

Lessons learned from EMS responses to COVID-19

Since January 2020, COVID-19 pandemic spread worldwide, affecting countries, communities, individuals and organizations. As part of NO FEAR WP4 activities, twenty webinars held since the spread of COVID-19 has begun, identifying the following lessons observed and areas for improvement, by sharing knowledge and experience of Emergency Medical Service (EMS) personnel and hospital emergency department staff from acute care organizations in Africa, Asia, Europe and the Americas.

Main issues identified in the following webinars: Caring for team members in COVID-19; A chance to learn from other National Societies; EMS experiences in COVID-19; EMS - new daily routines in COVID-19; Hospital organization in COVID-19; and EMS operations - lessons learned

The webinars took place on (respectively) 16.3.20, 27.3.20, 7.4.20, 11.5.20, 3.6.20, and 23.6.20.

Lessons learned (what worked and should be retained):

- Public support (emotional and material) has been significant.
- Personnel have been exceptionally motivated and engaged.
- EMS personnel gained new experience and skills (such as taking PCR samples) by working with PPE.
- Inter-agency cooperation and coordination has been effective.
- Ongoing updates of treatment protocols (as data became available) are useful to address the new risks and increase personnel safety. Adjustment of “normal treatment protocols” to “COVID-19 reality” to increase teams’ knowledge and response capacity.
- Triage of ALL incoming EMS calls for possible COVID-19 case definition is essential to reduce risks to responders. On-scene evaluation (and decisions for appropriate PPE levels) is also mandatory, as well as reducing the number of personnel in direct contact with the patient pre-evaluation. Minimum PPE (face masks) should be mandatory for all patient encounters – for EMS, patients, and anyone accompanying the patient.
- The medium matters. “Just in time” training is useful for personnel and daily briefings, delivered digitally/remotely (possibly by using the tablets used for patient records). Online training and webinars proved to be effective tools for updating knowledge and staying in touch with personnel. Personnel prefer “human interaction” (e.g., teleconferencing) to reading documents.
- “Unit spirit” is important. Team leaders play a crucial role and should take overall responsibility for technical issues and morale.
- International cooperation and information sharing helps personnel to support each other and share lessons learned, such as the results of security research projects (including social media analysis and sterilization of used material with plasma).
- Many resources are publically available, including tools for logistics planning.

- Volunteers, personnel from other services, and personnel from “less essential services” (such as training departments and administrative positions) were essential to sustain and augment EMS services during the peak of the crisis. Working to sustain those capacities for the next peak is a major challenge.
- The volunteers contributing to the system (including MDs and nurses) need to be managed well, to receive Psychosocial Support (PSS) and training on PPE use.
- The situation is stressful for responders and their loved ones. A comprehensive PSS plan is essential to reinforce a sense of belonging and being taken care of. Readily-available on-shift food and drinks (when shops were closed) and care provisions for responders quarantining at home were particularly essential to team members.
- Setting up a “health surveillance” protocol for personnel is key.
- PPE donning and doffing training, including for team members not usually involved in “PPE operations”, is key to building confidence and competency. This includes Infection Prevention and Control (IPC) training, including getting to know risk and mitigation strategies along with technical aspects of donning/doffing. A “Buddy System” helps team members check and reassure each other.
- Implementation of a hotline / web chat / email for questions from EMS personnel provided both “technical assistance” as well as psychosocial support for team members.
- Patients have been effectively reallocated based on bed availability (especially ICU beds). Means of transport used include ambulances, trains, helicopters and fixed-wing airplanes.
- The use of buildings with large spaces to set up “emergency hospitals” proved beneficial. Emergency hospitals should be part of an “existing” hospital (an annex rather than a separate entity).
- Using hotels for “hospitalization” of mild cases or recovering patients proved efficient.

To be improved:

- Long Term Care (LTC) facilities are among the most vulnerable locations. Specific pre-hospital and acute care protocols are needed, as transporting LTC patients to a hospital is not always in their best interests.
- As the COVID-19 outbreak declines, social and economic welfare needs increase and new “vulnerable” groups emerge.
- The impact of the long-term scale-down in “regular health care activities”, together with the long-term health effects of COVID-19, on the health needs of the population is still to be understood.
- It is critical to reassure the public that it is safe to call EMS or go to the ER.
- EMS are looking into incorporating “telemedicine” tools to 1) assess patients in home isolation and 2) provide a physician assessment (for services that don’t have a physician onboard) to decrease the number of ER transports for patients who could be attended to outside of the hospitals. This requires proper regulatory and financial frameworks.
- In cases where health care systems were overwhelmed by the number and severity of cases, health care workers (HCW) had to make difficult decisions to minimize patient care. A clear ethical framework and psychosocial support are needed to ease the emotional burden on HCW.

- Emergency management plans (including infrastructure) should be revisited in light of lessons from the first outbreak. The need to have flexible structures (both physical as well as procedural) that allow for easy up and down-scaling are essential. The main challenge at this point in time is scaling up again, in the event of a new peak of patients.
- Health care personnel are not used to working in a “command structure”. This resulted in delays in decision-making and conflicting instructions. “Incident Command” systems used by health care organizations should be adjusted.
- The shift from a “health care emergency” to a “national emergency” in many cases was not foreseen in the crisis management contingency plans, which created a lack of clarity on roles and responsibilities.
- As health care is not a “normal” participant in “crisis management structures”, communication and coordination was sometimes challenging.
- Differences in dispatch protocols between different dispatch centers were a challenge to EMS.
- A ‘hub and spoke’ approach (providing different level of care to different categories of patients) was not always respected. New care paths for discharged patients should be considered to free hospital beds.
- Non-Invasive ventilation uses 4 times as much O₂ as intubation and can impact O₂ storage.
- Rescue services were still working even though organizations had around 25% of staff in quarantine or sick. Having plans to reduce the risk is necessary, including separating workers into “capsules” who do not meet each other, strict disinfection facilities for common work areas, **prohibiting** joint meals, mitigation plans for the eventuality of large absences and programs to care for sick / under quarantined workers are essential.
- Due to movement restrictions, there were fewer fire and rescue calls. EMS calls reduced in some cases and were normal or higher in others. This creates a major challenge for services whose budgets are based on “reimbursement per service”. The cost of each EMS run increased dramatically (due to PPE costs and the need to pay “overtime” to replace absent personnel). Compensation for EMS services, and a new budget model should be considered.
- Personnel in “high risk groups” required changes to their job assignments. This is especially critical with EMS services with large numbers of volunteers, many of them elderly. The long term impact of career choices and personnel profiles is yet to be understood.
- Should HCW be asked if they would volunteer to work with COVID-19 patients? (In some cases physicians were asked, while nurses not).
- HCW’s needs include COVID-19 testing, accommodation, travel requirements, and other needs during isolation.
- HCW, while very cautious with their IPC procedures on-duty, don’t necessarily follow the same level of compliance off-duty.
- Many logistics aspects became “bottlenecks” for the operation – consumables supply and storage, “biohazard” waste management being two examples.
- Logistics self-sustainability of providers must be considered along with “critical items stockpiles” at the regional/national level, along with centralized procurement for items like PPE, Oxygen, certain medications, and ventilators.

- COVID-19 requires close monitoring of resources and capacities, and real time monitoring of availability. In a fragmented system like health care, service is often delivered on a voluntary basis with no “systems” to support this (especially as health care is not considered in many cases part of the “civil protection system”).
- Support personnel (such as cleaning staff) often have their needs and concerns overlooked. It is key to look at the whole chain of those involved.
- Disinfection procedures are often harmful to the equipment (such as the use of Hypochlorite solution 5000 ppm).
- Live training have been suspended, as simulation is key in acute care and pre-hospital training. In a reality where COVID-19 is here to stay, training of new providers and scaling up their skills are essential, there is a need for new and safe training methodologies.
- To meet the needs of large numbers of critical care patients, physicians and nurses, who had not been on ICU teams, were trained. The level of their skills should be assessed, a working modality created along with a program to retain skills for a future outbreak.
- HCW need to address emotional aspects to patients, their relatives and the community.
- Stigma and fear sometimes affected the acceptance of HCW by their communities.
- The new path of care for patients (separated “COVID-19 ER”) sometimes created delays in patient care and flow.
- Different response models in the EMS, with some services designating “dedicated COVID-19 units”.
- It is possible that a peak in EMS calls for “respiratory syndrome” is a predictor of a rise in COVID-19 patients.
- Change and better coordination is needed in treatment protocols between health care facilities, with different outcomes for patients. This includes also the need to harmonize the pre-hospital care protocol with the intra-hospital care protocol (e.g. patients who are intubated in the pre-hospital setting, but were not to be intubated according to the hospital protocol).

Main issues identified in Challenges and possible solutions for the PSS impact of wearing PPE webinar

The webinar took place on 9.7.20.

