NO - FEAR

Network Of practitioners For
Emergency medicAl systems
and cRitical care

NO-FEAR's summary of main findings, gaps and lessons learned from M18 to M24

Project title:	Network Of practitioners For Emergency medicAl systems and cRitical care				
Project short name:	NO-FEAR	Grant agreement number:	786670		
Author(s):	Luca Leonardi, Monica Linty				
Lead partner:	UPO	Contributing partners:	ALU, UCSC, MDA, UNS		
Work Package					
Dissemination level:	Public	Contractual due date		Actual Submission Date	

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1. Executive Summary

NO-FEAR project is bringing together a pan-European network of practitioners, decision and policy makers in the medical and security fields. They are collaborating to achieve a common understanding of needs, as well as - in collaboration with academia and industries – increase the EU innovation potential that could better fill the operational gaps and recommend areas for future innovations.

NO-FEAR main objectives are to:

- create a long-lasting community of practitioners, interacting with a network of suppliers and academia,

- elaborate an innovation roadmap, with practical recommendations for uptake,

- advise relevant Research and Innovation projects,

- support market uptake of EU research results,

- issue policy and regulatory recommendations enabling collective procurement,

- indicate priorities for standardization,

- support quick wins and practical short-term results,

- implement a transactional dynamic portal providing fora, a catalogue, marketplace and flexibility to address new threats.

The findings detailed below can be found in the NO-FEAR portal, categorized in the specific sections and linked with the respective pillars.

3. Abbreviations

CA = Consortium Agreement

DoA = Description of the Action

EC = European Commission

GA = General Assembly

PC = Project Coordinator

PM = Project Manager

PO = Project Officer

NMB = NO-FEAR Management Board

WP = Work Package

4. Summary of the findings in project's lines of action from M18 to M24

Work Package 1 – Ethics Requirements, Human, Social and Legal issues

Areas of Main R&D Gaps

- There is a growing number of trainings and tutorials on how to deal with and understand cultural, religious and traditional (CRT) aspects when providing health care. What is lacking are training modules/ programs on how to include CRT when responding to an acute emergency critical incident.
- It is hard to avoid social stigma when dealing with Covid-19 (and other communicable diseases).

Best Practices and Lessons Learned

- Huge need for ethical guidelines when dealing with communicable diseases.
- Raising awareness of the inevitable interaction between the EMS and bystanders is crucial in achieving a better understanding of the value each group has when joining efforts to save lives.
- National guidelines for establishing easily available first-aid courses to the public could be a way of strengthening the societal resilience.
- It is important that training in managing the bystanders and non-organized are embedded in a standardized education for EMS.
- **Focus group discussions on terrorist attacks and shooting incidents showed the following results:**
  There seems to be a **discrepancy between the security plans and the actual situation.** Whereas in the plans a red zone is defined rather fast into which only special police forces are allowed to proceed, as well as a yellow zone into which special groups of emergency first responders are allowed in order to save and rescue potential victims, in the events discussed, helpers were either not aware of red or yellow zones or were already within these zones when the police established the boundaries.
  Thu,s first responders were at high risk of injury which resulted in a need for special trainings on how to behave when suddenly finding oneself in a red or yellow zone. This becomes especially difficult when there is a mobile situation as in Paris or Brussels.

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Work Package 3 - Acute Care of the Patient

Research and Innovation Monitoring

Many public bodies organized Hackathons for finding solutions that can help in tackling coronavirus spread (https://theglobalhack.com/health-wellness/; https://hackcovid19.bemyapp.com/; https://codevscovid19.devpost.com; https://www.hackthecrisisnorway.com; https://euvsvirus.org/). Many of the solutions proposed could have a real impact on the hospital and emergency services. The most promising solutions should be followed by the project in order to inform the stakeholders and evaluate the real applicability of those. Some of the most interesting solutions identified are relative to:

- early detection of COVID symptoms [STOP-COVID (Safe Triage and Orientation of Patients); COVID-19 early detection with HRV app; Detect Now; VOICEMED; COV2WORDS - AI-based Shortness of Breath Detection via Phone]
- 3d models to print important supplies [CoProne; more solutions, not related to hackathons are: venturi mask valve, charlotte valve, face masks; face shields; Mask Ear Saver]
- prediction of COVID+ patients need for hospitalization or ICU [Huddle; doctor@home]

In the next reporting period other areas may be identified.

Many cost-effective solutions already identified in the past can be applied with success to this crisis. The case of Boussignac Valve (produced by Vygon) is to consider successful.

Areas of Main R&D Gaps

- Masks used for COVID from the Health Care Workers are often painful, masks break skin and the communication with patients is often affected because of it;
- Goggles become misted and have to be adjusted frequently;
- Suits or other body protections give a claustrophobia feeling and an extreme thermal discomfort.[1]
- Often during major crisis or disasters the health care sector (as many others) ran out of supplies, especially PPE or replacement parts, this poses at a serious risk workers and patients. A more detailed analysis on possible solution for the supply chain as well as a

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[1]CIEHF survey confirms serious PPE problems on the frontline - https://www.ergonomics.org.uk/Public/Think/CIEHF-survey-confirms-serious-PPE-problems-on-the-frontine.aspx

research around the possibility that the facility could produce their own PPE or spare parts is required. PPE should benefit from in depth research especially with regard to aerosolization side effects

Requirements to Fill Capability Gaps

- Psychological issues that COVID has raised in Health Care Workers are many, these were reported in the "Preliminary lessons learned around COVID-19 response" document on the portal, this includes: concerns about PPE, apprehension for HCWs families and relatives, stigma for being seen as plague-spreader.
- In the Employment in human health activities by sex and age (from 2008 onwards) statistic published by EIGE (European Institute for Gender Equality) highlight that women are up to 76% of the healthcare workers in EU-28.2 This request a serious and deep analysis of the needs that were unmet before and COVID can contribute to this.
- Information on new treatments and technology that might help in fighting the COVID (or other pandemic/CBRN event), as well as clinical trials should be largely and timely disseminated between countries and organization [an interesting partial solution to this gap can be viewed here: https://www.collabovid.org/].

Priorities with Regards to Standardization

Interoperability for shared information particularly at semantic and technical levels are key priority and is priority for NO-FEAR standardization. In this context, work on pre-standardization activities between the 3 platforms (Encircle, No-Fear and Stair4Security) is the focal point. As already identified in previous reporting periods is utmost important to identify the material that is necessary for each type of disaster and/or mass casualty for each stakeholder. This is relevant also for Health Care Workers and involves also other FRs that provide first aid. This was identified by practitioners during the COVID-19.

