COVID-19
Lessons Learned Workshop
May 23-25, 2023
Budapest, Hungary

Workshop Summary Report

Released: April 2024

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INTRODUCTION

Executive Summary

As we emerge from the COVID-19 pandemic, it is necessary to critically reflect on and review the phenomenon that took millions of lives worldwide, overwhelmed medical capabilities, and devasted communities. The negative impacts of the COVID-19 pandemic include an economic downturn, disruption of societal functioning, and degradation of operational readiness. We can see that the destabilizing effects of pandemics pose threats to regional, multinational, and organizational security. Fortunately, pandemics are historically infrequent, but with time memories and clarity fade. We recognize that without a concerted, deliberate effort to preserve the knowledge we have gained, it will be lost. Looking forward many of the lessons we learn from this pandemic have applicability not only to future pandemics but also towards combat operations, military operations other than war, and military support to national emergencies.

The NATO Centre of Excellence for Military Medicine (MILMED COE) organized the COVID-19 Lessons Learned Workshop, in Budapest, Hungary from 23 to 25 May 2023 to capture key lessons from the pandemic relevant to NATO. The workshop was attended by 60 participants from 17 nations and from multiple national and international organizations (Appendix A). The participants of the workshop were predominately from the military medical community, and, as such, the scope through which the pandemic was viewed had a decidedly military-medical lens.

The workshop consisted of an initial plenary day attended by all workshop participants. On the second day of the workshop, the participants were divided into syndicates focused on specific aspects of pandemic response:

Syndicate 1 – Clinical Care and Medical Facility Operations

Syndicate 2 – Medical Logistics, Mass Immunization and Testing

Syndicate 3 – Public Health, Force Health Protection, and Modelling

Syndicate 4 – Civil-Military Cooperation

Syndicate discussions were conducted in accordance with COMEDS Chair's guidance to capture Lessons that are transferrable between nations, and to ask/answer the following questions:

"What did we learn, or could we have learned, from other nations that would have altered our approach to the pandemic?"

"What must we remember to apply early in any future pandemic to reduce the impact of the disease and speed up our countries' ability to return to pre-pandemic levels of care provision?"

“Did the Alliance work to maximum effect to share best practices and sustain operational resilience?”

This document presents some of the critical lessons recognized throughout the pandemic plus those identified during the workshop. We have included the opening statement for the workshop by Major General Timothy Hodgetts, COMEDS Chair and Surgeon General GBR. The subsequent chapters provide summaries of the main discussion points and identified lessons from the plenary and syndicate sessions. Each lesson identified is categorized based on the DOTMLPF-I planning construct. The recommendations are stratified based on their scope of impact and whether actionable at an organizational or national level. Some identified lessons are valuable from an informative and planning perspective but do not generate actionable recommendations. To keep this document concise, not all observations that were captured are included in the report.

Five critical issues with actionable recommendations from the pandemic that have application across a range of military operations include:

1. Civilian/military cooperation:

Operationalise the collaboration between civilian and military organizations to facilitate self-help and mutual aid to maintain readiness and improve collective resilience in keeping with Article 3 of the North Atlantic Treaty (REC 5.2)

2. Supply chain:

Establish geographically dispersed manufacturing and storage networks for medical supplies and equipment to eliminate single points of failure in production, storage, and distribution. (REC 2.4.1, REC 2.4.2, REC 3.2.1)

3. Disinformation:

Collaborate with strategic communications and public affairs elements to prioritise combating cognitive warfare and develop defensive communication strategies to address medical disinformation. (REC 1.5.1)

4. Early outbreak recognition:

Deploy rapid disease surveillance programs for NATO missions and organisations and establish liaison relationships with subject matter expert organizations such as WHO, ECDC, or equivalent. (REC 1.1.2, REC 4.6)

5. Interoperability between nations and civilian organizations:

Regularly conduct large-scale exercises to evaluate agility, resiliency, and interoperability between

nations and civilian organizations in response to pandemics, disasters, and large-scale combat operations (REC 1.5.2)

All workshop observations and others pertaining to the pandemic can be found within the NATO Medical Lessons Learned Database, located on the MILMED COE website (www.coemed.org), and within the NATO Lessons Learned Portal of the Joint Analysis and Lessons Learned Centre (www.nllp.jallc.nato.int/Pages/HomePage.aspx).

The MILMED COE would like to thank the workshop participants and the nations for their support of during the pandemic and at the workshop.

WORKSHOP OPENING REMARKS

Major General Timothy Hodgetts, COMEDS Chair and Surgeon General GBR

"Thank you for participating in what is a really important workshop to capture the lessons from COVID. We've now passed through the eye of the pandemic. We can see our daily activities returned to a new steady state, and it is time to reflect deeply on all the lessons before they are lost. I'm certain that in the room there will be those who had experience of managing the clinical crisis in both primary and secondary care. There will be those with experience in clinical innovations and how the civilian healthcare system reorganized and reprioritized its tasks, with enduring high numbers of COVID sick. There will be those who were responsible for Force Health Protection, and who struggled in the daily uncertainty to maintain military operational effectiveness. And there will be those who understand how the military was asked to support the civilian healthcare system and wider critical infrastructure, to sustain national resilience. From where I sat during COVID as the head of the army medical service and then the Surgeon General, I would identify two prominent lessons:

First was that decision making was centralized in government in an understandable attempt to maintain a common policy. However, the consequences were this reduced tactical agility and resulted in slow decisions on aspects of Force Health Protection. It was actually contrary to the concept of mission command and empowerment that are necessary in a military operational setting to maintain the momentum.

The second lesson, which is related to the first, is the need to accept uncertainty and act on incomplete information in a crisis. This is called "bounded rationality" and has been described by General Colin Powell as the 40-70 principle of leadership. As an emergency physician, this is what we do with every single patient. Because in a crisis, the enemy is time. In COVID, it was the doubling time of viral replication marking the exponential spread of the disease. So, any measure that might realistically protect our people, even if based on indicative evidence, should be regarded as good enough until the definitive evidence is available. This concept has also been framed as the precautionary principal. Of course, where we are talking about the safety of vaccines and drugs to treat a disease, we must have properly constructed trials to demonstrate benefit and potential side-effects. But, if it is about a barrier spray or a decontaminant spray that is the equivalent of a component of physical body armour, then the threshold for evidence is less within a layered approach to force health protection. Here we genuinely only need indicative evidence, not definitive evidence. We need academic pragmatism, not academic purism. Afterall, you don't need a randomized controlled trial to demonstrate the effect of a parachute or a ballistic chest plate.

Extracting and distilling all the COVID lessons into a coherent roadmap for future preparedness is essential. The value of doing this across the member and partner nations is to identify different perspectives - to identify where best practice can be learned from and mirrored for the future and to seek how we can be more effective in the future in sharing in near real-time, to bolster preparedness ahead of any spreading pandemic wave.

We know that civil-military cooperation is a key tenant of the new NATO Medical Support Capstone Concept. And it works both ways. In the pandemic, it was about how the military could support the civilian system. In war, it will be about how the civilian system can support the military.

I do hope you have a really productive workshop. And I look forward to seeing the output and to discussing this at the next available COMEDS Plenary session."

CHAPTER 1
PLENARY SESSION
Overview

The workshop began with a plenary day. Eighteen presentations across a range of pandemic topics were delivered. Notably, the World Health Organization had declared an end to the global health emergency on the 5th of May 2023, a few weeks before the workshop. The plenary session rekindled fading memories of the pandemic and allowed for the sharing of experiences and information across the entire audience of the workshop.

There were many observations, best practices, and lessons that were identified in presentations and in the discussions that followed. For sake of brevity and readability, issues that were included in a syndicate report are not duplicated in this section. The presentations, listed in Appendix B, are available on the MILMED COE website, within the Medical Knowledge Management Portal. Readers are encouraged to visit the website and to review the presentations. The presenters' contributions to the success of the workshop are very much appreciated.

Early Knowledge Deficit

It is easy to forget how much was unknown about the SARS-CoV-2 virus early in the pandemic, as so much has been learned over the course of the pandemic. Key information for managing a local disease outbreak or a pandemic includes the type of agent, it's mode of transmission, incubation period, infectious period, reproduction number (R-naught), and virulence within different populations. While the agent responsible for the COVID-19 Pandemic was quickly identified as a novel coronavirus, our understanding of the virus developed gradually over time.

Observations (OBS 1.1): In time, it was discovered that virus variants developed with different degrees of transmissibility and virulence; that asymptomatic cases exist, and that they contributed to disease transmission; and that the incidence of severe disease and death within the activity duty military population was much lower than among the general population. The pandemic continued despite reaching high levels of vaccination and infection recovery due to waning immunity and the emergence of new virus variants.

Disease outbreaks occur unpredictability and may evolve rapidly into pandemics. Maintaining disease surveillance programs are critical in identifying outbreaks early and implementing force health protection early help preserve the fighting strength. In future pandemics, initial knowledge of the disease agent may be very limited. To quote Major General Hodgetts, we need to be prepared to "accept uncertainty and act on incomplete information" with "bounded rationality."