- HCW (Health Care Workers) wearing PPE are going through a process of loss. They experience the sense of losing skills, in some cases skills they worked hard to gain – touching patients, showing empathy – which create barriers to communication. HCW should recognize this loss and the fact they need to process it, in order to come to terms with it and allow the acquisition of new skills needed for this situation. Anger associated with PPE use is sometimes transferred to the patient.
- The working environment of HCW has changed significantly due to COVID-19. Discussing with the HCW the new environment, risks and possible mitigation strategies (especially those helpful for their peers) is an essential step in supporting them in dealing with this new situation. This discussion should include our "new emotional state" (e.g. while wearing PPE) and reduced personnel challenges.
- COVID-19 poses unique challenges for training personnel for Infection Prevention Control (IPC) measures and the use of PPE (donning and especially doffing), to create trust in their capacities and support them. A special challenge is the "risk group" that requires adaptation.
- HCW often sense fear associated with PPE use of making a mistake, contracting the virus and transmitting it to their loved ones" This fear could be reduced by using a "buddy system" while donning and doffing the PPE. 'Buddy' pairs observe each other donning and doffing to ensure the proper processes are followed. In case of a larger operation, a dedicated IPC officer should be appointed to ensure the proper procedures are followed. This increases the sense of safety of the personnel involved.
- PPE gives a sense of "depersonalization" both for the HCW as well as to the beneficiaries.

Strategies used and proposed included:

- a. "Personalization of the PPE" – writing your name and role on the PPE, attaching your picture to it.
- b. Requesting "colored PPE" by function "normally used" in Health Care (e.g. blue or green).
- c. Transparent facemasks could be made available (to be followed up). These masks are especially important while communicating with persons who have a hearing impairment (who assist themselves by lip reading).
- Dedicated "support lines" and systems for HCW responding to COVID-19 / COVID-19 suspected patients have been created. These lines dealt with: a) "technical" questions on COVID-19-related issues (use of PPE, disinfection, etc.) and b) provided "peer support" to the team members.

The role of team leaders has been as critical to team members feeling safe and taken care of. A feeling of support engendered by leaders proved to be a key factor in the ability of team members to keep on providing service despite hardships. The sense of "being taken care of" proved essential to the team morale and required a proactive approach (e.g. outreaching actively to all those at home quarantine, making sure those in quarantine have all their basic needs met). Team leaders needed coaching and support in these roles. COVID-19 operation is an opportunity to openly discuss the needs of HCW for psychosocial support (PSS), and the appropriate channels to provide it, as the PSS

needs are more evident during this crisis where they otherwise may have gone neglected (in many cases by the HCW themselves).

- Clear instructions and training on PPE are key to the sense of safety. One of the challenges during the operation were changes (sometimes frequent) in the guidelines. Providing clear and transparent information on the reasons for changes was essential to maintain trust in the guidelines and to help fight rumors (such as "this change is not to increase safety, but reduce costs").

Protocols on the use of PPE must include factors such as heat stress and recuperation after the use of PPE (hydration), to ensure a holistic safety approach - not just "donning / doffing".

- It is extremely important to understand the beneficiary perception of the PPE, and not to assume we know what the perceptions are. Cultural differences have been observed (in some countries not wearing PPE is considered an "anti-social behavior" while in other countries very few use PPE). At the same time, there are personal differences in the perception of PPE among the public. These may include fear, not understanding why the HCW is threatened by me, or fully appreciating that the HCW is protecting her / himself and me and feeling safer in the interaction with a HCW in full PPE.

The following mitigating strategies have been offered:

- a. It is extremely important to clearly communicate with the beneficiary why PPE is needed, why specific types of PPE are used, and allow time for questions (e.g. beneficiaries may not understand why on TV HCW's wear full suits, while the HCW providing them care is only wearing a mask, goggles, gown and gloves – which might be inaccurately assumed to be reckless).
 - b. Whenever possible, allowing both the HCW and the beneficiary to choose the type of intervention – virtual without PPE, or Face-to-Face using PPE (both by the HCW and beneficiary). The ability to choose has been greatly appreciated by both HCW and beneficiaries, and gives them a sense of control otherwise lost while using PPE. This also allows for recruiting more volunteers, as some will agree only to provide "remote services" (especially volunteers in "high risk groups").
 - c. In longer-term health related interventions, beneficiaries have been offered with the opportunity to wear PPE so they can experience the hardships encountered by HCW. This created a better understanding from the beneficiaries and increased trust.
- PPE use can be associated with sickness/being COVID-19 positive, along with the stigma associated with persons being sick/positive. This is very important for Red Cross/Red Crescent National Societies who are providing services to persons who are "potential cases" (e.g. taking tests – "home sampling" for people under home quarantine), and their family/neighbors see the team arriving with PPE. This might end with a refusal of service, with dire consequences. COVID-19 anti-stigma campaigns should address these issues.
 - Clear guidelines on the rationale of the use of PPE, from the very beginning, preferably for all HCW across sectors, is essential in creating trust and ensuring proper utilization of a scarce resource. Any change in the guidelines must be transparently communicated and explained to frontline responders.
 - Current PPE is cumbersome, hot, and impairs communication and patient assessment. This PPE is based on other outbreaks with pathogens that are close to COVID-19. We

need to a) better understand the spread of the virus and adjust the PPE accordingly, and b) design more “user-friendly” PPE that is c) also more environmentally friendly.

- Shortage in the supply of PPE resulted in competition between different organizations over the limited quantities available.
- Many instances of counterfeit PPE (items provided does not meet the claimed standards) were identified. Health care services, don't have the capacity to test equipment to verify if it meets the standard. Normally, standard institution-certified laboratories did not have the capacity to meet the demand to validate equipment.

Challenges/needs:

- To better understand the spread of the virus and adjust PPE and “normal treatment protocols” (e.g. aerosolizing procedures) accordingly.
- Better design of PPE better fit for purpose (specifically for COVID-19).
- To create a system for validation of PPE.
- To maintain the capacity to scale up and scale down the COVID-19 operation as needed.
- Methodologies for acquisition and reinforcement of skills and simulation, in an environment of “social distancing”.
- More environmentally and “equipment friendly” disinfection procedures.
- Addressing HCW fatigue

Statement associated with the use of PPE by HCW

(Used as a "problem statement" for the beginning of the webinar, and possible discussion points later)

1. The most frightening part of using PPE is knowing that even a small mistake might end in me being sick and contaminating my beloved ones. (more than 50% of the webinar participants voted for this statement as the most relevant for them)
2. Not being able to use my assessment skills while using PPE is very frustrating for me
3. I'm trained to provide "human care", and while I'm dressed with PPE I feel that I'm scaring my patients.
4. I see everyday patients who need human contact and are deprived of that. Surrounded by people in space suits, often replaced by robots and cameras
5. How am I supposed to communicate with a patient with my mouth covered? This is very stressful for me.
6. Mental health in front line workers- Identify and properly address mental health abnormalities in individuals who are at higher risk.
Shortage of workers increase working and mental pressure in healthy workers
7. Mental health care for medical staff - Why and what to do when the staff is reluctant to receive psychological help? They say they don't need a psychologist but more rest and PPE
8. Emotional distress among healthcare workers - Ethical obligations, Fear of personal safety and well-being of colleagues and family

Main lessons identified in "Use of Isolation Chambers by EMS in COVID-19 Response"

webinar

The webinar took place on 23.7.20.

- There is great variance between EMS systems in the use of Isolation chambers (from no use what so ever, to all confirmed patients should be transported in a chamber, and all the variants in between).
- Isolation chambers were designed to be used for patients whose bodily fluids pose a risk to the HCW (e.g. Ebola patients who are sweating, vomiting and suffer from diarrhea). As this is not the case with COVID-19 patients (contamination spread by droplets from the respiratory tract), most probably, from the risk perspective, there is no scientific evidence to demonstrate the need for transporting COVID-19 patients in isolation chambers.
- Most of the EMS using isolation chambers, do not use them in ground transport (using their own ambulances), but while transporting patients in other means (mainly fixed and rotating wing), the owner of the transportation device, demands the use of isolation chambers in order to "protect the vessel". This is especially true, for aircraft and helicopters, mainly due to the corrosive nature of the disinfection agents and their possible damage to the aircraft's avionics.
- The use of the isolation chamber requires a specific SOP, which includes not just the use of the chamber, but also the specific roles and actions of each team member. The team has to be trained in those procedures.
- Preparing a patient for a transfer in an Isolation Chamber is a time consuming processes (reported more than 2 hours down to about 54 minutes with a highly trained team).
- A specific "checklist" for transfer of patients using an Isolation Chamber has been developed. The checklists cover all the aspects (including informing the relatives and having their consent to the transfer).
- The checklist has some specific considerations:
 - a. Type of patients to be transferred (only stable patients, as medical interventions are not possible while the patient is encapsulated in the chamber).
 - b. Only sedated patients to be transferred in the chamber, to avoid the "claustrophobic" feeling while being in the chamber.
 - c. Sedated patients required higher doses of medications (mainly in airplanes)
 - d. What are the drugs to be used during the transfer (out of the many a patient could be receiving at the ICU)
- If the means of transportation are other than ambulances (from one hospital to the other), the coordination should look into the whole cycle – from hospital to the means of transportation (train, aircraft), and from the means of transportation point of arrival to the admitting hospital (e.g. police escorts, ambulances at the destination etc.).
- As the EMS crew is in contact with the patient, even if Isolation Chambers are used, the EMS crew still has to use PPE (in accordance with the EMS local SOP).
- Protecting and disinfecting the equipment used to transfer COVID-19 patients is a major issue, as many disinfecting agents damage the equipment.

