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Total Force Fitness: Bridging Performance Optimization and Health Approaches for Warfighter Readiness and Psychological Health

« Total Force Fitness »: L'optimisation des performances et les approches de la santé au service de la préparation des combattants et de la santé psychologique

G.H. Park¹, N. E. Barczak-Scarboro². UNITED STATES

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Abstract

The U.S. Department of Defense supports Warfighter readiness and performance through Total Force Fitness (TFF) in support of Human Performance Optimization (HPO). This conceptual framework helps Warfighters and military units reach and sustain holistic health and performance and guides policy, program, research, and educational efforts. It includes social, physical, environmental, medical/dental, spiritual, nutritional, psychological, and financial health. A brief history and overview of HPO/TFF efforts in the DoD will be introduced. The value of full-spectrum approaches to caring for Service Members will be illustrated using the domain of psychological fitness. Specifically, this paper (1) defines and delineates the expanding role of full-spectrum psychology applications within military psychology; (2) discusses the need for the development of metrics; (3) describes integration of psychological, social, and spiritual fitness domains as key to future efforts supporting HPO; and (4) emphasizes the importance of continued collaboration of multidisciplinary professions to accomplish holistic and integrated care.

Keywords: military, performance optimization, performance psychology, positive psychology, readiness

Résumé

Le Ministère de la Défense des États-Unis soutient la préparation et la performance des combattants par le biais de la « Total Force Fitness » (TFF) dans le cadre de l'optimisation des performances humaines (« HPO »). Ce cadre conceptuel permet aux combattants et aux unités militaires d'atteindre et de maintenir une santé et des performances holistiques et oriente les politiques, les programmes, la recherche et les efforts éducatifs. Il inclut la santé sociale, physique, environnementale, médicale/dentaire, spirituelle, nutritionnelle, psychologique et financière. Un bref historique et une vue d'ensemble des efforts HPO/TFF au sein du Ministère de la Défense seront présentés. L'intérêt d'une approche globale de la prise en charge des militaires sera illustré à travers le domaine de l'aptitude psychologique. Plus particulièrement, cet article (1) définit et délimite le rôle croissant des applications de la psychologie à spectre complet au sein de la psychologie militaire ; (2) traite de la nécessité de développer des mesures ; (3) décrit l'intégration des domaines de l'aptitude psychologique, sociale et spirituelle comme étant la clé des efforts futurs soutenant l'HPO ; et (4) souligne l'importance d'une collaboration continue des professionnels multidisciplinaires afin de réaliser des soins holistiques et intégrés.

Mots clés : armée, optimisation des performances, psychologie des performances, psychologie positive, état de préparation

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Introduction to Total Force Fitness and Human Performance Optimization

Caring for Service Member health prophylactically is critical for keeping the force

ready and able to take on global security challenges from adversaries that threaten the peace of our Nations. Total Force Fitness (TFF) is an essential component within the strategic framework of operational medicine (1) in a newly established era of

change in the U.S. Department of Defense's Military Health System (MHS). TFF is a conceptual framework that helps Warfighters and military units reach and sustain holistic health and performance aligned with mission, culture, and identity. The Department of Defense (DoD) utilizes the TFF framework to identify MHS gaps across health and performance domains and guide realignment efforts in policy, structures, and practices (2). Overall, TFF guides policy, program, research, and educational efforts within the U.S. military. The TFF model (Figure 1) includes social, physical, environmental, medical/dental, spiritual, nutritional, psychological, and financial health domains.

The intersection of these eight domains is the roadmap to achieve and maintain Human Performance Optimization (HPO), a key goal for the DoD (3). The framework focuses on rapid restoration and recovery, performance sustainment, and performance enhancement. HPO assumes a proactive, "left of bang" stance to prevent conditions that challenge Warfighter health and performance. This contrasts with traditional health care models, where providers engage reactively with Service Members after injury, or "right of bang." HPO is a capability-based approach focused on health and performance improvements essential for executing Warfighter's primary duties. HPO is accomplished by expanding the traditional spectrum of care, moving beyond health (i.e., weight management) towards building mission-focused capabilities (i.e., improved marksmanship) and consistently enhanced performance. As such, HPO's full-spectrum approach (Figure 2) spans restoration of health, performance sustainment, and performance enhancement. TFF and HPO frameworks offer a broadened paradigm for medical and operational communities to enable comprehensive support of Service Member readiness.

Myths of Baseline

Historically, readiness in the military context has been conceptualized as analogous to the medical "right of bang" approach and defined as being free from injury, illness, or disease that prevents a Warfighter from being fully capable and ready to execute their designated missions. Here, readiness – specifically, medical readiness – is often defined by the absence of pathology, which can span both physical (e.g., diabetes) and psychological (e.g., depression) domains. In ascribing to the perspective that a Service



Figure 1: Total Force Fitness (TFF) Model

Member's status and functioning are largely determined by the absence of pathology, a host of other logical fallacies have been propagated:

- A) a Warfighter is ready so long as they are free from illness or clinical diagnoses;
- B) the absence of pathology means a Warfighter is able to execute their mission essential tasks with proficiency and, consequently;
- C) the absence of pathology means the presence of optimal performance. These myths converge into the assumption that there is no need for any kind of intervention as long as the Warfighter is executing their mission essential tasks effectively, which has proven unreliable and dangerous for mission success.

With the emergence of HPO and TFF frameworks, there is evidence that true readiness considers aspects beyond one's baseline: First, there are skills and capabilities that can be cultivated to enable consistent optimal performance; Second, there are prophylactic and preventive approaches that must be leveraged to keep Service Members ready for the fight, and; Third, there

needs to be much more effort applied to support optimal health and performance than simply addressing illness and pathology (4). Approaches to alleviating illness and supporting optimal performance are often viewed as completely independent at conceptual, practical, and policy levels. However, complementary and collaborative efforts across the care spectrum and within all domains of TFF are necessary for considering the Service Member lifespan and the fluctuations in health status a Warfighter may experience throughout their military career.

An example of the TFF and HPO frameworks being applied can be seen within psychological health and functioning. Psychological status is often described as an overly-simplified linear continuum, with health at one end and illness at the other. To better capture the complexity of mental health and mental illness, as well as help break down the false dichotomies with their construal, more nuanced models are necessary. For example, the dual continua of mental health model (5, 6) presents a complete mental health model with

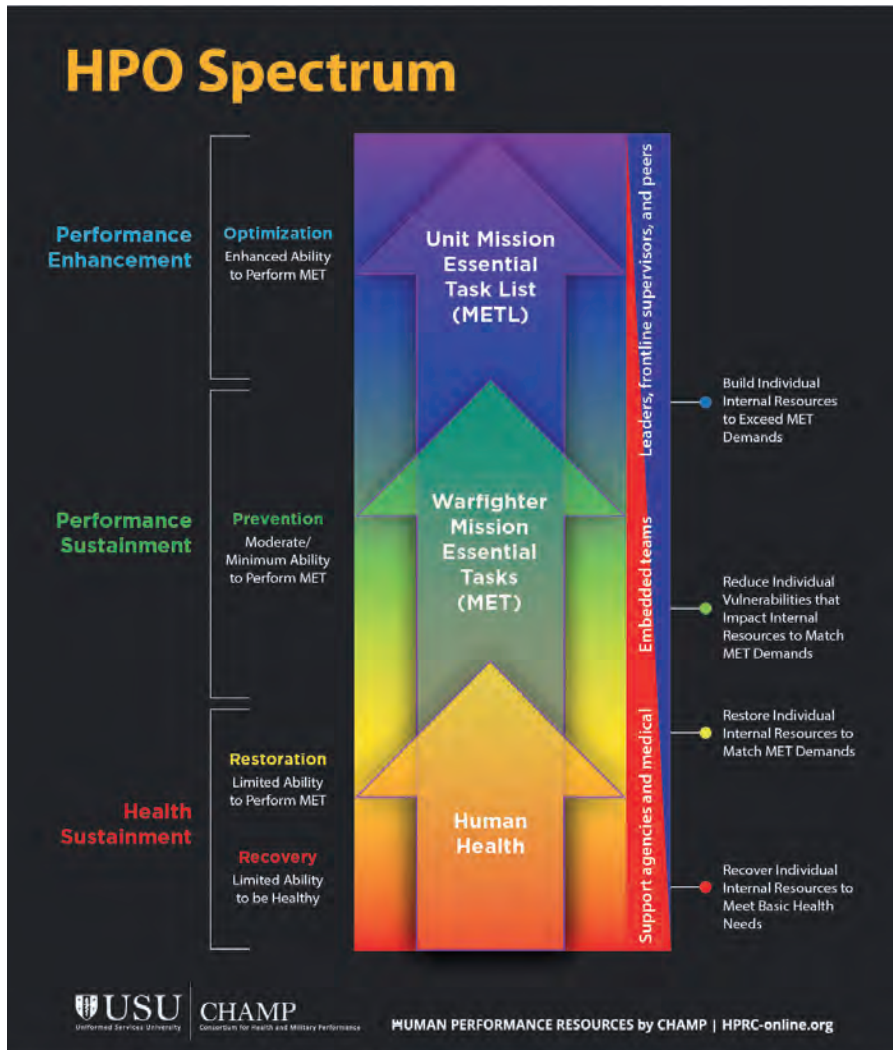


Figure 2: Conceptual Human Performance Optimization (HPO) Spectrum

well-being and illness represented on two separate but related dimensions (Figure 3). This model conveys that the absence of mental illness does not mean the presence of well-being. Rather, it is the amalgamation of one's current mental illness and well-being symptoms (5, 6). Being "completely mentally healthy ... [indicates experiencing] low symptoms of mental illness and high symptoms of well-being" (6) (p. 397), as shown in the upper right quadrant of Figure 3. This model enables a broadened perspective on pathways to support Warfighters and considers precise psychological health and readiness barriers compared to the unidimensional perspective. The complete state viewpoint also considers what might be gained by adding in an asset-based approach to developing skills that guard against poor mental health and could bolster health, well-being, and optimal functioning.

There has been some extant research conducted on both well-being and negative mental health in military populations. In Special Operations Forces (SOF) combat

and combat support Soldiers, well-being and mental illness symptoms—including depression, anxiety, and posttraumatic stress—were significantly related (7) though not to the strength suggested for convergent validity, which would indicate analogous constructs (8). This research also supported taking well-being into account as an important consideration for the Warfighter. Specifically, well-being or its components were significantly negatively associated with military exposures such as mild traumatic brain injury history (9), combat exposure, deployment frequency, and blast exposure (10). Additionally, well-being has been positively associated with psychological resilience (11), which is considered a key facet of military readiness.

Full-Spectrum Psychological Fitness

A full-spectrum approach emphasizes construction of Warfighter strengths and skills, in addition to mitigation of disease and risks to health. It encourages early cultivation of and engagement with health protective habits and behaviors rather than

relying on remedial application of behavior change after a problem has emerged. Full-spectrum approaches may also decrease the stigma associated with seeking and receiving support in all domains of TFF, particularly when principles are woven into the day-to-day training of Warfighters. Additionally, engagement across the spectrum for all of the domains of TFF provides the opportunity for more comprehensive root cause analysis and complementary approaches to addressing complex issues that are often the source of military health and performance issues.

In certain TFF domains, such as physical fitness, a full-spectrum approach has already been promoted across all the U.S. Service branches. Many service components have robust resources to address physical injury (service related and otherwise) as well as promote physical fitness. In contrast, considering the role of psychological well-being and optimal psychological functioning as a fundamental enabler of performance in the operational environment is relatively recent (12). The psychological fitness domain is a critical component of the TFF model as psychological performance can be optimized to sustain and improve Service Member capabilities (13) and protect overall psychological health and well-being for active duty, as well as transitioning and veteran Service Members.

The role of psychology in the military has and will continue to serve the important role of offering pathways to remediation of illness and alleviation of psychological trauma, distress, and negative outcomes associated with exposure to military related stressors and wartime sequelae (14). American psychology emerged in part to effectively train and deploy resources to help Service Members cope with the hardships and exposures of World Wars I and II, and their reintegration into the civilian population post-war (15). However, over the past few decades, psychological service delivery has evolved to be more comprehensive. There are now resources that have been extended to assist Service Members and their families navigate the challenges of military life, and many programs designed to provide proactive and skill-based training to prevent depression, suicide, and mitigate the impact of persistent stress exposure (16). Several other sub-disciplines of psychology have also been integrated into approaches to support the military. Positive military psychology (17) offers a salutogenic perspective and supplements

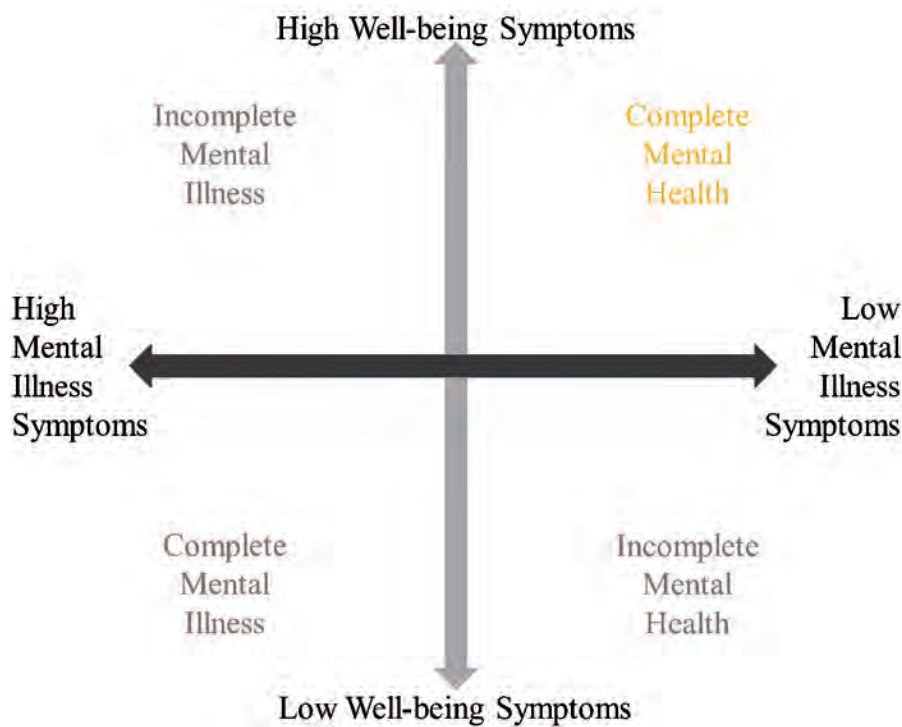


Figure 3: Dual Continua Model of Well-being and Mental Illness Symptoms
 Adapted from *Defining, Measuring, and Applying Subjective Well-Being* (p. 398) by Magyar & Keyes (2019) in *Positive Psychological Assessment: A Handbook of Models and Measures*, Second Edition, M. W. Gallagher and S. J. Lopez (Editors)

traditional approaches to optimizing Service Member psychological health based on understanding positive states, traits, and behaviors. Positive psychology is particularly relevant with the mostly young and healthy demographic of military personnel (17) and can elucidate predictors of success, inspire novel applications and approaches to treating disorder, and offer insight into strengthening military families. This focal area aims to illuminate both individual capabilities like resilience (12) and group-based factors, such as the role of morale and team cohesion and how they relate to the successful performance of military duties (18).

To date, military psychology focuses heavily on the negative psychological consequences of service rather than the strengths and attributes that make people fit for duty. Positive psychology offers additional language for describing Warfighter experiences, which often tend to be pathologized. Conducting research specifically on positive military psychology helps strengthen scientific understanding of all that constitutes complete mental health. For example, concepts like post-traumatic growth (19) highlight how trauma can pave the way for positive change following challenging life experiences. Empirical studies in this topic area have described the psychological processes that enable individu-

als to experience growth (i.e., deepened appreciation for life) despite the suffering they may endure (19). Psychology can also be applied toward optimizing performance of mission essential tasks (20). These mission essential tasks are a function of occupational specialty, thus approaches to optimize task performance should be both specific and precise. The science of performance psychology offers a framework to examine the mental skills (such as attention, arousal control, and self-talk) required to enhance specific performances across a broad range of tasks, from marksmanship, recovery from injury, execution of tactical strategy to decision-making and navigating complex environments. Performance psychology focuses on skills, techniques, and strategies to enhance an individual's ability to perform tasks associated with their job from a physical, cognitive, social, and emotional perspective. The role of performance psychology is neither to diagnose disorders nor to develop and maintain wellness, although the skills taught in the mental performance domain can be applied to sustain complete mental health. The role of performance psychology is to enhance an individual's ability and maintain a baseline of competence, efficiency, and repeatability of the tasks associated with their military occupational specialty. A working definition on performance psy-

chology collectively developed at the 2018 Performance Psychology Summit co-hosted by the Consortium for Health and Military Performance (CHAMP) and the Walter Reed Army Institute of Research (WRAIR) is: "The contribution of psychological factors to the execution of physical and cognitive actions by the human body to the greatest degree attainable under specified conditions and objectives".

Warfighter identity is tied inextricably to the incredibly difficult jobs they must execute in service of their respective countries. Performance psychology is focused on the psychological aspects of achievement in a social environment that values normative comparisons of success and where failure to perform to standards is detrimental to their professional and personal lifestyle (21). Thus, performance psychology is another sub-discipline of psychology with value in the military context. As with the broader field of performance psychology, military performance psychology supports more consistent execution of "context-specific KSAs [(knowledge, skills, and abilities)]. Over time, and then [have] the recollection of use of those KSAs leads to use during a 'discrete event'" (22) (p. 52-53). It is about understanding the contribution of psychological factors to the execution of physical and cognitive actions by the human body to the greatest degree attainable, to perform their mission essential tasks under specified conditions and objectives, and enable Service Members to perform more consistently at their upper registers.

Other disciplines of psychology, such as industrial/organizational (I/O) psychology, offer other insights into the functioning of groups and teams, as well as how to support person-to-occupation fit. I/O psychologists contribute to the social structure of the organization, optimizing administrative processes, physical fitness training, occupational specialty (OS) training, and operational organization strategies to facilitate optimal organizational structures. Examples include communication, expectation management, and talent management. I/O psychologists also contribute in the selection process to ensure the individual chosen for specific OS, groups, and teams fits the general personality and dispositional needs for each specific OS or team. Positive, performance, and I/O psychology are a few of the many other disciplines that play a role in supporting integration of full-spectrum psychological approaches to Warf-

ghter readiness. The broadening of psychological care beyond the clinical context complements the existing health and medical service delivery model and has important implications for practitioners in the military. With priorities focused on strengthening operational readiness, modernizing for a more lethal force, and optimal performance, it is crucial to understand how to effectively leverage and implement psychological science in the military.

Future Directions

Full-Spectrum Measurement

One of the greatest existing challenges in demonstrating the value of a full-spectrum approach to psychological health and performance is the dearth of metrics available to understand the connection between psychological characteristics or capabilities and outcomes of interest to stakeholders. Many validated measures, metrics, or tools have been empirically developed and deployed in the assessment and diagnosis of various psychological disorders. As previously stated, many efforts are made to understand how psychological illness and/or disorder impact readiness and functioning of Service Members despite this view not encompassing a complete picture of Service Member mental health and all possible interventions on performance. Comparatively, there are a limited number of validated tools for assessing psychological states, traits, and behaviors that are positively associated with performance and functioning. A major critique of positive psychology surrounds extant assessments. There are generally less options than those in mental health pathology and they do not appear to be as well validated (23) or applicable to military culture. For example, a metric of social cohesion has multiple references to “going out” which may or may not be possible on various military installations. Currently, very few instruments with established reliability exist to measure performance changes and few are validated because of the paucity of standardized outcome metrics for performance in military training and education courses and exercises. Although some studies have adapted the language of available measures for use in military studies (e.g. (24, 25)), context-specific measures would enable consistency in research efforts and support the development of detailed models for how changes in performance result from the application of performance psychology efforts.

General or military-specific measures could be enhanced by providing some objective construct validity, such as a direct link to desired performance or health outcomes. For the military to comprehend the relationship of optimal psychological functioning to readiness and operational outcomes of interest, funding and support are needed to develop and/or validate military-specific measures and metrics and define key relevant performance indicators. There have been recent efforts to disseminate various compendiums of validated measures across multiple domains, with the potential for predicting and assessing Service Member performance. The domains include behavioral, self-report, physiological, and specimen assays for physical fitness, nutrition, psychological status, cognition, environmental, sleep, and pain (26). Yet, without a standardized approach, which does not adversely impact the requirements for training in the military, little progress can be made to establish and collect meaningful measures of operational and/or core task performance for assessing the effectiveness of performance enhancement/optimization efforts.

Integration of Psychological, Social, and Spiritual Domains

Psychological, social, and spiritual fitness are vital components of health and performance for Service Members and their families. Further, psychological, social, and spiritual fitness often reflect the facets of HPO/TFF most relevant to re-humanizing human performance: In an era where biometrics, wearable technology, and objective data drive innovation in HPO, a return to understanding a Service Member’s sense of meaning, connection, purpose, motivation, and belonging would remind us that human beings are not simply reducible to inputs and outputs. The use of the analogy “humans as weapons systems” originated in the Air Force and was intended to convey that human beings need continual support and maintenance throughout their life cycle (27). However, human performance programs have been “generally more product focused than human centric, and relevant strategies and doctrine are limited to health services” (27) (p. 35).

Much of the existing research and many of the HPO/TFF programs have had an outsized emphasis on physiological capabilities, and the capacities of the human body to carry out missions successfully. The psychological, social, and spiritual dimensions

are comparatively less understood than other TFF domains despite their capacity to be both robust pathways for optimizing Warfighter performance and protecting an individuals’ vulnerability to health conditions. This is largely due to a lack of focalized research. The cognitive capabilities and competencies, as well as aspects of positive mental health and psychological fitness, have emerged in recent years as areas requiring greater emphasis (4). The social fitness domain, which can include work and familial relationships, dynamics with peers and teams, and within-rank hierarchy and the broader social context of the military, continues to garner increasing interest. Spiritual fitness is likely the least understood among the three constructs because discourse on this topic has been hampered at times by legal and ethical concerns.