Lesson Identified (LI 1.1): Outbreaks need to be identified rapidly and, based on the existing knowledge and understanding, measures to reduce disease transmission need to be implemented without delay. (Doctrine/Organization/Training)

Recommendations (REC 1.1.1): NATO-level: Continue disease surveillance programs such as EpiNATO and continue to develop innovative strategies such as and near-real time symptom surveillance programs during NATO operations and exercises.

Recommendations (REC 1.1.2): NATO-level: Develop a plan for gathering early epidemiologic and clinical data for outbreaks to shape force health protection posture and response plans. Options include organizing rapidly deployable outbreak investigation teams for NATO or developing agreements for information and personnel sharing with already established international, or national, teams.

Recommendations (REC1.1.3): NATO/National-level: Develop rapidly executable force health protection plans including transmission mitigation strategies for a variety of garrison and deployed environments.

Recommendations (REC 1.1.4): National-level: Utilize disease surveillance programs to identify potential outbreaks early in garrison plus during exercises and operations.

Health Services at the Centre of Gravity

Observation (OBS 1.2): In military operations, health services personnel are familiar with playing a supporting role. Medical units have had limited opportunities to be the primary supported effort during recent operations prior to 2020. In the COVID-19 Pandemic, health services were very much the "centre of gravity" of command operational activities. Out of necessity, medical leaders and staff officers had to assume a more central role in operations – including in policy development, planning, and logistics.

Lesson Identified (LI 1.2): While pandemics require a cross-function, coordinated response, effective management is also dependent upon medical knowledge, experience, and capabilities that are resident within military medical services. In a pandemic or epidemic, military medical leaders and staff need to have the training and experience to assume a central role in operations undertaken to reduce spread of disease and to preserve readiness. These operational planning and Command/Control skills also have applicability to other military operations. Medical units and leaders must be capable of stepping into these roles during disaster response as well as during combat when isolated or facing a mass casualty event. (Leadership/Training)

Recommendations (REC 1.2): National-level: Develop necessary leadership and planning skills for military medical personnel to be competent and capable leaders of supported elements through training and real-world experiences

Individual Medical Readiness

Observation (OBS1.3): Measures to reduce risks in health care settings for both patients and medical personnel led to reductions in appointment availability. Military medical readiness declined during the pandemic as individuals were unable to make or keep in-person maintenance and preventive care appointments.

Lesson Identified (LI1.3): In a pandemic, a reduction in military health-maintenance and preventive care appointments should be anticipated, with a resulting reduction in individual medical readiness. This can be mitigated, to a degree, by implementing measures to reduce risk of disease transmission in clinical care delivery and by expanding virtual care opportunities. (Personnel/Materiel)
Recommendations (REC 1.3.1): National-level: Increase telemedicine capability to minimize healthcare worker exposures, ensure the availability of personal protective equipment (PPE), allow for continued care of non-urgent or uninfected patients, and conserve overall medical capability and capacity.

Recommendations (REC 1.3.2): National-level: Address information technology and other challenges that make it difficult to get in-person or virtual care in pandemic conditions.

Recommendations (REC 1.3.3): Unit-level: Implement and sustain practices that reduce the risk of transmission of infectious diseases to both patients and providers, such as minimizing the number of staff in contact with a patient

Remote and Virtual Work

Observation (OBS 1.4): To increase physical distancing and reduce spread of the virus, national, local, and organizational restrictions on activities were imposed that limited access to work centres. During the COVID-19 Pandemic, the ability to perform remote work was central to maintaining NATO and national military productivity and readiness. Many different teleconferencing platforms were utilized to host and attend online meetings, conferences, and training events. Teleconferencing platforms used by external organizations could, in many cases, not be accessed from NATO networks, necessitating use of personal e-mail accounts and computers and attendance from off-worksite locations.

Lesson Identified (LI 1.4): NATO and national military elements need to be prepared to transition quickly to maximize remote work, with as many individuals working from home as possible. Such preparations will increase resiliency and reduce vulnerability to future outbreaks and other disruptive events. (Doctrine/Materiel)

Recommendations (REC 1.4.1): NATO/National-level: Develop plans and invest in secure network infrastructure that will allow rapid transition to remote work environments and video teleconferencing.

Recommendations (REC 1.4.2): Unit-level: Develop, maintain, and exercise headquarters/unit plans for conducting remote work, to include determining in advance which jobs can be performed from off site or with reduced physical presence.

Disinformation

Observations (OBS 1.5): Throughout the COVID-19 Pandemic, leaders and public health officials were not only in a fight against a deadly disease but also against rampant misinformation and dis-

information that spread widely via the internet and social media applications. Large segments of populations believe conspiracy theories, some of which are listed below:

- **The pandemic was a hoax. The virus didn't exist or wasn't as deadly as reported.**
- **The virus was created as a biological weapon or by pharmaceutical companies.**
- **The virus spread through 5G networks.**
- **Vaccination was a means of implanting digital microchips.**
- **Existing medications such as hydroxychloroquine and ivermectin were effective in prevention/treatment, while vaccines were unsafe.**

False beliefs regarding the origins of virus and the safety and efficacy of vaccines contributed to vaccine hesitancy and eroded trust in government and national health systems.

Social media platforms allow communication of information and disinformation without much effort or time. Utilizing brief, emotionally triggering, and often entertaining video posts, influencers can rapidly communicate wild theories with flawed logic.

Combating disinformation was complicated by centralized decision making. The centralized control of communication was not only slow to respond but also fed into the conspiracy theories. In addition, common policy messages were not effectively communicated over the same social media applications that were pushing disinformation.

Medical disinformation campaigns are not new, such as the anti-MMR vaccination movement, but previously have had limited impact on society. Contrastingly, the COVID-19 disinformation campaign was effectively a form of cognitive warfare working against efforts to protect the population, economy, and society. While this campaign appeared to be an asymmetric and grass-roots movement, the degree of malign external influence, if any, is likely never to be known. More organized disinformation/cognitive warfare attacks should be expected in future pandemics and military operations. Furthermore, the rapid evolution of artificial intelligence (AI) will complicate information dissemination in ways we cannot yet imagine.

Lesson Identified (LI 1.5): Disinformation undermined efforts to reduce spread of the SARS-CoV-2 virus and to minimize pandemic impacts on society. Cognitive warfare will be a problem in future pandemics and military operations. (Doctrine/Training/Materiel)

Recommendations (REC 1.5.1): NATO-level: Prioritise combating the disinformation component of cognitive warfare. Medical communities should collaborate with strategic communications and public affairs elements to learn how to rapidly develop messaging plans and how to deliver it effectively. Responses to disinformation should be rapid and via the same platforms on which the false information was communicated.

Recommendations (REC 1.5.2): NATO/National-level: Medical and strategic communications elements should adapt to include communication platforms used by target audiences. Consider identifying social media influencers, trusted within their community, who can help to convey and reinforce important information and counter disinformation.

Recommendations (REC 1.5.3): NATO/National-level: Be prepared to establish a science-based public health information and awareness campaign.

CHAPTER 2
CLINICAL CARE AND MEDICAL FACILITY OPERATIONS

CAPT Charles Wilson, MC, USN, NATO Centre of Excellence for Military Medicine

Overview

This syndicate was charged with assessing the impacts of the COVID-19 Pandemic on clinical care delivery and medical treatment facility operations, and to identify lessons that need to be learned to maintain/expand clinical capacity and capabilities in future pandemics. The syndicate had representatives from AUS, CAN, DEU, DNK, HUN, POL, and USA. Prior to the workshop, a list of subtopics related to care delivery and medical facility operations was developed that provided a framework for syndicate discussions. The discussions produced observations and related Lessons Identified that fell within the following major categories:

Pre-pandemic Planning
Medical Staffing/Augmentation
Medical Staff Training
Medical Supplies and Equipment
Medical Facilities
Preserving Hospital Capacity
Expanding Hospital Capacity
Patient Education

Pre-pandemic Planning

Observations (OBS 2.1): It was the consensus of the syndicate that the nations of the world and their military medical services were not adequately prepared for the pandemic. While some military medical services had pandemic plans, the plans were often based on assumptions that did not bear out to be true. When plans existed, they were based on influenza pandemic models and assumed short seasonal phases. In most cases, individual medical facilities lacked plans for the delivery of care during any local infectious disease outbreak or pandemic. Likewise, most operational forces lacked plans on how to operate and maintain readiness in a pandemic.

Lesson Identified (LI 2.1): Pandemic response plans are needed at all levels, including organizational, national, service, and individual hospital/unit. For military services, plans for how military operations would be conducted under pandemic conditions need to be developed, modified, and trained with the focus being on the preservation of combat power and force projection. (Doctrine/Training)

Lesson Identified (LI 2.2): Medical response plans should be adaptable, and leaders should have the skills to rapidly assess and adapt plans based on the threat. Because the next pandemic may not be caused by influenza, coronavirus, or other currently recognized agent, anchoring plans on an in-

fluenza or coronavirus agent may be counterproductive. In addition, rapid assessment and planning skills are necessary to respond effectively to disasters and new combat operations.

