

Military Medical Support Simulation for Large Scale Combat Operations (LSCO) Planning

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Abstract

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Background

Doctrinal concepts of medical support are codified in the Allied Joint Publication (AJP) 4-10 "Allied Joint Doctrine for Medical Support". This publication does not consider implications of large-scale combat operations (LSCO) against a near-peer adversary as we have seen in the Russian Aggression of Ukraine. LSCO necessitate exceptional measures, accentuating the need for robust medical planning and rigorous testing of current best practices within a worst-case scenario. Employing fictitious yet realistic scenarios through tabletop exercises (TTX), wargaming, and live exercises (LIVEX) provide crucial insights into military medical planning, unpacking critical steps to reduce preventable mortality and morbidity in future combat operations.

Computer simulation models, with their cost-effectiveness and adaptability features, offer an appealing avenue for evaluating a myriad of parameters and the testing of variables. Modelling enables comprehensive statistical analyses, allowing quantification of variations across timelines, threats, injury types, and environmental factors. However, the reliance of these models on validation is crucial to avoiding unrealistic predictions regarding casualty management and resource allocation for medical planners. The necessity for validation is underscored by historical examples, such as the overshoot estimates of casualties in the 1991 Persian Gulf War, among several other historical examples.

Military Relevance

The need to join forces to address this critical challenge is vital in preparations for article 5 situations, where all nations will need to deal with large influx of casualties, and optimized response plans. The Alliance needs to collate each member's expertise in the field and provide clinical data for model validation. Doctrinal concepts must address the change for the new face of the future war, NATO needs to leverage the best among its members to address this change, medical planners need to be armed with the proper tools to optimize medical operations and develop data-driven approach originating from the M&S ecosystem to establish the impact of limited resources and evacuation means/logistics on casualty rates and mortality outcomes to provide optimal needed resources in a dynamic environment subject to denial. The leadership needs to recognize that this gap needs to be addressed especially when considering drones, bulk evacuation means, and the absence of Geneva Convention respect by Russia

resulting in additional security measures for medical evacuation and personnel that have not been considered during the last operations, namely counter-insurgency.

Scientific Objectives

The scientific objective is to contribute to the Medical Management Prototype developed by ACT of other modules devised at creating a simulation system able to provide data-driven estimates of number of assets needed for a given operational context. This shall include Casualty Rate Estimations for multiple days of operations, and the quantification of needed medical supplies, personnel, an MTF laydown and capacity optimized via computer simulations. Inclusions of operational aspects, logistical, and consequence management will be included. STRATEVAC modules and tactical/operational response should be modelled in a dynamic environment with mobility and low-footprint means.

The scientific objectives of this activity are all novel concepts, as the use of M&S for medical support planning, currently not done in NATO.

Expected Achievements

Nations are currently not developing a common approach to solve the issue, although, independently, work is being performed. It is imperative to merge and augment each other by collaborating, especially when it comes to interoperability, data access, and tools. The goal of this RTG is to develop a tool that will be used by the Alliance in the field in mission planning, and for real-time assessment of medical operations. As a result of this activity a prototype should be built. Subsequently validated and follow M&S standards set forth by NMSG. A CDT (proof of concept demonstration) is expected and a TRL of 5 to 6 after the activity.

Synergies and Complementarities

ACO JMED should provide/agree on scenarios and provide input for user requirements needed to develop the simulations. ACT M&S branch should assist in providing access to infrastructure to perform the simulations. NCIA should facilitate access to the Data Lake data (clinical data) to create synthetic patients in the simulations that align with a clear medical picture. The need to embed the MILMED COE and Medical SMEs from the HFM panel are important to ensure validity in procedures and outcomes for treatment timelines change. These include the use of Prolonged Field Care, Damage Control Resuscitation and Damage Control Surgery approaches and modelling of treatment outcomes, the use of resources including and not limited to blood and blood products and specialized medical supplies for accurate and realistic Medical Logistics (MEDLOG) aspects in planning.

Exploitation and Impact

The outcomes of this research will contribute to augmenting the current Medical Management Prototype and provide new tools for operational planning which will be based on Modelling and Simulation. In addition, this will contribute to inform nations on the needed requirements to make medical support simulation based on M&S a new capability. This knowledge will allow Nations and the Alliance to be better prepared for LSCO, establishment of a community in the M&S and HFM domains to address the change in doctrine for LSCO.

D: Adapt concept of medical support doctrine based on simulation output and ensuing SME engagement;

O: Medical Planners and Med C2 are direct end users of the tool and are not benefiting from such a capability now;

T: The developed tool shall provide alternate training capabilities in both "medical" CPX (PECC for instance), wargames, and TTX with COAs augmented by prior simulated mission rehearsal;

M: Optimize stockpiling of medical countermeasures, obtain data-driven estimation of requirements for medevac assets;

L: Assist decision-makers with medical campaign analysis and updated COP;

P: M&S experts to augment Decision makers, PECC personnel;

F: IT infrastructure (cloud access for data collection and integration), local solution (running off grid on laptop);

I: ensure a common set of data standards between the tool and the data acquisition solutions (for instance VITALS IQ output format).

Conclusions

Pull Quote