EUROPEAN COMMISSION

pulse

Platform for European Medical Support During Major Emergencies

D5.2 PULSE SOP

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• Abstract:
This Deliverable documents the development of standard operational procedures (SOPs) for the PULSE system. Building upon a status quo analysis of national healthcare systems and international frameworks in D5.1, best practices are formulated for guiding the further development of the functionalities of the PULSE system. Detailed SoP are specified in a standard format for the individual use cases of the trials scenarios. From the expected benefits of the PULSE tools as delineated in the SOPs, the methodology and criteria for evaluating the PULSE platform are derived..

Keywords:
Standard operating procedure, Major medical emergency, health services, preparedness, response, crisis management, measures of effectiveness

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TABLE OF CONTENTS:

1 Introduction 7
1.1 Purpose and Objectives of the Document 7
1.2 Definitions 7
1.3 Scope and structure of the document 7
1.3.1 Framework for the document 7
1.3.2 Relations to other WPs 9
1.3.3 Document Structure 10
2 Status Quo Analysis in D5.1 and relation to D5.2 10
3 The Methodology for SOP 'best practice' and use case SOP definitions 11
3.1 Six core SOPs areas 11
3.2 SOPs and Use Cases 12
3.3 Cross-referencing the SOP areas and the Use Cases 12
4 Best practices for the SOP areas 13
4.1 Intelligence and information gathering 15
4.1.1 Overview of best practice 15
4.1.2 Implications for PULSE 17
4.1.3 PULSE guidelines for intelligence and information gathering 18
4.2 Threat and risk analysis; warning & alerting 19
4.2.1 Overview of best practice 19
4.2.2 Implications for PULSE 23
4.2.3 PULSE guidelines for threat and risk analysis; warning & alerting 24
4.3 Operational picture generation and situation assessment 26
4.3.1 Overview of best practice 26
4.3.2 Implications for PULSE 28
4.3.3 PULSE guidelines for operational picture generation and situation assessment 28
4.4 Task and resource planning 31
4.4.1 Overview of best practice 31
4.4.2 Implications for PULSE 32
4.4.3 PULSE guidelines for task and resource planning 37
4.5 Training and exercising capability 38
4.5.1 Overview of best practice 38
4.5.2 Implications for PULSE 41
4.5.3 PULSE guidelines for training and exercising capability 45
4.6 Knowledge Management 47

4.6.1 Overview of best practice 47
4.6.2 Implications for PULSE 50
4.6.3 PULSE guidelines for knowledge management 51
4.7 Best practices/guideline development summary 53
5 Use Case procedures SOPs 53
5.1 SARS Scenario 56
5.1.1 Weak signal detection and surveillance 56
5.1.2 An airplane is landing; a probable case is identified 60
5.1.3 Ship arriving, with probable case 65
5.1.4 Identification of a new probable case in a community 70
5.1.5 Assessment of available medical resources 74
5.1.6 ECDC recommendations 77
5.1.7 National Authority periodic assessment 80
5.1.8 Post emergency learning at national level 84
5.1.9 Post emergency learning at WHO level 87
5.2 Stadium Scenario 90
5.2.1 Scoring system in plan preparation 90
5.2.2 Use of MPORG simulation 93
5.2.3 Mobilization of additional resources 97
5.2.4 Hospital Surge Capacity and Bed Management 101
5.2.5 Triage in CCS and links to ePCR 105
5.2.6 Input critical data for the RCS 108
5.2.7 Post-event evaluation 111
5.2.8 Casualty Bureau Operation 114
6 Method for evaluating the PULSE platform and tools 118
6.1 Benefits/Effectiveness and MoEs 118
6.2 Performance of the PULSE system (MoPs) 124
6.3 Ethical, societal, political assessment 125
6.3.1 The challenge 125
6.3.2 Method and Tool 125
6.3.3 A Tentative Qualitative Criteria Catalogue 127
6.3.4 Next steps 127
7 Conclusions and Way Ahead 127
8 Acronyms and Terms 129
8.1 Glossary of terms and definitions 129
8.2 The PULSE TOOL acronyms: 134
8.3 Acronyms 135
9 References 138

Annex 1: Questionnaire 139
10 WORD Version 139
11 EXCEL-Version 146
Annex 2 151
12 Tentative socio-political criteria 151
Annex 3 155
13 Standards and Interoperability (IO) 155
13.1 General PULSE Context 155
13.2 Standardization/ Standards 155
13.3 Interoperability of PULSE 155
13.3.1 Objectives of interoperability 156
13.3.2 The PULSE Interoperability Concept 156
13.3.3 "Internal" Interoperability 157
13.3.4 External Interoperability 157

List of Tables

Table 1: Priority SOP areas....11
Table 2: Correlation of SOP areas and SARS scenario use cases 12
Table 3: Correlation of SOP areas and STADIUM scenario use cases....13
Table 4: Preparation of MoEs....119
Table 5: Categories and criteria as input to a QCA tool experiment....151
Table 6: Possible scheme for internal interoperability....157

List of Figures

Figure 1: D5.2 embedding in the PULSE project....8
Figure 2: The PULSE system architecture....9
Figure 3: PULSE WP5 D5.2 workflow....10
Figure 4: SOP areas in the process cycle....14
Figure 5: European approach to medical intelligence 15
Figure 6: SLD Notation and template....54
Figure 7: Use Case SA 01 SLD 57
Figure 8: Use Case SA 02 SLD 61
Figure 9: Use Case SA 03 SLD 66
Figure 10: Use Case SA 04 SLD 71

Figure 11: Use Case SA 05 SLD 75
Figure 12: Use Case SA 06 SLD 78
Figure 13: Use Case SA 07 SLD 81
Figure 14: Use Case SA 08 SLD 85
Figure 15: Use Case SA 09 SLD 88
Figure 16: Use Case SC 01 SLD 91
Figure 17: Use Case SC02 SLD 94
Figure 18: Use Case SC 03 SLD 98
Figure 19: Use Case SC 04 SLD 102
Figure 20: Use Case SC 05 SLD 106
Figure 21: Use Case SC06 SLD 109
Figure 22: Use Case SC 07 SLD 112
Figure 23: Use Case SC 08 SLD 115
Figure 24: Sample evaluation charts.....125

1 Introduction

1.1 Purpose and Objectives of the Document

The objective of WP5 is to provide validated procedures that will improve the operation and success of the healthcare system in challenging disaster situations where combined operations are required at local, regional, cross border and international levels. The WP will support this objective by Improving existing and where necessary developing new procedures.

Within task 51, the current status quo was explored. Health systems across Europe were examined, the health systems were assessed in the context of the legal and international frameworks in which European Health services operate. Strengths and weaknesses in current procedures were identified. Gaps and deficiencies were presented. In task 5.2, the Pulse consortium addresses the findings of 5.1 and identifies 'best practice'[1] across six key areas of major emergency management. Using specific use cases related to a SARS like event and stadium crush D5.2 presents significant improvements that the PULSE system can bring to SOPs related to major emergency management.

Specifically in this task,

- Best practice across key components of major emergency management will be outlined.
- The requirements for new procedures will be explored specifically in the area of cross-border response, coordination and inter-operation.
- Examination and identification is done of how the PULSE system can significantly enhance current SOPs in the area of managing a SARS type and a stadium crush type event.

1.2 Definitions

Discussion, evaluation, comparison of procedures require up front clear definitions and agreement of the relevant terms used, like SOP, scenario, use case etc.. For the purpose of PULSE, the agreed terms and definitions are listed in chapter 8.1. It contains terms and definitions of both, D5.1 and D5.2

For the acronyms used in this deliverable, see chapter 8.2 and 8.3

1.3 Scope and structure of the document

1.3.1 Framework for the document

The purpose of this deliverable has been described above. The Framework for this deliverable has been set by the requirements, the scenarios and use cases, and the preliminary architecture of the PULSE platform and the tools under development. In

[1] sometimes also referred to as "guideline(s)"

addition, the status quo analysis and the need for final comprehensive evaluation of the PULSE platform need to be regarded.

D5.2 logically follows and builds upon D5.1, the status quo analysis. Starting with a general view in D5.1 chapter 2,explains with four existing national samples the volume and complexity of actions needed in healthcare. Organisations, processes and resources largely differ between nations and organisations involved. PULSE can only selectively cover this huge spectrum but will concentrate on those procedural areas that after a process of analysis and validation by the team and by stakeholders have been identified to bear on the improvement potential of the EHS by a system like PULSE.