Best Practices and Lessons Learned

- Webinars are really important in discussing treatment options and organizational matters, furthermore they can be useful in reporting experiences.
- The webinar on ventilation highlighted the importance of a holistic approach: organizational, pharmaceutical and therapeutically from the beginning of the disease up to the full recovery. This approach should be shared by the general practitioners, FRs, hospital staff and relatives of the patient. It highlighted the fact that lessons are learned step by step and what was right yesterday might not be good tomorrow.
- From the webinar on ELSA and especially from the interviews conducted on the psychological part we learnt: importance of training, need to avoid the possible hoard of materials by staff, HCWs unrest.

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[2]https://eige.europa.eu/gender-statistics/dgs/indicator/ta_wrklab_lab_employ_selected_healthcare__lfsa_egan22d_hlth/hbar

Research and Innovation Monitoring

- The use of **drones used by EMS** has been one of this WP focus (webinar planned for Frbruary 2020 and postponed due to Covid-19)
- COVID19: MHPSS.NET- a platform of the IFRC, there is a dedicated group for COVID 19 with resources about PSS and mental support
- MCI: Several EU project, dealing with cybersecurity of medical devices were identified (www.panacearesearch.eu, https://sphinx-project.eu/, https://curex-project.eu/).
- Several EU projects and programs focus on drones (see annex 1)
- **Covid-19: useful resources:**
  The Norwegian Institute of Public Health: Coronavirus disease – advice and information
  https://www.fhi.no/en/

  European Research Area corona platform (useful links and resources):
  https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/covid-19

  Horizon 2020 FAQ (in relation to the Covid-19 outbreak):
  https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/faq;type=1;categories=;programme=H2020;actions=;keyword=COVID-19%20outbreak

  Organizations fighting COVID-19:
  World Health Organisation: Coronavirus disease (COVID-19) Pandemic

  CEPI (Coalition for Epidemic Preparedness Innovations), a global alliance financing and coordinating the development of vaccines against emerging infectious diseases

  GloPID-R (Global Research Collaboration for Infectious Disease Preparedness)

  European Centre for Disease Prevention and Control -
  Considerations relating to social distancing measures in response to COVID-19 – second update:
  https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-social-distancing-measuresg-guide-second-update.pdf

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- **Spontaneous volunteers** are especially vulnerable. The understanding of knowing that you did the right thing is key to "stay healthy" psychosocially after dealing with a traumatic event. It is a unique kind of care to provide for the spontaneous volunteers, both during and after a critical incident, and there should be systems in place to educate the EMS personnel in these matters. This point is closely linked to task 1.6 (WP 1).

Article in Ambulance Today on "First Responders at the Frontline: Collaborating with the Non-Professionals". The article focuses on the roles played by civilians, bystanders and other non-professionals in collaborating with first responders to enable scene and patient safety. It highlights key points regarding the relationship between the public and security incidents:

- Bystanders and non-organized volunteers usually initiate life-saving measures quickly
- Altruism of the population is crucial to the efforts made to save lives
- It is sometimes necessary for first responders to make use of bystanders and non-organized volunteers to effectively meet the needs of the injured

- **Scene security - safety first? What makes the scene unsafe?**

Training Manual for Ambulance Response in Risk Situations (TARS)
Verbal abuse and physical assaults are a growing problem and a global challenge for ambulance and pre-hospital services. There are different needs associated with different contexts and the lack of a low threshold tool that both meets and identifies the challenges associated with threats and violence is great.

NorCross (in collaboration with Community of Action for Ambulance and Pre-Hospital Services in Risk Situations, CoA (most who are stakeholders to the NO-FEAR network)) saw that there was an unmet need for a simple tool in dealing with threats and violence towards health personnel in acute operations, and decided to develop a method to meet this reality which is practical, but also simple and uncomplicated to apply in different contexts.

This tool will focus on risk awareness, conduct and behavior of medical emergency personnel (EMS) to help prevent or mitigate security incidents before, during and after the delivery of health services. The purpose is to learn how to prepare and respond to the variety of risks you may face while just doing your job. Evaluation of experienced security scenarios is also an important factor in promoting further learning and best practices.

This training tool is meant to be complementary to other approaches and tools. E.g. the Safer Access Framework[3], Best Practice for Ambulance Services in Risk Situations[4] and Training Manual on Interpersonal Violence Prevention and Stress Management in Health Facilities[5].

TARS is a prevention and a mitigation tool. It aims to strengthen the security of health professionals, as well as prepare for how the consequences of violence affect their services. TARS is a low threshold initiative that can provide a short set of informed and contextual recommendations on how to make operations a little safer: Universally accessible, used globally and can be contextualized for varying needs and realities.

Who should use this toolbox?

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[3] https://www.icrc.org/en/publication/4226-safer-access-introduction
[4] https://www.rodekors.no/globalassets/globalt/rapporter-program-avtaler/health-care-in-danger-hcid-rapporter/ambulance_best_practice_report_english.pdf
[5] https://www.rodekors.no/globalassets/globalt/rapporter-program-avtaler/health-care-in-danger-hcid-rapporter/hcid_manual_for_hcpersonnel_prev_violence_stress_.pdf

This manual is designed for ambulance and pre-hospital personnel and to provide an opportunity to be better prepared when exposed to perilous situations. The manual should be used by staff who have been trained in TARS.

How this toolbox should be used?
These guidelines provide an overall conceptual and methodological approach to help ambulance services providers to increase their resilience towards a series of risks they are faced with in the frame of their activity. This toolbox is not a prescriptive how-to guide but rather general guidance with some examples. It cannot be fully prescriptive; because it applies broadly too many contexts and scenarios, all the information it contains will have to be adapted in view of local needs.

Tentative table of contents:

Areas of Main R&D Gaps

- It is hard to avoid social stigma when dealing with Covid-19 (and other communicable diseases).
- Ethical challenges due to the treatment of Covid-19 patients:
    - High number of patients   -> Lack of medical personnel. Who will be treated?

               -> Lack of PPE. Health personnel afraid of getting infected.

