EUROPEAN COMMISSION

pulse

Platform for European Medical Support During Major Emergencies

D2.1 Requirements Specification

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PULSE

Platform for European Medical Support during major emergencies

WP2_Scenarios and requirements

Deliverable D2.1-Requirements specifications

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Analysis confirms the need for a platform like PULSE and suggests to position it not only as a Decision Support System but also as a Knowledge Management System that may leverage experience across Europe in health related decision making during major emergency.

PULSE Platform architecture is specified in terms of purpose, expected scenarios and users, components and SOP requirements, internal relationship among components and external relationship with users and with information and telecommunication systems already used by Emergency Medical Services across Europe.

Innovative software features (e.g. adaptable models) and SOPs (e.g. Knowledge Management Process) are identified.

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TABLE OF CONTENTS

List of figures

List of tables

1. Executive summary

This document is based mainly on inputs gathered from 34 end-users during the End-user Workshop held in Rome on 18th of July 2014, during an MRMI course carried out in Rome on the 13-15th of June 2014 and in additional interviews with end-users from Romania, Germany and ECDC (European Center for Disease Control).

Inputs from end-users confirm the need for a platform like PULSE, because current systems and current SOPs do not adequately provide **decision support** and **knowledge management**.

According to the end-users requirements and to the purpose and general features of the Platform as defined in the DoW (Description of Work) document, the selected **architecture of the PULSE Platform (PP)** will provide the **key features** described in the following sections.

PULSE Platform structure, purpose and users

1) PP will be composed of **8 software Tools** (they make up the PULSE system) and **9 SOP areas**
2) PP is an **integrated platform**: software Tools are integrated among themselves; SOPs that will be written will be integrated among themselves and will assume that PULSE System or a System with similar functionalities is available.
3) The **end-users of PP will be at decision making level**
4) **PP purpose will be to support decision making** during the preparedness and the response phases in two different types of emergency situations
   - **SARS-like epidemics of infectious respiratory disease**, represented by the SARS scenario
   - **Local incident with many casualties during a planned mass gathering**, represented by a Stadium crush scenario
5) Decisions, in both scenarios, will deal with: (1) decision on **resource allocation and patient triage and dispatch** with respect to the expected future flow/status of patients with the constraint of available resources and medical doctrines; (2) decision on the **level of risk to be attached to an event/situation** (e.g. to support a risk based approach for authorizing or planning an event)
6) PP will also have the **feature to support the knowledge management processes** across each Country and across Europe **with regard to the emergency management decision making processes**

PULSE System relationship with the ICT environment

1) PP will be designed under the **assumption that during the Response Phase of the Stadium scenario a high capacity**

telecommunication channel (e.g. REACT/Satellite communications link) is available for health services in order to send and receive data to/from the site of the incident.

2) **PULSE system will be able to operate at a reduced level also in a "downgraded" ICT environment**, i.e. an environment with no access to other systems or low capacity channels, such as TETRA.

PULSE System interface with users

1) The language used by PULSE platform is **English**.
2) PULSE System interface includes a **combination of images and data** which provide immediate evidence of what is the current status in the operational situation
3) Users will have the possibility, for some functionalities, to interface with the PULSE System using a dedicated **Smartphone App**, for both data input and output

Ethical, legal and societal issues

1) **Ethical, legal and societal issues must be taken into consideration in Tools and SOPs design and in Training Tools and SOP**; issues include: derogation of normal legal requirements, provide care notwithstanding personal risks protection of information (privacy); individual liberty; fairness of distribution of medication/vaccines/antidotes; prioritization of response and treatment; and respect for religious beliefs.

PULSE Tools features

1) **136 requirements** synthesize (see tables in paragraph 9.3) the requirements associated to PULSE Tools;
2) With specific regard to the **Smartphone App, in the Stadium Scenario** it is expected to be used by decision making personnel at the casualty clearing station, both for data input and the visualisation of information; functionalities include support for patient triage (check lists, step by step dynamic triage).

   Apart from voice and text input, the capture of video and pictures from the scene - where available, live video from the scene - was particularly interesting for the end users and shall be provided.

   For **both scenarios**, interfacing with external data bases (e.g. data on epidemics) could be available through the Smartphone app.

   For **SARS scenario**, the Smartphone app could be considered as a data input source from general practitioners and other geographically distributed sources. This would be seen as a possible substitute of the current input applications that are perceived to be quite cumbersome in nature.
3) **Training** will be focused on personnel that are involved in decision making roles. With regard to the **LMS**, it is felt by end users that the

highest need is in training on how to manage the **Preparedness in the Stadium Scenario.**

With regard to **MPORG**, it will be focused on the **Stadium scenario Response Phase**.

MPORG users could be not only decision makers, but also operational roles, because they create "real" input environment for the decision makers.

Both LMS and MPORG should be usable also by experts in order to extract feedback information for SOPs updates and lesson learned.

PULSE SOP areas features

1) **SOPs will be described mainly as template Policies**, intended as documents that provide high level guidelines, in terms that may create a common European framework leaving to each country the freedom to take care of its peculiar organization.
2) PULSE Platform should include **9 SOPs for each Scenario, for a total of 18 SOPs**
3) SOPs will cover **six areas of activity**:
   - Intelligence-information gathering;
   - Threat and risk analysis; Warning/ alerting;
   - Operational picture generation and situational assessment;
   - Task planning and execution (like movements, triage, ...), including Prioritization; Resources and capacities planning and control; Logistics/ stockpiling;
   - Training and exercising capability.
   - Coordination between different services/stakeholders, including cross-border support management, Post-crisis evaluation and collection of good practices".

   First five areas include one Policy each, while last area includes **four innovative Policies**
   - Knowledge Management
   - SOP for the reviewing and updating particular
   - Change Management
   - Communication

PULSE innovative features

The following key innovative (with respect to existing systems and procedures) features must be considered for PULSE development (they partially overlap with above features, but it is worth listing them all together):

1) **Recognised Current Situation {RCS}** based on all PULSE Tools, adaptable to the situation/ scenario, selective in presenting the correct but different information to the different users, based on a common knowledge base and data sources.
2) **Knowledge Acquisition and Management System** used across Europe and based on standardized knowledge and data structure,

collection and maintenance SOP and supporting tools. It includes input from training tool, when the MPORG is used as a simulator by experts.

3) **Adaptable analytical models, that** will have the capability of an ongoing adaptation of the mathematical models (usage of open and parameterized algorithms/models) in order, for instance, to allow rapid adaptation of the current forecasting algorithms during the first period of life of a new epidemics
4) **Interoperability with the existing systems,** in order to exchange data with other selected entities
5) **Telecommunication Scalability, i.e the** capability to work in different communication environments both from the communications technology and from the capacity/availability point of view
6) **Media Communication Officer support**, consisting in (1) a unified communication framework / policy for the Media Communication Officer; (2) system outputs, useful for external communication purposes
7) **Integrated architecture,** i.e. the PULSE system will have an architecture that will integrate all the Tools
8) **Change Management Process,** i.e. a procedure/ guideline facilitating the adoption of the PULSE system or new different systems, new regulations, different scenarios, etc. by the relevant actors across Europe.

2. Introduction

2.1 Purpose and scope of the Document

PULSE Project aims at implementing a Platform for European Medical Support during major emergencies.

Such medical emergencies may be emergencies similar to a stadium crush at a large concert and to a SARS-like epidemic.

This document is the first Deliverable of Work Package 2 (Scenarios and requirements) and has the purpose to identify the **high-level specifications of the PULSE Platform** taking into account

- the requirements of key end-users
- the purpose and general features of the Platform as defined in the DoW (Description of Work) document, version 2013-10-11.

It provides specifications at an **architectural level**, i.e. it describes in natural language and from an end-user perspective the **Pulse Platform architecture** in terms of

- components
- expected users
- operational an technical environment in which it is expected to be used
- key features and scope of its components
- key logical relationships among its components
- key innovative features that the Platform should have in order to add value to the already existing systems and SOPs

This document is mainly based on inputs gathered during the End-user Workshop held in Rome on 18th of July 2014, on the questionnaire submitted to the instructors of an MRMI course carried out in Rome on the 13-15th of June 2014and on additional interviews with end-users from Romania, Germany and ECDC.

It encompasses all the PULSE Platform components, and sets the stage for two more detailed delivery of Work Package 2: D2.2-Use case specification and D2.3-Training requirements.

2.2 Structure of the Document

The document is structured according to the following logic flow:

- Introduce the key components of the PULSE Platform, according to the DoW document
- Describe the reference Scenarios in which the platform is expected to be used and elicit the challenges it must face
- Analyze and prioritize the input gathered from the end-users, in order to translate the generic challenges in more specific and prioritized end-users requirements
- Extract a coherent set of specifications for the PULSE platform role

and for its individual components

3. Glossary

Table 1 Glossary

Term	Definition	Notes (examples from PULSE, explanations. ...)
Actor/Action tables	Tables that for each Action specifiy who are the Actors and which role they play (e.g. Accountable, Responsible, Cosulted, Informed). They are also known as RACI tables	
Architecture	see *System Architecture*	
CCS	Casualty Clearance Station	It is located at a safe distance away from the incident, to safely manage casualties delivered from the scene. It serves as a point for secondary triage and for provision of life saving treatments to safely package the casualties for transport to hospital
DoW	Document of Work	The official document, version 2013-10-11, that states PULSE project scope and content
ECDC	European Center of Desease Prevention and Control	
EMS	Emergency Medical Service	
EHS	EU health system	
Functionality	Any service that a product or a software can do for a user	
GUI	Graphic User Interface	
ICT	Information and Communication Technology	
Incident commander	The person in charge with the incident overal management	
Interoperability	The capability of different systems or tools to communicate with and to understand each other	
LEPPI Officer	Legal Ethical, Privacy and Policy Issues Officer	The LEPPI Officer is the coordinator of all the activities related to legal, ethical, and privacy and policy issues. In particular, LEPPI Officer will be in charge of monitoring that the tools and models developed within PULSE respect the national, European and international legislation; ensuring that the privacy directives are respected when implementing health services support systems due to the information handled; promotion awareness of ethical principles and legal requirements within the project work packages and dissemination of PULSE best practice with respect to the LEPPI applied during the project.
LMS	A Learning Management System is a software application for the administration, documentation, tracking, reporting and delivery of e-learning education courses or training programs. LMS typically are accessible through a standard web browser from which the courses being managed can be accessed and taken.	In PULSE, the LMS system will store and deliver training courses to the different categories of end users.
MERS	Middle East Respiratory Syndrome	
Model	Software routine, based on mathematical models/algotythms for describing phenomena (e.g. processes, problems,...) and for helping to find solutions.	
MPROG	MultiPlayer Online Role Playing Game are popular for both training and recreational gaming. People typically use an avatar to represent themselves in a virtual world where they can perform tasks in predefined scenarios. Multiple people participate and interact in the same virtual world in parallel. MPORG system are typically accessed via the internet and used by end users in disparate locations.	Within PULSE an MPORG system and environment will be used to train personnel within the stadium crush scenario where individuals will assume the roles of different resource personnel involved in such a scenario.
MRMI	Medical Response to Major Incidents	
PEIMAF	Piano di Emergenza per Massiccio Afflusso di Feriti (Emergency Plan to manage the arrival of many casualties)	It is used in Italian Hospitals and defines roles and responsibilties during the emergency
Phase	A subset of a Scenario. It may be, for instance, identified, for instance, in terms of time (e.g. before the incident) and/or location (e.g. Hospital) and/or type of population involved(e.g. people in "uncertain" status in a SARS like epidemic), and/or purpose (prepare, recover)	Each PULSE Scenario is split in two Phases: Preparedness and Response.

Term	Definition	Notes (examples from PULSE, explanations. ...)
Platform	see *PULSE Platform*	
Policy	Documents that provide high level guidelines, in terms of actors and responsibilities; they may also specify key phases	The "*Decision No 1082/2013/EU of European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health*" is an example of Policy
PP	PULSE Platform	
Preparedness phase	Activities that prepare and train responders and ensure that the needed mix of resources are ready to respond in case of adverse event	
Procedure	A document describing a sequence of actions that, in the end, produce an output; a procedure normally specify the flow diagram (logic and time sequence of the actions), the actors (who does the action) and the software tools used to do the action.	Classification rule for separating people "assaulting" a hospital
PULSE	Platform for European Medical Support during major emergencies	
PULSE End-user	Any actor that is expected to interact with the PULSE Platform. Interaction with the Tools may consist in: provide input, launch simulations/elaborations, get output	
PULSE Platform	PULSE System + PULSE SOP	
PULSE Project	The Project that will specify, design, implement and validate the PULSE Platform	
PULSE System	The entirety of all software and data produced in PULSE, their cooperation and communication, including the presentation of results	
REACT	Communication system that uses a variety of available technologies ranging from wireless broadband, TETRA, through to satellite communication.	
RCS	Recognised Current Situation	
Requirements	Justified characteristic needs, formulated by users and experts. For IT systems, usually one distinguishes between technical and operational (possibly strategic) requirements	
Response phase	Activities that are triggered by the adverse event, with the purpose to diminish/contain its effects	
SARS	Severe Acute Respiratory Syndrome	
SARS-like	Infectious respiraory desease	
Scenario	Description of an incident in terms of background, occurrence and the course of a incident, including response and other related processes of relevance	In PULSE we consider two Scenarios: SARS-like epidemics and Stadium crush-like incident
SOP	Standard Operational Procedures	SOPs may have different levels of detail: e.g. Policy, Actor/Activity tables, Procedures
SOP area	Function or process for which a set of SOPs is in place or may be produced.	PULSE Platform includes 9 SOP areas
Strategic Procedures	Procedures/processes on "very high" level	Decisions on political level; international cooperation
System	Collection of interrelated components	
System architecture	The structure of a system described in terms of scope, components, relationships to each other and reltionships of the system to the environment	The level of detail of the desription is dictated by the "granularity" of the components breakdown. In this document the components of the PULSE Platform are the 8 Tools and the 9 SOP areas
Tool	Any helping software instrument, including input/output interfaces with users or other Tools or Systems (mostly software). A Tool may use Models. A software Tool may also be identified with a set of functionalities.	PULSE Platform includes 8 Tools.
WP	Work Package	

4. Scenarios

4.1 Scenarios and Requirements

The role of scenarios in the process of developing requirements for the PULSE system is to make the requirements realistic and not speculative. They were e.g. be used in preparing the early requirements workshop with health system stakeholders on 16 to 19 July in Rome. This way we showed that PULSE is not only on basic theoretical research in certain areas but mainly is interested in really applicable solutions.

The scenarios have already been indicated in the DoW. The term "scenario" has been defined as description of an hazardous incident, the background, the occurrence and the course of main events including response and other related processes of relevance. A scenario is an environment from which certain use cases will be derived in which to finally evaluate the PULSE system. As within reasonable time and effort it will not be possible to prove the quality and effects of the PULSE system in all conceivable scenarios, the project will concentrate on two scenarios. But these will have to follow a number of requirements and should considerably differ in basic characteristics:

- They should be caused by different threats or hazard sources
- They should be representative and realistic, i.e. similar cases have occurred in the past
- They should offer a wide spectrum of challenges to and tasks to be fulfilled, by the different entities of the health system, and
- They should show basic differences in severity, time and geographic extension, societal, political and international relevance etc.

These characteristics are summarized in Table 2, for the two basic PULSE scenarios:

- Scenario 1) A SARS Incident with European dimension
- Scenario 2) A major stadium crush during a mass event

Some verbal descriptions of the scenarios are given in chapters 4.2 and 4.3. The scenarios will be elaborated in more detail in deliverable D2.2.

Table 2: Scenario characteristics

Characteristics	Scenario 1): SARS Incident	Scenario 2): Stadium Crush
Likelihood	Between likely and unlikely	Likely
Impact	Very serious to catastrophic	Very serious
Total risk class	Major emergency	Major emergency
Affected area	From local up to international	Regional/national/possibly limited international

Escalation time profile	Developing over days / weeks	Occurring quickly
Alerting of the public	Gradually progressing	No pre-alerting possible
Alerting/ instructing responder services	Long preparation & pre-alerting phase	Immediately; through emergency dispatching centres
Importance of international coordination	Very extensive	Only if event is located close to a border and/or if support is required for longer term care
Type of international coordination/ collaboration	Sharing of the • Identification of source of agent • scientific investigation of the agent type • Investigation of infection route(s) • hospital resources • special treatment • resources like Medications (Vaccines; antibiotics; ...) • sharing/mutual support in transportation of patients	Coordination of: Search and Rescue-Teams; Equipment , and Know How; Logistic support for Transfer/ distribution/ allocation of very seriously injured persons
Political relevance	High; on local / national government to international level	Low to medium;
Societal public perception	Very high	limited
Societal reactions	Very intensive, depending on spread and seriousness of infections	Locally limited concerns
Societal consequences/ impact on social order, peace	May escalate to panicking; undue withholding of medication; hoarding; looting;	limited
Ethical and psychological implications	Broad; may cause deep doubts and mistrust against public admin. and healthcare system	Limited; psychological treatment of relatives
Economic impact	May be very serious (loss of working force, ...)	Locally limited
Environmental impact	Possible impact on local, regional animal populations (if susceptible to the disease)	None to minor

Impact on vital infrastructures	On hospitals and ambulance services Collapse of health care sector due to loss of work force on the one side and high numbers of patients in need of intensive care. Possible collapse of supply chains due to loss of work force	Local stadium and possibly some surrounding infrastructure
Priority requirements: **Preparedness**	Medication stocks Early warning indication system Capacity planning of... Quality of diagnosis Hospital surge capability Communication strategies International coordination regulations	Resilience of stadium and site infrastructure Quality of first responders Real-time indicator monitoring Adaptive response capability Crowd Event Planning and Guidance
Priority requirements: **Response**	Alerting of ... Forecasting of development and spreading Public communication Inter-services and international cooperation Monitoring of criminal escalations	Very short-term decision making On-site communication Monitoring of critical spots and events Pre-hospital care capability Fast reinforcement of security staff

4.2 Scenario 1-SARS

4.2.1 General Situation

It is holiday season. The geographical scene consists of two metropolitan areas in neighbouring EU member states (MS1 and MS2) with international airport hubs, and one EU "Associated" state (AS) with borders to both MSs. "Medium" alert status has been issued by the EU/WHO[1] for the whole EU healthcare systems (EHS) because of SARS-like incidents and (still few) casualties in two East Asian States. The total number of people with general infection risk in this European area is 20 Mio.

4.2.2 Hazard Identification

Three patients are delivered to one metropolitan hospital with serious pneumonia symptoms. They have been on holidays and/or business missions in East Asia where local SARS epidemics are roaming. They have returned in 3 different fully occupied airplanes, unfortunately with stopovers in 3 different cities in neighbouring states. After about 48 hrs, diagnosis of a SARS-type virus is verified. EU and WHO organizations are informed. Origin from the Far East is confirmed by authorities, to have

[1] GORN Global Outbreak Alert and Response Network

zoonotic (animal) based roots.

Consultation with the neighbouring countries has to be initiated and coordination measures to be planned. WHO has issued guidelines for global surveillance, control and information exchange.

A total of 3 Mio people in the affected metropolitan areas are at risk. The total population to be put to alert is 9 Mio.

4.2.3 Hazard development [2]

The introduction phase of the disease in the local population of the cities affected starts when the first cases appear. Most likely in the beginning the disease will be under-diagnosed and many cases will go undetected and reported as pneumonia. When the first reports appear and the media start to talk about an unknown disease that is killing people without any idea what is causing this outbreak, the detection phase commences.

Information exchange with affected Asian state officials is established and special experts[3] are tasked. The number of patients is growing. When the medics and scientist will see certain patterns in the disease they will become able to isolate and identify the causative agent. In parallel epidemiological teams will try to find out the mode of transmission and the source. With confirmation of the agent, focused treatment and containment measures are taken up. Infection reaches a peak, when infections of people reach the end of incubation time. Infected might include considerable numbers of healthcare people, which could cause bottlenecks in response treatment. After peaking, the overall number of cases will steadily decline and within several months the outbreak will most likely be over. Several factors might work against this decline e.g. in cases of un-symptomatic spreaders or super-spreaders, of a new zoonosis in a local animal population with a constant re-entry of the pathogen into the human population, and so on.

It is assumed that within two weeks after the first patients were identified, the number of patients gradually develops to a total of 75 reported infected. 5 have died which increases the general alert of population and of the healthcare system. Within the next 4 Weeks, the outbreak develops to a peak, leading to a cumulated number of 820 clinically confirmed case and 32 deaths. The healthcare and other measures lead to a decline after 3 months and annihilation is reported after 5 months.

4.2.4 Protection and Response

Protection measures and responsive actions, with some latency, develop inparallel to the hazard development.
The forecasts of a pandemic to develop are very demanding. They should

[2] summary numbers are assumed here which will be distributed across the affected countries and municipalities in the later concrete scenario

[3] like the Robert Koch Institute in Germany

include short, medium and long term prognoses and be scientifically supported. Precautious and preparatory measures have to be taken immediately, and followed up and escalated according to the real development and the forecast of the situation. The set of coordinated measures will include but not be limited to:

- The health department, in coordination with state/ federal health authorities introduces a range of public health control measures, including guidelines on epidemiologic investigation and treatment of cases and contacts, and on hospital admission, clinical management, and infection control arrangements for patients.
- Dispatching plans for hospital capacities and surge are issued
- WHO issues guidelines for protection and response
- Information exchange with affected East Asia state and health authorities
- A competent scientific institute [4]in a neighboring state starts with disease spreading forecasts (indicators, numbers, seriousness etc.)
- Containment measures are taken locally
- Border control (including the "virtual" borders of airports) is arranged, particularly strong between the three neighboring states
- Public announcements and recommendations are issued on personal indicator observation, protection and behavior patterns in cases of positive indicators
- Population consulting centers are established (both, physically and electronically/virtually)
- An international health disaster management and collaboration board (a physical centre and a virtual network) is established with tasks including
    - Fast and confidential information exchange
    - "Field" support from States, NGOs, WHO, ...
    - Mutual support in logistics and resources sharing (Medicines, medical doctors, hospital beds, transportation, other surge capacities, ...)
    - Harmonization of media information and controlled release to the public
    - Psychological care of infected and relatives

The authorities and services involved will range from international and governmental agencies, the healthcare system of state, local and non-governmental organizations, to law enforcement for ensuring public order.

4.2.5 Expected role of a PULSE-like system in this scenario

The PULSE system is not a substitute to existing procedures, planning and decision support systems. It will be designed to fill obvious or assumed gaps in the existing EU health system (EHS). In this sense, it aims at contributing to harmonization of response procedures, improving decision support, harmonizing information management and controlling information distribution, improving training and feedback from lessons learned and

[4] like the Robert-Koch-Institute in Berlin

enhancing the information exchange between authorities and people. Pulse is to provide a framework and interoperable platform and tools for coordinated European response.

4.2.6 Expected challenges for a PULSE-like system

The vision of this PULSE support system is an integrated approach of innovative models of patients and treatment effects, improved situational awareness (RCS[5]) and sophisticated event evolution assessment and forecast, use of social media (e.g. via a special APP), logistics and surge capacity improvement, and powerful training and exercising tools.

For these very ambitious general objectives, the vision of a PULSE system and regarding the described Scenario 1 on SARS, a set of basic system requirements needs to be derived, which should include:

- Faster and more qualified early warning
- Better international/ cross border planning, cooperation and resource sharing
- Flexible and targeted use of hospital capacities and surge requirements
- Reduced bureaucracy and internal friction and drag
- Better use of volunteers and NGOs
- Flexible state-of-the-art and collaborative training and exercising of scenario1-type planning and response
- Utilization of individual "social" information via a dedicated APP for improvement of warning, situational assessment and response,

The main characteristics of this scenario are international propagation and collaboration and a time horizon of days to months. Pulse requirements have to be detailed within these framework conditions.

4.3 Scenario 2-STADIUM Crush

4.3.1 General Situation

A pop-concert in a large stadium with a capacity of 60,000 visitors, located in the vicinity of a border between two EU Member States. Tickets are fully sold out with some 10% over-selling through fake/ black market activity. A renowned Pop-band is performing, with the schedule of 1 hr pre-performance of a local band an 2.5 hrs main performance. Fake tickets cannot be identified by the entrance control system and personnel. The main band is Heavy Metal type which attracts some violence-prone groups. It is a hot mid-summer evening with heavy thunderstorms forecasted. Access routes to the stadium are rather limited in number, narrow and some with stairways.

4.3.2 Hazard Identification

Access to the stadium is obviously above capacity which already, before

[5] Recognised Current Situation

the start of the concert, causes several scrambles and disputes. Visitors start fighting for good seats and good viewing points in the bottom arena where visitors are standing. This is reinforced by the oversold tickets. Some groups are already drunk when entering. Alcohol is circulating and can be purchased inside the arena. Distribution and consumption of drugs is visible at many places. When the pre-performance is finished, the appearance of the main band id delayed for more than one hour. General mood becomes more and more aggressive. After the second hit of the main band, very suddenly a heavy hail and thunderstorm breaks out.

4.3.3 Hazard development

Within five minutes, approximately 50% of the visitors start rushing to sheltering areas and to the exits. Event private security are completely overrun. At three narrow exit stairways, crowds severely crush. People fall and are trampled. One of the stairways is a provisional metal construction. With some 100 concert goers on the stairs and many trying to enter the stairs by climbing the guardrail from the side, the whole stairway collapses, sending the whole construction and the people crashing into the crowd below.

After a time most of the attendance have fled the stadium in panic leaving a horror-scene of dead, dying and injured behind. Many lightly injured find their way home or consult emergency departments of adjacent hospitals. The outcome are high numbers of dead and injured.

4.3.4 Protection and Response

Private Security have not been trained to handle such a severe situation. The disaster develops in minutes without any noteworthy intervention and situation control – not to speak about help - by security personnel. Emergency status is called by the stadium supervisory and control centre and communicated to the crowd by stadium management/ loudspeakers, security guards and mobile phones of visitors as far as possible. Support from medical services, police and fire brigades are called and dispatched. Medical doctors6 already on site treat a few of the most seriously injured patients. Emergency doctors/ paramedics and ambulances arrive. First aid and triage starts and so does initial transportations to hospitals, according to SOPs. Stadium evacuation of remaining visitors is on-going. Another 8 dead are detected in more remote access/exit tunnels and stairways. 25 injured have self- evacuated to local hospitals.

A provisional incident control centre (IC) is installed in the stadium's communication centre. Command is taken by the head of the local fire brigade (police?)7. Nearby hospitals report overload and lack of surgical capacity. Operational Coordination asks the neighboring city for support with paramedics and ambulances. A short-term plan is agreed with the

[6] there may be not that many in a Heavy Metal concert

[7] Will depend on the country's SOPs, to be finally selected

police command in the neighboring state to arrange cross-border transportation, clearing of street traffic establishing priority routes and sharing of hospital resources. Fire brigades are securing unstable constructions and infrastructure. Police has started search for criminal/ illegal behavior, securing of evidence and forensics material. The process of informing relatives of victims is being organized.

Media on site have reported and broadcasted upon their own initiative, not coordinated with the IC and the responder organizations. A first official media report is released only 3 hours after the incident. Consultation on controlled and harmonized information of the public starts, with city, local and governmental authorities.

4.3.5 Expected role of a PULSE-like system in this scenario

The PULSE system is not a substitute to existing procedures, planning and decision support systems. It will be designed to fill obvious or assumed gaps in the existing EU health system (EHS) and its components. In this sense it aims at contributing to harmonizing response procedures, improving decision making, harmonizing information management and controlling information distribution, improving training and feedback from lessons learned and enhancing the information exchange between authorities and people. PULSE is to provide a framework and interoperable platform and tools for coordinated European response.

4.3.6 Expected challenges for a PULSE-like system

The vision of this PULSE support system is an integrated approach of innovative models of patients and treatment effects, improved situational awareness (RCS[8]) and sophisticated event evolution assessment and forecast, use of social media (e.g. via a special APP), logistics and surge capacity improvement, and powerful training and exercising tools.

For these very ambitious general objectives, the vision of a PULSE system and regarding the described Scenario 2 on a Stadium Crush, a set of basic system requirements needs to be derived, which should include:

- Better monitoring of pre-incident indicators
- Early on-site contingency planning and crowd event guidance
- Fast setup of disaster control (staffing, authorization, infrastructure)
- Flexible on-site treatment of injured
- Better availability of first-aid material
- Pre-planned cross border resource sharing and coordination
- Flexible and targeted use of hospital capacities, surge requirements
- Better use of volunteers and voluntary agencies.
- Flexible state-of-the-art and collaborative training and exercising of scenario2-type planning and response
- Utilization of individual "social" information via a dedicated APP for improvement of warning, situational assessment and response.

[8] Recognised Current Situation

The main characteristics of this scenario are little warning, short reaction times. high local impact with limited cross-border short term collaboration. Pulse requirements have to be detailed within these framework conditions.

5. PULSE platform relevant components

5.1 Overview

Figure 1 provides a high level representation of the PULSE Platform interaction framework:

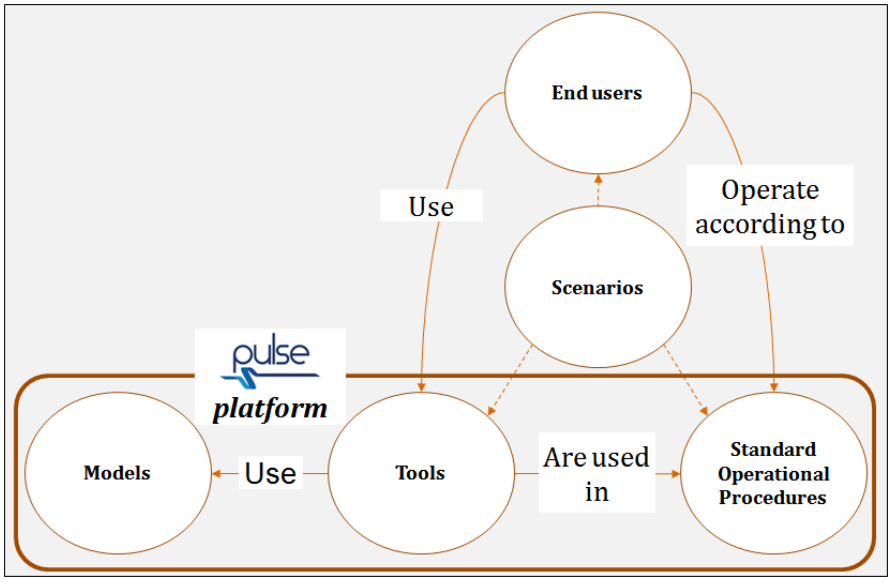


Figure 1 High level representation of the PULSE Platform Interaction Framework

PULSE Platform is made up of three high level components: software **Models** (that will be implemented by WP3), software **Tools** (that will be implemented by WP4) and **SOPs** (Standard Operational Procedures that will be produced by WP5).

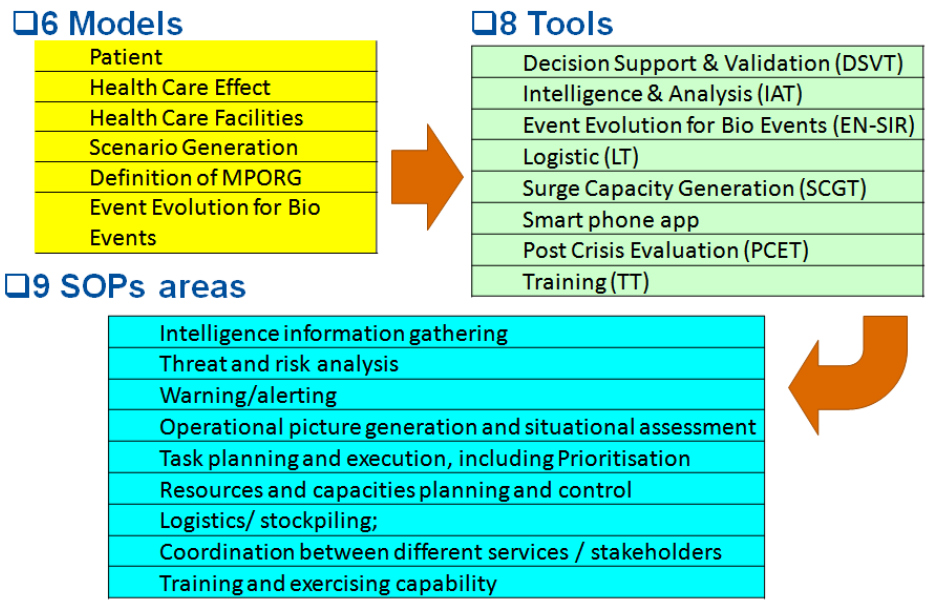


Figure 2 PULSE platform Models, Tools and SOPs areas

It is expected that **End-users** will take benefit from the PULSE platform using the **software Tools** while operating according to the Processes optimized by the PULSE project with **SOP** based on European best practices.

Software Tools are will use **Models**, which may be considered as "software routine" based on mathematical models/algorithms.

The Platform must be designed to fit a large spectrum of scenarios and it

Scenarios).

Each Scenario is split into two standard emergency management phases: Preparedness and Response .

Interactions among the components are expected to be specific for each Scenario and Phase.

PULSE Platform will mainly support the End-users **making the best decision** on **Resource allocation and Patient dispatch**

with respect to the

- Expected future flow/status of patients

with the constraint of

- Available resources and medical doctrines

Resources include:

- Personnel (Medical doctors, Nurses, Volunteers with healthcare capabilities, Ambulance drivers, first responders that may play healthcare roles)
- Equipments
- Drugs
- Transportation
- Hospital facilities
- ICT (Information and Communication Technology) resources

5.2 Tools

PULSE Project will produce 8 Tools (fig. 3).

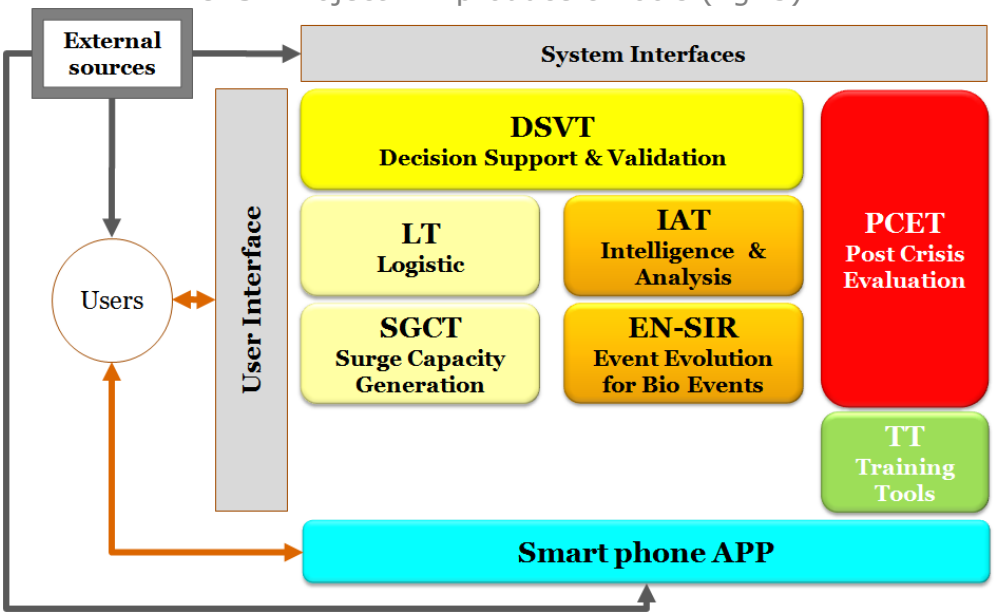


Figure 3 –PULSE Platform Tools

The high level scope of PULSE Tools is as follows:

1) DSVT-Decision Support & Validation Tool

   This tool will support the definition and optimization of the contingency plans during the preparedness phase

   It will support the decision makers with a quantitative assessment of the possible options.

2) IAT-Intelligence and Analysis Tool

   This tool will focus on weak signal detection to alert decision makers to the occurrence of an unusual biological event. In addition, this tool will also support the decision making process by providing a prediction on the evolution of the scenario.

3) ENSIR-Event Evolution model for Biological Events

   This tool will be the implementation of a mathematical model of epidemics evolution. The model will be an extended version of the classical SIR (Susceptible - Infected - Removed) models: a class of disease spread models where individuals are susceptible to a disease, contract the disease and then recover, becoming immune to future infections after recovery, or die from the disease. Geographic factors will be taken into account, allowing for disease spread with different rates depending on the social, logistic and physical characteristics of the environment

4) LT-Logistics Tool

   This tool will support in assessing the required stockpiles of any necessary equipment, medications, vaccinations etc.

5) SCGT-Surge Capacity Generation support tool

   This tool will aim at providing support for the creation of surge capacity in the event of a major health crisis focusing, amongst other things, on the coordination of the use of volunteers and of cross border assistance and taking into account the legal implications.

6) PCET-Post Crisis Evaluation Tool

   This tool will help in the identification of the lessons learned by supporting the evaluation of the effectiveness of the plans implementation and providing a view of the benefits that would be achieved with different approach/procedures/quantity/quality of resources.

7) TT-Training Tools

   This set of tools will support the implementation of the training methodologies The tools to be developed include a MPROG (Multiple Player On line Role Game) training platform for personnel involved Stadium crush response and a learning management system tailored for the emergency and health services with access to training courses from a wide variety of mobile devices.

8) Smart phone Apps

They may play three roles:

- As Input interface to the Tools
- As Output interface from the Tools
- Search in other databases via the web and presentation in a useful format (example: collection and structured presentation of all the warnings related to an epidemic)

5.3 SOPs

PULSE Project is expected to produce SOPs for 9 areas of activities:

1) Intelligence-information gathering;
2) Threat and risk analysis;
3) Warning/ alerting (warning indicators (for e.g. of a pending bio-threat));
4) Operational picture generation and situational assessment;
5) Task planning and execution (like movements, triage, ...), including Prioritization;
6) Resources and capacities planning and control;
7) Logistics/ stockpiling;
8) Coordination between different services/stakeholders, including cross-border support management, Post-crisis evaluation and collection of good practices
9) Training and exercising capability.

5.4 End-users

According to

- the nature of the Tools
- the nature of the SOPs
- the 7th Framework Programme THEME SEC-2013.4.1-4 request: *Development of decision support tools for improving preparedness and response of Health Services involved in emergency situations*

we assume that **the key End-users of the PULSE Platform will be managers that have decision making roles.**

According to the national organization and procedures it may happen that the same role is played by people reporting to different organizations.

We **assume that the roles described in following tables may be the minimum set of roles needed to manage emergencies in every European Country**.