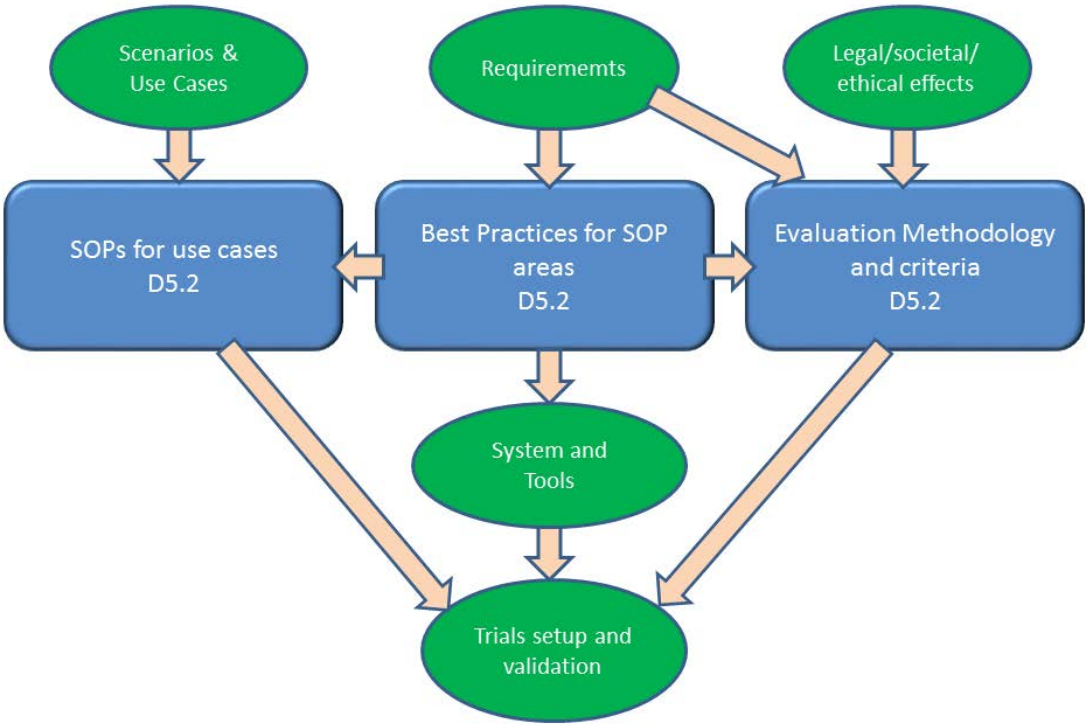
The core of the report consists of two types of SOPs

1. Best practice SOPs relevant for key areas of major emergency planning e.g. intelligence gathering, threat analysis
2. Specific Use Case SOPs for SARS and stadium crush directly relevant to the PULSE trials

A total of 17 use cases in two different scenarios have been developed in D2.2 which will serve as **instruments for the evaluation of the PULSE system and its tools**. The detailed local and international procedures to be followed in these use cases are developed, as the basis for setting up the trials experiments and the evaluation process.

A third pillar of this deliverable is the method and criteria that will finally facilitate the assessment of the PULSE system and its tools and procedures when applied to certain use cases. They include **criteria on effectiveness, performance and social impact.** Figure 1 summarises how the D5.2 results will be used in the overall PULSE project context.

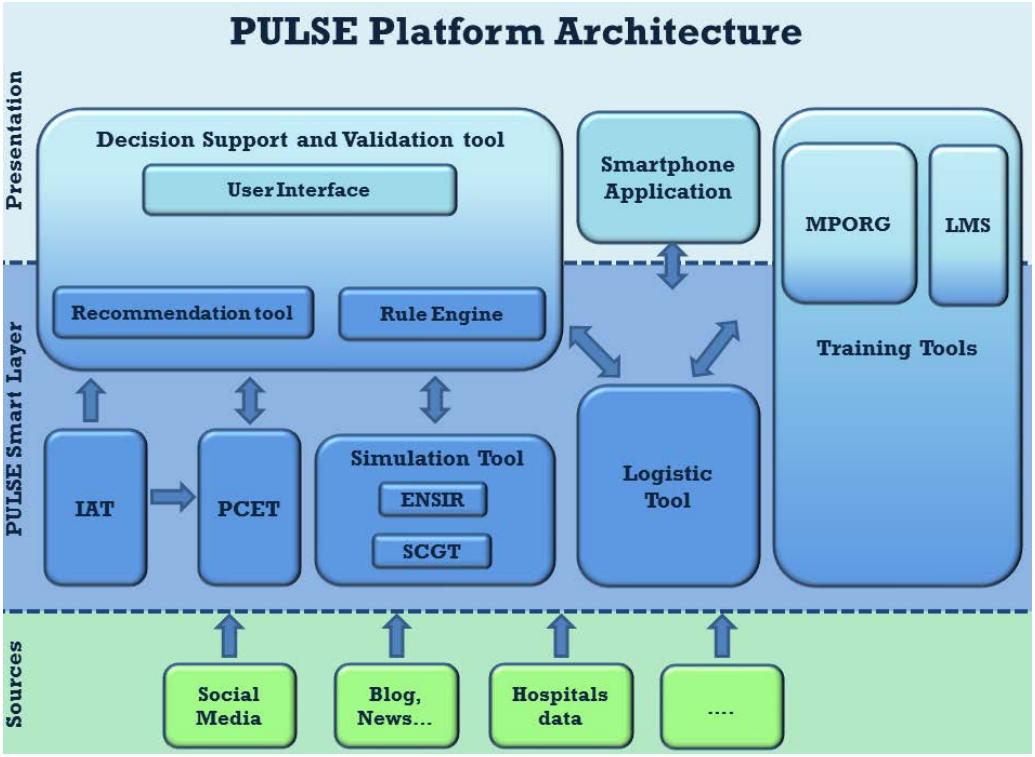
Figure 1: D5.2 embedding in the PULSE project



1.3.2 Relations to other WPs

The view on the PULSE architecture in Figure 2 below shows the individual components or "tools" and how they are arranged to interact as a functioning PULSE system. Architecture and tools are described in the individual deliverables of WP4. This D5.2 will describe the procedures of how these tools will work and cooperate in the two PULSE scenarios and their individual phases (Use Cases). This document will extract the operational procedures and will derive guidelines for implementing SOPs in the experimentation setups. The underlying structure of these 6 guidelines, also called best practices, follow the requirements developed in WP2, D2.1. For that purpose, this D5.2 will also regard the strengths and weaknesses of existing healthcare frameworks and procedures, which have been analysed in D5.1. A more detailed analysis will describe how these individual tools will operate in the use cases selected from the Pulse scenarios of D2.2, and which improvements or benefits they are expected to produce.

Figure 2: The PULSE system architecture



The officially used PULSE Tool Names:

DSVT	Decision Support and Validation Tool
IAT	Intelligence and Analysis Tool
PCET	Post Crisis Evaluation Tool
LT	Logistics Tool
SCGT	Surge Capacity Generation Tool
ENSIR	Event Evolution for Bio-events
TT	Training Tools

MPORG Multi Player Online Role Game (used as TT and for Demo support)

Finally, an outlook is given on how the D5.2 results will be used for the setup of the trial and for the evaluations of the outcome, in support of WPs 7 and 8. The expected benefits of the PULSE system and its tool components are collected in conjunction with the SOP descriptions. From there, the related Measures of Effectiveness and the methodology of how to evaluate the PULSE system will be derived in WP7. They will finally be applied in the trials and validation process.

1.3.3 Document Structure

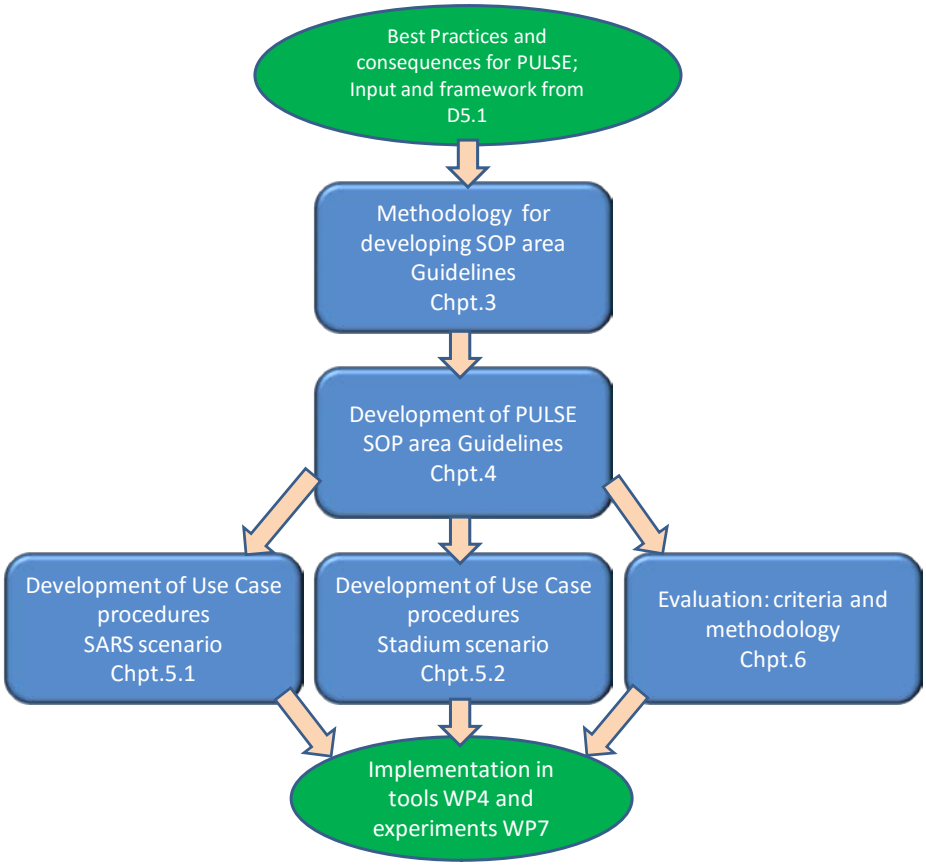
Chapter 2 draws the link between the findings in D5.1 from the status quo analysis of existing procedures to the SOP and the best practices/guidelines development in this D5.2. In chapter 3, the framework and methodology are set on the analysis of procedures. This gives the format of how the SOPs and the guidelines will be presented and compared. Chapters 4 and 5 form the core part of D5.2, developing the high level guidelines/best practices for SOP areas (chapter4), which have to be regarded in the experiments and in the possible later use of the PULSE system. In chapter 6, the measures of effectiveness (MoE) and measures of performance (MoP) have been derived from the mapping of tools to the use-cases and the expected benefits of the PULSE tools as described in chapter 5. It tells us what effects and utilities the PULSE system is expected to create. Finally, chapter 7 summarizes how the SOPs best practice guidelines and the MoEs of this D5.2 will be applied in the experiment setups, trials execution and result evaluation.