Recommendation (REC 2.1.1): NATO/National/Unit-Level: Existing pandemic plans should be reviewed and updated based on organizational knowledge gained over the course of the pandemic. Where no plan exists, they should be developed. In revising/developing plans, the pitfall of planning for a repeat of the COVID-19 Pandemic must be avoided.

Recommendation (REC 2.1.2): NATO/National/Unit-Level: Medical leadership should be trained in the planning process. Exercising the rapid planning process would improve medical response not only to pandemics but also to an array of possible combat operations and operations other than war.

Recommendation (REC 2.1.3): NATO/National-Level: Large-scale pandemic exercises should be conducted at regular intervals to challenge and evaluate organizational responses to threats. These exercises should not anchor on prior identified infectious agents. In addition to the benefit of testing plans through these thought experiments, these exercises would test communication, information dissemination, and improve interoperability at the international level between NATO, allies, and other international agencies, plus civilian-military collaboration at the national-levels. Improving communication, interoperability, and response would also enhance resiliency to large-scale combat operations and disaster response.

Medical Staffing/Augmentation

Observations (OBS 2.2): During pandemic waves, hospital staffing requirements increased while at the same time hospital manning was adversely impacted by exposure of staff members to infection resulting in protective quarantine and treatment. Approaches taken to address staffing shortfalls included utilizing assigned medical staff at their highest level of capability (and beyond); having active duty military healthcare workers augment civilian medical facilities; utilizing Reserve medical personnel, retirees, and medical students in patient care; and training non-medical personnel to perform non-clinical duties previously performed by healthcare personnel. It was noted that staff working outside of their normal duties require time and training to achieve competency in their new role, and that clinical oversight is needed to maintain patient safety. Providing such oversight placed an additional strain on primary intensive care unit (ICU) and ward staff during periods of time in which they were already overwhelmed by clinical workload. In addition, it was noted that utilization of Reserve medical personnel, in some instances, was counterproductive, as it took them out of other clinical facilities and roles in which their skills sets could have been better utilized.

Lesson Identified (LI 2.2.1): In future pandemics, hospital medical staffing requirements will increase and exceed baseline medical staffing levels. Staffing requirements will also increase rapidly and unexpectedly during natural disasters and combat operations that generate large numbers of casualties. As part of pre-pandemic, disaster, and near-peer conflict preparations, organizational planning – at all levels – should include plans for medical staffing augmentation. (Organization/ Personnel)

Recommendations (REC 2.2.1): National/Unit-level: Establish process for licensing and credentialing of medical personnel to allow for rapid augmentation during disasters.

Recommendations (REC 2.2.2): Unit-level: Develop plans to facilitate internal redistribution of hospital medical staff to areas of increased demand during pandemics and disasters, such as ICUs. Conduct cross-training based on the staff redistribution plan to achieve and maintain an increased baseline level of clinical competency of augmentees. Such efforts would also pay dividends in wartime, when working outside of one's normal clinical function may be required.

Lesson Identified (LI 2.2.2): Military healthcare personnel will likely be utilized to augment civilian healthcare systems in future crises. (Doctrine/Personnel)

Recommendations (REC 2.2.2): National-level: Include the military as a component in national emergency and disaster planning. Develop plans and training activities to have military medical personnel spend time in civilian health systems to improve interoperability.

Medical Staff Training

Observations (OB 2.3): Medical training needs increased due to the pandemic while traditional training opportunities decreased. As the virus rapidly propagated an immediate need emerged for skilled professionals in many areas of healthcare delivery including infection prevention, laboratory collection and processing, patient management, and epidemiologic tracking. These personnel and training requirements did not exist in the same magnitude at the end of 2019 as they did just two months later. Furthermore, the time needed to train personnel to conduct tracking and tracing was significantly shorter than the time needed to develop skilled, certified laboratory personnel to conduct molecular testing.

Existing healthcare professionals needed to learn new clinical decision tools, infection control measures, plus clinical therapeutic and prevention strategies including vaccines. Examples of additional pandemic-related training include proper donning and removal of PPE, test sample collection and processing procedures, training of staff in new roles (clinical, contact tracing, etc.), staff training on new policies and higher-level guidance.

During the pandemic, in-person training opportunities were reduced due to travel restrictions and requirements to maintain social distancing. A shift from in-person to virtual events was seen, with e-learning being leveraged as a more resilient but effective method of delivering certain types of training.

Lesson Identified (LI 2.3): The pandemic rapidly increased the need for more skilled personnel and increased training requirements for existing healthcare workers. Future pandemics and conflicts will likely create similar needs. (Training/Materiel)

Recommendations (REC 2.3.1): Unit-level: To build a resilient health care force, identify and maintain skills with valuable universal application, such as infection control, in times of peace and between pandemics. For example, PPE donning and doffing skills have applicability when caring for infected personnel, working in sterile environment, and in CBRN environment.

Recommendations (REC 2.3.2): National/Unit-level: Establish and maintain flexible training systems that can rapidly develop and deliver new course content, utilizing distance learning methods, based on current threats.

Medical Supplies and Equipment

Observations (OBS 2.4): At the onset of the pandemic, supplies of PPE were quickly consumed. Staff members managing infected patients often lacked the PPE needed to protect themselves. The lack of PPE not only put medical staff at risk of infection at times in which medical personnel were in great need, it also placed at risk vulnerable patients with whom they were in contact.

As a result of manufacturing and supply chain disruptions, many medications needed to manage critically ill patients, including sedatives and paralytics, were in short supply or were exhausted. Manufacturing disruption also impacted the production and delivery of ventilators and testing equipment. In some areas medical oxygen needs exceeded available supplies.

Lesson Identified (LI 2.4): Increased demand for certain consumable medical supplies and equipment, coupled with disruption of the global supply system, prevented hospitals and military units from obtaining critical items in the timeframe for which they were needed. Consolidated manufacturing and storage of medical supplies is cost effective but creates a vulnerability. Production of medical supplies have been disrupted by natural disaster in recent past well. (Doctrine/Materiel)

Recommendations (REC 2.4.1): NATO-level: Encourage geographically distributed manufacturing of PPE and other medical supplies. While it increases costs, it decreases the vulnerability of supply chains during natural disasters and combat operations. It also may have local economic benefit for those manufacturing locations.

Recommendations (REC 2.4.2): NATO-level: Encourage geographically distributed regional stockpiling of medical supplies. While it increases costs, it decreases the vulnerability of supply chains during natural disasters and combat operations. It also may have local economic benefit for those storage locations.

Recommendations (REC 2.4.3): National/Unit-level: Establish recommendations for minimum supply levels of PPE and other consumable supplies to cover the initial management of a local infectious disease outbreak based on projected staffing and patient volumes.

Medical Facilities

Existing Medical Treatment Facilities were, by-and-large, not designed with epidemic or pandemic care delivery in mind. In a pandemic, the capacity for managing infectious individuals and human remains must be expanded while the ability to provide essential care to uninfected individuals in a "clean" environment must be preserved.

Observation (OBS 2.5): The design of existing medical treatment facilities greatly limited the extent to which expansion could occur and the degree to which patient separation could be maintained.

Lesson Identified (LI 2.5): Many medical treatment facilities lacked the ability to effectively cohort infectious from non-infectious patients without significant modifications. (Facilities)

Recommendations (REC 2.5.1): NATO/National-level: Require architectural and environment

system solutions that allow for expansion and cohorting of infectious patients from non-infectious patients in the design of new or renovation of older medical facilities Consider

Recommendations (REC 2.5.2): National-level: Whenever possible incorporate plumbing for oxygen and medical air into the renovation of older, and design of new, ICU and ward expansion spaces.

Recommendations (REC 2.5.3): National-level: Encourage hospitals to increasing the number of negative pressure rooms for the isolation of infectious patients and for performing aerosolizing procedures.

Recommendations (REC 2.5.3): National-level: Consider installing or retrofitting an oxygen generating system in existing hospitals and to including such systems in the design of new hospitals.

Observation (OBS 2.6): In many areas, mortuary capacity became a point of crisis during peaks of pandemic waves. Refrigerated shipping containers were frequently used to quickly expand hospital morgue capacity.

Lesson Identified (LI 2.6): Management of human remains overwhelmed the local capabilities. Mortuary capacity is also likely to be an issue in large-scale NATO military operations. (Facilities)

Recommendation (REC 2.6): National-level: Identify regional and local sites to expand the disposition of a large number of human remains as a result of another pandemic, natural disaster, or combat operation. For military operations, develop and exercise plans for managing human remains on a large scale. Regional governments should consider plans to assist hospitals and community funeral services rapid expansion when needed.