Table 3 SARS Scenario

Scenario: SARS		
Role	**Description**	**e.g. in Italy**
European authority	ECDC	

National authority	The Agency that has national responsibility and directly interfaces WHO. It may also have a "scientific" Department, which provides medical directions on how to deal with the epidemic in the Country. It also gives directions and budget for vaccines procurement and storage	Ministry of Health. Directly reporting to the Ministry there is a scientific Department, Istituto Superiore della Sanità
Police (customs command)	Authority in charge for controlling borders	Police (Polizia di Stato)
Regional Authority	Regional level authority in the healthcare domain. It has a coordination role over the Local Health Agencies	In each of the 21 Regions there is a Healthcare Department, that manages the healthcare expense of the entire Region
Local Health Agency	Province or sub-province Agency, that has direct authority on all the healthcare providers (Hospitals, family doctors, pharmacies, laboratories)	In Italy there are 197 Local Health Agencies (ASL-Aziende Sanitarie Locali)
Lead Hospitals	Hospitals that with very high expertise and capacity in epidemic disease	In Italy there are two Lead Hospitals (Sacco in Milan, Spallanzani in Rome)
Hospitals with specific facilities	Hospitals that have facilities suitable for isolation	In Italy in each Province there is at least on Hospital with specific facilities
Communication Officers	Officers in charge for communications with media and public information roles	

Table 4 Stadium Scenario

Scenario: Stadium		
Role	**Description**	**e.g. in Italy**
High level command	Representative of the Political Authority at local level; it is not directly involved in emergency management, but has the authority to solve coordination issues	Government authority at Province level (Prefetto; in Italy there are 109 Provinces)

Local Coordination Unit (on site)	Members are identified once the event is scheduled. They come from all the agencies involved (EMS for Healthcare). The Unit has the full responsibility to ensure readiness and to coordinate the response (out of the hospitals). Each member contacts its Agency to mobilize needed resources	Members come from EMS (118), Fire Brigade (Vigili del Fuoco) and Police (Questura)
CCS (Casualty Clearance Station)	It is located at a safe distance away from the incident, to safely manage casualties delivered from the scene. It serves as a point for secondary triage and for provision of life saving treatments to safely package the casualties for transport to hospital.	
On site manager	Coordinates pre-hospital response in the field. He/she is in contact with the Local Coordination Unit to provide information and to get instructions.	In many EU countries this is a manager from the EMS.
EMS (Emergency Medical Service)	Agency that coordinates every medical emergency intervention outside the Hospitals in a given territorial area. It has a call center, has visibility and command on all available resources (transportation and hospital capabilities) both public and private (volunteer)	EMS has Provincial multi-provincial responsibility or. Call center number is 118 (it will soon become 112)
Hospital Emergency Management Unit	Multifunctional Unit that each Hospital activates in case of emergency. It has responsibility on the Hospital resources. It is in contact with EMS	In each Italian Hospital the Unit membership and role is defined in the PEIMAF (Piano di Emergenza Interno per Massiccio Afflusso di Feriti)
Hospital Disaster Manager	Coordinates hospital response on the field. He/she is in contact with the Hospital Emergency Management Unit to provide information and to get instructions.	Medical Doctor, activated according to the PEIMAF)
Communication Officer	Officers in charge for communications with media and public information roles	

6. Methodology for end user requirements gathering, prioritization and relaxation

6.1 Sources

In order to gather information for requirements analysis, a workshop was organized in Rome and also meetings with end-users from Romania and Germany and calls with an ECDC representative.

6.1.1 End-users Workshop in Rome

The workshop was organized in Rome, on 18th of July 2014 and had 13 participants (10 end-users and 3 partners with end-user experience or role).

In this workshop, questionnaires were submitted to the participants to collect data for further requirements analysis.

6.1.2 End-users interviews

CESS and ONEST have organized meetings with end-users from Germany and respectively, Romania and have applied questionnaires.

UCSC has interviewed a member of ECDC.

6.1.3 MRMI Course Instructors questionnaire

The MRMI Course is a training course for the Medical Response to Major Incidents ideated by Stenn Lennquist and that has been given at International and National Level for the past 10 years. An MRMI Course was carried out in Rome on the 13-15th of June 2014; All the Instructors were certified at International Level. The course had 200 participants and lasted 3 days.

The high level of the MRMI Instructors (18 instructors: medical doctors, nurses, ambulance conductors, psychologists) and their lasting experience in major emergencies (ranging from 1 to 20 years) indicated their role as End Users of the PULSE project.

The questionnaire used with them has been a simplified version of the one used in the Workshop.

6.2 Workshop questionnaire structure

The Questionnaire submitted to the Workshop end-users is attached as Annex 2. It is structured in four parts:

1) Questions on Training tools and Smartphone App (Session A)
2) Questions on Tools and SOPs, per SOP area and per scenario phase
    - Session B1_SARS Preparedness phase
    - Session B2_SARS Response phase

- Session C1_Stadium Preparedness phase
- Session C2_Stadium Response phase

3) Questions on priorities
   - Session B3_Prioritization for SARS scenario
   - Session C3_ Prioritization for Stadium scenario
4) Questions on legal/ethical/societal issues
   - Session B4_Legal, ethical and societal issues for SARS scenario
   - Session C4_Legal, ethical and societal issues for Stadium scenario

6.3 Prioritization and relaxation guidelines

The prioritization and relaxation main goal is to analyze the end users answers in order to avoid the overlaps, to put together similar feedbacks so, eventually, to get a list of ranked requirements / expectations.

6.3.1 Prioritization

6.3.1.1 Session A. Training tools and Smartphone App

The end users feedback will be analyzed in a similar manner for all three components: Multi Player Online Role Playing Game (MPORG), Training Tools – Learning Management System, Smartphone App.

For each section, the answers from the participants will be consolidated (similar proposals will be gathered in a common one bearing as a score the number of the contributors), listed and sorted by the score and the results is displayed in a graph.

For the sections where the participants have to answer with yes/no, the total number of answers for each category is calculated and the result is displayed in a graph.

6.3.1.2 Sessions B1 / C1, B2/C2 Tools / SOPs

The method is similar for all this sessions.

Into the first step, all the answers are summarized, following the questionnaire structure, in order to get a synthetic view over each specific aspect: Tools and SOPs for SARS and STADIUM for the Preparedness and Response phase, respectively.

For the next steps, the analysis is led by tool / SOPs category: intelligence information gathering, task and resource planning, threats and risks, lessons learning.

Table 5 Operational issues vs. questionnaires

	SESSION B1 - TOOLS AND SOPS FOR SARS/PREPAREDNESS PHASE	**SESSION B2** - TOOLS AND SOPS FOR SARS/RESPONSE PHASE	**SESSION C1** - TOOLS AND SOPS FOR STADIUM/PREPAREDNESS PHASE	**SESSION C2** - TOOLS AND SOPS FOR STADIUM/RESPONSE PHASE
Intelligence information gathering	#1	#5	#9	#13
Threat and risk analysis & Warning/Alerting	#2	#6	#10	
Operational picture generation and situational assessment		#7		#14
Task, resources, stocks, capacity planning and control	#3	#8	#11	#15
Lesson Learning	#4		#12	

In order to set a priority level and to harmonize the end users answers, for each tool / SOPs category, the consolidated questionnaires answers (from the previous step) will be compared in order to identify the overall key needs and the key features to be developed in PULSE for that specific tool. Thus, similar key needs/key features will be consolidated into one common issue which bear as a score the sum of the component issues scores. The final lists will eventually be sorted by the score and displays into a graph.

In a similar manner, the answers related to existing tools features/level of satisfaction as well as the expected satisfaction level from the implementation of the new key features, will be consolidated from all relevant sections.

At the end of this step we'll get, for each tool:

- Consolidated ordered list of identified key need.
- Sum of the features of the existing tools and the level of the end user's satisfaction.
- Aggregated key features to be implemented by Pulse in order to support the key needs and expected satisfaction level.
- Consolidated ordered list of the key SOPs improvements expected by the end users.

6.3.1.3 Sessions B3 & C3. Prioritization

For each operational issue (Intelligence information gathering, Threat and risk analysis & Warning/Alerting etc.) it is calculated the importance as being the weighted average of the valid (larger than 0, 0 meaning no answer/the end user didn't answered the question) answers; into the calculation, the "external" end-users (the workshop participants which are not members of the consortium) had a 100% contribution to the average while the consortium members were considered with 50% contribution. Then, since there are questions where the number of the answers was less than the number of the participants (not all the participants answered), in order to reflect the a trust level of the answers, the weighted average calculated before is pondered with number of the participants who contributed to it (example: we'll consider 100% of the calculated value if all the participants answered, while we take only 50% of the value if only half of the participants answered).

In a similar way is calculated the need of improvement for each operational issue.

Eventually we'll get the "importance" and "need for improvement" indicators for national/cross-border and SARS/Stadium scenarios, respectively.

6.3.1.4 Sessions B4 & C4. Legal, ethical and societal issues

Relevance for the end-user

In this section, the end-user has to answer for a set o issues and to express her/his level of relevance towards that issue by having three options: "Crucial", "Not a priority", "Irrelevant".

The issues to be answered were: Balancing of individual liberties, Privacy of personal and sensitive info, Duty to steward resources, Duty to provide care notwithstanding personal risks, Over-Triage, Accountability mitigation.

The meaning of the issues was clarified with examples (see Annex 3)

For each question it is calculated the percentage of the answers for each one of the three possible answer; for the calculation is considered the total number of the valid answers, collected from both scenarios. Eventually, the diagram of the distribution of the answers for each answer is displayed.

Applicable law allows derogating from the ordinary discipline

It will be calculated and displayed a graph with the percentage of "Yes" answers for each question, calculated from the total number of the valid answers.

Attention of policy makers

In this section, the end-user has to express her/his opinion regarding the attention of the policy makers towards the issues, by having three options: "IS SUFFICIENT", "CAN BE IMPROVED","IS INADEQUATE".

For each question it is calculated the percentage of the answers for each one of the three possible answer; for the calculation is considered the total

number of the valid answers, collected from both scenarios. Eventually, the diagram of the distribution of the answers for each answer is displayed.

The three most important ethical issues

Each participant has to enumerate, into the order of their importance a set of 3 most important ethical issues.

The answers from the two scenarios will be treated all together.

Each participant answers will be listed into the order of their importance; each issue will have an associated score: the first option will get 3 points, second – 2 points and the third one point.

The next step is to consolidate similar issues into a common one which will bear as a score the sum of the issues which is composed of.

The final list of the consolidated is ethical issues is ordered and displayed.

6.3.2 Relaxation

The main goal is to extract the general requirements for the platform, as well as the aggregated key needs and the aggregated key features for the PULSE modules and the key aspects for the training and smartphone apps, by analyzing the results from the prioritization section.

In order to extract the tools key needs and their key features, will be analyzed the results gathered from the previous section for each module; similar features will be consolidated, the particular aspects of the specific tools will be eliminated, so eventually we shall have an ordered list of the most relevant key needs / key features for PULSE. Tool's particular aspects will be presented separately.

7. End user requirements analysis

Detailed analysis of end users requirements is contained in Annex 4.

8. End users requirements relaxation

8.1 General

8.1.1 General requirements

An important issue is related to the **information management**: to have the right information at the right time.

Communication personnel emerged also as an important issue in the preparation for major disasters. In general, contact with the media in major incidents should only happen through selected and trained personnel. Also, the end-users consider that ethical/legal/societal issues related to communication should be included in training.

The end-users didn't suggest if PULSE tools should provide outputs ready to use for communication purposes.

The language to be used in PULSE platform is **English**.

8.1.2 GUI

By analyzing the end users feedback, there are some general requirements, applicable to the applications graphic users interface (GUI) of PULSE's modules:

- simple data input with less text and more graphics and colors (e.g. checklists)
- simple, intuitive, schematic : a combination of images and data and to permit access to more detailed information, easily understood by non-technical staff
- map support in order to display the resources localization, the number and code of the wounded, blocked roads
- predefined patterns (standard models)
- signal so instantaneous dissemination of a critical event, both graphically, through video images, and with numerical data of the nature and concentration
- data fusion and provide the information to the people who needed and not to all the participants, information management system

8.1.3 Communication means

It was also proposed to develop the tools in such a way that they can be used on different communication platforms and systems.

Another interesting issue related to communication is to develop chat capability, possibility to make live transmission, live communication system, fast communication way, mutual data exchange in order to obtain additional information about the event.

8.2 Training Tools

8.2.1 LMS

The analysis of the end users answers, showed an even distribution of the peoples with experience in training tools vs. those which used such instruments; anyway, the previous experiences with training tools are related to either test oriented tools, either more narrow technological niches (i.e. security systems engineering). Those aspects indicate **a gap** that may be filled by PULSE, **into the segment of lessons learning and training tools for the (medical) emergency integrated management platforms**.

From the end users perspective, a learning tool **is relevant especially for the Stadium's like incident Preparedness Phase**; the second option is SARS like incidents – Response Phase, while the SARS Preparedness was considered the last option. **Those indicated that the learning / training tool is regarded as being more useful as the potential incident / phase requires a fast, yet effective, response**.

The following issues were regarded as relevant to be included among the methods that must be supported by PULSE learning management system are:

- Simulation of real events/use cases, optionally by combining the "real" inputs from sensors, live video etc with simulated environment.
- It's necessary to implement a set o indicators in order to have a measure of the improvements acquired due to the training sessions.

Another important issues is the need to use the LMS/training tool not only in order to practice and improve the personnel skills but also to **use the training system by the highly experienced personnel** in order to test both the system capabilities as well as the effectiveness of the current SOPs; **the results of such sessions will be used to update the SOPs or the platform capabilities**, as required.

8.2.2 MPORG

The analysis of the end users answers, showed again, an even distribution of the answers regarding previous experience with similar MPORG tools.

The following personnel categories are considered relevant for MPORG:

1. first responders (firemen, police, ambulance);
2. operational and tactical decision makers (including local authorities responsible);

The key elements of a scenario that may be included into the MPORG simulation:

- overall decisional link, the incident management flows;
- incident scene representation (including access options, zones/operational area representation etc);

- resources and casualties representations;
- capability to implement different incident scenarios.

The end users consider that the MPORG graphical user interface should contain as much as possible graphics and color codes and less text; live communication between the players (including video conference) is another key success element of the MPORG's GUI.

The key features of the MPORG in order to offer an appropriate feedback to the users decisions during the execution:

- an accurate overall image of scenario evolution which reflect players decisions;
- means to acquire an objective rating of the results, in accordance with scenario expectations, type/category of the player etc.
- the possibility to use the MPORG by experts in order extract feedback information for SOPs updates.

8.3 Smartphone App

According to the view of the end users the main data to be captured at the clearing station on the second and third triage are:

1. The number and type of injury of the victims.
2. Type, amount and availability of the resources, including possible alternatives for dispatching the victims.
3. Easy reporting tools in order to keep contact with external services/authorities as well.
4. Connection with external specialist for remote assistance.

The main categories of the information to be presented by the smart phone apps are:

1. Information related to type/number of the casualties as well as location of the incident and available options for hospitals/medical care locations (including routing of the medical unit to the incident scene or hospitals)
2. Support for patient triage (check lists, triage)
3. Communication inside the incident scene and with external command points, external services (Police, Firefighters etc)
4. Patient related data
5. Number, location, availability and response level of the EMS units
6. Capability to define / signal presence in different operational zone into the incident scene

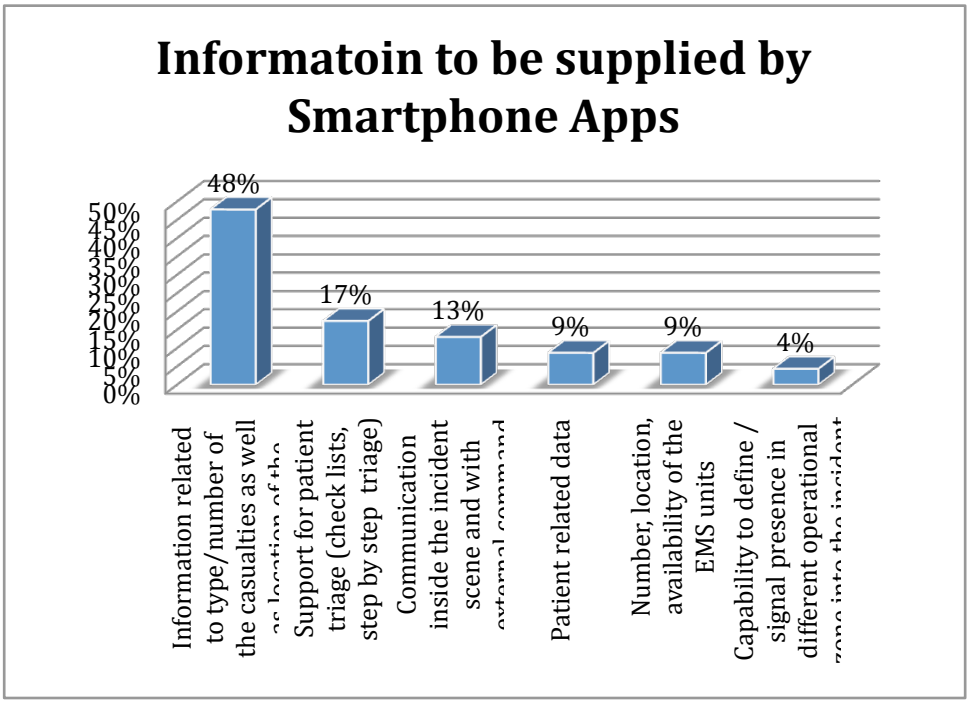


Figure 4 Information supplied by the smart phone Apps

Apart from voice and text input, the capture of video and pictures from the scene - where available, live video from the scene - was particularly interesting for the end users.

Other functions/features to be included in smartphone apps (into their order of importance):

1. Interfacing the smartphone with the onsite medical equipment (in order to collect automatically data regarding patient status) or additional sensor platforms (i.e. chemical sensors).
2. Storage the acquired information and interfacing with external data bases.
3. Positioning capability (GPS based).
4. Capability to secure the communications and the locally stored data.
5. Capability to interconnect with dedicated communications networks (e.g. REACT via Satellite Communication) or to set priority rules for communication.
6. Portable base command system.

For both scenarios, storage of the acquired information and interfacing with external data bases (e.g. data on epidemics)

For **SARS scenario**, Apps should be considered for

1. input from general practitioners and other geographically distributed sources, as substitute of current input applications that seem to be quite cumbersome

2. interfacing with external data bases (e.g. data on epidemics)

8.4 Other Tools

8.4.1 Aggregated Key Needs

By analyzing and aggregating (grouping similar aspects in an common one which bears the sum of the answers associated with each individual issue) the end users answers, leads to the following list of key needs -associated with the PULSE platform:

- Incidents database and information sharing
- Command and control capabilities
- Data/information representation
- Resource management
- Planning capabilities
- Reporting
- Decision support capabilities

The key needs ranking, from this perspective is presented into the following figure:

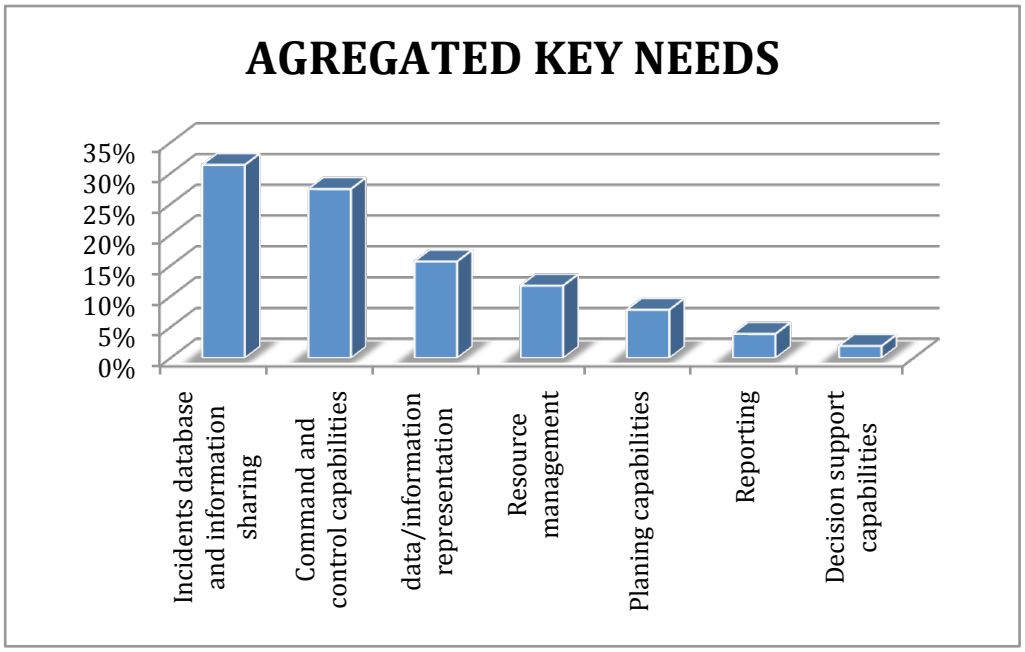


Figure 5 Aggregated key needs

8.4.2 Pulse platform gap potential

While the majority of the end users answers for "Intelligence information gathering tool" and "Lesson learning tool" says that are similar software tools on the market, for the rest of the platforms the majority of the answers were negative; anyway, the satisfaction level for the existing software tools indicates that is potential development and implementation for all PULSE modules:

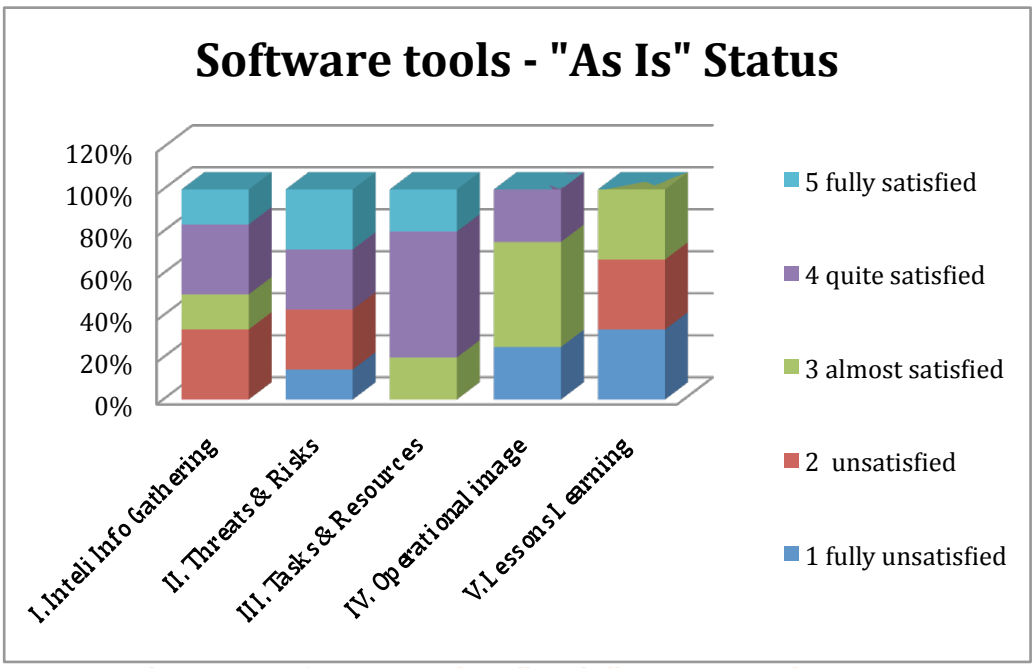


Figure 6 Software tools – "As is" aggregated status

8.4.3 Aggregated key features

Based on the identified key needs, the following key features were extracted from the end users answers:

- Data collection, recording and sharing
- Resource management & decision support tool
- Simple and intuitive user interface
- Risks assessment
- Lessons learned / incident prediction
- CBRN Support

The data aggregation methodology is similar with the previous chapter: similar key features were grouped in a category which holds the sum of the answers of each component. The ranking of the aggregated key features is presented into the next figure:

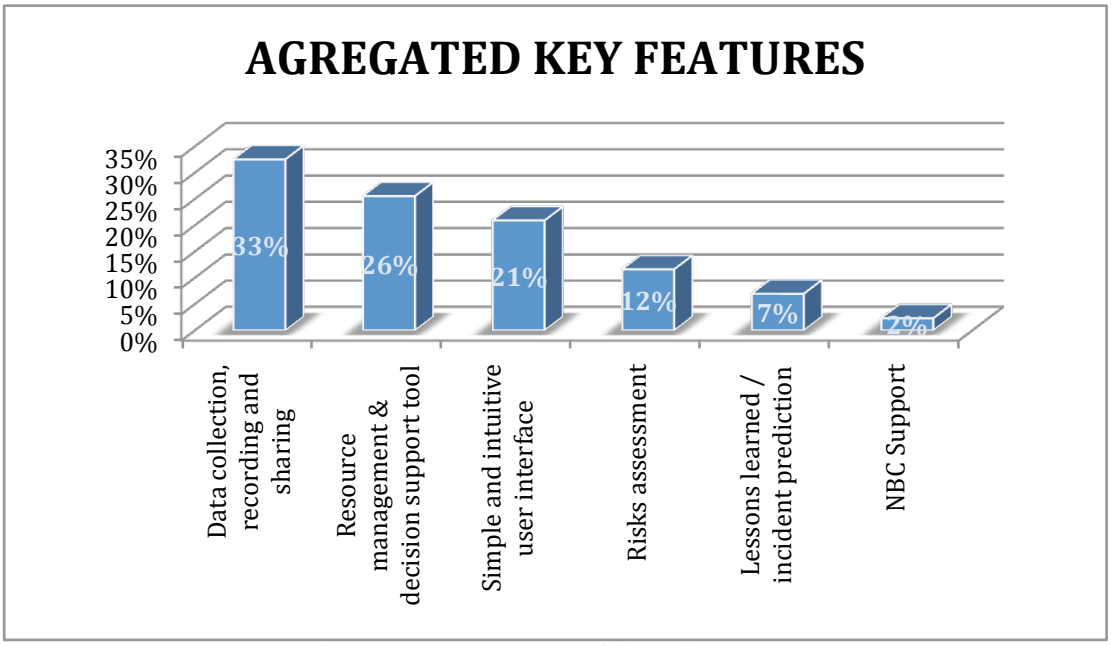


Figure 7 Aggregated key features

8.4.4 Intelligence information gathering tool specific aspects

Quite predicable, the "Information sharing capability" is the most important need; it shows that even today there are a lot of data collected, the main problem is to make use of it. The information sharing, of course, along with the information gathering, is regarded as one of the key needs to be addressed in Pulse.

The next most important is the usage of the information; once the data is collected, in PULSE is important to provide support in order to use the information for situation awareness and command and control features.

As a result, the key feature of the PULSE's Intelligence Information gathering tool is record incident data, to extract and share the valuable information, all of those by a simple interface and with decision support capabilities.

8.4.5 Threat and risk analysis & Warning/Alerting tool specific aspects

Here, there is an even distribution of the end users votes between: knowledge the threat, database with similar events and resources availability, event pre planning, and risk analysis and mitigations plans.

In respect to the key features of this PULSE tool, again the information sharing between different actors (with potential different database formats/structures) is regarded as the most important aspect.

8.4.6 Task, resources, stocks, capacity planning and control tool specific aspects

In respect to the planning and control tool, there are two key needs which emerge as the most important aspects:

- Estimation of the type and number of the needed resources.
- A general overview of the resource availability.

Next, is important to have knowledge over the legal / regulations constraints for the resources.

Apart from the key need, the following most important key features must be considered for this tool:

- Risk estimation capability.
- Decision support for resource selection.

8.4.7 Lesson learning tool specific aspects

For the lesson learning tool, a standard reporting system is the most important need to be addressed.

As for the most important feature of this tool, since there is an even distribution of the three identified features, we can define it as: automatic data collection, follow-ups and evaluation recording in order to support better planning for similar incidents.

8.4.8 Operational picture generation and situational assessment

The most important need identified for this tool is to have a simple and intuitive way of presenting the information. This is also supported by one of the most important identified key features: operational picture has to be presented in an intuitive way, by combining data with images.

Another important key feature is to process and structure the information and to make it available to the right persons at the right moment, in order to avoid the information overload which would obviously makes more damage than benefit.

8.5 SOPs

The most common aspects for the SOPs improvement are:

- Need **standardization** and regulation update: either to set new standards, either to update the standards / regulations related to operational procedures.
- Need for **interoperability / information sharing** between different agencies involved in incident management.

Another expected improvement refers to better resource management; this applies to tasks and resources planning, operational image and lesson learning tools.

Some particular aspects were also identified:

- Intelligence information gathering tool: SOP needed in order to apply evidence based medicine.
- Threats and risks assessment tools: better SOPs and decision checklists for particular operational segments (respiratory infections, healthcare chain).
- Tasks and resource planning: SOP for training for the personnel responsible for planning and control.

8.6 Ethical and legal requirements

Based on the findings of sections 7.1.2.3 and 7.1.2.4 and section 7.6, the following ethical and legal requirements have been formulated:

- The following issues should be included in national ethics training and personnel response training: protection of information (privacy); individual liberty; fairness of distribution of medication/vaccines/antidotes; prioritisation of response and treatment; and respect for religious beliefs.
- Accountability mitigation is a crucial issue. PULSE should provide guidance regarding the ethical and legal issues around the mitigation of accountability and devise strategic procedures to contribute to the development of EU-wide strategy and policies for the preparedness and response phases of major medical emergencies.
- Duty to provide care notwithstanding personal risks is a crucial issue requiring sensitive treatment and transparency in the development of procedures.
- Guidance regarding acceptable over-triage or under triage rates is an important input into the development of tactical procedures.
- Consideration of the duty to steward resources is a key element in the development of operational procedures.
- Ethical and legal consideration regarding the balancing of individual liberties should be a key component of the PULSE framework. The issues of individual liberties, resource allocation and support for first responders warrant particular attention in the design of processes and procedures and tools.
- The project should adhere to legal requirements, but there may be instances (in emergencies) where the exigencies of the situation may permit a derogation of normal legal requirements. This particularly applies to over-triage; balancing of individual liberties; privacy or personal and sensitive information; duty to manage resources; duty to provide care notwithstanding personal risks; and accountability mitigation.

The treatment of a number of ethical issues by policy-makers – duty to provide care notwithstanding personal risks, accountability mitigation, privacy of personal and sensitive information and over-triage or under triage - was viewed as inadequate by the end-users. The LEPPI officer (Trilater, partner of PULSE Consortium) will be particularly sensitive to these issues in the coordination of activities which fall under WP8.

9. Pulse platform architecture specifications

9.1 Operational purpose and scope

PULSE platform will be designed and implemented with the purpose to **support decision makers** during the **preparedness** and the **response** phases in **two types of emergency situations**, for which we have identified two "representative" scenarios (described in paragraph 4):

- **Epidemics of SARS-like infectious respiratory disease**, represented by the SARS scenario
- **Local incident with many casualties during a planned mass gathering**, represented by the Stadium crush scenario

This means that PULSE fully applies not only to the two representative scenarios, but, for instance, also to

- Seasonal influenza epidemics
- Localized outdoor or indoor crowd events (e.g. concerts, festivals, sporting events, parades, agricultural shows).

PULSE Platform may be partially applied in case of some "non planned" events, using it during the Response phase (e.g. an incident in a big discotheque).

Decisions, in both scenarios, will deal with: (1) decision on **resource allocation and patient dispatch** with respect to the expected future flow/status of patients with the constraint of available resources and medical doctrines; (2) decision on the **level of risk to be attached to an event/situation**.

This second type of decision may be needed, for instance, when a comprehensive risk based approach is used to authorize events (licence is based not only on crowd size but also on other situational and risk factors).

PULSE platform will also be designed and implemented with the purpose to **support knowledge management process across each Country and across Europe with regard to the emergency management decision making processes** in situations similar to SARS and Stadium crush scenarios.

9.2 Interactions with ICT environment

In both scenarios emergency healthcare organizations already use emergency management information systems (and related data bases).

In **SARS scenario** at European level, for instance, ECDC and European authorities may operate and cooperate with the support of following systems/tools:

- **EWRS** (Early Warning and Response System), a european network for epidemiological surveillance and control

- **EPIS** (Epidemic Intelligence Information System), a real-time international platform through which a network of experts can rapidly share information and data in a way which is fully transparent
- **TESSy** (European Surveillance System), a highly flexible metadata-driven system for collection, validation, cleaning, analysis and dissemination of data reported by all EU Member States (28) and 3 other EEA (European Economic Area) countries available on (49) communicable diseases.
- **Event based surveillance web-systems**, applications able to gather, filter and classify web-based unstructured information for public health purposes.
- **Modelling applications** allowing European stakeholders responsible for health threats response to consult and exchange health-related information in a structured and predictable manner.
- **Interactive Disaster analysis system providing** analysis of the surroundings of a given event (population, activities, hospitals,…)
- **Hospitals database** containing location and other information about European hospitals.

In **Stadium scenario**, each Emergency Medical Service is typically equipped with some information system providing repository for data on the available resources and allowing tracking the emergency situations.

In **both scenarios** (SARS and Stadium) from the interviews with the end-users we draw the conclusion that **existing systems are mainly conceived as data collectors and as repository systems**, which may show data also in "geographical" format.

Even if, in SARS scenario, systems do data filtering/classification and epidemic evolution forecasting, and provide web-based forums for interactions among experts, we understood that there is room for improvement at least in: data collection applications user-friendliness (e.g. from general practitioners), "weak signal" analysis models and forecasting models.

In both scenarios we also had no evidence that satisfactory Decision Support Systems are in place; on the contrary, we had evidence from the end-users that a platform like PULSE would be welcome.

And, on top of this, we have no evidence that a shared taxonomy and a true learning and management system, capable to leverage the European-wide experiences, are in place.

So PULSE Platform may add to the already available data a layer of "intelligent" elaboration to support decision making and knowledge capitalization and sharing.

We assume that, **in case of adoption of the PULSE system, the adopting organizations will allow PULSE to interface with their systems and data bases**.

It is also assumed that **in the Response Phase of the Stadium scenario a high capacity telecommunication channel (e.g. REACT**

Satellite Communication System) is available for health services in order to send and receive data to/from the site of the incident.

But the PULSE system **will be able to operate in a "downgraded" ICT environment**, i.e. an environment with lower capacity channels or with limited access to other systems

This might imply that PULSE system allows manual data inputs or uploads and has the capability to operate also with poorer set of data.

9.3 Key features of the PULSE platform at component level

Following paragraphs summarize the end-user requirements analyzed in Annex 4 and in chapter 8 and associate them with the PULSE components (Tools and SOP areas).

The following table states the different categories under which requirements will be stated:

Table 6 Requirements Categories

Category	Description
Functional	A functional requirement specifies what function shall be performed or activity carried out to successful completion and completion. Completion criteria should be explicitly stated if not evident from the description of the function.
Interoperability	What one system shall be able to achieve when operating in conjunction with another system under defined circumstances etc. (as per Functional requirements above).
Performance	Requirements on the time, resources etc. necessary to perform defined functions. All such requirements should be specified in terms of measurable (with appropriate units) with qualifications as to incidence as appropriate. Incidence qualifications may include descriptions such as absolutes ("never", "always") or relatives ("typically", "occasionally"). Relative descriptions must however be referenced to specific definitions in support of objective validation, e.g. "typically = on more than 90% of occasions."

Category	Description
Usability	Usability requirements relate to the ease with which a user with defined competences can achieve a desired outcome, or the competences required to achieve that outcome i.e. should be specified in terms of the role executing the function or activity that should lead to the desired outcome. Usability requirements on a system may be expressed qualitatively and by reference to other similar systems, or the same system under other circumstances. Usability requirements will typically relate roles and competences to Performance requirements and Usability requirements may be qualitative. For example, a system shall be considered "more usable" than some other system if either a similar or identical task can be carried out with less training, less time, in fewer steps, or using fewer resources by a single user with certain competences, or with comparable performance characteristics by a user with a fewer or lesser defined competences.
Compliance	Compliance requirements state that a thing or process complies with a defined specification, standard, policy or other such document, which shall be given with fully qualification as to the applicable configuration status (date of issue, issue, version or revision code, etc.)
Security	Requirements related to access to the system, including access through ESA's firewall need to be defined.
Quality	Quality requirements drive the architecture of software intensive systems. These requirements outline the quality that will be used in terms of both the software being delivered and any documentation that accompanies it.
Verification and Validation	Requirements that outline the verification and validation of the software by means of test case execution.

The normative force of each requirement is specified according to whether the satisfaction of that requirement is Mandatory, Desirable or Optional. The three classes of normative force are indicated by the use of must, should and could.

Table 7 Requirements Force

Normative Category	Description
Must	Mandatory: the requirement must be satisfied. The satisfaction of a Mandatory requirement shall not depend upon the satisfaction of a requirement of lesser force (i.e. Desirable or Optional requirements).
Should/Should Not	Desirable: the requirement shall be satisfied if all mandatory requirements can be satisfied with less time/effort than the project budget admits, unless the total time/effort of all Mandatory/Desirable requirements exceeds the project budgets, in which case the Desirable requirements shall be prioritised for action or reclassified and addressed accordingly. Desirable requirements that remain unsatisfied at the completion of the project shall not constitute grounds for non-acceptance of the relevant project deliverables. The satisfaction of a Desirable requirement shall not depend upon the satisfaction of a requirement of lesser force (i.e. Optional requirements) Deviations from 'should' requirement are only permitted with proper justification.
Could	Optional: the requirement shall be satisfied if all mandatory *and* desirable requirements can be satisfied as per the constraints described for Desirable requirements above. Optional requirements that remain unsatisfied at the completion of the project shall not constitute grounds for non-acceptance of the relevant project deliverables.
Would-Like-To-Have	A requirement marked as Would-Like-To-Have should be considered as nice to have.

For functional requirements a verification method is defined and stated for the requirements.