- While considering the use of Isolation chambers, the following issues should be considered:
 - a. The "general public" perception, who witnessed the isolation chamber being used.
 - b. The safety of the patient and of the team while using the chamber.
 - c. The impact on the emotional wellbeing of the patient transferred in the Isolation Chamber.
 - d. Time and effort associated with the use of the Isolation Chambers.
 - e. Disinfection of the Isolation Chamber (where and by whom, as many EMS systems will consider this as a HAZMAT operation).

Needs:

- Research on the spread of the COVID-19 and the protection needed, including ventilated patients.
- Harmless and more environmentally (and equipment) friendly disinfection agents.
- Discussion with the aviation industry on the transport of COVID-19 patients in air vessels, the risks and mitigation.

Main lessons identified in the "Innovative Disinfection Technologies" webinar

The webinar took place on August 27th, 2020

A. Background:

- The COVID-19 virus is a highly contagious pathogen that created the need to frequently disinfect equipment and surfaces, to eliminate the risk of the COVID-19 transmission touching “contaminated surfaces”. At the early stages of the COVID-19 pandemic, surfaces were sprayed as often as after each contact with a suspected patient or as a minimum every 8 hours. As per standard IPC (Infection Prevention Control) procedures, the standard solution used is Sodium Hypochlorite (NaClO) 0.1% (for suspected cases) and 0.5% for confirmed cases.
- The frequent use of Sodium Hypochlorite resulted in damage to the vehicles and equipment, manifested mainly in electric cables and metallic surfaces (with significant rusting).
- Sensitive equipment (as electronic equipment) cannot be disinfected using Sodium Hypochlorite, so Isopropyl Alcohol 70% was used to wipe the equipment.
- The objective of the webinar was to present new technologies, more friendly to the equipment, and to the environment.

B. Main issues observed:

- An important lesson observed is that "traditional" disinfection methods employing high concentrations of bleach – when used with high frequency – are harmful to equipment and vehicles. They are also not environmentally friendly. Health care organizations (intra-hospital as well as pre-hospital care) are looking to different global providers for innovative disinfection solutions.
- There is no clear international standard (known to the consortium members) that defines the effectiveness of cleaning. e.g., if a provider claims that the product “eliminates 98% of the pathogen” – is this good enough?
- What is the standard test used to determine “percentage of pathogen eliminated” (so different products can be compared)?
- What is the standard used to determine long term safety to human beings exposed to the residuals of the material without PPE (with different vulnerabilities, such as underlying medical conditions, pregnant women, children)?
- What is the standard used to assess the long-term impact on equipment (different types of equipment), considering frequent use of the product/technology?
- Are there any specific disinfection requirements due to specificities of the SARS2 – COVID-19 pathogen?
- Masks and other PPE are being reused without disinfection, putting worker health and safety at risk and increasing the spread of COVID-19 and other pathogens.
- Disinfection of N95 masks damages the elasticity of the mask, impairs fitting to face structure, and reduces the effectiveness of the mask.
- Proper re-use of masks and other PPE currently entails processing away from the using unit (Potential spread of infection during handling, workers do not necessarily get their own mask back- reduces work compliance).
- Air Purification systems not utilized or effective in hospital environments.

Main lessons identified in "COVID-19 operation - Emergency Call Centers and Operations Centers" webinar

The webinar took place on 13.8.20.

- Call takers and dispatchers need psychosocial support, as they are dealing with people who are sometimes at high stress, may become verbally aggressive. Others are dealing with guilt as they feel they have "exposed their colleagues to a positive case".
- Stigma plays a major role while people are calling for help, including delays, request for EMS personnel "not to be seen" (e.g. meeting the ambulance away from the actual home).
Stigma and fear might interfere with processing the needed data from the caller.
- EMS systems have seen delays in the calls for help, even in critical situations (stroke, heart attacks), due to the public afraid of interacting with health providers and facilities.
- EMS organizations are looking for alternative solutions, to reduce the "patient – health care provider physical interactions" and unnecessary transportation to hospital, mainly using telemedicine.
- Having a designate "COVID-19 Point of Contact" at the PSAP and EMS field crews, proved to be efficient and leads to better communication and coordination.
- Call takers would instruct the caller to ensure that the patient and those on scene wear a mask before the ambulance arrives (to the degree possible).
- Protocols minimizing the personnel at the dispatch agency to essential personnel only (no visitors), and separating the personnel into groups ("working capsules") are essential.
- Physical social distancing (including not allowing joint meals for example), increased hygiene protocols have been put in place.
- Disinfection of electronic equipment in the PSAP is a challenge as agents like Sodium Hypochlorite in high concentration will be harmful to the equipment.
- PSAP (Public Safety Answering Points) organizations have contingency plans, for the eventuality of an "outbreak among PSAP staff". These contingencies will include:
 - a. Having a roster of personnel who recently left (e.g. retired).
 - b. Having a roster who are reassigned to other public safety jobs (field positions, promoted).
 - c. A different shift pattern (sometimes reducing staffing when possible).
 - d. Having "backup" facilities, to be used in case the "main facility" has to be disinfected.
 - e. Having the IT system that allows call reception by call takers situated away from the PSAP (e.g. personnel working from home).
- PSAP have seen a very significant increase in the calls, as other "hotlines" set up to deal with the public inquiries, were overwhelmed or not prepared to deal with the volume of calls ("No system will be able to deal with the calls from 5 million worried citizens").

PSAP had to take a clear policy on how they would deal with the "none emergency COVID-19 calls". A variety of policies were identified – from "we answer all calls" on one side of the spectrum, to "if it is not an emergency it is not a PSAP issue". Mitigations organizations used:

- a. Using technology to help prioritization of incoming calls (IVR – boot)

- b. Set up of "dedicated COVID-19 call centers" staffed by none emergency medical dispatchers (e.g. volunteers).
- c. Create a "home care system" that can provide answers.
- d. Liaise with the other agencies that have the capacity to answer the need
- e. Have updated information that allows answering simple queries (and needs) easily.

- Most of the "COVID-19 calls" are for information, worried persons, etc. Providing clear, concise and updated information, along with providing guidance and reassurance to the caller are the most important features of those calls. Psychosocial support to the callers is Key. Constantly updating the information, and disseminating it to all those who respond to the calls is a challenge.

For the future we must understand what are the most effective means of interaction with the public and different groups in the public (as for example – not everyone is on social media), to create alternative means of effective two way communication with the public (the public needs an interaction, not just one sided information).

- All incoming emergency calls are triaged for "possible COVID-19". Screening criteria includes:
 - Travel history
 - Sign and symptoms (fever / respiratory syndrome / some include others as loss of taste and smell)
 - People under quarantine, living in the same household with a confirmed patient
 - Testing history

In some organizations AI is used to search for "keywords" in the dispatch log. In some organizations, if the call goes above a certain threshold an alert will appear on the responding unit screen (in any case, dispatchers are instructed to alert the responding team on the identified possible COVID-19 risk on the scene).s "COVID-19 calls" must be triaged by a medical emergency call taker, as the layperson cannot tell a "respiratory distress" from "COVID-19 symptoms", this will be even more important during seasonal influenza period.

- Some organizations use "site specifics" as a risk factor, specifically, any case in a long term health care facility will be considered as a COVID-19 risk.
- PSAP organizations have seen a high incidence of cyber-attacks (considering the rise in cyber-attacks globally during the COVID-19 outbreak). These implied heighten cyber security protocols.
- PSAP organizations had difficulties bringing parts of equipment (e.g. radios, computers), which is normally brought from abroad, due to the almost shut down of air traffic. This implies thinking of "PSAP critical equipment stockpile".
- EMS organizations should look into their contingency plan in case of a radio outage (e.g. due to the need to shut down a dispatch center), and consider alternative communications options.
- Coordination with admitting health care facilities became a challenge (for COVID-19 and None COVID-19 patients, due to the need to screen patients at the hospital triage). Integration of C4I systems that have real time information on beds availability was very important to help on this.
- Having a C4I system at the PSAP that allows sharing real time information with all the relevant stake holders, increases dramatically the situational awareness of the PSAP

(especially when it comes to sharing real time information with public health that are not part of the "regular" PSAP partners).

- EMS COVID-19 dispatches should be differentiated between:
 - Emergency calls, with the patient involved being "suspected/confirmed COVID-19" (these calls are not limited to home calls, as persons not respecting home quarantine, or unaware of their condition can be involved in emergencies outdoors, trauma, and even drowning).
 - Transfer of confirmed cases to and from a hospital and other health care facilities (usually none – urgent transfers).

Many EMS have created a separated system for the COVID-19 transfers, with dedicated personnel, resources and a different dispatch system.

- Constant review of protocols, necessary updates and briefings of personnel are essential. Personnel must be aware of the reasons for the changes in protocols (in order to ensure their confidence in the instructions they receive).
- PSAP activated their "crisis management protocol" to run the operation. Increasing response capacity is a major challenge (personnel, IT equipment and the needed software).

Main lessons identified in the "Silent Hypoxia and the Use of Pulse Oximetry for COVID-19 Patients in the Pre-Hospital Setting" webinar

The webinar took place on 29.10.20.