Preserving Hospital Capacity

Observation (OBS 2.7): In a pandemic, preventable deaths occur when intensive care needs exceed the local capacity and/or capability to deliver such care. Utilization of hospital services by patients who didn't require hospital-level care adversely impacted care delivery for those who did.

Lessons Identified (LI 2.7): Hospital capacity can be preserved by providing patients alternative means of obtaining consultation and evaluation, and by providing alternative ways of supporting patients who don't require hospital management. (Doctrine/Organization/Training)

Recommendations (REC 2.7.1): Unit-level: Develop telehealth programs to provide alternative ways of accessing health care. These may include establishing call centres, leveraging outpatient clinics, maximizing use of telemedicine/teleconsultation, and establishing isolation facilities for the management of uncomplicated cases

Recommendations (REC 2.7.2): Unit-level: When overwhelmed by patient volumes, consider postponing elective surgeries, preventive health screenings, and non-urgent treatment. However, plans must include the time, personnel, facilities, and supplies required to catch up with delaying the delivery of those aspects of healthcare.

Observation (OBS 2.8): Hospital capacity is also adversely impacted by intra-hospital disease transmission. Hospitals were a source of spread of SARS-CoV-2. Infection of medical personnel reduced staffing during periods of critical staffing shortages and placed patients with whom they were in contact at risk.

Lessons Identified (LI 2.8): The rigorous implementation of infection prevention and control measures is an important element for maintaining hospital capacity during an infectious disease outbreak. (Doctrine/Materiel/Leadership)

Recommendations (REC 2.8): Unit-level: Establish and enforce infection control measures such as:

- Utilize hygiene measures such as hand sanitizing stations
- Social distancing
- Use of masks with respiratory illnesses
- Control access to the facility
- Conduct symptom screening on entry, and restricting visitation
- When possible, conduct surveillance testing of staff members and test patients prior to ad mission
- Establish testing locations in areas separate from clinical care delivery
- When a vaccine becomes available, encourage/require staff to be vaccinated
- Use ozone generators and other means of performing space disinfection
- For airborne pathogens, consider increased ventilation and utilization HEPA filtration.

Expanding Hospital Capacity

Observations (OBS 2.9): Bed capacity was expanded through various means, including the repurposing of spaces within existing hospitals, use of military field hospitals, and establishment of temporary hospitals in existing buildings. In many cases, temporary facilities took a long time to establish and were underutilized. In other cases, they provided valuable and needed additional bed capacity.

Best Practice (BP 2.9): When a temporary facility is established near a fixed medical facility, utilize the temporary facility for lower acuity patients and the pre-existing, permanent medical facility for higher acuity patients. Close coordination between facilities is needed. (Organization/Facilities)

Patient Communication

Observations (OBS 2.10): There was considerable variability in the degree to which medical facilities were able to communicate with their supported patient population. Some hospitals were able to contact patients directly via e-mail or mailings. Others, with a less well-defined patient population, were limited to indirect means of communication, such as a facility website. The military population had the advantage of a chain of command through which up-to-date and validated information could be quickly and reliably passed.

Lesson Identified (LI 2.10): Patient education and information delivery is vital for minimizing morbidity and mortality and maximizing clinical effectiveness. (Doctrine/Materiel)

Recommendation (REC 2.10): Medical facilities should establish an effective means of communicating information to their supported patient population, for example to provide prevention guidance or information on healthcare access and utilization.

CHAPTER 3 – LOGISTICS, TESTING, AND MASS IMMUNIZATION

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Ms. Julia Burr, Institute for Defense Analyses

Overview

This syndicate focused on three specific areas of pandemic response – medical logistics, mass immunization, and testing. The topics were discussed within the same syndicate because of the importance of logistics in conducting large-scale immunization and testing operations. These topics are particularly important in military operational medicine, for maintaining operational readiness during a pandemic. The syndicate had representatives from BEL, DEU, EST, GBR, HUN, POL, PRT, SVK, and USA. This document captures the main discussion points of the syndicate as well as key observations, lessons, and recommendations.

Medical Logistics

Observations (OBS 3.1): Military forces have tremendous resources and capabilities. Not least among them are the logistical capabilities that were utilized to move personnel, equipment, and supplies to where they were needed. Informed and timely communication and coordination between civilian and military entities was felt to be key to ensuring that limited resources were appropriately utilized, and decisions made with full awareness of the associated military impacts/costs. For some nations, this type of civil-military coordination was facilitated by appointing senior military representatives to serve as liaisons within civilian organizations, such as the National Health Service. Other nations utilized existing operations centres or established ad hoc coordination centers to, among other functions, handle the considerable logistical coordination required in pandemic response.

Lesson Identified (LI 3.1): Military logistical capabilities can be effectively leveraged to support national and global response efforts. (Doctrine/Interoperability)

Recommendations (REC 3.1): NATO/National-level: Establish agreements between governmental agencies with a shared goal of maintaining logistic capabilities in times of crisis. Develop, maintain, and coordinate activities for receiving, processing, and tracking logistic requests for support.

Observations (OBS 3.2): A dependence on "just in time" delivery of items required for outbreak management created vulnerability. At the onset of the pandemic, a sudden increased global demand for limited quantities of medical consumables resulted in competition among nations, creating shortages, and driving up prices. Similar shortages were seen later in the pandemic with vaccines, antiviral medications, reagents, and testing kits. China, the initial epicentre of the pandemic, was the main producer of most of the consumables needed to combat spread of the virus. Disruption to Chinese manufacturing and disruption of global distribution mechanisms, due to the pandemic, also contributed to supply shortages.

Lessons Identified (LI 3.2): The pandemic disrupted manufacturing and distribution of medical consumables. The negative impact could have been lessened by stockpiling critical supplies and

developing a more geographically diverse and robust supply network. (Doctrine/Materiel)

Recommendation (REC 3.2.1): NATO/National-level: As mentioned above in REC 2.4.1 and REC 2.4.2, establish a geographically distributed medical supply manufacturing and storage supply network.

Recommendation (REC 3.2.2): NATO/National-level: Military treatment facilities should have enough medical materiel for 30 days of outbreak operations. Establish what are critical outbreak supplies and how many constitute a 30-day supply.

Recommendation (REC 3.2.3): NATO-Level: On NATO missions, maintain a stockpile of outbreak supplies sufficient for initial and rapid resupply

Recommendation (REC 3.2.4): National-level: Establish contracts to enable the rapid expansion of production of critical consumable medical supplies.

Testing

Observation (OBS 3.3): Testing was not available early in the pandemic, as reagents need to perform polymerase chain reaction (PCR) based testing had to be developed, produced in large quantities, and distributed. Prior to the availability of laboratory tests for the SARS-CoV-2 virus, clinicians relied on case definitions based on travel and exposure history, clinical signs, and symptoms to identify potential cases.

Lesson Identified (LI 3.3): For novel pathogens, case definitions are valuable prior to development of molecular testing, should be developed, and utilized in clinical and public health decision making in the absence of molecular testing. (Doctrine/Training)

Recommendations (REC 3.3): NATO/National-level: Establish agreements with international agencies and subject matter experts for early support in establishing early case definitions and clinical decision tools.

Observations (OBS 3.4): Testing capabilities and capacity developed gradually. When tests for the SARS-CoV-2 virus first became available, criteria for conducting testing were established to restrict testing and preserve the limited testing resources. In areas in which cases had not been previously identified, testing was often reserved for cases for which there was a higher likelihood of SARs-CoV-2 infection, such as a hospitalized individual with pulmonary infiltrates. The goal was to use the limited testing capacity to detect, as early as possible, the local presence of the virus, as knowing that the virus was present within the community was critical information from both a clinical and public health standpoint. During the early pandemic period, when testing capacity was limited, testing was often not performed if management of the patient would not be changed based on the results. Isolation and quarantine decisions were based largely on a presumptive diagnosis. Batch testing of specimens was utilized as a way of minimizing the number of tests performed, to preserve testing capacity.

Lesson Identified (LI 3.4.1): Testing criteria was valuable early when testing capacity was limited. Testing criteria changed as testing capacity increased. (Doctrine/Training/Materiel)

Recommendations (REC 3.4.1): Unit-level: Be prepared to adjust testing criteria based on disease prevalence and testing capacity.

Lesson Identified (LI 3.4.2): Batch testing was useful when testing capacity was limited. (Doctrine/ Training/Materiel)

Recommendations (REC 3.4.2): Unit-level: When testing capacity is limited, batch testing of specimens should be considered as a means of maximizing the benefit of limited testing resources. However, adequacy of test sensitivity needs to be verified before batch testing protocols are implemented.

Observations (OBS 3.5): Large-volume testing capability was a key technology used to combat the virus. Confirmatory testing allowed for the isolation of cases and the quarantine of close contacts. Community case data was the basis for determining what restrictions to impose and when to remove those restrictions.