Table 8 Verification Methods

Acronym	Description
TC	Test
R	Review of Design (Here: Used in the context of e.g. documentation review, architectural consistency check, review of functional interfaces)
A	Analysis (includes Similarity)
I	Inspection

9.3.1 PULSE General features

Table 9 Pulse - General Usability Requirements

Req. ID	Req. Force	Requirement Text	Verification method
GR-RQ-001	Must	Pulse GUI must have simple data input with less text and more graphics and colors (e.g. checklists)	I
GR-RQ-002	Must	Pulse GUI must be simple, intuitive, schematic : a combination of images and data and to permit access to more detailed information, easily understood by non-technical staff	I
GR-RQ-003	Must	Pulse GUI must offer maps support in order to display the resources localization, the number and code of the wounded, blocked roads	I
GR-RQ-004	Should	Pulse GUI should allow usage of predefined interface patterns.	I
GR-RQ-005	Should	PULSE GUI should clearly signal changes into the operational situation both graphically (even including video, if available) and with numeric data.	I
GR-RQ-006	Must	All documentation must be in the English language.	A
GR-RQ-007	Must	The language used by PULSE platform must be English.	I

Table 10 PULSE - General Compliance Requirements

Req. ID	Req. Force	Requirement Text	Verification method
GR-RQ-008	Must	The following issues must be included in national ethics training and personnel response training: protection of information (privacy); individual liberty; fairness of distribution of medication/vaccines/antidotes; prioritization of response and treatment; and respect for religious beliefs.	A
GR-RQ-009	Must	Accountability mitigation is a crucial issue. PULSE must provide guidance regarding the ethical and legal issues around the mitigation of accountability and devise strategic procedures to contribute to the development of EU-wide strategy and policies for the preparedness and response phases of major medical emergencies.	A

GR-RQ-010	Must	Duty to provide care notwithstanding personal risks is a crucial issue in PULSE and must require a sensitive treatment and transparency in the development of procedures.	A
GR-RQ-011	Must	Guidance regarding acceptable over-triage rates must be an important input into the development of tactical procedures.	A
GR-RQ-012	Must	In PULSE, consideration of the duty to steward resources must be a key element in the development of operational procedures.	A
GR-RQ-013	Must	Ethical and legal consideration regarding the balancing of individual liberties must be a key component of the PULSE framework. The issues of individual liberties, resource allocation and support for first responders warrant particular attention in the design of processes and procedures and tools	A
GR-RQ-014	Should	The project shall adhere to legal requirements, but there may be instances (in emergencies) where the exigencies of the situation should permit a derogation of normal legal requirements. This particularly applies to over-triage; balancing of individual liberties; privacy or personal and sensitive information; duty to steward resources; duty to provide care notwithstanding personal risks; and accountability mitigation.	A

Table 11 PULSE General Quality Requirements

Req. ID	Req. Force	Requirement Text	Verification method
GR-RQ-015	Should	All source code/executable packages, build and installation scripts, test cases, test scripts and documents shall be stored, managed and distributed through a software configuration management repository that is password protected, accessible through the Internet and implemented using an open source software version control system.	R
GR-RQ-016	Could	A web-based open source issue tracking system shall be provided to record issues and manage/document their resolution.	R

Table 12 PULSE General Verification and Validation Requirements

Req. ID	Req. Force	Requirement Text	Verification method
GR-RQ-017	Must	For each requirement at least one corresponding verification method shall be identified.	R
GR-RQ-018	Must	Any test case definition shall include the data, procedures, expected results and pass/fail criteria that are needed to execute it.	R
GR-RQ-019	Must	Test case execution should be automated through executable test scripts. Note: It is recommended to consider using a test definition and execution environment that is integrated with the issue tracking system.	R
GR-RQ-020	Should	All test cases shall be stored and managed in the same way as in the software configuration management repository.	R
GR-RQ-021	Must	The PULSE training system should be validated by running and passing all test cases successfully.	TC

9.3.2 PULSE Tools key features

9.3.2.1 Training Tools

The training solution provided within PULSE can be broken down into the requirements for two different components. These are:

- Learning Management System provided training
- MPORG based training

Based upon the detailed analysis of the end user requirements the following set of requirements will form the baseline for the PULSE training system. These requirements cover both the MPORG system and the LMS system and related training.

Table 13 Training Functional Requirements:

Req. ID	Req. Force	Requirement Text	Verification method
TR-RQ-001	Must	The training system must provide an MPORG component which covers the 'stadium crush' scenario.	TC
TR-RQ-002	Must	The MPORG system must provide role playing through selection of categories of personnel.	TC
TR-RQ-003	Must	The MPORG system must provide role playing through provision of categories of personnel.	TC

TR-RQ-004	Must	The MPORG system must provide the fireman/police personnel category.	TC
TR-RQ-005	Must	The MPORG system must provide the ambulance personnel category.	TC
TR-RQ-006	Should	The MPORG system should provide the Prefecture/ local administration, 118 / 112, public security authorities personnel categories.	TC
TR-RQ-007	Could	The MPORG system could provide the Italian "protezione civile", health authorities, media personnel categories.	TC
TR-RQ-008	Must	The MPORG system must simulate the management process.	TC
TR-RQ-009	Must	The MPORG system must allow the operator define zones within the scenario area.	TC
TR-RQ-010	Must	The MPORG system must simulate the hospital capability availability.	TC
TR-RQ-011	Must	The MPORG system must allow the operator assign patients to hospitals.	TC
TR-RQ-012	Must	The MPORG system must allow the operator view the hospital patient distribution.	TC
TR-RQ-013	Must	The MPORG system must allow the operator view roads and access links to scenario site.	TC
TR-RQ-014	Must	The MPORG system must be able to simulate triage conditions for victims.	TC
TR-RQ-015	Must	The MPORG system must allow for different stadium event scenarios to be able to be defined i.e. Concert, Rally, Religious, Sporting events.	TC
TR-RQ-016	Must	The MPORG system must be able to simulate different weather conditions.	TC
TR-RQ-017	Should	The MPORG system should be able simulate victim movement through exit paths.	TC
TR-RQ-018	Should	The MPORG system should be able to simulate ambulance availability	TC
TR-RQ-019	Should	The MPORG system should be able to simulate communication between different levels of command.	TC

TR-RQ-020	Could	The MPORG system could simulate bed availability.	TC
TR-RQ-021	Must	The MPORG system must have a simple and synthetic GUI.	TC
TR-RQ-022	Must	The MPORG system must use symbols and colours as the main interface elements.	TC
TR-RQ-023	Must	The MPORG system must use a 3D environment interface where relevant for training purposes.	TC
TR-RQ-024	Should	The MPORG system should provide video conferencing between end users.	TC
TR-RQ-025	Should	The MPORG system should provide voice communications between end users.	TC
TR-RQ-026	Could	The MPORG system could provide recording of video and voice sessions for later playback.	TC
TR-RQ-027	Could	The MPORG system could provide real time information from other categories of end users involved in decision making.	TC
TR-RQ-028	Could	The MPORG system could provide a text chat system.	TC
TR-RQ-029	Must	The MPORG system must provide feedback to operator upon exercise completion on operational accuracy.	TC
TR-RQ-030	Should	The MPORG system should provide verification of the results and score of the operator's actions.	TC
TR-RQ-031	Could	The MPORG system could provide separate ratings for different competence areas.	TC
TR-RQ-032	Must	The PULSE Training solution must provide an LMS system with access to training decision making courses.	TC
TR-RQ-033	Must	The LMS must provide a training course in stadium preparedness.	TC
TR-RQ-034	Must	The LMS must provide a training course in SARS response	TC
TR-RQ-035	Should	The LMS should provide a training course in SARS preparedness.	TC

TR-RQ-036	Must	The LMS training courses must provide information on ethical issues under each category trained.	TC
TR-RQ-037	Should	The LMS should provide ethical issues on privacy, liberty, fairness of medicine distribution, prioritization of response, and respect for religious beliefs.	TC
TR-RQ-038	Could	The LMS could provide a training course in practical simulations.	TC
TR-RQ-039	Could	The LMS training courses could use simulation to support the course topics.	TC
TR-RQ-040	Could	The LMS training courses could use video to support the course topics.	TC
TR-RQ-041	Could	The LMS training courses could use use-cases to support the course topics.	TC

Table 14 Training Interface Requirements:

Req. ID	Req. Force	Requirement Text	Verification method
TR-RQ-042	Must	The training LMS system must be accessible via a standard web browser.	I
TR-RQ-043	Must	The MPORG system must be deployable on a standard PC running the Microsoft Windows OS.	I

Table 15 Security Requirements:

Req. ID	Req. Force	Requirement Text	Verification method
TR-RQ-044	Must	The LMS shall be designed to provide a secure training environment that implements username/password user authentication	R
TR-RQ-045	Must	Trainees must be provided with secure authenticated access to their private environments. Trainees must not be able to access other trainees private environments	R
TR-RQ-046	Must	Test case execution should be automated through executable test scripts.	R

		Note: It is recommended to consider using a test definition and execution environment that is integrated with the issue tracking system.	
TR-RQ-047	Should	All test cases shall be stored and managed in the same way as in the software configuration management repository.	R
TR-RQ-048	Must	The PULSE training system should be validated by running and passing all test cases successfully.	TC

Table 16 Training Usability Requirements:

Req. ID	Req. Force	Requirement Text	Verification method
TR-RQ-049	Must	The training courses must appear professional and authoritive to engender user trust	A
TR-RQ-050	Must	The training system must be able to be used correctly by users with minimal training	A
TR-RQ-051	Must	All software tools that make up the LMS and MPORG must have a user manual, installation guide and release note.	A

9.3.2.2 Smartphone App

Based upon the detailed analysis of the surveys in relation to the smartphone app the following set of baseline requirements have been derived for the application. The requirements following the same requirements force categorization and verification methodology as has been used in the previous section for the training applications.

Table 17 Smartphone App Functional Requirements:

Req. ID	Req. Force	Requirement Text	Verification method
SM-RQ-001	Must	The smartphone app must provide for the recording of the severity of individual patients injuries.	TC
SM-RQ-002	Must	The smartphone app must provide for the recording and viewing of the number of victims at an incident.	TC
SM-RQ-003	Must	The smartphone app must provide for the recording and viewing of the	TC

		hospital bed capacity.	
SM-RQ-004	Must	The smartphone app must provide for the recording and viewing of the medical resources available.	TC
SM-RQ-005	Could	The smartphone app could provide for access to a database of historical records.	TC
SM-RQ-006	Should	The smartphone app should provide for recording and viewing of amount and type of ambulances available.	TC
SM-RQ-007	Should	The smartphone app should provide for recording and viewing specific alert messages.	TC
SM-RQ-008	Should	The smartphone app should provide for recording and viewing alternative sites of care.	TC
SM-RQ-009	Should	The smartphone app should provide for reporting on different triage categories for patients.	TC
SM-RQ-010	Could	The smartphone app could provide for displaying 3rd party information.	TC
SM-RQ-011	Should	The smartphone app should provide for recording and viewing details on unconscious patients.	TC
SM-RQ-012	Should	The smartphone app should provide for recording and viewing details on patients without documents.	TC
SM-RQ-013	Must	The smartphone app must provide for recording the hospitals patients sent to.	TC
SM-RQ-014	Must	The smartphone app must provide for recording of scene specific details.	TC
SM-RQ-015	Must	The smartphone app must provide for picture/video recording of the scene.	TC
SM-RQ-016	Must	The smartphone app must provide for picture/video recording of the casualties.	TC
SM-RQ-017	Could	The smartphone app could provide for live video streaming to a remote C&C room.	TC
SM-RQ-018	Could	The smartphone app could provide	TC

		for access to maps of emergency area.	
SM-RQ-019	Could	The smartphone app could provide a chemical decoder.	TC
SM-RQ-020	Could	The smartphone app could provide a GPS location sensor..	TC
SM-RQ-021	Could	The smartphone app hardware could provide an interface to medical equipment.	TC
SM-RQ-022	Could	The smartphone app hardware could provide access to pre-emergency plans of emergency sites.	TC
SM-RQ-023	Could	The smartphone app hardware could communicate over an emergency response phone network or local emergency zone wifi.	TC

Table 18 Smartphone App Interface Requirements:

Req. ID	Req. Force	Requirement Text	Verification method
SM-RQ-024	Must	The smartphone app must be accessible on an iOS tablet.	I
SM-RQ-025	Must	The smartphone app must be accessible on an Android tablet.	I
SM-RQ-026	Could	The smartphone app could exchange information with the *KEMLER/ONU system.*	TC
SM-RQ-027	Could	The smartphone app could exchange information with the *GETR system.*	TC
SM-RQ-028	Could	The smartphone app could exchange information with the *WISM system.*	TC
SM-RQ-029	Could	The smartphone app could exchange information with the *REACT Satellite Communication system.*	TC
SM-RQ-030	Could	The smartphone app could exchange information with the *Police system.*	TC
SM-RQ-031	Could	The smartphone app could exchange information with the *118 system.*	TC
SM-RQ-032	Could	The smartphone app could exchange information with the *Italian Protezione Civile system.*	TC

9.3.2.3 Other Tools

The following tables summarizes the key features, as they resulted after the end users feedback analysis, of the PULSE platform modules:

- Decision Support & Validation (DSVT)
- Intelligence & Analysis (IAT)
- Event Evolution for Bio Events (EN-SIR)
- Logistic (LT)
- Surge Capacity Generation (SCGT)
- Post Crisis Evaluation (PCET)

For each requirement it is shown for which scenarios it is applicable, as following:

- "1" – SARS scenario;
- "2" – STADIUM scenario;
- "1/2" – both scenarios;
- "-" none.

Table 19 PULSE Tools Functional Requirements

Req. ID	Req. Force	Requirement Text	Verification method	DSVT	IAT	EN-STR	LT	SCGT	PCET
PT-RQ-001	Must	The system shall must functions to open and manage a new incident, to display the current operational situation and to manage the available resources.	TC	1/2	-	-	1/2	1/2	-
PT-RQ-002	Must	The system must have functions to define categories of incidents, resources, wounds, threats, risks.	TC	1/2	-	-	-	-	-
PT-RQ-003	Must	The system must have functions in order to record and display the number and code(s) of the wounded/infected people.	TC	1/2	1	1	-	-	-
PT-RQ-004	Should	The system should have maps support and the capability to geo-localize both mobile and immobile resources as well as the location of the incident(s), wound(s) etc	A	1/2	1	1	1/2	1/2	1/2
PT-RQ-005	Should	PULSE should offer automatic guidance of the mobile resources in order to reach de incident scene on the shortest time by taking into consideration: the incident position, resource position, traffic estimation, blocked roads etc.	A	1/2	-	1	-	-	-
PT-RQ-006	Must	The system must have decision support capabilities based on data collected from previous similar incidents (what kind of resources were used in similar incidents, what risks/threats are relevant etc.).	A	1/2	1	1	1/2	-	-

PT-RQ-007	Must	The system must perform automatic estimation of the time to intervention for the mobile resources (mobile emergency units, relevant drugs /equipment in transit to the incident scene etc);	TC	1/2	-	1	1/2	1/2	-
PT-RQ-008	Must	The system must provide a general view of the resources available and real time update of their availability, based on the incident location, resource updated availability etc.	I	1/2	-	-	1/2	1/2	-
PT-RQ-009	Must	The system must have frameworks (tools and SOPs) to record the current incident data and to manage and develop a database with similar incidents information.	R	1/2	-	-	-	-	1/2
PT-RQ-010	Should	Upon defining a new incident, the system should provide automatically information from previous incidents, relevant for the current incident commander.	TC	1/2	1	1	-	-	-
PT-RQ-011	Should	The system should automatically record the data related to the decisions made during the incident, the resources evolution/availability etc	TC	1/2	-	-	-	-	1/2
PT-RQ-012	Should	The system should perform data fusion and provide the information to the people/role in accordance with their operational/strategic role.	I	1/2	1	1	1/2	-	-
PT-RQ-013	Must	The system must offer coherent information exchange mechanisms in order to support the incident management.	TC	1/2	1	1	-	-	-
PT-RQ-014	Should	The system should have tools to record a database with laws/regulation constrains (European, national, regional) and to make this information available in accordance with the incident typology.	I	1/2	1	1	-	-	1/2
PT-RQ-015	Must	The system Must perform automatic backup of the database(s)	TC	1/2	1	1	1/2	1/2	1/2
PT-RQ-016	Should	The system should have mechanisms to record and maintain a threats database and to implement mechanisms to automatic warn the relevant roles/people whenever a threat goes above a threshold.	TC	1/2	1	1	-	-	1/2
PT-RQ-017	Must	The graphic user interface must have support for maps, area of events as well as the geo-localization of the teams/wound/resources.	I	1/2	1	1	-	-	1/2

PT-RQ-018	Should	The system should provide tools to define threats and associated risk categories	TC	1/2	1	1	-	-	1/2
PT-RQ-019	Should	To system should offer tools to classify the risk according to the people, the type of event, the place, the population density of the area, weather etc.	TC	1/2	1	1	-	-	1/2
PT-RQ-020	Should	The system should offer support for risk analysis and to build mitigations plans(predefined list of actions / resources needed in order to avoid the unwanted results of a materialized risk)	TC	1/2	1	1	-	-	-
PT-RQ-021	Should	The system should offer support for definition of the event categories	TC	1/2	-	-	-	-	-
PT-RQ-022	Should	The system should provide support in order to associate threats to an event	TC	1/2	1	1	-	-	1/2
PT-RQ-023	Should	The system should provide support for event planning, in order to estimate the number/amount and type of the resource needed based on the event type and the associated threats.	TC	1/2	1	1	1	1	-
PT-RQ-024	Must	The system must offer tools and associated SOPs in order to capture post incident data and to record relevant key-aspects of an incident in a structured way.	I	1/2	-	-	-	-	1/2
PT-RQ-025	Should	Based on records from similar incidents, the system should offer predictions of the threats towards a planed event and give an estimation of the needed resources	TC	1/2	1	1	1/2	1/2	-
PT-RQ-026	Must	The system must be able to predict the incident evolution and may automatically update the prediction when the operational context is changing.	TC	1/2	1	1	-	-	-

Table 20 PULSE Tools Interface Requirements

Req. ID	Req. Force	Requirement Text	Verification method	DSVT	IAT	EN-SIR	LT	SCGT	PCET
PT-RQ-027	Should	The system should provide open interfaces in order to share the record data as well as the information related to the ongoing incidents with authorized European organizations/ structures.	R	1/2	1	1	-	1/2	1/2

Table 21 PULSE Tools Usability Requirements

Req. ID	Req. Force	Requirement Text	Verification method	DSVT	IAT	EN-SIR	LT	SCGT	PCET
PT-RQ-028	Must	The graphic user interface must use graphics and colors in order to offer a simple, intuitive, schematic view of the incidents. The interfaces must be easily understood by non-technical personnel.	I	1/2	1	1	1/2	1/2	1/2
PT-RQ-029	Should	Usage of predefined interface patterns should be available in order to quickly change/adapt the interface to user role and/or operational situation.	I	1/2	1	1	1/2	1/2	1/2
PT-RQ-030	Must	The system must implement a standard reporting system for all its modules. The reporting system must include both texts/numbers as well as synthetic information representations (graphics, bar-charts, color codes etc).	I	1/2	1	1	1/2	1/2	1/2
PT-RQ-031	Must	The graphic user interface must have support to clearly signal changes into the operational situation both graphically (even including video, if available) and with numeric data.	I	1/2	-	-	-	-	-
PT-RQ-032	Should	The tools to input data should use checklists rather than texts.	I	1/2	1	1	1/2	1/2	1/2

9.3.3 PULSE SOP areas key features

The end users answers analysis emphasises the following important needs related to the SOPs:

1. There is a general need to **review/update the current SOPs** (including the SOP domains specified into the PULSE DoW: Intelligence information gathering, Threat and risk analysis, Warning/ alerting, Operational picture generation and situational assessment, Task planning and execution, Resources and capacities planning and control, Logistics/ stockpiling, Coordination between different services / stakeholders).
   This need leads to the necessity to develop a **new SOP for the reviewing and updating particular SOPs** in European context; this new SOP will have to set the general framework for identifying, analyzing, reviewing and – where necessary – updating a particular SOP (SHOULD requirement)
2. Another relevant issue is that many currently applicable SOPs are based on data repositories and their outputs are used in order to update those data repositories.
   Currently, there is no, or, at most, limited interconnections between the

different – although similar – SOPs in different countries/regions. Therefore, facts which are triggering SOPs updates in some countries are not taken into consideration in others countries for similar SOPs. This situation leads to the necessity of developing a PULSE knowledge management system, which must stands on two major pillars:

- **Technological capability to interconnect with others systems as well the development of tools for collecting data in an unified manner** (e.g. interfaces to the external entities, based on a template for the messages that should be sent in order to obtain the information)
- An associated new SOP for data collection and knowledge sharing – **a new Knowledge Management SOP** - to be used at European level in order to acquire a common view over the particular – yet similar – SOPs, built on the lesson learned on different events in different countries/regions (MUST requirement)

3. Additionally, apart from the end users outputs mentioned above, it is also considered important the development of a new SOP for the adoption of new system/regulation and alignment with new scenarios by the relevant actors across Europe – a **new Change Management SOP**. The goal is to raise the acceptance rate of the new system among the end users and to reduce, as much as possible, the time needed for the full implementation of the new system. PULSE would be the producer, but also one of the first beneficiaries of such SOP (SHOULD requirement)
4. Communication with media has also been indicated as an area of need by end-users. A **Communication SOP** should be defined (SHOULD requirement)
5. For the SARS scenario, PULSE SOPs must **comply with the Decision** No 1082/2013/EU of European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health.

Above SOPs:

- Knowledge Management SOP (MUST requirement)
- SOP for the reviewing and updating particular SOPs (SHOULD requirement)
- Change Management SOP (SHOULD requirement)
- Communication SOP (SHOULD requirement)

may be considered as part of the SOP area "Coordination between different services/stakeholders, including cross-border support management, Post-crisis evaluation and collection of good practices".

According to PULSE DoW, other 8 SOP areas MUST be investigated.

Analysis of the 8 SOP areas shows that they may be grouped in 5 clusters:

- Intelligence-information gathering;
- Threat and risk analysis; Warning/ alerting;
- Operational picture generation and situational assessment;
- Task planning and execution (like movements, triage, ...), including Prioritization; Resources and capacities planning and control; Logistics/ stockpiling;

- Training and exercising capability.

For each one of them a SOP will be analysed and designed (this is a MUST requirement).

The **SOPs will be described mainly as Policies**, intended as documents that provide high level guidelines, in terms of actors and responsibilities; they may also specify key phases. For the purposes of PULSE Policies are expected to be better than procedures, because they may create a common European framework that may ensure cross-border coordination and knowledge sharing, leaving to each country the freedom to take care of its peculiar organization.

In conclusion, considering two Scenarios, **12 SOP-Policies (with "MUST" requirement force) and 6 SOP-Policies (with "SHOULD" requirement force) are expected designed**.

9.4 Key innovation requirements of the PULSE platform

PULSE development should aim at implementing following key innovative (with respect to existing systems and procedures) features. Not all of them are expected be exploited to the full extent, within time and budget.

Table 22 PULSE key innovative features

No	Category	Innovative Characteristics	Req. force
1	**Recognised Current Situation**	PULSE platform must offer a Recognised Current Situation which • contains elements from all the component Tools • is adaptable to the characteristics of the situation/ scenario • is selective in presenting the right information to the different users (user types, tasks and decision levels) • Is based on a common knowledge base (see 2)	**MUST**
2	**Knowledge Acquisition and Management System**	PULSE provides a standardized knowledge and data structure, a data collection and maintenance process, facilitated by tools which support easy and homogeneous data gathering along with developing an associated data repository. It will be set as a framework, able to transform the collected data into knowledge gathered from and applicable across Europe. It will include input from training tools,	**MUST**

		when the MPORG is used as a simulator by experts.	
3	**Innovative and adaptable analytical models**	The PULSE's knowledge management system must be able to feed the developed mathematical models with dynamically changing operational data; thus, the models will be used to develop e.g. predictions to better forecast the future evolution of the pandemic, intelligent situation assessment and decision support. This also requires the capability of an ongoing adaptation of the mathematical models (usage of open and parameterized algorithms/models) in order, for instance, to allow rapid adaptation of the forecasting algorithms during the first period of life of a new epidemics.	**MUST**
4	**Interoperability with the existing systems**	The PULSE platform will propose interfaces in order to exchange data with other selected entities (organizations, processes, software) with a relevant role in European medical emergencies management.	**MUST**
5	**Telecommunication Scalability**	The PULSE platform must have capability to work in different communication environments. Whenever the available communications channel bandwidth is lower than the required capacity, the functions of the PULSE must be automatically downgraded – in order to keep up functionality, though reduced- while the users will be notified accordingly.	**MUST**
6	**Media Communication Officer support**	In order to support the Media Communication Officer, the PULSE should: • describe a unified communication framework / policy for the Media Communication Officer; • provide system outputs, useful for external communication purposes A set of commonly agreed rules will be formulated which should be used as a framework for well organized and structured communication between response forces and the public media.	**SHOULD**

		Social media may be used in the context of the PULSE APP for improved information of individuals.	
7	**Integrated architecture**	The PULSE system will comprise an open flexible architecture and a set of innovative functionalities including different analysis and assessment functions, planning, decision support, logistics and learning, and the underlying methodologies and models. They will be to a high extent integrated under a common framework architecture and data base (see also Nos.1 & 2)	**MUST**
8	**Change Management Process**	A procedure/ guideline should be established in order to facilitate the adoption of the PULSE system or new different systems, new regulations, new scenarios, etc. by the relevant actors across Europe. This is to reduce time and effort to reach the full operability of the modified system/regulations across Europe.	**SHOULD**

9.5 Key information flows

If we focus on the "information technology" side of the PULSE Platform, i.e. the PULSE system, a high level map of the internal and external relationships of the system, valid for both scenarios (except for the fact that IAT and EN-SIR are not used in the Stadium scenario) is the following (see fig. 8):

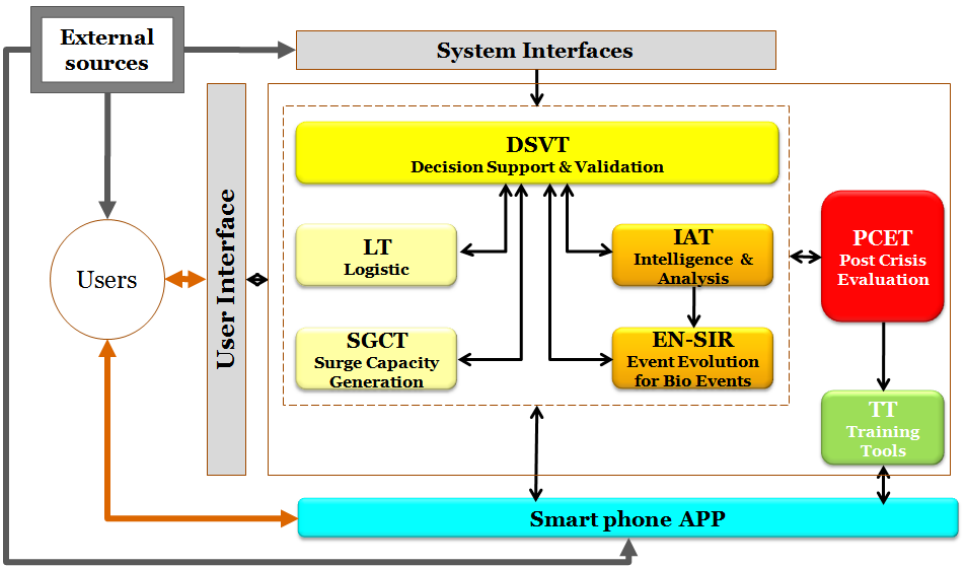


Figure 8 PULSE system internal and external relationships

- For all the functions, users may input and get data via a user interface suitable for lap-top and desk-top
- For some functions, input and output may also be managed via smart phone App
- Smart phone App may also be used, for some functions, to interact with the Training Tools and to access external sources
- PULSE system will be designed to use, as much as possible, data that are already collected by existing external systems dedicated to health emergency management; these data may be input manually, but PULSE system will be implemented having in mind the need to maximize the possibility to interface those external systems
- During the operations, Smartphone Apps, DSVT, LT, SGCT (and IAT and EN-SIR for SARS scenario) will be used to elaborate data related to the situation at hand
- DSVT will be the "master" Tool, that will "orchestrate" the elaboration/simulations of LT, SGCT and EN-SIR and put together their output (and IAT output) in order to build deliverable supporting the decision makers
- IAT may provide input to EN-SIR
- During the operations users may also access PCET (Post Crisis Evaluation Tool) in order to retrieve check lists and other lesson learned
- During operations PCET will also work as "black box" recorder, acting as a repository of attributes related to key events (e.g. their time)
- When the response phase is over, the PCET will be used to input data manually (via User Interface) and to analyze the data collected during the operations
- Training Tools may access, for training purposes, to the PCET repository of lesson learned and check lists

9.6 Interactions among End users, Tools and SOPs

In following paragraphs, for each Scene, tables show the answers given to following two questions:

- Which Tools should support the decisions in a given SOP (Standard Operational Procedure)? This is shown in the upper part of the tables.
- Which End-user is involved in a given SOP and which Tool he/she is expected to use? This is shown in the lower part of the tables.

Note: in following tables

- Tools are tagged with the Task number (T4.1 … T4.7) that will implement it in WP4 of the Pulse Project

- Numbers (from 1 to 8) indicate the Tool that is used in the SOP or by the end-user
- x indicates that the End-user is involved in the SOP, but without the support of a Tool
- grey columns and grey rows indicate that the entity is not involved in the phase

Example:

in the SARS Preparedness phase, the *Logistic Tool* (tagged T4.3) is numbered as "3" and is expected to be used

- in two SOPs (*Intelligence information gathering*; *Logistics/stockpiling*)
- by three end-users, namely
  - *Local Health Agency* in *Intelligence information gathering*
  - *Local Health Agency*, *Lead Hospitals* and *Hospitals with specific facilities* in *Logistics/stockpiling* SOP.

9.6.1 Interactions in SARS Scenario

Table 23 SARS Preparedness: End-users, Tools and SOPs relationships

Tools	T 4.1	Decision Support & Validation (DSVT)	1	1				1	1		
	T 4.2	Intelligence & Analysis (IAT)	2	2							
	T 4.3	Logistic (LT)	3						3		
	T 4.4	Surge Capacity Generation (SCGT)	4					4			
	T 4.5	Training (TT)									5
	T 4.6	Post Crisis Evaluation (PCET)								6	
	T 4.7	Event Evolution for Bio Events (EN-SIR)		7							
	8	Smart phone app	8		8						
		Standard Operating Procedures (SOPs) -->	Intelligence information gathering	Threat and risk analysis	Warning/ alerting	Operational picture generation and situational assessment	Task planning and execution, including Prioritisation	Resources and capacities planning and control	Logistics/ stockpiling;	Coordination between different services / stakeholders	Training and exercising capability
End-users		European authority	1,2	1,2,7	8			1	1	6	5
		National authority	1,2	1,2,7	8			1	1	6	5
		Police (customs command)	1,8		8					6	5
		Regional Authority	1	1,2,7	8					6	5
		Local Health Agency	1,3,8	1,2,7	8			x	3	6	5
		Lead Hospitals	4	1,2,7	8			4	3	6	5
		Hospitals with specfic facilities	4		8			4	3	6	5
		Communication Officer		1						6	5

Table 24 SARS Response: End-users, Tools and SOPs relationships

Tools	T 4.1	Decision Support & Validation (DSVT)	1	1		1	1	1	1		
	T 4.2	Intelligence & Analysis (IAT)									
	T 4.3	Logistic (LT)	3			3	3		3		
	T 4.4	Surge Capacity Generation (SCGT)	4			4	4	4			
	T 4.5	Training (TT)									
	T 4.6	Post Crisis Evaluation (PCET)									
	T 4.7	Event Evolution for Bio Events (EN-SIR)	7	7			7				
	8	Smart phone app			8						
		Standard Operating Procedures (SOPs) -->	Intelligence information gathering	Threat and risk analysis	Warning/ alerting	Operational picture generation and situational assessment	Task planning and execution, including Prioritisation	Resources and capacities planning and control	Logistics/ stockpiling;	Coordination between different services / stakeholders	Training and exercising capability
End-users		European authority		1,7	8	1,3,4	1,3,4,7			x	
		National authority		1,7	8	1,3,4	1,3,4,7			x	
		Police (customs command)									
		Regional Authority			8					x	
		Local Health Agency	1,3,4,7		8				1,3	x	
		Lead Hospitals	1,3,4,7	x	8	x	x	1,4	x	x	
		Hospitals with specfic facilities	1,3,4,7	x	8	x	x	1,4	x	x	
		Communication Officer		1						x	

9.6.2 Interactions in STADIUM Scenario

Table 25 STADIUM Preparedness: End-users, Tools and SOPs relationships

TOOLS	T 4.1	Decision Support & Validation (DSVT)	1	1				1	1		
	T 4.2	Intelligence & Analysis (IAT)									
	T 4.3	Logistic (LT)	3						3		
	T 4.4	Surge Capacity Generation (SCGT)	4					4			
	T 4.5	Training (TT)									5
	T 4.6	Post Crisis Evaluation (PCET)								6	
	T 4.7	Event Evolution for Bio Events (EN-SIR)									
	8	Smart phone app	8		8						
		Standard Operating Procedures (SOPs) -->	Intelligence information gathering	Threat and risk analysis	Warning/ alerting	Operational picture generation and situational assessment	Task planning and execution, including Prioritisation	Resources and capacities planning and control	Logistics/ stockpiling;	Coordination between different services / stakeholders	Training and exercising capability
End-users		High level command								x, 6	5
		Local Coordination Team (on site)	1,8	1	8			1,4	1,3	x, 6	5
		Pre Hospital Disaster Manager								6	5
		CCS (Casualty Clearance Station)								6	5
		EMS (Emergency Medical Service)	3,4	x	8			4	3	x, 6	5
		Hospital Emergency Management Unit			8					6	5
		Hospital Disaster Manager								6	5
		Communication Officer		1						6	5

Table 26 STADIUM Response: End-users, Tools and SOPs relationships

TOOLS	T 4.1	Decision Support & Validation (DSVT)	1			1	1	1	1		
	T 4.2	Intelligence & Analysis (IAT)									
	T 4.3	Logistic (LT)	3			3	3		3		
	T 4.4	Surge Capacity Generation (SCGT)	4			4	4	4			
	T 4.5	Training (TT)									
	T 4.6	Post Crisis Evaluation (PCET)									
	T 4.7	Event Evolution for Bio Events (EN-SIR)									
	8	Smart phone app	8			8					
		Standard Operating Procedures (SOPs) -->	Intelligence information gathering	Threat and risk analysis	Warning/ alerting	Operational picture generation and situational assessment	Task planning and execution, including Prioritisation	Resources and capacities planning and control	Logistics/ stockpiling;	Coordination between different services / stakeholders	Training and exercising capability
End-users		High level command								x	
		Local Coordination Team (on site)	1,3,4,8			1,8	1		1,3	x	
		Pre Hospital Disaster Manager	8			x	x			x	
		CCS (Casualty Clearance Station)	8			1,8				s	
		EMS (Emergency Medical Service)	1			1,8	1			x	
		Hospital Emergency Management Unit	1,3,4,8			1,8	x	1,4	1,3	x	
		Hospital Disaster Manager	8			x	x	x		x	
		Communication Officer				1,8				x	

9.7 Benchmarks for validation

PULSE Project includes *Work Package 7-Trials & validation*, which has the goals of creating the trials prototypes -for SARS and Stadium scenarios- and of assessing and validating the technologies developed by the project.

Validation methodology will be based on a benchmarking approach, where the benchmarks are the requirements contained in this document.

The assumption underlying this approach is that if these requirements were satisfied, end-users would count on systems and procedures that would allow taking better decisions; as a consequence it is expected that emergencies produce a lower negative impact.

Following table summarizes where Requirements are described in this document and which verification method should be used.

Table 27 Summary of benchmarks for validation

Category	Where are they in this document?	Force of the requirements	Method of verification
General requirements	9.3.1	As stated for each requirement in 9.3.1	As stated for each requirement in 9.3.1
PULSE Tools key features	9.3.2	As stated for each requirement in 9.3.2	As stated for each requirement in 9.3.2
PULSE SOPs key features	9.3.3	As stated in 9.3.3	Inspection
Key innovative features	9.4	As stated in table 22	Inspection

10. ANNEX 1 - End user organizations

Organization	Notes
ECDC	European Center of Desease Prevention and Control
IAEMO	Inter-Agency Emergency Management Office (IAEMO) for Major Emergency Management (MEM) Region South (Ireland)
Inspectoratul General pentru Situaţii de Urgenţă - IGSU	Romanian General Inspectorate for Emergency Situations

Akademie für Krisenmanagement, Notfallplanung und Zivilschutz	German Academy for Crisis Management, Emergency Planning and Civil Protection
CRIMEDIM	University Research Center on health emerncy (Centro di Ricerca Interdipartimentale in Medicina d'Emergenza e dei Disastri e di Informatica applicata alla didattica e alla pratica Medica-Università del Piemonte Orientale)

Polyclinic A. Gemelli (Rome)	
San Raffaele Hospital (Milan)	
Niguarda Hospital (Milan)	
Sacco Hospital (Milan)	
Institute of Infectious Diseases "L.Spallanzani" (Rome)	
Regional Emergency Management Center (Servizio di Urgenza ed Emergenza 118 -Turin/Italy)	
Regional Emergency Management Center (Servizio di Urgenza ed Emergenza 118 -Milan/Italy)	

Prefettura di Roma	Ministry of Interior representative at provincial level; is in charge for resolving institutional issues in every type of emergency
Italian National Police	
Italian National Fire Department	

11. ANNEX 2 - Workshop Questionnaire

PULSE

Platform for European Medical Support during major emergencies

WP2_Scenarios and requirements

Task 2.1_Health service user requirements gathering and reviewing including threat analysis

Questionnaire for PULSE Tools and SOPs

18 July 2014

Table of content

End user profile

Name	
Organization	
Current position	
e-mail	
cell phone	
Role or roles normally played in epidemic emergency	
Role or roles normally played in local emergency	
Years of experience in emergency management	

Session A_Training Tools and Smartphone App

1	**Multi Player Online Role Playing Game (MPORG)**
2	Have you previously used MPORG tools for training purposes? YES ___ NO ___
3	If YES, can you provide more details on them and rate them according to their effectiveness in training?
4	MPORG will only deal with the decision making procedures and that deal with resource allocation. What categories of personnel should be available for role playing.?
5	MPORG will only deal with the Stadium Response Scene. What are the key elements of the scenario that should be simulated and presented in the MPORG for effective training.
6	Describe how the graphical interface and real time communication between online players should be presented. This can range from text based with chat room like interactions through to a game like interface with avatars and video conferencing between people that are being trained. Please clarify the reasoning behind your choice of user interactions.
7	How should users get feedback on the quality of their decisions and usage of resources during the execution of the scenario within the MPORG?
8	**Training Tools – Learning Management System**
9	Have you previously used an online LMS tools for training purposes? YES ___ NO ___
10	If YES, can you provide more details on them and rate them according to their effectiveness for access to training?
11	The training courses planned to be available through the LMS are currently under the categories of: 1) Stadium Preparedness, 2) SARS Preparedness 3) SARS Response Please rate the above in order of importance for end users to be training in i.e. Where have you seen the most difficulty previously in people understanding the SOPs?
12	On what aspects of the ethical issue are responders trained in your country?
13	Are there other ethical issues you would like included in training for responders?
14	Do you have any additional categories of courses that should be covered?
15	The training courses will use the process of presentation followed by online questionnaires to verify the users understanding of the topic. Is there any additional methods you wish to use in the training? E.g. simulation, etc. If yes, can you outline how you see it working?
	Smartphone App
16	The smartphone app displays data to doctors in the casualty clearing station to input data on the second and third triage. What data should be captured at that stage?