- COVID19: Prepare for large numbers in Oxygen therapy, with flows of 10 LPM (masks and CPAP). Consumes a lot of oxygen, and requires proper oxygen supply to provide it for long time and with high enough pressure.
- COVID19: PPE used is based on experience from other outbreaks, and varies greatly between organizations. Need: Based on the characteristics of the pathogen, definition of the needed PPE per procedures.
- COVID19: PPE used is plastic based. Besides the environmental impact of the amount of single use PPE discarded on a daily basis, there is Need: for PPE who is more comfortable to use (especially on its thermal stress impact).
- COVID19: Decontamination and disinfection – decontamination and disinfection procedures are based on the use of Alcohol 70% or Hypochlorite solution (1000 ppm or 5000 ppm). The procedure requires PPE to be used by the persons performing the disinfection, considerable time, and is associated with corrosion (and some equipment that cannot sustain the Hypochlorite disinfection). Needs:
- Validation
- New disinfection procedures utilizing new technologies / products that are more environmentally / equipment friendly, require less time and resources, and are more effective than current ones.
- Disinfection procedures for ambulances considering parts of the vehicle to be serviced by mechanics without PPE.
- Disinfection procedures for large spaces like – classrooms (to allow resuming activities like trainings).
- COVID19: "Social distancing" creates major challenges for trainings, especially of team members, as treatment of acute patients requires "team work". Needs:
- Need to validate the capacities and limitations of "e-learning" concerning skills acquisition and retention.
- Models for "remote skills stations".
- Guidelines for simulations involving a group providing care (considering participants who are participating in "part time trainings").
- New framework for "refresher training" including remote and hands on trainings (with validation of the skills retention).
- Design and validation of tools that will allow mass training of personnel with basic training, who need to upgrade their skills (e.g. nurses and physicians who are not ICU personnel and have to be trained to care for ventilated patients).
- COVID19: Career choices – COVID 19 exposed many Health Care Workers in very different settings to a great risk (with illness and death among HCP), resulting in organization implementing limitations on the activities of staff and volunteers considered as being part of "risk groups" [to the degree that some volunteers based EMS services had to dramatically reduce their response].
  Need: understand the impact of COVID on career choices of health care providers – paid

staff and volunteers. Develop a "personal risk assessment" scale that will allow for decision making processes on the involvement of work force considered "risk groups".

- COVID19: The epidemic is associated with several issues related to the way acute patients are treated: 1) Procedures that are considered "standard of care" are associated with possible creation of aerosol from the patient's airway thus considered risky to the team (e.g. Nebulization, CPAP), 2) For EMS with a concept of operations requiring transport to a hospital, patients do not want to be transported or hospital refusing admission of "none critical patients" 3) for COVID confirmed patients under "hone quarantine" the need to minimize none necessary transfers to hospitals. 4) Elderly patients and those living in institutions as especially vulnerable. Needs:
- New medical devices protecting HCP from the aerosolization risk.
- Validation of tele-medicine tools concerning decreasing the number of patients eventually transferred to hospitals.
- Tools for continuous monitoring the health status of vulnerable groups, with the intention of early identification of outbreaks.
- Tools for continuous monitoring of outbreaks using AI.
- COVID-19 crisis is associated with major societal impact. Need: understand the impact of the crisis on disaster management (trust, willingness of the public to follow instructions, resources) as well as lessons learned from the "crisis management / risk communication" perspectives.

Best Practices and Lessons Learned
- Huge need for ethical guidelines when dealing with communicable diseases.
- Raising awareness of the inevitable interaction between the EMS and bystanders is crucial in achieving a better understanding of the value each group has when joining efforts to save lives.
- National guidelines for establishing easily available first-aid courses to the public could be a way of strengthening the societal resilience.
- It is important that training in managing the bystanders and non-organized are embedded in a standardized education for EMS.
- COVID19: Actions done be an EMS in Spain- protecting human resources, debriefings every shift including updates, web updates and guidance movies. Also- increasing ALS availability, increase equipment preserving and disinfectant. CBRN teams help other teams to dress, decontaminate- improves safe feeling of staff. Trying to avoid entrance of mild cases to the units or hospitals. Using a new machine to decontaminate units in 15 min and not in 4 hours. Have a psychologist available 24/7/365.
- COVID19: Plan and prepare to adjust better to the new situation (working from home, staying with the children). Reach out to the staff and volunteers, offer support (not only by mail). Use the peer support system, have hot line for staff members. Ideas for parents to spend time with the children, have online training for staff. More information is also available on the PSCENTRE.ORG.
- COVID19: People see the information on the official websites, call the emergency hot line and hear the same information and only then they believe. Tent to accept only spoken information, not just written.

- COVID19: Many EMS personnel under quarantine, most are non-work relates exposures. They have a WhatsApp groups to share concerns, questions and funny things. It is important to have someone accepted by the group to give the "formal" answers.
- COVID19: Instruct personnel not to carry personal bags to the ambulances to avoid to need of disinfection
- COVID19: Use designated teams to assist others to wear or remove PPE
- COVID19: When transporting a patient, open the vehicle windows
- COVID19: The location of the personnel should be as far as possible from the patient (when the medical conditions allow it)
- COVID19: Avoid as much as possible from airway procedures (intubation, CPAP)
- COVID19: Open an email for questions or suggestions from personnel (if operating a hot line is not possible)
- COVID19: Share recommendations and instructions by video (through WhatsApp or social media). People prefer seeing other people, rather than reading texts.
- COVID19: Less surgeries (no electives), OT recovery room ready to be converted to General ICU.
- COVID19: Under investigation cases stay at home, and supposed to be tested again in 4-5 or more days. They are usually frightened and sometimes go to the hospital by themselves. A possible solution could be a daily communication, remote or physical.
- COVID19: Waste management (bio-hazards) is important and must be planned well, as amounts of waste keep growing.
- COVID19: Personal Protective Equipment (PPE) – for the foreseen future (many months) PPE is going to be part of the "normal SOP" for EMS responder, from respiratory and eye protection as "basic protection" to "full PPE" in certain cases suspected as potential COVID patients (e.g. patients with respiratory distress).
- COVID19: The crisis emphasizes that CBRN specialty is very important. Even if COVID-19 is borderline between medicine and CBRN, the ability of health care workers to understand and to know CBRN procedures and issues, is very important to provide authorities accurate recommendations.
- MCI: The triage of patients is being performed at the entrance of the hospital versus inside the ER in other incidents.
- MCI: Registration of patients will be done during the initial triage.
- MCI: At the triage, security and bomb squad technicians will check the casualties and their belongings to prevent entrance of dangerous objects into the hospital.
- MCI: Creating easy and safe route to allow ambulances and vehicles to bring casualties to the hospital without creating traffic congestion is essential.
- MCI: If possible, consider reutilizing a clinic in the hospital for the treatment of the walking wounded.
- MCI: Special attention must be given to walking casualties in incidents of shootings or blasts. All of these casualties will go through a chest X-ray / ear and eye examination, to roll out blast injuries / penetration of foreign objects.
- MCI: Psycho-social support will be given only after the medical clearance is done by a physician
- MCI: Ideally, critical casualties will be regulated between different hospitals. To avoid overloads, casualties that need to be hospitalized will be transported after stabilization to other hospitals.

