6, SD 6.2). Since two patients were intubated at admission, it was impossible to determine the time period from the onset of clinical symptoms to the diagnosis of CSDH in these cases. Accordingly, this parameter was assessed in 58 patients. The period from symptom onset to diagnosis ranged from a minimum of 1 day to a maximum of 84 days (mean 17.68, median 7, SD 32.4). Diagnosis was not made until four weeks after the onset of symptoms in more than two thirds of the cases and in two cases it took as long as more than eight weeks after the initial onset of symptoms.

Clinical manifestation

Signs and symptoms

Patients presented with a wide variety of clinical signs and symptoms (Table 1). Fifteen different signs and symptoms were reported. In the majority of cases, patients had a combination of symptoms. Two patients had been intubated in the prehospital setting and were therefore unable to describe their previous subjective symptoms. Headache was the most common symptom, presenting in 52 of 58 patients.

Haematoma size

Mean haematoma thickness was 1.7 cm (median 2, minimum 1, maximum 5, SD 0.89). Haematomas were found to be bilateral in 23 of the 60 patients. Fifteen patients presented with a unilateral right-sided haematoma and 22 patients with a unilateral left-sided haematoma.

Recurrences

Ten patients experienced haematoma recurrence. Haematomas recurred in 4 cases within the first week of initial surgery, in another 4 cases after one week to one month of surgery. Recurrence occurred more than one month after surgery in only two patients: after seven weeks in one case and after five months in the other. Seven of ten patients had a single recurrence, one patient had two, and two patients had three recurrences.

Predisposing factors

Thirty-six of 60 patients had at least one predisposing factor for haematoma (see Table 2 for the frequency of factors).

Analysis of dependence: Group A with and Group B without predisposing factors

Age

The mean age was 36 years in Group A (median 38, minimum 9, maximum 50, SD 9.83) and 32.29 years in Group B (median 28, minimum 5, maximum 50, SD 13.6). There was no significant difference (p = 0.202, Mann-Whitney U test). Since the ratio between females and males was 1:2 in both groups, no significant difference between the groups was found (p = 1.0, Pearson’s chi-squared test).

Severity of TBI

All patients who had no memory of a TBI were in Group A. The percentage of cases with mild TBI (Grades 0 and 1, 83.3%) was higher in Group A than in Group B (25%, 6 of 24 cases). By contrast, the percentage of patients with a Grade 2 or Grade 3 TBI was higher in Group B (75%).

The difference between the two groups in TBI severity was significant (p = 0.015, Pearson’s chi-squared test). In addition, there was a significant correlation between TBI severity and groups (p = 0.001, Pearson’s chi-squared test). The mean time from the onset of symptoms to diagnosis was 20.3 days in Group A (median 8.75, minimum 3, maximum 54, SD 4.9) and 13.1 days in Group B (median 7, minimum 1, maximum 42, SD 4.1). There was no significant difference (p = 0.147, Mann-Whitney U test) and no significant correlation (p > 0.1, Pearson’s chi-squared test) between the two groups in this regard. The two patients who had been intubated in the prehospital setting were in Group B.
Table 1. Frequency of clinical signs and symptoms (n = 58)

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Number of patients (n = 58)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches</td>
<td>52</td>
</tr>
<tr>
<td>Hemiparesis</td>
<td>13</td>
</tr>
<tr>
<td>Decreased consciousness</td>
<td>12</td>
</tr>
<tr>
<td>Vertigo</td>
<td>10</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>8</td>
</tr>
<tr>
<td>Speech impairment</td>
<td>6</td>
</tr>
<tr>
<td>Memory/concentration problems</td>
<td>5</td>
</tr>
<tr>
<td>Paraesthesia/dysaesthesia</td>
<td>5</td>
</tr>
<tr>
<td>Seizures</td>
<td>4</td>
</tr>
<tr>
<td>Gait disturbance</td>
<td>4</td>
</tr>
<tr>
<td>Confusion</td>
<td>3</td>
</tr>
<tr>
<td>Personality changes</td>
<td>2</td>
</tr>
<tr>
<td>Dysgraphia</td>
<td>1</td>
</tr>
<tr>
<td>Taste disorders</td>
<td>1</td>
</tr>
<tr>
<td>Organic psychosyndrome</td>
<td>1</td>
</tr>
</tbody>
</table>

Signs and symptoms
Headache was the most common presenting symptom in both groups and was reported by 83.3% of the patients in Group A and by 91.7% in Group B. There was no significant difference (p > 0.1, Pearson's chi-squared test) and no significant correlation (p > 0.25, Pearson's chi-squared test) between the groups in the frequency of the various clinical signs and symptoms.