Continued innovation in all three of these domains is required for programs and practitioners to respond to the complex and dynamic psycho/social/spiritual needs of Service Members. CHAMP is one of the only entities within the DoD examining psycho/social/spiritual health through an integrated, proactive, and preventive lens. CHAMP supports HPO/TFF initiatives by:

- A) advocating for a broadened conceptualization of full-spectrum psycho/social/spiritual fitness;
- B) convening collaborative summits and consensus meetings to advance the practice of performance psychology; and
- C) quantifying spiritual fitness through the spiritual fitness scale, a validated metric for coaching provided by chaplains or other providers and spirituality research (28). A spirituality metric will allow for empirical integration with established social and psychological research.

Enhancing Holistic and Integrated Care

In accordance with Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3405.01, TFF is recognized as a key component of DoD health promotion and disease prevention, as well as a “methodology for understanding, assessing, and maintaining Service members’ ability to meet mission requirements”. A goal for proper TFF implementation is to establish Human Performance Teams (HPTs), defined as groups of interprofessional and multidisciplinary medical and performance professionals that support health sustainment and enhance mission capabilities of the Warfighter community. This effort involves a significant financial investment by the DoD

to hire professional assets that cover a range of disciplines across the TFF domains. While the increase in assets has been a net positive for access to care, it remains a concern that HPT professionals may lack the skills and knowledge required to effectively collaborate and coordinate as an interprofessional team between the TFF domains to maximize success in service delivery. The complex nature of health care and performance optimization calls for interprofessional teams to bring together skill sets that are not easily represented in one discipline (29). The military is no exception to this need. However, there is little rigorous research on interprofessional teams, much less interprofessional teams in the military setting. In the medical setting, organizing military interprofessional health care teams may improve patient satisfaction, increase professional collaboration, reduce clinical error rates, and streamline management of care (30). These findings should be replicated within the military health care system via new research or accessing extant health care data.

As resources continue to be devoted to recruiting, hiring, and organizing HPT, there is an increased need to support team-based capabilities, or their ability to work collaboratively and cooperatively across domains. Evidence-based approaches are needed to support team-based competencies designed to address barriers to cross-boundary teaming, catalyze innovation and precision of HPO service delivery, and maximize the impact of HPT on Warfighter medical and mission readiness (31). Recognizing the need for research in this area, CHAMP is pioneering an exploratory study of practitioners to understand processes and procedures to enhance multidisciplinary care in response to an emerging emphasis on enhancing integrated care, and increasing investment in HPT assets to support readiness across all branches of service. The objective of the proposed research project is to understand how to train and deploy HPT staff into the military environment, to enable collaboration of HPTs with existing medical professionals, and to more effectively coordinate and leverage resources for Service Members across their lifespan.

Conclusion

Advancing military Service Members' capabilities, cultivating workforce talent, and building a more effective force remain top priorities for the DoD. Key to that effort is

the continual innovation of full-spectrum psychological well-being and performance approaches. The U.S. Secretary of Defense argued that: "People are our most valuable resource" (32) (p. 2). If this is indeed true, more must be done to identify how to organize, resource, and prioritize future efforts to bolster psychological health in those who serve.

Shifting the paradigm of psychological care from a clinical to a full-spectrum approach should be top priority for researchers, practitioners, and policy makers. Discussions must continue addressing the need for a unified strategy and may best facilitated by embracing conceptually the notion of full-spectrum psychology and its many facets. In addition to increasing the number of practitioners supporting Service Members and their families, frameworks and methodologies must be developed to organize and maximize the impact of a broader range of services. Through high-quality implementation science, tangible return on investment needs to be demonstrated for practice and policy to change.

With ongoing collaborations, cooperation and the sharing of best practices, practitioners can work together to enable a better future for Service Members and their families. Proactive efforts to minimize downstream consequences are critical to holistically meet the intent of the TFF framework. The desired end state is when:

- A) protections for mental health and well-being are woven into the fabric of military life;
- B) medical and performance professionals are able to better align and leverage their skills and training to meet performance demands; and
- C) an emphasis on growth and innovation will elevate conversations on approaches to enhance and sustain readiness across all branches of service throughout the world.

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News & Events



November 6-10, Tozeur, TUNISIA
11th ICMM International Course for Health Support in Saharan Environment



November 22-25, Marrakech, MOROCCO
6th ICMM Pan-Arab and Maghrebien Regional Congress on Military Medicine



November 27- December 01, Tunis, TUNISIA
9th Course on Law of Armed Conflict and Medical Ethics

Improvement in nasal obstruction and quality of life after nasal saline irrigation in 62 military projected in desert area

Amélioration de l'obstruction nasale et de la qualité de vie après irrigation nasale au sérum physiologique chez 62 militaires projetés en zone désertique

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Résumé

Contexte : Les conditions environnementales de la bande sahélo-saharienne, de par leur d'hygrométrie, leurs températures et leur densité de particules en suspension sont très particulières. Elles induisent une irritation du tractus respiratoire supérieur. En 2019, 69% des militaires déployés en opérations extérieures (OPEX) étaient déployés au Sahel.

Objectifs : Le but de cette étude était de déterminer par une évaluation prospective subjective si une irrigation nasale au sérum physiologique isotonique biquotidienne pouvait permettre une amélioration du confort nasal chez les militaires français projetés en région désertique.

Méthodes : Les questionnaires NOSE (Nasal Obstruction Symptom Evaluation) et le SNOT22 (Sino Nasal Outcom Test -22) étaient distribués à 62 soldats déployés sur le théâtre de l'opération Barkhane depuis au moins 1 mois. Puis un soin nasal consistant à l'instillation de 5cc de sérum physiologique isotonique par narine matin et soir leur était proposé pendant 1 mois. A l'issue, ils remplissaient à nouveau les questionnaires.

Résultats : L'interprétation des données du questionnaire NOSE a montré une amélioration significative du confort nasal avant (10,00) et après soin nasal (7,83). De même, l'interprétation du questionnaire SNOT22 a montré une amélioration significative de la qualité de vie avant (30,10) et après soin nasal (20,26). La diminution de l'obstruction nasale entraîne une amélioration du sommeil. L'efficacité opérationnelle est *ipso facto* augmentée. L'observance est maximale sur les postes en base arrière.

Conclusion : Les résultats de cette étude confortent l'intérêt de la mise en place d'un soin simple, peu onéreux, facile à mettre en place pour l'ensemble des militaires déployés en zone désertique.

Mots clefs : irrigation nasale, SNOT 22, NOSE, obstruction nasale, capacité opérationnelle

Summary

Background: The environmental conditions of the Sahelo-Saharan strip, due to their hygrometry, their temperatures and their density of suspended particles are very particular. They induce irritation of the upper respiratory tract. In 2019, 69% of soldiers deployed in external operations (OPEX) were deployed in the Sahel.

Objectives: The aim of this study was to determine, through a subjective prospective evaluation, whether twice-daily nasal irrigation with isotonic saline solution could improve nasal comfort in French soldiers sent to a desert region.

Methods: The NOSE (Nasal Obstruction Symptom Evaluation) and SNOT22 (Sino Nasal Outcom Test -22) questionnaires were distributed to 62 soldiers deployed in the theater of Operation Barkhane for at least 1 month. Then a nasal care consisting of the instillation of 5cc of isotonic saline solution per nostril morning and evening was offered to them for 1 month. At the end, they filled out the questionnaires again.

Results: Interpretation of the NOSE questionnaire data showed a significant improvement in nasal comfort before (10.00) and after nasal care (7.83). Similarly, the interpretation of the SNOT22 questionnaire showed a significant improvement in quality of life before (30.10) and after nasal care (20.26). The decrease in nasal obstruction leads to an improvement in sleep. Operational efficiency is *ipso facto* increased. Compliance is maximum on rear base positions.

Conclusion: The results of this study confirm the value of setting up a simple, inexpensive, easy-to-implement treatment for all soldiers deployed in desert areas.

Keywords: nasal irrigation, SNOT 22, NOSE, nasal obstruction, operational capacity

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Introduction

La situation géostratégique actuelle impose un déploiement de la majorité de nos effectifs militaires en zone désertique, notamment dans la bande sahélo-saharienne. Les conditions environnementales y sont particulières : le changement d'hygrométrie, de

température et la densité de particules en suspension constituent un défi pour notre muqueuse nasale. Aussi, de nombreux soldats vont rapidement présenter des symptômes d'inconfort nasal pouvant retentir sur leur qualité de vie et *ipso facto* leur capacité opérationnelle en majorant leur fatigue et en diminuant leur capacité physique.

Matériels et méthodes

Contexte

En 2019, 4 500 militaires français ont été engagés au sein de l'Opération Barkhane, opération lancée le 1^{er} Août 2014 en partenariat avec le G5 Sahel (Burkina Faso, Mali, Mauritanie, Niger et Tchad). Ainsi, 69% des effectifs des militaires en OPEX (opérations extérieures) sont déployés dans la bande sahélo-saharienne. C'est vers cette population que s'est tournée notre étude.

Méthodologie

Il s'agissait d'une étude prospective observationnelle mono centrique réalisée au Mali du 1^{er} février 2019 au 5 Avril 2019

L'inclusion a été proposée à tous les membres d'une compagnie présente sur le théâtre depuis un mois, tous grades confondus, qui faisait ponctuellement des actions de combats, volontaires.

Les critères d'exclusion étaient les militaires présentant un antécédent de chirurgie rhino-sinusienne,

et les militaires présentant une pathologie rhino sinusienne chronique antérieure à la mission.

Les données ont été recueillies au moyen de deux auto-questionnaires, le NOSE (Nasal Obstruction Symptom Evaluation) (annexe1) et le SNOT22 (Sino Nasal Outcome Test -22) (annexe2). Les questionnaires ont été remplis par des soldats projetés après au moins 1 mois de mission en zone désertique puis après 1 mois de soins nasaux.

Le questionnaire NOSE (Nasal Obstruction Symptom Evaluation) est un questionnaire standardisé de qualité de vie, comportant 5 items : sensation de nez plein, de nez bouché, d'avoir des difficultés à respirer par le nez, d'avoir des difficultés à dormir et des difficultés respiratoires à l'exercice physique. Chaque item est noté sur une échelle de Likert de 5 points en fonction de la sévérité. L'ensemble est noté sur 20. Une sensation d'obstruction nasale était définie par un NOSE ≥ 10 .

Le test SNOT22 (Sino Nasal Outcome Test -22) est un questionnaire d'évaluation de qualité de vie destiné aux patients souffrants de rhinosinusite chronique et aiguë. Le questionnaire évalue la fréquence des symptômes, la gêne liée aux symptômes et l'impact sur la vie quotidienne. Une sensation d'inconfort nasal retentissant que la qualité de vie nasale était définie par un snot22 ≥ 30 .

Ces deux questionnaires ont bénéficié d'une traduction et d'une adaptation socio-

culturelle pour être utilisés en français. Il y a plusieurs avantages à les utiliser conjointement : ils sont validés, utilisables dans les deux langues. Ils sont fiables, reproductibles et sensibles aux changements, et permettent des évaluations pré et post-thérapeutiques. Mais surtout, ils sont synergiques et permettent ainsi l'évaluation de l'obstruction nasale dans toutes ses dimensions.

Les volontaires recevaient comme instruction de pratiquer une irrigation biquotidienne des fosses nasales : 1 dosette de sérum physiologique isotonique de 5cc par narine matin et soir (figure1).



Figure 1: volontaire pratiquant une irrigation nasale au sérum physiologique à petit volume, 5cc par narine.

Statistiques

Les relevés des questionnaires étaient colligés sur une base de données anonymisée. Les comparaisons de moyenne étaient réalisées avec le test T de Student. Le seuil de significativité retenu était $p \leq 0.05$.

Considérations éthiques

La participation à l'étude était sur la base du volontariat, chaque personnel étant

libre de refuser sans aucune conséquence pour sa prise en charge ou son exercice professionnel. Le consentement a été recueilli préalablement au remplissage des questionnaires. Le comité d'éthique de l'Hôpital d'instruction des Armées Percy a autorisé cette étude (Janvier 2019).

Résultats

62 volontaires ont participé à l'étude du 1^{er} février 2019 au 5 Avril 2019. Ces militaires volontaires étaient déployés au Sahel depuis plus d'un mois.

87% d'hommes (n=54) et 13% de femmes (n=8) ont été inclus. L'âge moyen était de 30 ans [21-57].

Tableau 1 Caractéristiques des patients

Nombre	62
Sexe H/F	54/8
Âge moyen	30 (21-57)
Observance complète	54 (87%)

Seuls 54 (87%) soldats ont eu une observance complète du soin nasal.

Les 8 (13%) soldats ayant interrompu le soin nasal partiellement ou totalement étaient tous projetés sur des postes avancés avec action de combat.

Le score NOSE initial était élevé, en moyenne de 10,00 [3-18], avec des fortes disparités.

Le score NOSE après soins nasaux était en moyenne de 7,83 [1-17]

Il existait une amélioration significative du score NOSE après traitement ($p \leq 0.05$).

Il existait une amélioration significative du score NOSE après traitement ($p \leq 0.05$).

Résultat du score NOSE avant et après soins nasaux

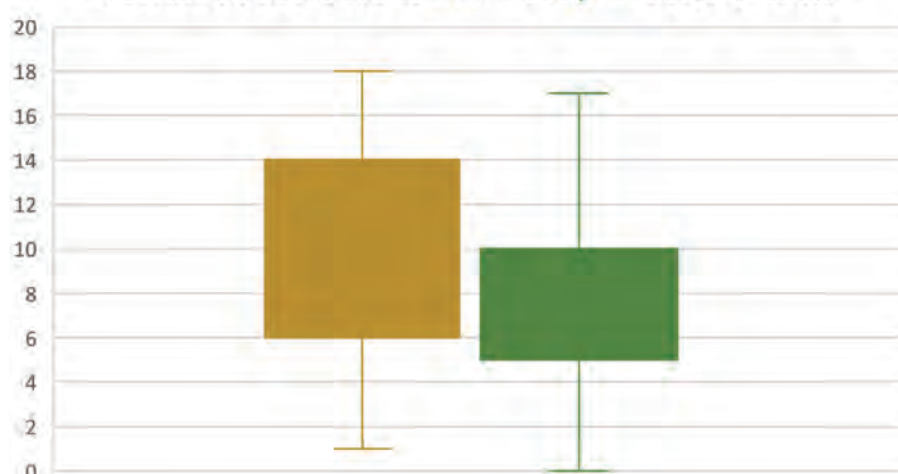


Figure 2 : évolution du score NOSE avant et après soins nasaux

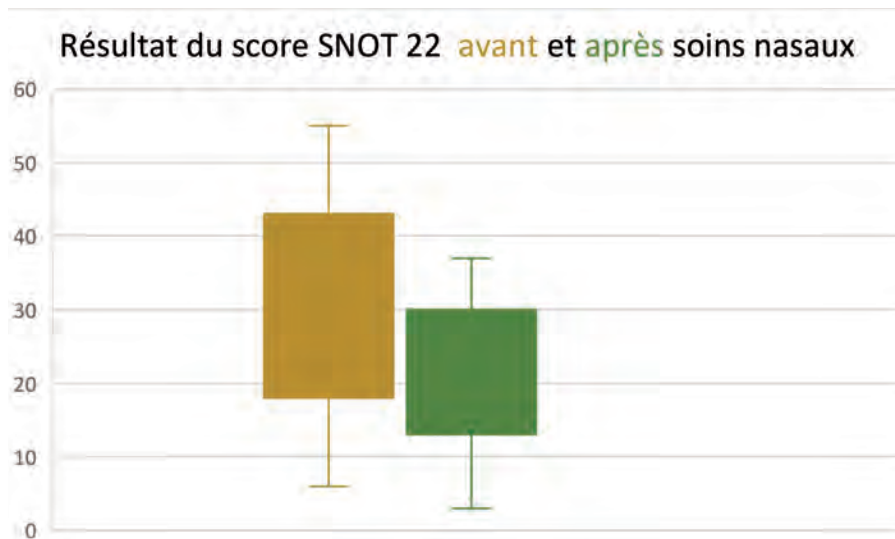


Figure 3 : évolution du score SNOT 22 avant et après soins nasaux

Le score SNOT 22 initial était élevé, en moyenne de 30,10 [6-55], avec des fortes disparités.

Le score SNOT 22 après soins nasaux était en moyenne de 20,26 [3-37].

Le confort nasal et plus globalement, le confort de vie des militaires a été ainsi significativement amélioré.

Discussion

Conditions environnementales

La respiration de particules de sable entraîne une inflammation de l'ensemble de la filière aérienne³ et par là même une rhinite. Cela explique que, même en l'absence de pathologie nasale chronique en métropole, les scores NOSE et SNOT22 des militaires déployés en zones désertiques atteignent rapidement des valeurs de patients souffrant de rhinosinusite chronique sévère⁵. On retrouve ainsi avant le traitement des moyennes de score bien plus élevés que la population générale ne souffrant d'aucune pathologie nasale. Il eût été intéressant de reproduire l'étude pendant la saison des pluies, en été, où le différentiel de température diurne et nocturne est moindre, et l'hygrométrie maximale.

Irrigation au sérum physiologique isotonique

L'irrigation nasale permet une triple action : une action mécanique prédominante avec drainage du mucus contenant les médiateurs de l'inflammation, une augmentation de la clairance mucociliaire⁶ et, une modification ionique favorable au fonctionnement de la muqueuse. L'action mécanique du lavage prime sur la composition de l'irrigation⁷.

De nombreuses études ont démontré l'intérêt de la pratique d'une irrigation nasale quotidienne même en l'absence de pathologie nasale. Cette dernière est d'ailleurs pratiquée par différentes populations comme en Inde. Cette technique de yoga, le Yala Neti, permet de rincer et nettoyer les cavités nasales à l'aide d'un récipient (le Neti Lota) rempli d'eau tiède salée. *S.Meera et al.* dresse une revue de la littérature de 1980 à 2016 sur les bienfaits thérapeutiques de cette pratique qui retrouve une amélioration des troubles respiratoires du tractus supérieur, une diminution de la survenue d'infection respiratoires hautes et une diminution de consommation d'antibiotiques chez les pratiquants de cette technique ancestrale⁸.

Les effets secondaires, inconfort, épistaxis, rhinorrhée post lavage, que ce soit à petit ou gros volume, à basse ou haute pression, sont considérées comme négligeables⁹.

La douche nasale à grand volume type 500 cc de sérum physiologique est préférable à l'irrigation par spray ou pipette en termes de pénétration intrasinusienne¹⁰. Cependant, il semble difficile pour les combattants déployés en zone désertiques de pouvoir sécuriser l'eau employé pour l'irrigation¹¹, qui sans être stérile doit au minimum être subir une potabilisation et une salaison.

Observance

Notre étude rapporte une observance moyenne de l'ordre de 87%. Cette observance est maximale chez les soldats postés « en base arrière ». Pourtant, dans les études, l'irrigation nasale est une procédure rapportée comme facile à mettre en œuvre par les patients⁹. Cependant, la moindre charge supplémentaire peut en-

traver la capacité physique des combattants¹². Pour une opération d'un mois sans ravitaillement possible, la surcharge imposée par le lavage nasal au sérum physiologique avec son conditionnement est évaluée à près d'un kilogramme avec le conditionnement, ce qui n'est pas négligeable et difficilement acceptable sur des opérations longues.

Une reconstitution de la solution saline est tout à fait envisageable en ajoutant 10grammes de sel à 1 litre d'eau bouillie refroidie ou d'eau potable. Si cette solution permet d'amoinrir la charge du combattant, elle nécessite une manipulation chronophage peu concevable dans des périodes d'actions de combats où les périodes de repos sont rares.

Surcoût et logistique

La boîte de 30 unidoses de NaCl 5ml coûte 0.94€ sans prendre en compte les coûts d'acheminement sur le théâtre d'opération. Le surcoût estimé est de 0.6 centimes d'euro/jour/patient soit environ 8€ d'euros par combattant sur la durée de leur mandat de 4 mois en général. Ce surcoût est négligeable par au coût estimé d'un militaire déployé en OPEX de l'ordre de plus de 100 000 euros par an¹³.

D'un point de vu de l'empreinte logistique, pour 3000 soldats, cela représente 90L de sérum physiologique par mois ce qui, au regard du fret médical transporté : plusieurs tonnes par mois pour l'opération Barkhane, est négligeable.

Amélioration de la condition opérationnelle

Les symptômes respiratoires sont couramment rapportés par les militaires déployés en zone désertiques. Ils influent sur la qualité de sommeil, et rendent dans près de 2% des cas le militaire incapacitant¹⁴. Le manque de sommeil est ainsi le facteur principal limitant les capacités physiques¹⁵. Aussi est-il primordial de diminuer au maximum les symptômes d'inconfort nasal de nos combattants. C'est le but de l'instauration de ce soin nasal en milieu opérationnel.