2 Status Quo Analysis in D5.1 and relation to D5.2

The groundwork for developing SOPs and SOP best practice guidelines in this document has been set in D5.1. According to WP5 and Task 5.2, strengths, weaknesses and the improvement potential of existing procedures have been identified. In D5.1, chapter5 it has been concluded: "Acting on the assumption of a European-wide necessity for a platform like PULSE providing not only decision support but also knowledge management in health related decision making during major emergencies, existing national and international systems and respective procedures have been analysed for the identification of common grounds and divergences in this field. Resulting conclusions and recommendations will set the framework conditions for specific PULSE operational procedures emerging from the (D5.1) findings and will be discussed in D.5.2.". This way, consistency between the two deliverables is achieved.

Figure 3 displays the flow of the main working steps in D5.2, following the status quo analysis of D5.1.

Figure 3: PULSE WP5 D5.2 workflow



The main findings in D5.1 that will be regarded here in D5.2 are the need for conceptual design of procedures that improve healthcare in areas for improvement, and the need for setting use case procedures and the subsequent experiments in a way that will allow validating these improvements.

3 The Methodology for SOP 'best practice'[2] and use case SOP definitions

This chapter briefly describes the methodology of how SOPs will be derived and described and how the associated descriptions will be structured. It sets the basic methodology for chapters 4 and 5.

3.1 Six core SOPs areas

In this document, the standard SOPs for managing key aspects of major emergency management will be outlined. Perceived best practice will be identified across six core areas considered the most important for PULSE, as listed in Table 1 below.

Table 1: Priority SOP areas

[2] The term "Guidelines" is sometimes used sysnonymously to "Best Practices"

#	SOP area		
1.	**Intelligence-information gathering;**	**MUST**	
2.	**Threat and risk analysis; Warning/ alerting;**	**MUST**	
3.	**Operational picture generation and situational assessment;**	**MUST**	
4.	**Task planning and execution (like movements, triage, ...), including Prioritization; Resources and capacities planning and control; Logistics/ stockpiling.**	**MUST**	
5.	**Training and exercising capability.**	**MUST**	
6.	**Knowledge Management**	**MUST**	

For the two scenarios SARS (SA) and Stadium Crush (SC) these SOP areas will have common and partially different functional structures. Chapter 4 describes which functionalities of the PULSE tools need to contribute to these SOP areas in the two scenarios.

3.2 SOPs and Use Cases

As described in detail in D2.2, the PULSE scenarios are broken down into a number of use cases. There are 9 use cases for the SARS scenario (SA01 to SA09), and 8 for the Stadium scenario (SC01 to SC08). They have been designed for the purpose of evaluating the PULSE platform and /or individual tools in a variety of very concrete realistic events or courses of events. Based on these descriptions, detailed SOPs for each use case will be described in standardised SOP diagrams [3][3] , each of which is supplemented by analysis tables describing (1) the activities of the depicted processes in some detail and (2) the functionality and expected benefits of the tools if applied in the use case (chapter 5).

3.3 Cross-referencing the SOP areas and the Use Cases

SOPs are practices that are needed in use cases and vice versa. This correlation between SOP areas (left column) and Use Case SOPs (Top line) is summarized in the Table 2 and Table 3 below. Colours indicate the partners responsible to work out the individual use case SOPs (horizontal) and the SOP Area best practices (vertical).

Table 2: Correlation of SOP areas and SARS scenario use cases

Colour code
CESS
UCSC

[3] the method is called Swim Lane Diagram (SLD)

SARS Scenario Use Cases / SOP Areas	SA 01 Weak signal detection and surveillance	SA 02 An airplane is landing in Italy. A probable case is now identified	SA 03 A ship is arriving in Italy. A passenger has been identified as probable case	SA 04 Identification of a new probable case in a community	SA 05 Assessment of the available medical resources during the pandemic phase	SA 06 ECDC recommendations	SA 07 National Authority periodic assessment	SA 08 Post emergency learning at national level	SA 09 Post emergency learning at WHO level
1 Intelligence-information gathering;	x								
2 Threat and risk analysis; Warning/ alerting;	x					x	x		
3 Operational picture generation and situational assessment;		x	x	x					
4 Task planning and execution (like movements, triage, ...), including Prioritization; Resources and capacities planning and control; Logistics/ stockpiling.					x				
5 Training and exercising capability.									
6 Knowledge Management								x	x
7 SOP for the reviewing and updating particular SOPs									
8 Change Management									
9 Communication									

Table 3: Correlation of SOP areas and STADIUM scenario use cases

Stadium Scenario Use Cases / SOP Areas	SC 01 Scoring System in the Event Medical and Other Plan Preparation Phase	SC 02 Usage of a (serious) Multi-user Online Role-Playing Game as a Simulation Training Tool	SC 03 User wishes to mobilise additional resources from Public, Private, Voluntary and Response Assets from other member states. Via surge capacity tool.	SC 04 Hospital Surge Capacity and Bed Management	SDC 05 Triage in Casualty Clearing Station [CCS] and links to PULSE proposals on electronic patient care records [ePCR].	SC 06 Input critical data for the RCS on Site and from other relevant off-site sources	SC07 Post-Event, Post Exercise Evaluation Tool to identify lessons to be learned.	SC 08 Casualty Bureau Operation searchable data base created for specific multi casualty incident.
1 Intelligence-information gathering;	x							
2 Threat and risk analysis; Warning/ alerting;	x							
3 Operational picture generation and situational assessment;						x		x
4 Task planning and execution (like movements, triage, ...), including Prioritization; Resources and capacities planning and control; Logistics/ stockpiling.	x		x	x	x			
5 Training and exercising capability.		x						
6 Knowledge Management							x	
7 SOP for the reviewing and updating particular SOPs								
8 Change Management								
9 Communication								

4 Best practices for the SOP areas

According to the PULSE DoW, SOP areas analysed subsequently have been grouped in five clusters for the purpose of deliberations in this document. They are

- Intelligence-information gathering,
- Threat & risk analysis and warning/alerting,
- Operational picture generation & situational assessment,
- Task & resource planning, execution and control including prioritization; logistics and stockpiling,

- Training & exercising capability.

In addition, an associated crosscutting SOP area for data collection and knowledge sharing has been identified as a priority requirement. This adds

- Knowledge management

to become number six to be investigated.

Above SOP areas constitute a plausible and realistic flow of action and functions embedded in a recurring process cycle. They are contingent on each other, so are the guidelines to be developed for each SOP area. They describe the basic functionalities relevant for the PULSE platform. Figure 4 depicts how the five PULSE SOP areas comprise a system of interdependent basic functionalities in PULSE.

Figure 4: SOP areas in the process cycle

Compared to the detailed operational use case procedures, guidelines have the character of policies and key principles which have the potential to contribute to a common European framework that will ease harmonization of systems, cross-border coordination and knowledge sharing while leaving to each country the freedom to take care of its particular organization."[4] In order to provide a broad basis for the evaluation of the performance of the PULSE system in the trials, the two PULSE scenarios chosen reflect basic differences of geography, timelines, threats and vulnerabilities, consequences and political range (for details see D2.2 and in D5.1 Annex2/10.2). The guidelines/best practices therefore are formulated separately for the SARS and the STADIUM scenario. Otherwise, they would become too general and generic. In the following six subchapters, the individual guidelines are displayed in parallel for the two scenarios. This should ease to identify the differences as well as the commonalities of the guidelines in the two different scenario views.

[4] PULSE, D 2.1 Requirements Specification, Chapter 9.3.3 "PULSE SOP areas key features", page 69.