Time from TBI to treatment
The time interval from TBI to treatment was longer in Group A (mean 7.33 weeks, median 8.5, minimum 3, maximum 12, SD 3.6) than in Group B (mean 5.83 weeks, median 5, minimum 1, maximum 9, SD 3.8). Half of the patients in Group A underwent treatment no earlier than four to eight weeks after trauma. By contrast, half of the patients in Group B received treatment less than four weeks after injury. In spite of this clear trend towards earlier treatment in Group B, there was no significant difference (p = 0.208, Mann-Whitney U test) and no significant correlation (p > 0.25, Pearson’s chi-squared test) between the groups.

Haematoma size
Haematomas in Group A (with a mean thickness of 2 cm) were larger than in Group B (with a mean thickness of 1.2 cm). Group A included all haematomas with a thickness of more than 4 cm. Almost all CSDHs in Group B (23 of 24 haematomas) were smaller than 2 cm. The difference between the groups in haematoma size was significant (p < 0.001, Mann-Whitney U test). There was also a significant correlation between haematoma thickness and groups (p < 0.01, Pearson's chi-squared test).

Laterality
Haematoma laterality was identical in both groups. Bilateral haematomas were seen in 44.4% of the patients in Group A and in only 29.2% of the patients in Group B. There was no significant difference (p = 0.285, Fisher’s exact test) and no significant correlation (p > 0.25, Pearson’s chi-squared test) between the groups.

Recurrence rates
The rate of recurrence was higher in Group A (22.2%) than in Group B (8.3%). All patients with more than one recurrence were in Group A. There was, however, no significant difference (p = 0.289, Fisher’s exact test) and no significant correlation (p > 0.1; Pearson’s chi-squared test) between the groups.

Discussion
All in all, the results of this study show that predisposing factors have a notable influence on the development of CSDH in patients under 50 years of age. A comparison of our findings with the existing literature reveals a number of points that will be discussed here in detail. It should be noted that significance tests must be considered with caution in the analyses of dependence since retrospective power analysis demonstrated that some tests were slightly underpowered. Statistical power, however, was never lower than 0.65.

Demographic and medical history factors
Sex
The ratio between males and females was 2:1 in the total patient population. This result is consistent with other studies and was observed across age groups. [7, 8, 21] It may be attributable to the males’ generally greater accident risk.

There was also no difference between the groups of patients with and without predisposing factors in terms of the ratio between females and males. In our study, sex ratio differences were found only in the subgroups of patients with predisposing factors.

Arachnoid cysts were more commonly encountered in men. This result is in line with data reported by Zuckerman et al. [26] Likewise, the patients in the subgroup that was characterised by an “increased consumption of alcohol” were predominantly male. A likely explanation for this finding is the generally higher prevalence of alcohol dependence and abuse among men. [19]

TBI history
In our study, 75% of all patients remembered a TBI. This percentage is comparable to that reported in similar studies. [1, 7, 15] In the group of patients with predisposing factors (Group A), mild TBI was more often the cause of CSDH than in the group of patients without predisposing factors (Group B). In Group A, 42% of the patients had no memory of a TBI and a further 42% had sustained only a mild TBI (cumulative percentage 84%, TBI Grades 0 and 1). These findings also apply to CSDH in elderly patients. By contrast, the majority of patients in Group B, who probably developed CSDH solely as a result of their TBI, had suffered a moderate or severe TBI (cumulative percentage 75%, TBI Grades 2 and 3). Since all patients in Group B remembered at least a mild injury, it was possible to determine

Table 2. Frequency of predisposing factors related to haematoma characteristics in the group of patients with predisposing factors (n = 36)