B. Background:

- Hypoxia – lack of Oxygen in the tissues (Hypoxemia – lack of Oxygen in the blood), is a life threatening condition
- Direct measurement of the Oxygen requires a blood test (gases in the blood). An assessment of the oxygenated blood can be achieved using a technology called Pulse Oximetry (very sensitive to color)
- As per WHO standards – a COVID-19 patient with Pulse Ox of 94% and below is seriously sick
- **As per the textbook – Hypoxia is clinically manifested**
- During COVID-19, a growing body of evidence on patients who don't feel very sick, and are apparently well in a preliminary evaluation, but have low O2 saturation (some time as low as 80%). This phenomenon is called "**Silent Hypoxia**" (as there is very little clinical presentation of the Hypoxia), or "**Happy hypoxia**" (as the patients seem happy despite being hypoxic).

B. Main issues observed:

- Health Care Workers (HCW) must be familiarized with "silent hypoxia", as this is a potentially life threatening condition. Training must include the proper use of pulse oximetry.
- Assessment of possible / confirmed cases requires modified skills that have to be created among responders (with the limitations of simulation in a social distancing environment, creating major challenges to those training).
- While for some EMS Pulse Oximetry is considered as a basic vital sign to be obtained by BLS (Basic Life Support) personnel, this is not the case for all the services. (Introduced in the past, to support care for patients who need their saturation level within a certain range of parameters (as Acute Coronary Syndrome, Stroke, some trauma patients).
- Though Pulse Oximetry is a simple and very useful technology, EMS personnel has to be well trained in its use, and possible pitfalls due to issues around the way the reading is obtained, issues with the device, external temperature, color of the finger nail etc.
- Commercially available pulse oximeters, while being accessible to the general public as per their low price, does not always meet a good quality standard.
- Though the limitations of pulse oximetry with regards to the accuracy of the reading are well known they are mainly around the lower spectrum of readings, thus have little impact on the decision making (no real difference in the decision for a patient with Sat O2 84% and for the one with 78% in the pre-hospital setting).
- For patients suspected / confirmed as COVID-19 patients, Pulse Oximetry has proven as a very useful tool to assess the severity of the patient's condition.
- Pulse Oximetry (together with temperature measurement and report on sign and symptoms) has proven as very useful for long distance monitoring of patients staying at home, after an initial assessment and training by a physician (reducing the need for direct physician – patient contact).
- Having patients equipped with pulse oximeters at home, increases the confidence of family members in their capacity to handle the situation and the sick person.

- Having patients at home with pulse oximeters, provides health care providers with an important decision making tool for their treatment decisions.
- Due to the difficulty to properly auscultate patients while wearing PPE, HCW rely more and more on pulse oximetry to assess patients. Saturation becomes a key parameter in the triage of suspected/confirmed COVID-19 patients, and their categorization into the appropriate referral path.
- Some patients have rather normal saturation while in rest. It is advised to ask the patient to engage in minimal effort (e.g. short walking around). Some patients present a dramatic drop in saturation following this minimal effort (a very important indicative sign for patients with "silent hypoxia").
- More scientific research as needed:
 - a. To better understand the pathophysiology of the syndrome (though there are some possible explanations, e.g. that since the onset of the hypoxia is gradual, the receptors "get used" thus does not activate "emergency respiratory response mechanisms" until a very late phase of the situation).
 - b. A better understanding of the epidemiology of "silent hypoxia" (e.g. prevalence, reports it is more frequent in elderly patients).
 - c. The relation between alteration in cardiac functions and respiratory functions has to be studied further, e.g. the origin of chest pain complaint of COVID-19 patients (cardiac or hypoxic) (a study conducted by BioBeat, on 500 COVID-19 patients, points out the alteration in cardiac function comes first).
- New remote sensing (telemedicine) of several parameters, with wearable devices, allow for 24/7 safer monitoring of patients. These tools are also useful for the monitoring of the wellbeing of responders using PPE.
- "Traditional telemedicine" (a video chat with the patient), with the patient might be misleading, as the patient may have minimal complaints and seems clinically rather well. Best practice: Self-monitoring of pulse oximetry by patients. These recommendations could be considered as recommendations for primary health care providers as well.
- In order to have better decision making based on saturation, more index should be developed. The prehospital SpO₂/RRi ratio needs further investigation because it might help to identify non-clinically obvious ARFs (Acute respiratory Failure) and correlation with severity
- COVID-19, highlighted that clinical decisions on the field with regards to the treatment given to a patient, are influenced by the availability of resources in the health care chain. Besides the ethical implications, real time coordination mechanisms, tools and technology should be studied.
- As high flow Oxygen therapy is considered of high risk for the HCW (potential spread of aerosol), new technologies for the pre-hospital setting, especially for the crowded back of an ambulance should be studied. High flow Oxygen therapy and other non-invasive ventilation, are key, as the prognosis of these patients is better than that of those mechanically ventilated. The risk to the HCW and the precautions taken should be taken into consideration while taking these decisions.
- As the use of pulse oximetry at home is becoming more and more popular, along with 24/7 monitoring of other clinical parameters, data management tools and technologies will be needed, especially due to the cases of "false alarms" of cheap devices.

Main lessons identified in the "Human Resource management during COVID 19 " webinar

The webinar took place on December 10th 2020.

C. Background:

- COVID 19 pandemic posed many challenges, some of them related to the impact on the health care workers. Issues related to the impact on the work force were mentioned on several occasions during the COVID LESSONS IDENTIFIED webinars organized by WP4. Thus, a dedicated webinar was organized on this topic.

C. Main issues observed:

- Putting into action lessons identified from previous operations is a major challenge. When it comes to COVID 19, response, we are at a critical point, as we have to look into implementing what we learned in the COVID operation so far.
- Great differences between "first wave" and "second wave" are observed. These are related to policy (lock down, secession of elective activities in the hospitals), general public activity, public perception of the situation and compliance with restrictions, as well as the willingness of HCW to take part in COVID response activities and assume risks.
- COVID is an opportunity for pushing forward project, especially around digital transformation, and for recruiting new volunteers and enhancing the volunteer base.

Human Impact on the work force and support:

- EMS personnel are facing a major burden during COVID, both physical as well as emotional. The emotional burden became evident rather late, and it seems that current solutions used, does not meet all the needs. Some solutions target awareness raising (such as brochure for team members and supervisors), while others are more "mental health" oriented. Fatigue is evident among HCW as time passes by (along with an evident public fatigue).
- Transmission of the disease to their beloved ones, was pointed out many times, as one of the major concerns of HCW.
- It seems that HCW want to have a "human interaction" with their supporters, and are upset when they are directed to a "support line".
- Adapting "staff support" existing mechanisms to COVID reality is a challenge. Peer support systems proved to be more flexible.
- Volunteer EMS are facing many challenges. One of the reasons is the pressure on the volunteers not to engage in patient care due to the risk associated (pressure from relatives, employers and others).
- During the webinar cases of abuse against HCW were reported (both virtual as well as physical) – mainly associated with infodemics against HCW. Management of fake news proved to be a great challenge (internally and externally).
- In some instances, organizations provided accommodation as personnel was worried of bringing the virus home, and refrain from returning to their homes. Other "support services" (e.g. kindergarten for young children of staff), to allow them taking part in the joint effort.

- EMS resiliency is a concept that requires further attention and development of tools to both conceptualize measure and improve. Wellbeing must be a key pillar in this resiliency framework.
Resilient EMT / Paramedic must be a fundamental pillar of this concept.
HCW don't want to be perceived as "persons who need psychosocial support", but as "resilient persons", who need a "healthy framework" that will allow them to deal better with the extraordinary situation they are lining through.
It is the "duty of care" of organizations to provide such a framework.
- HCW expect "organizational justice" in distribution of workload and resources, and support in the many ethical dilemmas they encountered during the outbreak.
- Response to the pandemic required shifting to "disaster medicine philosophy" (which means from a concept – "the best for the most critical" to "the best for the most" sometimes reducing the level of care to the most critical). Many HCW are not trained in "disaster medicine" and this shift created for them many ethical dilemmas.

Governance:

- Multidisciplinary working group on EMS during COVID 19 has proven highly effective, as it embarks many stakeholders and aspects of COVID response (e.g. licensees, dispatchers, PPE, First Responders who are not EMS like law enforcement). Having ONE entity that sets up the guidelines for both public and private sector proved helpful.
- Central oversight of the manpower in the health care sector (with its many different components – pre-hospital, intra-hospital, primary health care, public health, long term care, and balance of load and shortage is a good practice.
Legal and administrative mechanisms to allow for volunteers, re integration of retired personnel, temporary licensing are essential to allow for growth of the system to meet the needs.
- Many organizations used schemes of "temporary licensing" students, at different stages of advanced training. These "temporary licensing" were used to increase the work force, and as clinical training opportunities are not available (to bare in mind, that those trainees went to the field with very little or none real clinical experience. The impact of that lack of experience is still to be tackled).
- Leadership (including personal role modeling) and institutional communications were key to the organizational resilience.
- Adaption of work patterns (not limited to "work from home") to COVID reality is essential (e.g. new shift patterns).
- The standardization of PPE is critical, as differences in PPE across organizations (private versus public, hospitals, long term health care facilities and EMS) create uncertainty and concerns among providers.
- Public education on "proper use" of EMS, especially during COVID outbreak, needs to be improved. COVID had an impact on public perception of EMS and ED (sometimes positive "heroes", sometimes negative, and sometimes with "side effects – "heroes who don't have enough PPE, thus are putting their beloved ones in harm's way").