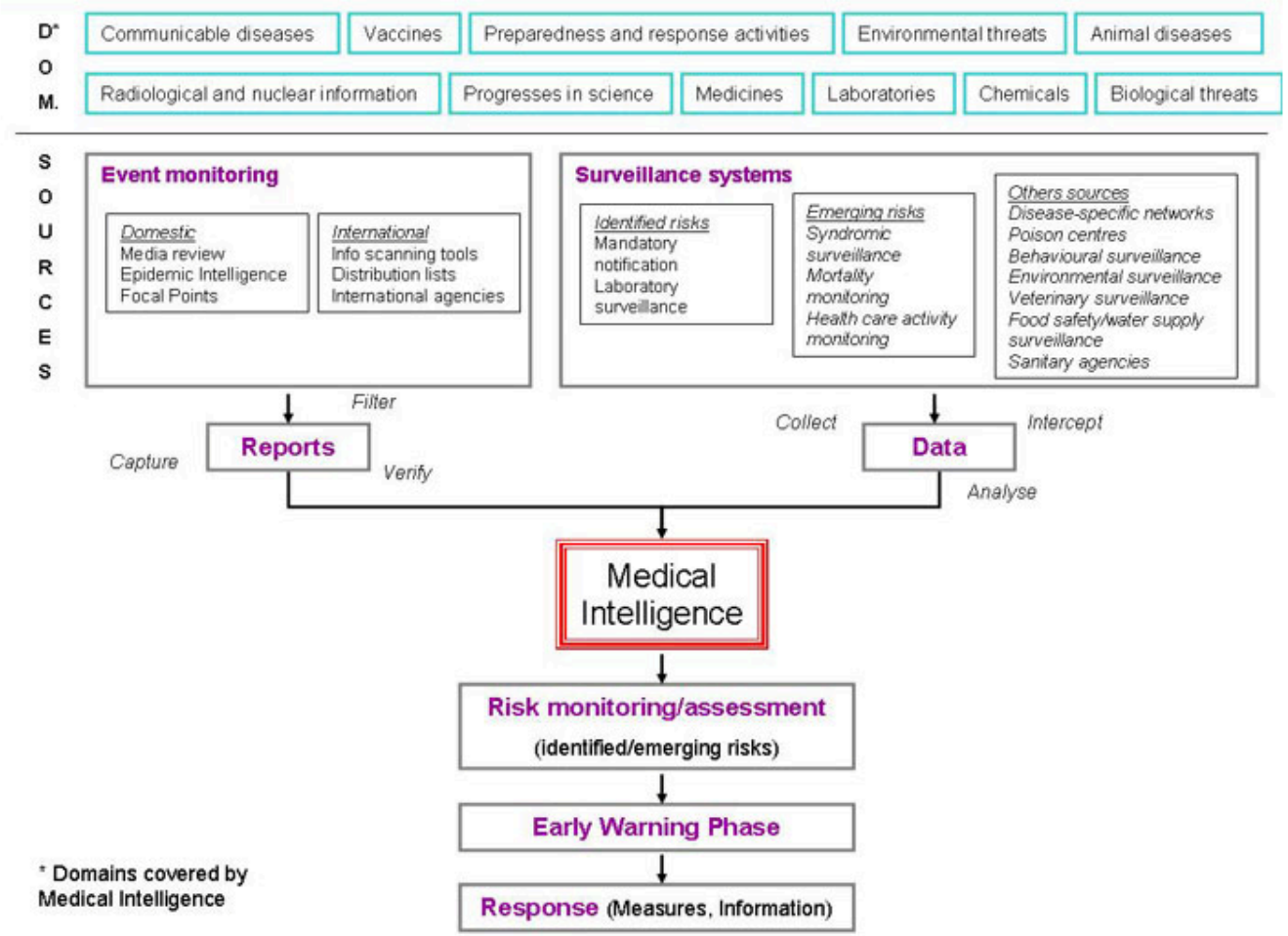
4.1 Intelligence and information gathering

4.1.1 Overview of best practice

SARS	Stadium
„Sound and reliable information is the foundation of decision-making across all health system building blocks, and is essential for health system policy development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery and financing“. [5] Medical Intelligence in this sense relates to all activities regarding early identification of potential health threats, their verification, assessment and investigation (according to 4.2) in order to recommend public health control measures to control them. Instituted worldwide the WHO runs a complex health information structure of its own. The European approach to medical intelligence is summarized in Figure 5.[6] Stretching over the domains as identified, the medical intelligence systems rests on the two pillars ‘Event Monitoring’ and ‘Surveillance Systems’. Disease surveillance systems are providing information on potential threats by identifying abnormal events in the temporal distribution of known disease indicators routinely collected, including laboratory characteristics. In order to capture information not detected by disease surveillance systems, event monitoring provides supplementary information for the detection of emerging threats.	Intelligence is the collection of open source and/or confidential information provided by other legally accessed sources for analysis to be disseminated as a product to assist with the decision making processes during all stages of the pre-hospital care operation at a mass gathering event. Currently there are tools available for utilising intelligence or predicting patient case-loads that would ensure medical staff are adequately staffed for specifics aspects and the likelihood of serious medical incidents at a mass gathering event. International literature has examined various types of mass gathering events from sporting events to large-scale music concerts. It is evident that a number of key variables exist depending on the type of event. Intelligence-information gathering variables that affect the way in which a crowd behaves as a collective, resulting from a number of key factors influencing not alone the number but the type of injuries that are likely to present at a medical centre. The role of intelligence within a mass gathering medical contest is an aspect of the event management process. It is the collection of open source and/or confidential information provided by other legally accessed sources for analysis to be disseminated as a product to assist with the decision making process during all stages of medical care at a mass gathering event.

Figure 5: European approach to medical intelligence

[5] Toolkit on monitoring health systems strengthening – Health Information Systems – WHO, June 2008, page 2.
[6] European Commission/DG Health and Food Safety/Public Health/Preapredness and Response/Medical Intelligence in Europe


D*
O
M.
Communicable diseases
Vaccines
Preparedness and response activities
Environmental threats
Animal diseases
Radiological and nuclear information
Progresses in science
Medicines
Laboratories
Chemicals
Biological threats
S
O
U
R
C
E
S
Event monitoring
Domestic
Media review
Epidemic Intelligence
Focal Points
International
Info scanning tools
Distribution lists
International agencies
Surveillance systems
Identified risks
Mandatory notification
Laboratory surveillance
Emerging risks
Syndromic surveillance
Mortality monitoring
Health care activity monitoring
Others sources
Disease-specific networks
Poison centres
Behavioural surveillance
Environmental surveillance
Veterinary surveillance
Food safety/water supply surveillance
Sanitary agencies
Filter
Capture
Reports
Verify
Collect
Intercept
Data
Analyse
Medical Intelligence
Risk monitoring/assessment
(identified/emerging risks)
Early Warning Phase
Response (Measures, Information)
* Domains covered by Medical Intelligence

4.1.2 Implications for PULSE

SARS	Stadium
The health information systems installed and instrumented by WHO and EU (ECDC) collect data from the health sector and other relevant sources, compile and fuse these data converting them into medical intelligence, analyses it accordingly, and ensures their overall quality, relevance and timeliness for health related decision making. National health information systems abide by these terms focusing on key functions: data generation, compilation and synthesis (fusion), analysis, as well as communication and use. To meet needs and demands of multiple users (policy-makers, planners, managers, health care providers, communities, individuals) operating inside existing international and national health systems, most essential attributes of PULSE-supported health intelligence/information tools in this context are: ▪ Topics and formats meeting the needs of multiple users, ▪ Dissemination and communication assistance, ▪ Unrestricted access to consistent, reliable and understandable information by authorized users. Consequently, above attributes need to be accounted for in the respective PULSE tool architecture and set-up.	The health information systems installed and instrumented by WHO and EU (ECDC) and both regional and national authorities collect data from the health sector and other relevant sources. This information is further compiled and fused converting them into medical intelligence, analyses it accordingly, and ensures their overall quality, relevance and timeliness for health related decision making. National health information systems abide by these terms focusing on key functions: data generation, compilation and synthesis (fusion), analysis, as well as communication and use. To meet needs and demands of multiple users (policy-makers, planners, managers, health care providers, event organisers, communities, individuals) operating inside existing international and national health systems, most essential attributes of PULSE-supported health intelligence/information tools in this context are: ▪ Topics and formats meeting the needs of multiple users, ▪ Dissemination and communication assistance, ▪ Unrestricted access to consistent, reliable and understandable information by authorized users. Consequently, above attributes need to be accounted for in the respective PULSE tool architecture and set-up.