<table>
<thead>
<tr>
<th>Predisposing factor</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrospinal fluid hypotension (n = 13 of 36 patients)</td>
<td></td>
</tr>
<tr>
<td>Postoperative cerebrospinal fluid leak</td>
<td>5</td>
</tr>
<tr>
<td>After shunt surgery</td>
<td>3</td>
</tr>
<tr>
<td>After lumbar puncture</td>
<td>3</td>
</tr>
<tr>
<td>After epidural anaesthesia (with dural puncture)</td>
<td>2</td>
</tr>
<tr>
<td>Disorder of haemostasis (n = 12 of 36 patients)</td>
<td></td>
</tr>
<tr>
<td>Anticoagulant medications</td>
<td>10</td>
</tr>
<tr>
<td>Congenital coagulation disorder</td>
<td>2</td>
</tr>
<tr>
<td>Anatomical malformation (n = 9 of 36 patients)</td>
<td></td>
</tr>
<tr>
<td>Intracranial arachnoid cyst</td>
<td>8</td>
</tr>
<tr>
<td>Dandy-Walker malformation</td>
<td>1</td>
</tr>
<tr>
<td>Alcohol abuse (n = 6 of 36 patients)</td>
<td>6</td>
</tr>
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the exact time of injury in all cases. A mild, moderate or severe TBI was thus required to cause CSDH in approximately 75% of the total population of patients with CSDH. Accordingly, 25% of all patients with a CSDH had no memory of a TBI. All these patients, however, had at least one predisposing factor. This suggests that people without a predisposing factor and without a noticeable TBI do not develop CSDH. To our knowledge, this finding, which is supported by our data, has not yet been reported in such an explicit manner. The results reported by Yang and Hunang in an article from 2017 too suggested this correlation. CSDH always has a cause, it does not arise spontaneously. A TBI (however mild it may be) or a predisposing or causative factor can always be detected. [25]

Clinical manifestation
Although no significant differences were observed between the groups of patients with and without predisposing factors in terms of specific clinical signs and symptoms, the clinical manifestation of CSDH in young patients is different from that in elderly patients. In our study, headache was the most common presenting symptom and was reported by 86.7% of the patients. This finding is largely consistent with results reported in other studies. [13, 15] The percentage of patients under 50 years of age who experienced nausea and/or vomiting was 13.3%. In an article by Missori et al., 8.43% of the patients aged between 20 and 50 years experienced signs and symptoms of intracranial hypertension. [15] Other studies reported similar results and found that the most common presenting signs and symptoms were headache, nausea and vomiting (i.e. typical symptoms associated with intracranial pressure) in young patients, and disturbance of consciousness, hemiparesis and mental disorders (i.e. higher cognitive dysfunctions) in elderly patients (as a result of atrophy, which can compensate for increases in intracranial pressure). [6, 7, 8, 13, 15, 18] The fact that only 50% of the patients with alcohol abuse reported a history of headache may be attributable to the presence of cerebral atrophy despite the patients’ younger age or to a certain degree of habituation or tolerance to headache. Seizures as a symptom of CSDH were relatively rare in our study (6.7%). Gelabert-Gonzalez et al. observed seizures in 21.4% of the patients under 40 years of age. [7]

Predisposing factors: haematoma characteristics
Cerebrospinal fluid imbalance
Cerebrospinal fluid imbalance was the most common predisposing factor in our analysis, presenting in 36.1% of cases. Five of 13 patients developed CSDH following a surgical procedure of the spine with dural opening during which they likely experienced (temporary) CSF hypotension. Three patients with hydrocephalus were treated with a shunt that probably drained too much CSF. The additional outflow of CSF during haematoma formation prevented the build-up of intracerebral pressure, which would have inhibited the formation of extracerebral haematoma. Apart from open procedures involving the CSF system, punctures of the CSF space (lumbar punctures or, for example, placement of an epidural catheter [2, 22]) can lead to hypotension and the formation of CSDH (n = 5 of 13 patients in our study).

