

The European funded project Nightingale: a leap forward in the management of victims of mass casualty incidents and disasters

Le projet européen Nightingale : un pas en avant dans la prise en charge des victimes d'incidents et de catastrophes de masse

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Introduction

Major emergencies have increased in complexity and scale. They have become more severe in magnitude and societal repercussions. They cross borders and affect the livelihoods of local and global communities. To increase resilience and disaster protection in the European Union, it is imperative to use the most advanced technology and up-to-date civil protection systems. NIGHTINGALE aims to optimize current procedures and methods and to enhance the operational capacities of emergency medical services and civil protection agencies in Mass Casualty Incidents (MCIs) and disasters. NIGHTINGALE offers intelligent, integrated, and interconnected tools and services. These technological solutions will be complemented with a commonly agreed operational framework that will be embedded seamlessly within the workflow. NIGHTINGALE enhances prehospital life support and triage procedures in two distinct ways. Firstly, by integrating training and validation approaches involving First Responders (FRs) in real-life scenarios. Secondly, by developing a wide set of technological tools that are aimed to be used by FRs in challenging and complex MCI environments allowing continuous monitoring and data capturing of the victims whilst enhancing for all actors in the chain the awareness of the incident's dynamics and availability of resources.

Keywords: Disasters, Mass Casualty Incidents, First Responders, Crisis Management

Introduction

Les urgences majeures ont gagné en complexité et en ampleur. Elles sont devenues plus graves en termes d'ampleur et de répercussions sociétales. Elles dépassent les frontières et affectent les moyens de subsistance des communautés locales et mondiales. Pour accroître la résilience et la protection contre les catastrophes dans l'Union européenne, il est impératif d'utiliser les technologies les plus avancées et les systèmes de protection civile les plus récents.

NIGHTINGALE vise à optimiser les procédures et les méthodes actuelles et à renforcer les capacités opérationnelles des services médicaux d'urgence et des agences de protection civile en cas d'incidents impliquant un grand nombre de victimes et de catastrophes. NIGHTINGALE propose des outils et des services intelligents, intégrés et interconnectés. Ces solutions technologiques seront complétées par un cadre opérationnel convenu d'un commun accord qui sera intégré de manière transparente dans le système. NIGHTINGALE améliore le soutien à la vie préhospitalière et les procédures de triage de deux manières distinctes. Premièrement, en intégrant des approches de formation et de validation impliquant les premiers intervenants dans des scénarios réels. Deuxièmement, en développant un large éventail d'outils technologiques destinés à être utilisés par les premiers intervenants dans des environnements de « Mass Casualty Incidents » difficiles et complexes, permettant une surveillance continue et la saisie de données sur les victimes, tout en améliorant la prise de conscience de tous les acteurs de la chaîne, la conscience de la dynamique de l'incident et de la disponibilité des ressources.

Mots-clés : catastrophes, incidents, victimes, premiers intervenants, gestion de crise

The NIGHTINGALE toolkit

In a world where disasters and crises evolve and cross boundaries with speed and ease, their complexity and magnitude increase and societal repercussions often reach severe scales, it is imperative to increase citizens' upkeep and feeling of safety and pro-

vide affected people the top-level healthcare that modern technology and current civil protection systems can offer. However, during the management of MCIs, emergency medical services (EMS) and non-medical civil protection practitioners, striving to save lives and care for the injured, often have to rely on complicated and outdated procedures. These can include multiple, sometimes conflicting protocols, and a lack of uniformity in response

methods and guidelines, as well as obsolete technology. The NIGHTINGALE project develops, integrates, tests, deploys, demonstrates and validates a Novel Integrated Toolkit for Emergency Medical Response (NIT-MR) which enhances pre-hospital life support and triage capabilities. This toolkit comprises a multitude of tools, services and applications designed to 1) upgrade the evaluation and prioritization of injured and affected individuals (triage)

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and manage casualties by providing digital identification, traceability, fast diagnosis and prognosis support, continuous monitoring, and accurate classification of medical conditions; 2) optimize pre-hospital life support and damage control through AI-based tracking, tracing, routing and utilization enhancements of assets, resources, and capacities, while enabling continuous monitoring and correlation of vital signs and actions; 3) facilitate coordinated response across EMS, non-medical civil protection personnel, volunteers and citizens. In the project the NIT-MR is provided at the service of EMS, non-medical civil protection personnel, volunteers and citizens for extensive testing, training and validation in the framework of a rich training and validation programme of 5 round tables, 3 table-top exercises, 1 laboratory integration test, 1 small scale and 2 full-scale exercises.

The presentation of the project in the 6th ICMM Paneuropean Regional Congress on Military Medicine

The NIGHTINGALE project has been presented in the 6th International Committee of Military Medicine (ICMM) Paneuropean Regional Congress on Military Medicine, held in Athens on April 16-19, 2024, by Roberto Faccincani, Emergency Surgeon, Principal Investigator in the project for the European Society of Trauma and Emergency Surgery (ESTES).