Early in the pandemic hospitals lacked not only the consumable supplies and chemicals needed to conduct mass testing but, in many cases, the equipment itself. The development and mass production of testing reagents and increased production of consumable testing supplies occurred much faster than the manufacturing of large-volume test equipment. As a result, testing capacity remained inadequate throughout much of the pandemic.

Once testing capacity increased to the point of enabling asymptomatic screening, several military services utilized pre-deployment testing in combination with quarantine as a way of reducing the chances of introducing the virus into operating bases and ships that were disease-free. This approach proved to be effective.

Lesson Identified (LI 3.5): Large-volume laboratory testing capability is critical to pandemic management and to preserving military operational readiness. (Training/Materiel)

Recommendation (REC 3.5.1): National-level: Nations should ensure that regional medical facilities maintain the capability of performing large-volume viral testing and a sufficient supply of consumables for initial outbreak management

Recommendation (REC 3.5.2): National-level: High-volume testing capability is also needed to support military operational deployments that require pre and/or post-deployment testing

Recommendation (REC 3.5.3): NATO-level/National-level: Ensure testing capabilities are available while deployed in support NATO and national missions.

Observations (LI 3.6): As testing became more widely available, it was conducted more liberally. Eventually, antigen-based point of care test kits became available over-the-counter. Some nations distributed test kits to their citizens to increase case identification. Many hospitals and some military services instituted sentinel testing – testing a percentage of asymptomatic personnel on a daily or weekly basis – to reduce the number of infected individuals within the workplace. Testing for the presence of the virus in wastewater was used to gauge disease prevalence within communities. The same approach was utilized within some military services to identify the presence of cases within individual barracks. Additionally, nations and other organizations imposed testing requirements as

a precondition to attending school and public events, for international travel, etc. In Slovakia, mass testing of the national population was performed over several days to flatten the epidemic curve during a wave that threatened to overwhelm its hospitals. This effort was effective but at a considerable cost, including medical manpower.

Lesson Identified (LI 3.6.1): Sentinel testing programs were effective means of identifying potentially infectious individuals within workplaces and reducing workplace-based spread of a disease. However, in addition to removing infectious individuals from the workplace, recently infected individuals who are no longer infectious were also isolated after false positive test result. (Doctrine/Training/Materiel/Personnel)

Recommendation (REC 3.6.1): National-level: When testing capacity is sufficient, and when test and disease agent characteristics support doing so, consider implementing sentinel testing of hospital staff and military personnel as a means of reducing the number of asymptomatic active cases within facilities.

Lesson Identified (LI 3.6.2): During the COVID-19 Pandemic, wastewater surveillance testing was of utility in monitoring disease prevalence within a community and for identifying the presence of active cases with military barracks. (Doctrine/Training/Materiel)

Recommendation (REC 3.6.2): National-level: If testing capability exists to detect the presence of a pathogen in wastewater, consider wastewater surveillance testing as a means of monitoring disease prevalence within a defined community and for identifying active cases in military barracks.

Observation (OBS 3.7): Tests that were developed and approved for the testing of symptomatic individuals were utilized "off label" for asymptomatic screening, without data on the test's reliability (sensitivity and specificity) in asymptomatic individuals. Data on the reliability of a given test kit was not always readily available.

Lesson Identified (LI 3.7): A test that was developed and approved for testing of symptomatic individuals may be incapable or much less capable of detecting the presence of the pathogen in an asymptomatic individual. It is important to know the reliability of a test under the conditions for which it is being utilized. If sensitivity and specificity data are not available for the conditions under which the test is being utilized, it should not be assumed that test results are accurate. (Doctrine/Training)

Recommendations (REC 3.7): NATO/National-level: Encourage leaders to include the risks of false positive and negative results in their risk management matrix when using testing "off label".

Observation (OBS 3.8): During the early pandemic, informal collaboration was initiated between several NATO countries' microbiology laboratories to exchange virus genome sequencing information. The exchange of such data proved to be very valuable.

Best Practice (BP 3.8): Data sharing and exchanging of other information between national laboratories was important for the development of testing capabilities, immunizations, and therapeutics. (Interoperability)

Recommendation (REC 3.8): NATO-level: Establish agreements and protocols to promote mechanisms for military scientific laboratory networking amongst NATO and partner nations.

Mass Immunization

Pandemics and epidemics end when a sufficient level of immunity is achieved within the population – either through vaccination or through natural exposure and recovery – to make transmission from person to person unlikely (R-naught less than 1). Without vaccination, "population immunity" will eventually be achieved through infection, likely at great cost in terms of lives lost and societal impact. The main goal in the management of a pandemic should be to slow the spread of the disease and to minimize the number of cases until a vaccine can be developed and be made widely available. In the COVID-19 Pandemic, transmission continued even in locations where a large percentage of individuals were vaccinated. Nevertheless, the vaccines were very effective in reducing hospitalizations and deaths, and in enabling a return to normal.

Observation (OBS 3.9.1): Although several effective vaccines were developed in less than one year, it took considerably more time to produce the vaccines in quantities sufficient to meet the global need. The contracting processes utilized for vaccine procurement created competition among countries and resulted in inequitable vaccine distribution. Some countries had vaccinated most of their population before other countries received initial supplies. Countries without the financial resources to purchase vaccines in bulk were dependent on donations from other countries and did not receive vaccines until much later in the pandemic.

Lesson Identified (LI 3.9.1): The pandemic created an imbalance between the supply and demand for critical items, including vaccines. Unless other mechanisms are developed, market forces will determine their distribution. This may be to the disadvantage of all, as controlling the spread of a pathogen could depend on utilization of limited resources where they are most needed vice where they can be most afforded. (Doctrine/Materiel/Interoperability)

Observation (OBS 3.9.2): Most countries prioritized vaccination of the elderly, those with underlying medical conditions that put them at increased risk of severe illness or death from infection, and medical personnel. In some countries, military personnel and first responders were also prioritized above the general population.

Lesson Identified (LI 3.9.2): When vaccine needs exceeded supply, vaccines should be utilized to the greatest benefit. The population which constitutes the greatest benefit is open to debate. It is unclear if that would be the group with greatest exposure, the group at risk for worse outcome, or the group that transmits asymptomatically. The most important factor is that the guidelines are ethically defensible are applied as equitably as possible. (Doctrine/Materiel)

Recommendations (REC 3.9): NATO-level: Strategic objectives should be considered when making decisions regarding the distribution of limited resources. The optimal public health option may not be ideal for economic, political, or security objectives. Developing a consensus decision that is widely accepted is likely to prove difficult, however misuse should be discouraged. Collaboration with other international agencies may be valuable.

Observation (OBS 3.10): A significant percentage of individuals declined to be vaccinated. The level of "vaccine hesitancy" seemed to be inversely related to the perceived risks of infection and vaccine availability. Vaccine misinformation on the internet and a distrust in governmental institutions among segments of the population were contributing factors and discussed above in OBS 1.5.

Lesson Identified (LI 3.10): Vaccine and governmental distrust proved more significant than anticipated. This baseline mistrust coupled with widespread vaccine misinformation, contributed to a significant percentage of the population declining vaccination or achieving only partial vaccination. (Doctrine/Materiel)

Recommendation (REC 3.10): NATO/National-level: As discussed in REC 1.5 above, be prepared to establish a science-based information campaign, utilize social media platforms and influencers trusted within their community, and recognize that members of the armed forces are as susceptible to cognitive warfare and disinformation as the civilian population.

Observation (OBS 3.11): Some military medical services required service members to be vaccinated. Others, due to national restrictions or for other reasons, did not require service members to be vaccinated and, instead, made vaccines available and encouraged their military personnel to get vaccinated. A requirement for service personnel deploying on NATO mission to be vaccinated against COVID-19 could not be established. But vaccination was required to enter NATO mission installations, effectively excluding from NATO missions service members who were unvaccinated.

Lesson Identified (LI 3.11): Vaccination requirements are a national responsibility, and limited by their laws, but NATO can set force health protection (FHP) standards for NATO missions.
Restricting base access and mission participation to those who meet mission-specific vaccination requirements is an effective means of establishing a protected population that meet the vaccination standard. (Doctrine/Materiel/Interoperability)

Recommendations (REC 3.12): NATO-level: Continue to use FHP standards to maintain a healthy, fighting force. Understand that the pool of personnel that may be available from each country may be less than their total military population.

Observation (OBS 3.13): The military services and medical services of many NATO nations played a major role in national vaccination efforts, from research and development to storage and transport, as well as vaccine administration.

Lesson Identified (LI 3.11): Military services were vital in supporting large-scale vaccination operations for many nations.

Best Practice (BP 3.13): The involvement of military services in national vaccination operations proved vital in rapidly vaccinating large populations. It should be anticipated that military services will be called upon to support such activities in a future pandemic and should be prepared for such missions. (Doctrine)

Recommendation (REC 3.13.1): National-level: Mass vaccination should be included among the mission sets for which military services to plan, prepare, and conduct.

Recommendation (REC 3.13.2): National-level: Consider utilizing annual influenza vaccination of military service members as an opportunity to exercise pandemic mass vaccination plans.