- Role of "technical experts" (Infection Prevention and Control, IPC, or CBRN) on duty, as focal points to support the team members in their mission and concern, proved important, and as a factor that adds to the sense of safety by personnel.
- ICP measures on administrative / logistics areas of the establishment proved very important (resting area for personnel are a "soft spot" in the system).
- The role of "health and safety" in the institution received special importance.
- As volunteer organizations took roles that demand "certainty of the service", and as people are resuming their daily activities (thus reducing the time available for volunteering), a hybrid model of paid staff and volunteers is introduced (with significant financial implications).
- Ad hoc volunteers are key component in the response capacity. The capacity to manage "ad hoc volunteers" is based on "existing institutional affiliated volunteers", who are trained in management of ad hoc volunteers, supporting the organization during emergencies.
- Changing the organization's modus operandi to "crisis mode" is one of challenge.
- Response organizations should keep in mind "other disasters" and have the contingency for "disaster response under COVID" (e.g. shelter in the upcoming winter).

Reducing the workload:

- Programs aiming at reducing the transport of none – critical patients to hospitals, are growing in number (with limitations, such as the way EMS are funded). These programs require specific training of EMS personal (as the "load and go" traditional model has changed).
Other services set up dedicated teams responding to "none critical patients".
- COVID pushed forward the use of telemedicine. While it's full impact is still be learned, HCW need training and learning the pros and cons of these technologies.
- Some specific locations require "tailored response". Long Term Health Care Facility are widely identified. Understanding that patients from Long Term Health care Facilities, are bettered care for on those facilities, solutions to allow for COVID patients from those facilities receiving care for their COVID disease at the facility were very useful and important. Correctional facilities are under the same category due to the crowded living conditions, and the logistics associated with transport of inmates to health care facilities.
- Some Long Term Health Care facilities have "entry protocols" such as – a negative COVID test over the last 24 hours. Such procedures became an obstacle in the EMS response to those facilities.
- Work overload is one of the major stressors identified.
A strategy proved effective:
 1. Set up formal mechanisms to minimize the workload on the "field personnel" trying to ensure balance of work and rest time.
 2. Increasing "support services" to the "field responders" (e.g. logistics).
 3. Creating "opportunities to rest" in the workplace (if possible) – resting area, food and drinks
- Volunteers took "support roles" in order to allow HCW to focus on the more seriously ill (e.g. transport of confirmed a-symptomatic cases).

Human resource management:

- Having a "reserve unit" to augment the capacities of the health care system, is essential to the system's capacity to meet the needs.
- Health Care requires in many instances physical presence of the HCW (especially for those seriously sick). As a result, many organization offered vulnerable HCW (due to age, underlying medical conditions) other opportunities (other working positions).
- Having a "replacement program" for personnel who became sick, or under quarantine, is key to the "business continuity" of the organization. Having such a plan for "senior positions", was often neglected or a challenge. Having such a plan during the "second wave" proves to be more challenging (personnel are less willing to walk the extra mile, more personnel on sick leave, personnel leaving the organization).
- Absence of HCW became an issue for some organizations, along with personnel on prolonged sick leave and others leaving their organizations.
- Recruitment of new EMS personnel and retention of those already in the service will be a major challenge in the years to come.
- Due to the lack of nurses and physicians, some organizations have turned to having paramedics and EMT in their facilities. This adds a strain on EMS organizations, already short on trained personnel. Many health care organizations entered the pandemic short of HCW to start with.
- One of the greatest strengths during the first wave was the flexibility of personnel and their willingness to assume new roles.
- One of the personnel planning pitfalls – under estimation of the need for additional personnel (both clinical as well as support services), due to the separation between COVID and none-COVID areas.
- Some services instituted a regular testing system of their personnel.

Training:

- All HCW should be trained in Disaster Medicine (including nurses).
- "Just in time trainings" are an essential part of the response; these trainings are targeting different aspects – knowledge about the disease, treatment protocols, practice of ICP and PPE procedures, as well as practical treatment protocols (e.g. pronning of patients).
- HCW had to adjust to different working conditions – working in PPE, in "isolation conditions", in improvised facilities are some examples. All this required training as well as adaptation.
- Looking into the data, HCW presented in most countries a ration of infection lower than the general public, with most of the contamination occurring in family / social settings and not in the labor setting (as per epidemiological investigation). This gives the confidence that IPC at the work setting was successful. It also raises the concern concerning the success of the behavioral change among HCW when it comes to their "out of work" activities.

Main lessons identified in the "COVID 19 risk communication in the health sector" webinar

The webinar took place on December 18 2020.

A. Background:

- COVID 19 outbreak is associated with many risk communications challenges, being a new disease, with evolving knowledge changing frequently. The “infodemic” the broke out in parallel (alternative thoughts, conspiracy theories, and debates on the science), made the communication with the public very challenging to the health authorities.

During the different webinars organized by NO FEAR WP4, risk communications with the members of the health sector was singled out as a topic with singular challenges, as the health work force is on one hand more knowledgeable and critic than most of the general public, and on the other hand, many of them requested to put themselves in harm's way to treat patients.

- This webinar is another example of the implementation of the DG HOME – USA DHS cooperation agreement, bringing together knowledge from both sides of the Atlantic, in favor of our communities.

B. Main issues observed:

- The involvement of practitioners is essential to the future safety and security of European Citizens (and as a result to future HORIZON EUROPE program). Networks of practitioners play a major role in bringing the voice of practitioners to the attention of policy makers, suppliers and the academia.
- COVID outbreak is teaching us many lessons on societal resilience. One of the big challenges will be ensuring that the lessons observed from this pandemic are learned and not forgotten (as lessons from other outbreaks during the 19th century).
- Having a “trusted source” is one of the most important issues in effective risk communications. Health Care Force (HCF) have here a double role:
 1. As a recipient of information, that demand a “trusted resource” to communicate with them (and are a challenging audience).
 2. The professional organizations of HCF (e.g. nurses association) are often a well-respected organization, who can serve as “trusted source”.
 3. As a “trusted source” for those whom they care for. In order to act as a “trusted source” HCF have to be convinced themselves in the information and messages they convey.
- Though we refer to HCF (Health Care Force), it is essential to understand that this is a huge sector, with many variants in their background, training, setting of care and type of contact and communication with the care recipients. Communication strategies and channels should be tailored accordingly.
- Any communication with the HCF should consider them BOTH as recipients and as Messengers (as the public trusts more the message from a fellow citizen than from an “official source”). Any information provided, must allow the HCF address the concerns of their audience (giving them answers to FAQ as well as addressing information circulating on other means of communication).
- HCF are essential not only as a “messenger to the community” but also as a “sensor” to hear the voices and mood of the community.

- Communication with HCF must be a 2way communication. Having a mechanism where HCF could express and discuss their questions and concerns is a key success factor. This includes daily briefings by senior managers, who are also an opportunity to express the leadership support and gratitude to the personnel. HCF expect a “human interface” (even if virtual), and not just a website / email address. Direct access to subject matter experts was a very successful approach. Having a 24/7 expert team on duty, was very highly appreciated, and gave the team members the reassurance that their safety and concerns are well taken care of.
- In order to have an effective “two ways communications” feedback mechanism are essential. It is crucial that the HCF feels that their voice and feedback are heard, respected and considered while taking decisions. Different programs have to be designed to have an effective feedback mechanism built in.
- One of the key factors in effective Risk Communications is **Transparency!** Transparency comes with an open dialogue and public participation (often forgotten, and an approach of “giving instructions” used).
- One of the main issues with the COVID 19 outbreak is the **uncertainty**. This uncertainty, which created changing knowledge and changes in instructions (in the past use of facemasks, now vaccines), diminished the trust in experts. The challenge is **building trust in face of uncertainty**. In this process, transparency and two ways communications are essential. Organizations that told their personnel “we don’t have the answer” gained trust.
- “Speaking in one voice”, while identified as key to building trust and effective risk communications, has proven impossible in a democratic society, especially when competing societal values are at stake.
- One of the major concerns of HCF is bringing the disease home, to their beloved ones. Many of those concerns were around PPE, counterfeit PPE – having a dedicated team on call with protection (CBRN) experts, helped considerably ensuring the personnel they are well protected. The concerns around PPE were greater than those over the high workload.
- Ensuring that the HCF understand the “full picture” is a challenge (as they are involved in a specific aspect of the incident).
- While considering HCF, a holistic approach must be in place, considering all those involved in health care not just those providing direct patient care (e.g. Physical Therapists, pharmacists, administrative and auxiliary services personnel).
- Long term health care facilities, are a unique challenge, where the HCF are “trusted messenger” for a larger audience (not just those being cared for, but also the larger family members of those).
- The message had to be conveyed to the HCF at their place of work; within the very limited time, they had available in between many other tasks. Due to time and attention constraints, the information should be concise and well organized; e.g. Summary on the Top, details below, and references for those who are interested.
- Guidelines were often too long, ambiguous, and frequently changed. This created mistrust. How guidelines are perceived by the user, should be a consideration while being written and changes.
- Major changes in guidelines – e.g. the use of masks by the public, created mistrust. The change should have been better “marketed”. Understanding the **risk perception**

of the different HCF components is key, and measures to be taken should consider both the “actual risk” as well as the “risk perception” (e.g. routine / daily testing of personnel, daily reporting of symptoms).