Disorders of haemostasis
Disorders of haemostasis were present in 33.3% of the patients with predisposing factors. The use of anticoagulant medications was the most common cause in the group of patients younger than 50 years. Baechi et al. reported that anticoagulants were used by 41% of the patients with CSDH across age groups. [1] In our study, these patients accounted for only 15% of the total population of patients, who, however, were of younger age. This finding is in line with the results reported by Gelabert-Gonzalez et al., who observed a similarly low percentage of young patients with CSDH receiving anticoagulation therapy (12.2%). [7] Only two patients in our study had a congenital coagulation disorder. It was interesting to note that the rate of patients with CSDH who had no memory of a TBI was higher among young patients with impaired haemostasis (60.0%) than among patients with other predisposing factors (35.5%). This finding suggests that less severe TBI can cause the formation of CSDH in patients on anticoagulation therapy compared to patients with other predisposing factors.

Anatomical malformations
In our study, 15% of the patients with predisposing factors (Group A) presented with an anatomical malformation. The presence of a malformation was the only predisposing factor that was detected in patients under 20 years of age. Intracranial arachnoid cysts were the most common malformation in Group A (88.9%). Takizawa et al. investigated a group of patients with CSDH who were aged between 7 and 40 years and found that 47.6% of these patients had an arachnoid cyst. [20] In our study, this percentage is lower (13.3% of the total patient population), but the mean age of the patients with an arachnoid cyst and CSDH was 32.62 years in our study and 32 years in the study by Takizawa et al.

Alcohol abuse
A history of alcohol abuse was far less common than the presence of CSF imbalance, disorders of haemostasis, and cerebral or cerebrovascular malformations. Only 10% of the patients with predisposing factors had a history of alcohol abuse, which was thus the least common predisposing factor in our group of patients. Similar low percentages were reported by Liliang et al. [13]

The role of time
The mean time from the onset of signs and symptoms to the diagnosis of CSDH was 17 days for the total patient population in our study. In the literature, however, shorter intervals (e.g. six days) [7] were reported as well. In our study, the time period from onset of symptoms to diagnosis is longer in the group of patients with predisposing factors (20 days) than in the group of patients without predisposing factors (13 days). The time interval from TBI to treatment was 6.53 weeks in the total patient population. This interval is again shorter in Group B (6 weeks) than in Group A (7 weeks). The difference was not significant but the results show a clear trend suggesting a delay in the identification, diagnosis and treatment of patients with predisposing factors.

The reason for the more rapid response to patients without predisposing factors (Group B) may be that these patients received more intensive observation and follow-up since most of them sustained more severe injuries and a more severe TBI than the other patients. By contrast, our data suggest that awareness of the risk of CSDH formation is lower in the management of young patients without a history of a major TBI. To our knowledge, this hypothesis has not yet been proposed in the literature. However, the number of young intensive-care patients who, in everyday clinical settings, are diagnosed with relatively small CSDHs on standard follow-up CT – and who are then followed up more closely as a re-
sult of that diagnosis – is remarkably high. At the same time, there appears to be a general willingness to perform diagnostic imaging in young patients who sustained a severe TBI and complain of posttraumatic headache. At least, this willingness to perform imaging in these patients is considerably greater than in young patients who report chronic headaches but have no known history of TBI. This is confirmed by our data and is consistent with our experience in everyday clinical practice.

Conclusions

Young patients too can develop CSDH. If a CSDH is detected in a young patient, it is absolutely important that this patient be assessed for a possible predisposition to haematomata, especially if there is no known history of severe TBI. Young patients with known predisposing factors for CSDH must undergo thorough diagnostic procedures in the clinical setting even if they sustained only a trivial head injury, e.g. during football heading (the true impact of heading in football is often underestimated), especially if a persistent or newly presenting headache is present. In addition, patients and their families should be informed of the predisposition and its consequences and should be made aware of the increased risk of a delayed CSDH even after a mild head injury. A predisposition to CSDH formation should also be considered in decisions that are made when the medical fitness of individuals with predisposing factors (chronic CSF hypotension, anticoagulant therapy, cerebral malformations) is assessed. In our opinion, military personnel with a predisposition to CSDH should be excluded from certain military duties that are associated with an increased risk of TBI or head accelerations (e.g. parachuting, flying duties, special forces).