CHAPTER 4
FORCE HEALTH PROTECTION, PUBLIC HEALTH, AND MODELLING

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Overview

This syndicate reviewed Force Health Protection (FHP) and public health aspects of the pandemic response, including the use of modelling. The syndicate had representatives from CAN, DEU, DNK, GBR, HUN, POL, CHE, and the USA. The syndicate leaders developed a conceptual framework (see Fig. 1, below) to aid the discussion of key issues. Topics were identified within the three main categories of Prevention, Information, and Mitigation.

Force Health Protection (FHP) and public health are broad and technical fields. Because of the breadth of the subject matter, it took time to agree on the root cause of an issue and its applicability to the NATO context. Unfortunately, the syndicate did not have time to discuss every identified issue in detail or to identify lessons associated with each issue. This document captures the main discussion points of the syndicate. Further work is required to identify the principal lessons for additional areas identified in the framework. The NATO Force Health Protection Working Group was identified as a potential forum for further discussion of these issues.

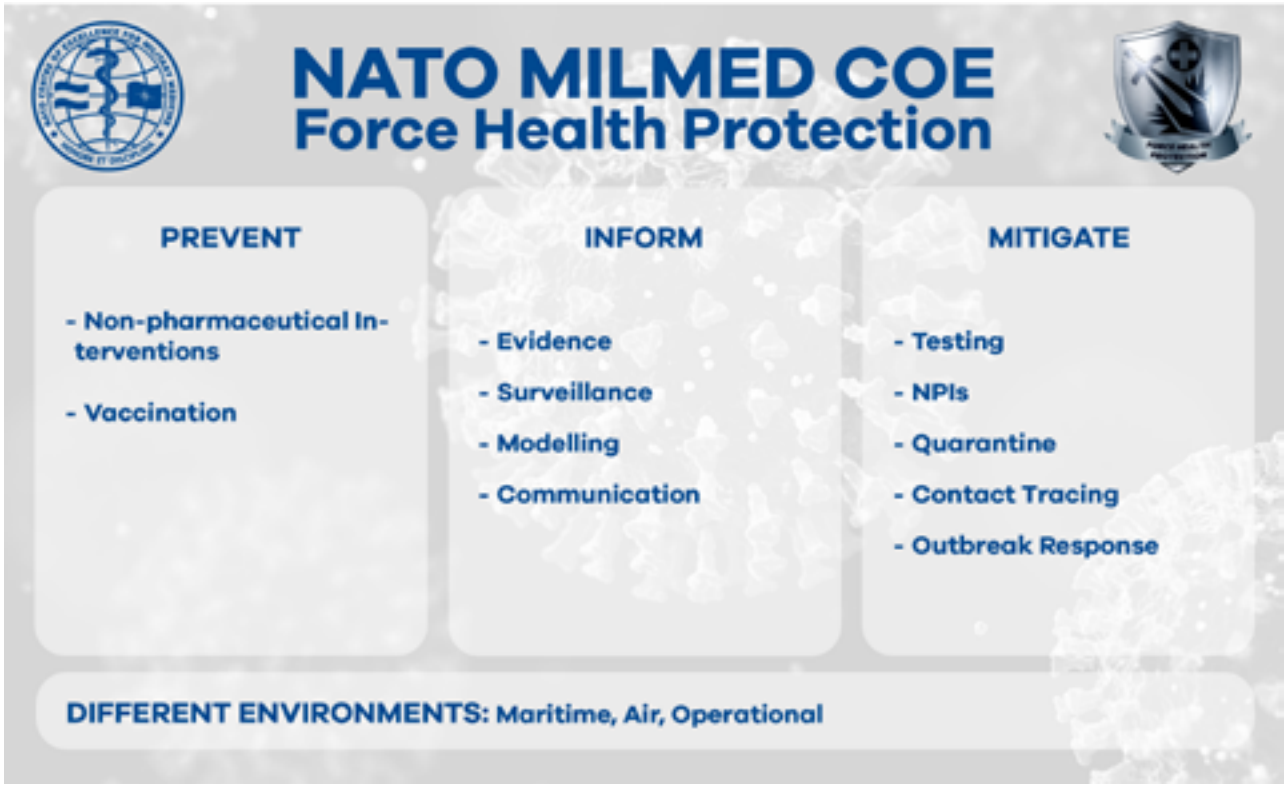

Fig 1: Conceptual Framework for Discussing FHP Pandemic Lessons

Prevention

Observation (OBS 4.1): Diagnostic testing tools, therapeutics, and vaccines all took considerable time to develop. At the one-year point of the COVID-19 Pandemic, advanced therapeutics, such as monoclonal antibody treatment, were still not widely available. And the administration of vaccines, which were developed in record time, was just being initiated. For much of the pandemic, public health guidance and basic hygiene measures were the tools available to minimize the spread of the virus and to reduce the impact on society. They, to a large extent, determined the success or failure of nations and military services in dealing with the pandemic.

Lesson Identified (LI 4.1): The importance of sound, informed public health policy and public adherence to basic hygiene measures should not be underestimated. (Doctrine/Training)

Recommendation (REC 4.1): NATO-Level: Include training on the prevention of disease transmission in the Force Health Protection training of deploying NATO military personnel.

Observations (OBS 4.2): At the beginning of pandemic, the World Health Organization and other health organization initially advised against asymptomatic individuals wearing masks. There wasn't data showing that mask wearing was effective at reducing spread of the SAR-CoV-2 virus. Additionally, as there were not enough N95 and surgical masks for medical personnel, and there was concern that recommending mask wearing by the public would further limit availability to medical professionals. Also, there was concern that recommending mask wearing would give the public a false sense of security that would work against efforts to maintain social distancing. Over the course of the pandemic, the growing body of scientific evidence showed that wearing a mask does, under certain circumstances, reduce transmission of the SARS-CoV-2 virus.

Lesson Identified (LI 4.2.1): Any population-based material requirements – for example, surgical masks and respirators, such as the N95, are likely to be in short supply early in a pandemic. (Materiel)

Lessons Identified (LI 4.2.2): Unless there is sufficient scientific evidence to advise against specific non-pharmaceutical interventions, such as mask use, a recommendation to use the intervention to mitigate against the spread of a potential pathogen based on the 'precautionary principle' should be considered at the onset of an outbreak. But this decision must be taken within the context of wider government and international regulations and advice. (Doctrine/Interoperability)

Recommendation (REC 4.2): NATO/National-level: In the absence of data to the contrary, mask use should be recommended as an intervention to mitigate against the spread of a potential respiratory pathogen at the onset of an outbreak.
Information

Observations (OBS 4.3.1): Several examples were given of multiple statistical models being used within the same nation – military and civilian. Conflicting models made decision-making difficult and reduced trust. Some nations only had a single model at the national level that was applied to the military. Examples were given of how, in these cases, a single 'version of the truth' was used to brief the public. Other nations, which utilized various models, described a review process, with advice given to the leadership as to which one was likely to be most useful for a specific situation. There was also discussion about information being shared with the public where the provenance of the data was unclear, and whether this led to confusion.

Lessons Identified (4.3.1): Disease modelling was incredibly useful in pandemic management. But, at the same time, the limitations of models need to be understood and factored into decision-making processes. (Doctrine/Training)

Observations (OBS 4.3.2): An initial lack of data was described as limiting the usefulness of models. As increased data became available and the model was shown to have predictive value, trust increased.

Lesson Identified (LI 4.3.2): In a pandemic caused by a novel pathogen, early disease modelling is likely to be inaccurate due to a lack of data and knowledge of the disease agent. The accuracy of models will improve over time as the amount of data collected and knowledge of the pathogen increases. (Training)

Observations (OBS 4.3.3): Information produced by models requires interpretation. It was the consensus of the syndicate that having a specialist trained in epidemiology and public health on the medical staff of higher headquarters was beneficial. The need for such expertise is not limited to pandemics but is especially acute at such times.

Lesson Identified (LI 4.3.3): Consideration should be given to having an individual with epidemiological and public health skills (Note: the relevant cadre varies by nation) on the medical staff of higher headquarters, to assist with interpretation of epidemiological and modelling data and to provide FHP advice and consultation. (Personnel)

Recommendation (REC 4.3): NATO-level: From a NATO perspective it was agreed that a consensus statement on disease modelling might be a useful adjunct to policy, so that there are agreed principles applied to NATO missions. Of note, the UK has produced a consensus statement on the use of modelling. It may be that a similar consensus statement would be useful to define requirements for NATO.

Observations (OBS 4.4): Stove-piping of information was noted to be a problem – with information moving up and down the chain of command better than it did horizontally. There were several examples of nations setting up COVID cells with responsibility for managing information, including providing FHP information to commands. Whilst the COVID cells were considered extremely useful in the pandemic response, many of these have been disbanded. There was concern that lessons in establishing successful systems to aid communication during the pandemic have not been captured or learned.