- MCI: In a security related MCI, personal belongings will not be taken by the EMS from the scene to the hospital.
- MCI: Every casualty that enters the ER will be stripped of their clothes and be checked by a security guard before triage is done.
- MCI: Perpetrators will be transported with a police escort in order to create a "sterile" environment that enables medical treatment. Many times the offending side and the injured party will be treated in the same trauma or emergency room, which might cause public antagonism and another incident in the hospital. The hospital personnel will try to hospitalize them in different rooms, in case hospitalization is needed.
- MCI: It is important to identify the local security forces active near the hospital, for better cooperation and support when needed.

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Using a heat-seeking camera from a drone, a missing woman was found alive in Mandal. This is the first time in Norwegian police history.
This is what the police use drones for: -fires -Search actions and search for missing persons -Documentation of scene -Preparing for the arrest of dangerous persons -Mapping and observing an area https://www.nrk.no/sorlandet/politiet-fant-savnet-kvinne-i-mandal-ved-hjelp-av-drone-1.14984110

Work Package 5 - Education and Training of Personnel and Volunteers

Due to the COVID-19 Pandemic the roadmap identified in the previous reporting period was delayed. The WP5 recognized the importance to give a contribution in the fight against coronavirus with regards to training of staff and volunteers.

Research and Innovation Monitoring
Just-in-Time training is utmost important in the case of coronavirus, an emerging infectious disease with limited knowledge of the contagion, pathophysiology, diagnosis and treatment. Planners, educators and clinicians have had to learn and disseminate information in real time to affect appropriate care.

1. Here below are reported the most interesting areas of research and innovative monitoring identified during the COVID-19 pandemic:
    A. PPE supply shortage
    B. Triage Screening for Person under investigation
    C. Alternate Care Site
    D. Laboratory Investigation
    E. Imaging strategy
    F. IV Fluid management
    G. Pharmacologic Therapy options
    H. Respiratory Management
    I. Personnel Redeployment

    J. Incident Command System
    K. Fatality Management
    L. Messaging
    M. Rationing of Care
    N. Contagion Control

2. Examples of Just-in Time training for COVID-19 were delivered by important agencies for health in the world, here below some examples:

    A. https://asprtracie.hhs.gov/technical-resources/137/covid-19-healthcare-workforce-training-resources/99

    B. https://eva.ecdc.europa.eu/course/search.php?search=COVID-19

    C. https://emergency.cdc.gov/cerc/training/archives.asp

Areas of Main R&D Gaps

1. Lack of the following points results in issues in designing plans, educational modules and training courses.
   A. Lack of pandemic plans: sudden onset disaster mass casualty incident management plans have limited application to a pandemic, a gap is created without plans health care delivery systems risk inadequate staff, stuff and structural response.
   B. Lack of evidence-based guidelines: an emerging infectious disease presents clinical diagnostic and treatment challenges with few if any previously disseminated evidence based clinical treatment guidelines for clinicians to adapt and adopt to the evolving SARS-nCoV-2 clinical spectrum a critical clinical treatment gap is created
   C. Reliance on observation studies: as the COVID-19 clinical spectrum emerges the medical community has to rely on observation studies from various health care facilities a gap is created without validation of data, heterogeneous reporting of data, inadequate conclusions based on small sample sizes that lack the scientific analysis provided by random controlled or cohort studies.
   D. Need to pool studies: reliable data can be obtained from multiple health care facilities across cities, regions, states and nations, however privacy concerns, mistrust amongst competing entities and regulations limits rapid acquisition and analysis of critical information, this gap leads to a lack of rapid clinical treatment strategies.
   E. Expedite ethics/IRB approval: delays in approval for proper clinical studies leads to gaps in clinical knowledge.
   F. Peer-review journal process: researchers have delays in publication of relevant clinical information and this leads to a gap in the production and dissemination of educational information and this creates gaps in clinical practice.
   G. Reliance on professional association evidence-based guidelines, consensus statements or "white papers": clinicians follow these evidence based guidelines that are created following strict processes a gap ensues when these processes are delayed due to lack of scientific studies that lead to these guidelines as well as the usual deliberative process that spans months.

2. Limitation in rapid validation of education games: educational on-line gaming programs require multiple validation steps to assure content accuracy and functionality that typically takes months from planning to completion that is not available to educators in the evolving COVID-19 pandemic this gap limits a proven educational tool.

3. Lack of consistent train-the-trainer programs to rapidly educate clinicians to innovative practices/equipment/therapies: as the COVID-19 clinical spectrum has evolved the time to assess data to develop clinical safety, triage, diagnostic and treatment strategies has been prolonged and this creates a gap to train-the-trainer to then be able to widely disseminate the information.

4. Effective use of volunteers: ranges from physicians, nurses, EMTs and other allied health professionals that are either retired, practice outside the hospital, or have maintained their license and certification but do not actively practice will require the same education and training for their assigned duty station similar to the active health care provider, if not more since these non-active providers have not been practicing in the hospital. These non-active providers will require extra attention or additional education and training to achieve competencies.

Common Requirements to Fill Capability Gaps

1. Consistent evidence-based guidelines: health care practitioners across the spectrum of medicine can rapidly and effectively receive just-in-time training based on a consistent format consistent format of Evidence Based Guidelines. Delays in first explaining the format of a clinical guideline will lead to delays in care.