References


NAVFY COMMANDER (MC) Chris SCHULZ

Chris SCHULZ (MC) was born in september 1974. He was called up for basic military service in july 1993. After serving in the Medical Corps of the Army for 2 years he developed to a navy medical officer and went to medical school of the universities in Gießen (Germany), Vienna (Austria) and Zurich (Switzerland) 1996-2002. Afterwards he served as a Resident Physician in Neurosurgery at the Bundeswehr Hospitals in Koblenz and Ulm. 2006 he was graduated to Medical Doctor by his dissertation at the University in Gießen. 2008 he reached Board Certification in Neurosurgery and was than Senior Physician in ULM. 2005-2014 he has been deployed to Prizren/Kosovo and 3 times to Mazar-e-Sharif (Afghanistan). He is currently the Deputy Head and Chief Senior Physician of the Neurosurgical Department at the Bundeswehr Hospital in Ulm since 2016. After successful habilitation the medical school of the University in Ulm graduated him to an assistant professor in 2019.
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Some thoughts on “One Health”

Even at the beginning of 2023, many people have not heard of “One Health” or are unaware of a concept they may consider new, abstract, and unconnected to their daily needs and concerns. These lines share some ideas in the hope that they could help situate this approach along the time and the current reality of our global society.

In 2004, the Wildlife Conservation Society organized a symposium hosted by the Rockefeller University, focusing on reported and potential movements of diseases among human, domestic animal, and wildlife populations. Using case studies on Ebola, Avian Influenza, and Chronic Wasting Disease as examples. The experts listed twelve recommendations for establishing a more holistic approach to preventing epidemic and epizootic disease, and maintaining ecosystem and biodiversity, in a document entitled The Manhattan Principles on “One World, One Health.”(1) We can affirm that this is the origin of the term “One Health.”

The fact that this term was coined in the 21st century does not mean that the concept did not nestle in the minds of significant thinkers and scientists for a long time. Hippocrates, the Greek father of Medicine, four centuries BC, in his treatises “On Airs, Waters, and Places,” points out that diet, climate, quality of the land, wind, and water are factors involved in the development of diseases in the population by influencing the balance of man with their environment. Moreover, if we look back to the Academy of Athens, which is considered the unfolding of science development and teaching, we met Aristotle and his outstanding contributions to biology, zoology, embryology, and the scientific method, through his observations, the study of Hippocratic treatises, and the information collected from

Dr. Rafael Lagunes, President of the World Veterinary Association

Hippocrates (460-377 BC)
ordinary people, such as fishermen, shepherds, hunters, and beekeepers. Aristotle is considered the founder of comparative Medicine by studying the common characteristics shared by human diseases with those of different animal species.

From classical Greece to the present day, although with ups and downs throughout history, science has significantly developed, divided into branches, subdivided into countless separate fields and more specialized disciplines, that sometimes evidence a severe and progressive fragmentation among them.

This fragmentation can also be observed in health professions, which stimulates large-scale specialization, conducting to disease-specific perspective, with which the specialist risks perceive individuals as a set of organs, tissues, cells, or diseases, isolated from other parts of their bodies and environment; losing sight of the big picture.

Observing this tendency, in the 19th century, Dr. Rudolf Virchow, the father of modern pathology and founder of social medicine, called for multidisciplinarity, stating, “Between animal and human medicines, there are no dividing lines - nor should there be. The object is different, but the experience obtained constitutes the basis of all medicine.”

With the same intention that Dr. Virchow, this time from the veterinary profession, in 1964, Dr. Calvin Schwabe published the textbook Veterinary Medicine and Human Health, which called for the integration of animal, human and environmental health within a public health approach. In his book, Dr. Schwabe mentions the term “one medicine.” The relationships between human and animal health are not new but as old as humanity. The article “Origin of measles virus: divergence from rinderpest virus between the 11th and 12th centuries” shows the connection between viruses, both diseases for humans and animals, proving that a common ancestor of measles virus and rinderpest virus infect both humans and cattle, the measles virus probably evolved after commencement civilization in the Middle East. Therefore, the measles virus may have originated from non-human species and caused emerging infectious diseases around the 11th to 12th centuries.