An issue was identified that the NATO Command Structures did not have a point of contact to answer FHP-related questions on NATO Missions. This led to the FHP Branch of the MILMEC COE establishing a forum to discuss these issues.

Lesson Identified (LI 4.4): The need for information collection and exchange increases considerably during a pandemic. Mechanisms, such as special cells, are needed to facilitate information flow between and within nations and national military medical services. (Organization/Interoperability)

Recommendations (REC 4.4.1): NATO/National/Unit-level: Specified operational cells, like the COVID cells during the pandemic, should be established early to facilitate information flow within and between military and civilian organizations.

Recommendations (REC 4.4.2): NATO/National/Unit-level: Within command structures, establish a point of contact for addressing FHP-related questions and to circulate information widely

Recommendations (REC 4.4.3): establish a dashboard containing important information that can be accessed by relevant parties.

Observation (OBS 4.5): As with modelling, having multiple sources for surveillance data created confusion at times. In some instances, case counts and other related information was reported separately by national and military systems and did not add up. This issue was highlighted by several nations and was related to problems with capturing data on cases. Data submission usually involved an individual manually entering details into a system and sending a document via email to a central location. Other nations described different methods. Issues highlighted including case definitions ('what constituted a case?') and sending personal information via email.

There was a consistent issue of a lack of individuals to undertake contact tracing – often resulting in a small team being burnt out very quickly. There were some examples of training of J1 and other personnel to perform contract tracing. However, there was frequently a conflict between the requirements of the contact tracing cell and the 'parent' unit.

Discussion also focused on the absence of specific IT systems for contact tracing in the military context. However, several nations that reported using their national system did not have this problem. There was also a discussion about the different systems used within NATO and the lack of standardisation.

Lesson Identified (LI 4.5): Having an organized, well-resourced system to monitor and manage cases and their contacts is vitally important in pandemic management. System speed, efficiency, and accuracy are increased when the same system is utilized across and between organizations and when, to the greatest extent possible, data entry is automated. (Materiel/Interoperability)

Recommendation (REC 4.5): NATO/National-level: IT solutions that would be valuable in future pandemics would also be valuable for tracking trauma casualties during operations and large-scale conflicts. Explore IT platforms that could be adapted to meet a variety of tracking and reporting requirements associated with the full spectrum of military operations.

Observations (OBS 4.6): NATO has long recognized the need to develop a disease surveillance system to enable earlier detection of outbreaks on deployment. The pandemic served to highlight this need. Although there are plans to include a disease surveillance module within a medical information management system (Medsuite) that is under development, the module, and the systems itself, is years away from being fielded. To bridge the period-of-time until the NATO system under development is operational, the MILMED COE has developed and tested, in various exercises and the Kosovo Mission, a functioning disease surveillance tool that can be used now. Knowledge gained through development of the "Near-Realtime Surveillance System (NRTS)" will help to inform the development of the future Medsuite disease surveillance module.

Lesson Identified (LI 4.6): The collection and sharing of accurate and timely information is critical to FHP-related decision making. The earlier an infectious disease outbreak is detected, the greater the chances of controlling the spread and preserving mission capability. A system for early identification of outbreaks on NATO missions is needed as soon as possible. (Materiel/Interoperability)

Recommendation (REC 4.6): NATO-level: Continue the develop and deployment of a NATO near real-time disease surveillance system for early identification of a disease outbreak among deployed forces on NATO missions. Furthermore, as mentioned in REC 4.5 above, the same platform could be adapted to start a NATO Trauma Registry. The current Ukrainian conflict has underscored the need for developing a deployable trauma registry sooner than later. Recommend developing a NATO Trauma Registry now to start gathering critical data pending the development of a Medsuite alternative.

Observation (OBS 4.7): At the onset of the pandemic, the "NATO COVID-19 Working Group" was established, with bi-weekly video teleconferences attended by national representatives, public health and medical specialists, scientists, and medical leaders from across NATO.

Best Practice (BP 4.7): Establishment of this working group facilitated sharing of information on the evolving public health crisis. In addition, it provided a mechanism for leveraging subject matter expertise resident within NATO and for engaging with experts outside of NATO. (Organizational)

Recommendation (REC 4.7): NATO-level: Maintain a subject matter expert body, within the NATO Force Health Protection Working Group, focused on public health and infectious disease epidemiology, with periodic meetings held to discuss emerging global disease threats, existing disease threats in Europe, and disease threats in current deployment locations. Having a standing body of this type would increase preparedness for future global health emergencies, help to increase awareness of infectious disease threats, and provide Medical Advisors and Commanders with a source of consultation on public health and infectious disease matters.

Mitigation

Observations (OBS 4.8): There were many national examples of outbreak investigation teams being deployed in support of operational forces. These teams, which provided subject matter expertise on outbreak management and, in some cases, a forward testing capability, proved to be extremely valuable to operational commanders. The need/demand for Rapid Deployable Outbreak Investigation Team (RDOIT) support far exceeded the availability of existing assets. Due to the lack of such a capability for support of NATO Mission Iraq, support for the mission had to contracted, which resulted in a considerable delay in the capability being provided.

Lesson Identified (LI 4.8): Deployable capabilities for epidemiological investigation and pathogen identification will be in high national demand in a future pandemic. Outbreak investigation teams that can be deployed on short notice are needed to support deployed operational forces. Such capabilities will not be available to support NATO missions unless previously identified and committed. (Doctrine/Organization)

Recommendation (REC 4.8.1): NATO-level: Establish multinational/national Rapidly Deployable Outbreak Investigation Teams (RDOITs) and ensure their readiness to be deploy on short notice in support of NATO and national missions. Have identified RDOITs on standby to deploy in support of NATO missions, with such support contracted if necessary.

Recommendation (REC 4.8.2): NATO-level: Include RDOITs in the NATO Defence Planning Process (NDDP)

CHAPTER 5
CIVIL-MILITARY COOPERATION

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Overview

This workshop syndicate considered the implications of the role of NATO military health services in providing support for the civilian response to the COVID-19 crisis for future civil-military relations within NATO member states. We approached this analysis using the typology of military activities during the COVID-19 crisis developed by the syndicate leader . The participants first reviewed the activities of armed forces in non-healthcare related support roles in order to discuss the general role of armed forces in domestic resilience. Most of our time was spent considering the implications of military support to the civilian health system. The workshop group had representatives from AUS, CZE, DEU, DNK, European Union, FRA, GBR, HUN, ITA, and USA, with members having a breadth of roles, including international policy, Department of Defence operations, health facility leadership, and force health protection.

Generic Military Support to National Emergencies

All NATO countries used non-health elements of their armed forces to augment the civilian response to the pandemic. For many NATO countries, the first task was to assist with the global repatriation of citizens from China and localised outbreaks (primarily associated with cruise ships). The armed forces then provided military personnel as liaison and staff augmentation to crisis response teams at national, regional, and local levels. In some countries, military personnel also provided technical assistance in intelligence, cyber-defence, and strategic communications. Military logistic and transport units assisted with the procurement and distribution of medical supplies, ventilators, personal protective equipment, and essential food and other items. There were also examples of military personnel augmenting police or border security services in their duties. All these tasks fell with existing constitutional or legal arrangements whereby military resources can be assigned to support other government activity in a national emergency. The group noted that this represented a significant additional task that lay beyond routine military competencies.

Observation (OBS 5.1): Military assistance to civil authorities during domestic crisis lies outside the NATO concept of civil-military cooperation for civil-military relations in support of military operations in Article 4 or 5 operations and does not seem to be covered by any other NATO terminology for the employment of the armed forces. This could detract from the employment of armed forces in national and collective defence if there is a security crisis concurrent with another domestic or global emergency.

Lesson Identified (LI 5.1): No term or concept exists currently in NATO doctrine for the employment of armed forces in support of national resilience and emergencies. (Doctrine)

Recommendation (REC 5.1): NATO-level: Modify doctrine to acknowledge the value and role in national resilience and security to employ armed forces in support of national emergencies.

Specific Military Support to the Health Response to the COVID pandemic

There were examples of military and military health services personnel contributing to every component of the civilian health system response to the COVID crisis as categorised using the typology. The exact timing, scale, and activity varied by country according to the severity and timing of the epidemic curve and the size and capabilities of each military medical system. Whilst a relatively small component of the overall national health system, military medical services provided an adaptable and rapidly deployable strategic pool of capability that could be assigned to augment local civilian health economies in particular crises. Military medical services also assisted outbreak control, test and tracing, vaccination roll out, and nursing/social care services. There were multiple, individual examples of tactical successes. The group identified the following strategic topics:

Observation (OBS 5.2): Lack of knowledge and misunderstandings between civil and military components of member state's health systems, initially impeded appropriate tasking of military medical capabilities.