17	What existing systems do you know of that it would be useful to interface the smartphone app with to exchange information e.g. Emergency Operation Centres (118) tools like Beta 80. Name and main function of system required.
18	What information captured by the app should be available to all users of the app. i.e. General information on all patients, hospital bed availability, current allocation of people to hospitals?
19	The system will provide both text and voice input, should any other data inputs be provided. E.g. Picture of personnel or injuries, possible interface of smartphone app with onsite medical equipment for transmission of medical data?
20	Any other functions/features that should be included in the smartphone app?

Session B1 - Tools and SOPs for SARS/Preparedness phase

#1-Intelligence information gathering

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#2- Threat and risk analysis & Warning/Alerting

1	**Key needs (decisions, knowledge)**

2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#3-Task, resources, stocks, capacity planning and control

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in

	satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#4- Lesson Learning

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

Session B2 - Tools and SOPs for SARS/Response phase

#5- Intelligence information gathering

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in

	satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#6-Threat and risk analysis & Warning/Alerting

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#7-Operational picture generation and situational assessment

1	**Key needs (decisions, knowledge)**
2	**TOOLS**

3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#8- Task, resources, stocks, capacity planning and control

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in

	satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

Session B3_Prioritization for SARS scenario

National management

Phase	#	Operational situation	Importance	Need of improvement
Preparedness	1	Intelligence information gathering		
	2	Threat and risk analysis & Warning/Alerting		
	3	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
	4a	Coordination between different services / stakeholders (lesson learning)		
	4b	Coordination between different services / stakeholders (general)		
Response	5	Intelligence information gathering		
	6	Threat and risk analysis & Warning/Alerting		
	7	Operational picture generation and situational assessment		
	8	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
		Coordination between different services / stakeholders (general)		

Cross-border management

Phase	#	Operational situation	Importance	Need of improvement
Preparedness	1	Intelligence information gathering		
	2	Threat and risk analysis & Warning/Alerting		
	3	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
	4a	Coordination between different services / stakeholders (lesson learning)		
	4b	Coordination between different services / stakeholders (general)		
Response	5	Intelligence information gathering		

	6	Threat and risk analysis & Warning/Alerting		
	7	Operational picture generation and situational assessment		
	8	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
		Coordination between different services / stakeholders (general)		

Session B4_ Legal, ethical and societal issues for SARS Scenario

- Do you repute the ethical/legal issue is sufficiently dealt with by emergency procedures which would be applied in your country in a SARS like pandemic? YES [ ] NO [ ]

- With regard to the following issues, in my country, in a SARS like pandemic:

ISSUE	FROM MY POINT OF VIEW, THE ISSUE IS				APPLICABLE LAW ALLOWES ME TO DEROGATE FROM THE ORDINARY DISCIPLINE		FROM MY POINT OF VIEW, ATTENTION OF POLICY MAKERS TOWARDS THIS ISSUE		
	CRUCIAL	NOT A PRIORITY	IRRELEVANT				IS SUFFICIENT	CAN BE IMPROVED	IS INADEQUATE
Balancing of individual liberties	☐	☐	☐		☐		☐	☐	☐
Privacy of personal and sensitive info	☐	☐	☐		☐		☐	☐	☐
Duty to steward resources	☐	☐	☐		☐		☐	☐	☐
Duty to provide care notwithstanding personal risks	☐	☐	☐		☐		☐	☐	☐
Over-Triage	☐	☐	☐		☐		☐	☐	☐
Accountability mitigation	☐	☐	☐		☐		☐	☐	☐
(Other (indicate)	☐	☐	☐		☐		☐	☐	☐

Other (indicate)	☐	☐	☐		☐		☐	☐	☐

- Which are the three most important ethical issues that you repute might come up in a SARS like pandemic?

- In your experience, have their been legal cases for civil liability against responders in a SARS like pandemic?

Session C1 - Tools and SOPs for STADIUM/Preparedness phase

#9-Intelligence information gathering

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#10-Threat and risk analysis & Warning/Alerting

1	**Key needs (decisions, knowledge)**

2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#11-Task, resources, stocks, capacity planning and control

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?

11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#12-Lesson Learning

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

Session C2 - Tools and SOPs for STADIUM/Response phase

#13-Intelligence information gathering

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?

5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

#14-Operational picture generation and situational assessment

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____

	• For Cross border management ___

#15-Task, resources, stocks, capacity planning and control

1	**Key needs (decisions, knowledge)**
2	**TOOLS**
3	Are there software tools that support these key needs? YES ___ NO ___
4	If YES, what is their scope?
5	How much are you satisfied with the AS IS situation for software for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
6	What should PULSE Tools do in order to satisfy key needs, in terms of 1-Way to input data, 2- Way to show output, 3-Elaboration, 4- Other
7	If your Tools requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact,, 5 very high impact): ____
8	**SOPs**
9	Are there SOPs that address these key needs? YES ___ NO ___
10	If YES, what is their scope?
11	How much are you satisfied with the AS IS situation for SOP for these key needs? (1-5 scale: 1 fully unsatisfied,, 5 fully satisfied): ____
12	How would you improve SOPs for these key needs?
13	If your SOPs requirements were implemented by PULSE, how much this would help in satisfying the key needs? (1-5 scale: 1 very low impact, 5 very high impact): • For National emergency management ____ • For Cross border management ___

Session C3_Prioritization for STADIUM scenario

National management

Phase	#	Operational situation	Importance	Need of improvement
Preparedness	1	Intelligence information gathering		
	2	Threat and risk analysis & Warning/Alerting		
	3	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
	4a	Coordination between different services / stakeholders (lesson learning)		
	4b	Coordination between different services / stakeholders (general)		
Response	5	Intelligence information gathering		
	6	Threat and risk analysis & Warning/Alerting		

	7	Operational picture generation and situational assessment		
	8	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
		Coordination between different services / stakeholders (general)		

Cross-border management

Phase	#	Operational situation	Importance	Need of improvement
Preparedness	1	Intelligence information gathering		
	2	Threat and risk analysis & Warning/Alerting		
	3	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
	4a	Coordination between different services / stakeholders (lesson learning)		
	4b	Coordination between different services / stakeholders (general)		
Response	5	Intelligence information gathering		
	6	Threat and risk analysis & Warning/Alerting		
	7	Operational picture generation and situational assessment		
	8	Task planning, Resources and capacities planning and control, Logistics/ stockpiling		
		Coordination between different services / stakeholders (general)		

Session C4_ Legal, ethical and societal issues for STADIUM Scenario

- Do you repute the ethical/legal issue is sufficiently dealt with by emergency procedures which would be applied in your country in a stadium crush scenario?
  YES [ ] NO [ ]

- With regard to the following issues, in my country, in a stadium crush scenario:

ISSUE	FROM MY POINT OF VIEW, THE ISSUE IS			APPLICABLE LAW ALLOWES ME TO DEROGATE FROM THE ORDINARY DISCIPLINE	FROM MY POINT OF VIEW, ATTENTION OF POLICY MAKERS TOWARDS THIS ISSUE		
	CRUCIAL	NOT A PRIORITY	IRRELEVANT		IS SUFFICIENT	CAN BE IMPROVED	IS INADEQUATE
Balancing of individual liberties	☐	☐	☐	☐	☐	☐	☐
Privacy of personal and sensitive info	☐	☐	☐	☐	☐	☐	☐
Duty to steward resources	☐	☐	☐	☐	☐	☐	☐
Duty to provide care notwithstanding personal risks	☐	☐	☐	☐	☐	☐	☐
Over-Triage	☐	☐	☐	☐	☐	☐	☐
Accountability mitigation	☐	☐	☐	☐	☐	☐	☐
(other, indicate)	☐	☐	☐	☐	☐	☐	☐
(other, indicate)	☐	☐	☐	☐	☐	☐	☐

- Which are the three most important ethical issues that you repute might come up in a stadium crush scenario?

- In your experience, have their been legal cases for civil liability against responders in a stadium crush scenario?

12. ANNEX 3 - Ethical and legal issues: examples

Together with the Questionnaire, end-users were provided with following examples in order to share the same meaning for each issue.

SARS LIKE Scenario

Balancing of individual liberties

Individuals might be ordered by authorities not to leave their homes or workplaces to mitigate risks of disease spreading, or for the same reasons may be compelled to undergo medical treatment.

Privacy of personal and sensitive info

Sensitive data might be transferred to authorities or temporarily stored with systems or methods which are non-compliant to privacy standards set forth ordinarily or it might be obtained without ordinarily necessary permissions.

Duty to steward resources

It might be necessary to reallocate resources with sacrifice for given activities, and it might be necessary to evaluate the measure of this reallocation (e.g. it might be necessary to interrupt certain activities to dedicate more rescue staff on the field, or it may prove necessary, in the hospital setting, to dedicate more resources (staff, beds, equipment, operating theatres etc) for the pandemic emergency at the cost of ordinary activity.

Duty to provide care notwithstanding personal risks

It is a compulsory duty of rescuers to protect themselves against risks. However in certain cases temporarily lowering this standard (allowing given risks) may bring a mitigation of damage (in terms of victims, diffusion of the pandemic etc.): could this decision be taken autonomously by the rescuer or should it be authorized by the hierarchical chain?

Over-Triage

When in doubt, who is performing Triage may decide to attribute a more severe code (e.g. yellow ➔red) to provide major chances of survival/recovery to the victim. This, on the other hand, may make the time for all red codes in getting attention and treatment (even the not over-triaged ones) longer. Can you decide this autonomously? What is your approach towards the issue?

Accountability mitigation

In some emergency cases such as a SARS like pandemic the responsibility of rescuers could be mitigated (such as the responsibility on obtaining informed consent for treatment, or for handling sensitive data). In your setting how does this apply?

STADIUM CRUSH SCENARIO

Balancing of individual liberties

Individuals might be ordered by authorities to make their vehicle available for the transportation of rescuers to and from the accident site or to transport vital supplies.

Privacy of personal and sensitive info

Sensitive data might be transferred to authorities or temporarily stored with systems or methods which are non-compliant to privacy standards set forth ordinarily or it might be obtained without ordinarily necessary permissions.

Duty to steward resources

It might be necessary to reallocate resources with sacrifice for given activities, and it might be necessary to evaluate the measure of this reallocation (e.g. it might be necessary to interrupt certain activities to dedicate more rescue staff on the field, or it may prove necessary, in the hospital setting, to dedicate more resources (staff, beds, equipment, operating theatres etc) for the stadium crush emergency at the cost of ordinary activity.

Duty to provide care notwithstanding personal risks

It is a compulsory duty of rescuers to protect themselves against risks. However in certain cases temporarily lowering this standard (allowing given risks) may bring a mitigation of damage (in terms of victims, altogether damage etc.): could this decision be taken autonomously by the rescuer or should it be authorized by the hierarchical chain?

Over-Triage

When in doubt, who is performing Triage may decide to attribute a more severe code (e.g. yellow ➔red) to provide major chances of survival/recovery to the victim. This, on the other hand, may make the time for all red codes in getting attention and treatment (even the not over-triaged ones) longer. Can you decide this autonomously? What is your approach towards the issue?

Accountability mitigation

In given cases accountability of rescuers, due to the conditions they are operating in, may be mitigated. For example in the US and Canada the "Samaritan Law" protects doctors against malpractice law suites should they intervene/provide care on an accident scene. Does a similar provision apply in your country?

13. ANNEX 4 - End user requirements and priorities analysis

This section contains requirements analysis, and it is **based on the data collected from the end-users and PULSE partners via the Questionnaires**.

The purpose of this section is to elicit from the Questionnaires responses the key needs, issues and requirements considered useful for the PULSE training tools, ICT instruments, SOPs, legal and ethical aspects.

13.1 Training Tools

In this session the information gathered refers to training tools, including multiplayer online role playing game (MPORG).

The methodology used for data analysis consists in taking into consideration all the participants answers, the total of respondents, type of respondent (end-user or PULSE partner). After the data summarizing, the answers were ordered after the number of participants who has contributed in that answer. Some participant gave more options of responses, so they were took into consideration in more answers (in this aspect, the total percentage of the answers will not always be 100%).

Also, the information collected through "Other key issues" questionnaire were analyzed and distributed to the category they belong to (e.g. Key issues for MPORG).

13.1.1 Multi Player Online Role Playing Game (MPORG)

In this part of the questionnaire, the data collected refers to the utility of using MPORG for training purposes.

Almost half of the participants (43%) have used before MPORG for training purposes. Part of them have used RICELAND GAME- useful for multi player games for health disaster preparedness (29%), RLAND- useful for multi player games for crisis and disaster preparedness and response (14%), MRMI- useful for disaster management in the hospital (14%) . Other participants gave details about the functions of other types of MPORG used (each of the following scoring 14%) : two systems, ones for tactical level, two for ops level simulation; resource manager, operational manager (tactical) first responders, strategic decision makers; coordinators of the intervention outside the field (not first responder but people who have to send ambulances / helicopters to the crash site and indicate their thing to do and where to go); live, synthetic and tabletop (TTE) dip exercises (awareness raising, evaluation of SOPs and technologies).

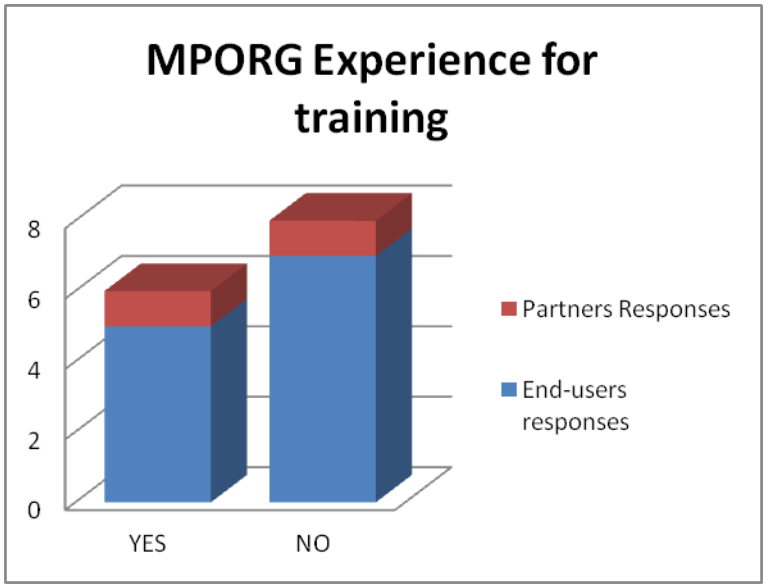


Figure 9 MPORG experience for training

In conclusion, half of the participants have indicated the following types of MPORG as being useful:

1. RICELAND GAME
2. RLAND
3. MRMI
4. Other responses:

- two systems, ones for tactical level, two for ops level simulation
- resource manager, operational manager (tactical) first responders strategic decision makers
- coordinators of the intervention outside the field (not first responder but people who have to send ambulances / helicopters to the crash site and indicate their thing to do and where to go)
- live, synthetic and tabletop (TTE) dip exercises (awareness raising, evaluation of SOPs and technologies)

13.1.1.1 Categories of personnel to be involved in role playing in MPORG

The MPORG that will be designed in this project it will be useful for decision making procedures and it will deal with resource allocation and it may be used for stadium 'crush' scenario.

Thus, the participants think that the categories of personnel that should be available for role playing in MPORG are: POLICE (50%), FIREMAN (50%), ambulance (30%), prefecture, local administration (20%), 118 / 112 (20%), public security authorities (20%).

The participants scored with a lower percentage- 10% each following category of personnel: Italian "protezione civile", health authorities, media. Half of the participants (50 %) gave general information about the category of personnel that should be involved in role playing: operational, tactical and strategic personnel, the personnel of the decision makers

involved, those involved in the immediate response, so that the result could be useful for decision makers in choosing the Appropriate tactical Approach, decision makers for management activities and all actors involved that provide forces and means in case of intervention.

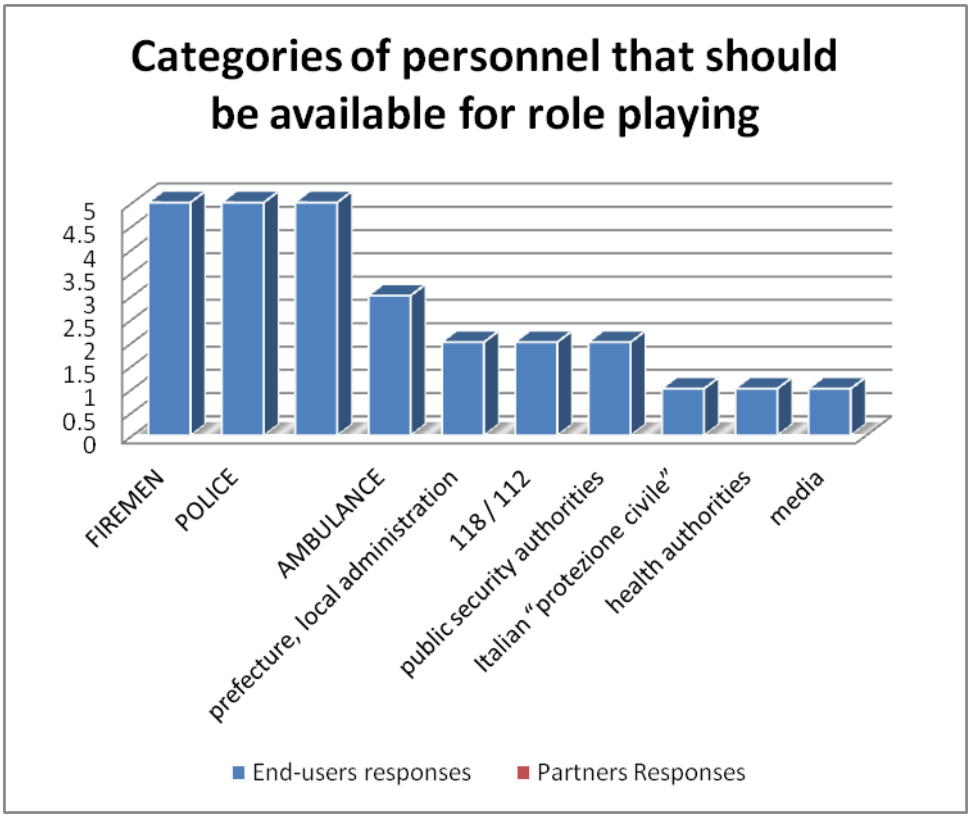


Figure 10 Categories of personnel for role playing

In conclusion, the respondents consider that the following categories of personnel should be involved in role playing:

1. POLICE, FIREMEN
2. Ambulance
3. Prefecture/ local administration, 118 / 112, public security authorities
4. Italian "protezione civile", health authorities, media

13.1.1.2 Utility of involving actively the first responders in the MPORG

Another key issue that was investigated for MPORG in the interview session with the end-users from Romania and Germany is that first responders should be actively involved in the game or it is enough to simulate them with avatar.

The Romanian and Germany end-users agree that it is important to have a combined table-top and real field exercise.

Also, the German end-user highlights the fact that the operational first responders with hands-on experience in real situations are often not been

involved in the preparations for future situations, so it should be imperative to use MPORG in the education and training of decision makers. One of the partners finds MPORG interesting and helpful, but he prefers out of office training because it gives more leisure than office training.

13.1.1.3 Key elements to be simulated and presented in MPORG

Concerning the key elements that should be simulated and presented in MPORG, 42% of the participants consider that the management process (the decision-makers, complexity/ on site data gathering necessary for mission execution -type of emergency, associated risks, constraints regarding task execution, interoperability /communications between action commander and intervention and support forces, resources) is very important and it should be included in MPORG. 33% of the participants think that zoning, areas of the stadium where the incidents occur/ map of the affected area it is a key element in MPORG.

A part of the participants indicated the following elements as key elements in MPORG, each of the answers scoring 17%: hospital patient distribution and availability; number of victims; roads and other links available, access to crush sites/locations; triage; celebrations (political rally- religious), sporting events; weather conditions.

Each of the following elements scored 8% of the total of responses: gates of stadium with the actual ability to drain people and enter the rescuers; space resource victims; ambulances availability; communication with the chain of command; terrorist attack airport; effect of the measures using the evolution of the scenario; structural elements of stadium; evaluation of the casualties number; bed availability; quality of the crowd.

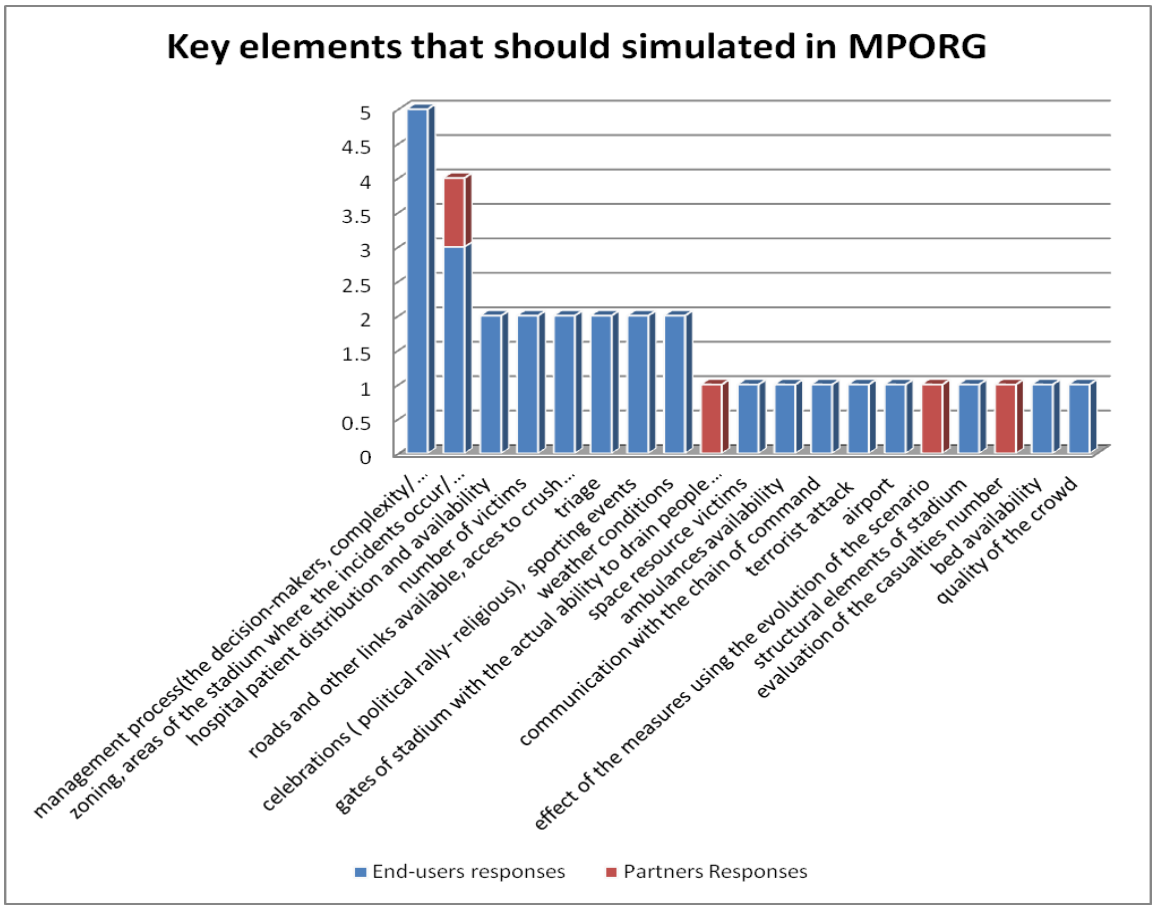


Figure 11 Key elements for MPORG simulation

Summarizing, the respondents indicated the key elements and gave them the following priority:

1. management process (the decision-makers, complexity/ on site data gathering necessary for mission execution -type of emergency, associated risks, constraints regarding task execution, interoperability /communications between action commander and intervention and support forces, resources)
2. zoning, areas of the stadium where the incidents occur/ map of the affected area
3. hospital patient distribution and availability;
4. number of victims;
5. roads and other links available, access to crush sites/locations;
6. triage;
7. celebrations (political rally- religious), sporting events;
8. weather conditions;
9. other responses:
    - gates of stadium with the actual ability to drain people and enter the rescuers;
    - space resource victims;
    - ambulances availability;
    - communication with the chain of command;
    - terrorist attack airport;

- effect of the measures using the evolution of the scenario;
- structural elements of stadium;
- evaluation of the casualties number;
- bed availability;
- quality of the crowd.

13.1.1.4 Graphical interface and real time communication between players

Regarding the graphical interface of MPORG, 38% of the participants would like a simple and synthetic GUI that uses more symbols and colors, less text. 15% of the participants think that a 3D interface it will be useful.

As for the real time communication between players, 23% of the participants think that the players should have the possibility to make videoconferences and voice communications with other players. Each of the following elements scored 8% of the total of responses: live communication unit recording system will be useful for further analysis, real time information and data for all the involved decision makers (action commander and on site commanders), chat text based.

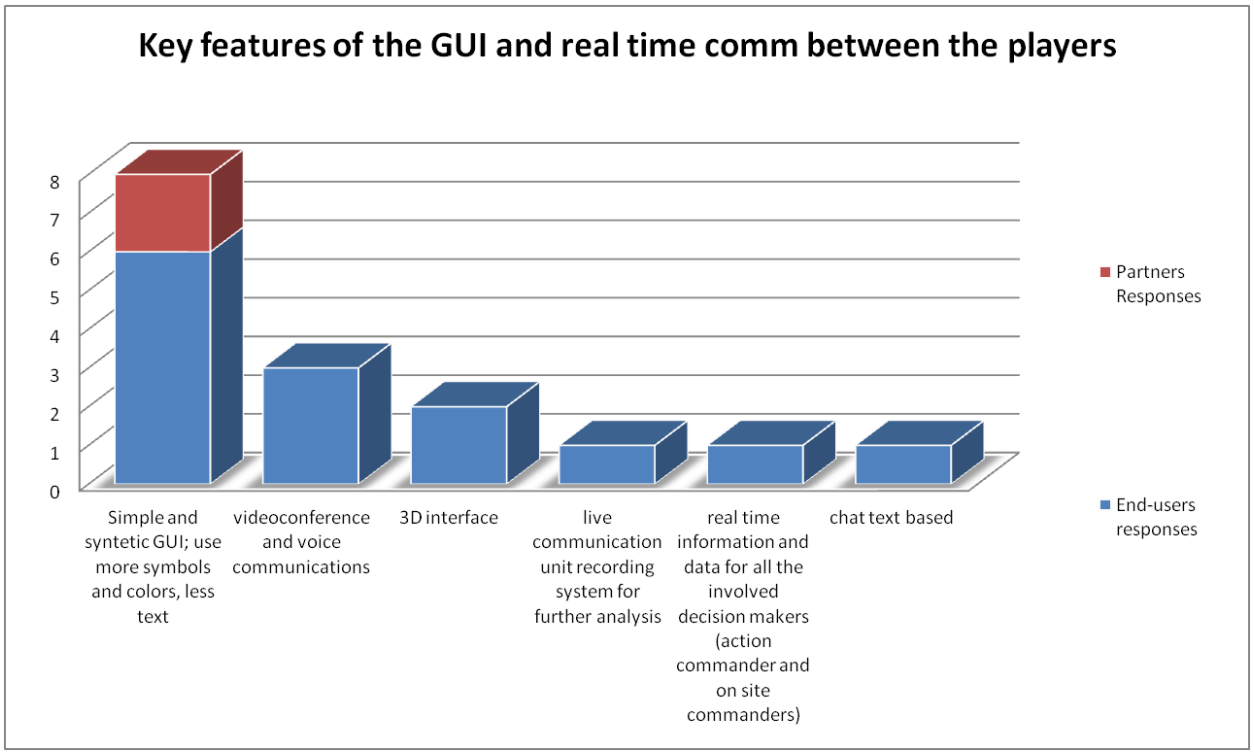


Figure 12 GUI key features and real time communication

The respondents considered the following key features important:

1. Simple and synthetic GUI (more symbols, less text)
2. 3D interface

For the type of real time communication, the respondents considered the following types:

1. videoconferences and voice communications
2. other responses
   - live communication unit recording system for further analysis
   - real time information and data for all the involved decision makers (action commander and on site commanders)
   - chat text based.

13.1.1.5 Feedback on the quality of users' decisions and usage of resources during the execution of the scenario within the MPORG

Like any other training, feedback is important, so the participants had to propose a variant for players' effectiveness ranking (quality of their decisions and usage of resources) within the MPORG.

In this matter, the following two answers had the biggest percentage (36%): operational accuracy and timing (triage, evacuation, clinical actions, fatalities number); image of the overall scenario status and the effect of their decisions, evolution of the areas of the stadium that gradually emptied or color in a different way, command and control, resources. 18% of the participants find important the verification of the results and score on the actions performed in accordance with expectations. Also, 18% of the participants consider that the feedback should be done only at the end of the MPORG execution, not during the execution. The following answers gathered each 9%: separate ratings for different competence areas; information return and SOPs review; judgment provided by experts.

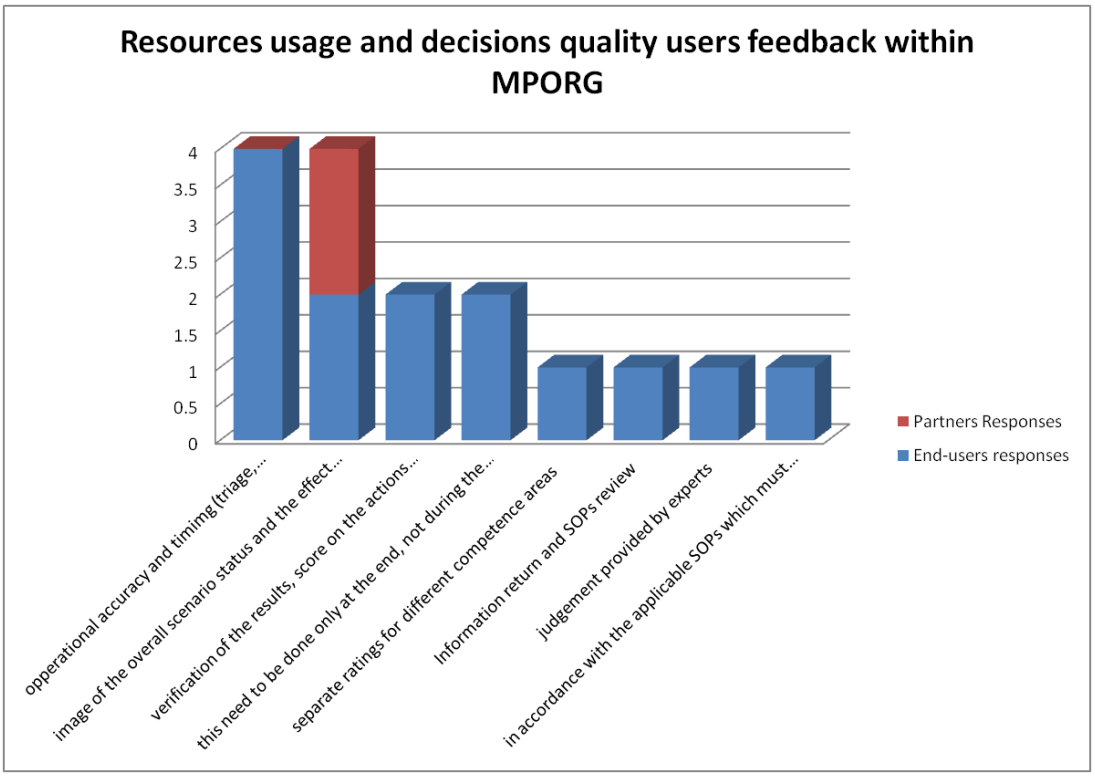


Figure 13 Resource usage and quality of decision

In conclusion, the respondents considered that feedback for the players' quality of decisions and the resources usage should be made taking into account:

1. operational accuracy and timing (triage, evacuation, clinical actions, fatalities number; image of the overall scenario status and the effect of their decisions, evolution of the areas of the stadium that gradually emptied or color in a different way, command and control, resources.
2. verification of the results and score on the actions performed in accordance with expectations
3. separate ratings for different competence areas; information return and SOPs review; judgment provided by experts

13.1.2 Learning Management System

In this part of the questionnaire, the data collected refers to the LMS training tools. The method used for the requirements analysis is similar with the method used in the previous part of questionnaire.

58% of the participants have not used LMS tools for training tools and 42% of the participants have used LMS tools for training purposes.

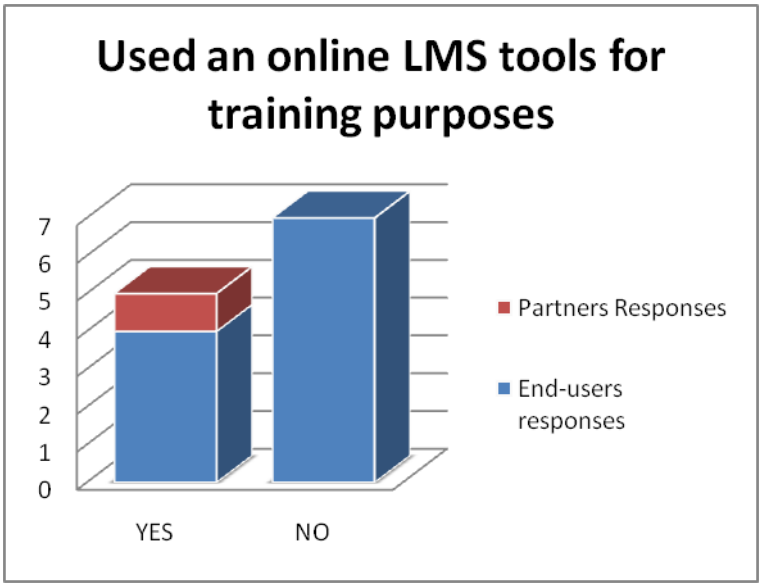


Figure 14 LMS tolos for training experience

13.1.2.1 LMS tools effectiveness

The participants have used different LMS tools: MOODLE, systems with documents and learning test available, tools with test unit capability, tools with test unit resilience, a tool dedicated to security systems engineering (considered effective as a preliminary training followed by the practical training).

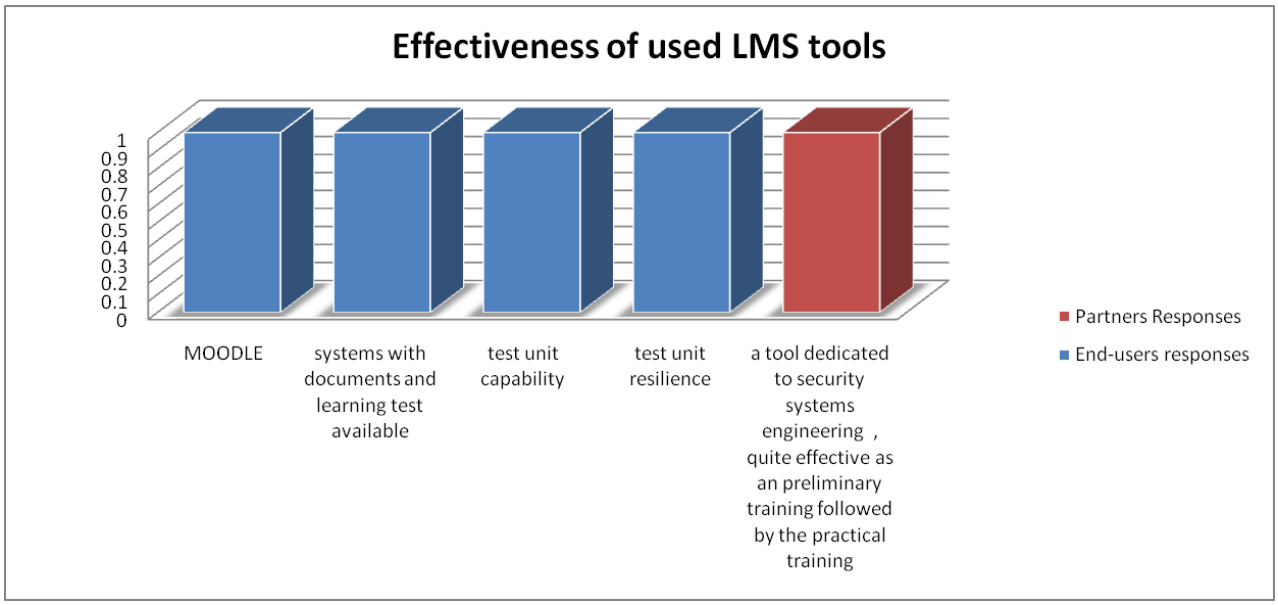


Figure 15 Effectiveness of LMS tools

It can be observed that each of the respondents gave a different answer about the LMS tools used and their effectiveness:

- MOODLE
- systems with documents and learning test available
- tools with test unit capability
- tools with test unit resilience
- tool dedicated to security systems engineering

13.1.2.2 Priority of LMS courses

The planned courses that would be available through LMS refer to the following categories: 1) Stadium Preparedness, 2) SARS Preparedness 3) SARS Response. The participants have prioritized these categories, so the results indicate that the order priority of the categories courses is:

1. Stadium Preparedness
2. SARS Response
3. SARS Preparedness

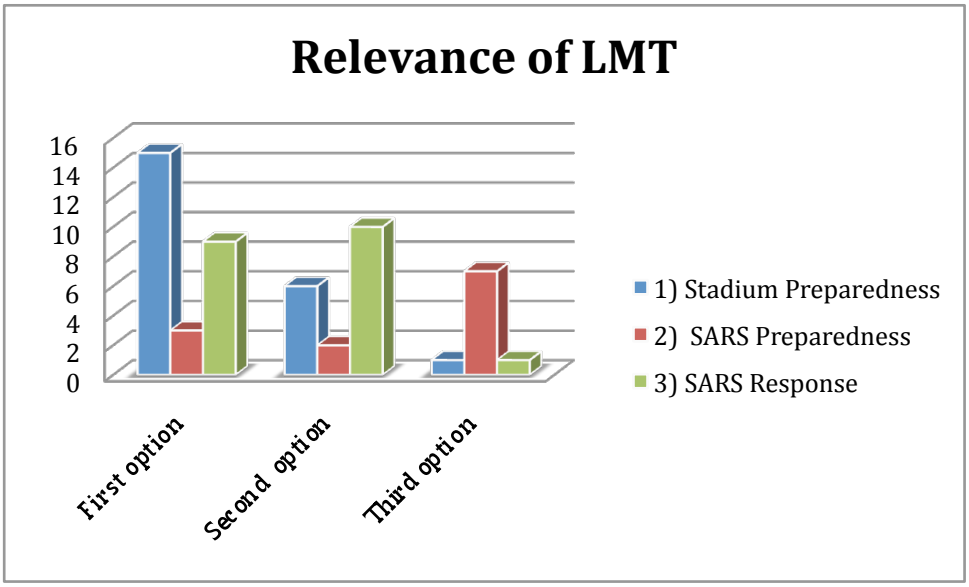


Figure 16 Relevance of LMS

13.1.2.3 Ethical aspects included in national trainings

As for the ethical aspects included in the national trainings, 29% of the participants responded that in the national trainings are not included any ethical aspects. The others participants scored each of the following responses with 14%: resuscitation suspension, triage activities, rationalization of resources, religious concerns, gender nationality.