Conclusion

Un soin nasal simple, facile à mettre en œuvre, disponible facilement peut permettre d'améliorer la qualité de vie de nos militaires déployés et par là même leur efficacité opérationnelle. Son surcoût est négligeable et la logistique d'acheminement facile. Bien que plus difficile à mettre en

ENTOUREZ LA REPONSE LA PLUS ADAPTEE ET ADDITIONNEZ LES CHIFFRES

	Pas de problème	Problème très modéré	Problème modéré	Problème peu sévère	Problème sévère
1) Problème occasionné par la sensation d'avoir le nez plein	0	1	2	3	4
2) Problème occasionné par la sensation d'avoir le nez bouché ou bloqué	0	1	2	3	4
3) Problème occasionné par la sensation d'avoir des difficultés à respirer par le nez	0	1	2	3	4
4) Problème occasionné par la sensation d'avoir des difficultés à dormir	0	1	2	3	4
5) Problème occasionné par la sensation que votre nez ne vous permet pas de respirer suffisamment durant l'exercice physique	0	1	2	3	4

**Sino-Nasal Outcome Test-22
(Test d'impact des symptômes sino-nasaux-22)**

Vous trouverez ci-dessous une liste de symptômes et de conséquences sociales et/ou émotionnelles liées à votre pathologie nasale. Nous aimerions en apprendre davantage sur ces problèmes et appréciations que vous répondez aux questions suivantes au meilleur de vos capacités. Il n'y a pas de bonnes ou de mauvaises réponses et vous seul(e) pouvez nous donner ces informations. Veuillez évaluer vos problèmes, tels qu'ils se sont présentés durant les deux dernières semaines. Nous vous remercions pour votre participation

En considérant la sévérité du problème quand il survient et la fréquence avec laquelle il survient, veuillez coter chaque item ci-dessous en entourant le chiffre qui correspond à votre ressenti, en utilisant l'échelle suivante →

	Aucun problème	Problème très léger	Problème léger	Problème modéré	Problème sévère	Problème très sévère
1. Besoin de se moucher	0	1	2	3	4	5
2. Eternuements	0	1	2	3	4	5
3. Nez qui coule	0	1	2	3	4	5
4. Toux	0	1	2	3	4	5
5. Écoulement nasal postérieur (dans la gorge)	0	1	2	3	4	5
6. Écoulement nasal épais	0	1	2	3	4	5
7. Oreilles bouchées	0	1	2	3	4	5
8. Vertiges	0	1	2	3	4	5
9. Douleur/pression dans l'oreille	0	1	2	3	4	5
10. Douleur/pression faciale	0	1	2	3	4	5
11. Difficulté pour s'endormir	0	1	2	3	4	5
12. Se réveiller la nuit	0	1	2	3	4	5
13. Manque d'une bonne nuit de sommeil (mauvaise qualité de sommeil)	0	1	2	3	4	5
14. Se réveiller fatigué	0	1	2	3	4	5
15. Fatigue (durant la journée)	0	1	2	3	4	5
16. Baisse de productivité (rendement, efficacité)	0	1	2	3	4	5
17. Baisse de concentration	0	1	2	3	4	5
18. Frustration/agitation/irritabilité	0	1	2	3	4	5
19. Baisse de moral (tristesse)	0	1	2	3	4	5
20. Gêne/inconfort	0	1	2	3	4	5
21. Perturbation du goût, de l'odorat	0	1	2	3	4	5
22. Obstruction/congestion nasale	0	1	2	3	4	5

TOTAL: _____

TOTAL GÉNÉRAL : _____

œuvre dans les phases tactiques de la mission, il est à prôner en dehors de ces phases de combat.

Annexe 1 : QUESTIONNAIRE NOSE

Les symptômes sont notés de 0 (« aucun problème ») à 4 (« problème très sévère »). Plus le score général est élevé, plus la qualité de vie est altérée.

Durant le **dernier mois**, dans quelle mesure les circonstances suivantes ont-elles été un problème pour vous ?

Annexe 2

Version française des 22 items du Sino Nasal Outcom Test (SNOT22). Les symptômes sont notés de 0 (« aucun problème ») à 5 (« problème très sévère »). Plus le score général est élevé, plus les symptômes rhinosinusiens sont jugés sévères.

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Déclaration d'intérêts

Les auteurs déclarent ne pas avoir de conflit d'intérêts en relation avec cet article.

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Implementation of damage control for severe traumas in perilous conditions with limited medical resources

Mise en œuvre du contrôle des dommages pour les traumatismes graves dans des conditions périlleuses avec des ressources médicales limitées

H.D. Sama¹, E. Padaro², S. Adam³, D. Lamboni⁴, Y. Coulibaly⁵. TOGO

Abstract

Background: damage control in trauma describes a strategy for the management of haemorrhagic shock centered on limited rescue surgery when required together with resuscitation. The aim is to present the results of a DC protocol for a low resource setting in a conflict environment.

Methods: this is a descriptive study of damage control in severe trauma patients conducted between January 2014 and December 2018 in a peacekeeping hospital deployed in Kidal region, Mali.

Results: during the study period and per year, 9786 consultations were carried out, of which 1468 were surgical consultations. Of the 752 surgeries performed, there were 498 traumas. There was an average of 150 (30,1%) serious trauma per year who underwent DC. They were predominantly male (136 / 90,7%) and soldiers (112 / 74,4%) with a mean age of 26.6 years. 85% were rated absolute emergency (128 / 85%). Traumas of limbs predominated due to weapons (143 / 95,6%). All patients presented haemorrhagic shock received rescue care and DCR with RBC transfusion. For GA + fast sequence induction, we used preferentially propofol (78 / 52%). DCS was indicated mostly for orthopedic stabilization (113 / 75%). Following admission, 136 (90,7%) patients were stabilized. Nine (6,3%) patients had worsened. A total of 100 patients (67%) benefited of Medevac after stabilization. Four deaths occurred after admission to the hospital (5 / 3%).

Conclusion: this study showed that, it is possible to implement effectiveness DC in severe traumas in limited resources environments, by vulgarizing these therapeutics when indicated even in rural and teaching hospitals, develop medical life support plans and medical simulation training.

Keywords: Damage control, traumas resuscitation and surgery, critical and rescue care, haemorrhagic shock, perilous environment.

Résumé

Contexte : En traumatologie, le damage control décrit une stratégie de gestion du choc hémorragique par l'articulation d'une chirurgie de sauvetage limitée associée à des mesures de réanimation.

Objectif de l'article : L'objectif est de présenter les résultats d'une étude concernant les blessés qui ont bénéficié d'un protocole de damage control mis en œuvre dans un environnement de conflit avec des moyens limités.

Méthode : Il s'agit d'une étude descriptive concernant la mise en œuvre de mesures de damage control chez des patients traumatisés graves.

Cette étude a été menée entre janvier 2014 et décembre 2018 dans un hôpital de maintien de la paix déployé dans la région de Kidal au Mali

Résultats : Durant la période concernée, 9786 consultations ont été réalisées dans l'hôpital concerné dont 1468 consultations chirurgicales. Sur les 752 chirurgies réalisées, 498 l'ont été pour des atteintes traumatiques.

En moyenne, 30,1% des traumatismes graves ont bénéficié d'une mesure de damage control. Il s'agissait principalement d'hommes (136 / 90,7%) et de soldats (112 / 74,4%) avec un âge moyen de 26,6 ans. 128 soit 85% se sont trouvés catégorisés comme urgence absolue. Les traumatismes des membres étaient majoritairement des blessures par armes (143 / 95,6%).

Tous les patients présentant un choc hémorragique ont reçu des soins de secours et une DCR avec transfusion de globules rouges. Pour l'induction de l'AG + séquence rapide, c'est le Propofol qui a été utilisé préférentiellement (78 / 52%). La DCS a été indiquée principalement pour la stabilisation orthopédique (113 / 75%). Après l'admission, 136 (90,7%) patients ont été stabilisés. Neuf (6,3 %) patients ont vu leur état s'aggraver.

Au total, 100 patients (67%) ont bénéficié d'une évacuation médicale après stabilisation. Seuls quatre décès sont survenus après l'admission à l'hôpital (3%).

Conclusion : Cette étude a montré qu'il est possible de mettre en œuvre un damage control efficace pour des traumatismes graves même en environnement difficile et lorsque l'on dispose de ressources limitées. Il importe donc d'enseigner largement ce type de technique dans les hôpitaux universitaires mais également dans les établissements ruraux en diffusant des protocoles de prise en charge et en développant des formations par simulation.

Mots-clés : Soins de sauvetage, réanimation et chirurgie des traumatismes, choc hémorragique, damage control, environnement périlleux .

Background

The concept of damage control (DC) for trauma encompasses a strategy for the management of haemorrhagic shock centered on limited rescue surgery, associated with perioperative resuscitation, for critically ill patients.^{1,2} This concept was first described as DC surgery (DCS) for military patients with penetrating abdominal trauma complicated of serious haemorrhage.³ DC resuscitation (DCR) refers to the modalities of pre and intra-hospital resuscitation performed in patients with traumatic haemorrhagic shock under.⁴ Considerations are given nowadays to the lethal diamond: coagulopathy, hypothermia, acidosis and hypocalcemia.⁵ The concept of DCR combines early transfusion of red blood cell concentrates (RBC) and coagulation factors.^{3,6,7} Early aggressive transfusion strategy of plasma / platelet / RBC at a 1/1/1 ratio, has been associated with a reduction in haemorrhagic shock related mortality in the severely traumatized patients in 35%.⁷ Despite therapeutic progress,^{8,9} haemorrhagic shock remains a major cause of preventable death.¹⁰

The concept of DCR is the standard of care in war medicine.⁵ However, the use of weapons, and traumas caused are no longer confined to armed conflict, but civilians are also frequently victims. The implementation of DCS and DCR is not directly applicable in Kidal, and more generally in sub-Saharan Africa, due to the weakness of medical structures and the location of peacekeeping installations in an insecure zone. The remote DCR¹¹ requires human and material resources often inaccessible in our precarious conditions. This seems to be confirmed by the fact that there is not enough publications on the treatment of war-wounded in low income countries¹² despite recurring armed conflicts in these areas. This protocol is in line with the international guidelines.¹³⁻¹⁵ These recommendations required adaptation because of the environment of the hospital area, particu-

larly the long evacuation times needed. Medical regulations within, and feedback from, the theatre in the war situation also effected changes in the protocol to optimize logistical and organizational aspects of trauma management. In addition, high frequency of terrorist attacks are occurring in Sahelian strip and extending to Guinea gulf countries realizing public health concern, displacement of populations with many socio-economic consequences.

The main objective of this work is to present the results of the implementation of a resource limited DC protocol for the benefit of the seriously wounded who presented haemorrhagic shock for 5 year, between January 1, 2014 and December 31, 2018.

Methods

Study Framework: description of Togo Level II Hospital (HN2)

The bad security context in Kidal region, where the cities of Kidal, Aguelhok, and Tessalit are located, has led UN to deploy civilian and peacekeeping personnel to stabilize this region. Medical support for forces is provided by a Level II hospital staffed by a Togolese team. This hospital was initially deployed in Sevare since January 2013 before being moved to Kidal in January 2015. In addition to more than 4000 officials, this hospital also provided care to allied forces and local civilian population. The missions of the HN2 involve management of medical-surgical emergencies, stabilization of the wounded, external consultations, hospitalizations, dental care, paraclinical examinations (laboratory and medical imaging), and medical evacuations (Medevac). The HN2-Togo is staffed by 15 doctors (1 chief medical officer, 1 generalist, 5 emergency physicians, 2 surgeons: trauma and generalist, 1 resuscitation anesthesiologist, 1 internist, 1 public health, 1 dental surgeon, 1 pharmacist, 25 nurses). Including technical staff, there were 70 people at the hospital. The HN2 has 1 triage room, 2 consultations, 4 resuscitation beds, 4 intensive care beds, 1 operating room, 1 dental office, 1 laboratory, 1 medical imaging unit with 2 ultrasounds machines and 1 fixed Rx, 1 pharmacy and 1 aero medical evacuation team (Amet). There were an armored ambulance and a light ambulance. All these human and material resources give the HN2 a daily capacity of 5 surgical procedures, 40 medical consultations and 10 dental consultations. The hospitalization capacity of HN2 is

20 hospitalizations with an average duration of seven days. The hospital is self-sufficient in medications and consumables for 60 days minimum. The level of prioritization for wounded evacuation is as defined: "Alpha" (A) patients are those who must be evacuated within 90 minutes, four hours for "Bravo" (B), and 24 hours for "Charlie" (C).¹⁶ Patients categorized as "Echo" (E) are those who died before they arrived at the hospital.

Method

All patients who were received at HN2 from January 2014 to December 2018, and who were treated according to a DCR or DCS protocol, were included. The data collection was based on the hospital's records of consultations, hospitalizations, and operating records, as recommended in the updated contingent own equipment manual of 2017.¹⁷ The collection was carried out by the coordinating physician and the study's investigative doctors trained for this purpose. For each victim supported, the following data was extracted: 1) socio-demographic data; 2) circumstances of the accident or attack; 3) level of evacuation prioritization of the victim; 4) presence or absence of haemorrhagic shock; 5) clinical, standard X-ray, FAST ultrasound and blood test data; 6) emergency and 72-hour post-operative intensive care; 7) type of anaesthesia and analgesia; 8) immediate evolution; 9) information on medical evacuation; and 10) occurrence of death, if appropriate. All the data was initially collected on a standardized and anonymous form and then entered later in an Excel spreadsheet (Microsoft® Redmond, USA) by the coordinating doctor of the study after agreement of committee of ethics and protection of persons from the medical staff.

Operational definitions

Limited medical resources: areas with limited blood, reagents, surgical equipment, insufficient medical transport, absence of CT scanners.

Local conditions: isolated regions, climatic constraints (heat, sandstorm), long distances from largest cities.

Results

The review of activities of the hospital in this hostile environment (figure 1) during the study period was as follows: 9786 consultations of which 1468 surgical consultations, 8282 biological examinations, 2222

1. Service d'anesthésie réanimation, CHU Sylvanus Olympio, SSA Lomé Togo
2. Service de biologie et d'hématologie clinique, CHU Campus, SSA Lomé Togo
3. Service de chirurgie maxillo-faciale et plastique, CHU Sylvanus Olympio, SSA Lomé Togo
4. Service de chirurgie thoracique, CHU Sylvanus Olympio, SSA Lomé Togo
5. Service d'anesthésie réanimation et urgences, CHU Point G, Bamako Mali



Figure 1 : ambulance fired by terrorist



Figure 2 : triage, categorization during massive casualties

x-rays and ultrasounds, 1306 hospitalizations and 578 Amet per year.

Description of the trauma patients

On average and annually, 752 surgeries were performed, 498 (66%) were traumas. Among these, there were 150 (30,1%) severe traumas requiring care according to

the DC protocol. These 150 averaged wounded every year were mostly men (136 / 90.7%) of whom almost 75% military (112 / 74.4%). The mean age of the injured were 26.6 years with ranged from 4 to 52 years. Most of the injuries were related to armed conflicts in the region: complex kamikaze attack with explosions of mines / impro-

vised explosive devices (77 / 51%), heavy weapons (36 / 24%) and gunshot (31 / 20,6%). Injuries related to road accidents were minor (6 / 4.4%). The injuries caused were often treated in mass casualty context, admission of more than 5 serious wounded at the same time, needing special procedures as categorization (figure 2). Among traumatized patients, the majority were classified as absolute (128 / 85%) emergence and (23 / 15%) relative emergence. All patients presented haemorrhagic shock. The anatomical location of trauma was predominantly in limbs (105 / 69.8%). Some patients had multiple fractures (56 / 37.2%) or multiple injuries (17 / 11.6%).

Description of medical care

All patients had benefited from a medical assessment with laboratory analysis and radiological imaging (figure 3). All patients received emergency rescue care and DCR (see Table I). They had been transfused by 1 packed RBC / 1 fresh frozen plasma; in half of cases received poly transfusion. General anaesthesia with fast sequence induction was required using: Propofol (92 / 61%) and Ketamine (41 / 27%). For the maintenance, Fentanyl was the only morphinic available and Ketamine or Propofol (113 / 75%) were used according to the hemodynamic state of patients. Regional anaesthesia was performed for 13 including three cases of peripheral nerve blocks under ultrasounds. We use multimodal analgesia for all patient with morphine in 44 cases.

The surgical procedures performed for the patients who benefited from DCS is presented in Table II. Laparotomies included repairs such as resection, anastomosis, or

Table I Diagnostic tests, emergency rescue care and damage control resuscitation.

Types of diagnosis and non-surgical therapy		Number of interventions performed for the 150 patients	
Diagnostic tests	FAST Ultrasound	1 254	53
	Standard X-ray		364
	Laboratory tests		837
Emergency and critical care	Central venous access	692	52
	Oxygen therapy		75
	Tracheal intubation		40
	Mechanical ventilation		40
	Fluid replacement		79
	Transfusion		150
	Administration of vasopressors		23
	Administration of tranexamic acid		150
	Narcotics		44
	Morphin		44

Table II damage control surgery procedures performed .

Types of surgery	Number performed
Orthopaedic stabilization	75
Hemostasis laparotomy	20
Open reduction internal fixation of fractures	17
Rescue amputation	11
Fasciotomy	10
Suturing	9
Thoracic drainage	8
Vascular ligation	7
Hepatic packing	2



Figure 3 : team performing X-rays and FAST ultrasound

excision and suture for perforated small bowel and or small bowel stoma, and stomy for perforated large bowel. Hepatic packing was done for ruptured liver. In addition to the surgical procedures described, numerous extractions of foreign bodies, suturing, local care, and orthopaedic stabilizations were done.

All patients with open or untreated trauma, were systematically treated with antibiotics, analgesia, anti-inflammatory drugs, thromboembolism prophylaxis, tetanus toxoid and gastric protection. The electrolytic balance was assured with an early resumption of feeding in the absence of contraindication. Following their care, 136 (90.7%) patients were stabilized. Nine

(6.3%) patients had worsened. A total of 100 patients (67%) received medical evacuation (Medevac) after stabilization in accordance with UN standards. Four deaths occurred after admission to the hospital (5 / 3%) due sometimes to life-threatening early critical lesions (figure 4) associate to hemorrhagic shock, acute post trauma coagulopathy irreversibly leading to multi-organ failure.

Discussion

Implementation of DC protocols within HN2

The management of seriously traumatized patients, including war-wounded in isolated situations is complex. It is based on

three pillars: equipment (technical platform, etc.), personnel (staffing, training), and use of standardized protocols. Respect for these principles at HN2 enabled the simultaneous care of 29 victims, including 5 'alpha' and 10 'bravo', after attack of Kidal camp in 2016.¹⁸ Following this attack, three hemostasis laparotomies, two exploration thoracotomy, one rescue amputation, two limb vascular ligations, and numerous debridements with orthopaedic stabilization were performed within a short time. The quality of the triage of the wounded also played a key role in the care of these wounded.¹⁹ The protocols implemented at HN2 throughout the five years covered by the study are DC laparotomy, orthopaedic and DCR. These protocols are an adaptation of internationally recognized protocols to fit with constraints in isolated situations.

Damage control laparotomy

In all cases of laparotomy performed at HN2, the abdominal cavity was not completely closed to prevent abdominal compartment syndrome and allow surgical revision after Medevac. The techniques of damage control laparotomy with incomplete closure of the abdominal cavity have evolved since primary skin closure with suture or installation of clips, followed by improvised vacuum plastic silos such as the pockets of Bogota, up to the modified vacuum packs of Barker.²⁰ If the onset of abdominal compartment syndrome seems to be under control, the major challenge remains the management of fascial retractions and intra-abdominal overpressure with loss of substance of the abdominal wall and wide abdominal hernia. When



Figure 4 : ballistic cranio cerebral wound



Figure 5 : Polycrissage in a child

comparing these different techniques, the results are variable and debated.²¹ The extension of DC laparotomy to non-traumatic surgical abdominal emergencies should also be beneficial in limited medical resources.²²

Orthopaedic Damage Control

The achievement of local haemostasis had been achieved through the use of tourniquets and haemostatic dressings. Amputations were decided upon with respect to the indications for amputations in emergency.²³ As part of the activity of HN2, orthopaedic DC relies on the combination of debridement-dressing and temporary bone stabilization to avoid serious infectious complications that could compromise subsequent attempts at reconstruction.²⁴ The current literature suggests no significant difference in the risk of compartment syndrome between orthopaedic and early reconstructive surgery. However, improved outcomes have been associated with orthopaedic damage control by the implementation of the DCR.²⁵

Damage control resuscitation

In terms of diagnosis and treatment, there are current standards of care for damage control for the wounded.^{6,26} The treatment includes early introduction of blood products with aggressive transfusion according to protocol plasma / platelet / RBC ratio: 1/1/1;⁸ early use of tranexamic acid; use of vasopressors and compliance with contraindications to the use of coagulation factors.²⁷ Similarly, measurement of lactate, pH and base deficit, and the assay of coagulation factors is needed during patient monitoring. In all cases, management optimization includes 3 components: DC ground zero, DC resuscitation and DC surgery.

Transposition of DC implementation from HN2 to other medical facilities in Sub-Saharan Africa

Sub-Saharan Africa remains an area where medical facilities are limited, often with a lack of equipment and trained personal continuously. The example of HN2 shows, however, quality care for severe wounded is possible.

Necessary requirements:

- The presence of medical equipment: advanced technologies used in developed countries⁸ still seem not very accessible in these regions. However, HN2 activity report shows that simple, effective, safe and less expensive solutions can be used in a limited resourced environment.^{19,24,28} This equipment should form the basis for staffing of medical facilities in this region.
- Respect standardized care protocols (DCR, DCS, etc.). Quality care of the wounded requires compliance with standardized protocols. However, constraints inherent to the sub-Saharan zone require an adaptation of these protocols to the realities on the ground.
- The presence of trained personnel. The training of medical, nurses and paramedics in damage control strategy is essential to deal with emergencies.²⁹ This training should include knowledge of protocols and use of equipment.

At a time when this mission is coming to the end³⁰, it seemed useful to share this feedback to strengthen the hospital organization in collective emergency situations in our regions. Promote more civilian-military health collaboration both in rural and teaching hospitals should help overcoming new and emerging public health challenges in our regions and more generally barriers to the culture of research and innovation in Africa³¹

Conclusion

Providing care when you have bombings in your hospital is a challenge, you need to run to underground or bunker for safety and come-back. That can be more difficult in regions where there is few or no traumas centers. The HN2 hospital and staff, infrastructure, civilian and military population are subject to attacks and different types of threats. The activity report of HN2 shows that it is possible to meet this challenge, but many actions need to be undertaken such as the implementation of protocols of emergency care (damage control, etc.) adapted to the specific constraints of these regions, improvement of medical facilities and regular training of medical and nurses. For these actions to be efficient, they could be part of regional development programs with the support of national and international partners.

List of abbreviations

- Amet: aero-medical evacuation team
 DC: damage control
 DCS: damage control surgery
 DCR: damage control resuscitation
 FAST: Extended-focused abdominal sonography for trauma
 GA: General anesthesia
 HN2: Togo level 2 hospital
 IED: improvised explosive devices
 Medevac: medical evacuation
 RBC: red blood cells
 UN: United Nation

Declarations

Ethical Approval and Consent to participate: All procedures performed in our study were in accordance with the ethical standards of the institutional and national standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments. For our type of study (retrospective study), formal consent was not required.

Authors' contributions

HDS perform manuscript conception and draft critically revised the manuscript. HDS, EP, SA, DL, YC contribute to important scientific knowledge giving the final approval.