Another article that illustrates this relationship, but related to the SARS epidemic in 2002-2003, is “SARS molecular epidemiology: a Chinese fairy tale of controlling an emerging zoonotic disease in the genomics era”. This article, related to the SARS epidemic in 2002-2003 is another example of interspecies transmission of viral pathogens and the involvement of the environment (urban-rural-wild) in developing diseases. The article stated, “Severe acute respiratory syndrome (SARS) was the first natural disaster that challenged the Chinese people at the beginning of the twenty-first century.” It was caused by a novel animal coronavirus (SARS-CoV).

This study was carried out mainly in the Pearl River Delta, which is one of the most densely populated and urbanized regions in the world, and draws attention to the need to improve the knowledge and understanding of reservoir host distribution, the animal-animal and human-animal interactions, and the virus genetic diversity of bat-borne viruses; to prevent future outbreaks. The final observation is that “the coordinated global response, the research strategy, and methodology developed (in this case), can be applied in response to future emerging/re-emerging infectious”. But recent history shows us that humankind has not yet been able to learn these lessons and warnings from the past.

The efforts to control highly pathogenic avian influenza (HPAI) led FAO, OIE, and WHO to recognize the need for multi-sectoral and multi-institutional cooperation. In 2010 a Tripartite Concept Note (4) was published, setting the strategic direction for FAO-OIE-WHO to take together and proposing a long-term basis for international collaboration, sharing responsibilities, and coordinating global activities to address health risks at the animal-human-ecosystems interfaces.

Furthermore, the COVID-19 pandemic emphasized the need to strengthen coordination and collaboration among sectors to prevent, prepare, and respond to these threats more efficiently. That is the reason why, in November 2020, the Ministerial Meeting of the Alliance for Multilateralism called on the Tripartite (FAO, OIE, and WHO) and the UN Environment Programme (UNEP) to create a One Health High-Level Expert Panel (OHHLEP) (5).

Despite being equally important, the environmental dimension of One Health has fallen behind the human and animal dimensions. As the leading global voice on the environment, the presence in this group of UNEP is vital to defend a healthy planet as a prerequisite for the health of
people and animals. According to UNEP, the triple planetary crisis of climate change, biodiversity loss, pollution, and waste threaten our health and well-being.

According to its terms of reference, the OHHLEP is expected to provide advice to the Partners to support their provision of evidence-based scientific and policy advice to address the challenges raised by One Health.

The OHHLEP focuses on providing policy relevant scientific assessment on the emergence of health crises arising from the human-animal-ecosystem interface, as well as research gaps; and guidance on the development of a long-term strategic approach to reducing the risk of zoonotic pandemics, with an associated monitoring and early warning framework, and the synergies needed to institutionalize and implement the One Health approach, including in areas that drive pandemic risk.

One of the first deliverables of OHHLEP was the development of a definition of One Health, which was published in the OHHLEP annual report 2021. The previous definitions had been considered incomplete, depending on the point of view of the one who read them. Although a bit long, this new definition considers all the aspects that must be considered when launching or managing actions with a One Health approach. And it is worth rereading it one more time. The One Health definition developed by the OHHLEP states:

- One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

- It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent.

- The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.

In March 2022, FAO, OIE, WHO, and UNEP signed a MoU, turning the so-called tripartite into quadripartite, and in its One Health Joint Plan of Action (2022-2026) (6), working together for the health of humans, animals, plants and the environment, one of their objectives is to protect and restore biodiversity, prevent the degradation of ecosystems and the wider environment to jointly support the health of people, animals, plants and ecosystems, underpinned by sustainable development.

Of course, it is necessary to know the most significant data and the most recent initiatives of international organizations related to “One Health”, reviewed in this article. Still, the individual engagement of all health professionals (and other professionals, too) is vital in implementing this transversal, multisectoral, and multidisciplinary approach in daily professional practice.

References


### Member States

**Founder States**: Belgium, Brazil, France, Italy, Spain, Switzerland, United Kingdom, U.S.A.

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