2. Consistent clinical competencies: when redeployed from usual duty station to a COVID-19 duty station there needs to be a standardized milestone achievements that demonstrate competency before permitting staff to assume a new role

3. Consistent mentoring: train-the-trainer coaching needs to be uniform to assure appropriate teaching

4. Consistent empowerment of personnel to practice proper hygiene through the buddy system: to encourage workplace safety from proper PPE utilization, mental health and physical fitness each provider has to first be fit for duty to achieve proper clinical care of a patient

Indicate Priorities with Regards to Standardization

In case of pandemic, as already mentioned, it is important to react rapidly. Normal standardization activities take time and effort through rigorous studies, systematic literature reviews, meta-analysis and then publication and dissemination of the analysis.

There needs to be a strategy to streamline the rapid standardization to effect the development of rapid training in the areas of: diagnostic strategy, defining clinical outcomes and data reporting.

The recent COVID-19 pandemic proved once more the need of standardization in DM education and widespread of this academic topic.

Best Practices and Lessons Learned

A. Lessons learned from CBRN exercise conducted in February 2020:
   - The bottleneck was the disrobing station, implying that one additional nurse at disrobing could significantly improve this capacity.
   - This study shows a positive trend in CBRNe procedure knowledge thanks to the training and simulation. After the simulation exercise, all personnel felt prepared for a real chemical decontamination of multiple victims, therefore we promote to organize more of these simulations in the future.

B. Lessons learned selected in recent literature:

Mixed training (webinar + discussion + hands-on training) instead of only in-presence training can be useful when physical distance should be maintained. The real effectiveness of such methods should be assessed.
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Effective use of virtual Hand Hygiene education.
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Education while social distancing.
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Effective training of nurses during the pandemic.
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Effective use of videoconference for confined students.
Moszkowicz D, Duboc H, Dubertret C, Roux D, Bretagnol F. Daily medical education for confined students during COVID-19 pandemic: A simple videoconference solution [published online ahead of print, 2020 Apr 6]. Clin Anat. 2020;10.1002/ca.23601. doi:10.1002/ca.23601

Effective adaptation strategies to maintain competency based medical education.
Hall AK, Nousiainen MT, Campisi P, et al. Training disrupted: Practical tips for supporting competency-based medical education during the COVID-19 pandemic [published online ahead of print, 2020 May 25]. Med Teach. 2020;1-6. doi:10.1080/0142159X.2020.1766669

Effective on-line training of faculty to develop multiple-choice questions.
Eltayar AN, Eldesoky NI, Khalifa H, Rashed S. Online faculty development using Cognitive apprenticeship in response to COVID 19 [published online ahead of print, 2020 Apr 23]. Med Educ. 2020;10.1111/medu.14190. doi:10.1111/medu.14190

Work Package 6 – Innovation Monitoring and Uptake

Research and Innovation Monitoring

Trends were described in our periodical report where market fields related to the project topic were identified and marked. It has been noticed that there is a transition from high quality – high cost products to low cost – medium/low quality. The need to lower operational costs but to keep the same preparedness and response levels, leads to a change in the decision making in medical device tenders.

As governments and health insurers worldwide implement measures to control costs, EMS services, fire departments and hospitals are operating on tighter budgets, while private facilities are receiving lower reimbursements. These measures are triggering a transformation of the purchasing process that will change the way that medical products are bought and valued. Manufacturers need to adopt themselves to the rapidly changing market in order to continue the production of certified, quality passed and safe products. Few customers seek for low cost devices, lowering expectations regarding the "premium" position of the product, yet not giving up on safety, efficacy and customer service.

Companies dealing with medical device production and R&D must consider few points, such as:
- Registration. What is the designated class of the device? How difficult the registration will be and how many stages it will require. New devices might require clinical testing and ethical approvals – this is a long a difficult procedure that might halt the initiative at the beginning.
- How "new" is your device at the market? Is it bringing a message of life saving, life quality improvement or just an improvement in comfortability? Example from the area of hemorrhage control: Is the new device designed for aggressive arterial bleed, care of diabetic wounds or treatment of light bruise? All these will require different R&D, different registration and different pricing.
- Marketability. Is your product "selling itself"? How much you will need to invest in marketing after the registration phase? Competitor research is crucial at this point.

Suppliers have identified new obstacles in terms of manufacturing as a result of COVID-19:

- Monitored trends in hemorrhage control in mass casualty and single perpetrator events.
  - Many companies now producing first aid kits and tourniquets in response to this trend (slowed due to COVID-19 but expected to pick up following crisis).
- Requirement for Ventilator related products increased significantly as a direct consequence of COVID-19. (To be monitored following COVID-19 crisis.)
- Airway management became extremely challenging in COVID-19 context. This required new protocols and limitation of use of aerosol spreading airway devices
- Blood products in the field is trending – related to trauma (slowed due to COVID-19 but expected to pick up following crisis).

Change in EU policy of medical devices. Higher quality for patients but very expensive for companies due to the increased level of quality control required including large scale clinical trials.

- Current ISO 13485 – was May 2020, now June 2021.
- MDD to MDR registration change
- Audits being completed via VC. This is in the early stages so unclear whether it will be a success.
- In the UK, there are currently not enough auditors qualified to the new standards to actually carry out the audit. Delays of up to 1 year prior to COVID-19 crisis.

Best Practices and Lessons Learned:

TASKS 3.3, 4.3, 5.3: Workshops, Demonstrations and Exercises	TASKS 3.1, 4.1 and 5.1: Lessons Learned & best practices, current needs, new threats and new trends identification
Months 1-18 — Foresight Exercise (Nice November 2018) — WP4 Exercise (Madrid April 2019) — WP3 Workshop (Rome November 2019)	**WP3: Acute Care of the Patient** Prehospital care of paediatric patients is limited. Children of all ages require special care. They cannot be treated as small humans. Transport & transfer of the patients from EMS to Hospital. Hot Topic in the medical community due to need of a rapid intervention but also avoidance of loss of information. Damage Control and education around it (Linked to WP5). Previously relegated to military personnel, today this knowledge is being transferred to the civilian setting. Responder safety (including psychological care) is limited. Physiological care of patients. Further information is available in the analysis conducted by Task 1.7 Biological hazards and epidemic/pandemic **WP4: Acute Care Operations in Security related Incidents** Scene safety ("safety first" does not work in reality) Personal protective Equipment (PPE) for EMS Hospital preparedness PSS for bystanders who provided FA Communications systems Reporting and lessons identified methodology Risk assessment methodology Common language and joint planning Real time management of data from multiple site – "making sense" Lack of resources to avoid issues with cyber security **WP5: Education and Training of Personnel** Development of disaster medicine curriculum for all stakeholders involved in response (ambulance, RN, MD, volunteers); focus on basic training and in second step advanced More specific training in certain skills depending on the task in response: e.g. PPE for fire fighters, bleeding control for medical and non-medical personnel etc. Harmonization of drills code of federal regulations WHO guidelines on exercises, drills, table-tops etc. Development of KPI for trainings and drills in order to be able to evaluate the success of the exercises and to be able to perform research in this domain Validation of new training tools (VR, AR, computer simulation) as an acceptable educational methodology.