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Intérêt de la composante ravitaillement médical dans la résilience du service de santé des armées français

The value of the medical supply component in the resilience of the French Military Health Service

P. Favaro¹, B. Conte². FRANCE

Résumé

La mission du service de santé des armées (SSA) français est d'apporter en tout temps, en tous lieux et en toutes circonstances aux militaires exposés à un risque lié à l'engagement opérationnel, un soutien santé qui leur garantit la prévention la plus efficace et la meilleure qualité de prise en charge en cas de blessure ou de maladie. Pour assurer cette mission, la composante « ravitaillement médical » est chargée de mettre à disposition les produits de santé nécessaires et adaptés. Elle a été particulièrement sollicitée lors de la crise COVID 19 et le modèle existant a montré sa capacité de résilience propre, et par la même, a assuré celle du SSA dans son ensemble. Ainsi, la disponibilité d'une chaîne intégrée sur l'ensemble des missions de la supply chain, indépendante, réactive et agile a été un facteur-clé de réussite de la gestion de cette crise.

Mots-clés : santé, logistique, COVID 19, service de santé des armées, résilience

Summary

The mission of the French Military Health Service (SSA) is to provide health support at all times, in all places and under all circumstances to military personnel exposed to a risk related to their operational commitment, in order to guarantee the most effective prevention and the best quality of care in the event of injury or illness. To ensure this mission, the "medical supply" component is responsible for providing the necessary and adapted health products. It was particularly solicited during the COVID 19 crisis and the existing model showed its own resilience, and by the same token, assured the SSA as a whole. Thus, the availability of an integrated, independent, responsive and agile supply chain was a key factor in the successful management of this crisis.

Keywords: health, logistics, COVID 19, military health service, resilience

La mission du service de santé des armées (SSA) français est d'apporter en tout temps, en tous lieux et en toutes circonstances aux militaires exposés à un risque lié à l'engagement opérationnel, un soutien santé qui leur garantit la prévention la plus efficace et la meilleure qualité de prise en charge en cas de blessure ou de maladie. Pour ce faire, le SSA dispose d'une capacité de très haute technicité, autonome et cohérente qui repose sur cinq composantes intégrées et interactives que sont la médecine des forces, la médecine hospitalière, la formation, la recherche et le ravitaillement médical. La performance opérationnelle qui en résulte,

reconnue comme l'une des meilleures du monde sur les théâtres d'opérations où l'armée française est engagée, permet de déployer une chaîne de soins complète depuis le théâtre des opérations. Cette performance doit également s'envisager dans des situations inédites, comme l'a montré l'exemple récent de la pandémie COVID-19. Cela peut être résumé par le terme résilience qui traduit la capacité du SSA à s'adapter et à durer quel que soit l'environnement. La situation exceptionnelle de l'année 2020, qui a perduré jusqu'en début 2022, a montré l'importance d'une capacité médicale militaire intégrée et notamment l'importance de l'appui de sa chaîne de ravitaillement médical qui sera exposée ci-après. Ainsi, au sein du SSA, la composante « ravitaillement médical » (RAVMED) a une vocation transverse de soutien aux autres composantes en étant chargée de mettre à leur disposition les produits de santé nécessaires et adaptés

pour assurer le soutien santé des forces armées, quel que soit l'endroit du monde et quelles que soient les conditions où elles sont déployées.

Missions de la composante « ravitaillement médical »

La composante RAVMED est à l'appui des quatre autres composantes du SSA (médecine des forces, hôpital, formation, recherche) pour garantir le déploiement d'une chaîne santé opérationnelle complète et autonome. Elle permet en outre d'assurer au quotidien que tous les professionnels de santé du ministère des armées disposent, quel que soit le lieu, de tous les moyens nécessaires pour assurer le soutien médical des forces armées : « Fournir les bons produits, au bon endroit, au bon destinataire, au bon moment, pour un coût optimal ». Cet approvisionnement en produits de santé inclut principalement de fa-

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çon large les médicaments, les produits sanguins labiles, les gaz médicaux, les matériels biomédicaux et les dispositifs médicaux.

Pour mener à bien cette mission, l'activité du RAVMED se structure autour de cinq domaines qui constituent son cœur de métier :

- l'achat et l'approvisionnement des produits de santé ;
- la fabrication de produits de santé spécifiques orientée vers la résolution de problématiques opérationnelles comme le développement de médicaments (contremesures médicales de lutte NRBC¹, traitements antalgiques de l'avant), de produits sanguins labiles (plasma lyophilisé, kits de transfusion en situation d'exception), de dispositifs de correction visuelle (pour la vision sous masque de protection respiratoire ou sous forme d'inserts pour les lunettes de protection balistique) ;
- la gestion logistique santé : gérer, stocker, distribuer et expédier ;
- la fourniture d'unités médicales opérationnelles (UMO) qui sont des ensembles standardisés prêts à l'emploi (trousses individuelles du combattant, postes médicaux, lots pour évacuation médicale, antennes chirurgicales, groupes médico-chirurgicaux...);
- le maintien en condition opérationnelle (MCO) : maintenance des matériels biomédicaux de niveaux NTI 2 et 3² corrélée à une formation internalisée des techniciens de maintenance santé.

Organisation

Armée par un peu plus de 1000 personnes, la chaîne de ravitaillement médical se compose d'une direction s'appuyant sur 6 établissements spécialisés dans un ou plusieurs domaines cités précédemment :

- La direction des approvisionnements en produits de santé des armées (DAPSA) : elle est en charge du pilotage de la composante. Centrée sur une division du ravitaillement sanitaire opérationnel qui assure la

¹ Nucléaire, radiologique, biologique et chimique

² Niveaux techniques d'intervention 2 et 3 : dans le domaine de la maintenance, le 1er niveau correspond aux interventions simples, qui peuvent être effectuées par l'opérateur qui exploite l'équipement. A l'inverse, les 2^{ème} et 3^{ème} niveaux nécessitent des techniciens spécialisés disposant d'un outillage adapté. Le niveau 3, le plus complexe, est généralement réservé au constructeur ou à une société qu'il a agréée.



Figure 1 : Zone de stockage d'UMO au sein de l'établissement de ravitaillement sanitaire des armées de Marolles

conduite opérationnelle du ravitaillement ainsi que la gestion centralisée des stocks et des commandes, elle s'appuie sur des entités (divisions, bureaux) en charge du soutien spécifique métier (finances, ressources humaines, infrastructure), de la planification, du contrôle et du pilotage.

- La pharmacie centrale des armées (PCA) : établissement pharmaceutique fabricant, importateur, titulaire et exploitant d'autorisations de mise sur le marché (AMM), ses missions principales consistent à développer et fabriquer des médicaments spécifiques aux besoins des armées, principalement dans deux domaines :

- des contre-mesures médicales des risques NRBC ;
- des formes galéniques adaptées à la médecine d'urgence en environnement hostile ou extrême.
- Deux établissements de ravitaillement sanitaire des armées (ERSA) : implantés à Marseille (Bouches du Rhône) et à Marolles (Marne), ce sont des établissements pharmaceutiques de distribution en gros de médicaments. Leurs missions consistent en la réception et le stockage des articles santé, le conditionnement et reconditionnement de médicaments et de dispositifs médicaux pour s'adapter aux conditions d'utilisation spécifiques opérationnelles, la conception, la constitution et l'entretien des unités médicales opérationnelles et le traitement des commandes des bénéficiaires de la composante (centres médicaux des armées,

hôpitaux d'instruction des armées, entités du SSA outre-mer et opérations extérieures).

- L'établissement central des matériels du service de santé des armées (ECMSSA) : pôle d'expertise du matériel santé, il a pour missions la maintenance des matériels biomédicaux, la constitution d'unités médicales opérationnelles, la délivrance des dispositifs de correction visuelle aux militaires et la formation des sous-officiers techniciens des matériels santé. L'ECMSSA dispose d'une activité d'ingénierie santé qui lui permet d'assurer une veille technologique, un volet d'innovation ainsi que la réalisation de prototypes.
- La plateforme achats finances santé (PFAF-S) : elle constitue la centrale d'achat du SSA et a pour missions principales de satisfaire les besoins en biens et services « cœur de métier » des établissements du SSA par la mise en place de procédures d'achats dans le respect de la réglementation de la commande publique, d'assurer l'exécution contractuelle de ces marchés et l'exécution financière des dépenses et des recettes non fiscales³.
- Le centre de transfusion sanguine des armées (CTSA) : établissement de trans-

³ Recettes non fiscales : elles sont définies par défaut, par opposition aux recettes fiscales qui proviennent des impôts et taxes. Ce sont par exemple les remboursements par les mutuelles ou les particuliers pour des soins prodigués dans les hôpitaux militaires.



Figure 2 : Capacité MEDEVAC Morphée pour Airbus A330

fusion sanguine, il dispose également d'une unité de médicaments de thérapie innovante (avec le statut d'établissement pharmaceutique). Ses missions consistent dans le soutien transfusionnel des missions extérieures et des ensembles hospitaliers militaires, la mise en œuvre d'une thérapie cellulaire et tissulaire appliquée aux armées, l'enseignement, l'expertise et le conseil pour les spécificités transfusionnelles militaires. Il dispose en outre d'une capacité de recherche et d'innovation.

Intérêt de disposer de cinq composantes intégrées pour le SSA sur le volet ravitaillement

Disposer d'une composante hospitalière et d'une composante de la médecine des forces permet d'avoir l'ensemble des prescripteurs qui utilisent les mêmes produits de santé en temps de paix comme en période de crise ou de guerre, que ce soit sur le territoire métropolitain, en outre-mer, à l'étranger ou sur les théâtres d'opérations extérieures (OPEX). Pour l'approvisionnement, cela permet d'avoir une cohérence sur l'arsenal de matériels et de médicaments, qui reste actualisé en permanence grâce à l'activité quotidienne du temps de paix et les retours d'expérience des soignants participant aux OPEX.

La composante de la formation assure au SSA un très bon niveau de compétences de ses personnels de santé en partant de la formation initiale académique et diplômante qui sera complétée, tout au long de la carrière, par une formation continue et adaptée aux contraintes spécifiques de l'exercice d'une médecine d'armée. Il est particulièrement important de souligner les formations opérationnelle et milieu. La formation opérationnelle prépare notamment à la prise en charge optimisée des blessés de guerre à l'extrême-avant jusqu'à leur rapatriement en métropole, en intégrant les évacuations médicales tactiques et stratégiques. Les formations milieu quant à elles, préparent les soignants aux différents milieux d'exercice particuliers, comme l'environnement aéronautique, subaquatique, haute montagne, etc. Sur le plan du ravitaillement médical, ces formations, grâce à la standardisation des pratiques, contribuent à la cohérence de l'arsenal des produits approvisionnés dans le continuum « apprentissage en formation » et utilisation dans la pratique professionnelle qui va en découler en temps de paix, de crise ou de guerre.

La composante recherche, en outre relevant de la même direction que la formation, permet d'apporter les évolutions techniques et des axes de progrès dans les

milieux d'exercice de la médecine d'armée et les conditions d'emploi particulières des militaires.

L'association de ces cinq composantes sous une direction unique, la direction centrale du service de santé des armées, présente donc un intérêt majeur pour la cohérence de fonctionnement dans le SSA et notamment sur le plan de la logistique santé car elle garantit un cycle de vie des produits, fluide. Cela part de l'achat des produits et leur choix en lien avec les prescripteurs qui sont aussi les utilisateurs (utilisation quotidienne dans tous les milieux : métropole, outre-mer, OPEX). Parallèlement, le domaine de conception des UMO se fait avec les mêmes prescripteurs, ce qui préserve ainsi la cohérence avec les produits de santé qu'ils utilisent au quotidien. Enfin, la détention de stocks, qui garantissent autonomie dans la durée et résilience, ne constitue plus une charge économique péjorative car ces stocks sont vivants au sens qu'ils se renouvellent en permanence grâce aux consommations quotidiennes des différents bénéficiaires.

Intérêt de disposer d'une chaîne intégrée de ravitaillement médical

Ayant pour finalité le ravitaillement médical des UMO déployées en opérations, l'intérêt de disposer d'une chaîne logistique

santé intégrée dès le temps de paix se démontre au quotidien et de surcroît en temps de crise. Ainsi, la crise sanitaire COVID 19 a conforté cette capacité que le SSA a choisi de conserver au regard de ses différentes transformations. Elle a su se révéler particulièrement précieuse dans les domaines suivants.

1/La gestion logistique : gérer, stocker, distribuer et expédier plus particulièrement avec son volet stocks

Dans le cadre normal de son activité, la DAPSA constitue des stocks pour répondre aux différentes hypothèses d'engagement des forces (aspects qualitatifs et quantitatifs, évalués à la fois sur le volume des forces à soutenir, sur le délai de mise à disposition et sur la durée d'autonomie souhaitée). Les stocks dès le temps de paix sont donc dimensionnés au-delà d'une utilisation courante au quotidien et permettent ainsi de faire face, comme dans la crise sanitaire COVID 19, à une mobilisation importante de moyens détenus en réserve. Par ailleurs, le SSA a toujours établi une politique de stocks de précaution et de stocks stratégiques permettant une autonomie de fonctionnement lors de survenue de crises, quelle qu'en soit sa nature (sanitaire, technologique, climatique...). Ainsi, un des enseignements qui ont pu être tirés de cette crise, concerne l'intérêt de disposer de stocks stratégiques. En effet, cette dernière

a démontré l'importance de détenir des ressources au sein des établissements du SSA, disponibles immédiatement et permettant de couvrir la crise dans la durée. La pandémie a mis en exergue la difficulté à mobiliser des ressources qui sont convoitées de façon simultanée par de nombreux acteurs y compris à l'étranger, de surcroît, quand elles se trouvent majoritairement en provenance de Chine. Les efforts pour s'approvisionner en équipements de protection individuelle santé (masques, charlottes, blouses, gants...) qui ont manqué dès le début de la crise, démontrent tout l'intérêt de les posséder en amont. Cela implique nécessairement des efforts budgétaires, mais qui seuls permettent de répondre à ces défis. L'intérêt économique de disposer des composantes soignantes (HIA, CMA) au sein du SSA atténue néanmoins cette mobilisation financière par une consommation régulière de ces articles stockés qui peuvent être ainsi renouvelés avant la fin de leur validité.

2/La capacité d'achat propre au SSA

La détention de capacités d'achat propres au SSA est essentielle sur le plan de l'autonomie stratégique. N'étant pas en mesure d'être en totale autonomie sur ses matières premières ou en terme de production, le SSA doit maîtriser sa dépendance aux fournisseurs. En effet, la majeure partie de l'approvisionnement se fait sur le marché civil

classique des laboratoires pharmaceutiques et des fournisseurs de matériel médical dans le cadre de marchés publics mettant en concurrence les différents soumissionnaires. Pour maîtriser ses approvisionnements, le SSA ne peut donc déléguer à d'autres prestataires la capacité d'achats dans le cadre de contrats répondant à la réglementation européenne sur la commande publique, sans risquer la perte de cette maîtrise. Par ailleurs, la connaissance simultanée des besoins spécifiques aux soins sur les théâtres d'opérations et des capacités du marché n'existe qu'au sein du SSA.

Ainsi, si l'approvisionnement des structures de métropole (hôpitaux militaires, centres médicaux des armées...) pourrait être décentralisé par exemple auprès de centrales d'achat civiles, une approche globale du ravitaillement médical permet de bénéficier d'un effet de massification favorable au SSA du point de vue économique et de garder la cohérence des matériels et articles utilisés dans le continuum paix-crise-guerre ou comme le définit nouvellement le chef d'état-major des armées : compétition, confrontation, affrontement.

La crise sanitaire COVID-19 a par ailleurs démontré là aussi l'intérêt de cette capacité autonome d'achat. Pour faire face aux ruptures d'approvisionnement touchant les titulaires de marchés qui étaient en cours sur des articles mis en tension internationale



Figure 3 : Réception d'une livraison par Antonov 124



Figure 4 : Elément militaire de réanimation (EMR) du SSA déployé à Mulhouse (source : MINARM)

(masques FFP2 et chirurgicaux, gel hydro alcoolique, autres équipements de protection individuelle santé...) ainsi que pour doter les structures médicales des équipements nécessaires à la gestion de la crise (acquisition d'automates de biologie moléculaire, tests de dépistage, de principes actifs, matériels d'isolement...), le sourcing de nouveaux fournisseurs a pu être conduit en autonomie sur le marché international et particulièrement chinois, dans un contexte de forte concurrence, en coordination avec les autres acteurs nationaux qu'ils soient militaires (centre de soutien aux opérations et aux acheminements, par exemple, pour le fret aérien depuis la Chine) ou extérieurs au ministère, comme les services des douanes ou les services du

ministère en charge des finances, pour les procédures de dédouanement des produits importés en franchise de droits et taxes et en gérant l'urgence. Enfin, l'autonomie du SSA dans ce domaine a garanti l'agilité de contractualisation rapide et notamment a été prépondérante pour assurer la passation de marchés en urgence impérieuse quand la nécessité l'imposait.

En complément de cette capacité d'achat, la PFAF-S a pu assumer le traitement des commandes urgentes et extrêmes urgentes des établissements du SSA qui ont explosé (exemple : +227% entre février et mars 2020 avec une durée moyenne de traitement de 2 heures le jour même pour les extrêmes urgences), tout en garantissant aux fournisseurs une fluidité de paiement

(en versant notamment des avances financières supérieures à 60% en application d'une ordonnance de mars 2020 relative aux règles applicables aux contrats de la commande publique pendant la crise sanitaire).

3/ Le volet production

La capacité de produire en régie dans certains domaines est prépondérante notamment sur le volet de la production de spécialités adaptées aux exigences et contraintes à l'exercice des forces armées, comme les contre-mesures médicales du domaine NRBC. Elle a également démontré son intérêt lors de la crise, avec par exemple, la mise en route à la pharmacie centrale des armées d'une chaîne de production de solution hydro-alcoolique pour pallier la pénurie survenue sur le marché civil.

Sur le volet biomédical, la production par technique additive en impression 3D a permis également la mise à disposition de pièces développées spécifiquement pour permettre aux respirateurs d'anesthésie de fonctionner à partir de concentrateurs mobiles d'oxygène.

4/ La fourniture d'UMO

Le SSA déploie de manière régulière des UMO, ensembles standardisés qualitativement et quantitativement, qui vont de la simple trousse individuelle du combattant jusqu'aux structures hospitalières et chirurgicales pour prendre en charge les blessés de guerre. A partir de ce savoir-faire, et à la demande du Président de la République Française, le SSA a créé et déployé en 5



Figure 5 : Capacité de réanimation au sein de l'EMR SSA (source : SIRPA Terre)

jours en mars 2020, un Élément Militaire de Réanimation du SSA (EMR-SSA), structure médicale inédite sous tente dédiée à la prise en charge de patients COVID-19 et dont la capacité a été fixée à 30 lits de réanimation. Cette structure a été adossée à l'hôpital civil de Mulhouse pour prendre en charge, secondairement, des patients COVID-19 intubés et ventilés, favorisant ainsi le désengorgement des lits de réanimation de l'hôpital civil.

L'EMR-SSA a été préparé et qualifié au sein de la chaîne de ravitaillement médical du SSA en y associant des personnels soignants et avec l'appui du régiment médical de la Valbonne pour la partie soutien logistique (transport, sécurité...).

Durant cette première vague COVID-19 au premier semestre 2020, d'autres hôpitaux civils ont aussi dû faire face à l'engorgement de leurs services de réanimation. Des moyens d'évacuation médicale (MEDEVAC) par moyens militaires ont donc aussi été mobilisés pour diriger les patients vers des structures hospitalières dans des territoires moins touchés.

Le module de réanimation pour patient à haute élévation d'évacuation (MoRPHEE), qui permet d'évacuer des blessés lourds sur de longues distances en avion de transport, opérationnel depuis 2006, n'avait jusqu'alors été utilisé que pour des évacuations de théâtres d'opérations (Kosovo, Afghanistan...) mais jamais sur le territoire national. Le déclenchement de la capacité MEDEVAC MoRPHEE a été décidée afin de participer au transfert de patients depuis les hôpitaux métropolitains les plus saturés vers des structures encore libres entre différentes régions françaises, en l'adaptant au risque infectieux de circonstance.

Ce module MoRPHEE mis en œuvre sur Boeing C135 a été adapté de façon très rapide pour être compatible avec l'avion MRTT Phenix (Airbus A330) acquis plus récemment par l'armée de l'air permettant de réaliser plusieurs missions d'évacuations depuis les hôpitaux de Mulhouse et Colmar.

Sur le même modèle que MoRPHEE, la marine nationale a mis à disposition le porte hélicoptère amphibie Tonnerre pour l'évacuation de patients COVID en réanimation de la Corse au sud, mobilisant là aussi la chaîne du RAVMED.

Ainsi, à l'instar des UMO plus classiques, pour leur élaboration et leur entretien, la composante RAVMED a été fortement mobilisée permettant l'approvisionnement des aéronefs ayant assuré les différentes évacuations médicales de patients COVID,

permettant aussi de rendre les vecteurs disponibles très rapidement pour de nouvelles interventions dès la fin de leur mission, mais aussi la définition de nouvelles entités comme les Capacités de réanimation projetables (CaRP) à 2 lits de réanimation et les nouvelles capacités MEDEVAC sur A330 Phénix et A400M (MEROPE).

Enfin, en déclinaison plus réduite de l'EMR-SSA, des modules militaires de réanimation (MMR) ont été déployés sur des territoires ultramarins afin de renforcer ces territoires en lits de réanimation ponctuellement (Mayotte, Guadeloupe, Martinique, Nouvelle Calédonie).

5/ Le MCO

Le cinquième volet missionnel de la composante RAVMED offre la garantie aux équipes médicales du SSA de disposer de matériels biomédicaux fonctionnels pour couvrir leurs missions. Ce volet a lui aussi été prépondérant dans la réponse à la lutte contre la COVID 19. Ainsi, les techniciens assurant le MCO ont été fortement mobilisés pour, dans un premier temps, assurer la vérification et la remise en fonctionnement des matériels qui ont armé l'EMR-SSA de Mulhouse. Tous les matériels biomédicaux ont été vérifiés avant déploiement en moins de 5 jours, soit plusieurs centaines, et de façon emblématique, il peut être mentionné les 2 concentrateurs d'oxygène grande capacité en conteneur intégré, normalement dédiés aux OPEX, qui ont été mis en œuvre à Mulhouse pour alimenter en oxygène de manière autonome la structure déployée, produit indispensable et de premier recours dans la prise en charge des patients COVID.