- Management support is key. SAMUR P.C Madrid set an example having a senior manager on site for any activity on “COVID patients care sites”.
- COVID 19 affected health care systems who were often understaffed before the outbreak. The outbreak added many strains adding additional patient load, new tasks, while reducing the personnel available (due to sickness or isolation). On the positive side, in most of the western countries, the ration of HCF critically ill with COVID 19 is lower than the public, demonstrating a relative success protecting the HCF (a combination of PPE and appropriate IPC (Infection Prevention Control) measures that the HCF followed). This is predominant especially among HCF 55 and older (a more vulnerable group).
Decrease in the ratio of HCF infected with COVID 19, as the outbreak progressed, is an important indicator to the effectiveness of IPC measures, risk communications campaign, together with better availability of PPE.
- Bringing occupational health and safety functions to support the HCF proved an efficient tool to increase HCF sense of safety.
- The public perception of HCF changed from the beginning of the outbreak – from “heroes” to “neglected” at best case, or even blamed for “not saving every one”, or harassed as they “bring the disease to the community”. This change is a reason for worry.
- One of the most difficult issues to communicate is around testing and stopping the spread of the disease (being testing an essential step, but not the only one). Especially when high positive ratio of results in restrictive measures.
- Many on line tools were developed (e.g. by the WHO and CDC), very helpful and providing the latest updated information.
- People are using their experience with seasonal flu, and flu vaccines as reference to COVID – 19. This is not well addressed.
- One of the challenges in COVID 19 risk communication is the need to have people (and HCF among them), discuss both the personal as well as the societal risk perception of the outbreak and the means to minimize the risk (to the individual and to the society, which may differ one from the other).
- COVID 19 is the first pandemic where social media has been used to share a vast amount of protective information as well as misinformation, resulting in it being labelled as an infodemic. It proved the power of social media. COVID created many communications challenges (some of the physical as PPE, some of the conceptual, like those created by rumors on social media).
- It is important to recognize that both personnel and the public consist of different groups with different information needs which will require different communication channels for two-way engagement. Groups may differ based on factors such as age, gender, ethnicity, languages spoken, health status, income, etc.
- Messages should be **short, clear, concise and consistent**
- One of the lessons learned from the outbreak is that **people are well informed, but still do not take the necessary actions**. This is worth of further investigation.
- One of the long term challenges is maintaining the communications channels with the personnel (staff and volunteers) open, through the different phases of the pandemic (as the waves come and go).

Main lessons identified in the "COVID-19 Vaccination" Webinar

The webinar took place on January 7th 2021

A. Background:

- As many countries initiated their COVID-19 vaccination campaign, the webinar was organized in order to listen to preliminary lessons observed from the early days of the campaign, in order to improve this huge activity.

B. The recording of public parts of the webinar can be found at –

<https://youtu.be/Smn-a14wJII>

Webinar slides – attached.

C. Main issues observed:

- Logistics:
 1. The vaccination is a major logistics operation; storage, distribution, vaccination sites, organization of appointments.
 2. Health personnel are in most cases not used to this type of operations, thus should ensure the support from the right operations and logistics profiles.
 3. The necessary assets (e.g. refrigeration tracks, temperature controlled refrigerators, generators, large vaccination sites) have to be secured.
 4. Planning has to look into all assets needed, starting from syringes and alcohol swabs to the medical personnel on standby (in case of adverse reactions) – e.g. shift from ambulance on each site (availability challenge) to having a kit with EPIPEN on site and calling the EMS if needed.
 5. Detailed planning is key to the operation. Differences between expected quantities to actual quantities created a challenge.
 6. Different vaccines offer different levels of flexibility. This flexibility should be concerned also in planning for different communities in different settings.
 7. Door-to-Door vaccination for people with limited mobility remain an unsolved problem.
- Who gets the vaccine:
 1. All countries have clear policies with on “eligibility for vaccination” (though differ one from the other, e.g. on vaccination of front health care workers as a priority group for vaccination). One of the challenges is the use of “left overs” – doses that will be thrown away if not used that day. Different agencies, have different policies (from sticking to the roles, with the cost of throwing away doses, to bringing in “first responders” on duty to be vaccinated).
Defining who “first responders” are is another challenge, as in many services, fire fighters and law enforcement are dispatched to EMS calls, as “first responders”.
 2. All organizations identified “special groups” that can be vaccinated only with special precautions (especially persons with history of allergies or severe side effects to vaccines). Usually those will be vaccinated in Hospitals.
 3. Due to the logistics challenges, hospitals use as “vaccination hubs” for first responders.

- Who the actual personnel vaccinating are?
 1. Great variety showed a. From a physician conducting the “pre vaccination interview” and a nurse delivering the vaccine, to a nurse supervising the processes and EMT delivering the vaccine. In some countries, the military is called in to support.
 - One of the major challenges discussed is that the clinical personnel used to vaccinate, is the same dealing with the COVID response (sampling, clinical care and public health), thus in acute shortage (see below about the challenge of vaccination in the midst of an outbreak).
 2. Some agencies allowed EMT to vaccinate, under the supervision of the EMS medical director, after a specific training (virtual for the theoretical part followed by a practical component).
 3. In context that is it allowed, partnerships with “external providers”, as pharmacy chains proved helpful.
- Ensuring that vaccination sites meets the “COVID-19 safety precautions” is a priority and a must, while offering a welcoming environment.
- Vaccination guidelines:
 1. Following the changes in guidelines is a challenge (e.g. the change in indications for vaccination of pregnant women).
 2. Ensuring proper follow of two (or 3) different vaccination processes will be a great challenge in terms of patient safety.
- Acceptance of the vaccine:
 1. Acceptance of the vaccine is one of the major challenges that has to be endorsed to ensure the long-term success of the campaign.
 2. One of the key issues is around **trust** in many different levels. This could be around the trust of the community with the authorities, and in many cases, the personal trust people have with the person communicating with them. This is directly associated with the personal example set by the key figures.
 3. Personnel found a portal as insufficient, and wanted an address they can refer to with their concerns on the vaccine.
 4. Understanding the key sources of trust and miss trust, building on past relationships must be used as pivot for any vaccination campaign, and lead any action (e.g. isolated communities who don't want strangers to come into their community). Having a transparent dialogue with communities, in order to have “community vaccination planning” proved key.
- Management of the outbreak (especially with the rise in cases seen in Europe, USA, Canada and Israel) in parallel with the vaccination campaign in the biggest challenge now. Public perception is that the vaccine is the “magic solution” so compliance with pandemic precautions (social distancing, facemasks and hygiene) might diminish, resulting in increase in the number of new cases, undermining the vaccination efforts. This is also true for health care workers and the need to ensure they are following IPC procedures, after they are vaccinated.

- Informed consent – different approaches identified. Some require a signed form, while for others the fact that a legal adult walks in suffices. Having an “informed consent” at long-term care facilities is a must, and a challenge that delays the operation.
- While the actual delivery of the vaccine is rather very fast, the whole processes might be slower – interview, registration, preparation of the vaccine and the mandatory 15 min (or 45 min) stay after the delivery of the vaccine. The whole processes has to be discussed, so it is effective, and still maintains the social distancing roles.
- IT issues:
 1. Ensuring transfer of data between different agencies, while protecting privacy is a challenge (as the vaccine has to be reflected in the personal medical file, central registry, while the agency delivering the vaccine is not necessarily the “normal primary health care provider”).
 2. Having in place the system for the 2nd appointment and follow up (including the exclusion who were confirmed as positive after the 1st vaccination) is challenging.
 3. Having a good IT system to collect information on side effects on real time and share that data.
- Most of the countries will most probably not opt for “mandatory COVID-19 vaccinations”, though benefits for those vaccinated are discussed (e.g. free access to public events). Some organizations are discussing the implications of having front line health care workers who are not vaccinated, ranging from removing them from their positions to having them formally accept the risks associated.
- Door to door distribution for those who cannot access vaccination centers is still a challenge (needs approval from the pharmaceutical companies), and highly needed in order to cover the most vulnerable population.

Main lessons identified in the "Supply Chain challenges during COVID 19" webinar

The webinar took place on March 24th 2021

A. Background:

- COVID 19 created among others, challenges in the supplies of equipment to health care organizations (pre-hospital and intra hospital care providers). Those challenges were flagged on previous NO FEAR WP4 webinars, thus decided to dedicate a webinar to further discuss them.

As Personal protective Equipment (PPE) challenges were discussed on numerous occasions, this webinar was dedicated to other items, not only PPE and disinfection materials.