Lesson Identified (LI 5.2): Military health professionals need to have a good understanding of the organisation of their national civilian health services, and the positive relationships between the civil-military system should be maintained through placements and liaison between both systems. (Doctrine/Interoperability)

Recommendation (REC 5.2): NATO-level: The NATO Medical Support Capstone Concept (NMSCC) has an enabling theme 'collaborative healthcare between civilian and military health services' which needs to be 'operationalised'. AMedP 6 - Allied Joint Civil-Military Medical Interface Doctrine - should also cover Role 4/civil-military relationships in domestic military health systems. This might require a specific working group within the COMEDS committees/working groups structure to complement the strategic perspective of the Joint Health Group.

Observation (OBS 5.3): Military 'medics' were employed in a wide range of roles in civilian health systems (pre-hospital care, hospital care, nursing/social care). Lack of reciprocal civil-military professional accreditation impeded placement of military 'medics' until professional regulations were waived.

Lesson Identified (LI 5.3): Military 'medics' should have a minimum civilian accreditation to enable their employment within the civilian health and social care system for both maintenance of clinical skills and emergency augmentation of civilian health service capacity. (Doctrine/Training/Interoperability)

Recommendation (REC 5.3): National-level: Encourage military personnel to obtain and maintain comparable civilian accreditation for clinical skills sustainment and facilitate emergency augmentation.

Observation (OBS 5.4): When not on operations, military health professionals are committed to garrison healthcare for armed forces personnel and beneficiaries in community and hospital services, or within the civilian health system. Removing them from these roles for employment elsewhere during a health emergency potentially denudes garrison healthcare or the civil health system.

Lesson Identified (LI 5.4): The re-deployment of military health personnel (including Reservists) from pre-existing clinical roles for other duties in an emergency is a strategic choice within the balance of priorities for the whole national health workforce. (Doctrine)

Recommendation (REC 5.4): National-level: When balancing strategic goals consider the second order effects of mobilizing military healthcare personnel who may already be working in an overtaxed system during a pandemic or disaster.

Observation (OBS 5.5): There were multiple different examples of the use of military health capabilities to augment civilian capacity ranging from hospital ships to small augmentation teams. These had varying effectiveness and efficiency.

Lesson Identified (LI 5.5): Nations should be encouraged to share their observations/lessons from the multiple different types of augmentation to civilian health services in order to evaluate the strengths and weakness of each. (Doctrine/Organisation/Interoperability)

Recommendation (REC 5.5): National/Unit-level: Provide observations, lessons identified, and best practices on tactical activities in support of civilian medical services to the NATO Centre of Excellence for Military Medicine, Lessons Learned and Innovation Branch.

CONCLUSION

Although 100 years passed between the 1918 Influenza Pandemic and the COVID-19 Pandemic, we should not assume that it will be another 100 years before the next pandemic. The growth of the world population, deforestation, overcrowding, climate change, and increasing global travel make the spread of infectious diseases unavoidable and future pandemics inevitable. It is likely that the next pandemic will occur much sooner, perhaps this decade. And the next pandemic agent could be much more lethal.

An honest assessment of the COVID-19 Pandemic response would conclude that the nations of the world, their military forces, and military medical services were not adequately prepared. The pandemic should serve as a warning and a call to action, to prepare, now, for the next pandemic. Learning the lessons of the COVID-19 Pandemic would not only make us better prepared for future global health emergencies but would also increase our preparedness for other future crises, including those resulting from global warming and armed conflict.

The COVID-19 Pandemic has shown the great capability and utility of the armed forces and their medical services in supporting national response efforts. Military services must be prepared to execute a broad pandemic mission set while also maintaining operational readiness under pandemic conditions. To do so, individual experiences and knowledge gained over the course of the COVID-19 pandemic must be incorporated into organizational knowledge.

While this document does not capture all the lessons that need to be learned from the COVID-19 Pandemic, we hope that that the lessons identified will be of use in preparing for future pandemics. We would like to encourage military medical services and other organizations that haven't done so already to conduct their own lessons learned workshop and share the lessons that are identified. The lessons of one military service, coordination cell, or hospital would undoubtedly be of value to others. Providing reports, individual observations, lessons identified, and lessons learned to the Joint Analysis and Lessons Learned Centre and the MILMED COE would facilitate sharing of the information and achievement of a greater collective preparedness for the next pandemic.

Final Observation: We wished to acknowledge the bravery of all military personnel who accepted the task to support our communities for their selfless exposure to the risk of contracting COVID-19, especially in the uncertain times of early 2020.

APPENDIX A
LIST OF WORKSHOP PARTICIPANTS

National Representatives

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Denmark	Lt Col Dr. Anne Marie Fenger, Maj Dr. Lena Rangstrup-Christensen, Maj Dr. Ulla Bonde van Zwol
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Germany	Brig Gen Dr. Jens Diehm, Maj Dr. Viola Düring, Lt Col Dr. Gelimer Genzel SMSgt Sabine Pries
Great Britain	Col Dr. Mark Dermont, Col Prof David Ross, Maj Dr. Kristen Morris Maj Peter Pybis
Hungary	LT Cintia Cseplye, Lt Col Dr. Adam Peter, Maj Gábor Dudás Maj Krisztina Szabó-Filyó, Maj Dr. Gergely Csaba Babinszky
Italy	Dr. Marco Filippi
Poland	Col Zygmunt Glogowski, Lt Col Lukasz Krzowski, Lt Col Dr. Rafał Sokołowski
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United States	Lt Col Katherine Kinder, Maj Karen Vandor

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Prof. Miklós Szócska (HUN)
Dr. Tamás Joó(HUN), Dr. Tamás Palicz (HUN)

APPENDIX B
LIST OF PLENARY PRESENTATIONS

An overview to military activities during the COVID pandemic
Lt Gen (Rtd) Professor Martin CM Bricknell CB OStJ PhD DM MBA MA MedSci, Professor of Conflict, Health and Military Medicine, King's College London

COVID-19 Lessons Learned: Bundeswehr Central Hospital, Koblenz
Brig Gen Dr Jens Diehm, Commander and Medical Director of Bundeswehr Central Hospital, Koblenz, and Dr Viola Düring, Bundeswehr Central Hospital, Koblenz

Data-driven solutions during a health security event
Professor Miklós Szócska, Semmelweis University Health Services Management Training Centre, Health Security and Cyber Defence Knowledge Centre

COVID-19 Lessons Learned for NATO Bio-responsiveness Capabilities
Julia Burr and Dr Ashley Farris, Strategy, Forces, and Resources Division, US Institute for Defense Analyses

The COVID-19 challenges and experiences of the European Union
CDR Dr Christian Haggenmiller, Medical Adviser, European Union Military Staff (EUMS) and Mrs. Luciana da Silva Santos, Health Emergency Preparedness and Response Authority (HERA)

Summative Evaluation of the Canadian Armed Forces Health Services Response to the COVID-19 Emergency
LtCol Monica Ott, Clinical Quality, Directorate Health Services Quality and Performance, Canadian Armed Forces

The Polish Armed Forces Medical Lessons of COVID-19
LtCol Lukasz Krzowski, Department of the Military Medical Service of the PAF, Lecturer of the Military University of Technology, Warsaw

The Great Britain Experience
Capt Kristen Morris, Public Health Registrar, UK Ministry of Defence

Lessons learned from the COVID-19 Pandemic in Romania
Dr Calin Alexandru, Director General inside the Department for Emergency Situations, Romanian Ministry of Internal Affairs

SARS-CoV-2 Experiences: HUN Integrated COVID Laboratory
Maj Gergely Babinszky, PhD, Scientific Officer, Mobile Biological Laboratory, Medical Centre, Hungarian Defence Forces

Mass testing for SARS-CoV-2 in Slovakia
Col Dr Marian IVAN, MPH, Head of Military Medical Capability Development Division, Military Medical Command

Vaccination Effectiveness and Impact on Defense Readiness in the Estonian Defense Forces in 2021
Lilli Gross, MSc, Estonian Defense Forces, HQ, J4-4

COVID-19 clinical experience at the ICU Military Medical Centre
LtCol Dr. Adam Peter, Hungarian Military Medical Centre, Budapest

Modelling, analysis, and decision making during COVID-19 in Hungary
Dr Gergely Röst, Department Chair of Applied Mathematics at the University of Szeged

Lessons Learned Relating to Infection Prevention and Control from the Canadian Armed Forces Health Services Response to the COVID-19 Pandemic
LCDR Jeffrey Lee, Communicable Disease Control Program, Directorate Force Health Protection, Canadian Armed Forces

Medical material to secure Slovak counter COVID-19 pandemic operations
PharmDr Peter Dučák, General Pharmacist, Division of logistics services, Department of Logistics, Military Medical Command

Organization of an emergency system for the provision of Medical Services in connection with COVID-19
LtCol Dr. Rafal Sokolowski, Department Pneumonology, Military Institute of Medicine, Warsaw

COVID-19 Pandemic lessons in the Portuguese Armed Forces
Maj Dr Sara Dias Grazina, Centre of Epidemiology and Preventive Intervention, Portuguese Armed Forces Hospital

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