Conclusion

La composante ravitaillement médical a été particulièrement sollicitée lors de la crise

COVID 19 et le modèle existant a montré sa capacité de résilience propre, et par la même, a assuré celle du service de santé des armées français dans son ensemble. Le SSA a ainsi pu aborder la crise avec des stocks stratégiques de produits de santé permettant de répondre aux sollicitations immédiates puis de tenir dans la durée alors que sa centrale d'achat activait des processus de sourcing pour des achats en urgence et la recherche d'alternatives pour les produits en pénurie dans un contexte de concurrence internationale débridée. Parallèlement, pour pallier les ruptures d'approvisionnement, des chaînes de production de la PCA étaient réorientées pour produire en urgence de la solution hydroalcoolique. L'activité de constitution d'UMO a été particulièrement sollicitée pour la conception des nouvelles capacités médicales dans de très courts délais : EMR-SSA, MMR, capacité MEROPE, lots CaRP pour les OPEX, et par la constitution de nouveaux lots MoRPHEE. La maintenance préventive et corrective des équipements biomédicaux a également été un élément essentiel pour garantir le fonctionnement des matériels armant ces UMO.

Ainsi, la disponibilité d'une chaîne intégrée de ravitaillement médical, sur l'ensemble des missions de la supply chain, a été un facteur-clé de réussite de la gestion de la crise COVID-19.

De manière plus générale, disposer d'une chaîne de ravitaillement indépendante, réactive et agile reste ainsi une garantie pour la performance de la chaîne santé opérationnelle, permettant de conserver sa raison d'être, le soutien médical opérationnel efficace des forces armées quels que soient leurs engagements, la rapidité de leurs actions et la tenue de l'effort dans la durée.

PHARMACIEN GÉNÉRAL INSPECTEUR (Maj Gal) Pascal FAVARO



Le Pharmacien général inspecteur (Maj Gal) Pascal FAVARO a intégré le service de santé des armées en 1986. Il est certifié en techniques d'organisation de la logistique santé. Sa carrière est marquée par des affectations dans trois domaines que sont la pharmacie hospitalière, l'administration centrale et principalement le ravitaillement médical où il a occupé différents postes, des entrepôts de stockage et de distribution jusqu'à la direction centrale où il a tenu le poste de chef du bureau politique des approvisionnements et des équipements, avec également des projections en unités de distribution en opérations extérieures.

Depuis 2018, le PGI FAVARO dirige la composante du ravitaillement médical composée d'une direction et six établissements spécialisés dans la logistique santé.



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Preliminary results and future directions of gathered pre-deployment training for Level 2 medical facility of peacekeeping operations in a training base

Résultats préliminaires et orientations futures de la formation pré-déploiement regroupée pour la formation médicale de niveau 2 des opérations de maintien de la paix dans une base d'entraînement

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Abstract

Objectives: To establish a gathered pre-deployment training procedure in a training base for Level 2 medical treatment facilities (MTFs) of the United Nations (UN) peacekeeping operations (PKO) and to observe the effectiveness of the established training procedure.

Methods: The training contents were established first on the basis of the requirements of the UN and the epidemiology of injury and illness in the field mission of PKO by referring to the literature. Then, two-round Delphi consultation was used to validate the constructed training procedure. The established training procedure was conducted in four MTFs in 2022, and the effectiveness of the training procedure was observed by assessment of battlefield first aid skills and two simulated scenarios, i.e., simulated reception of outpatients and simulated damage control surgery in animals. After the assessment, the trainees were asked to rate their agreement to a series of survey items on a 7-point Likert scale, and a free discussion between the trainees and the trainers was convened after the test.

Results: A gathered pre-deployment training procedure in a training base for Level 2 MTFs of the UN PKO was successfully established, which consisted of 3 modules and 18 items. During the consultation, the experts rated a mean score of 7 in 10 listed items and a mean score of 6 in 7 listed items. After the training, all trainees passed the assessment, and the ratio of excellence was 45.8%. The average scores in the simulated reception of outpatients of the MTFs were 79.3 ± 2.56 , 83.3 ± 3.58 , 77.8 ± 3.58 , and 81.3 ± 3.16 , respectively, and the average scores in the simulated damage control surgery were 79.3 ± 2.56 , 83.3 ± 3.58 , 77.8 ± 3.58 , and 81.3 ± 3.16 , respectively. In addition, there was no statistical difference among the four MTFs. Post-testing survey revealed that the trainees agreed with most of the surveyed items, except for the item: "The total training time and the time for each training content are reasonable." They believed that some of the training contents could be learned through self-training before the gathered training.

Conclusion: A training base-based pre-deployment training procedure for Level 2 MTFs was established, and it was found to be effective in improving the ability of the trainees and helping the trainees to fulfill the requirements of the UN. However, the training procedure does have certain aspects that need to be further developed to further improve the training effectiveness.

Keywords: pre-deployment; level 2, peacekeeping, training base

Résumé

Objectif : L'établissement d'une procédure de formation préalable au déploiement de structures de traitement médical (STM) de niveau 2 dans le cadre d'opérations de maintien de la paix des Nations Unies (OMP) et l'évaluation de son efficacité.

Méthodes : Le contenu de la formation a été établi en fonction des exigences de l'ONU ainsi que de la prise en compte des données épidémiologiques issues de la littérature à propos des blessures et des maladies observées dans le cadre des opérations de maintien de la paix. L'utilisation de la méthode DELPHI à deux tours a ensuite été utilisée pour valider la procédure de formation.

Celle-ci a été mise en œuvre dans quatre STM en 2022, et son efficacité a été évaluée sur les compétences observées en matière de premiers secours sur le champ de bataille mais aussi à partir de deux scénarios simulés, l'un portant sur l'accueil de patients ambulatoires et l'autre sur une chirurgie de damage contrôle sur des animaux.

Après évaluation de cette formation, les stagiaires ont été invités à donner leur avis sur une série de questions renseignées grâce à une échelle de Likert en 7 points, et au cours d'une discussion libre entre stagiaires et formateurs organisée après le test.

Résultats : La procédure de formation pré-déploiement effectuée dans une base de formation pour STM de niveau 2 des OMP des Nations unies a été mise en place avec succès ; elle comprenait 3 modules et 18 points. Lors de l'évaluation, les experts ont attribué une note moyenne de 7 à 10 items et une note moyenne de 6 à 7 autres items.

Suite à cette formation pour laquelle tous les stagiaires ont réussi les évaluations, le taux d'excellence était de 45,8 %. Les scores

moyens dans la simulation de l'accueil des patients ambulatoires des STM étaient respectivement de $79,3 \pm 2,56$, $83,3 \pm 3,58$, $77,8 \pm 3,58$ et $81,3 \pm 3,16$, et les scores moyens dans la simulation de la chirurgie de contrôle des dommages étaient respectivement de $79,3 \pm 2,56$, $83,3 \pm 3,58$, $77,8 \pm 3,58$ et $81,3 \pm 3,16$. Par ailleurs, aucune différence statistique n'a été constatée entre les quatre STM.

L'enquête post-test a révélé que les stagiaires portaient un avis positif à la plupart des éléments de l'enquête, à l'exception cependant du point suivant : "La durée totale de la formation et la durée de chaque contenu de formation sont raisonnables". Ils ont exprimé à ce propos le fait que certains des contenus de la formation pouvaient être acquis par auto-apprentissage avant la formation collective.

Conclusion : La procédure de formation pré-déploiement effectuée sur la base de formation pour les STM de niveau 2 s'est avérée efficace pour améliorer les compétences des stagiaires et les aider à répondre aux exigences de l'ONU. Certains aspects cependant méritent d'être développés davantage pour améliorer l'efficacité de la formation.

Mots-clés : pré-déploiement, structures sanitaires de niveau 2, opérations de maintien de la paix, base de formation.

Introduction

The United Nations (UN) peacekeeping operations (PKO) refer to a military operation that, under the authorization of the UN Security Council, utilizes non-force means to help the conflicting parties to maintain peace, restore peace, and finally achieve peace. An essential element of the UN PKO is the provision of healthcare services in support of mission personnel in fields of operations [1]. The medical system in UN field missions comprises a five-level framework, of which Level 2 medical treatment facilities (MTFs) provide surgical and life-saving capabilities and common hospital services. It is where the wounded and ill patients are gathered, stabilized, and treated prior to return to duty or evacuation [1], and it is therefore one of the most important levels for the survival of severely injured patients.

The UN PKO mission mandate requires that missions be self-reliant as far as their medical care is concerned. Therefore, it is expected that all the personnel needed in Level 2 MTFs are well-trained before deployment [2]. The training contents and training standards are provided clearly by the UN [2]. However, the UN is not responsible for the training. Instead, the contributing countries are responsible for their training process and training quality. In China, usually, the hospitals send Level 2 MTFs to

organize the pre-deployment training themselves [3-4]. The training time, training equipment, trainers, training quality, and assessment standard vary among the contributing hospitals, which might result in poor training outcomes, which consequently affects the medical service during missions [3-4]. The present study aims to establish a gathered pre-deployment training procedure in a training base and to observe the effectiveness of the established training procedure. In addition, the future directions are summarized on the basis of the post-assessment questionnaire and trainer-trainee discussion.

Methods

Construction and validation of training procedure

The training contents were established first on the basis of the requirements of the UN [2] and the epidemiology of injury and illness in the field mission of PKO by referring to the literature. An extensive literature review was performed to identify the epidemiology with keywords including "UN," "PKO," "epidemiology," "injury," "illness," and "field of mission." Published studies directly related to the epidemiology of injury and illness during PKO were specifically selected. On the basis of the requirements of the UN and literature review, the training contents were established by discussion within the research group, followed by which the training lists were constructed, and then the training time was allocated to each listed training content after discussion within the research group.

The two-round Delphi method was used to validate the constructed training procedure [5]. A total of 10 military experts were invited to participate in the consultation. They are all active in the field of healthcare service or combat casualty care, and five of them have experience in PKO.

In the first round of consultation, the original training lists were provided to the experts, and they were asked to select the items that need to be deleted or added on the basis of their professional judgment and to comment on each item if they deem it necessary. After the first round of consultation, experts' suggestions and recommendations were collected, based on which the original lists were adjusted and used for the second round of consultation. In the second round of consultation, the same experts in the first round of consultation rated the lists to indicate their agreement on a 7-point Likert scale (1 = fully disagree, 2 = disagree, 3 = mildly disagree, 4 = neutral, 5 = mildly agree, 6 = agree, and 7 = fully agree) [6-7].

The ratings were then collected and analyzed. The mean score was calculated to reveal the experts' agreement on the lists. The score was rounded to the first digit after the decimal point of an expert's score. For example, if the average score is 1.4, the final score will be recorded as 1, indicating full disagreement. If the score is 4.6, the final score will be recorded as 5, indicating mild agreement. In addition, the coefficient of variation (CV) was calculated to evaluate the consistency among the experts. The smaller the CV value, the higher the degree that the experts agreed with each other. A CV value less than 25% was considered to be significant [6-7]. The CV values of the score on each listed item were calculated as previously reported [8].

Pre-deployment training

On May and August 2022, two Level 2 MTFs ($n = 30$, $n = 28$, $n = 31$, and $n = 42$) that would be assigned to fields of PKO missions soon were trained in a training base with the established training procedure. The training lasted for 3 weeks. During the training process, experts were invited to teach, and those with experience in PKO

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were specifically selected. Because of the COVID-19 pandemic, some of the lectures were presented through real-time online distance learning. All the trainers were required to deliver the lecture in English.

Assessment

After the training, the four trained MTFs were assessed. All trainees accepted the test for battlefield first aid (BFA) skills. The test standard for BFA refers to that used by the UN [9]. The doctors in the MTFs accepted the assessment of a simulated reception of outpatients. Simulated patients with cough, fever, broken legs, or headache were randomly assigned to a doctor, and the doctor was asked to provide a proper reception, examination, and correct diagnosis. Effective communication, proper examination, correct diagnosis, and correct treatment were given 25 points each with a total score of 100. The surgical teams in the MTFs accepted the assessment of damage control surgery and resuscitation (DCS and DCR) with a previously established method and test standard [8]. Briefly, explosion and thoracoabdominal injuries in live porcine were produced by a real explosion, and the surgical team was tasked to perform DCS and DCR. Then, the team's score was based on the previously established standard [8]. In each test part, a total score greater than 60 was considered to be satisfactory, and a score greater than 90 was considered to be excellent.

Post-assessment questionnaire and discussion

After the training and testing, all the trainees rated agreement to a series of survey items on a 7-point Likert scale as mentioned earlier. The questions are presented in Table 1. Four doctors, four nurses, and two administrative officers were randomly selected for the questionnaire survey. In addition, a free discussion between the trainees and the trainers was convened af-

ter the test. Any suggestions, criticisms, and proposals related to the training and test procedure were encouraged and then were all collected, analyzed, and used for future improvement. The trainees who participated in the discussion were the same as those who participated in the post-assessment survey.

Statistical analysis

All data are expressed as the mean \pm standard deviations, and statistical analysis was performed using SPSS Statistics software, version 17.0 (SPSS Inc., Chicago, IL, USA). The Kolmogorov–Smirnov test was used to determine the normality of the data distribution. Multigroup comparison tests were conducted using a one-way analysis of variance. The confidence interval was set at 95%. A value of $p < 0.05$ was considered statistically significant.

Results

Construction and validation of training procedure

As prescribed by the *Medical Support Manual for United Nations Field Missions*, Level 2 MTFs are required to master the following knowledge or skills [1-2]. (1) For all members: regulations and policies of PKO, which include field mission organization, UN headquarters medical organizational structure, healthcare policies and procedures, medical survey, medical records and reporting, and security issues. (2) For all members: first aid skills. (3) For medical professionals: advanced life support, advanced trauma life support, evacuation of injured and ill patients, and DCS and DCR. (4) Post-related skills for medical professionals: intensive care–resuscitation, in-patient services, basic imaging services, and laboratory, pharmaceutical, preventive medicine, and dental services. The post-related medical skills are supposed to be mastered in daily medical service in the

hospital. Thus, only the first three categories were included in the training lists.

The *Medical Support Manual for United Nations Field Missions* was released in 2015, and the epidemiology of diseases or trauma in the fields of PKO missions might change much. Thus, an extensive literature review was conducted. It was found that the needs for training were expanded in the following areas: (1) preventive medicine and disease contagion prevention, especially after the outbreak and worldwide spread of COVID-19 in recent years [10-11]; (2) enhanced need of the DCS for explosion injuries [12-14]; and (3) interventions designed to reduce psychological morbidity [10, 11, 15, 16]. It was found that peacekeepers had a significantly higher 12-month prevalence of psychological morbidities such as post-traumatic stress disorder, major depressive episode, and anxiety disorder when compared with their civilian counterparts [17]. In addition, the propensity to psychological morbidity during missions increased significantly in recent years, especially during the COVID-19 pandemic [10-11].

By combining the requirements of the UN and the results of the literature review, the original training contents and lists were constructed, and the training time for each training content is presented in Table 2. In the first round of consultation, the experts did not delete any item from the lists. However, two experts suggested adding “introduction of the assigned mission,” four experts suggested adding “verification of the equipment” and “management of mass casualty,” and three experts suggested adding “comprehensive rehearsal” to the training lists. No suggestion was proposed for the teaching time. One expert suggested that the training contents should be divided into several modules, with each module containing related training contents.

We accepted all the suggestions and re-constructed the training lists (Table 3), which were then used for the second round of consultation. There were three modules in the revised training lists, i.e., basic knowledge and background of PKO, medical skills, and comprehensive rehearsal (Table 3).

In the second round of consultation, the experts provided a mean score of 7 in 10 listed items, accounting for 55.6% of all surveyed items (Table 3); the experts provided a mean score of 6 in 7 listed items, accounting for 38.9% of all surveyed items (Table 3). These indicated that the experts were in full agreement or agreed with the listed

Table 1 Questions on the post-training survey

No.	Questions
1	The training contents and lists are reasonable.
2	The total training time and the time for each training content are reasonable.
3	The training methods and the apparatus selected for training are appropriate.
4	The trainers selected are qualified for the training.
5	I think the gathered training is better than self-training and that it can improve the comprehensive ability of Level 2 medical treatment facilities greatly.
6	I feel confident and competent in accomplishing the coming mission after the training.

Table 2 Original training list

Training list	Assigned time (h)
Organization of field mission and UN headquarters medical structure	2
Healthcare policies and procedures	2
Medical survey	2
Medical records and reporting	2
Security issues	2
First aid skills	8
Advanced life support, advanced trauma life support	8
Evacuation of injured and ill patients	4
Damage control surgery and resuscitation	8
Preventive medicine and disease contagion prevention	4
Prevention of psychological morbidity	4

Table 3 Revised training lists and rating of the experts

Training list	Assigned time (h)	Rating	CV (%)
Part 1: basic knowledge and background of PKO			
Organization of field mission and UN headquarters medical structure	2	6.5 ± 0.53	8.11
Healthcare policies and procedures	2	6.3 ± 0.68	10.71
Medical survey	2	5.6 ± 0.699	12.49
Medical records and reporting	2	6.7 ± 0.48	7.21
Security issues	2	5.3 ± 0.48	9.11
Verification of the equipment	4	5.8 ± 0.63	10.9
Introduction of the mission and the area of PKO	4	6.7 ± 0.48	7.21
Part 2: medical skills			
First aid skills	8	7 ± 0	0
Advanced life support, advanced trauma life support	8	7 ± 0	0
Evacuation of injured and ill patients	4	6.6 ± 0.52	7.82
Damage control surgery and resuscitation	8	6.2 ± 0.43	6.8
Management of mass casualty	4	6.5 ± 0.53	8.11
Preventive medicine and disease contagion prevention	4	6.8 ± 0.42	6.2
Prevention of psychological morbidity	4	6.2 ± 0.79	12.72
Part 3: comprehensive rehearsal			
Reception of outpatients	4	5.9 ± 0.74	12.51
Scenario-based battlefield first aid	4	7 ± 0	0
Damage control surgery and resuscitation for severely injured patients with simulated animals	8	6.5 ± 0.71	10.88
Evacuation of patients	4	5.8 ± 0.43	7.27

Note. CV, coefficient of variation; PKO, peacekeeping operations.

items. All CV values were lower than 15%, indicating high consistency among experts [7] (Table 3).

Training process

The training was conducted as listed in Table 3. All the teachers were asked to deliver

the lectures in English. However, lectures were delivered in mixed Chinese and English either because the teachers were not proficient in English or because the trainees could not adequately understand the contents delivered in English.

To conduct the training, a simulated Level 2

field hospital similar to the hospital in the field area of PKO was constructed. In the simulated hospital, all necessary medical equipment was available (Figure 1).

Results of assessment

As for the BFA skills, all trainees passed the assessment, and the ratio of excellence was 45.8%. The mean scores of the four MTFs were 89.4 ± 6.78 , 85.6 ± 9.56 , 83.4 ± 10.22 , and 90.5 ± 12.4 , respectively, indicating no statistical difference among the four MTFs. In the assessment of the simulated reception of outpatients, there were 12, 11, 9, and 13 doctors in the MTFs' accepted test. The average scores of the MTFs were 79.3 ± 2.56 , 83.3 ± 3.58 , 77.8 ± 3.58 , and 81.3 ± 3.16 , respectively. In addition, there was no statistical difference among the four MTFs. In the assessment of DCS and DCR, the MTFs had four, five, six, and four surgical teams. The average scores of the MTFs were 76.3 ± 3.30 , 80.4 ± 4.57 , 82.2 ± 3.49 , and 78.3 ± 1.71 , respectively, indicating that all of the teams passed the assessment, and there was no statistical difference among the four MTFs.

Results of the post-assessment questionnaire and discussion

A total of 40 questionnaires were administered, and all of the questionnaires were collected. Table 4 presents the results of the post-training survey rating of the four MTFs. For Question 1, the trainees assigned a mean score of 6.48 ± 0.51 , indicating that they fully agreed that the training contents and lists are reasonable.

For Question 2, the trainees assigned a mean score of 3.48 ± 0.59 , indicating that they somewhat disagreed with the total training time or that the time for each training content is reasonable. In the free discussion, a total of five trainees suggested that 3 weeks was somewhat lengthy and that some of the training contents could be produced as videos for self-training, such as some contents of the basic knowledge and background of PKO.

For Question 3, the trainees assigned a mean score of 5.43 ± 0.59 . During the free discussion, the trainees were satisfied with the simulated training method for BFA, advanced trauma life support, and DCS but somehow not too satisfied with the "verification of the equipment" and the "prevention of psychological morbidity." Furthermore, five trainees were not satisfied with the remote online teaching due to the COVID-19 pandemic because their internet

speed was occasionally too slow that it blocked the lecture.

For Question 4, the trainees assigned a mean score of 6.28 ± 0.55 . During the free discussion, the trainees stated that all the trainers have profound knowledge. However, some of the trainers were not professional teachers, and their teaching skills were not satisfactory. In addition, the trainees complained that two of the teachers' English language skills were inadequate.

For Questions 5 and 6, the trainees assigned mean scores of 6.73 ± 0.45 and 6.25 ± 0.59 , respectively, indicating that they highly agreed that the gathered training is better than self-training and that it can improve the comprehensive ability of Level 2 MTFs considerably. The trainees were very confident and competent in accomplishing the coming mission after the training. In the free discussion, the trainees talked about the advantages of the training base-gathered training over self-training.

Discussion

In the present study, a gathered pre-deployment training procedure in a training base for Level 2 MTFs of UN PKO was constructed and validated, and it was found that the established training procedure could improve the ability of the trainees and fulfill the requirements of the UN. In addition, the post-assessment questionnaire revealed that the trainees felt that gathered training is better than self-training and that it could improve their comprehensive ability considerably. They were very confident and competent in accomplishing the coming mission after the training.

There are several advantages of gathered pre-deployment training in a training base. First, a standard pre-deployment training procedure was constructed on the basis of the requirements of the UN and the epidemiology of diseases or trauma in the fields of PKO missions, and then it was used to train four MTFs that were from different units, ensuring that the MTFs accomplish the mission in a unified standard. Previously, the MTFs organized the training themselves. The training standard and training contents are numerous among MTFs. This might lead to unsatisfactory training outcomes, consequently affecting the health care in the field of mission [3]. Second, the trainers delivering the lectures were all military experts, and most of them have extensive experience in PKO. In addition,

one of the trainers (Zhaowen Zong, one of the authors of this manuscript) was a UN-certified master trainer for BFA and a trainer for field medical assistants. In the self-training by MTFs, the MTFs do not have such qualified trainers, which might lead to lower training effectiveness [4]. Third, the training equipment in the Army Training Base for Health Care is much better than that in the MTFs.