NIGHTINGALE is a 40 months project funded by the European Union's Horizon 2020 research and innovation programme. It started on October 1, 2021 and sched-

uled to conclude in January 31, 2025. The project Consortium comprises 23 partners from 10 EU Member States and Israel, consisting of 8 specialized Small-Medium Enterprises (SME) and Industries, 7 Research and Technology Organizations (RTO) and 9 End-Users partners. The latter include Emergency Medical Services of France (Service d'aide médicale d'urgence – SAMU de Paris), Israel (Magen David Adom - MDA), and Italy (Azienda Sanitaria Locale 2, Savona, Italy); 2 of the leading Academic Institutions in Disaster Medicine in Europe, the Center for Research and Training in Disaster Medicine, Humanitarian Aid, and Global Health, Università del Piemonte Orientale (CRIMEDIM-UPO, Italy) and the International Association for Promotion of Education and Training in Major Incidents and Disasters (MRMI&D, Sweden), Università Cattolica del Sacro Cuore (UCSC, Italy), and the largest scientific network of experts in Europe in the management of trauma and emergency surgery: the European Society of Trauma and Emergency Surgery - ESTES. Additionally, the consortium includes the Italian Ministry of Interior, representing non-medical FRs (firefighters and police forces), and the largest European network of citizens, Active Citizenship Network.

ESTES, as Coordinator of the User Advisory Board, contributed in the project by involving its 28 National Societies, representing 25 Member States of the European Union plus Turkey, Ukraine and Israel, collectively encompassing thousands of members. Through its Section for Disaster and Military Surgery, ESTES also convened into the project other relevant user institutions, to serve as member of the project Advisory Board,

including the World Health Organization, the Society of Trauma Nurses, the European Society of Emergency Medicine, the World Association for Disaster and Emergency Medicine, the European Society of Intensive Care Medicine, Medecines Sans Frontieres, the International Committee of the Red Cross, and the International Committee of Military Medicine. The Consortium's significant and well-qualified presence of end users, whose valuable contributions to the project were facilitated through a series of round table discussions organized by ESTES, was underscored – a rarity in Research and Development projects (R&D), usually dominated by enterprises.

To orientate the entire project towards the contributions of end users, this emphasis on users' involvement was pursued from the proposal phase onwards, under the coordination of Marta Caviglia, anesthesiologist and senior researcher from CRIMEDIM-UPO. Indeed, users' involvement spanned various stages, including the review of current guidelines and Standard Operating Procedures (SOPs) in disaster management, identification of existing gaps, and the request to technological partners for tools to address these gaps. Furthermore, it encompassed the development of user requirements for the whole NIT-MR toolkit, as well as its testing, evaluation, and validation through table-top, small-scale and full-scale exercises.

The NIGHTINGALE tools have been demonstrated for their potential use to a specific MCI scenario towards augmenting FRs' capabilities. Spyros Athanasiadis, engineer and senior researcher from the Institute of Communication and Computer Systems of Athens



Figure 1: Roberto Faccincani presenting NIGHTINGALE during the Paneuropean Regional Congress on Military Medicine, held in Athens on April 16-19, 2024



Figure 2: Spyros Athanasiadis presenting the ICCS technological tools during the Paneuropean Regional Congress on Military Medicine, held in Athens on April 16-19, 2024



Figure 3. Triage tools, including the DTT, First Responders Wearable - FRW (similar device with monitor) and the Triage Vital Sign App (TSVA), which manages the DTT.

(ICCS), provided a detailed presentation of one of the tools included in the NIT-MR toolkit, the Digital Triage Tag. This wearable device, when attached to a victim, serves multiple functions: 1) ensures unique identification, 2) monitors vital signs (Oxygen Saturation, Blood Pressure, Heart Rate, Respiratory Rate, Skin Temperature, Heart Rate Variability, Galvanic Skin Response), 3) continuously monitors the victim and updates the vitals every 30" seconds, and 4) distributes all the information collected or entered by the FR in real time at the command center. The vital signs are transmitted to the FRs wearable device, which is a device similar to DTT with the addition of a screen, furthermore the information is available to any mobile device and can be used on scene by the Triage Officer or the Incident Commander **at the of the project the NIGHTINGALE Toolkit consisting of more than 20 different tools, including the backend services, will reach TRL7 and deliver the 2nd prototype of the NIT-MR updated according to the end-user feedback.** This continuous monitoring of multiple victims by a single FR and the transmission of the information in real time to the command center, clearly demonstrates the added value of this technological tool.

Conclusions

The **NIGHTINGALE** project represents a leap forward in the management of victims of MCI and disasters. The NIT-MR comprises a multitude of tools, services and applications required to enhance the operational capacity of FRs across various levels (scene, transport, hospital, command and control centers) and Agencies (EMS, Fire Fighters, Police, Civil Protection). At the timeline of the project the NIGHTINGALE Toolkit consisting of

more than 20 different tools, including the backend services, will reach TRL7 and deliver the 2nd prototype of the NIT-MR updated according to the end-user feedback. Nonetheless, the pivotal involvement of end users

throughout the project lifecycle ensures that they have been developed, evaluated, and validated according to user requirements. The collaborative relationship established among all project participants, including ICMM, will undoubtedly persist with the shared goal of enhancing the management of victims during MCI and Disasters.

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Disaster and Emergency Medicine (Frontiers in Public Health)

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Many publications on the topic of Disaster Medicine

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Chairman of ESTES (European Society of Trauma and Emergency Surgery) Advisory Council and Executive Board 2019-2022

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Principal Investigator for OSR (Ospedale San Raffaele) of the European funded project THREATS (<http://www.threatsproject.eu/>)

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