Priority Standardization Action Plan: NEN was actively monitoring No Fear WP 3, 4 and 5 meetings and activities (e.g. trainings / seminars), with the aim to signal gaps, needs and opportunities for standardization purposes. These are continuously mapped and brough to the attention of the relevant standards organization, CEN TC's and ISO TC's for further uptake. To enable this, a comprehensive overview of for the project relevant technical standards committees (listed per subject) has been assembled. Moreover, connection was sought with other stakeholders, both on national and EU/international level, to connect expert practice with a wide array of stakeholder (policy-makers, academia, sector organization, standardization community etc.). Further work was put it to identify relevant standards, guidance documents and "questions from the standardization field" into the NO-Fear network. With this activity the link from the No-Fear network to standardization and vice versa was guaranteed. Greatly strengthening the networks outreach and effectivity. This activity is as of February 2020 on request of the European Commission fully dedicated to the COVID-19 response.

Administer CWA: NEN reviewed the CWA proposal in collaboration with DIN and AFNOR and advised the project team on the content of a CWA and the processes of CEN/CLC.

ANNEX 1. Focus on EU projects on drones and scene security/operations

Ongoing projects/ programs (Horizon 2020):

RESPONDRONE - NOVEL INTEGRATED SOLUTION OF OPERATING A FLEET OF DRONES WITH MULTIPLE SYNCHRONIZED MISSIONS FOR DISASTER RESPONSES
RESPONDRONE will develop and validate an integrated solution for first responders to easily operate a fleet of drones with multiple synchronized missions to enhance their situation assessment capacity and own protection. This System of Systems will simplify and accelerate situation assessment and sharing, decision making and operations management, while requiring a small crew to operate it. Moreover, it will deliver high-level information to any involved control centre through an intelligent web-based system that can be operated and accessed from a remote site as well as serving as on-demand airborne communications network to allow people on the ground to communicate with the command centre in case of cellular coverage collapse. With these situational-awareness enhancing tools, emergency response teams will be able to more rapidly, effectively and efficiently respond to an emergency or disaster and therefore save more lives. The fleet of drones will provide enhanced capabilities to support assessment missions, search and rescue operations, as well as forest fire fighting. The deployment will still be very simple. Each fleet or unit of drones will be able to be operated by a single pilot and few observers. To ensure seamless uptake and adaption by first responder organizations, RESPONDRONE will be fully integrated and embedded within the current processes and procedures of real emergency response agencies and teams, among others through advanced training programs. Therefore, RESPONDRONE will increase the effectiveness and efficiency of civil protection operations as it will consider the first responder total mission time, cost, and effectiveness (and not just considering the deployment time). RESPONDRONE will be demonstrated through participation in actual civil protection exercises on Corsica, involving several agencies simultaneously. **End date: 30 April 2022**

CURSOR - Coordinated Use of miniaturized Robotic equipment and advanced Sensors for search and rescue OpeRations. Grant agreement ID: 832790
Life-detecting robot to the rescue
After an earthquake, landslide or flood, search and rescue teams scramble to help trapped survivors. Finding victims can be a tough job, even with the use of sniffer dogs, highly sensitive audio listening devices, and thermal imaging cameras. The EU-funded CURSOR project is developing mini robotic equipment and advanced sensors to assist in these operations. Specifically, their system comprises unmanned aerial vehicles (UAVs), 3D modelling, and transportation of disposable miniaturised robots that are equipped with advanced sensors for the detection of volatile chemical signatures emanating from human beings. Information and data collected are transferred in real time to a handheld device operated by first responders at the disaster site. **End date: 31 August 2022**

Ended projects/ programs (Horizon 2020):

SURVEIRON: Advanced surveillance system for the protection of urban soft targets and urban critical infrastructures
SURVEIRON is an innovative solution for the protection of urban environments and critical infrastructures that provides those in charge of public and private security with an intelligent

surveillance and decision making service in critical situations. SURVEIRON constitutes a powerful tool for the prevention and management of potential disasters. Those in charge of coordinating security will be able to minimize the risks currently taken due to a scarcity of available information, which in general is provided solely by security cameras and telephone calls. Such gaps in the information available cause serious security problems. The project is based in a set of AEORUMs intelligent robots embedded inside a fleet of unmanned aerial vehicles (UAVs). This fleet is deployed in fixed and mobile locations and supervised from an emergency command center. When an alarm is notified, the system sends one or more UAVs to the emergency area avoiding any obstacle in their way. Once there, SURVEIRON starts scanning and automatically analyzing the environment with different AEORUM detection technologies. All identified risks are sent to the control center and represented in a 3D environment for an easy evaluation of human operators in real time. The system will also recommend action plans with AEORUM's decision making technologies based on artificial intelligence. As an example, in a fire emergency or an earthquake, SURVEIRON will provide (with AEORUM's ENVIRONMENT ANALYSIS TOOLS) the total amount of energy in calories generated by the fire, the cracks in the buildings, the amount of people in danger, toxic gas leaks and the status of the infrastructures affected. Moreover, the system is capable of recommending (with AEORUM's DECISION TOOLS) the volume of fire extinguisher and the amount of firetrucks needed, a building evacuation order list, a toxic gas map or the amount of healthcare personnel to be mobilized. All this information will be displayed in the command center. **End date: 28 February 2018**

AIRCARRUS - Autonomous Drone Delivery System
Objective
Aircarrus is an autonomous rapid response drone delivery system that services remote locations and or time critical events utilizing an automated ground processing station. The system is completely autonomous and requires no ground operators to launch or retrieve the delivery drone. The drone is operated through the Cloud on a GSM mobile network using our proprietary Dbotix autopilot. The drone is charged using a series of jump stations that allow it to travel long distances and load cargo automatically. AERDRON aims to study the feasibility of upgrading and adapting our existing delivery drone HL4 Herculift to increase its range and automate the charging and payload loading systems. AERDRON will also study the feasibility of using off the grid jump stations powered only by renewable green energy systems (solar/wind) to service areas with limited infrastructure. The Aircarrus project plans to leverage existing EU Commission technology programs from the Galileo GPS to the SESAR U-Space network. **End date: 31 Oct 2019**