However, the gathered training has certain aspects that need to be improved. First, the training time needs to be optimized. In the free discussion after the training and assessment, some of the trainees complained that a duration of 3 weeks is too long, and they suggested that some of the training contents could be learned through self-training. To ensure the training outcome, some of the required training contents such as basic knowledge and background of PKO could be produced as videos, which could be studied by MTFs before the gathered training. Once the gathered training begins, the MTFs should undergo a test on self-trained contents to assess whether they have mastered the related contents. Second, training of trainers should be enforced [18]. Although the trainers are military experts and many of them are experienced in PKO, they might not be skilled at teaching. In the free discussion after the training and assessment, some of the trainees suggested that the training methods of some trainers are not satisfactory, some key points were not specifically enforced, and even some lectures were monotonous and not engaging. In the future, the trainers should be trained in a unified standard before they conduct lectures. Third, the language ability of both the trainees and the trainers should be further enhanced. The trainees will soon be deployed to the mission area, and they need to communicate with people from different countries. Thus, they should have good English communication skills [4]. During the training process, it was found that although some of the trainees are proficient in speaking English, some are very poor at it, and some of the trainers are ill-equipped at giving lectures in English.

Conclusions

In this study, a training base-based pre-deployment training procedure for Level 2 MTFs of UN PKO was established, and it was found to be effective in improving the ability of the trainees and in helping the train-

ees to fulfill the requirements of the UN. However, the training procedure does have certain aspects that need to be further improved, e.g., further optimization of the training time, training of the trainers, and enhancement of language ability. Future efforts should be focused on these aspects to further improve the training effectiveness.

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Conflicts of interest

The authors declare no conflicts of interest.

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De l'éthique militaire à l'éthique du Service de Santé des Armées (SSA) à partir d'exemples

From military ethics to the ethics of the Army Health Service (SSA)

B. Massoubre¹, A. Cauet², JP. Baechle³. FRANCE

Résumé

Le but de cet article est de présenter l'éthique militaire au sein du Service de santé des armées (SSA) en France, c'est-à-dire d'aborder la question de l'éthique médicale. Ce sujet omniprésent, dans l'institution militaire, est le plus souvent occulté, mal compris ou sous-estimé.

Les membres du SSA, médicaux et paramédicaux, sont confrontés à des dilemmes, surtout en situations dégradées comme lors des opérations extérieures (OPEX).

Deux officiers illustrent leur questionnement éthique dans des situations précises. Le pharmacien en chef CAUET y décrit l'Unité de distribution de produits de santé (UDPS) et ses contraintes. Puis, avec deux exemples vécus, le médecin en chef[®] BAECHLE illustre les conflits de valeurs entre obéissance aux ordres de la hiérarchie militaire, et approche humaniste.

Mots-clés : éthique militaire et médicale, opérations extérieures, questionnement éthique, Service de santé des armées en France

Summary

The aim of this article is to present military ethics within the French Army Medical Corps (SSA), i.e. to address the issue of medical ethics. This omnipresent subject, in the military institution, is most often hidden, misunderstood or underestimated.

The members of the SSA, medical and paramedical, are confronted with dilemmas, especially in degraded situations such as during external operations (OPEX).

Two officers illustrate their ethical questioning in specific situations. Chief Pharmacist CAUET describes the Health Products Distribution Unit (HPDU) and its constraints. Then, with two real-life examples, the chief medical officer[®] BAECHLE illustrates the conflict of values between obedience to orders from the military hierarchy and a humanistic approach.

Keywords : military and medical ethics, external operations, ethical questioning, French Army Medical Corps

Introduction

Dans le langage courant, les mots éthique et morale ont un sens commun : on parle d'ethos en grec et de mores en latin. En fait, les deux notions sont complémentaires. La morale définit des règles, des limites à ne pas franchir. L'éthique ne s'oppose pas à la morale, qui est contraignante par définition. La morale traite du bien et du mal, et l'éthique du bon et du mauvais. Pour simplifier, la morale peut être symbolisée par un point d'exclamation et l'éthique par un point d'interrogation. (1)

L'éthique militaire est clairement une éthique de responsabilité (2). En effet, Le but des armées est la défense du territoire national, que ce soit à titre préventif (pour anticiper une attaque) ou à titre de riposte. Elle permet aux soldats de s'adapter à des situations nouvelles. L'objectif du combattant est d'atteindre sa cible et de la neutraliser.

Après une présentation générale, le PHC Amélie Cauet, commandant le 2^{ème} bataillon de l'ESA (École de santé des armées), et le Docteur Jean-Pierre Baechle, anesthésiste-réanimateur et ancien médecin du SSA, feront part de leur expérience.

Aspects généraux

État des lieux

Depuis la fin de la seconde guerre mondiale et jusqu'à une période très récente, les guerres étaient asymétriques. La disproportion technologique entre les forces

combattantes, et le fait que ce ne soit pas entre deux États reconnus et souverains, ont conduit à parler de conflit plutôt que de guerre. Aussi, les citoyens se sentaient moins concernés par celle-ci et souhaitaient une guerre « zéro mort », loin de chez eux. Les militaires étaient aussi moins portés par des grandes valeurs morales, comme le sacrifice pour leur pays ou l'engagement pour la défense du territoire. Le soldat était amené à combattre dans des zones arides, contre un ennemi qu'il ne voyait pas, qui utilisaient des engins explosifs improvisés (IED) et pour une cause qui, parfois, lui échappait.

Mais, l'invasion de l'Ukraine par la Russie le 24 février 2022 a changé la donne internationale, la doctrine et la sémantique de nos armées. On parle maintenant de guerre de haute intensité, et celle-ci est aux portes de l'Europe. Certes, la France n'est pas engagée frontalement, mais nul ne peut présa-

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ger de l'avenir. A ce jour, des soldats français sont en Roumanie.

Les questions éthiques évoluent avec la réalité du terrain. En ce qui nous concerne, nous réfléchissons à des situations actuelles, notamment sur les théâtres d'opérations.

A ce sujet, les OPEX (Opérations extérieures) sont la grande différence entre les services médicaux militaire et civil. Et, malgré le retrait du Mali de l'opération Barkhane, la France reste le pays d'Europe le plus présent sur le terrain. En fait, alors que les Anglo-Saxons privilégient la rapidité de l'évacuation, le concept français place l'équipe chirurgicale au plus près du blessé.

À chaque retour d'OPEX, un débriefing est fait lors de RETEX (Retours d'expérience), au cours desquels toutes les phases d'une opération sont analysées de façon collégiale et constructive. Le but n'est pas de juger, ou de punir, mais d'améliorer l'efficacité des missions.

Éthique des armées et du SSA

Le métier de militaire est celui des armes. L'emploi de la force nécessite un *ethos* accordé au besoin d'en maîtriser l'application et les conséquences. Cela peut paraître antinomique, mais l'éthique nous renvoie à un questionnement, à une remise en question. Pourtant, l'éthique militaire n'est pas un oxymore. Certes, elle servira moins au soldat qu'un casque lourd et un FAMAS, au moins dans un premier temps celui de sa survie physique. L'éthique n'est pas là pour gêner la vie du combattant. Aussi, elle ne peut être hors-sol ni donner une vision de la guerre telle que nul ne s'y reconnaîtrait. (2)

Nous devrions parler des conventions de Genève. Elles dictent les règles de conduite à adopter en période de conflits armés, notamment à l'égard des civils et du respect de l'adversaire. Le respect de ces conventions est à l'honneur de la France, même si elle n'est pas respectée par l'ensemble des belligérants. (3)

Le militaire a une feuille de route qu'il doit respecter et, si les causes sont établies, il doit se soucier des conséquences de ses actes. L'éthique nous rappelle que le compromis n'est pas la compromission. Mais, cette distinction est pourtant difficile à établir, celle de savoir jusqu'où un soldat peut aller sans dépasser la limite.

En OPEX, le personnel du SSA est armé, et néanmoins il appréhende cette situation. La double dotation (arme de poing et FAMAS) est parfois mal perçue par ceux dont le rôle est de sauver des vies, même si cet armement est défensif.

Dans l'armée, l'individu existe au sein du groupe qu'il alimente et qu'il renforce. Est-ce la même chose pour les personnels du SSA ? En effet, la responsabilité militaire est collective mais l'acte médical est individuel. Même si pour l'essentiel, le SSA relève d'une éthique de responsabilité, il n'est pas soumis à un ordre moral qui se défie des conséquences. Le but est de soigner les blessés, et de limiter le nombre de morts.

Le médecin militaire a une obligation de moyens et pas de résultats. Sur un théâtre d'opérations, les modalités du triage ou des hospitalisations sont fonction des nécessités du moment, dans le cadre des directives du commandement du SSA. De plus, les médecins ne disposent que d'une liste limitative en médicaments, en matériels et dispositifs médicaux. Et le personnel est contraint.

L'éthique du pharmacien militaire en OPEX

L'éthique militaire est clairement une éthique de responsabilité, par opposition à l'éthique de conviction. En effet, dans le cadre de soins à apporter à des blessés, l'éthique de conviction nécessiterait d'engager tous les moyens disponibles pour traiter un blessé, là où l'éthique de responsabilité exige une rationalisation des ressources et une priorisation du soin. (4,5)

L'article 25 du décret n° 2008-967 fixe d'ailleurs les règles de déontologie propres aux praticiens des armées et précise que : « l'autorité peut lui ordonner d'interrompre tout ou partie de ses activités pour se consacrer exclusivement à sa mission prioritaire de soutien des armées et des formations rattachées » (6). Nous allons donc discuter de la traduction pharmaceutique de cette éthique en OPEX et de son impact sur le ravitaillement médical.

L'unité de distribution de produits de santé (UDPS)

En OPEX, l'UDPS est la structure chargée du ravitaillement médical avec à sa tête un pharmacien des armées. Son rôle est d'assurer l'approvisionnement en produits de santé du théâtre, la maintenance des

matériels biomédicaux et la distribution de ces produits dans les différentes unités mobiles opérationnelles (UMO) rattachées.

Les délais d'approvisionnement sont relativement longs par rapport à la France. Si une commande urgente de petit volume peut être livrée en 10 jours, la majorité des commandes le sont en 6 semaines minimum. Le transport dépend des vecteurs aériens disponibles et le fret santé n'est pas toujours prioritaire.

La capacité de stockage de l'UDPS est limitée et les bonnes pratiques de distribution imposent une qualité adéquate de stockage afin de diminuer le risque d'erreur aux conséquences parfois désastreuses.

L'UDPS doit donc détenir un stock de trois mois de consommation, en veillant à limiter les destructions de périmés, le sur-stockage, et en assurant un stock de sécurité permettant d'accueillir un afflux massif de blessés (ou MASCAL pour « Massive casualties »). Il est donc ainsi possible d'apporter une aide médicale aux populations (AMP) quand la situation opérationnelle le permet, en gardant à l'esprit que la priorité de la mission est d'assurer le soutien des forces.

Quand l'éthique du soignant se confronte à la réalité, les praticiens que nous sommes peuvent avoir des difficultés d'adaptation. Il y a ceux qui veulent « soigner la terre entière » et ceux qui ne veulent pas se retrouver démunis en cas de MASCAL. Mi-cigale mi-fourmi, nous-voilà dans l'obligation de placer le curseur et de prendre les décisions adéquates pour maintenir une activité d'AMP régulière sans mettre en danger le soutien des forces.

Questions et contraintes

La première question qu'un pharmacien doit se poser en mission concerne le stock de sécurité à conserver en cas de MASCAL. Quels sont les produits indispensables à la prise en charge des blessés ? Pour cela il existe sur tous les théâtres, et dans chaque UMO, des lots « MASCAL ». Ils doivent être régulièrement entretenus, avec des listings doivent être mis à jour et des périmés remplacés. Ces lots serviront en cas d'afflux de blessés. Ensuite, peut-on utiliser tout le stock UDPS jusqu'à la rupture ? Connaissant les délais d'approvisionnement, la question se pose chaque fois que le stock diminue. Les pratiques diffèrent d'une équipe à

l'autre, et il n'est pas rare que les consommations fluctuent de manière imprévisible. Quand je suis arrivée à l'UDPS de N'Djamena (Tchad), l'article « à surveiller de près » était tout simplement l'eau déminéralisée, qui sert à la stérilisation des instruments du bloc opératoire. Les bidons étant assez volumineux, le stockage ainsi que leur approvisionnement en urgence étaient limités. Comme l'antenne médicale avait eu une forte activité d'AMP, le stock allait devenir critique.

Le rôle du pharmacien en OPEX est également de conseiller les praticiens pour les demandes de produits « hors catalogue ». Les articles ne sont pas tous approvisionnés pour des raisons de rationalisation des moyens, et certaines prises en charge risquent de finir en impasse thérapeutique. Le but des catalogues est de soigner les soldats qui seront rapidement évacués en cas de besoin. Il n'y a donc pas de produits pour des prises en charge longues (stock d'antibiotiques pour des antibiothérapies longues, nutrition entérale ou parentérale, antifongiques IV). La crainte est de ne pouvoir proposer un projet thérapeutique sur le long terme.

Que faire alors d'un soldat ennemi opéré en urgence mais qui, à l'issue de l'intervention, ne pourrait plus s'alimenter ? Le manque de structures civiles pour prendre le relai met parfois les équipes en difficulté. Ces patients sont consommateurs de ressources, de temps, d'énergie et ont une incidence sur le moral des soignants. La possibilité de faire des demandes exceptionnelles, ou des demandes d'évolution du catalogue, est parfois une solution, les modalités d'approvisionnement devront cependant être prises en compte.

L'UDPS est composée d'êtres humains, susceptibles de faire des erreurs. Le logiciel est assez ancien et peu sécurisant pour la gestion des stocks. Il est courant qu'il y ait des erreurs de stock dans le logiciel, dans un sens ou dans l'autre. Lorsqu'un magasinier se rend compte que le stock est très faible (alors qu'il devrait être bien plus important) la commande urgente s'impose. Le temps qu'elle arrive, une adaptation de l'activité doit être envisagée.

Ainsi, pour différentes raisons, l'AMP doit tenir compte des contraintes. Bien sûr, chaque soignant fait de son mieux pour traiter les patients. Les ressources maté-

rielles sont cependant limitées et l'éthique de responsabilité une réalité parfois difficile à envisager pour les soignants. L'enjeu est alors la gestion de la frustration des équipes et l'acceptation du fait que le métier que nous avons choisi peut nous amener à faire des choix difficiles.

La bonne communication entre les équipes médicales et pharmaceutiques est essentielle, et permet souvent d'éviter bien des conflits.

L'éthique du médecin militaire en missions extérieures (OPEX)

La profession de médecin militaire exige une double-loyauté. Ce qui fonde le médecin militaire est en effet l'association du statut d'officier et de règles professionnelles médicales strictes.

Ces règles propres de déontologie du médecin militaire, regroupées dans un décret spécifique, rappellent que les médecins militaires ne sont pas inscrits au conseil de l'Ordre des Médecins (6).

L'analyse de ce code de déontologie permet d'observer une tendance forte, rappelée à plusieurs reprises. Sans négliger l'importance des hiérarchies technique et militaire (statut d'officier), le respect des règles éthiques qui sous-tendent l'exercice médical restent toujours prégnantes et modèrent les décisions et ordres qui conduiraient à des dilemmes profonds.

Le médecin militaire est, et doit rester en toutes circonstances, un médecin « éthiquement responsable ». Deux exemples vécus illustrent les conflits de valeurs potentiels entre obéissance « légaliste » aux ordres de la hiérarchie militaire, et approche humaniste médicale en lien avec le serment d'Hippocrate.

Mission Épervier, Ndjamen (Tchad)

En l'absence de conflit, l'Antenne Chirurgicale Aérotransportée (ACA) dispose de deux blocs opératoires et d'une structure d'hospitalisation sous tente. Elle reste quatre mois sur la base et opère quotidiennement, à titre de soutien humanitaire, des patients tchadiens choisis parmi les plus démunis, sans autres possibilités de prise en charge dans le pays.

Deux sous-officiers sont arrêtés arbitrairement sur la base aérienne et personne ne sait où ils se trouvent. Le colonel Comman-

dant des Éléments Français au Tchad se rend immédiatement à l'ACA et exige que l'on cesse toute aide humanitaire par mesure de rétorsion.

Les deux chirurgiens et le médecin anesthésiste militaires argumentent qu'il est inadmissible de priver les patients de gestes chirurgicaux, alors qu'ils n'ont aucun lien avec l'arrestation. Le ton monte, et ordre est donné de fermer, et de garder, le passage permettant aux futurs opérés de rentrer dans les locaux de l'antenne chirurgicale. Le blocage de l'accès durera jusqu'à la libération des deux sous-officiers et sans lien avec la mesure de rétorsion.

Dans ce cas précis, aucune discussion n'aura été possible mais l'ensemble de l'équipe chirurgicale est unanime et uni. Elle est soudée par l'injustice et la frustration profonde face à l'interdiction de remplir la fonction humanitaire de l'antenne chirurgicale.

Càzin, district de Bihac (Bosnie)

Les ordres politiques sont clairs : il ne faut en aucun cas prendre parti, ni s'engager pour une des trois factions en présence (Serbes, Bosniaques ou Croates). Une neutralité absolue est exigée.

Au cours d'une visite de courtoisie dans le petit hôpital bosniaque le plus proche, à Càzin, le chirurgien et l'anesthésiste de l'Antenne chirurgicale découvrent une situation médicale effroyable : un bloc opératoire installé dans un ancien laboratoire d'analyses médicales. Il n'y a pas de chirurgien et un jeune interne d'anesthésie (réfugié ayant validé trois semestres) effectue les premiers soins d'urgence sur des blessés de guerre évacués du front. Ceux-ci sont épuisés, en hypothermie, hagards, parfois choqués.

Les médecins de l'ACA décident de prendre en charge certains blessés avec le matériel de chirurgie de guerre de l'ex-Yougoslavie existant dans un stock local.

Le soir venu, le colonel commandant la mission française, fait un rappel à l'ordre à ses médecins, et leur interdit de participer à la prise en charge de blessés de guerre d'une des factions. Il rappelle les choix politiques de neutralité qui ont été faits et les risques potentiels.

Sans avoir besoin d'en reparler, les praticiens des armées décident dès le lende-

main de passer outre à cet ordre. Il leur était impossible de s'imaginer lire sur un lit de camp en attendant un éventuel blessé grave, alors que des hommes souffraient sans aucun espoir de soins dans un hôpital oublié de tous. Cela leur était intolérable.

Convoqués dès leur retour par le chef de corps, à l'issue d'une discussion ferme mais loyale, les arguments humanitaires l'emportent sur la morale politique. Une autorisation est donnée de continuer la prise en charge des blessés, sous réserve d'accepter une protection rapprochée.

Ces deux exemples montrent l'importance du comportement éthique d'un médecin militaire. L'éthique est en effet l'ensemble des comportements qu'un individu met en œuvre et qui finit par le définir. Cette éthique personnelle, qui permet de passer d'un ethos à l'autre, de l'habitude (ethos) à l'habitus (ethos), explique que le choix d'une profession ne peut se faire qu'en accord avec ce que l'on est.

Le médecin militaire est la résultante de plusieurs composantes identitaires : personnelles, faisant référence à ses propres expériences de vie, et professionnelles ou sociales, construites dans la collectivité médico-militaire. Il va ainsi se forger, au fil du temps, une identité morale en devenir, dynamique, nourrie de la multiplicité des expériences personnelles et collectives.

La cohérence de l'individu exige que ces identités se réunissent au sein de l'identité morale. Elle est essentielle, car il existe un lien étroit entre identité et action morales. Les individus vont généralement choisir l'action la plus adaptée aux croyances qu'ils ont d'eux-mêmes.

Dans l'expérience bosniaque, si l'identité « professionnelle » avait été suffisante pour définir les praticiens des armées en cause, ces derniers auraient pu accepter les ordres, et céder ainsi à la tentation de ce qu'André Comte-Sponville appelle le « légalisme » : se contenter d'appliquer la loi. Mais leur identité morale leur avait interdit cette solution.

Une formation à l'éthique pratique s'avère indispensable, afin de permettre aux médecins et aux infirmiers militaires de pouvoir évaluer « l'éthicité » de leur comportement et de prendre conscience en équipe des éventuels conflits de valeur en OPEX. Seule

une homogénéité de la formation éthique pourrait éviter le « désengagement moral » auquel ont pu céder des médecins militaires américains en Irak et à Guantanamo. Plusieurs médecins militaires français ont récemment publié des articles sur les problèmes éthiques du médecin militaire français en OPEX (7,8). Les problématiques éthiques restent identiques, le plus souvent liées aux tensions entre le désir de porter une assistance humanitaire aux populations locales et les obligations militaires. La doctrine du Service de santé est claire : la mission première du service de santé des armées est le soutien santé opérationnel des forces armées. C'est sa raison d'être, son cœur de métier.

Mais il est vrai, et heureusement, que les équipes chirurgicales passent beaucoup de temps dans l'attente de blessés éventuels. Et qu'attendre, quand on est parfois la seule ressource médicale locale, n'est pas éthiquement défendable. Il faut donc au cas par cas composer avec l'autorité militaire, en ayant en tête les principes éthiques de bienfaisance, et surtout de justice distributive.

Conclusion

L'éthique est consubstantielle à l'exercice de la médecine, elle est ancienne comme Hippocrate. Elle est présente aussi au sein du monde militaire, avec des spécificités cependant.

La prise de conscience de l'importance de l'éthique est récente. Le Comité d'éthique de la défense (COMEDDEF) a été créé le 10 janvier 2020 par la Ministre des armées et il n'y a pas à ce jour, à notre connaissance, de comité d'éthique du SSA.

Pourtant, nous aurions tort de penser que cet enseignement est superfétatoire, comme coupé de la réalité du terrain. Certes, le militaire pourrait se demander

quel est la plus-value d'une éthique, arbitre d'un match où l'un des deux camps ne respecteraient pas les « règles du jeu »?