Figure 17 Ethical issues - national trainings

On the ethical aspects included in their national trainings, the respondents have indicated the following answers:

1. None
2. Other responses:
   - resuscitation suspension
   - triage activities
   - rationalization of resources
   - religious concerns
   - gender
   - nationality

13.1.2.4 Other ethical aspects to be included in national trainings

Other ethical issues that participants have considered important are: protected information (privacy), individual liberty, fairness of distribution of medication/vaccines/antidotes, prioritization of response and treatment, respect for religious beliefs.

Figure 18 Other ethical issues for training

The participants considered that the next ethical issues have to be included in national trainings:

1. General ethical issues
2. Other responses:
   - protected information (privacy),
   - individual liberty,
   - fairness of distribution of medication/vaccines/antidotes prioritization of response and treatment,
   - respect for religious beliefs.

13.1.2.5 Other courses to be included

Other courses that participants consider useful are: practical simulation (33%), privacy and data protection (17%), communication and information (17%), stadium response (17%), CBRN accident (17%).

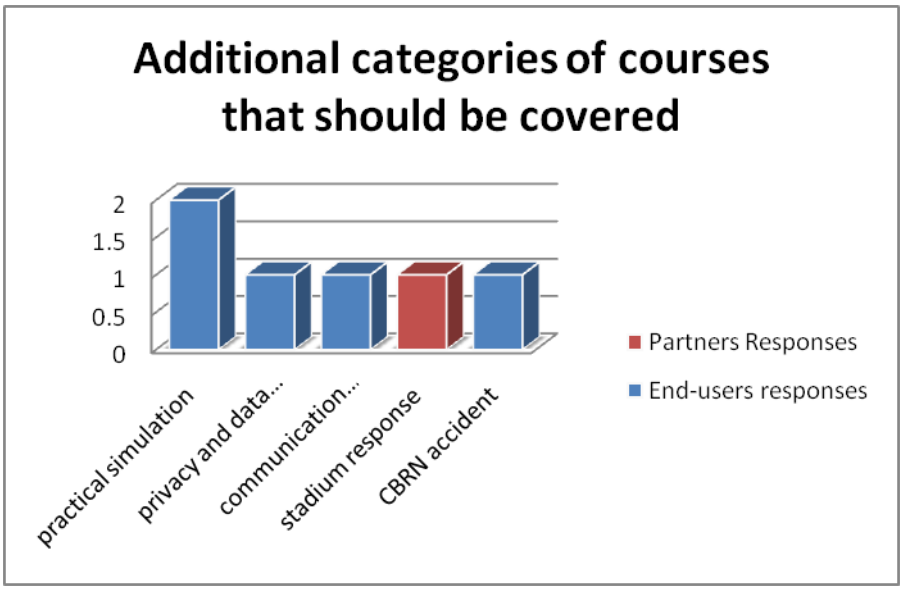


Figure 19 Additional categories of courses

The responders considered that the following categories of courses should be added:

1. practical simulation
2. other responses:
   - privacy and data protection
   - communication and information
   - stadium response
   - CBRN accident

13.1.2.6 Training methods

The training courses that are planned to use as methods: presentation, followed by online questionnaire to verify the level of the topic understanding. The participants proposed additional methods for the training courses: simulation (25%), real live training (25%), video (13%), use-cases (13%), MPORG (13%), keep track of the improvements on how to handle emergencies, for example based on the effectiveness and efficiency of the strategy (but not patients saved resources / consumed)-13%, table top exercise(13%).

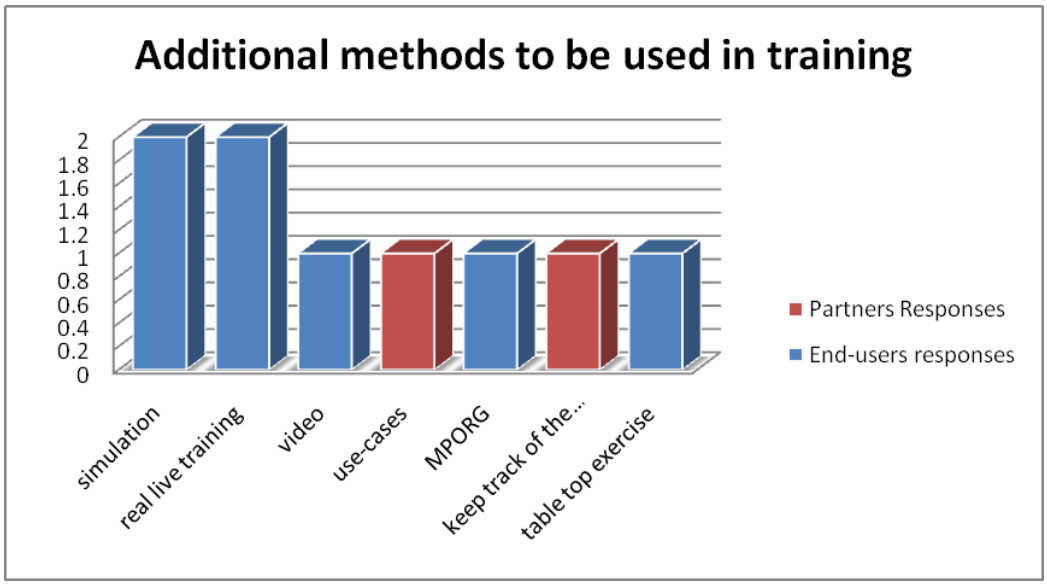


Figure 20 Additional methods for training

Besides the methods planned to be used, the respondents proposed the following methods:

1. simulation , real live training
2. other responses
    - video
    - use-cases
    - MPORG
    - keep track of the improvements on how to handle emergencies
    - table top exercise

13.2 Smartphone App

In this part of the questionnaire, the participants suggested the requirements for the Smartphone Application. The method used for the data analysis is the same used for the previous part of the questionnaire.

13.2.1 Data to be captured at clearing station by the Smartphone App

The Smartphone App displays data to doctors in the casualties clearing station to input data on the second and third triage. The participants had to propose the type of data that should be captured in this phase, so the following answers were submitted: severity of patients (38%), number of victims (38%), hospital bed capacity / medical resources (25%), library / database with historical records (25%) and the next answers gathered each 13%: amount and type of ambulances available, specific alert messages, possible alternative sites of care (eg. schools, hotels, etc..), reporting data of 1st,2nd,3rd triage ; reporting data from "other sources

of information", identification of unconscious patients or patients without documents, a way to be assisted remotely by a specialist location.

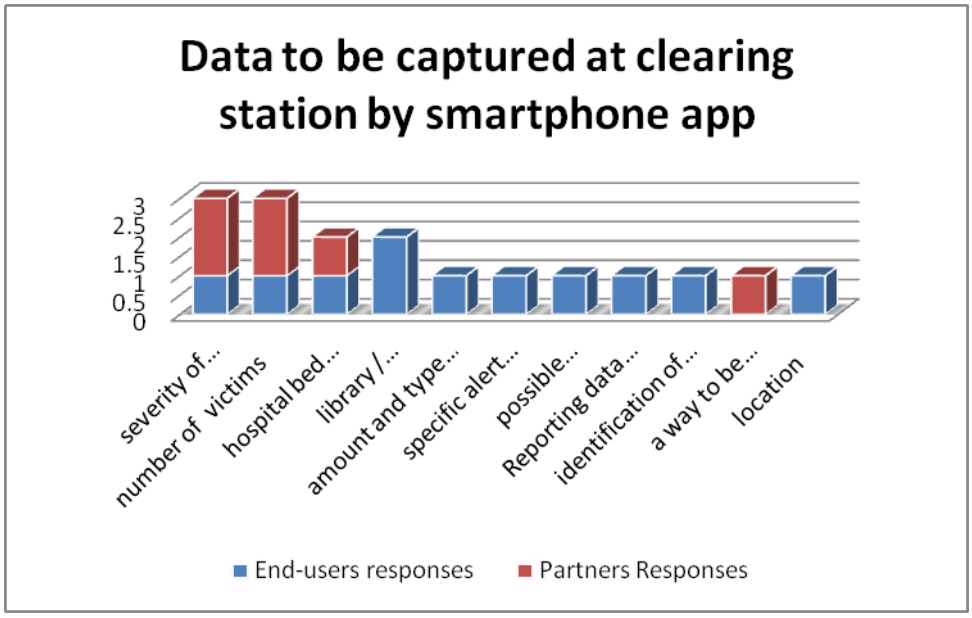


Figure 21 Smartphone app - data to be captured at clearing station

Concerning the data to be captured by the Smartphone App, the following are considered useful:

1. severity of patients; number of victims
2. hospital bed capacity / medical resources; library / database with historical records
3. other responses:
    - amount and type of ambulances available
    - specific alert messages
    - possible alternative sites of care (e.g. schools, hotels etc..)
    - reporting data of 1st, 2nd, 3rd triage
    - reporting data from "other sources of information"
    - identification of unconscious patients or patients without documents, a way to be assisted remotely by a specialist location.

13.2.2 Useful systems and functions for Smartphone App interfacing

Among the existing systems and/ or function useful to interface the Smartphone App with to exchange information, the participants considered useful the following: specific alert messages (60%) and the following functions/ systems scored evenly -KEMLER/ONU, GETR, WISM, TETRA system.

The functions considered useful for Smartphone App are:

1. specific alert messages
2. database, library.

Each of the respondents gave a different example of useful system:

- KEMLER/ONU
- GETR
- WISM
- TETRA system

13.2.3 Information to be captured by the Smartphone App

As for the type of information to be captured by the Smartphone App, to be available for all users, 30% of the participants considered that the hospitals to be reached is a very useful information, 20% of the participants considered the following information useful: EMS team available; type of casualties; scene, event, localization; general info of the patient (+ photo) / pictures; operation command; number of the patients; database / data gathering for documentation, other 10% of the participants considered the following type of information useful: red zoning; step by step triage algorithm; information about security of the field; type and number of the emergency units heading to the scene; lessons learned process; distinguish between "real time" use; communication between field and command; cops-coordination; preparedness and arriving time on site of the other support teams.

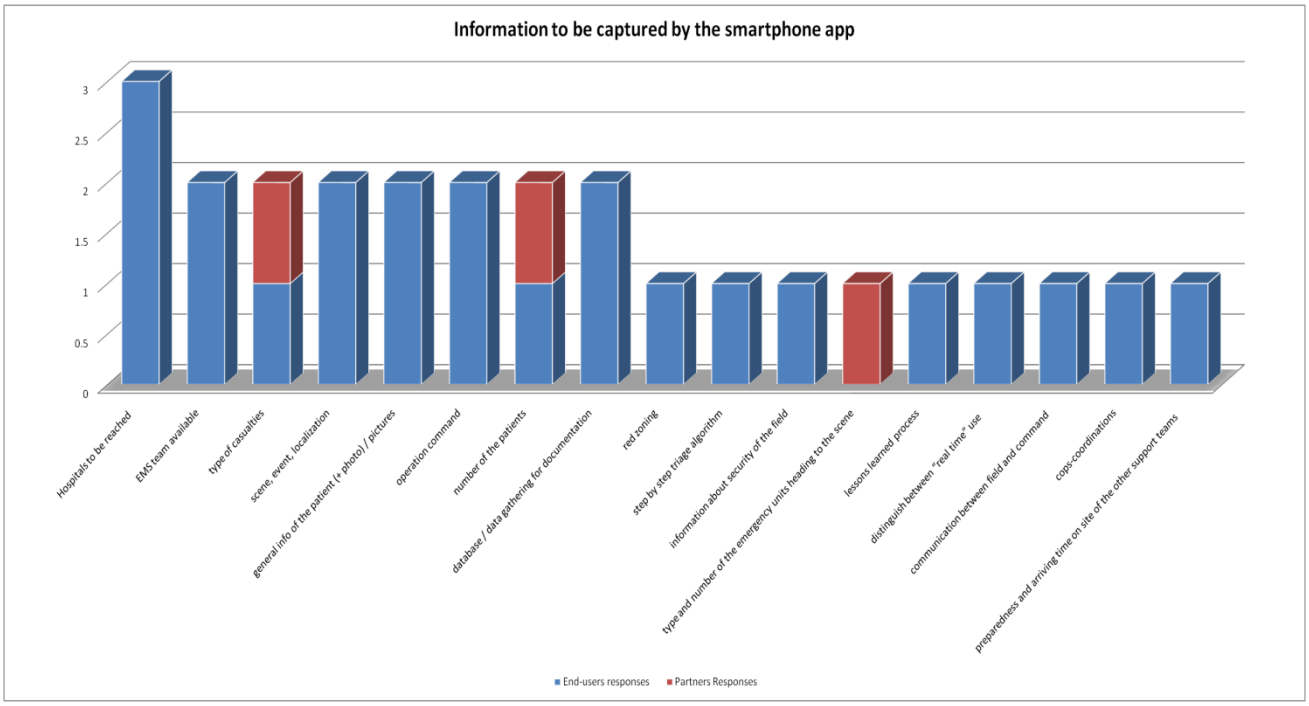


Figure 22 Smartphone app - Information to be captured

Concluding, the information to be captured by the Smartphone App should refer to:

1. hospitals to be reached
2. EMS team available; type of casualties; scene, event, localization; general info of the patient (+ photo) / pictures; operation command; number of the patients; database / data gathering for documentation
3. other responses:
    - red zoning
    - step by step triage algorithm
    - information about security of the field
    - type and number of the emergency units heading to the scene
    - lessons learned process
    - distinguish between "real time" use
    - communication between field and command
    - cops-coordination
    - preparedness and arriving time on site of the other support teams

13.2.4 Data inputs for the Smartphone App

The system will provide primarily text and voice inputs, so the participants were asked what other type of data inputs should be provided. Half of the participants believe that picture and/or video of the scene (weather, wind, etc..) it will be useful, 38% of the participants responded that a picture of casualties is important, other answers scored each 13%: on site video to the emergency room, database, maps.

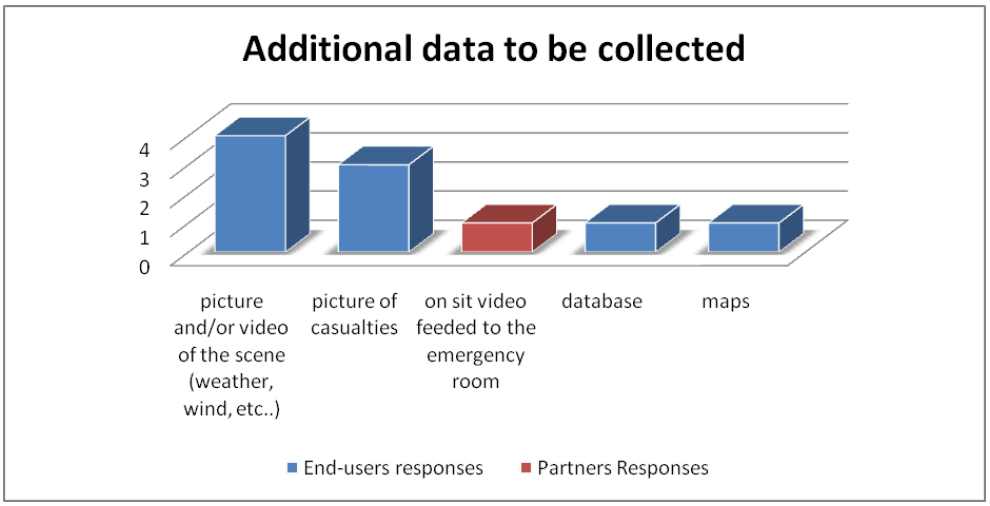


Figure 23 Smartphone app - Additional data to be collected

The respondents have indicated the next additional data to be collected for the Smartphone App:

1. picture of casualties
2. other responses:
    - on site video to the emergency room
    - database
    - maps

13.2.5 Smartphone App functions and features

Each of the participants proposed other functions/ features that the Smartphone App should have: motion base command system, chemical decoder, GPS, database, interfacing the smart phone with the onsite medical equipment in order to collect automatically data regarding patient status, access to relevant public data (in stadium case, e.g. Information on stadium structure/geometry/topology), encrypted information, priority rules for cell phone or have a dedicated system like REACT Satellite Communication.

Besides the established functions of the Smartphone App, it can be observed that each of the respondents proposed different additional features/ functions for the Smartphone App:

- motion base command system
- chemical decoder
- GPS
- database
- interfacing the Smartphone with the onsite medical equipment in order to collect automatically data regarding patient status
- access to relevant public data (in stadium case, e.g. information on stadium structure/geometry/topology)
- encrypted information
- priority rules for cell phone or a dedicated system like REACT Satellite Communication.

13.3 ICT instruments

The information contained in this chapter refers to the type of ICT instruments considered useful by the end-users in their activity. The data was collected by Applying a questionnaire to 18 Instructors of MRMI Course that took place in Rome on 13-15th June 2014. The questionnaire submitted has 3 questions, each of them with two or three options and one for other suggestions.

13.3.1 Useful type of App or software in end-users work

End users were asked:

what kind of App or Software would you like to use in your work?

a) A system of real time transmission of the patients clinical situation between the ambulance or transport vehicle and the established trauma center
b) A Decision Support Tool (an app with a mathematical model that can forecast the evolution of the patient's condition in the next few minutes or hours)
c) Other suggestions

With regard to option a)

A system of real time transmission of the patients clinical situation between the ambulance or transport vehicle and the established trauma center

the respondents have considered the following: 89.47%- Useful, 5.26%- Not useful for the person's role in maxi emergency, 5.26%- I do not express an opinion.

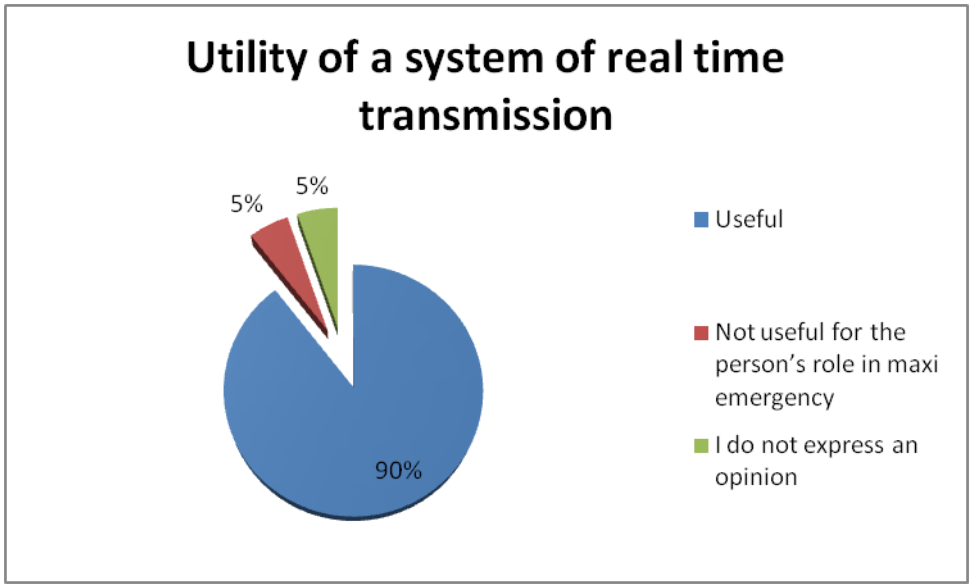


Figure 24 Utility of the real time transmission

The majority of the respondents consider that a system of real time transmission of the patients clinical situation between the ambulance or transport vehicle and the established trauma center would be very useful in their work.

Also, one end-user gave details about other systems used in Germany. He reminded a system called IVENA, an internet based program for the regional rescue coordination center. Through this Application, they can see, with any device able to access internet, medical treatment capacities availability at the regional hospitals. This Application is in the implementation phase and has an add-on that permits not only to preregister their patients over the coordination centers after category (triage levels red, yellow and green) and a medical specification at the hospitals, they can also directly transfer relevant medical data (gender, age, suspected diagnosis, vital parameters etc.) in real time to the

assigned hospital.

The end-user indicated also another add-on used in the German federal state Hessian, called MANV-(mass casualty incident). With this add-on they can see what emergency grow up capacities every hospital has and they will be able to alert the corresponding hospitals to activate these capacities.

With regard to option b)

A Decision Support Tool (an app with a mathematical model that can forecast the evolution of the patient's condition in the next few minutes or hours)

almost half of the respondents think that this kind of Application is not useful; also, an end-user highlighted that it would be very difficult to use such an App because of the complexity and uniqueness of every patient.

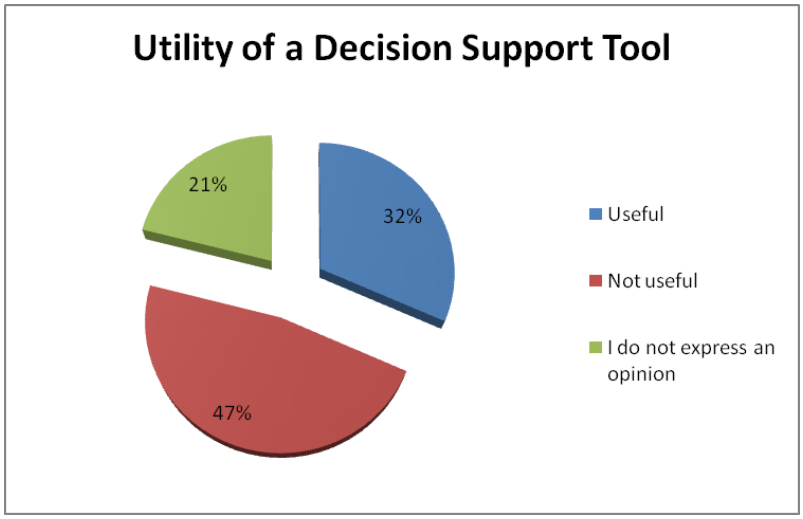


Figure 25 Utility of a decision support tool

With regard to option c)

Other suggestions

An end-user indicated that it will be useful to have an **App with the scoring system for trauma patients**, but another one indicated that it will be difficult to develop such an App because of different types of scorings used in different regions.

One end-user consider that an **App with data on triage and geo localization of the victim** it will be very useful, but another one suggest that this kind of application is more appropriate to be used only in case of large scale emergencies due to the infrastructure that has to be build primarily.

The end-user considered also useful an **App to know the dislocation of**

resources and the time necessary for procurement, another one sustained that this kind of App it can be very useful, but it has to be decided who will have access at this sensitive data and who will be allowed to put the resources to the field.

Also, the end-user proposed the following:

- a multichannel communication system to identify the evolution of the emergency
- an App with streaming from maxi emergency site

13.3.2 Useful type of App or software in end-users in a SARS Scenario

End users were asked:

In case of a scenario with an SARS-like epidemic of what kind of app or software would you benefit?

a) Interactive app on smartphone that gives in real time the update on the state of diffusion of the epidemic and the guidelines issued by the competent authorities.
b) Other suggestions

With regard to option a)

Interactive App on Smartphone that gives in real time the update on the state of diffusion of the epidemic and the guidelines issued by the competent authorities

almost all the respondents (94.74%) consider that this app would be useful and 5.26% of the responders didn't express an opinion in this matter.

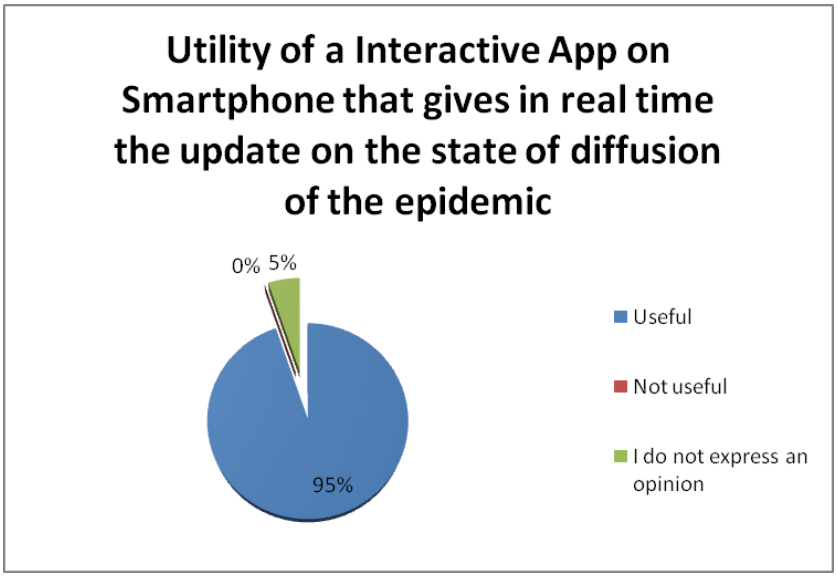


Figure 26 Utility of an interactive app

With regard to option b)

Other suggestions

One end- user indicated that the following feature it will be useful **Real time update on the hierarchic scale of command during the emergency, another one believes that if the personnel involved knows** who they have to report to / from whom to accept orders, they don't need this kind of App.

An end-user proposed an **App on risks of public health during the maxi emergency and how to address them,** but another one considers that this kind of information isn't necessary and it will be too much information to handle with.

The end-user proposed also an **App for personal protective equipment and how to use them and how they are to be procured and where**, but another one suggested that this kind of training should be done before the situation (e.g. Information about how can they produce new PPE or what to use instead if the stocks are used).

13.3.3 Useful type of App or software in end-users work in STADIUM Scenario

End users were asked:

What kind of App or Software would you like to use in your work?

a) A system of real time transmission of the patients clinical situation between the ambulance or transport vehicle and the established trauma center
b) A Decision Support Tool (an app with a mathematical model that can forecast the evolution of the patient's condition in the next few minutes or hours)
c) Other suggestions

With regard to option a)

Decision support tool that can inform in real time the bed capacity for injured victims in the hospitals

More than half of the respondents find this kind of App very useful (73.68%), 15.79% of the responders didn't express their opinion and 10.53% think that this App is not useful.

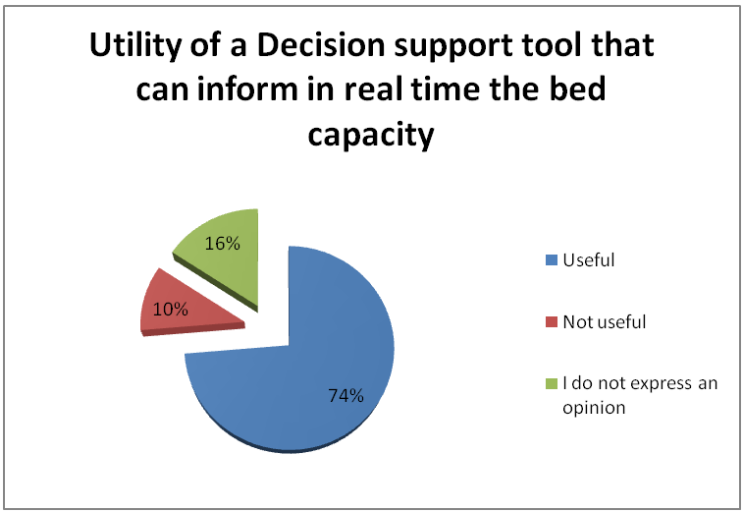


Figure 27 Utility of a decision support tool

Also, similar to the **Error! Reference source not found. Error! Reference source not found.**, one end-user gave the IVENA App example.

With regard to option b)

A system for recognition at a distance if the victim is dead or alive

Almost half of the respondents (42.11%) find this App useful, so there will not be resource wasting, 36.84% of respondents find this App not useful and the other 21.05% didn't express their opinion.

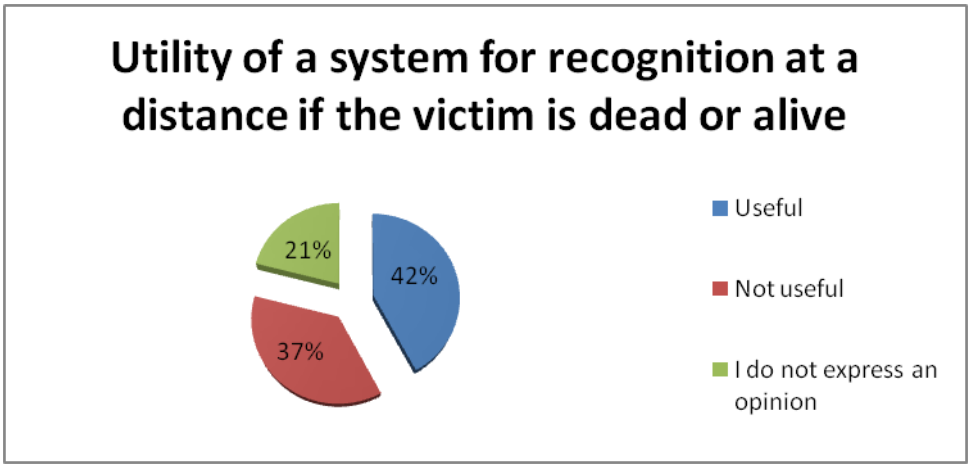


Figure 28 Utility of a tool for victim recognition

With regard to option c)

Other suggestions

One of the end-users indicated as useful the following Apps:

- **App on risks of public health during the maxi emergency and how to address them**
- **App with a triage system that stores the codes of the patients and their geo localization**

Also, similar to **Error! Reference source not found. Error! Reference source not found.**, one end-user considers the last App suitable just for large scale scenarios.

13.3.4 Summary

The majority of the operators found the real time transmission of the clinical situation of the patient between the ambulance or transport vehicle to the trauma center **useful**.

The Decision support tool for the evolution of the patient's conditions in the following minutes or hours was not deemed particularly useful. There is the doubt that some people might not know what a decision support tool is and how it is to be used.

Moreover, **useful Apps** were identified:

- a scoring system for trauma patients,
- a multichannel communication system to identify the evolution of the emergency
- a triage and geo localization of the victim system,
- streaming from the emergency site,
- knowledge of the dislocation of resource and time necessary for procurement.

For the **SARS-like scenario** the majority was favorable to an **interactive App** that gives

- real time update of the state of diffusion of the epidemic and guidelines issued by the competent authorities,

that was considered **useful**.

One operator suggested the utility of real time update on the command and control scale during the emergency, one he access to knowledge of public health risks in this situation and how to address them, one the availability and location and indication to use personal protective equipment.

For the **Rock concert scenario** the majority deemed **usefu**l a Decision support tool that can inform in real time the bed capacity for the injured victims in the hospitals. The majority deemed **Not useful** a system for the recognition at distance of the vitality of the victim. Suggestions as to possibly useful systems in this scenario included: App on risks of public health during maxi emergency and how to address them; App with triage system that stores the codes of the patients and their geo localization.

In conclusion:

- Operators favor majorly real time, online systems to gather more information from the scene, communicate more accurately with hospitals of destination, know the command and control system that has been instituted, identify the location and the conditions of the victims.

- A decision support tool was considered useful mainly for the identification of hospital beds and availability.
- Informative Apps on health risks of emergency situations were sponsored.

13.4 Tools and SOPs end users requirements analysis (Sessions B1 & C1, B2 & C2)

In this session the information gathered refers to tools and SOPs for Stadium Crush Simulation scenario- preparedness and response phase and tools and SOPs for SARS scenario- preparedness and response phase.

The questionnaire is structured into the following modules:

- Intelligence information gathering
- Threat and risk analysis & Warning/Alerting
- Task, resources, stocks, capacity planning and control
- Lesson Learning
- Operational picture generation and situational assessment

Every module described has four parts: two parts for each scenario (SARS-preparedness and response phase and Stadium preparedness and response phase). Also, each module is structured in three categories of information: key needs, tools and SOPs.

Table 28 Questionnaire sessions

	SESSION B1 - TOOLS AND SOPS FOR SARS/PREPAREDNESS PHASE	**SESSION B2** - TOOLS AND SOPS FOR SARS/RESPONSE PHASE	**SESSION C1** - TOOLS AND SOPS FOR STADIUM/PREPAREDNESS PHASE	**SESSION C2** - TOOLS AND SOPS FOR STADIUM/RESPONSE PHASE
Intelligence information gathering	#1	#5	#9	#13
Threat and risk analysis & Warning/Alerting	#2	#6	#10	
Operational picture generation and situational assessment		#7		#14
Task, resources, stocks, capacity planning and control	#3	#8	#11	#15
Lesson Learning	#4		#12	

Note:

The methodology used for data analysis consists in summarizing the information gathered per module, by taking into consideration all the participants' answers, the total of respondents, type of respondent (end-user or PULSE partner).

13.4.1 Intelligence information gathering

The data analysis of this module consists in summarizing the information gathered into the four parts of the questionnaire (SARS- preparedness and response phase and Stadium preparedness and response phase).

13.4.1.1 Key needs

This part of the questionnaire covers the information needed for a stadium crush scenario.

The respondents believe that information sharing capabilities (35%), the command and control functions (24%), situation control capabilities (18%), resource management (12%), decision support capabilities based on data collected from previous similar incidents (6%) and casualties related data (6%) are the key needs of intelligence gathering related to this scenario.

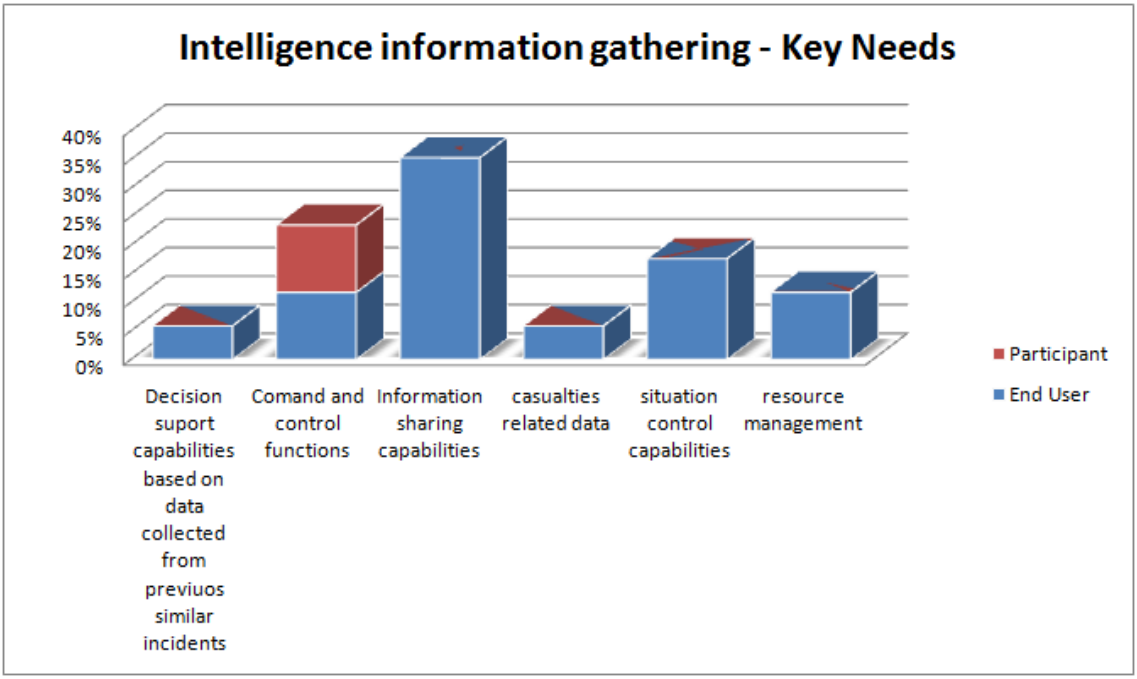


Figure 29 Intelligence information gathering key needs

So, the participants defined the following key needs:

1. Information sharing capabilities
2. Command and control functions
3. Situation control capabilities
4. Resource management
5. Other responses:

- decision support capabilities based on data collected from previous similar incidents
- casualties related data

13.4.1.2 Tools

In this part of the questionnaire was gathered information about the existing software tools and key features to be implemented within PULSE project.

Existing software tools that support key needs for Stadium Crush Scenario

More than half of the respondents (63%) said that they don't know software tools that cover the key needs described, 37% of the participants said that are aware of software tools that support the key needs for this scenarios.

They used or tested software like **Promed**, **Healthnet**, **GIDEON** or **TESSY.** These software have features as site architecture mapping, area and exits organizing, crowd control, medical support. They can also notify main response agencies, help in event and medical planning, offer forensic and decision support tools (through information sharing), and provide radio command and ambulance control tools.

In spite of the functionalities palette the above software provide, the end users are **mostly unsatisfied** by the current tools.

Aggregated key features to be implemented by Pulse in order to support the key needs

Almost half of the participants (41%) suggested that Pulse should implement a database recording and matching for similar incidents, information sharing and organizer warnings and resource estimation tool.

The next features scored 18%: simple data input with less text and more graphics and colors (e.g. checklists), decision support for resources management.

6% of the respondents indicated the next features as being useful: risk evaluation tool, incident evolution prediction, operations checklists, geo localization.