4.1.3 PULSE guidelines for intelligence and information gathering

SARS	Stadium
▪ Consider instituting a hub linking national medical authorities/resources and international agencies such as EWRS, ECDC, EMEA, GHSI, HSC, SCEPC, EADRCC, JMC utilizing the national IHR Focal Point. ▪ Engineer and maintain a network of national and international contacts bringing together relevant partners. ▪ Establish and run a national platform for communicable disease surveillance relative to the diseases identified in the WHO IHR, including data analysis, data submission, data storage and dissemination offering an interface to third parties surveillance systems such as TESSy in future evolutions. ▪ Join and maintain interfaces to international agencies and other also non-medical information sources to capture information detected by event monitoring to provide supplementary information for the detection of emerging threats. ▪ For the early identification of potential health threats, their verification, assessment and investigation: collect, compile and fuse medical information. ▪ Identify multi-user target audience and structure information accordingly in order to meet diverging information, communication and dissemination requirements. ▪ Provide reliable, authoritative, useable, understandable, and comparative health information data. Facilitate coordination of intelligence-information gathering activities with other similar systems operating nationally or internationally to avoid overlap or contradiction.	▪ Consider instituting a hub linking regional, national medical authorities/resources and neighbouring agencies. ▪ Engineer and maintain a network of national and international contacts bringing together relevant partners. ▪ Establish and run a national platform providing data analysis, data submission, data storage and dissemination also offering an interface to third parties for mass gathering major emergencies. ▪ Join and maintain interfaces to national, international agencies and other also non-medical information sources to capture information and experience from mass gathering major emergencies. ▪ Identify multi-user target audience and structure information accordingly in order to meet diverging information, communication and dissemination requirements. ▪ Provide reliable, authoritative, useable, understandable, and comparative health information data. ▪ Facilitate coordination of intelligence-information gathering activities with other similar systems operating nationally or internationally

4.2 Threat and risk analysis; warning & alerting

4.2.1 Overview of best practice

SARS	Stadium
Risk and threat are different terms, which are not interchangeable. Although threat and susceptibility, for the same token, are a part of risk. ▪ **Threats** generally cannot be controlled. They need to be identified, but they often remain out of control. ▪ **Risk** is usually defined as the probability of a threat to materialze times the expected impact caused. It can be mitigated and managed to either lower susceptibility and/or the overall health impact.[7] ▪ **Susceptibility** can be diminished or treated. Based on „ ... early identification of potential health threats, their verification, assessment and investigation in order to recommend public health control measures to control them“[8]. Risk analysis incorporates: ▪ Threat identification, ▪ Risk assessment, ▪ Risk management and	As a generic approach to risk management, the international standard ISO/ DIS 31000 consists of a framework of essential components to help ensure that risk is managed effectively and coherently. Within the process of risk management is risk assessment; the overall process of risk identification, risk analysis, and risk evaluation. Identify any risks that may enhance, prevent, degrade or delay the mass gathering, including whether or not their source is under control. Identifying what might happen is the fundamental risk assessment for the mass gathering. It is built on four questions: 1. What are the existing health risks within a certain population (and will they be affected, for better or worse, by a mass gathering)? 2. What health risks might be imported during a mass gathering? 3. What health risks might be exported from the host country after the mass gathering? 4. Are there any particular risks from terrorism? Risk assessments need input from all stakeholders involved in planning health measures, including the international community, and often from

[7] Compare: Risk vs Threat vs Vulnerability – and Why You Should Know the Differences, by: Pinkerton on October 16, 2014 in All Posts, available at: http://www.pinkerton.com/blog/risk-vulnerability-threat-differences

[8] See: PULSE D.5.1 chapter 4.1.1.1 – Intelligence and Information Gathering,

- Risk communication.

Above components are embedded in a sequenced process, in which all elements are accompanied by corresponding risk communication with both, stakeholders and the public.

Threat & Risk Components

While Risk asessment provides information based on the analysis of data which describe the form, magnitude, and characteristics of a risk, i.e. the likelihood of harm to humans, risk management is about taking measures based on risk assessment and considerations of a legal, political, social, economic, and engineering nature.

Threat and risk analysis is not an end in itself. In order to ensure a rapid and effective response to a wide range of emergencies, early warning and alert must follow in its wake.

Nations[9], the European Commission (EWRS[10]) and the WHO (GOARN[11])

those outside the health sector as well. Each responsible authority should contribute and collaborate on the risk assessment of other areas. Likewise, these need to be shared across agencies in case they have an impact on the on-going risk assessment process. It is important to involve other organizations and understand their different roles, for example:

• Public health agencies are responsible for preventing or minimizing the risk of injury or illness and maximizing safety for participants, spectators, event staff and volunteers, and residents
• Law enforcement agencies are responsible for ensuring law and order and preventing criminal and terrorist activity
• Event organizers are responsible for ensuring that an event is successfully held and they may also have financial obligations to meet.

Public health needs will be determined on the basis of the results of the strategic risk assessment for a mass gathering event. This is undertaken before the event and requires a thorough examination of potential threats: a threat assessment and a set of standardized questions, which help identify the risks to different groups. In addition to strategic risk assessments a system for case-based rapid risk assessment will be required if a significant health event is detected, from the initial alert throughout the duration of response. If an outbreak occurs, and once its aetiology is known, further refinement of the risk assessment may be required

Strategic risk assessment
Strategic risk assessment identifies health risks and determines realistic goals for reducing their impact. Mass gathering events may cause an

[9] Example Germany: German Emergency Preparedness Information System (deNIS), the satellite based Modular Warning and Alerting System (MoWAS) and the Emergency Information Application (NINA), http://www.bbk.bund.de
[10] ECDC – European Warning and Response System, https://ewrs.ecdc.europa.eu
[11] WHO – Global Outbreak Alert and Reponse Network, http://www.who.int/ihr/alert_and_response/outbreak-network/en/

have installed and operate early warning and response systems used in the context of communicable diseases threats. These systems regulate procedures for reporting and interfacing with each other, also providing scientific advice and risk assessment by operating informatics tools[12]. The purpose of this chapter is to provide guidance ▪ To identify, acquire and use the information needed to assess communicable diseases, transmission paths, disease propagation and spread, and corresponding health risks in their given health risk assessment contexts including public information, and To the utilization of and integration into warning and alerting systems at local, national and/or international levels.	increase in the level of existing risks, or they may pose entirely new risks. The public health risk should be identified and assessed in relation to how the mass gathering event will affect the probability of these diseases occurring and spreading in the host area and bordering regions. In addition to the public health risks it is important to also undertake an analysis of strengths and vulnerabilities in existing health systems, including surveillance and response systems, and medical services and hospital systems. **Risk identification** This is the process of identifying known or potential hazards for a mass gathering event. This should include: • Context - type of event, • Demographics - participants and / or spectators, both host country and visitors, • Normal incidence of public health risks in the host community, including communicable diseases, • Environmental factors such as location, access and temperature, • Potential importation and / or exportation of communicable diseases, • Event additionality required for host country systems / processes, • Political and / or media interest. **Risk characterization** A systematic characterization of the identified threats and vulnerabilities will help public health authorities and responsible officials to prioritize risks that require mitigation and to plan public health measures. This is a qualitative assessment of the threats identified based on expert opinion and public health practitioners. This includes: • Are current controls and mitigation measures sufficient or do they need to

[12] such as TESSy, http://ecdc.europa.eu/en/activities/surveillance/Pages/index.aspx

	be enhanced for a mass gathering event. • What conditions should be a priority for prevention, surveillance and treatment. • Have the assumptions been evaluated and assessed. The level of risk for each factor is a function of two variables: the probability of a threat occurring and the consequences (impact) of that event. Once the risks have been mapped on the risk matrix, the objective of public health planning for the mass gathering will be to reduce the likelihood of a threat occurring and to reduce the consequences of each threat: risk management. **Risk management** This identifies what mitigation measures can be put into place to manage the risk and reduce either the probability or impact. Based on the risk evaluation, options should be determined for treating each risk. These could include initiating new surveillance programmes for early identification of disease, implementing a range of special prevention programmes to reduce the risk of food-borne, waterborne, airborne and person-to-person spread of diseases, and developing plans for immediate acquisition of additional human and material resources should a crisis occur.

4.2.2 Implications for PULSE

SARS	Stadium
Acquisition of information appropriate to a scenario of interest prepared by international and national organizations providing rapid access to information on infectious diseases, exposures and risks; is a fundamental challenge in risk assessment because countless sources of such information can be readily found through literature searches. Electronic tools could be extremely useful in structuring and organizing this search, facilitating and expediting risk assessment and informed decision making. Although science is involved, risk management is dependent on additional technical, social or economic information, which PULSE tools could provide interfaces to. In situations of emergency the public no longer automatically acquiesces to authority nowadays, unless public information leaves out-dated tracks and offers a greater role in decision-making to the public concerned. Attributes of contemporary risk communication should include: ▪ Provision of information when science is uncertain. ▪ Explanation of the risk assessment process. ▪ Incorporation of the differing ways that various groups interpret the science into risk communication strategies. ▪ Accounting for differing concepts of an 'acceptable' level of risk. ▪ Provision of information that assists in personal decisions and informs opinions on policy."[13]	Acquisition of information appropriate to a scenario of interest prepared by international and national organizations providing rapid access to information on infectious diseases, exposures and risks; is a fundamental challenge in risk assessment because countless sources of such information can be readily found through literature searches. Electronic tools could be extremely useful in structuring and organizing this search, facilitating and expediting risk assessment and informed decision making. Although science is involved, risk management is dependent on additional technical, social or economic information, which PULSE tools could provide interfaces to. In situations of emergency the public no longer automatically acquiesces to authority nowadays, unless public information leaves out-dated tracks and offers a greater role in decision-making to the public concerned. Attributes of contemporary risk communication should include: ▪ Provision of information when science is uncertain. ▪ Explanation of the risk assessment process. ▪ Incorporation of the differing ways that various groups interpret the science into risk communication strategies. ▪ Accounting for differing concepts of an 'acceptable' level of risk. ▪ Provision of information that assists in personal decisions and informs opinions on policy. "[14] PULSE could offer help functions in explaining above attributes, providing

[13] Sue Lang, et al., Risk Communication, www.who.int/water_sanitation_health/dwq/iwachap14.pdf, page 318.
[14] Sue Lang, et al., Risk Communication, www.who.int/water_sanitation_health/dwq/iwachap14.pdf, page 318.