KNOX - Cost advantageous and scalable drone alarm and protection system for urban contexts
The Danish SME MyDefence aims to pursue a major market opportunity through the optimization and demonstration of an innovative, cost advantageous and scalable drone alarm and protection system (KNOX) to be used by security services providers and infrastructure owners - public and private sectors - in urban contexts. KNOX detects and identifies civilian drones and protects infrastructures and mobile soft targets against drones' threats. Drones are quickly moving from being mainly a military technology to a mass market gadget. Whereas demand and applications for drones are fast-growing, the drone market also raises security and privacy concerns. Presently, there are obvious concerns about the possibility of using drones for illicit purposes and terrorist attacks in which drones could be equipped with explosives, biological or chemical weapons. MyDefence has developed an innovative drone alarm able to detect, identify and locate civilian drones around secure areas, and to jam in a specific wireless frequency range without interfering with other mobile signals and forcing a controlled drone landing. KNOX is also an early warning of

drones' activity and helps to locate the pilot before the accident/attack takes place. KNOX is expected to be a game changing solution for drone detection and protection in urban contexts. The present innovation project will focus on demonstrating the full KNOX solution including tactical operating procedures in 2 prisons and in 2 sports stadiums in Denmark and UK. This will be the first step towards showcasing the full concept and validating the solution under real operational environments, thus representing a key milestone for overcoming prevailing market entrance barriers for MyDefence. In 5 years post-project, cumulative turnover from sales and maintenance service agreements are expected to reach 133 M€, with net profits of 55M€. **End date: 31 July 2019**

DroC2om - Drone Critical Communications

The key objective of the DroC2om project is to contribute to the definition of integrated cellular-satellite data link specifications for UASs. Major focus will be on the design and evaluation of data links based on experimental radio investigations and system simulations. The primary goal is to design a cellular-satellite system architecture concept, which ensures reliable and safe operation for remote controlled, semi-autonomous and fully autonomous small UAS. The DroC2om project will design and evaluate an integrated cellular-satellite system architecture concept for data links in order to support reliable and safe operation of UAS based on real drone measurements and modelling. The diversity of the project partners ensures a balanced and high quality expertise in all relevant technological areas. • Thales Alenia Space is a key player in aerospace air/ground communications. • Nokia is one of the major mobile service and infrastructure providers worldwide. • atesio provides solutions for automatic planning and optimization algorithms of multi-layer multi-service cellular telecommunication networks. • Aalborg University has a well-established research centre for mobile communications systems. To meet its objectives, the approach of DroC2om is to structure the work around four main building blocks that will be communicating with each other along the execution of the project following a continuous delivery approach: 1. Definition of scenarios and requirements 2. Software-based evaluation environment for aerial drone communication3. Aerial communication system architecture4. Drone flight and measurementsAll these four building blocks will be structured by a tight and rigorous management action from the project manager (PM) and the technical manager (TM), and complemented with a particular action devoted to ensure the proper dissemination of all activities, results, and outcomes of the project to maximize impact and visibility of the actions carried out. **End date: 31 August 2019**

PODIUM - Proving Operations of Drones with Initial UTM Management

The PODIUM project comprises four complementary, large scale demonstrations, taking place in Denmark, France and the Netherlands where more than 185 drone flights will be conducted. Its partners' quick wins integrated UTM solution will be demonstrated in a broad range of realistic operational conditions of drone operations (VLOS and BVLOS) in VLL airspace (controlled & uncontrolled airspace; urban, rural and in the vicinity of airports) interacting with manned traffic. Each of its four sites has its own specificities (e.g. routine day to day operations, emphasis on UTM/ATM communication, normal/abnormal conditions). The demonstrations will notably enable its safe and secure use by various categories of users (e.g. authorities, drone operations, drone pilots) and for many types of drone operations (e.g. electricity line inspection, emergency services). Together the four sites demonstrations ensure a comprehensive and extensive demonstration of the full potential and technology readiness level of the PODIUM UTM functionalities (from Before-flight to Post-flight with a special focus on in-flight dynamic geo-fencing). PODIUM is a U-Space compliant demonstration. Under EUROCONTROL leadership,

PODIUM consortium comprises 10 members, 17 linked third parties and 4 sub-contractors, including many in-kind contributions. By bringing together drone actors (UTM provider, drone operators, drone trackers manufacturers), ATM actors (ANSPs, ATM system integrator & others) and infrastructure providers (drone demonstrations centers, telecommunication network) supported by their local authorities in its Advisory Board, PODIUM project will naturally improve the links between the drone and the ATM communities therefore contributing to a safer integration of drone operation in the European airspace and maximising the outreach of the project at regulatory and standardisation levels. **End date: 31 December 2019**

DRONECOP - The first integral control and command system for managing missions which delivers 3D cartography and georeferenced data in real-time
Geointelligence Systems is a Spanish company founded in 2015 that offers services based on Geointelligence from remote sensing and unmanned aerial vehicles. Over the last 3 years, we have developed DRONECOP, the first integral general operation system for managing missions for combating natural disasters able to process data captured by a drone (video, photogrammetry) in real-time and automatically generate 3D cartography and georeferenced targets. Several regional and global emergency mechanisms exist to support disaster management, but they lack efficiency due to the unstructured existing management systems: unable to process information in real-time and to provide accurate tools for critical decision making based on objective information. With DRONECOP, natural disasters management bodies will have access to critical catastrophic areas and get accurate and updated 3D mapping information and georefereced targets in real time. This will allow them to plan their missions and make fast decision in critical moments in a much more effective way due to the objective information they will count with. Consequently, there will be a reduction in fatalities and injured among their crews and in social, environmental and economic impact of the disasters. DRONECOP will disrupt in the Mapping for Incident and emergency Market (valued at €10,440Mill in 2018) creating a new niche of integral management system for missions with real-time 3D mapping and georeferenced data that no other competitor has already achieved. DRONECOP will make any disaster management operation safer, faster and more efficient than ever. It will positively impact on the human, environmental and economic scope of any natural disaster in which it will be used. **End date: 13 September 2019**