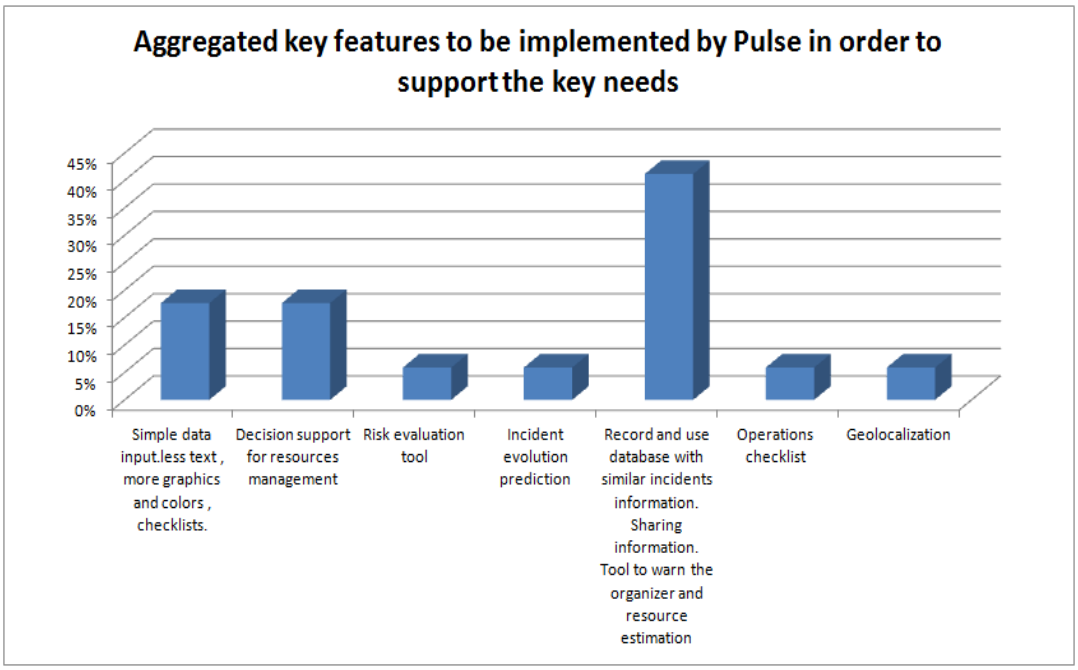


Figure 30 Intelligence information gathering - Aggregated key features

The key features that responders considered necessary to be implemented within PULSE project are ordered below:

1. a database recording and matching for similar incidents, information sharing and organizer warnings and resource estimation tool
2. simple data input with less text and more graphics and colors (e.g. checklists)
3. decision support for resources management
4. Other responses:
    - risk evaluation tool
    - incident evolution prediction
    - operations checklists
    - geo localization

<u>Estimated satisfaction level if the requirements would be implemented by PULSE</u>

Based on their answers given in **Key needs** and **Aggregated key features** sections, the participants were asked how much would help satisfying the key needs, on a 1 to 5 scale, if the tools they required were implemented by PULSE.

Half of the respondents answered that the level of impact on satisfying the key needs would be high, 31% believe the impact would be very high.19% of them think that this would have medium impact.

Figure 31 Intelligence information gathering – estimated satisfaction level

Existing software tools that support key needs for SARS Scenario

Note: The situation of the existing software tools for SARS scenario is described in chapter 9.2.

13.4.1.3 SOPs

In this part of the questionnaire was gathered information about current SOPs and how they can be improved.

Current SOPs

Asked if there are currently any SOPs that address these key needs , most of the participants (87%) answered **YES**.

40% of the end-users said that the scope of the SOPs is operational approach standardization, basic guidance, interagency guidance, 30% said that the scope of the SOPs is health needs estimations and resource planning, 20% answered that sharing information is SOPs scope and 10% said that EMS is SOPs scope.

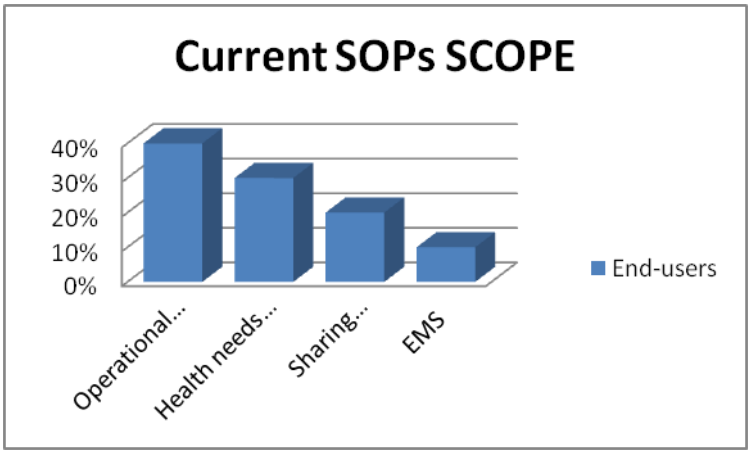


Figure 32 Intelligence information gathering - Current SOPs scope

As the end-users explained, the scope of this SOPs are as follows:

1. operational approach standardization, basic guidance, interagency guidance
2. health needs estimations and resource planning
3. sharing information
4. EMS

Furthermore, the end users are mostly unsatisfied with the AS IS for SOP for these key needs, a third of them being **fully unsatisfied** , 25% **unsatisfied**, 33% **quite satisfied**, and only 8% of participants considered they were **fully satisfied**.

Improvements for current SOPs

The respondents would improve existing SOPs for key needs by applying standardization (38%), improved, dynamic, interdisciplinary management (38%) and evidence based medicine (25%)

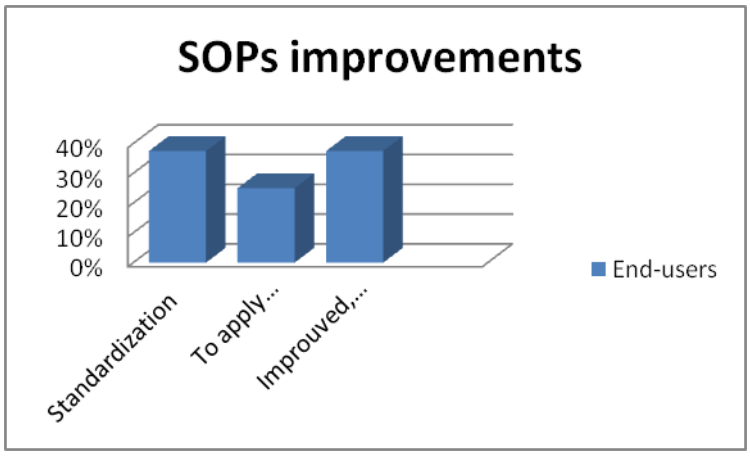


Figure 33 Intelligence information gathering - SOPS improvements

The respondents believe that the following improvements are necessary to comply with the key needs:

1. standardization; improved, dynamic, interdisciplinary management
2. evidence based medicine

Estimated satisfaction level if the requirements would be implemented by PULSE

Both for the national emergency management and for the cross-border management, more than half of the respondents (67%) believe that the SOPs improvement will highly respond to the key needs. Other 17% of the participants believe that it will have a very high impact and other 17% said that it will make no difference.

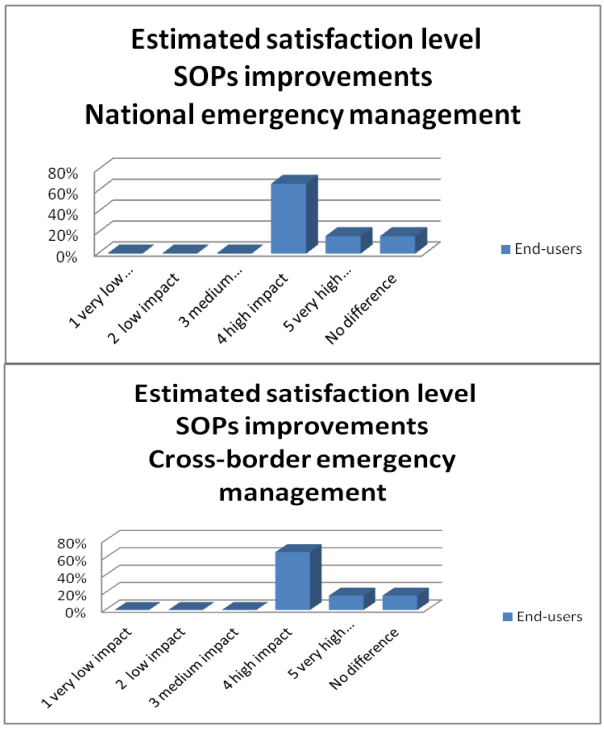


Figure 34 Intelligence information gathering – SOPs improvements

13.4.2 Threat and risk analysis & Warning/Alerting

The data analysis of this module consists in summarizing the information gathered into the four parts of the questionnaire (SARS- preparedness and response phase and Stadium preparedness and response phase).

13.4.2.1 Key needs

This part of the questionnaire covers the information needed for a stadium crush scenario.

The respondents believe that is important to knowledge the threat (25%), to make a pre plan for a large crowd event pre planning, to know the proposed crowd, the type of event and potential audience (25%), to have a database with similar incidents and to know the available resources (25%) and to make risk analysis and mitigations plans (25%).

So, the respondents considered the following key needs:

- knowledge the threat
- database with similar events and available resources
- pre planning of a large crowd event, to know the type of event and crowd, potential audience
- risk analysis and mitigations plans

13.4.2.2 Tools

In this part of the questionnaire the information gathered refers to the

existing software tools and key features to be implemented within PULSE project.

Existing software tools that support key needs for Stadium Crush Scenario

More than a half of the respondents (55%) believe that there is software that responds to the key needs- 17% of them said that there is existing software for threat knowledge, the others didn't indicate the key needs they where referring to.

45% of the respondents indicated that there is no existing software that responds to the key needs- 20% consider that is no software for a large crowd event pre planning, to know the type of event and crowd, potential audience, , the others didn't indicate the key needs they where referring to.

20% of the respondents gave the HVA software as an example and the rest of the respondents gave a different answer: Kaiser analysis (10%), FEMA model (10%), rational management of technical experience (10%), G8 weekly warnings for unexpected events (10%), RA (10%), threat evaluation (10%), FIRST (first support tool app)-10%.

29% of the respondents are fully satisfied with the AS IS situation, 29% of the respondents are quite satisfied with the AS IS situation, 29% of the respondents are unsatisfied and the rest 14% are fully unsatisfied with the AS IS situation.

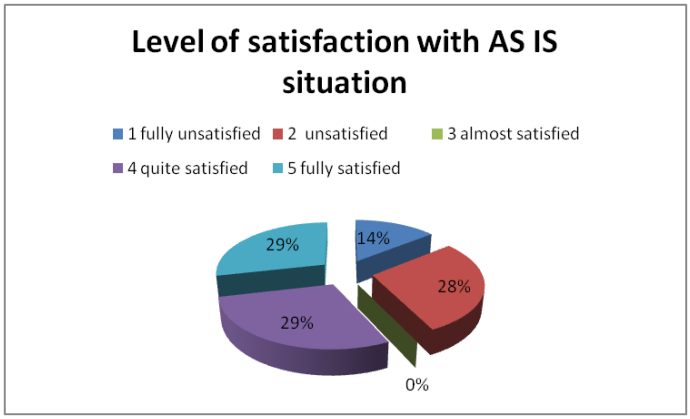


Figure 35 Threats and risks - "As is" satisfaction level

Aggregated key features to be implemented by Pulse in order to support the key needs

29% of the respondents suggested that Pulse should implement info sharing and integration between databases, the others indicated the following key features: more friendly and intuitive way to show output, interoperability of tools (14%), NBC system (14%), HVA, RA (risk analysis) , historicity, local situation (14%), classify the risk according to the people, the type of event, the place, the population density of the area, weather (14%), chat, possibility to make live transmission, live communication system, fast communication way, mutual data exchange in order to obtain additional information about the occurred event (14%).

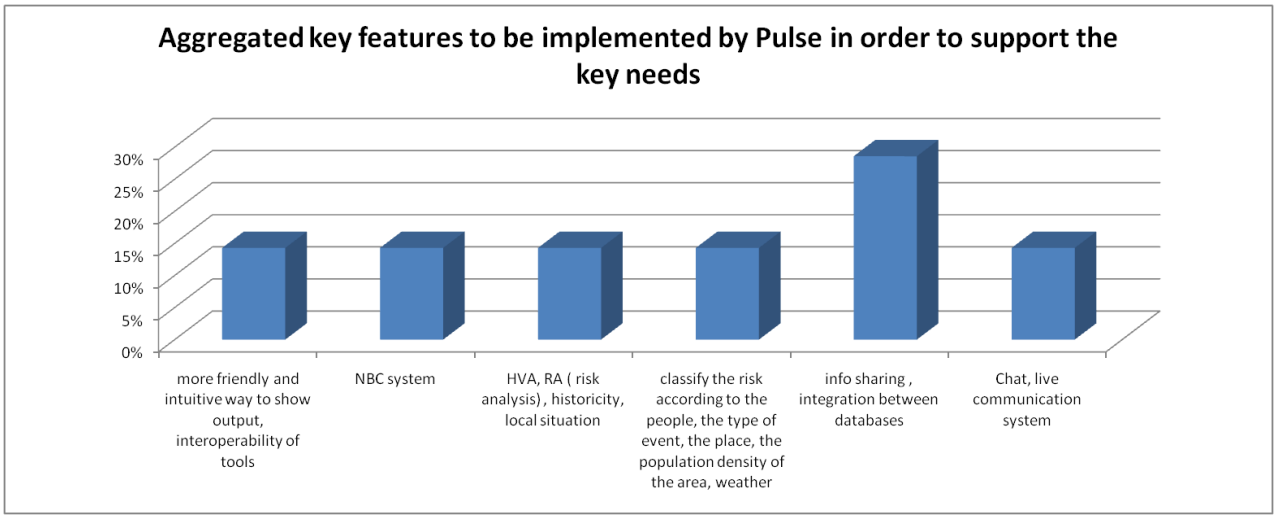


Figure 36 Threats and risks - Aggregated key features

The key features that responders considered necessary to be implemented within PULSE project are ordered below:

1. info sharing and integration between databases
2. Other responses:
    - more friendly and intuitive way to show output, interoperability of tools
    - NBC system
    - HVA, RA (risk analysis) , historicity, local situation
    - classify the risk according to the people, the type of event, the place, the population density of the area, weather
    - chat, possibility to make live transmission, live communication system, fast communication way, mutual data exchange in order to obtain additional information about the occurred event

Estimated satisfaction level if the requirements would be implemented by PULSE

Based on their answers given in **Key needs** and **Aggregated key features** sections, the participants were asked how much would help satisfying the key needs, on a 1 to 5 scale, if the tools they required were implemented by PULSE.

80% of the respondents answered that the level of satisfaction would be **high** if the key needs would be implemented by PULSE and 20% consider that the impact will be **very high**.

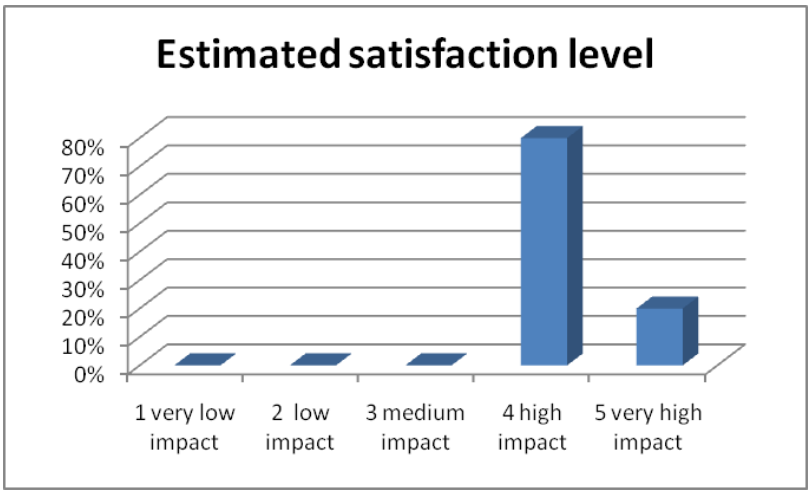


Figure 37 Threats and risks - Estimated satisfaction level

13.4.2.3 SOPs

In this part of the questionnaire was gathered information about current SOPs and how they can be improved.

Current SOPs

Asked if there are currently any SOPs that address these key needs , most of the participants (80%) answered **YES**.

67% of the end-users said that the scope of the SOPs is health – hst guidance framework for emergency management and guide to risk assessment, the rest 17% said that the scope of the SOPs is to establish an unitary set of rules regarding the activities for sending / receiving notification about occurrence / imminent occurrence of the emergency situation.

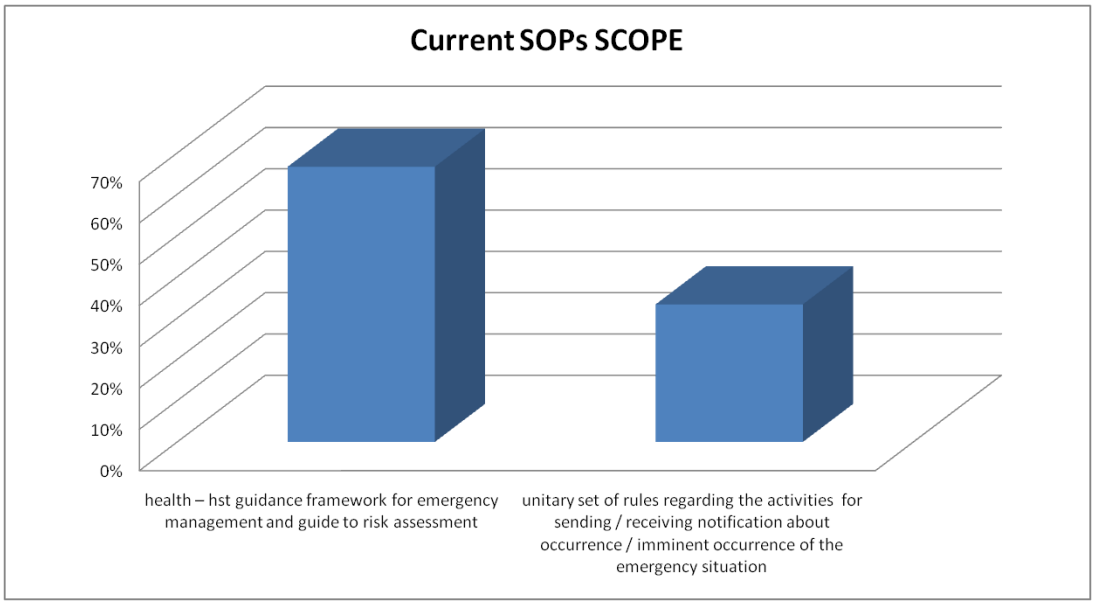


Figure 38 Threats and risks - Currents SOPs scope

As the end-users explained, the scope of this SOPs are as follows:

1. health –guidance framework for emergency management and guide to risk assessment
2. establishing an unitary set of rules regarding the activities for sending / receiving notification about occurrence / imminent occurrence of the emergency situation

Furthermore, 75% of the respondents **are quite satisfied**, and 25% said they are **almost satisfied**.

Improvements for current SOPs

The respondents would improve existing SOPs with better screening for respiratory infections at a primary level (physicians, GPs) (17%), healthcare channel (17%), all hazard (17%), decision check list (17%), high level sharing of info (17%), national level risk typology update (17%).

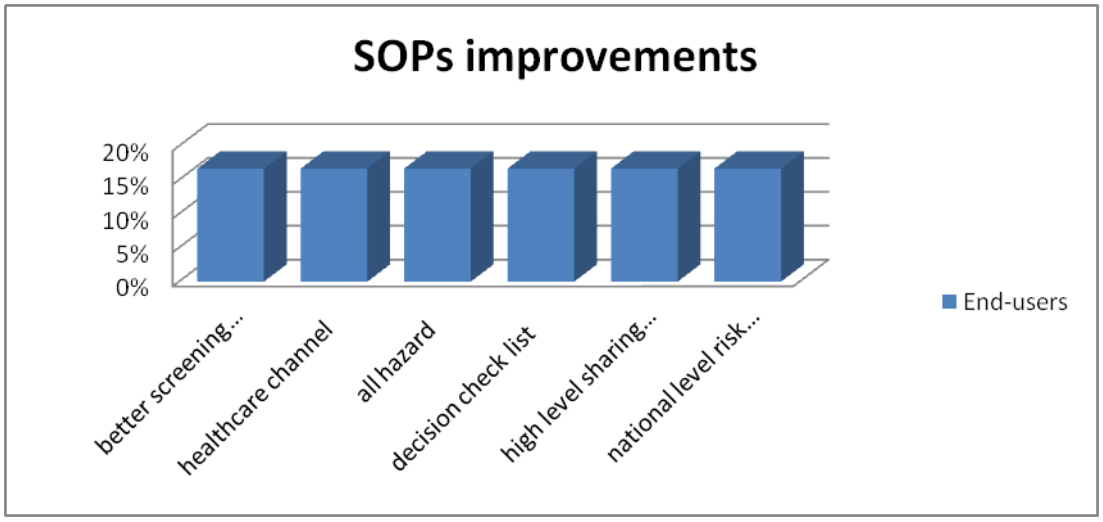


Figure 39 Threats and risks - SOPs improvements

The respondents believe that the following improvements are necessary to comply with the key needs:

- better screening for respiratory infections at a primary level (physicians, GPs)
- healthcare channel
- all hazard
- decision check list
- high level sharing of info
- national level risk typology update

Estimated satisfaction level if the requirements would be implemented by PULSE

For the national emergency management, more than half of the

respondents (67%) believe that the SOPs improvement will have a **very high impact**. The rest of the respondents (33%) believe that it will have a **high impact**.

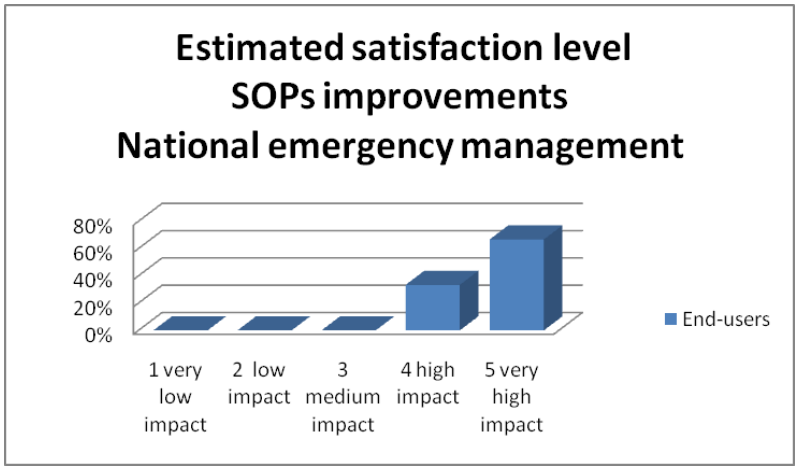


Figure 40 Threats and risks - Estimated satisfaction level (national)

For the cross-border management, more than half of the respondents (67%) believe that the SOPs improvement will have a **high impact**. The rest of the respondents (33%) believe that it will have a **very high impact**.

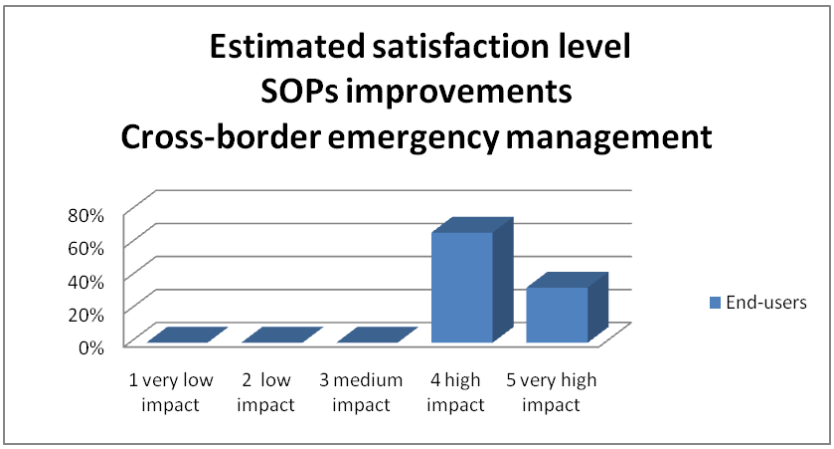


Figure 41 Threats and risks - Estimated satisfaction level (cross border)

13.4.3 Task, resources, stocks, capacity planning and control

The data analysis of this module consists in summarizing the information gathered into the four parts of the questionnaire (SARS- preparedness and response phase and Stadium preparedness and response phase).

13.4.3.1 Key needs

This part of the questionnaire covers the information needed for a stadium crush scenario.

The respondents detailed the following key needs: estimation of the number and type of resources needed (18%), to have a general view of

the resources available and real time update (18%), to have law regulation, rules (12%), emergency vehicles (6%), receptivity DEA (6%), corridors health (6%), to see guidance (6%), backup and timetable to get it (6%), to have all the information in a schematic way and through images (6%), to have all the positions of the forces engaged on the ground (6%), to achieve the information flow with the other type of forces that cooperate and the information exchange between intervention forces and Command point, organizing and equipping of the intervention structures; conception of intervention actions (6%).

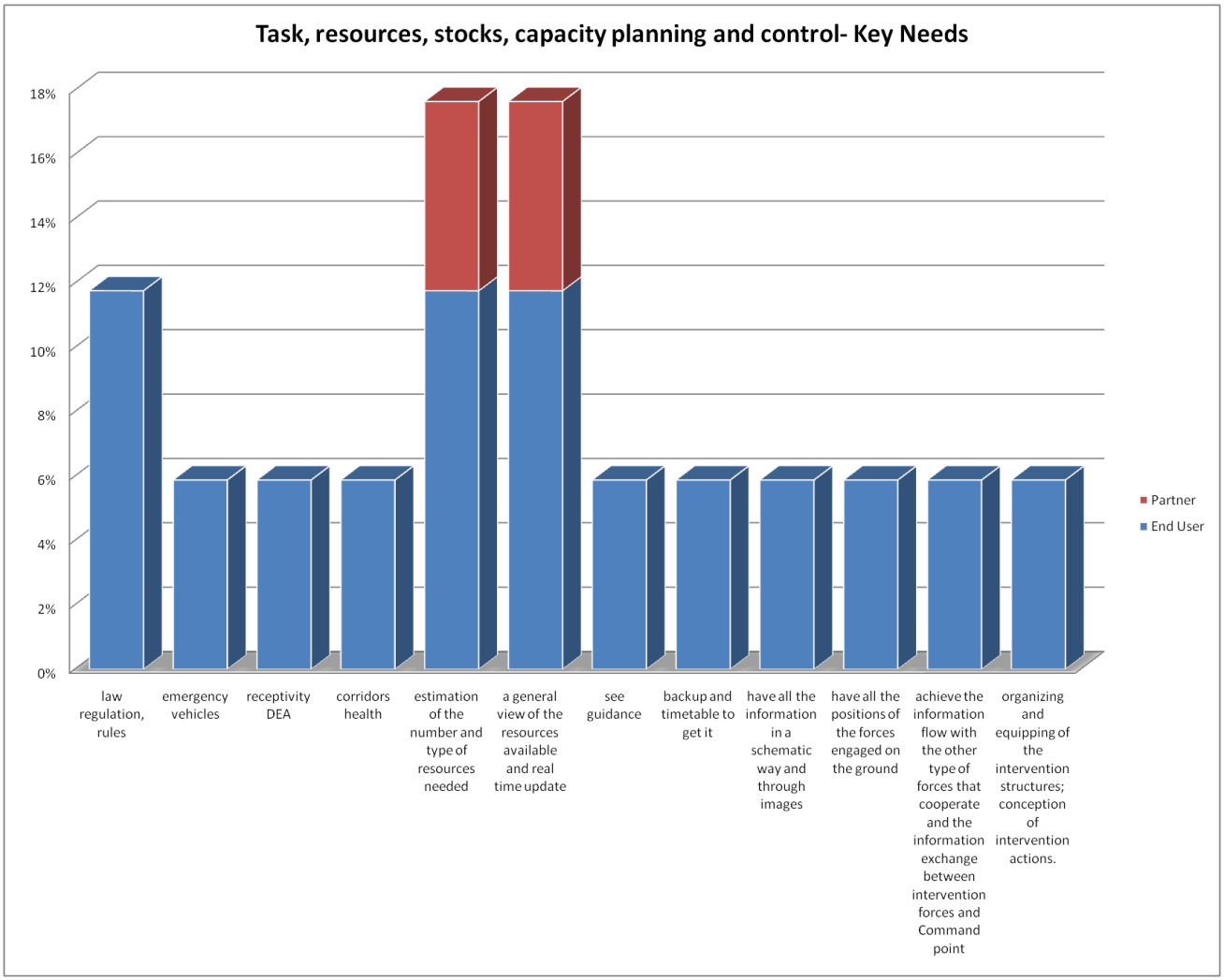


Figure 42 Resource planning - Key needs

Summarizing, the respondents considered the following key needs:

1. resources management:
    - estimation of the number and type of resources needed
    - a general view of the resources available and real time update
2. law regulation, rules
3. Other responses:

- emergency vehicles
- receptivity DEA
- corridors health
- to see guidance
- backup and timetable to get it
- all the information in a schematic way and through images
- all the positions of the forces engaged on the ground
- the information flow with the other type of forces that cooperate and the information exchange between intervention forces and Command point
- organizing and equipping of the intervention structures, conception of intervention actions

13.4.3.2 Tools

In this part of the questionnaire the information gathered refers to the existing software tools and key features to be implemented within PULSE project.

Existing software tools that support key needs for Stadium Crush Scenario

More than a half of the respondents (58%) believe that there is no software that responds to the key needs- 14% of them said that there is no software for the achievement of information flow with the other type of forces that cooperate and the information exchange between intervention forces and Command point and establishing the resource needs to be requested / provided, other 14% said there is no software that covers intervention structures organizing and equipping, conception of intervention actions, another 14% consider that law regulation/ rules are not covered in the existing software tools, the others (68%) didn't indicate the key needs they where referring to.

42% of the respondents indicated that there is software that responds to the key needs- 20% said that there is software that covers regulation, other 20% responded that there are tools that permit you to see guidance, another 20% said that they know tools that respond to the emergency vehicles, receptivity DEA, corridors health , for a large crowd event pre planning, to know the type of event and crowd, potential audience, the other 40% didn't indicate the key needs they where referring to.

29% of the respondents gave the EMS selection of the type of ambulances depending on the severity of the patients as a tool example and the rest of the respondents gave a different answer: Decision support system (EU project and product)- 14%, Tool for the city of Rome- 14%, Risk assessments, bed management, patient management system- 14%, EMS patient evacuation in case of major incident- 14%, crisis management teams- 14%.

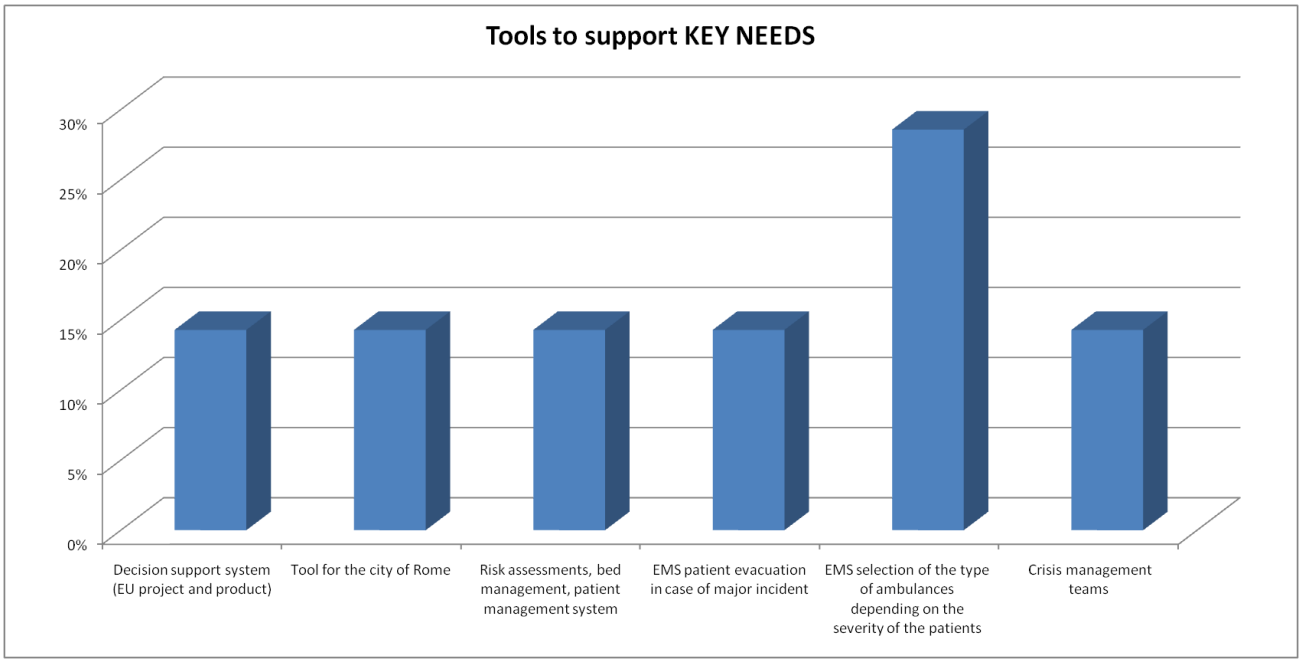


Figure 43 Resource planning - Tools to support the key needs

29% of the respondents are fully satisfied with the AS IS situation, 29% of the respondents are quite satisfied with the AS IS situation, 29% of the respondents are unsatisfied and the rest 14% are fully unsatisfied with the AS IS situation.

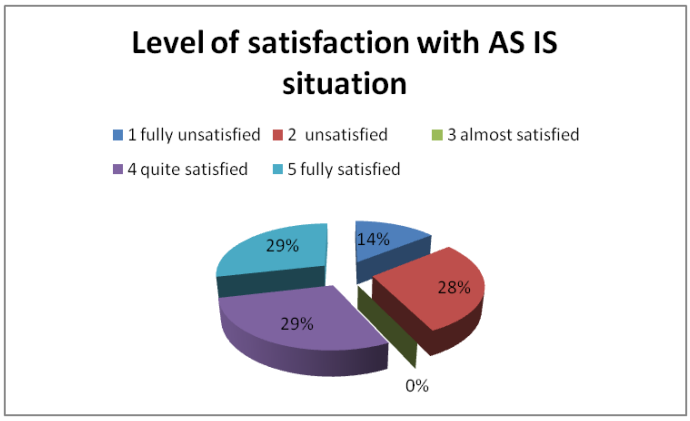


Figure 44 Resource planning – "As is" level of satisfaction

Aggregated key features to be implemented by Pulse in order to support the key needs

18% of the respondents suggested that Pulse should implement a feature that permits to communicate the type of risk at the hospital, other 18% indicated the automatic generation and section of most appropriate resources, the others gave different answers: daily localization system rescue of firefighters, located beside the resources specifically for the event (9%), ipms – Ireland (9%), capability of hospitals, communicate this to EMS and to each ambulance (9%), timeframe and potential resource (9%), number / type of the response means available (firefighters, EMS etc)-9%, chat, possibility to make live transmission, live communication system, fast

communication way, mutual data exchange in order to obtain additional information about the occurred event (9%).

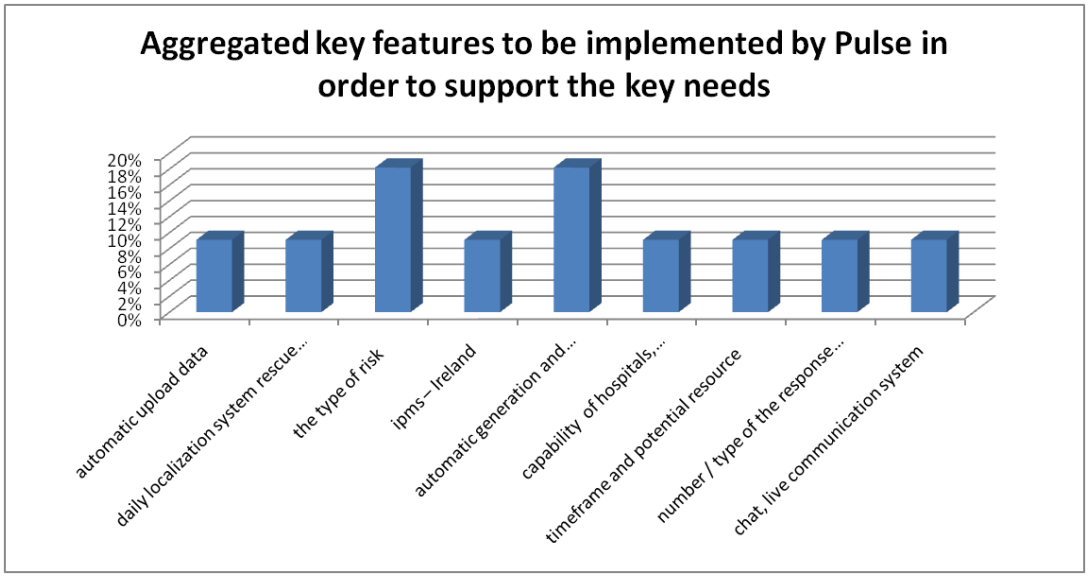


Figure 45 Resource planning - aggregated key needs

The key features that respondents considered necessary to be implemented within PULSE project are ordered below:

1. communicate the type of risk at the hospital; automatic generation and section of most appropriate resources
2. Other responses:
   - daily localization system rescue of firefighters, located beside the resources specifically for the event ipms – Ireland
   - capability of hospitals, communicate this to EMS and to each ambulance
   - timeframe and potential resource
   - number / type of the response means available (firefighters, EMS etc)
   - chat, possibility to make live transmission, live communication system, fast communication way, mutual data exchange in order to obtain additional information about the occurred event

Estimated satisfaction level if the requirements would be implemented by PULSE

Based on their answers given in **Key needs** and **Aggregated key features** sections, the participants were asked how much would help satisfying the key needs, on a 1 to 5 scale, if the tools they required were implemented by PULSE.

40% of the respondents answered that the level of satisfaction would be **high** if the key needs would be implemented by PULSE and 60% consider that the impact will be **very high**.