PULSE could offer help functions in explaining above attributes, providing portals to required information, describing processes or help addressing different target groups.	portals to required information, describing processes or help addressing different target groups.

4.2.3 PULSE guidelines for threat and risk analysis; warning & alerting

SARS	**Stadium**
▪ Assistance with conducting risk assessments by: - Outlining the sequence of steps for a risk assessment, - Identifying information that must be gathered for the assessment, - Providing references, including electronic links to risk assessment information and data published by national and international organizations/authorities, - Structuring and streamlining the multitude of information and information sources for ease and effectiveness of access, ▪ Integrating data published by national and international organizations and supplementary technical, social or economic information as it becomes available or is provided to PULSE. ▪ Guiding authorities in the conduct of threat & risk communication by: - Proposing methodical notes for emergency communication and best practices, - Offering a structure for the planning phase for emergency communication, - Suggesting a template for communication with the media and	▪ Assistance with conducting risk assessments by: - Outlining the sequence of steps for a risk assessment, - Identifying information that must be gathered for the assessment, - Providing references, including electronic links to risk assessment information and data published by national and international organizations/authorities, - Structuring and streamlining the multitude of information and information sources for ease and effectiveness of access, ▪ Proposing links and access to additional technical, social or economic information in support of the risk management process. ▪ Guiding authorities in the conduct of contemporary threat & risk communication by: - Identifying emergency communication essentials and best practices, - Structuring the planning phase for emergency communication, - Help developing a public information strategy, using the mass

the public.[15] ▪ Warning/Alerting: - In reaction to WHO/ECDC warnings/alerts facilitate exchange of situational reports and data for decision-making as far as necessary in real-time, - Providing information to and retrieving information from existing national and international warning and alerting systems and respective applications for issuance of timely warnings/alerts. In the event of going beyond PULSE, more comprehensively composed guidelines above need to be considered to the extent feasible under the current status/capability of PULSE tools. In particular this relates to: - Assistance with conducting risk assessment for which the tools and means can be provided by PULSE but content has to be populated by the user, - Information provided by PULSE need to be integrated in the tools beforehand, - The provision of an interface to push external warning/alerting information to PULSE is the actual functionality.	media and social networks.[16]

[15] See: WHO "Outbreak Communication – Best Practices for Communicating with the Public during an Outbreak", 2005. http://www.who.int/csr/resources/publications/WHO_CDS_2005_32web.pdf

[16] See: WHO "Outbreak Communication – Best Practices for Communicating with the Public during an Outbreak", 2005. http://www.who.int/csr/resources/publications/WHO_CDS_2005_32web.pdf

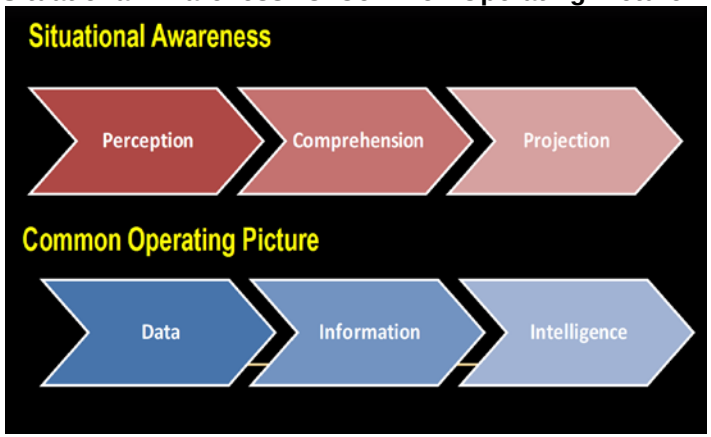
4.3 Operational picture generation and situation assessment

4.3.1 Overview of best practice

SARS	Stadium
„Effective emergency management and incident response activities rely on flexible communications and information systems that provide a common operating picture to emergency management personnel and their affiliated organizations.“[17] In other words, COP[18] is the key communication and information management element. It provides an overview and information of an incident or a series of incidents created by gathering and collating data and information from the public, from media, stakeholders, organisations and authorities. Resulting from analysed information shared intelligence enable the direction of effective response, to manage assets, to obtain situational awareness, and to generate requests for additional resources. Situational assessment is a snapshot or illustration of a present situation in a given environment, which is required to plan for future activities. Situational Assessment is a process based on the knowledge situational awareness generates. In this context, COP and situational awareness are closely dependent on each other.	„Effective emergency management and incident response activities rely on flexible communications and information systems that provide a common operating picture to emergency management personnel and their affiliated organizations.“[21] In other words, COP[22] is the key communication and information management element. It provides an overview and information of an incident or a series of incidents created by gathering and collating data and information from the public, from media, stakeholders, organisations and authorities. Resulting from analysed information shared intelligence enable the direction of effective response, to manage assets, to obtain situational awareness, and to generate requests for additional resources. Situational assessment is a snapshot or illustration of a present situation in a given environment, which is required to plan for future activities. Situational Assessment is a process based on the knowledge situational awareness generates. In this context, COP and situational awareness are closely dependent on each other.

[17] US Department of Homeland Security, „National Incident Management System, December 2008, page 23. http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf
[18] Common Operational Picture
[21] US Department of Homeland Security, „National Incident Management System, December 2008, page 23. http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf
[22] Common Operational Picture

Situational Awareness vs. Common Operating Picture[19]

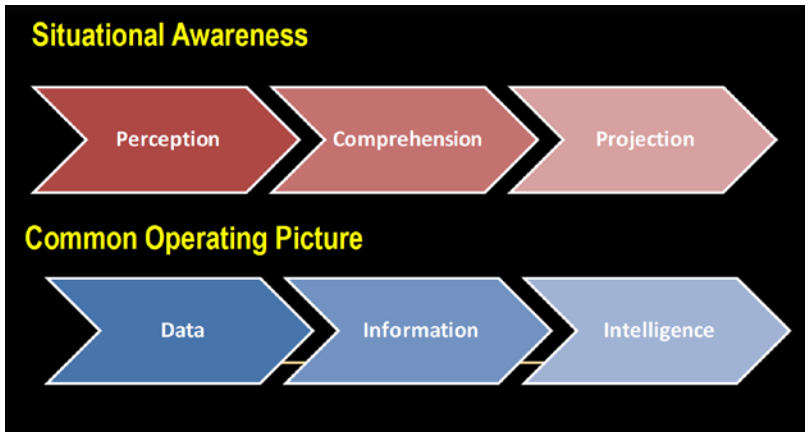


The elements of situational awareness portrayed address:

- Perception of elements in the environment within a volume of time and space,
- Comprehension of their meaning, and
- The projection of their status into the near future.[20]

The purpose of this chapter is to put medical support into the perspective of an integrated system for communication, information management, intelligence and information sharing, and to establish requirements and guidelines for the integration of PULSE and the contribution it can offer to a comprehensive common operating picture system.

Situational Awareness vs. Common Operating Picture[23]



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[19] Graph adopted from: McCain, Mark H., „Foundations of Situational Awareness and Common Operating Picture", http://www.chathamemergency.org/2015-hurricane-conference-pres.php
[20] Ibid.
[23] Graph adopted from: McCain, Mark H., „Foundations of Situational Awareness and Common Operating Picture", http://www.chathamemergency.org/2015-hurricane-conference-pres.php
[24] Ibid.

4.3.2 Implications for PULSE

SARS	Stadium
No matter what is the actual cause of a major emergency, medical support is a crucial pillar of response. Consequently, its functionality is integrated in any common operating picture that serves to ▪ Enhance real-time communication and instant messaging, ▪ Establish channels for information sharing, ▪ Identify and process critical information requirements, ▪ Coordinate response priorities, ▪ Improve resource management, ▪ Capture mission relevant documents in a library, and ▪ Share relevant and vetted official information with all levels of administration and the public/private sector. In consequence, PULSE-supported common operating picture displays the same information about the emergency and its health impact and consequences, ▪ Including the availability and location of medical/health resources, personnel, facilities, and equipment, and ▪ The status of requests for assistance/support.	No matter what is the actual cause of a major emergency, medical support is a crucial pillar of response. Consequently, its functionality is integrated in any common operating picture that serves to: ▪ Enhance real-time communication and instant messaging, ▪ Establish channels for information sharing, ▪ Identify and process critical information requirements, ▪ Coordinate response priorities, ▪ Improve resource management, ▪ Capture mission relevant documents in a library, and ▪ Share relevant and vetted official information with all levels of administration and the public/private sector. In consequence, PULSE-supported common operating picture displays the same information about the emergency and its health impact and consequences, ▪ Including the availability and location of medical/health resources, personnel, facilities, and equipment, and ▪ The status of requests for assistance/support.