C'est une question essentielle, à laquelle il est difficile de répondre. Le Général Royal apporte néanmoins un élément de réflexion : « Lorsque le soldat ne trouve que la barbarie pour répondre à la barbarie, le conflit bascule dans la violence réciproque et c'est la notion même de civilisation qui est atteinte ». (9)

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LIEUTENANT-COLONEL Bernard MASSOUBRE



Lieutenant-colonel dans la réserve opérationnelle du Service de Santé des Armées, le pharmacien en chef Bernard MASSOUBRE est biologiste médical dans le civil. Il est chef de l'engagement des réservistes du SSA au 7^{ème} Centre médical des armées (CMA) de Lyon, sous la direction du médecin Chef des Services Blandine CARENZO-CORBERAND.

Pendant plus de dix ans, il a été responsable de l'Espace de réflexion éthique de l'hôpital militaire Desgenettes de Lyon. Il est titulaire d'un diplôme d'université (DIU) d'Éthique de la santé.

Present and future of Spanish military telemedicine

25 years of the Military Telemedicine Unit at the Central Defense Hospital "Gómez Ulla"

Le présent et l'avenir de la télémédecine militaire espagnole

25 ans de l'unité de télémédecine de l'hôpital central de la défense «Gómez Ulla»

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Abstract

Telemedicine consists of the exchange of health information between healthcare professionals and between healthcare professionals and patients through the use of information and communications technologies (ICT). It is already considered an emerging technology in what is commonly called the "Productivity Plateau". It is also probably an exponential growth technology, in which the "trigger" for such growth will be a mixture of new technologies such as portable sensors/ wearables that detect multiple patient data (Blood Pressure, Heart Rate, Respiratory Rate, Glycaemia, Temperature, etc), better communications (5G), augmented and mixed reality (augmented and virtual), artificial intelligence systems to improve diagnosis, etc.

In Spain, Military Telemedicine is a pioneer in the field. The main mission is to provide remote health support to health professionals or military personnel deployed in Operations and remote or difficult-to-access locations. In 2021 the Spanish Telemedicine Unit at Central Defense Hospital "Gómez Ulla" will celebrate its 25th anniversary.

This article discusses the aforementioned aspects of telemedicine as an emerging technology and describes the current mission, organization and capabilities of Spanish military telemedicine, as well as its future.

Keywords: military medicine, telemedicine/emergent technologies, telemedicine/exponential growth, telemedicine/capabilities.

Résumé

La télémédecine consiste en l'échange d'informations sur la santé entre professionnels de la santé ou entre professionnels de la santé et patients, par le biais des technologies de l'information et de la communication (TIC). La télémédecine est déjà considérée comme une technologie émergente dans ce que l'on appelle le «Plateau de productivité». Il s'agit aussi probablement d'une technologie à croissance exponentielle, dont le «déclencheur» sera un mélange de différentes technologies, telles que les nouveaux capteurs portables qui détectent de multiples données sur le patient (pression artérielle, fréquence cardiaque, fréquence respiratoire, glycémie, température, etc.), de meilleures communications (5G), la réalité augmentée et mixte (augmentée et virtuelle), les systèmes d'intelligence artificielle pour faciliter le diagnostic, etc.

En Espagne, la télémédecine militaire est pionnière dans ce domaine. Sa mission fondamentale est de fournir un soutien et des conseils en matière de santé à distance grâce aux technologies de l'information et de la communication (TIC) au personnel médical et non médical, tant dans la zone d'opérations que dans des situations d'isolement et/ou d'éloignement. En 2021, le service de télémédecine de l'hôpital central de la défense «Gomez Ulla» fêtera son 25^e anniversaire.

L'article aborde les aspects susmentionnés de la télémédecine en tant que technologie émergente et décrit la mission, l'organisation et les capacités actuelles de la télémédecine militaire espagnole, ainsi que ses perspectives d'avenir.

Mots-clés : médecine militaire, télémédecine/technologies émergentes, télémédecine/croissance exponentielle, télémédecine militaire, télémédecine/capacités.

INTRODUCTION. TELEMEDICINE, TELE-HEALTH AND E-HEALTH.

Telemedicine consists of the exchange of health information between healthcare professionals and between healthcare professionals and patients through the use of information and communications technologies (ITC).

There are several definitions in the civilian and military setting, but all of them meaning the above concept^{1,2,3}.

Nowadays, it is considered in its etymological definition, as "the practice of medicine over a distance..." or "the delivery of health care services, where distance is a critical factor..."^{4,5}

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There are two major fields in telemedicine: the exchange of information between healthcare professionals (e.g. primary physician with specialists, nurse with physician, etc) and between the healthcare professional and the patient. In Europe, especially in the military, the first field is the most common. The second needs much more technology because the number of patients potentially using telemedicine is huge, so millions of wearables to record patients vitals are necessary, and strong organization is needed, including artificial intelligence systems to process and analyze the billions of data points that the wearables send so that only the useful ones are received by the health care workers and algorithms to determine where the data goes, who receives it, and when it should be received.

Tele-health is a much wider concept than telemedicine, dealing not only with the exchange of information for clinical use (diagnosis, treatment, etc) but also for "patient and professional health-related education, public health and health administration"^{6,7}. When it comes to telemedicine, reality usually goes in front of legality. Thus, although there are a lot of people already using this technology, ethical documents of both international and national medical organizations^{5,8,9} recommend its use only in specific circumstances for some cases during the clinical process and with specific requirements and legislation and guidelines and standards, many of which are still lacking.

E-health would be considered the widest concept and is defined as "in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology"¹⁰.

Where is Telemedicine as a Technology?

Gartner, a leading research and advisory company in the U.S., has developed what it is called the Hyper Cycle of Emergent Technologies¹¹ that "provides a graphic representation of the maturity and adoption of technologies and applications."

This Hype Cycle establishes five phases of a technology's life:

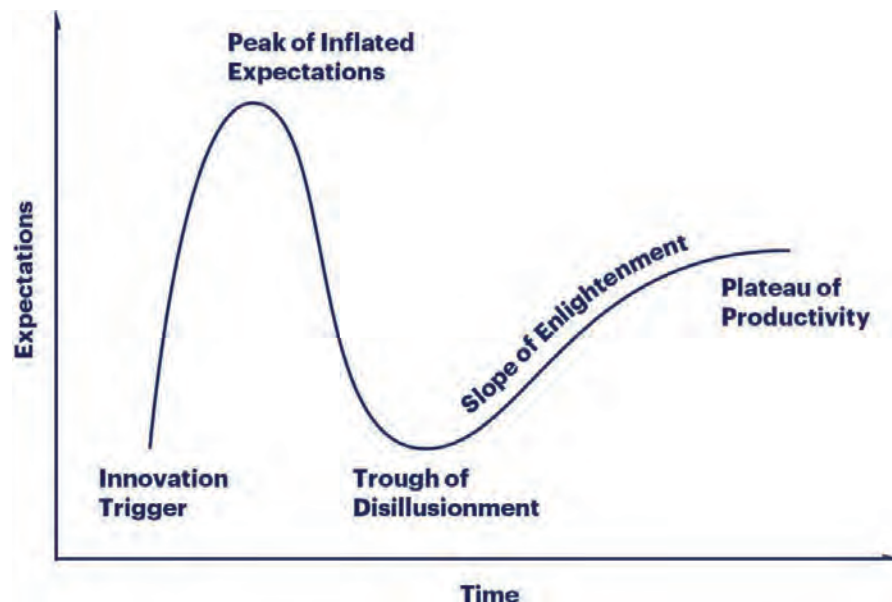


Figure 1. Hype Cycle of Emergent Technologies. Available at: <https://www.gartner.com/en/research/methodologies/gartner-hypecycle>.

•**Innovation Trigger:** The first phase of the cycle is the "launch", the presentation of the product or any other event that generates interest, presence and impact on the media. At this stage there are rarely usable products and commercial viability is not proven.

•**Peak of Inflated Expectations:** At this stage the impact on the media usually generates unreasonable enthusiasm and expectations about the possibilities of technology. Some pioneering experiences may be successful, but there are usually more failures.

•**Trough of Disillusionment:** Expectations are not met, because they are delayed, etc. Interest is being diluted and some investors are starting to fall. After the advertising boom of the second phase some technologies are no longer in vogue and, consequently, the media usually forget about them.

•**Slope of Enlightenment:** Although the media have already no interest in the technology, some companies continue testing to understand the benefits that technology can provide and explore new practical applications. Some technologies begin to crystallize the benefits they can bring and begin to be widely understood. Technologies are improved with 2nd and 3rd generation products and services.

•**Plateau of Productivity:** A technology reaches the "productivity plateau" when its benefits are widely demonstrated and accepted. Finally, the criteria for determining commercial viability begins to become clear. The mass adoption of technology is beginning to become a reality. Technology is starting to provide benefits."

When we look at Digital Health Gartner's Hyper cycle, we find that Tele-health is al-

ready considered to be in the "Plateau of Productivity"¹².

So, world-wide, it is considered a well-established technology, but that is not what we see, at least in Europe. Why? Maybe because it is growing as an exponential technology does.

Telemedicine as an Exponential Technology.

Ray Kurzweil, a famous American inventor and futurist, says that "the future is widely misunderstood. Our forebears expected it to be pretty much like their present, which had been pretty much like their past. The rapid growth of technology is actually accelerating progress across a host of domains. This has led to unexpected degrees of technological and social change occurring not only between generations, but within them"¹³.

Related to this is the concept of exponential growth of some technologies. What does exponential growth mean?

This figure gives you a clear idea.

Most likely, telemedicine is an exponential growth technology. These technologies have a curious type of growth, compared with the classic linear technologies, perfectly described by different authors¹⁴.

At first, they grow even slower than linear technologies, which is deceptive and creates a feeling of disappointment, but, at some point, there is a trigger that accelerates this growth like an explosion, thus making it exponential. But, what will be the trigger induces exponential growth for Telemedicine? Probably it will be a combination of different things: cheap and comfortable wearables (like stickers or decals that children

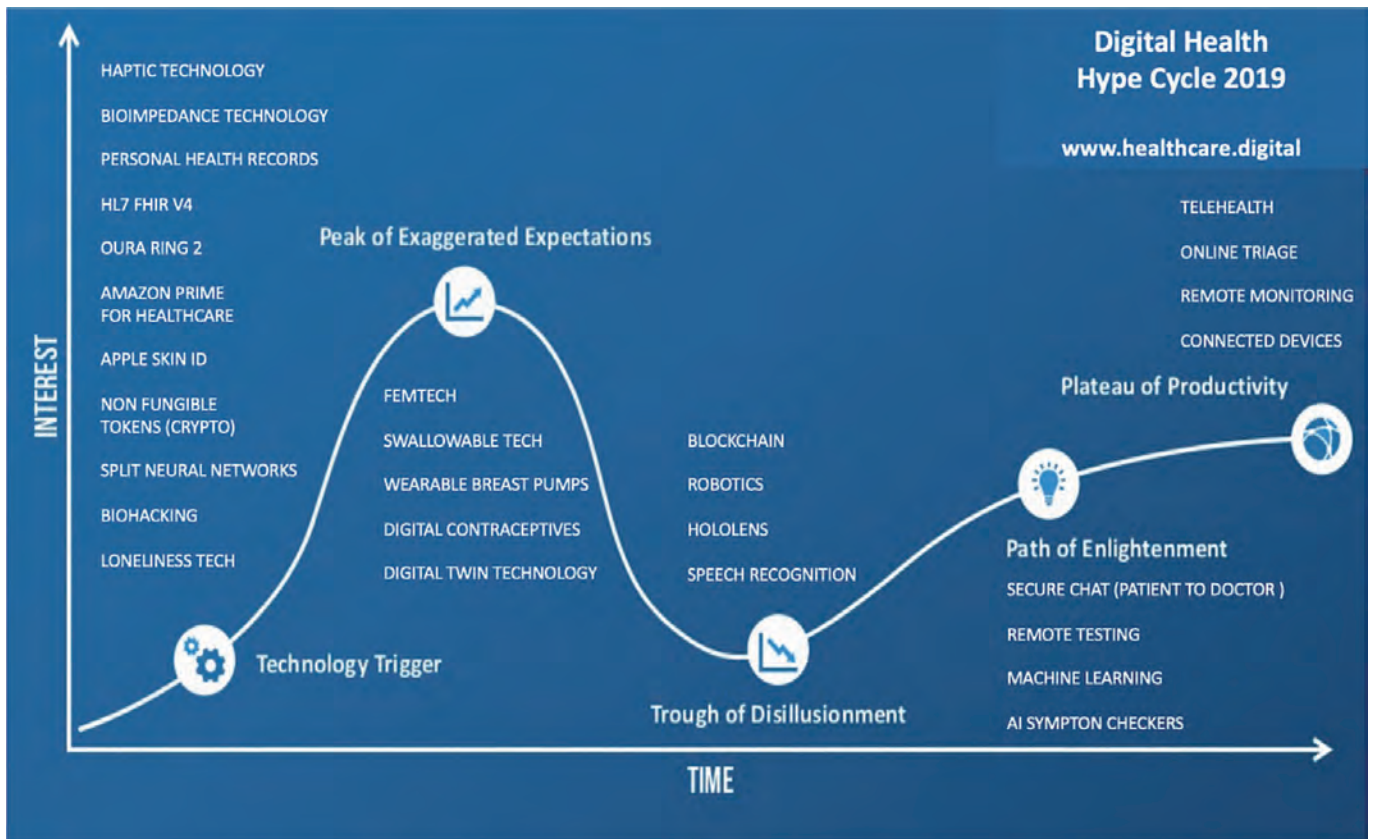


Figure 2. Gartner's Digital Health Hype cycle. Available at: <https://www.healthcare.digital/single-post/2019/01/12/The-Digital-Health-Hype-Cycle-2019>.

use) for the patients to send their vitals, improved communication technology (5G), artificial intelligence systems to analyze all the information sent, a complex and automatized organization of the system of telemedicine, etc.

HISTORICAL BACKGROUND OF SPANISH MILITARY TELEMEDICINE.

The use of telemedicine in Spain started in the 1930s when Medical Officers on Navy

Ships used the radio to send tele-consultations to the Navy Hospitals back in Spain that were answered by the Emergency Physicians on duty, who gave remote support with the means available at that time (radio)¹⁵.

In 1996, the "Gómez Ulla" Military Hospital Telemedicine Unit was founded during Hospital Centennial Celebration (using Tandberg Vision videoconference equipment). It was immediately used in Operations (at that time in Former Yugoslavia's conflict) and, since then, has always been

used in all the Operations where Spain has deployed personnel.

PRESENT OF THE SPANISH MILITARY TELEMEDICINE.

Overview^{16,17}

Our main mission is remote health support to health professionals or military personnel deployed in Operations^{18,19,20}, and remote²¹ or difficult-to-access locations²².

From the Reference Center at the Telemedicine Unit in the Central Defense Hospital "Gómez Ulla," we give remote health support to what we call "Remote Nodes" from the Army, Air Force, Navy, Guardia Civil Navy Ships, Civilian Naval Hospitals, Civilian Hospitals and NGO Hospitals.

Our main strength is to have all medical and surgical specialists of the hospital available to give remote support 24/7, which contributes to the Hospital mission as a Role 4 for Operations.

As any other Hospital Unit/ Department we perform other tasks, apart from the clinical (remote) assistance, such as²³:

- Training personnel using Telemedicine Equipment in the Operational Theatre, connection for Clinical Sessions between hospitals, Smart Operating Room- Telemedicine Unit connection for surgery students/ residents/ nurses training, etc.

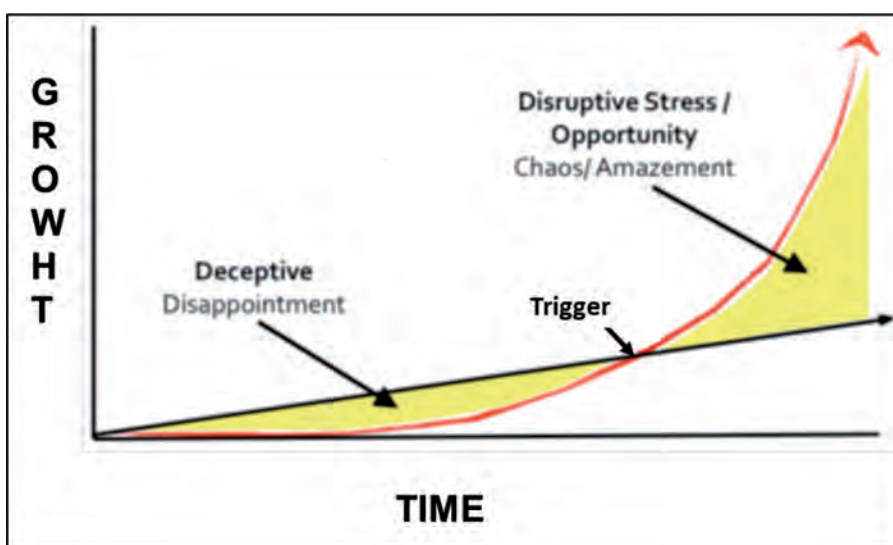


Figure 3. Exponential Disruption - Rob Nail, CEO, Singularity at AAI16 by BootstrapLabs. Available at: <https://www.youtube.com/watch?v=SGBLcvAGWAM>

- R&D: New equipment/ devices for the tactical environment.
- Consulting: National / International (ESA, NATO) Working Groups.
- Other: support to Military Medical Legal Assessment Boards and Military Justice Courts (declaration of Medical Experts in Trials).

Organization

One of the main needs when starting a Telemedicine System is organization (more than equipment, personnel or communications). So, before implementing the system, it is necessary to answer some questions, which could be called the Five Ws of a Telemedicine System:

Who is going to exchange information (only health care professionals, patients and health care professionals)?

Which ICT (information and communications technology) is going to be used to transmit the information (terrestrial lines or wireless; optic fiber or 5G; a combination)?

What kind of information is going to be transmitted (e-consultation, videoconference, patient registers, such as vitals and images including ultrasound)?

When will the exchange of information happen (in real time or synchronous, delayed or asynchronous, or both)?

Why are you going to use Telemedicine (better diagnosis/ treatment, evaluate the need for evacuation/ transfer the patient, follow up)?

In the Spanish Military Telemedicine System, this organization is established²⁴ so that any Remote Node (Medical Units in the Operational Theatre, Military or Civilians Ships, even military personnel) can reach our Telemedicine Unit through a 24/7 mobile phone/ e-mail. Most importantly, this call/ e-mail is received by Military Health Care Personnel (Military Nurse) in the Telemedicine Unit. Our experience dictates that the tele-consultation usually needs some kind of management which must be done by Military Health Care personnel and not simply by a Call Center (for example, the specialist required to give remote support). When the Alert Telemedicine Officer (as we call the Military Nurse Officer that receives and answers this call/ e-mail) receives the request of a tele-consultation, they get in touch with the specialist required to give remote support, sometimes answering by e-mail (e-consultation) or, if videoconference or additional tests (like tele-otoscopy, tele-ultrasound, etc) are needed, they meet at the Reference Centre in the Telemedicine

Unit. The 24/7 availability of the medical/ surgical specialist is guaranteed by the personnel on duty at the Central Defense Hospital and the command's order that this hospital is the Role 4 or Higher Echelon for the Operations.

Spanish Military Telemedicine Capabilities

The capabilities are a key point when talking about Telemedicine. Telemedicine is frequently confused with videoconference, but telemedicine has many other capabilities that Spanish Military Telemedicine has used for a long time ago:

Vital Signs and EKG transmission (in Real Time = RT)²⁵. A patient can be monitored and his/ her vitals (heart rate, respiratory rate, temperature, pulse oximetry, and the most important, EKG) sent and received at that moment, what is called "in real time" at the Reference Centre, so the specialist can study them and give better medical remote support.

External Exam Camera images transmission (RT). The deployed Telemedicine equipment has a high-resolution external camera that sends dynamic imaging but also allows freezing the image to increase resolution (for example, of a suspicious lesion in the oral cavity).

Cold Light Source images transmission: teleotoscope, teleophthalmoscope and teledermatoscope: (RT). With these medical

instruments connected to the equipment, otoscopy, ophthalmoscopy and dermatoscopy images obtained from the patient can also be sent in real time to help the specialist give remote support.

Teleultrasound (RT). Ultrasound is a widely used technology and very useful for diagnostic and therapeutic procedures. The remote operator needs some basic training, but with the so called Dual Video Technology (diagnostic ultrasound image and an image of the hand of the remote operator with the probe on the screen at the same time), and what we call "Agreed Language for teleultrasound"²⁶, the radiologist (or other specialist with ultrasound skills like a cardiologist, urologist, etc^{27,28}) is able to guide the remote operator to move the probe to get the needed image for ultrasound diagnosis.

Surgical Telementoring (RT)²⁹. Some years ago, we started to use this technology. It consists of obtaining a surgical field image in the operating room at the remote site projected on monitors both in the remote operating room and in the Reference Centre of the Telemedicine Unit in Role 4, so that both (usually junior) surgical personnel at the remote site and experienced/ senior surgeons in the Hospital can watch it. Then, senior surgeons at the Role 4 use the Surgical Teleassistant. This system allows the drawings of the senior surgeons to be seen over the surgical field image and permits them to point specific areas of the sur-

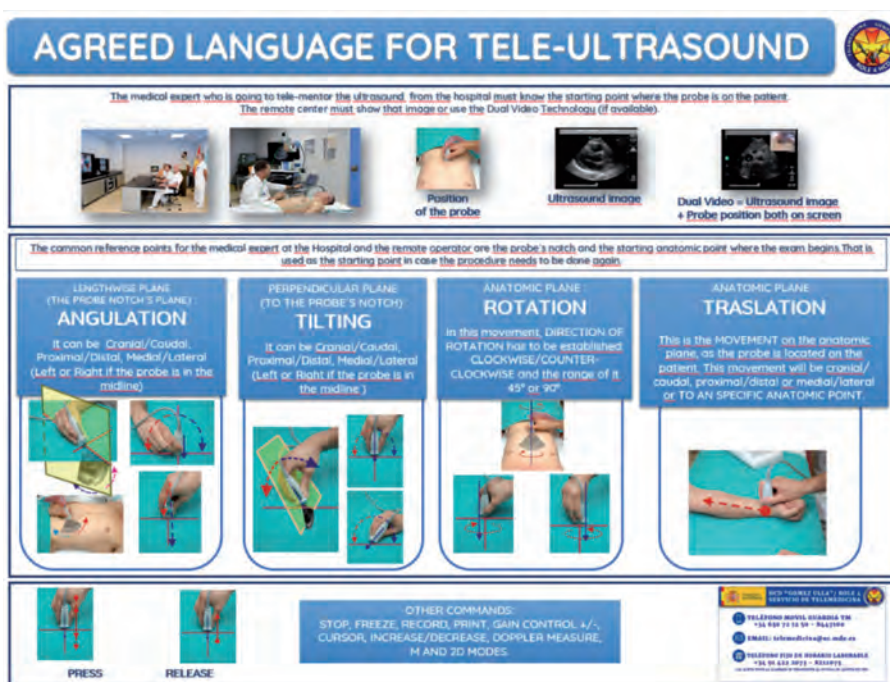


Figure 4. Agreed language for Tele-Ultrasound (Hernandez-Abadía, A., Molina, P. et al, not published).