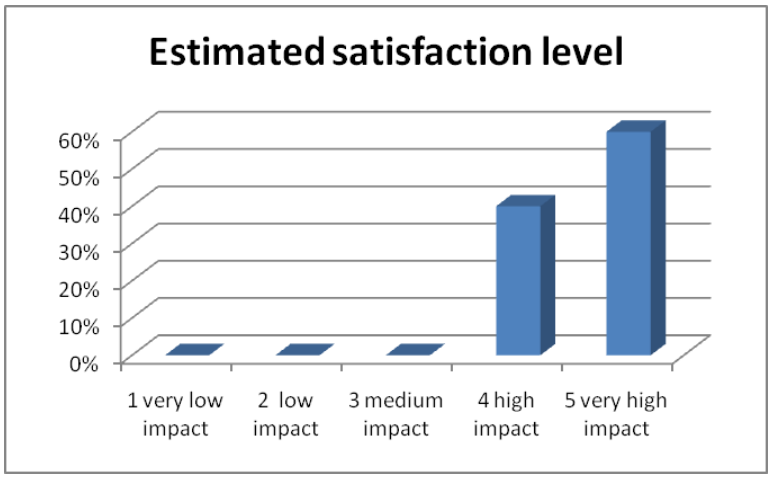


Figure 46 Resource planning - estimated satisfaction level

13.4.3.3 SOPs

In this part of the questionnaire was gathered information about current SOPs and how they can be improved.

Current SOPs

Asked if the current SOPs cover the key needs , 67% of the participants answered **YES**.

The end-users said that the scopes of the current SOPs are: to make recommendations about influence tool, emergency plan, interagency (14%), to ensure the coordination of forces and means (14%), to establish the decision making information flow (14%), a unitary set of rules regarding the activities carried out in emergency situations (14%), the manner of intervention for emergency situations management in order to save / protect life, property and patrimonial values and mitigation of events, (14%), triage; patient distribution to hospital (14%), algorithm (14%).

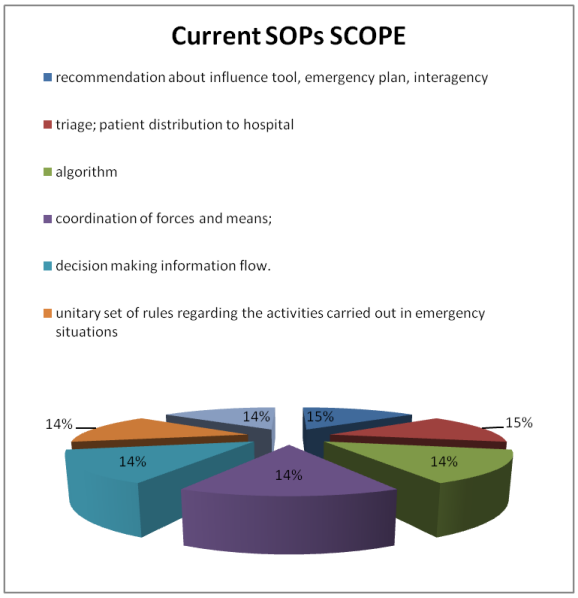


Figure 47 Resource planning - current SOPs scope

As the end-users explained, the scopes of the SOPs are as it follows:

- recommendation about influence tool, emergency plan, interagency
- triage; patient distribution to hospital
- algorithm
- coordination of forces and means;
- decision making information flow.
- unitary set of rules regarding the activities carried out in emergency situations
- manner of intervention for emergency situations management in order to save / protect life, property and patrimonial values and mitigation of events.

Furthermore, 60% of the respondents **are quite satisfied**, 20 % said they are **almost satisfied** and the other 20% said they are **fully satisfied** with the current SOPs.

Improvements for current SOPs

Half of the respondents would improve existing SOPs by sharing with other countries, the other half by training the personnel responsible for planning and control.

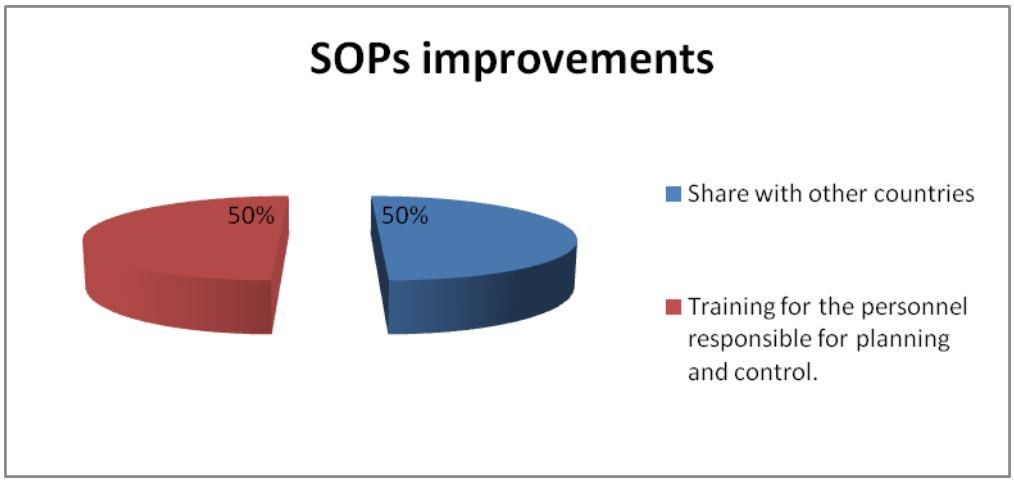


Figure 48 Resource planning - SOPs improvements

The respondents believe that the following improvements are necessary to comply with the key needs:

- sharing with other countries
- training the personnel responsible for planning and control

Estimated satisfaction level if the requirements would be implemented by PULSE

For the national emergency management, 33% of the respondents believe that the SOPs improvement will have a **very high impact**, 33% of the respondents believe that it will have a **high impact** and the other 33% believe that it will have a **medium impact**.

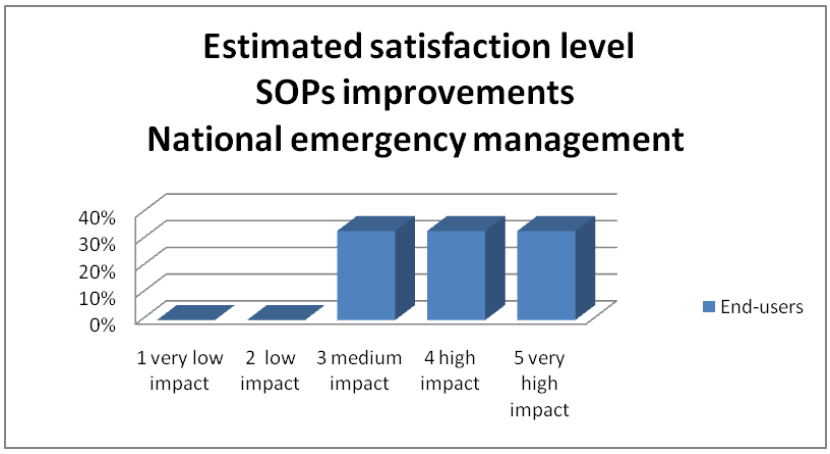


Figure 49 Resource planning - Estimated satisfaction level for SOPs (National)

For the cross-border management, more than half of the respondents (67%) believe that the SOPs improvement will have a **high impact**. The rest of the respondents (33%) believe that it will have a **very high impact**.

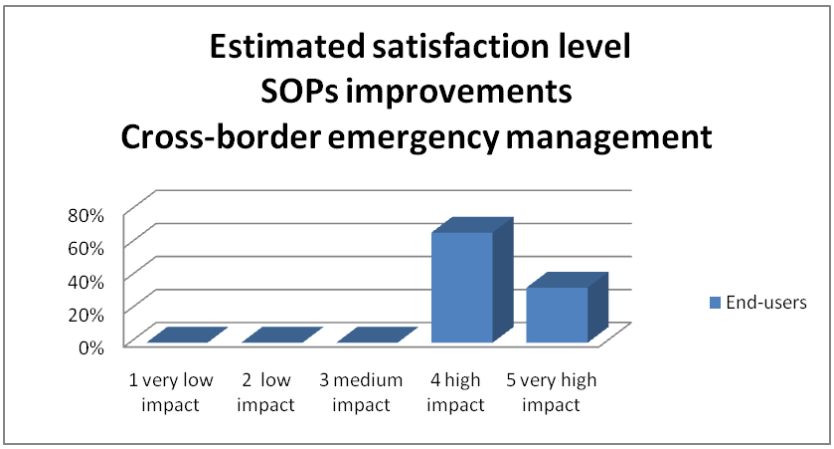


Figure 50 Resource planning - Estimated satisfaction level for SOPs (cross border)

13.4.4 Operational picture generation and situational assessment

The data analysis of this module consists in summarizing the information gathered into two parts of the questionnaire (SARS- response phase and Stadium- response phase).

13.4.4.1 Key needs

This part of the questionnaire covers the information needed for a stadium crush scenario.

The respondents suggested the following key needs for the operational picture generation and situational assessment: simple, intuitive, schematic (71%), maps, area of events, geo location of the teams (14%), predefined patterns (standard models)- 14%.

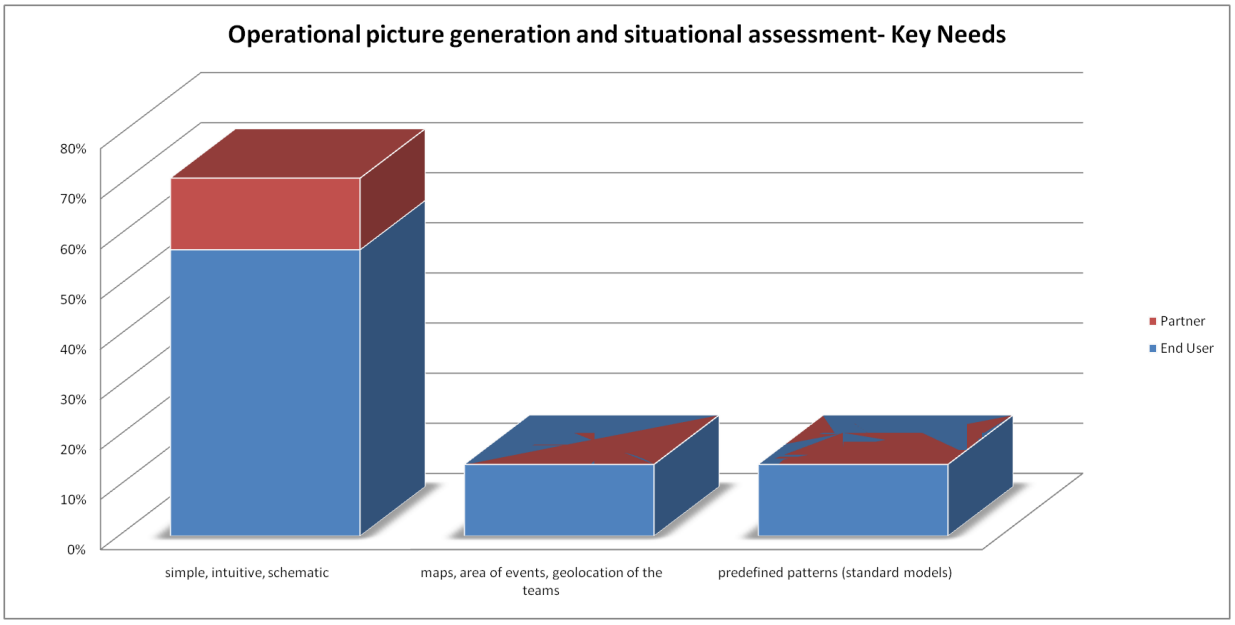


Figure 51 Operational picture - Key needs

So, the respondents considered the following key needs for the operational picture generation and situational assessment:

1. simple, intuitive, schematic
2. Other responses:
   - maps, area of events, geo location of the teams
   - predefined patterns (standard models)

13.4.4.2 Tools

In this part of the questionnaire the information gathered refers to the existing software tools and key features to be implemented within PULSE project.

Existing software tools that support key needs for Stadium Crush Scenario

67% of the respondents said that they know software that covers the key needs.

Every respondent gave a different example of tools that cover the key needs: WEBEOC (14%), a software related to instrumentation systems intended for experts, with CBRN implications (14%), tool that gets data about the event (14%), tool for ops evaluation and planning (14%), a tool that allows the connection of technical information by the operators at the top through the Incident Commander (14%), COPE project: more or less common picture exploitation by FP7 project (14%), a tool for information management, careful not to provide information to wrong people (right people, right time , right information)- 14%.

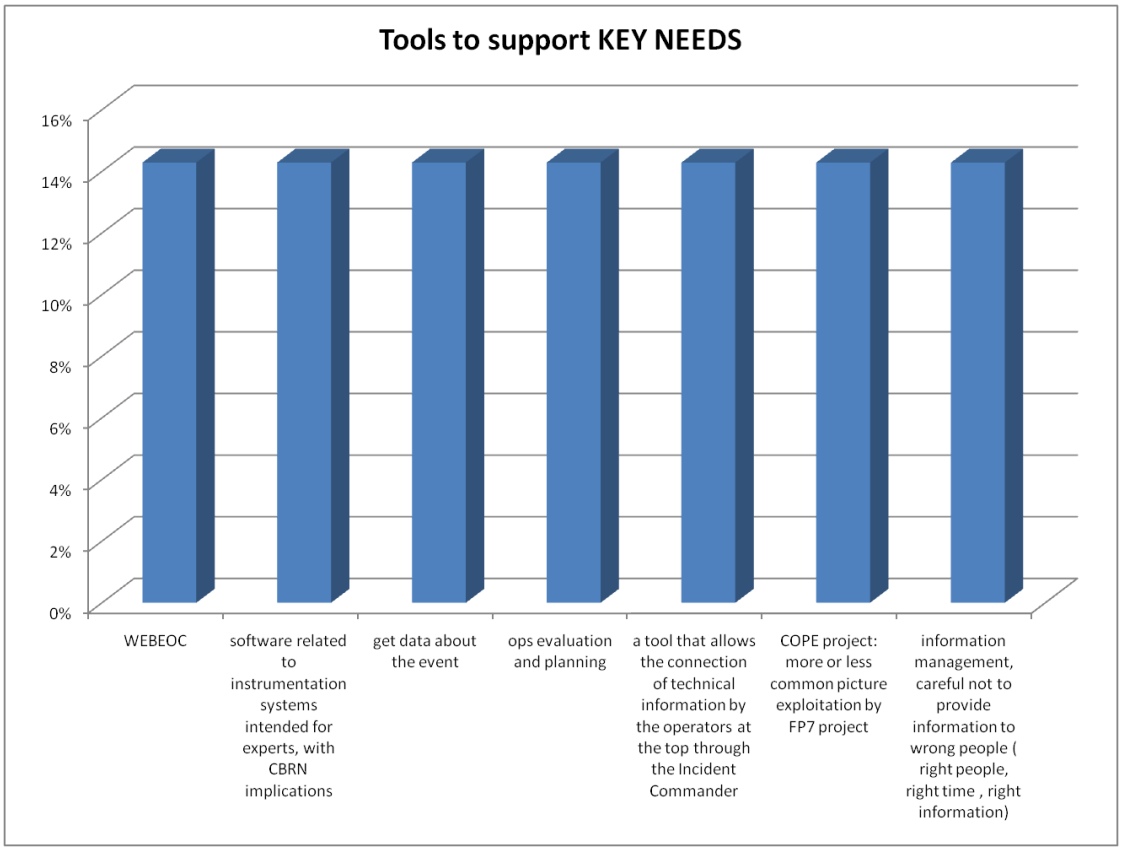


Figure 52- Tools Operational picture

Furthermore, for the AS IS situation, 50% of the respondents said that they are **almost satisfied** with the existing software tools, 25 % of the respondents said they are **quite satisfied** and the other 25% said they are **fully unsatisfied** with the existing software tools.

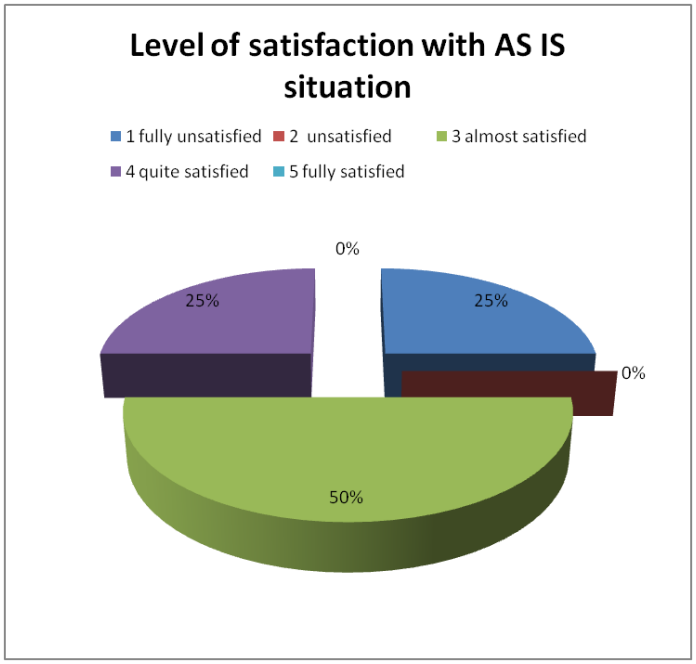


Figure 53 Operational picture - "As is" satisfaction level

Aggregated key features to be implemented by Pulse in order to support the key needs

22% of the respondents suggested that Pulse should have an intuitive way, a combination of images and data and to permit access to more detailed information. The others gave the following suggestions: it should signal so instantaneous dissemination of an aggression, both graphically, through video images, and with numerical data of the nature and concentration (11%), to have maps to get information about the number and code of the wounded, blocked roads (11%), to be easily understood by non-technical staff (11%), data fusion and provide the information to the people who needed and not to all the participants, information management system (11%), hospital control (11%), electronic version appropriate to level (operational , strategic)-11%.

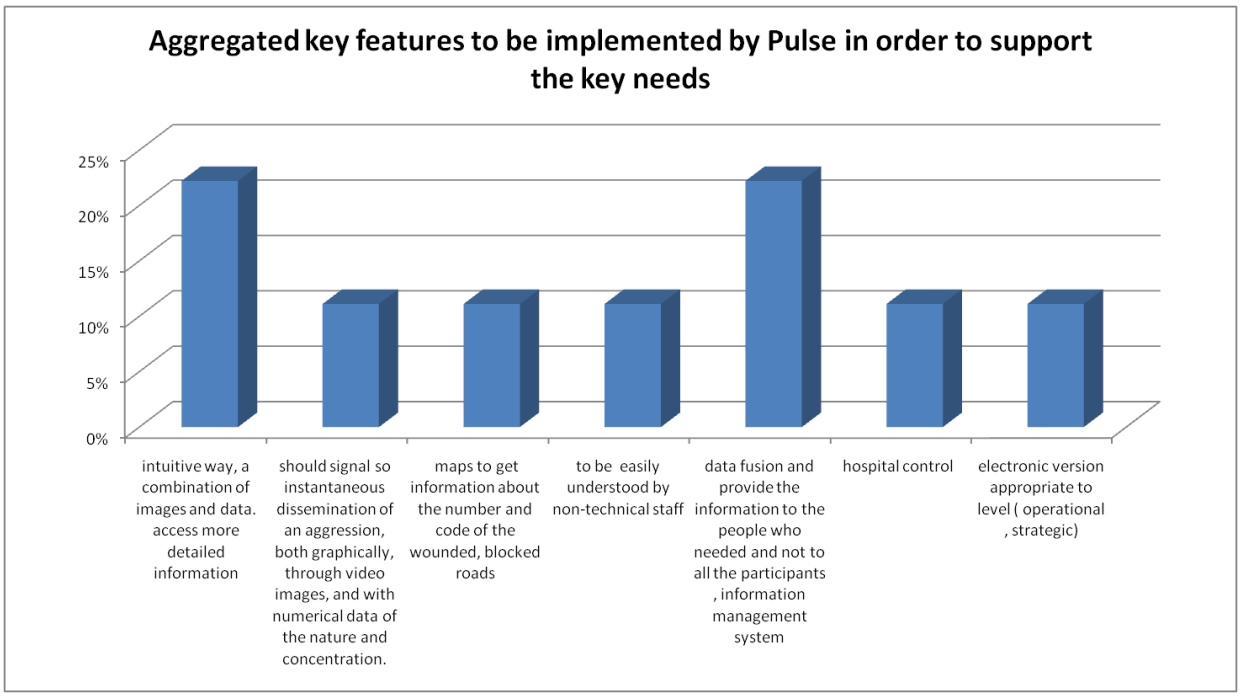


Figure 54 Operational picture - Aggregated key features

The key features that respondents considered necessary to be implemented within PULSE project are ordered below:

1. intuitive way, a combination of images and data and to permit access to more detailed information
2. Other responses:
   - signal so instantaneous dissemination of an aggression, both graphically, through video images, and with numerical data of the nature and concentration
   - maps to get information about the number and code of the wounded, blocked roads

- easily understood by non-technical staff
- data fusion and provide the information to the people who needed and not to all the participants, information management system
- hospital control
- electronic version appropriate to level (operational , strategic)

Estimated satisfaction level if the requirements would be implemented by PULSE

Based on their answers given in **Key needs** and **Aggregated key features** sections, the participants were asked how much would help satisfying the key needs, on a 1 to 5 scale, if the tools they required were implemented by PULSE.

Half of the respondents answered that the level of satisfaction would be **high** if the key needs would be implemented by PULSE and the other half consider that the impact will be **very high**.

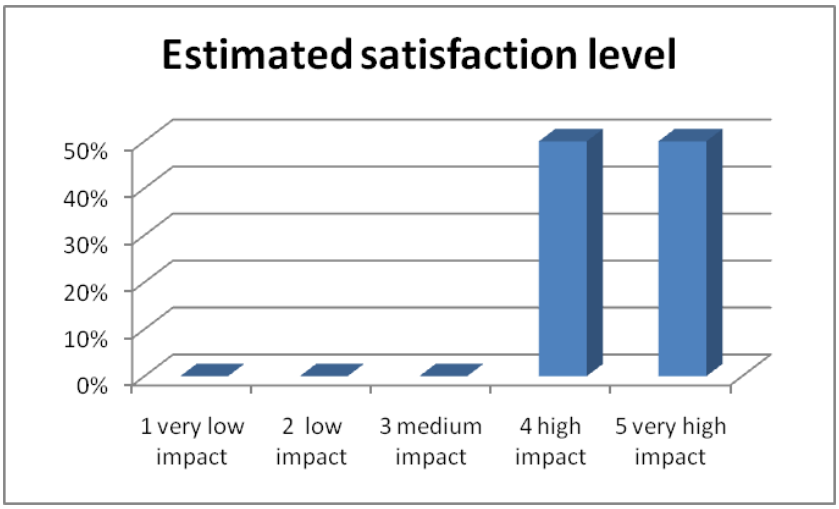


Figure 55 Operational picture - Estimated satisfaction level

13.4.4.3 SOPs

In this part of the questionnaire was gathered information about current SOPs and how they can be improved.

Current SOPs

Asked if the current SOPs cover the key needs for the operational picture generation, 56% of the respondents answered **NO**. The end-users didn't mention what are the scopes of the current SOPs.

Also, all of the respondents are **fully satisfied** with the current SOPs.

Improvements for current SOPs

The respondents would improve existing SOPs: the outcome of rescue operations (triage and evacuation of the wounded)-25%, for hospital and 118 - how many vehicles are coming and what kind of injuries- 25%, a standardized procedure for the incident report (eg missing a format)-25%, hospital control, information management system , electronic version appropriate to level (operational , strategic)-25%.

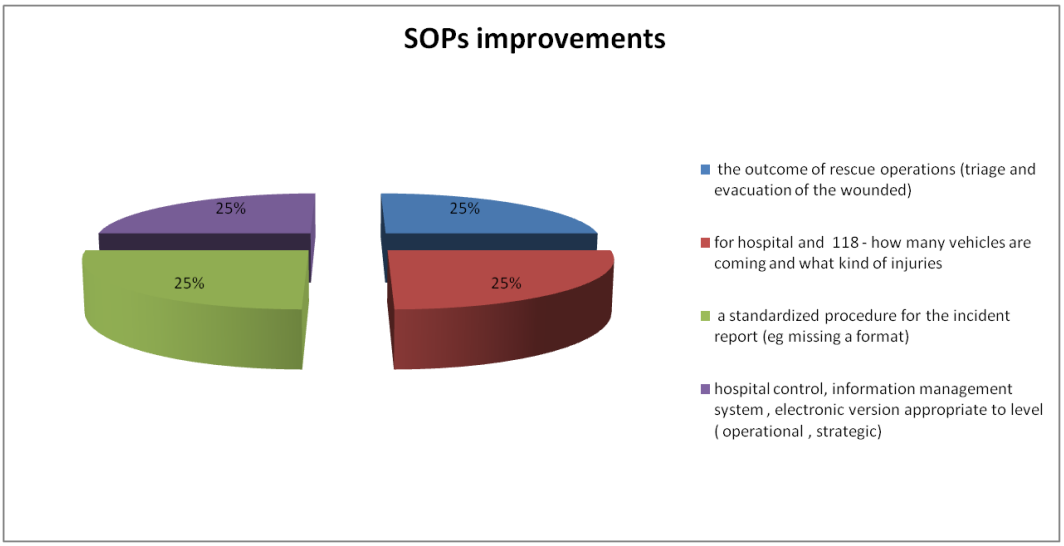


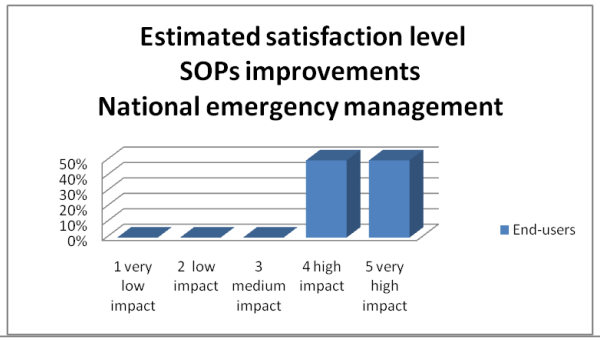
Figure 56 Operational picture - SOPs improvement

The respondents believe that the following improvements are necessary to comply with the key needs:

- the outcome of rescue operations (triage and evacuation of the wounded
- for hospital and 118 - how many vehicles are coming and what kind of injuries
- a standardized procedure for the incident report (eg missing a format)
- hospital control, information management system , electronic version appropriate to level (operational , strategic)

Estimated satisfaction level if the requirements would be implemented by PULSE

For both the national and cross-border emergency management, half of the respondents believe that the SOPs improvement will have a **very high impact** and the other half of the respondents believe that it will have a **high impact**.



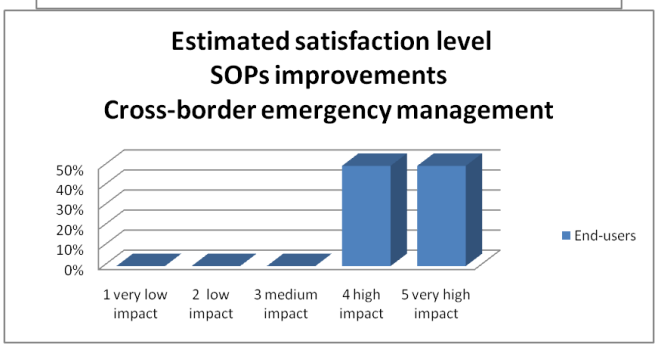


Figure 57 Operational picture - SOPs estimated satisfaction level

13.4.5 Lesson Learning

The data analysis of this module consists in summarizing the information gathered into two parts of the questionnaire (SARS- preparedness phase and Stadium preparedness phase).

13.4.5.1 Key needs

This part of the questionnaire covers the information needed for a stadium crush scenario.

The respondents detailed the following key needs: standard report system (33%), mechanism to records data in a structured way (17%), national database of lesson learning (17%), post exercise information (17%), improving the intervention of the all the involved personal (management, intervention and support-17%.

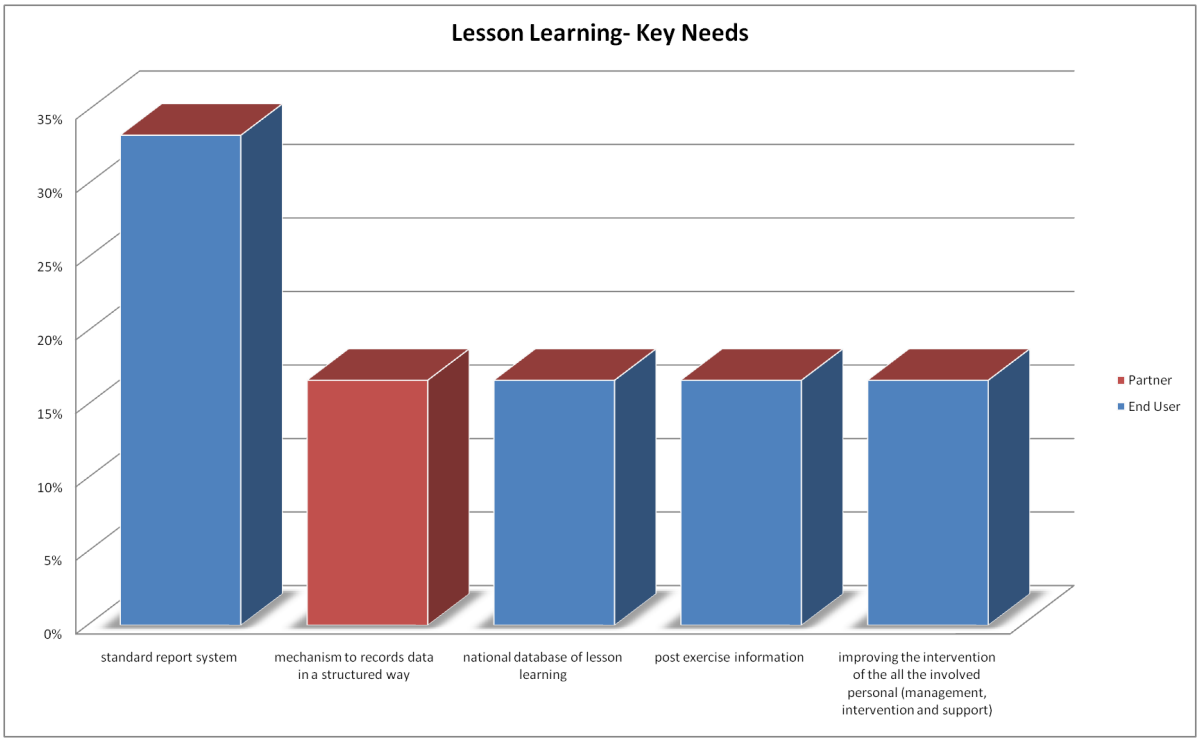


Figure 58 Lessons learning - Key needs

The respondents considered the following key needs for the lesson learning module:

1. standard report system
2. Other responses:
    - mechanism to records data in a structured way
    - national database of lesson learning
    - post exercise information
    - improving the intervention of the all the involved personal (management, intervention and support

13.4.5.2 Tools

In this part of the questionnaire the information gathered refers to the existing software tools and key features to be implemented within PULSE project.

Existing software tools that support key needs for Stadium Crush Scenario

Almost all of the respondents (86%) believe that there is no software that responds to the key needs and 14% of them said that there is software that has standard report system and national database of lesson learning.

As for the existing tools that respond to the key needs for lesson learning, the respondents gave general examples like: utilize in template (50%) and casualty report form (50%).

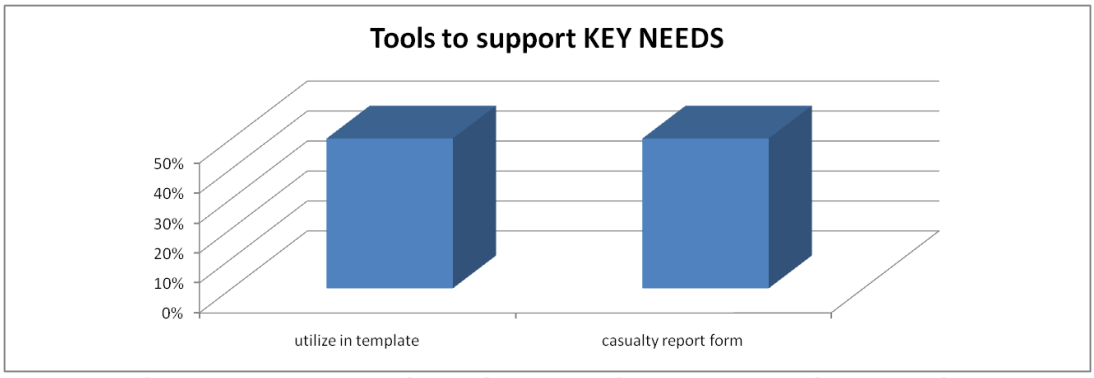


Figure 59 Lessons learning - Tools to support key needs

33% of the respondents are **fully unsatisfied** with the AS IS situation, 33% of the respondents are **unsatisfied** with the AS IS situation and the other 33% of the respondents are **almost satisfied** with the AS IS situation.

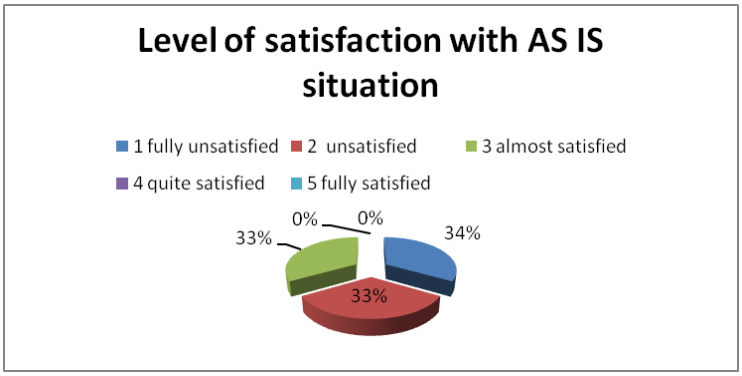


Figure 60 Lessons learning - "As is" satisfaction level

Aggregated key features to be implemented by Pulse in order to support the key needs

The respondents suggested that Pulse should implement the following features: automatic collection of data, to better plan similar events, to follow up, lessons learning, evaluations- each of the features have scored 33%.

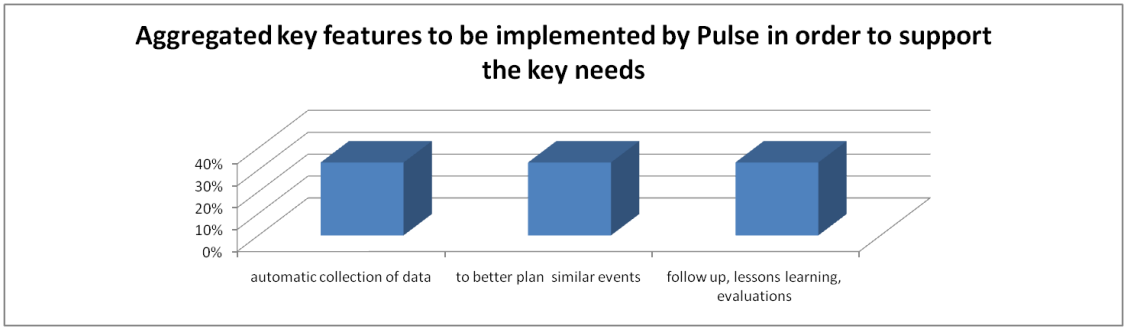


Figure 61 Lessons learning - Aggregated key features

The key features that respondents considered necessary to be

implemented within PULSE project are below:

- automatic collection of data
- to better plan similar events
- to follow up, lessons learning, evaluations

Estimated satisfaction level if the requirements would be implemented by PULSE

Based on their answers given in **Key needs** and **Aggregated key features** sections, the participants were asked how much would help satisfying the key needs, on a 1 to 5 scale, if the tools they required were implemented by PULSE.

All of the respondents answered that the level of satisfaction would be **high** if the key needs would be implemented by PULSE.

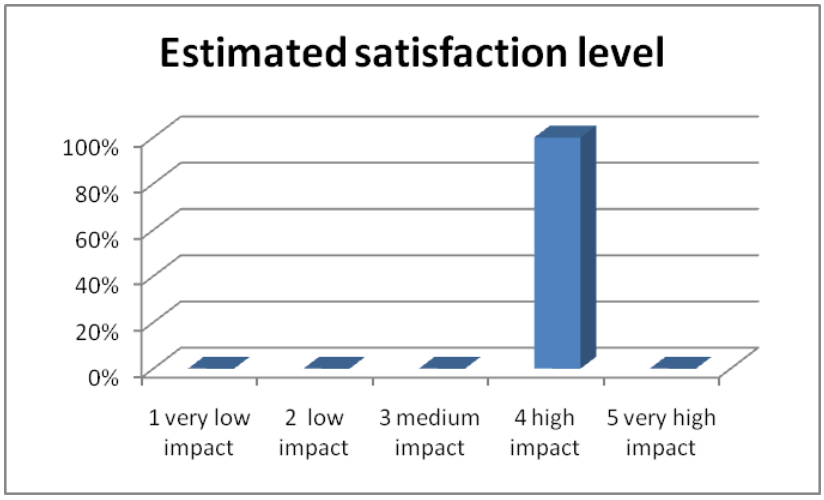


Figure 62 Lessons learning - Estimated satisfaction level

13.4.5.3 SOPs

In this part of the questionnaire was gathered information about current SOPs and how they can be improved.

Current SOPs

Asked if the current SOPs cover the key needs, half of the respondents answered **YES**.

The end-users said that the scopes of the current SOPs are: automatic collection of data (50%), HSE guidance, risk assessment (50%).

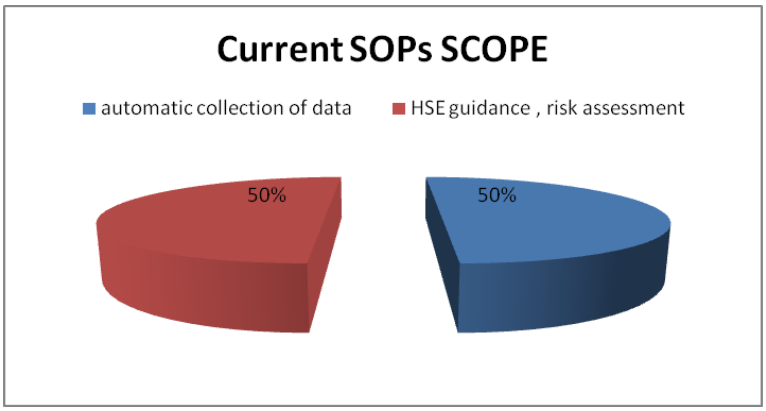


Figure 63 Lessons learning - Current SOPs scope

As the end-users explained, the scopes of the SOPs are as it follows:

- automatic collection of data
- HSE guidance, risk assessment

Furthermore, 60% of the respondents are **fully satisfied**, 20 % said they are **unsatisfied** and the other 20% said they are **fully unsatisfied** with the current SOPs.