4.3.3 PULSE guidelines for operational picture generation and situation assessment

SARS	Stadium
Aiming at a single set of relevant, usable information that is shared across	Aiming at a single set of relevant, usable information that is shared across

medical/health responder at all levels and with other response entities as required, PULSE is to: ▪ Continuously contribute and share data and information throughout a major emergency's life cycle. ▪ Retrieve and make available for review incident related information and intelligence provided by non-medical responders to build and maintain a medical/health related operational picture. ▪ Maintain a chronological log of the sequence and series of decisions taken and activities happened and their respective space and/or location. ▪ Document assessments, decisions, orders, tasks, reports, resources statuses and respective requirements relevant to medical support and health. ▪ List informational items required for continuous assessment (EEI - Essential Element of Information, in this context EEMI -Essential Element of Medical Information). ▪ Allows users to search for medical data/information. ▪ Facilitate the sharing of information and intelligence. ▪ Support building relationships to and utilizing multiple feeds and multiple sources, at least a selection of: the public, and responders and their parent organizations, public/private partnerships, NGOs, and different levels of administration. ▪ Make available accurate and releasable information for public information purposes. ▪ Support the exportability to hand-held devices. ▪ Provide medical/health related information and data for training and operational support. In the event of going beyond PULSE[25], more comprehensively composed guidelines above need to be considered to the extent that they are feasible	response organisations at all levels including medical/health responders, PULSE is to: ▪ Continuously contribute and share data and information throughout a major emergency's life cycle. ▪ Retrieve and make available for review information and intelligence provided by other users to build and maintain a medical/health related operating picture. ▪ Maintain a chronological log of the sequence and series of decisions taken and activities happened and their respective space and/or location. ▪ Document assessments, decisions, orders, tasks, reports, resources statuses and respective requirements relevant to medical support and health. ▪ List and adjust informational items required for continuous assessment (EEI -Essential Element of Information, in this context EEMI -Essential Element of Medical Information). ▪ Allows users to search for relevant medical data/information. ▪ Facilitate the sharing of information and intelligence both ways. ▪ Support building relationships to and utilizing multiple feeds and multiple sources including the public, responders and their parent organizations, public/private partnerships, NGOs, and all levels of administration. ▪ Make available accurate and releasable information for public information purposes. ▪ Support the exportability to hand-held devices, and instituting above PULSE functionality there is a need for: ▪ Agreed interagency conventions, processes, standards and interoperability.

[25] should also be regarded in the PULSE exploitation strategy

under the current status/capability of PULSE tools. In particular this relates to: ▪ Instituting agreed interagency conventions, processes, standards and interoperability beyond current PULSE functionality, ▪ The definition of relationships between medical/health responders across national and international levels. ▪ The requirement to address the range of affected stakeholders beyond the immediate medical/health environment as currently planned.	

4.4 Task and resource planning

4.4.1 Overview of best practice

SARS	Stadium
National emergency operations planning comprehensively deals with mass casualty events in most cases. Because of the complexity created by the wide range of organizations involved in the case of major emergencies the various national response systems implemented are based on a structured framework used by first responders including EMS agencies, by law enforcement authorities, and other stakeholders as they become available. Some entities are under national control, others remain under regional or local purview. Some are public, others are private, and all have distinct organizational structures, agendas, and core missions that also could markedly differ from one another.	National emergency operations planning comprehensively deals with mass casualty events in most cases. Because of the complexity created by the wide range of organizations involved in the case of major emergencies the various national response systems implemented are based on a structured framework used by first responders including EMS agencies, by law enforcement authorities, and other stakeholders as they become available. Some entities are under national control, others remain under regional or local purview. Some are public, others are private, and all have distinct organizational structures, agendas, and core missions that also could markedly differ from one another.
Organized hierarchically the respective framework approaches establish responsibilities, lines of authority, span of control, management of resources, and defined paths for information flow.	Organized hierarchically the respective framework approaches establish responsibilities, lines of authority, span of control, management of resources, and defined paths for information flow.
Structure and key considerations of such frameworks are also applicable to major emergencies concerning pandemics. Compared to a mass casualty event, however, in a pandemic scenario the health sector including the entire medical chain from EMS up to and including post-rehabilitation support is the prime stakeholder, also covered in separate complementary national pandemic plans.[26]	The purpose of this chapter is the identification of the contribution PULSE could offer in this multi-dimensional collaborative planning process involving the whole range of stakeholders at different levels of response and administration, and to locate the links and interfaces PULSE could utilize to deliver its services.
In coping with the aspects of a pandemic, PULSE is to support decision	

[26] ECDC – “Influenza Pandemic Preparedness Plans”, updated 18 March 2014, file:///Users/apple/Documents/PULSE/ECDC/Influenza%20pandemic%20preparedness%20plans.webarchive

making during the preparedness and response phases[27]. The purpose of this chapter is the identification of the contribution PULSE could offer in this multi-dimensional collaborative planning process involving the whole range of stakeholders at different levels of response and administration, and to locate the links and interfaces PULSE could utilize to deliver its services.	

4.4.2 Implications for PULSE

SARS	**Stadium**
To offer a credible planning support to decision making, collaborative planning functions and the respective national planning context must be reviewed and examined to determine the appropriate gateway for PULSE capabilities. This effort also includes inherent support functions to the various existing planning techniques as well as concomitant procedures such as information management and communication. **Collaborative Planning** Deliberate or advanced planning is based on anticipated situations ahead of an actual crisis. It is used to develop campaign and contingency plans for a broad range of emergencies and it facilitates information sharing among the stakeholders engaged in the joint planning effort. In a crisis or time-sensitive situation, emergency management authorities review previously prepared plans for suitability and convert them into case-specific and executable operations directions/procedures or develop such orders from scratch when no	To offer a credible planning support to decision making, collaborative planning functions and the respective national planning context must be reviewed and examined to determine the appropriate gateway for PULSE capabilities. This effort also includes inherent support functions to the various existing planning techniques as well as concomitant procedures such as information management and communication. **Collaborative Planning** Deliberate or advanced planning is based on anticipated situations ahead of an actual crisis. It is used to develop campaign and contingency plans for a broad range of emergencies and it facilitates information sharing among the stakeholders engaged in the joint planning effort. In a crisis or time-sensitive situation, emergency management authorities review previously prepared plans for suitability and convert them into case-specific and executable operations directions/procedures or develop such orders from scratch when no

[27] See: PULSE D.2.1 „Requirements Specification“, page 12.

useful contingency or campaign plan exist.[28]

Collaborative Planning Functions

PLANNING CATEGORIES	DELIBERATE/ADVANCED PLANNING	CRISIS ACTION PLANNING
CRISIS CONTEXT	OUTSIDE	FAST-BREAKING
CONTENT	PLANNING	EXECUTION
OUTPUT	CAMPAIGN/CONTINGENCY PLAN	OPERATIONS ORDER
ASSETS & RESOURCES	APPORTIONMENT	ALLOCATION
COORDINATION	INTERAGENCY INTERORGANIZATIONAL MULTINATIONAL INTERNATIONAL	INTRA-STAKEHOLDER

Planning Context

Aiming at managing the incident and mitigating the effects to the extent possible, First Responders including EMS, health care facilities and appropriate emergency management authorities begin to deal with the incident(s) at local level initially.

When scale and nature require a higher, more robust and more time-consuming level of response, regional authorities are called into action

useful contingency or campaign plan exist.[31]

Collaborative Planning Functions

PLANNING CATEGORIES	DELIBERATE/ADVANCED PLANNING	CRISIS ACTION PLANNING
CRISIS CONTEXT	OUTSIDE	FAST-BREAKING
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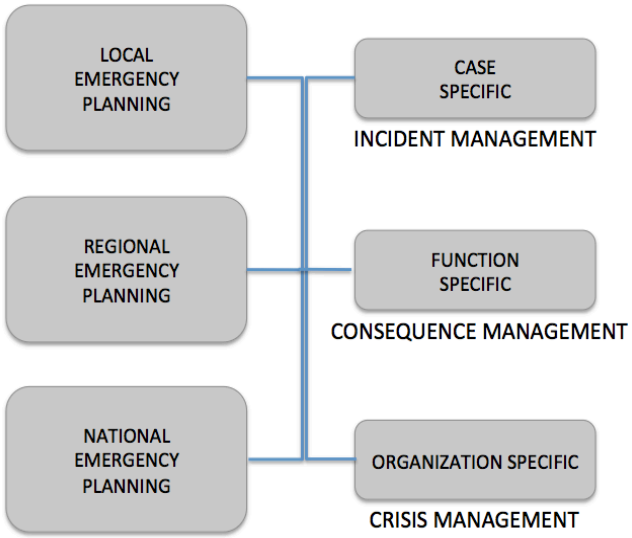
[28] Mentioned planning categories are common and best practice in the military world. Description used is adopted from:
US Armed Forces Joint Publication JP 5-0, „Strategic Direction and Joint Operation Planning“, page II-23 - 28.