Figure 5. Surgical Tele-mentoring.

gical field image to highlight some key structure (such as a vessel, nerve, etc) or aspect of the field.

Spanish Military Telemedicine Equipment

The equipment used for telemedicine in Spain has different electro-medical devices that get different records from the patient (from vital signs to EKG, ultrasound image, ophthalmoscopy, otoscopy or dermatoscopy images, etc) and a CIS system able to send them in real time to the Medical Treatment Facility (Role) that is going to give remote health support.

Spanish Military Telemedicine Communications

As our mission is remote health support to health professionals or military personnel deployed in Operations and remote/ difficult-to-access locations all over the world, our main communication is by Satellite, civilian or military, depending of the coverage in the area where teleconsultation is needed.

This is one of the big differences with civilian telemedicine, where optic fiber (or soon 5G or a combination of both) can be used with much more bandwidth (our system is very efficient, as we work usually with so very low bandwidth as 100-200 Kbps).

SPANISH MILITARY TELEMEDICINE FUTURE: RESEARCH AND DEVELOPMENT.

There are several areas in which we have already done or are currently doing research:

Sensors (wearables): A project called e-Safe Tag³⁰ was developed to send information from wearables (Instant Applicable Plaster Sensor) to portable devices to help in casualty classification and care in the field. Our vision about wearables is that if they are part of the soldier's armor, there is a risk that they are damaged (by explosions or

shrapnel, etc.) or malfunction due to blood during combat, so they would be better carried and put on the casualty by the military health personnel at the point of injury, as soon as they approach to the patient.

Portable Telemedicine Devices: Today, the technology permits using portable equipment to practice telemedicine with all the capabilities mentioned above. They are small backpacks or suitcases that include all the electro-medical devices needed to obtain images or records from the patient and a CIS component able to send them to the hospital in real time. As far as we know, there are not many on the market.

We know at least three:

- QOREHEALTH-SCHILLER Portable Solution (tactical backpacks, rugged portable cases and duffle bags

- TEMPUS PRO (PHILIPS)
- SAFETRIAGE PRO (RDT)

We have tested two: QOREHEALTH-SCHILLER (QHS) Portable Solution in tactical exercises with Spanish Signal Battalion Regimiento de Transmisiones n. 1 and TEMPUS PRO (TP) from the Antarctica Spanish Base connected to our hospital, Spanish Role 4.

The conclusions of these preliminary tests are:

1. Both models allow us to practice telemedicine in tactical situations.
2. QHS Portable Solution needs a greater bandwidth while the TP is able to work in a limited scenario of 32-64 Kbps which makes it really efficient considering the austere combat environment in which this equipment is going to be used.



Figure 6. Spanish Telemedicine ruggedized equipment «Telemedicine Tower».



Figure 7. E-Safe Tag wearables.

3. Tempus Pro is less versatile, as it works in the mentioned 32-64 Kbps fixed bandwidth scenario, while QH can work in multiple telecommunications scenarios.
4. QHS is able to send images from several devices simultaneously, can send large files and has the capability to chat in degraded link conditions. The Tempus Pro can only send one image at a time, so if you carry out a medical test, it stops the communication and only restarts when the test is complete and can be sent. Also, TP can only send small files (QS can send much bigger ones) and you do not have a chat capability (QS has), so if the link malfunctions only audio is available for teleconsultations.

Augmented Reality Glasses (ARG): These ultra-portable devices used in Telemedicine allow remote military health care personnel

to send images and sound and, very importantly, to receive (in a small screen in the glasses) remote support from the Medical Treatment Facilities in the field (Roles in the military terminology) or in the country (Central Hospital of Defense or Role 4), through a little camera in the inside of the glass.

Our tests in the tactical field during exercises with various models (Sony, Epson, Fujitsu) ended with four basic conclusions:

1. They could be perfect in the tactical field for Special Operation Units, where there is always a shortage of personnel and material.
2. The moment for Sp Ops Units to use them would be in the TFC or TACEVAC phases of the TCCC³¹ always after initial emergency care of the casualty has been completed (when health care personnel can pay attention to the instructions of a remote health support).
3. We detected problems to fit the ARG with the tactic equipment (e.g. helmet, etc) so we are currently working with the ARG concept but with components distributed separately in the tactical helmet, body armour and protective garments.
4. In military health care, they could be very useful for telementoring, e.g. used by the surgeon in the operating room.

Telemedicine in the evacuation platforms (armored ambulances, rotary or fix wing): This is another of our main R&D lines because receiving remote support from the

specialists at Role 2/3 in the Operational Theatre or in Role 4 is an advantage to the medical officers who travel with the casualty during tactical or strategic medevac. Some tests have been done with ambulances in the military, but we need to continue testing with fix wing aircrafts used for strategic medevac (equipped with satellite communications) and the much more complicated and challenging scenario of rotary wing aircrafts in the Operational Theatre.

Telemicrobiology³²: During our national deployment in Afghanistan, we performed some tests sending a field image from a microscope in our Role 2 in Herat just connecting a camera to the microscope and sending the image as any other through the "Telemedicine Ruggedized Equipment", making it available on a monitor at the Role 4/ "Gómez Ulla" hospital for all the Microbiology Specialists to evaluate in real time the patient's blood prepared at the remote site.

Robotic Teleultrasound: Some years ago, the Spanish Telemedicine Unit worked in an ESA project³³ that tested this system for astronauts to be evaluated by ultrasounds from Earth. A robotic arm is placed over the astronaut and the Radiologist performs the ultrasound and makes a diagnosis from the image at the same time by moving the probe of the US equipment with a joystick. This technology was tested in Spanish Role 2 deployed in Afghanistan³⁴.



Figure 8. Portable telemedicine devices. A) Available at: Qorhealth-Schiller: Qorehealth Product Catalog 2020 (not published). B) TEMPUS PRO: <https://www.philips.co.uk/healthcare/product/HC989706000051/tempus-pro-rugged-advanced-monitor>.



Figure 9. Augmented reality glasses. A) Available at: <https://www.androidcentral.com/epson-moverio-bt-200-smart-glasses-now-available>. B) Available at: <https://www.bhphotovideo.com/explora/mobile/news/sony-smarteyeglass>. C) Available at: <https://blog.capterra.com/3-things-field-service-can-teach-any-mobile-workforce/>

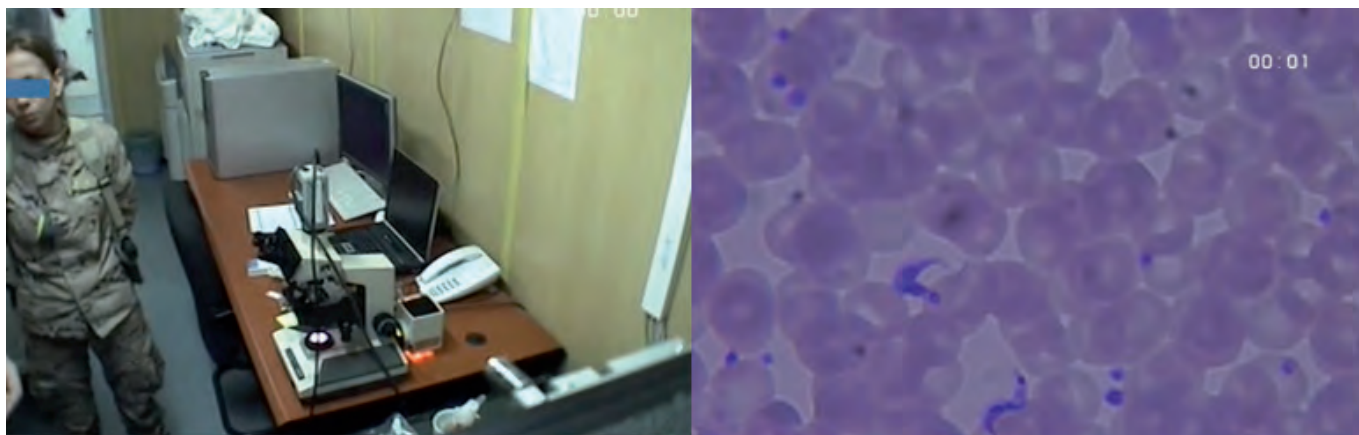


Figure 10. Telemicrobiology.

TeleICU: Leveraging the classic concept of “centralized or remotely-based critical care team networked with the bedside ICU team and patient via state-of-the-art audiovisual communication and computer systems”^{35, 36}, our systems gives our ICU specialist control over the remote electro-medical equipment of the critical care patient at some Medical Treatment Facilities, for example, on board Hospital of Spain’s Juan Carlos I Navy Ship.

Teleendoscopy: Any image obtained with a fiberscope of any internal cavity could be sent in real time. We have tested this capability in laryngoscopy³⁷ and bronchoscopy from the Operational Theater (Afghanistan Spanish Role 2 at Herat) with good results and even using the previously mentioned tele-assistant.

Telemedicine integration with Military Health Information Systems and Electronic Health Records

We are currently working to integrate all the electronic health records of teleconsul-

tations with our Operational Military Health Information System, called Cendala, so the physician giving remote health support can have all the information needed about the patient.

Telemedicine and Covid 19: Due to the Covid 19 pandemic, the relationship between health professionals and patients has changed. There is an explosive rise in the use of Telemedicine in healthcare, as for the pandemic it can be useful not only for individual medical aspects (diagnosis, treatment, aftercare, etc) but also public health aspects (early outbreaks detection, avoiding the spread of infection, helping social distance measures, saving personal protection equipment, etc)³⁸. Due to the SARS CoV-2 pandemic, all health care facilities are implementing new strategies in the field of Telemedicine. Telemedicine/ Tele-health can be also useful for the exchange of information between experts to contain the pandemic, telementoring of health personnel or patients, prescribe medications...

In the other hand, it can also be very useful for the diagnosis, treatment and follow-up

of patients with other diseases that have their access to health care limited or delayed because of the pandemic, specially those with chronic diseases with the use of wearables or sensors.

CONCLUSION

The Spanish Military Telemedicine System is pioneer in this field in Spain. Today it works 24/7 to give remote health support to military personnel deployed in Operations and remote or difficult-to-access locations. The strength of the system is the availability of all medical/ surgical specialists at the Central Defense Hospital “Gómez Ulla” in Madrid to give remote health support based on being the Higher Health Support Echelon to Operations or Role 4. In addition to e-consultation and videoconference teleconsultation, it has other capabilities (transmission of vitals, EKG, images of otoscopy, ophthalmoscopy, dermatoscopy, teleultrasound and surgical telementoring, all of them synchronous/ in real time).



Figure 11. Robotic teleultrasound.

The future of the system will include improved equipment (portable telemedicine devices, augmented reality glasses, sensors/ wearables) that will move Military Telemedicine to the point of injury, broaden its use (in evacuation platforms, telemicroscopy, teleendoscopy, etc) and integrate it with Health Information Systems and Electronic Health Records for more complete remote support in diagnosis and treatment.

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The International Pharmaceutical Federation (FIP) and its role to support Ukraine.

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Who is FIP and what it offers to its members?

The International Pharmaceutical Federation (FIP) is a non-governmental organisation that has been in official relations with the World Health Organization since 1948 and is the global body representing over 4 million pharmacists and pharmaceutical scientists. The FIP signed a Memorandum of Understanding with the ICMM during the Basil congress, in order to increase the collaboration between the two organizations.

The FIP Humanitarian programme¹ highlights how FIP can provide support to pharmacists and pharmacy teams in crises. It showcases the different humanitarian initiatives carried by pharmacists across the globe to demonstrate how adaptable the profession is depending on the crisis at hand and how colleagues can be more involved in supporting healthcare delivery in disaster and emergency settings, also highlighting the interprofessional collaboration among healthcare professionals in humanitarian arenas.² Very often, pharmacists provide essential roles and services by supporting the distribution of medicines to patients and providing advice on stock management.^{3,4}

As healthcare professionals, pharmacists have an ethical duty and responsibility of providing aid to others in disaster situations. FIP's Statement of Policy on the role of the pharmacist in the management of disasters⁵, makes recommendations to governments, supply chain and pharmacists organizations, and individual pharmacists

on the role they can play in preparation for disasters, be they natural or man-made, war, civil disorder or pandemics.

FIP supports the profession in countries during a crisis and create awareness of pharmacists' roles in disasters and emergencies, using their communities as support frameworks to ensure the profession's preparedness. Members of the Military and Emergency Pharmacists Section (MEPS) have been working in managing emergencies for years. As we see the impact of crises in increasingly fragile environments, it is paramount that pharmacists continue the work post-emergency and provide sustained humanitarian support, which can be achieved in many ways.

When an emergency or disaster situation arises, FIP uses several tools and options to support members in disaster situations including:

Communication and engagement

- Send a letter of support from the CEO / President with all types of FIP member organisations (MO) in the country/region affected. Offer the opportunity to meet at a suitable time to identify their needs.
- Where there are no member organisations, FIP will identify pharmacists on the ground to offer support.
- Contact WHO HQ / Regional / Country office to offer support (medicines access for example) and detail the actions FIP is delivering in nation and which organisations.
- Create an informal communication group with relevant team members for a quick communication and chasing actions
- Include communications on the FIP website and all relevant communication channels (FIP LinkedIn page, FIP Facebook page, member newsletter, etc).
- Identify contact/liaison between FIP and concerned organizations for continuous communication and coordination.
- On longer term, support organizations as required, in the field, by providing digital events or closed meetings to discuss and learn from other MOs.



Support through documents and resources

- Share FIP documents related to disaster/humanitarian situations
- Work closely with FIP Military and Emergency Pharmacy section.
- Start a fundraising initiative in line with the FIP governance framework on fundraising.
- Create a fundraising capability on the FIP Foundation website and ensure links are communicated widely, with members and externally.

What FIP did to support Ukraine

Subsequent to Russia's invasion of Ukraine on 24 February 2022, FIP has been in contact with the All-Ukrainian Pharmaceutical Chamber, as is our custom to reach out to our MOs in a time of tragedy. FIP acted on a request from The All-Ukrainian Pharmaceutical Chamber to organize humanitarian aid, in line with its vision and mission.

FIP obtained a list of aid products that were needed, developed by The Ukraine Ministry of Health. The Deputy Minister of Health of Ukraine for European Integration, coordinated the receipt of humanitarian goods. FIP continues active contact with several groups, both within and across the profession and external to the profession, in a concerted effort to provide support to our colleagues in Ukraine and maintain access to pharmaceutical care for its people. Further FIP shared the work of the World Health Organization that has established a web page on medical supplies donations for Ukraine⁶, which includes a list of critical needs requested by the Ukrainian Ministry of Health. Table 1 showcases some examples of FIP's resources developed for this cause.

¹ Canadian Armed Forces;

² Department of Medicine, University of Ottawa, Canada;

³ FIP-Military and Emergency Pharmacy Section;

⁴ FIP;

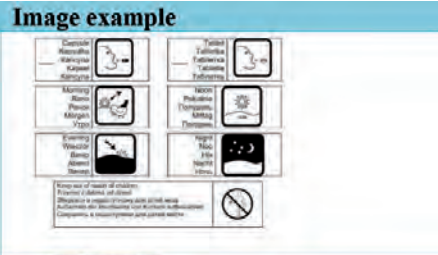



⁵ BCE Pharma

⁶ Department of Pharmacology and Clinical Pharmacology, Faculty of Medicine, Collegium Medicum. Cardinal Stefan Wyszyński University in Warsaw, Poland;

⁷ Austrian Armed Forces;

⁸ Pharmacists without Borders Austria.

Table 1 - List of FIP's resources in support to Ukraine

Type of resource	Image example
Medication instructions/pictograms - useable form in English, German, Polish, Russian and Ukrainian. ⁷	
Medication instructions/pictograms - example of how to use medications ⁸	
Tables of equivalence ⁹ between medicines registered in Ukraine and those available in other countries.	
“Guidance to facilitate the integration of the refugee pharmacy workforce from Ukraine” ¹⁰	

FIP continues to be engaged in the following activities and projects:

- Creation of a humanitarian webpage¹: <https://humanitarian.fip.org/>
- Update of a Statement of policy on disaster management
- Development of digital events for 2023
- Development of short videos to raise awareness and provide content on this area
- Translation of relevant documents for members in affected areas
- List volunteering opportunities for pharmacists to engage in humanitarian work

How the MEPS supported FIP in its effort

MEPS is one of eight sections of the Board of Pharmaceutical Practice of FIP. Its members include military pharmacists, pharmacists working with humanitarian and emergency organizations, academics whose areas of research include humanitarian and emergency pharmacy.¹¹

Upon receiving the request for humanitarian support from All Ukraine Pharmaceutical Chamber, FIP reached out to MEPS who was already in communication with some of its members currently serving in Ukraine. The war between Russian and Ukraine quickly resulted in a massive wave of Ukrainians leaving their country to take refuge in neighboring states. Many languages are spoken in Europe; however, most do not speak Ukrainian, the main language spoken by the refugees. The language differences became a barrier to the provision of basic pharmaceutical care in providing basic instructions on how to take medicine. The FIP via MEPS had developed and validated pictograms to label medications. As it is critical for pictogram to be accompanied with words, a small group of FIP members created a basic tool to assist pharmacists to communicate with patients. The one pager document provided pictograms to label medications with basic in-

structions in English, Polish, German and Ukrainian⁷. The one pager document was posted on the main FIP website for anyone to download. It was also distributed electronically to all Polish pharmacists via the Polish Pharmacy Trade Unions (ZZPF) part of the EPhEU (European Association of Employed community Pharmacists in Europe). This practice tool was welcomed by Ukrainian patients. A local assessment of the tool in a Polish camp welcoming Ukrainian refugees was prepared by the Medical Faculty, Collegium Medicum, Cardinal Stefan Wyszyński University in Warsaw, Poland under the supervision of two of the authors (Merks and Vaillancourt). The survey was implemented in cooperation with Farmaceuti.org. The survey revealed about a 99% Ukrainian patient satisfaction rate with this practice tool.

Another initiative was the “Medicines To Ukraine” website¹² posted on the FIP website. This website allows donations to procure medicine for Ukraine via Poland. The Pharmacists Defence Association, working with various continental pharmacist union partners is responding to the calls from Ukrainian hospitals for help and specialist medicines.

In parallel, through its members, MEPS had documents with basic useful medication information translated into German, Ukrainian, Hungarian, Polish and Romanian. These documents were made available on the FIP website.

Using its group chat, MEPS was also able to create a forum where members could ask for resources such as guidelines, and other relevant information to support them. This group chat has been active for many years and received the most traffic during the initial months of the Ukraine-Russia war. One MEPS member even shared his journey live, while trying to escape the fighting in the early days of the conflict.

Shortly after receiving the letter of request for humanitarian support with medications and medical products by the “All Ukraine Pharmaceutical Chamber” addressed to FIP president, the VP of MEPS informed the Austrian Chamber of Pharmacists about the need.

The Austrian Chamber of Pharmacists itself could not provide help directly to Ukraine but offered support within their possibilities and suggested “Pharmacists without Borders Austria (PSF-AUT)” to raise a possi-

ble humanitarian support with medications to Ukraine.

This was the start of a successful mission from PSF-AUT to bring medications and medical products into Ukraine to places where needed.

PSF-AUT is a young NGO established in 2017 following the example of Pharmacists without Borders Germany. The Ukraine engagement was the biggest mission for PSF-AUT so far.

The war led to an increased need of necessary medications and medical products to all regions of Ukraine to enable health care institutions (e.g. hospitals) fulfil their objectives, providing at least vital medical treatment to the population.

Humanitarian support in 2022 was brought to: Uzhhorod (Zakarpattia Oblast) Lviv (Lviv Oblast), Ivano-Frankivsk Oblast, and Kyiv (Kyiv Oblast) Kharkiv (Kharkiv Oblast)

Nearly all the humanitarian goods from all NGOs and Governments were transported into Ukraine by land and rail from a western border (Poland, Slovakia, Hungary or Romania.) – All the border stations had extremely long waiting periods.

In 2022 PSF-AUT was able to arrange 25 tonnes of humanitarian support of medica-

tions including controlled substances into Ukraine.

The humanitarian goods brought into the country have been coordinated by the Oblast authorities to ensure that the goods could be transferred to the places in need.

Because of the implementation of martial law in Ukraine it was necessary to coordinate each transport with the local (military) authorities.

The activities of PSF-AUT have been strongly supported by the Ukraine authorities. In some cases, police escort was provided.

Most of the transports were performed or accompanied by a PSF team to supervise the handling of the medications during transport and to ensure a proper handover to the recipient. The recipients were in all cases a hospital pharmacy or a designated (governmental) warehouse with experienced medical staff (pharmacist or nurse) in charge to handle medications.

All of these convoys brought their own challenges and risks, in one instance, on the transport to Kharkiv, the PSF Team was faced with two air raid alarms and had to find protection in shelter rooms.

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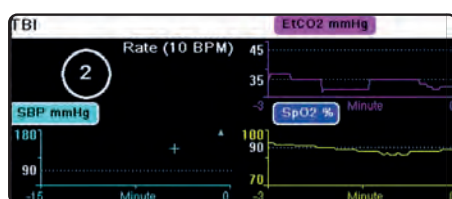


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¹Pazdan R, et al. *Traumatic Brain Injury in the Military*. Fundamentals of Military Medicine. Borden Institute-Office of the Surgeon General U.S. Army MedCoE. 2019, Chapter 38

²epic.arizona.edu

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