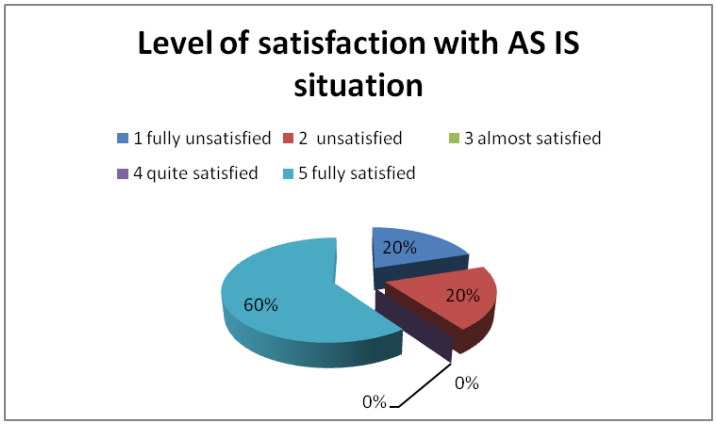


Figure 64 Lessons learning - "As is" satisfaction level

<u>Improvements for current SOPs</u>

Half of the respondents would improve existing SOPs by standardize, the other half said that all agencies promoters organizers comply.

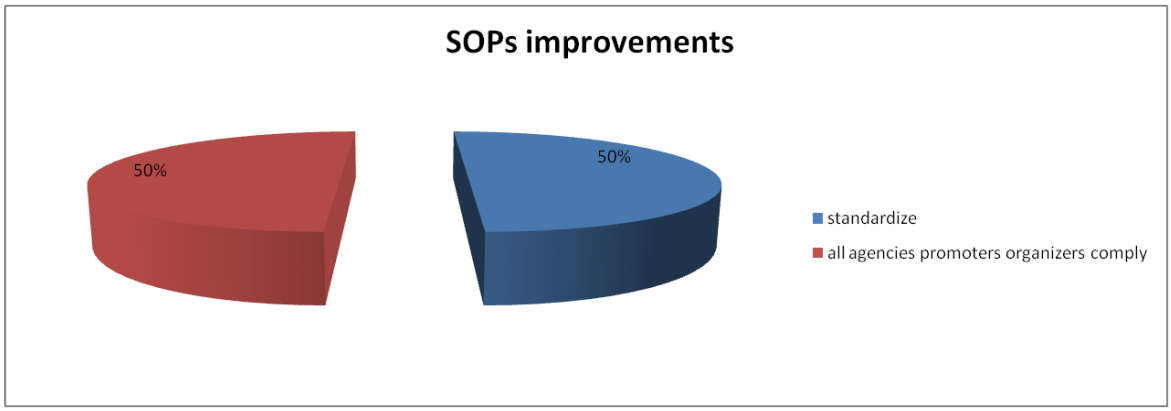


Figure 65 SOPs improvements

The respondents believe that the following improvements are necessary to comply with the key needs:

- standardize
- all agencies promoters organizers comply

Estimated satisfaction level if the requirements would be implemented by PULSE

For the national emergency management, 50% of the respondents believe that the SOPs improvement will have a **very high impact**, the other 50% of the respondents believe that it will have a **high impact**.

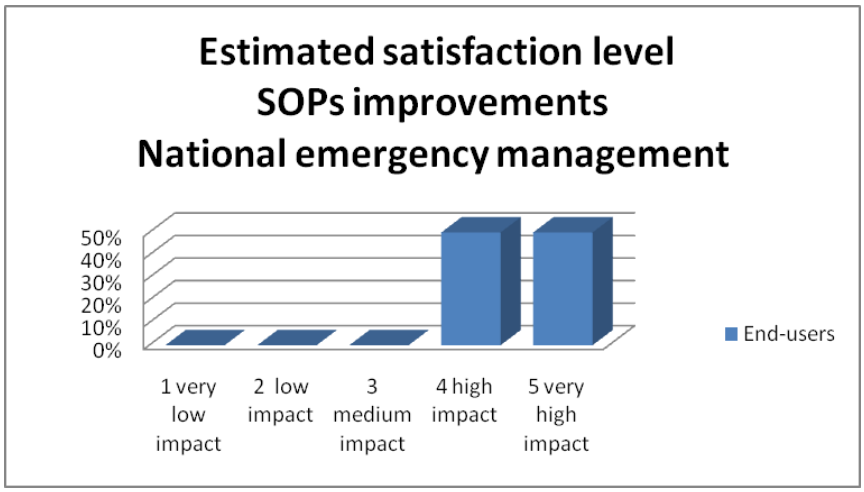


Figure 66 Lessons learning - SOPs estimated satisfaction level (national)

For the cross-border management, more than half of the respondents (67%) believe that the SOPs improvement will have a **very high impact**. The rest of the respondents (33%) believe that it will have a **high impact**.

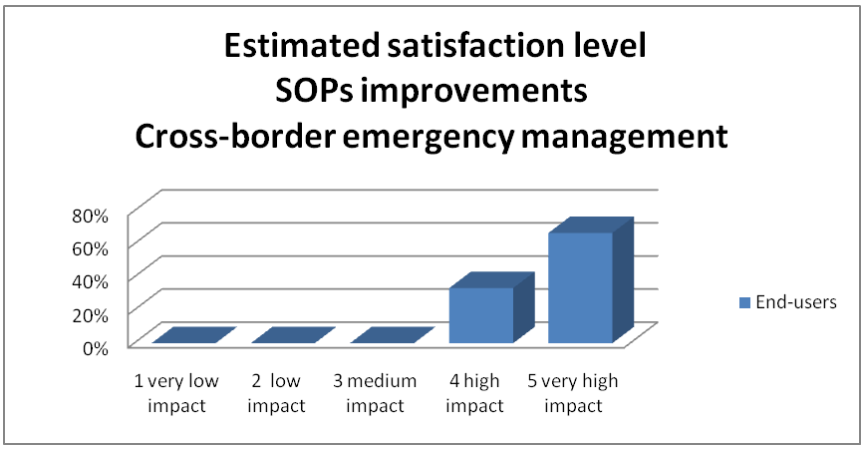


Figure 67 Lessons learning - SOPs estimated satisfaction level (cross border)

13.5 Prioritization – the end users point of view (Sessions B3 & C3)

In this session the information gathered refers to the prioritization of the modules for Stadium Crush Simulation scenario- preparedness and response phase and for SARS scenario- preparedness and response phase, both for national and cross-border emergency management. Also, the information gathered in the Key issues document for the Stadium and SARS scenario was taken into consideration.

The questionnaire is structured into the following modules:

Preparedness phase:

1. Intelligence information gathering
2. Threat and risk analysis & Warning/Alerting
3. Task planning, Resources and capacities planning and control, Logistics/ stockpiling
4. Coordination between different services / stakeholders (lesson learning)
5. Coordination between different services / stakeholders (general)

Response phase:

- Intelligence information gathering
- Threat and risk analysis & Warning/Alerting
- Operational picture generation and situational assessment
- Task planning, Resources and capacities planning and control, Logistics/ stockpiling
- Coordination between different services / stakeholders (general)

Every phase (preparedness and response) described has two parts: one for the national emergency management and one for the cross-border

management.

The methodology used for data analysis consists in summarizing the information gathered per module, by taking into consideration all the participants' answers, the total of respondents, type of respondent (end-user or PULSE partner). The data collected was structured as described below:

1. The information collected for the two scenarios was centralized into the two phases: preparedness and response. Each of the phases was analyzed through their modules
2. The modules were analyzed both for the national and cross-border emergency management
3. For the national and cross- border management, the data was analyzed through the scores for the Importance and Need of Improvement for each module.
4. The Importance and Need of Improvement was determined by taking into account the average of the responses (considering the quality of the respondent- an end-user answer is considered having 100%, a partner answer is considered 50%), the percent of the respondents. The result is a weighted average between the average and the percent of the respondents.
5. For each module, both for the national and cross-border, the final score was determined by averaging the scores calculated for the Importance and Need of Improvement
6. In the final step, the final score of each module was calculated by averaging the scored obtained for the national emergency management and for the cross-border management

13.5.1 Preparedness phase- National and Cross-border emergency management

After the data analysis, the following results were determined for the preparedness phase, for national and cross-border emergency management.

<u>National emergency management:</u>

1. Coordination between different services / stakeholders (lesson learning)
2. Coordination between different services / stakeholders (general)
3. Task planning, Resources and capacities planning and control, Logistics/ stockpiling
4. Intelligence information gathering
5. Threat and risk analysis & Warning/Alerting

<u>Cross-border emergency management:</u>

1. Coordination between different services / stakeholders (lesson learning)

2. Threat and risk analysis & Warning/Alerting
3. Coordination between different services / stakeholders (general)
4. Intelligence information gathering
5. Task planning, Resources and capacities planning and control, Logistics/ stockpiling

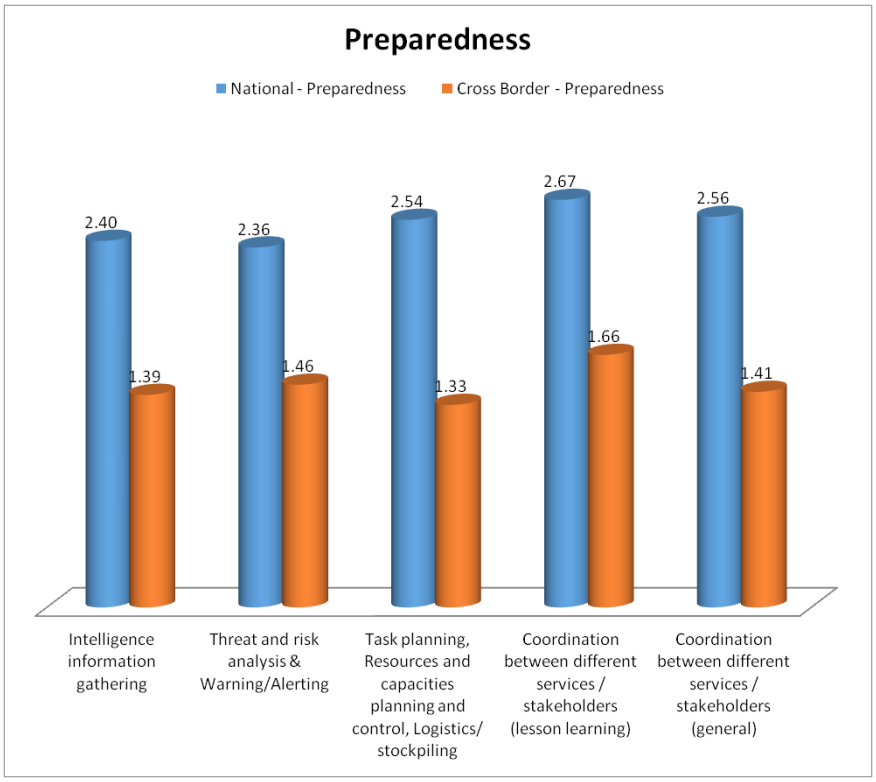


Figure 68 Preparedness

It can be observed, that both for the national and cross-border management, the respondents considered that **Coordination between different services / stakeholders (lesson learning)** is the most important module.

13.5.1.1 Preparedness phase- centralized

Centralizing the data from the national and cross-border emergency management responses, the following results were registered:

Preparedness phase:

1. Coordination between different services / stakeholders (lesson learning)
2. Coordination between different services / stakeholders (general)
3. Task planning, Resources and capacities planning and control, Logistics/ stockpiling
4. Threat and risk analysis & Warning/Alerting

5. Intelligence information gathering

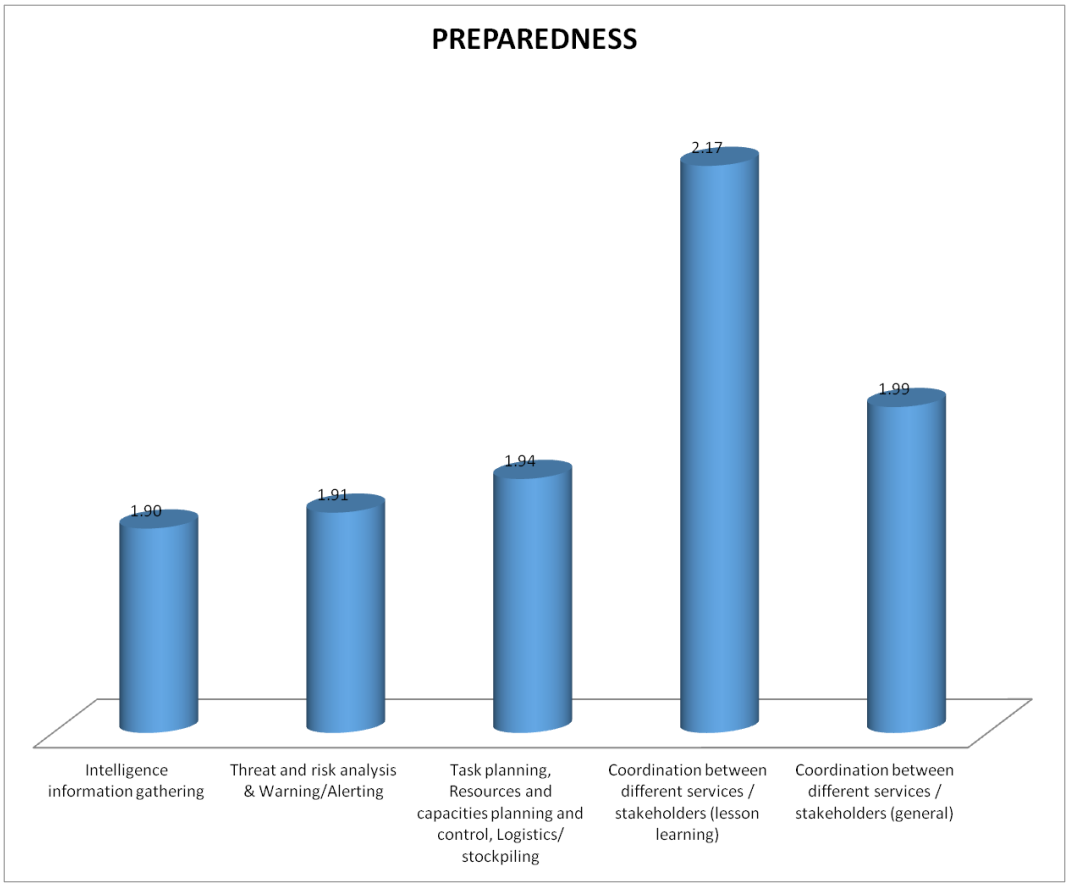


Figure 69 Preparedness - consolidated data

13.5.2 Response phase- National and Cross-border emergency management

After the data analysis, the following results were determined for the response phase, for national and cross-border emergency management.

National emergency management:

1. Coordination between different services / stakeholders (general)
2. Operational picture generation and situational assessment
3. Task planning, Resources and capacities planning and control, Logistics/ stockpiling
4. Intelligence information gathering
5. Threat and risk analysis & Warning/Alerting

Cross-border emergency management:

1. Coordination between different services / stakeholders (general)
2. Task planning, Resources and capacities planning and control, Logistics/ stockpiling
3. Intelligence information gathering

4. Threat and risk analysis & Warning/Alerting
5. Operational picture generation and situational assessment

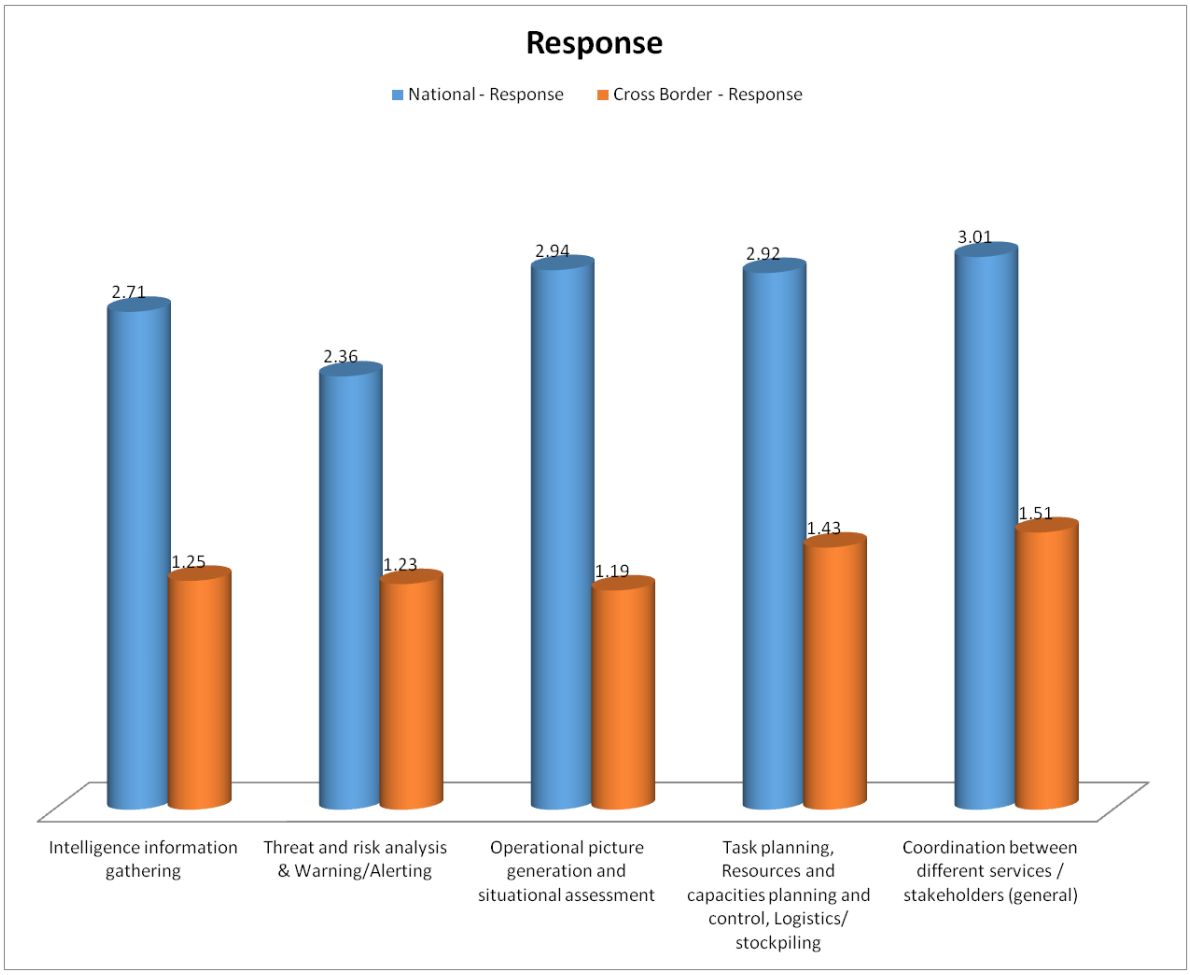


Figure 70 Response

It can be observed, that both for the national and cross-border management, the respondents considered that **Coordination between different services / stakeholders (general)** is the most important module.

13.5.2.1 Response phase- centralized

Centralizing the data from the national and cross-border emergency management responses, the following results were registered:

Response phase:

1. Coordination between different services / stakeholders (general)
2. Task planning, Resources and capacities planning and control, Logistics/ stockpiling
3. Operational picture generation and situational assessment
4. Intelligence information gathering

5. Threat and risk analysis & Warning/Alerting

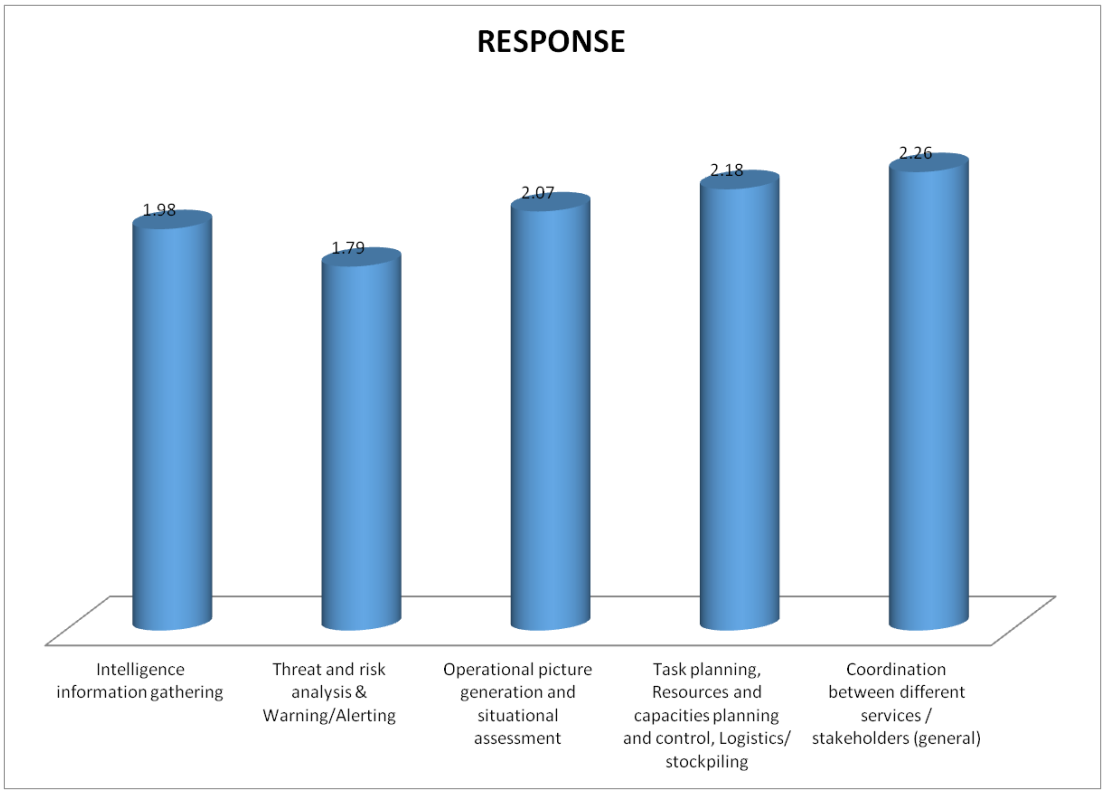


Figure 71 Response - consolidated data

13.5.3 Communication systems for emergency management

The end-users were asked what kind of communication systems is available in their countries for the healthcare forces during the response phase and if they can transmit digital data.

The Romanian end-user gave the **TETRA** example that can transmit digital data. The German end-user said that there are different communication systems depending on the federal state, but in most of the states they can rely on digital radio transmissions with different features. The standard used in Germany is **TETRA 25**.

Another issue that it was investigated was if that for the SARS scenario, family doctors can communicate via an information system data on suspect cases and what kind of system is used and its features . Also, they were asked how PULSE App could improve the distributed data collection.

The German end-user indicated that in Germany are reporting systems; medical facilities as well as family doctors can access data bases after a registration process – to report diseases, depending on the disease ("notifiable" vs. "not notifiable")and the alert phase. Also, he mentioned that he doesn't know if they use the same data bases to receive

information.

13.6 Legal, ethical and societal issues (Sessions B4 &C4)

In this session, the data collected refers to the legal, ethical and societal issues concerning the two scenarios: Stadium crush and SARS.

The questionnaire is structured into the following issues:

- Balancing of individual liberties
- Privacy of personal and sensitive info
- Duty to steward resources
- Duty to provide care notwithstanding personal risks
- Over-Triage
- Accountability mitigation

Every issue was analyzed through the answers received at the following sections:

1. From my point of view, the issue is: crucial, not a priority or irrelevant
2. Applicable law allows me to derogate from the ordinary discipline (YES/NO)
3. from my point of view, attention of policy makers towards this issue: is sufficient, can be improved, is inadequate

The methodology used for data analyzing consist in taking into account the number of responses and the type of responses for each issue from the questionnaire.

13.6.1 Balancing of individual liberties

For this issue, the following results were registered:

- From my point of view, the issue is:
    1. Irrelevant (56%)
    2. Crucial (22%)
    3. Not a priority (22%)
- Applicable law allows me to derogate from the ordinary discipline
    1. YES- 56%
- From my point of view, attention of policy makers towards this issue:
    1. Can be improved (56%)
    2. Is sufficient (44%)
    3. Is inadequate (0%)

13.6.2 Privacy of personal and sensitive info

For this issue, the following results were registered:

- From my point of view, the issue is:
    1. Irrelevant (33%)
    2. Not a priority (33%)
    3. Crucial (33%)
- Applicable law allows me to derogate from the ordinary discipline
    1. YES- 56%
- From my point of view, attention of policy makers towards this issue:
    1. Is sufficient (44%)
    2. Can be improved (33%)
    3. Is inadequate (22%)

13.6.3 Duty to steward resources

For this issue, the following results were registered:

- From my point of view, the issue is:
    1. Crucial (56%)
    2. Not a priority (33%)
    3. Irrelevant (11%)
- Applicable law allows me to derogate from the ordinary discipline
    1. YES- 56%
- From my point of view, attention of policy makers towards this issue:
    1. Is sufficient (67%)
    2. Can be improved (33%)
    3. Is inadequate (0%)

13.6.4 Duty to provide care notwithstanding personal risks

For this issue, the following results were registered:

- From my point of view, the issue is:
    4. Crucial (78%)
    5. Not a priority (11%)
    6. Irrelevant (11%)

- Applicable law allows me to derogate from the ordinary discipline
    1. YES- 33%

- From my point of view, attention of policy makers towards this issue:
    1. Is inadequate (57%)
    2. Can be improved (29%)
    3. Is sufficient (14%)

13.6.5 Over-Triage

For this issue, the following results were registered:

- From my point of view, the issue is:
    7. Crucial (60%)
    8. Not a priority (20%)
    9. Irrelevant (20%)
- Applicable law allows me to derogate from the ordinary discipline
    1. YES- 60%
- From my point of view, attention of policy makers towards this issue:
    1. Is inadequate (67%)
    2. Can be improved (17%)
    3. Is sufficient (16%)

13.6.6 Accountability mitigation

For this issue, the following results were registered:

- From my point of view, the issue is:
    10. Crucial (100%)
    11. Not a priority (0%)
    12. Irrelevant (0%)
- Applicable law allows me to derogate from the ordinary discipline
    1. YES- 17%
- From my point of view, attention of policy makers towards this issue:
    1. Can be improved (75%)
    2. Is inadequate (25%)
    3. Is sufficient (0%)

13.6.7 Ethical issues classification

Considering the above results, it was made a classification, by relevance, of the ethical issues:

<u>Crucial</u>

1. Accountability mitigation
2. Duty to provide care notwithstanding personal risks
3. Over-Triage
4. Duty to steward resources
5. Privacy of personal and sensitive info
6. Balancing of individual liberties

Not a priority

1. Privacy of personal and sensitive info; Duty to steward resources
2. Balancing of individual liberties
3. Over-Triage
4. Duty to provide care notwithstanding personal risks

Irrelevant

1. Balancing of individual liberties
2. Privacy of personal and sensitive info
3. Duty to steward resources
4. Over-Triage
5. Duty to provide care notwithstanding personal risks

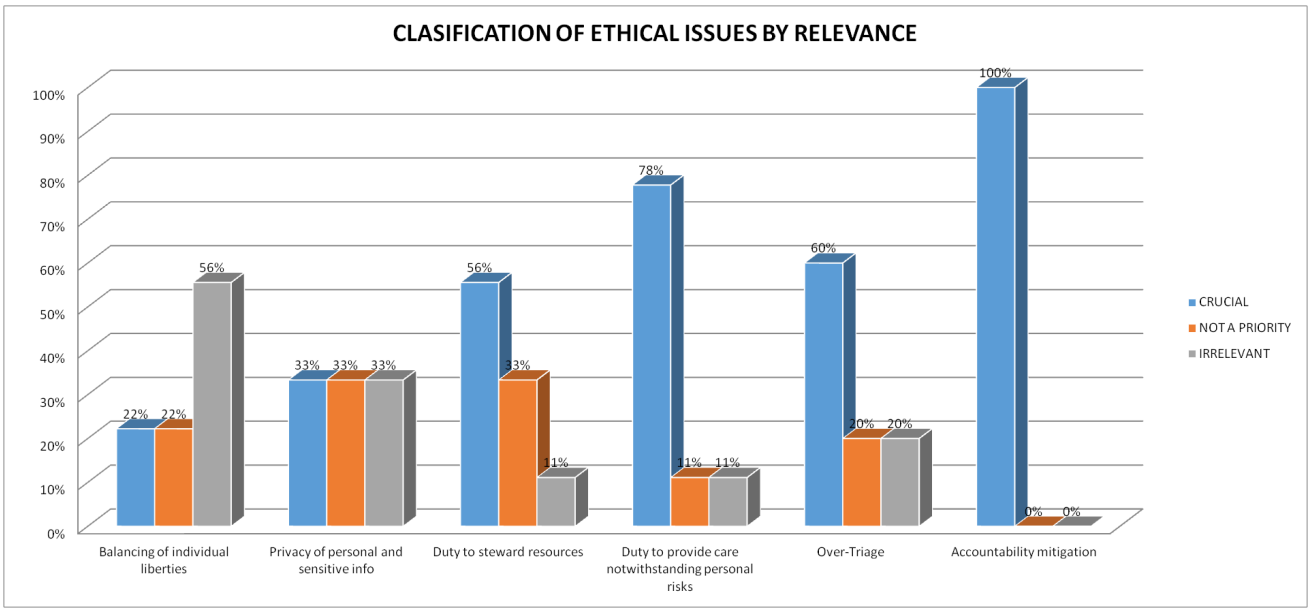


Figure 72 Classification of the ethical issues by relevance

For the applicable law derogation, the following classification could be

made:

1. Over-Triage
2. Balancing of individual liberties; Privacy of personal and sensitive info; Duty to steward resources
3. Duty to provide care notwithstanding personal risks
4. Accountability mitigation

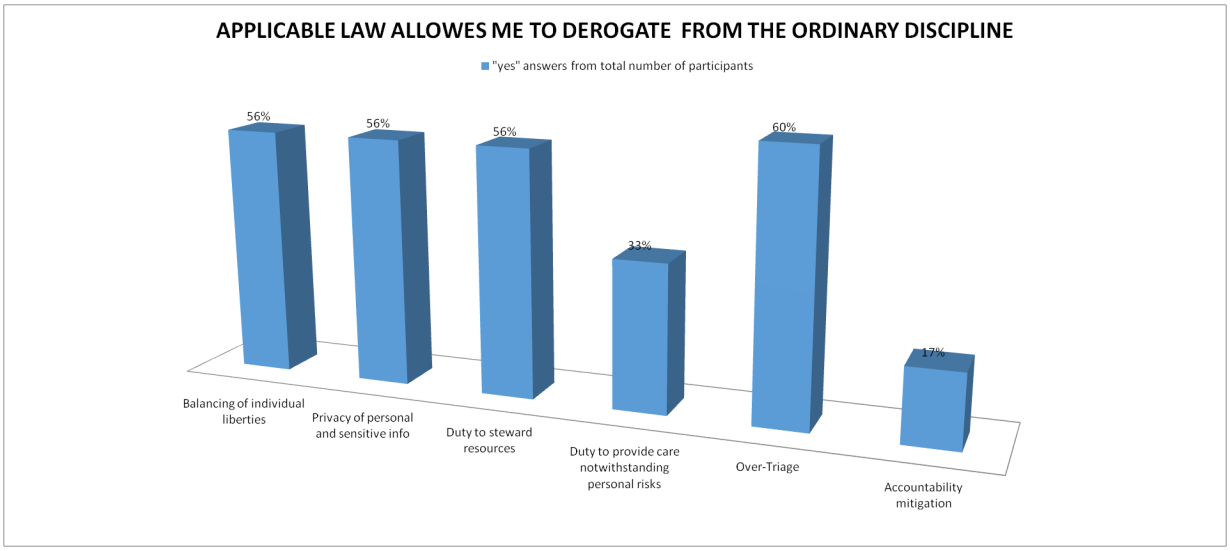


Figure 73 Applicable law allows derogating from ordinary discipline

For the policy makers' attention towards these ethical issues, the following classification was made:

Is sufficient

1. Duty to steward resources
2. Privacy of personal and sensitive info; Balancing of individual liberties
3. Over-Triage
4. Duty to provide care notwithstanding personal risks

Can be improved

1. Accountability mitigation
2. Over-Triage
3. Balancing of individual liberties
4. Privacy of personal and sensitive info; Duty to steward resources
5. Duty to provide care notwithstanding personal risks

Is inadequate

1. Duty to provide care notwithstanding personal risks

2. Accountability mitigation
3. Privacy of personal and sensitive info
4. Over-Triage

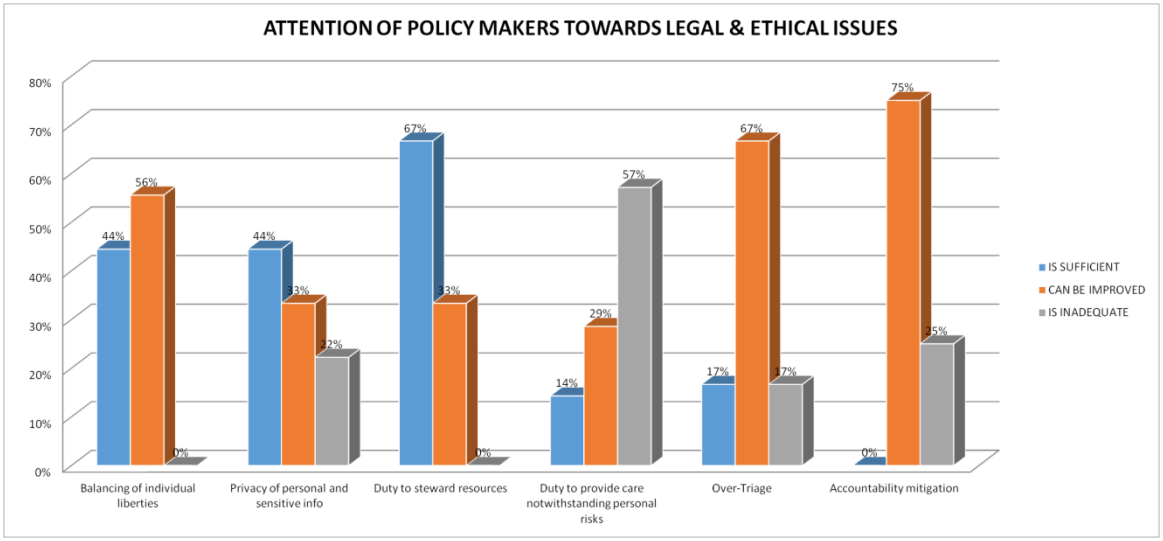


Figure 74 Attention of the policy makers

13.6.8 Aggregated ethical issues

In this part of the questionnaire, the end-users suggested the three most important ethical issues that might appear in the two scenarios (Stadium crush and SARS).

For the data summarizing and analysis, the responses were gathered and each of the answers had an associated score, due to the ranking proposed by the respondents. After the data scoring, the same answers from the two scenarios were centralized by adding them into one single answer.

The following aggregated ethical issues were determined:

1. Individual liberties (30%)
2. Resource allocation (27%)
3. Support for first responders; People discrimination (gender, race, nationality etc)- 14%
4. People privacy (8%)
5. Treatment with drugs to professional athletes (5%)
6. Property damage (3%)

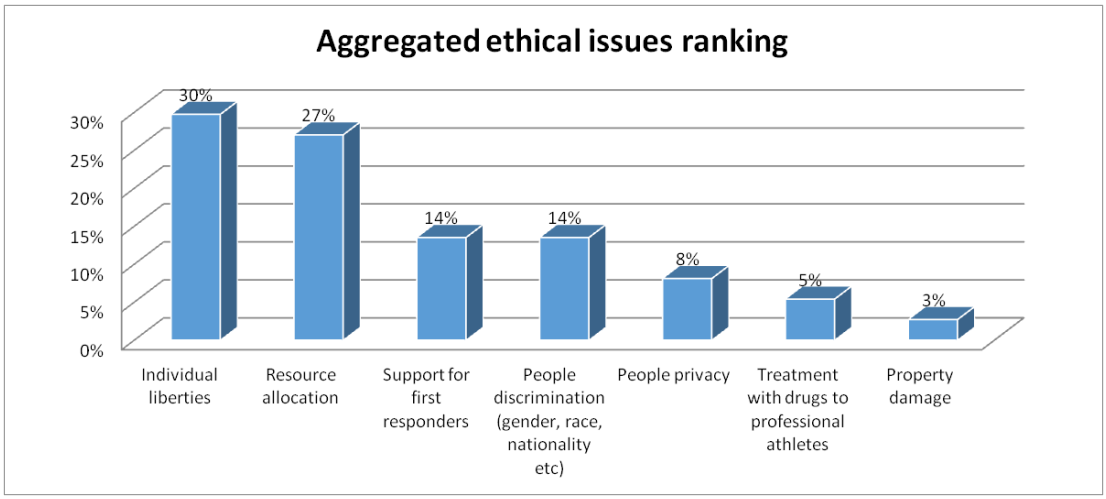


Figure 75 Aggregated ethical issues

As for the existence of legal cases for civil liability against responders from the two type of scenarios, the 50% of the end-users said that it is possible that all decision done under emergency to be called on court for complain or exams, the other 50% said they don't know existing legal cases on this matter.

13.7 General key issues

These general key issues were gathered additionally, from the end-users. They refers to the communication officer and to the transmission standard that PULSE should use.

13.7.1 Role of Communication officer

The end-users consider that the training of the communication personnel is **an important issue** in the preparation for major disasters. In general, contact to the media in major incidents should only happen through selected and trained personnel. Also, the end-users consider that ethical/legal/societal issues related to communication should be included in training.

Half of the end-users do not think that the special training for communication officers should be part of the MPORG, but they can be included as sources of interference.

As for the SOPs, the end-users believe that is important to have SOPs for the communication officer and there are existing SOPs for this matter.

The end-users didn't suggest if PULSE tools should provide outputs ready to use for communication purposes.

13.7.2 Transmission Standard for PULSE

Between TETRA or LTE (Long Term Evolution), the end-users suggested using as a transmission standard for PULSE: TETRA, TETRA 25. As well,

one end-user proposed to develop a tool that can be used on different platform and systems.

13.7.3 Other general issues

The end-users consider that an important issue in major disaster scenarios is **fast indication and detection** that can be improved through the use and evaluation of information of social media.

Another important issue is related to the **information management**; to have the right information at the right time. The end-users sustained that it is important to send the necessary amount of information, at the right time and to the right person because sometimes too much information may cause more damage than it should prevent.