B. Main issues observed:

- The pandemic characterized with an extremely hectic initiation. While at early 2020, it was "almost under the radar" for Europe and the USA, in early March 2020, it exploded, with organizations trying to buy "every possible item on the catalogue" (mainly PPE and disinfection products).
- While at the beginning PPE standards were not clear, later lack of availability created a behavior of "buy whatever you can".
A policy of "flooding the market" with enough equipment by the authorities, controlled the situation, and helped preventing organizations from creating their "own stockpiles" (sometimes at the expense of other organizations).
- Re use of equipment (due to shortage, financial and environmental considerations), became an important trend, that should be investigated further, especially in view of future preparedness.
- Fighting counterfeit products, fraud documentation and suppliers not meeting their commitments are great challenges. Standard shipment documents (in a clear set of languages readable by all, standard and verifiable denominators) are key to goods transfers during emergencies (e.g. the size definitions of clothing is different among countries).
Vendors are not normally involved in the processes of "emergency supply standards" and can contribute their experience to the discussion.
- Vendors and suppliers are not always declared as "critical infrastructure" in their countries. This created challenges in their operations due to restrictions (both at operating their facilities, as well as with their access to air freight, customs etc.).
- "Customer education" is key, as in many cases health care organizations found themselves in procurement of equipment that is considered "HAZARDOUS MATERIALS" (HAZ-MAT), without the technical knowhow.
- The COVID outbreak in early March 2020 was associated with:
 1. Closure of borders and major restrictions. This was associated with cancellation on many passenger flights (e.g. from China) dramatically decreasing the freight capacity available. This resulted in dramatic increase in shipping costs (up to – 3-4 times higher) to the point that airfreight was unfordable, and maritime freight considered only for large quantities.
The exception to this were shipments organized by the governments (e.g. vaccines)

2. Major fluctuation in exchange rates, creating an additional financial instability for manufacturers and vendors.
 3. Increase in freight costs of up to 3-4 times more expensive.
 4. Lockdowns and personnel absence putting different levels of restrictions on manufacturing capacities of vendors.
 5. These issues resulted in one or some of the following:
 - 1) Raw materials not reaching the manufacturing site.
 - 2) Raw materials at the manufacturing site with reduced production capacity.
 - 3) Finished products sitting at the vendor's warehouse and not being shipped.
- Having the first outbreak in parallel with BREXIT created many uncertainties around import / export rules, taxes etc.
 - Some countries applied different levels of restrictions on export of goods (e.g. PPE, ventilators, medications), considering their internal needs as the top priority (even in case of signed contracts between a vendor and a customer).
 - In some cases the authorities using emergency powers, prioritized the supply of products (e.g. surgical masks designated specifically to hospitals, creating shortage in EMS being part of a Fire Department).
 - When governments shifted to a "crisis mode" and activated associated crisis management mechanisms, many issues improved. The challenge – when the situation improves, how are we going to maintain those mechanisms active?
 - COVID 19 outbreak created interest in EMS organizations in infectious diseases. This is something to leverage.
 - Special approvals from customs were needed to expedite entry of certain types of equipment into the country (medical supplies and equipment). Customs agencies needed technical support of health care technical personnel.
 - Technically, shifting from shipments in pallets to boxes made freight much easier.
 - Batteries (normally made in China) were an item in shortage.
 - One of the major issues discussed following the shortages in medical supplies (e.g. ventilators, Oxygen, certain drugs needed to ventilate patients) is going back to the "national critical stockpile" (model the existed with Civil Defense during the Cold War). Emergency warehouses from Ebola preparedness were the "first line" of response for many organizations.
If such an approach is adopted, storage and the regular use of stored goods should be part of the processes. "Equipment and supplies for an extraordinary case" (scenario based) should be considered and stored on those stockpiles.
 - Emergency authorizations were used to substitute medications that became unavailable (e.g. replaced respiratory drugs given by inhalation that were not available, with drugs given IV)
 - We need to re-visit our contingency planning, as of now many of the assumptions are around mutual aid, and not considering "being alone / isolated for a prolonged period of time". The concept of "self-sufficient" needs to be discussed and clearly defined by each organization.
 - The pandemic gave opportunity to many PPP (public Private Partnership) that should be further investigated and set good examples for the future.
 - The outbreak saw innovative solutions as printing swabs with 3D printers, and adoption of new respiratory protection being adopted.
- As the pandemic continues, we need to re think more re-use of equipment.

- Blood became an item in shortage due to difficulties recruiting volunteer blood donors (both willingness of donors to arrive to blood drive sites, and the restrictions on organizing blood drives).
- "Foreseeing the future and procuring" is a great challenge. E.g. looking into all the consumables needed for the vaccination campaign, and initiating the procurement ahead in time.
- Procurement became of the key components in the operation.
- Procurement must come with training and certification of users, when it is new equipment (that was often the case during the operation). Due to the intensity of the operation and the restrictions – a very ambitious challenge. More thought is needed on this.
- Public Procurement procedures were sometimes challenged due to the unpredictable, ever changing and volatile market nature of the pandemic. Needed "extraordinary measures" should be investigated.
- Organizations must consider "donated equipment and supplies" and have a clear procedure to manage the donors and the donations.
- As "just in time" approach is a normal practice in the health care sector, vendors are required to have a 3 months stock at hand. With the massive influx of patients, these stocks were used in days and due to flight restrictions, restocking was very limited. Organizations should look into their "minimum stock".
- Having a clear and robust "quality assurance system" for equipment and supplies creates great deal of confidence and reassures the team members. This should be clearly communicated to the personnel.
- Management of multiple suppliers for the same items (some of them new vendors), created many challenges to organizations.
- Distribution from central warehouses to the end user – a major operation that required a very strong IT system. Sometimes the "end user" was the citizen (e.g. pulse oximeter, that one cannot go out and purchase being tested positive).
- Identifying "bottle necks" on real time is essential – sometimes distribution issues, not by procurement issues, cause the lack of equipment for the end-user.
- The pandemic changes the perception of the European Commission concerning its roles during a global emergency, thus adjusting the Joint Procurement Agreement to be more agile and allow better responding to emergencies. In this line, discussions around "emergency health response" in the EU and related mechanisms are taking place.

Main lessons identified in the "New COVID 19 wave - what changed?" webinar

The webinar took place on April 22nd, 2021

A. Background:

- Europe is seeing since January 2021 a new surge in COVID 19 cases (with different time lines and intensity).
- This webinar was organized in order to identify differences and changes from previous waves of cases and the adaptations adopted by different organizations.

B. Main issues observed:

- The health care system in many countries entered the current wave, facing results of one year of pandemic:
 1. Many "routine" health care activities, downsized or postponed during 1 year of pandemic, resumed, resulting in reduced availability of resources.
 2. Emergency Departments (ED) are often very busy with "regular calls" that resumed, many of them with serious medical issues, undertreated during the pandemic (combination of reluctance of patients, combined with lesser availability of health care, for none-COVID cases).
 3. Due to successful decrease in cases, resources (human and material) were "pooled out" of COVID response.
Lack of resources was repeatedly mentioned, along with solutions – as mobile ICU trailers. The issue of trained personnel to manage the critical COVID patients remains the main struggle.
 4. The dramatic decrease in primary health care during previous waves, as well as citizen's reluctance to approach health care facilities, is resulting in more "routine cases" that exacerbated due to lack of proper care.
The importance of effective primary care during an outbreak (both for "routine cases" as well as for COVID patients with minimal signs and symptoms) was clearly identified.
Need: to better design regular and primary healthcare during outbreaks (including tele-medicine)
 5. With increase of "routine medicine", there is a need for increased availability of ICU beds (e.g. for post-operative patients. These became a bottle neck as many ICU beds are still designated to COVID critical patients).
 6. ICU beds shortage, makes patients transfer ("to an available ICU bed") a real challenge. In some cases, family members refuse transfer to remote care facilities.
 7. Having "possible COVID patients" arriving in an ED, while some of them are: fully vaccinated, some partially vaccinated" and some "none vaccinated" requires re-design of patient flow and procedures.
- Health care personnel being – tired, burned out were reported by some services (associated in some cases in higher rates of absence).
Interestingly, volunteers working along with paid staff, reportedly assist in keeping the team spirit up.
Needs –

1. To look into the long term impact of COVID on personnel (burn out?, and reasons why in some cases less "burn out" is perceived).
 2. To look into the potential role of volunteers in team's moral.
- Upcoming summer, and possibly lack of proper holidays (second year straight) was pointed out as a potential additional stressor.
 - The political dimension of the new wave was mentioned by many speakers:
 1. As response to the pandemic (e.g. around lock downs, vaccination) became politically challenged, health care providers found themselves in the storm eye of a political dispute (that is some countries became a violent disputes. One case of aggression against health care workers reported).
 2. The public discussion putting different societal priorities in contrast one to the other (e.g. health versus economy), put health care as "taking sides" in a political discussion.
 3. Cross border cooperation became very difficult, in some cases ceasing "regular cross border cooperation". When that cooperation will be resumed is a challenge.
 4. "The virus does not respect political / administrative borders". But different political / administrative structures applied different containment measures / vaccination policies, which make the sanitary response extremely difficult.
 5. Decisions to ease restrictions around Christmas time.
 6. Vaccination policy and distribution of vaccines to different regions, in some cases considered more political, than based on evidence.
 - The role of media in creating a "public mood" (positive and negative) was mentioned, along with changes in the media mood towards health care providers. This is also directly related to the spread of "fake news" by some media outlets.
 - Epidemiology:
 1. New variants (Mainly the Kent Variant), changed the cases panorama very rapidly and created the need to rapidly adjust.
 2. Emerge on new variants (more contagious, more violent, resistant to the vaccine) are currently the major source of concern.
 3. The 3 waves is characterized by:
 - Younger patients, associated with more severe cases and death among them.
 - Most of the cases are NOT associated with long-term care facilities. These are most probably associated with health policies targeting protection of the elderly and vaccination (of the elderly first).
 - pregnant women, being sick (some of them critically ill)
 4. Higher infection rates (in Ireland one case of a funeral that ended with 300 new confirmed cases).
 - Outbreaks among health care providers (could be associated with relaxing of ICP procedures or false sense of safety by the personnel).
Need for the public health care system to step in, supporting private health care facilities, left without personnel (in order to prevent those staying in those facilities from being transferred into hospitals).
 - Measures implemented based on best practices from previous waves:

1. Patients are required to disinfect their hands before touching ambulance equipment, and EMS personnel disinfects ambulance surface after each call.
 2. "Spoke and hub" models for referral of confirmed COVID cases and centralized management of the referrals.
 3. New PPE standards are put in place applicable for ALL patient interactions in EMS (and expected to stay for a long period of time).
 4. Introduction of new technologies to better assess patients (e.g. rapid COVID tests, lung sonography at the prehospital setting).
 5. The positive role of CPAP in preventing mechanical ventilation is being evaluated as a possible "best practice".
 6. Dedicated call centers to triage and support COVID patients (also to reduce the burden of the hospitalization structures).
 7. Set up of "emergency hospitals" to remove "normal case load" from hospitals (still having trained personnel as a challenge).
 8. EMS personnel involved in "none traditional EMS functions" (sampling, vaccination), a positive lesson learned, as it allowed for nurses to be dedicated to treat critical patients.
 9. Virtual learning platforms that allowed learning and updates – positive lesson learned.
- Vaccination hesitancy in the public is also clearly noted among health care providers, especially with the recent concerns with specific vaccines. Freedom of choice around type of vaccine persons receive became an issue.
 - The impact of COVID patients of EMS (longer "turn around", need to don / doff PPE) should be studied in order to have a proper contingency for future outbreaks.
 - When considering "first wave" (April 2020) data, it is important to consider that due to testing availability limitations (e.g. testing only those who are admitted to a hospital based on clinical presentation) , and as a result testing policy, the official figures are most probably under estimate.

Main lessons identified in the "DELTA COVID 19 wave - what changed?" webinar

The webinar took place on September 2nd, 2021

A. Background:

- Since July 2021 some countries see a new surge in COVID 19 cases. In many of those cases, the surge is associated with wide spread of the COVID 19 – DELTA variant.

B. The objective of the webinar was to share the experience in different countries, and discuss possible changes in the characteristics of the outbreak and in the response.

C. Main issues observed:

- No major changes observed in the clinical presentation of patients. Some mild symptoms could be interpreted as “bad cold” (especially among young patients).
- The Delta variant is associated with much higher rates of transmissibility. Research shows that the viral load of vaccinated persons is as high as for non-vaccinated persons, thus posing a transmission risk if become positive with DELTA variant.
- The impact of the vaccination is evident, resulting in: a) patients who are not vaccinated are in more serious condition b) ratio of non – vaccinated is higher than those vaccinated (ratios are important, as in some regions the numbers of those vaccinated are much higher than those vaccinated)
- The surge is associated with younger patients (including school age). A major change from the beginning of the pandemic, where the more critical were the older.
- Often the source on transmission is in social activities (some against regulations). This comes with a sense of lack of trust in the authorities and restrictive measures in place. A general sense among speakers about the need to communicate better, and be more effective in regain the public trust (as well as the trust of the media).
- High incidence of positive cases among persons fully vaccinated (Madrid 16.6%, Israel up to 54%), though a fully vaccinated person is still well protected against serious illness.
- Decrease in reported cases of acute respiratory infections in Spain. In Israel, surge in respiratory infections among young children.
- Third / booster dose is a topic under discussion for many countries. Israel's data shows waning effect of Pfizer vaccine after 6 months that together with the higher transmissibility of DELTA variant, contributed to the surge. This surge was controlled with an aggressive booster campaign.
- The “opening of travel” is definitely a contributor to the surge.
- Mitigation strategies:
Several mitigation strategies were discussed:
 1. “COVID 19 health pass” – instituted in France, Italy, Ireland and Israel (allowing access to certain activities – e.g. public gatherings, restaurants) only to: 1) fully vaccinated 2) COVID 19 recovering patients 3) recent COVID 19 negative test.
 2. Making non – vaccinated persons pay for their tests.
 3. Making COVID vaccines mandatory for certain groups (e.g. health care workers, education personnel). In some countries, the vaccine is not mandatory, but if the professional is not vaccinated, has to be tested twice a week (at one's own expense).

- One of the greatest challenges is “reinstating” mechanisms that were functional before spring, and were dissolved with the sense that the pandemic is over after the vaccination campaign.
- As the health care system re-took “normal activities”, the surge in new cases, was met in some cases with less surge capacity (also associated with personnel fatigue).
- Lack of compliance with treatment protocols by health care providers becomes an issue.

Non – vaccinated are not distributed homogeneously in the population (e.g. – age, socio economic status). Better understanding the demographics of non – vaccinated / vaccination hesitates, and the reasons for their hesitancy, will allow better planning approaches to tackle those causes. This is essential, as at the moment vaccines seem to be the most efficient defense mechanism (against DELTA, and hopefully further variants that are expected).

Main lessons identified in the "Medical and logistical constraints of COVID-19 patient transfers" webinar

The webinar took place on November 10th, 2021.

B. Background:

- AP-HP is sharing its unique experience of severe COVID-19 patients air transfers, highlighting the medical and logistical constraints. SAMU 94 reports an experience of the first wave, transforming an airport into a medical hub to evacuate and dispatch patients all over France, in regions with remaining critical bed capacities.
- The difficulties of handling patient flows in island areas and the need to transfer patients by air, sometimes over very long distances, were presented. Major constraints applied to aeromedical patient evacuations and these situations show in what sense this pandemic is a disaster. A particular focus was placed on oxygen issue.
- The consortium's work has also highlighted the discomfort of Biological PPE worn by medical teams. A promising hood created in partnership with BAE system and the Lancaster University was presented in the webinar.

C. Main issues observed:

- Need to transfer severe Covid patients due to a lack of ICU beds in some regions
- Advantage of transferring 24 patients at once by train
- Advantage of transferring patients by plane or helicopter if they have to be distributed in different regions, sometimes far away
- High level of expertise for medical teams
- Need to take into account ethical issues when the family did not agree to the transfer
- Particular attention to be paid to the power supply and batteries, the safety of oxygen transport, the non-contamination of the teams
- Advantage of organising a medical hub in an airport nearby allowing the evacuation of patients by civilian and military planes and helicopters.
- The impact of the low vaccination rate in an island causing a real health catastrophe and the need to transfer patients by long distance plane
- Difficulties in selecting transferable patients due to the need for strict medical criteria when the evolution of the disease is not predictable
- Importance of having sufficient oxygen capacity in the islands and knowing the regulations for transporting oxygen by air
- Underlining the interest of a cooperation between industrials, engineers and academy to answer a in real time demand of end users
- Importance and interest of creating biological hoods offering safety, good vision without fogging on glasses and prolonged wear

Main lessons identified in the "patient distribution during COVID 19" webinar

The webinar took place on November 30th, 2021

A. Background:

- COVID 19 stressed health care systems globally, creating acute shortage of hospitalization beds in some cases, resulting in ambulances queuing in front of hospitals and patients been transferred to other facilities to meet their needs.
- The objective of the webinar was to discuss the lessons observed during COVID 19 peaks related to patients distribution

B. Main issues observed:

- The challenges identified are global.
- The main challenge is to bring to the hospital only those who will most probably require hospitalization.
This implies:
 1. Having a system that allows EMS not to transport all patients to the hospital (legal implications, reimbursement of EMS issues)
 2. Tele medicine plays a key role. COVID 19 pushed the use of telemedicine for patients at home. This requires a deep look, and discussion on the best practices and gaps.
 3. Having a system to provide primary health care at home for confirmed cases, under home quarantine.
 4. Call taking and dispatch protocols should be amended to meet the "pandemic reality".
 5. Confirmed COVID cases who receive chronic treatment (e.g. hemodialysis) pose specific challenges to the system, due to their immunocompromised condition.
- Ensuring that patients admitted to the hospital are COVID 19 free is an additional challenge (with serious implications when failed).
- Hospital logistics setting in the admission areas for COVID 19 suspected cases are key to their capacity to admit patients (e.g. waiting areas, until rapid COVID 19 tests are received).
- **Shortage in health care personnel, before the pandemic, is dramatically exacerbated due to the pandemic, worsening as the pandemic goes on and on. Lack of qualified personnel is becoming the bottleneck in the capacity to meet the COVID 19 demand.**
- Long distance transfer of patients requires specific logistics preparations (e.g. spare batteries, sufficient Oxygen supply).
- The cost / benefit of using dedicated "COVID 19 ambulances", requires additional discussion.
- Patient and family consent to be transferred to remote hospitals is a challenge, especially in under privileged communities.
- Preparing for the situation that the system cannot care for everyone is essential. Both at the protocols level, as well as the mental preparation of the caregivers.
- Psychosocial support to **all** those involved is essential (including for example call takers and dispatchers). "we are burning them out" must be avoided.
- Preparing for the next wave / pandemic requires looking into the "normal referral / transportation rules" and amending them as needed (sometimes requires

administrative actions), to allow for early activation of a "wider" patient distribution plans (early activation is essential to alleviate the pressure in the system before it becomes critical).

- Models are key in forecasting critical overload on the system, and taking early corrective measures.
- Air transportation was widely used for patient transportation. Standards and solutions used to protect and disinfect the team / aircraft should be elaborated (e.g. the requirement of some air operators to use isolation chambers). This is a critical gap, as air evacuation (MEDAVAC) is a key asset in any secondary reallocation of patients.