AutoFlyMap - AUTOnomous FLYing Robots in GNSS denied environments for 3D Underground infrastructure MAPping and inspection.
THE PROBLEMThe inspection of underground infrastructure is done by operators using expensive machinery, with associated high costs (within the range 15 - 60 k€/km), high risks and safety issues. Unmanned Aerial Vehicles can replace inspection teams in these demanding tasks, reducing the cost by 90%, but no product in the market is able to operate autonomously in GNSS-denied environments and to produce reliable 3D mapping of the sites, sending high quality information to the system/person in charge of taking decisions. AUTOFLYMAP SOLUTIONHS has developed the first drone able to fly autonomously in underground environments (GNSS-denied) and capable to produce high quality 3D textured models for mapping and inspection of indoor scenarios. The solution is applicable in several sectors requiring eventual or regular inspection of underground sites without the need of operator's presence at visual distance: e.g. tunnel construction, underground infrastructure inspection and maintenance, rail and road operation, facilities management, mining, etc. This breakthrough solution is achievable thanks to the development of two proprietary technological solutions: 1) indoor multi-sensor-based positioning system; 2) high-performance on-board data gathering sensors sets and raw data processing solution for 3D mapping. THE FEASIBILITY STUDYHS will develop a detailed technical and business

feasibility analysis, to assess the details of the service to be provided (procedures, data encryption, user interfaces, sensors update and functionalities of the flying robot), to quantify the achievable markets and to refine the Business Model to be implemented in the Market Entry phase. The targets are: i) Cost of Production (Robot Bill-Of-Materials) < 6 k€; ii) Service model confirmed at > 6 k€/km; iii) Letters of Intent signed with one international distributor; iv) 2 end users selected for the demo tests planned for Phase 2**. End date: 30 June 2019**

MOBNET - MOBile NETwork for people's location in natural and man-made disasters

Unmanned vehicles (UVs) now play an increasing role in Public Protection and Disaster Relief (PPDR) missions such as border surveillance, cropping monitoring or local law enforcement. However, fast location of isolated people in the case of natural or man-made disasters still continues to be a crucial and arduous task. MOBNET will design a Search and Rescue (SAR) system for the location of isolated victims in the case of natural or man-made disasters such as earthquakes, hurricanes or large snow storms. It will also help first responder services to find fugitives or smugglers hidden within buildings. To that end, the use of European Global Navigation Satellite (EGNSS) systems (both Galileo early services and EGNOS) and Digital Cellular Technologies (DCT) will play the key role in these situations in which it is difficult, dangerous or even impossible to access the affected areas. The EGNSS and DCT technologies will be tightly synchronised to provide accurate positioning. However, this demanding synchronisation exceeds the current capabilities of most GNSS and cellular equipment. In order to achieve the required performance, novel EGNSS and DCT methods will be applied. Furthermore, an effective and reliable communication link between Unmanned Aerial Vehicles (UAVs) and the ground station will be designed. This datalink will ensure uninterrupted command and control communication among devices and the integrity of communication signals. Thus, the UAVs will always operate as intended. Research will be driven by the end-user and industrial partners to ensure that it addresses the needs of the PPDR services. The potential for a fast and reliable SAR system will be illustrated by a prototype that will work at long distances. The developed SAR system will take advantage of the Galileo and EGNOS capabilities and will strengthen the position of European Industry in the field of security services. It will greatly facilitate their missions and the rescue of isolated victims. **End date: 28 February 2018**

ROCSAFE - Remotely Operated CBRNe Scene Assessment Forensic Examination

The overall goal of ROCSAFE is to fundamentally change how CBRNe events are assessed, in order to and ensure the safety of crime scene investigators by reducing the need for them to enter high-risk scenes when they have to determine the nature of threats and gather forensics. For this, ROCSAFE will make use of cost-effective modern remotely-controlled robotic air and ground vehicles (RAVs/RGVs) that are designed for use in rain, wind, and challenging ground surfaces and obstacles. First, RAVs will assess the scene. These will have cameras and can carry an array of innovative new high-performance and rugged miniaturised sensor systems for RN, chemical and biological threats. To reduce the scene commander's cognitive load, ROCSAFE will include new Central Decision Management software and a Command Centre. All images and data will be streamed to this, where it will be analyzed and displayed on a sophisticated and intuitive interface with maps and video, showing results of analytics and giving readings geographical context. This will enable the scene commander to assess the nature of threats, develop an Action Plan and an Evidence Plan, supported as needed by the Central Decision Management. It will also assist in coordinating sensors and mobile units. Its data analytics will provide fusion of multiple sensor data sources, to allow probabilistic reasoning about the most likely threats and likely locations of

epicenters. After the scene is assessed, RGVs will be dispatched to collect forensic material/evidence, with automatically-optimized routes to avoid hazards. They will have innovative new equipment for forensics collection that will automate best practices. Forensic material will be collected, bagged, tagged, documented, and stored by the RGV. Thus, ROCSAFE will ensure that CBRNe scenes are assessed more rapidly and thoroughly than is currently possible, and that forensic evidence is collected in a manner that stands up in court, without putting personnel at risk. **End date: 31 December 2019**

The Consortium

UPO
UNIVERSITÀ DEL PIEMONTE ORIENTALE
CRIMEDIM
RESEARCH CENTER IN EMERGENCY AND DISASTER MEDICINE

POMPIERS DE PARIS

PerSys MEDICAL

Norwegian Red Cross

MAGEN DAVID ADOM IN ISRAEL
מגן דוד אדום בישראל

HSE
Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

ciudad de madrid
S.A.M.U.R.
PROTECCION CIVIL

Université Nice Sophia Antipolis
Membre de UNIVERSITÉ CÔTE D'AZUR

UNIVERSITÀ CATTOLICA del Sacro Cuore

universität innsbruck
Institut für Psychologie

DEPARTAMENTUL PENTRU SITUAȚII DE URGENȚĂ
M.A.I.

VUB REGEDIM RESEARCH GROUP ON EMERGENCY & DISASTER MEDICINE

ASSISTANCE HÔPITAUX PUBLIQUE DE PARIS
GREATER PARIS UNIVERSITY HOSPITALS

Centre for Security and Society
Albert-Ludwigs-Universität Freiburg

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