[31] Mentioned planning categories are common and best practice in the military world. Description used is adopted from: US Armed Forces Joint Publication JP 5-0, „Strategic Direction and Joint Operation Planning“, page II-23 - 28.

providing additional resources and co-ordination for managing the consequences of the incident. In case the incident demands the management of an ensuing crisis and the intervention at higher levels and/or is of international significance, national authorities are taking action identifying „ ... what must be done by whom, with what authority.“[29] In consequence, national preparedness should be based on a tiered approach as depicted in Figure 2. **Context of Emergency Planning**	consuming level of response, regional authorities are called into action providing additional resources and co-ordination for managing the consequences of the incident. In case the incident demands the management of an ensuing crisis and the intervention at higher levels and/or is of international significance, national authorities are taking action identifying „ ... what must be done by whom, with what authority.“[32] In consequence, national preparedness should be based on a tiered approach as depicted in Figure . **Context of Emergency Planning**

[29] Compare: WHO, „Mass Casualty Management Systems – Strategies and Guidelines for building Health Sector Capacity“, April 2007, page 17. http://www.who.int/hac/techguidance/tools/mcm_guidelines_en.pdf

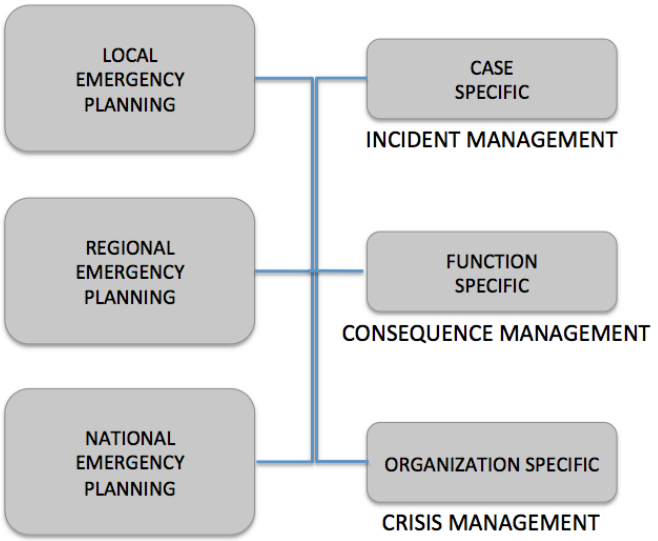
[32] Compare: WHO, „Mass Casualty Management Systems – Strategies and Guidelines for building Health Sector Capacity“, April 2007, page 17. http://www.who.int/hac/techguidance/tools/mcm_guidelines_en.pdf



Operational Planning

In principle, any operational planning process is a structured and disciplined process conducted step-wise, as below graph portrays. The process is time-consuming, requires specialized staff support, is based on procedures to limit time spent for exchanging information, and relies on commonly accepted intermediate planning products, formats and templates. As an exception from the rule, an abbreviated process is feasible.

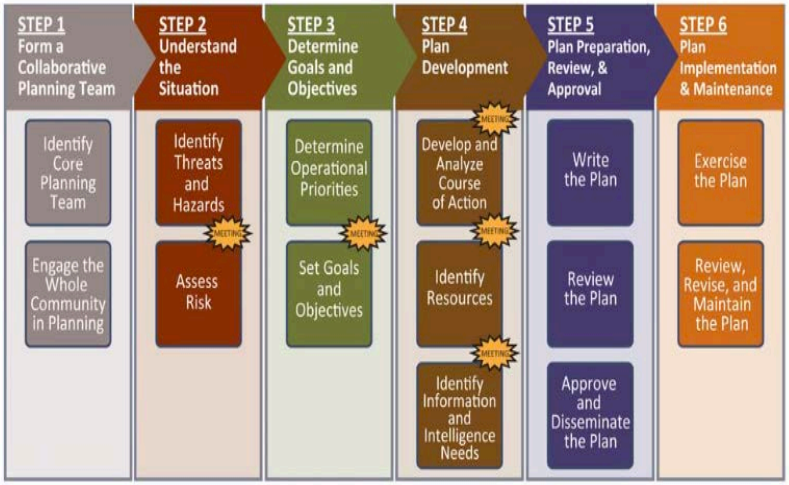
Planning Steps



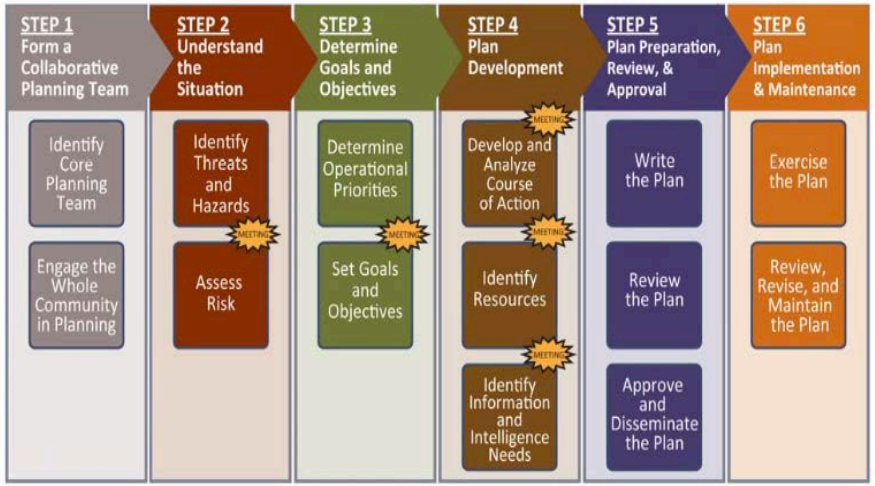
Operational Planning

In principle, any operational planning process is a structured and disciplined process conducted step-wise, as below graph (Figure 2) portrays. The process is time-consuming, requires specialized staff support, is based on procedures to limit time spent for exchanging information, and relies on commonly accepted intermediate planning products, formats and templates. As an exception from the rule, an abbreviated process is feasible.

Planning Steps



Above graph is adopted from a US/FEMA source and seems to be the most comprehensive document on emergency operational planning. It lends itself as a reference document for the detailed planning process. [30]



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[30] Copied from: US Department of Homeland Security/FEMA – „Developing and Maintaining Emergency Operations Plans“, https://www.fema.gov/media-library-data/20130726-1828-25045-0014/cpg_101_comprehensive_preparedness_guide_developing_and_maintaining_emergency_operations_plans_2010.pdf

[33] Copied from: US Department of Homeland Security/FEMA – „Developing and Maintaining Emergency Operations Plans“, https://www.fema.gov/media-library-data/20130726-1828-25045-0014/cpg_101_comprehensive_preparedness_guide_developing_and_maintaining_emergency_operations_plans_2010.pdf

4.4.3 PULSE guidelines for task and resource planning

SARS	Stadium
▪ Differentiation between pre-event advanced planning options and crisis action planning, description of the different planning steps, respective functions and products of planning, and identifying when and in what phase/step input regarding medical/health support is required ▪ Proposing planning formats & templates (maybe in SARS only suggestions). ▪ Identifying medical/health personnel, equipment, facilities, and other resources available at the different levels, and identifying requirement procedures. ▪ planning of stocks and distribution of medical supplies (Vaccines, antidotes, medication,...) ▪ Listing authorities and stakeholders engaged in emergency operation activities and applicable references. ▪ Continuously offering PULSE contribution to the planning processes on local, regional and national levels and utilizing respective interfaces. ▪ Determining synthesis and dissemination of task and resources planning information and methods of conveying information. ▪ Providing interfaces for interoperation[34] with existing planning systems and instruments. In the event of going beyond PULSE, more comprehensively composed guidelines above need to be considered to the extent feasible under the current status/capability of PULSE tools. In particular this relates to:	▪ Differentiation between deliberate/advanced planning and crisis action planning, and description and instrumentation of the steps, functions and products of the operational planning process of both approaches. ▪ Proposing planning formats and offering planning templates. ▪ Identifying medical/health personnel, equipment, facilities, and other resources available at the different levels, and identifying requirement procedures. ▪ Listing authorities and stakeholders engaged in emergency operation activities and applicable references. ▪ Constantly integrating PULSE into the planning process on local, regional and national levels and utilizing respective interfaces. ▪ Determining information management (synthesis and dissemination of planning information) and methods of conveying information (communication). ▪ Ensuring compatibility and interoperability with existing planning systems and instruments.

[34] This is probably the maximum PULSE will achieve. A discussion of interoperability principle and ENISA references is given in Annex 3

▪ PULSE not recognizing and breaking down the different planning procedures, ▪ PULSE not offering planning templates in the SARS scenario, ▪ PULSE currently not ensuring compatibility with existing planning systems and instruments.	

4.5 Training and exercising capability

4.5.1 Overview of best practice

SARS	Stadium
Training educates and qualifies people. Exercises test procedures. Combined, both aim to ensure that all organisations and authorities, including their respective staff, are fully prepared for emergencies by practising and testing all elements of emergency plans. In short, training and exercising serves the following purposes: ▪ To practice and develop individual and staff competencies, ▪ To validate plans, and ▪ To test established procedures and resources. Ranging across training courses, discussion-based forums, table-top and live exercises, the following training or exercise types are instrumental to shaping emergency preparedness: ▪ Orientation (familiarization), ▪ Drill (specific skills),	All involved in delivering mass gathering events need to ensure that training and exercises are included in the planning process. The T&E programme should include testing the plans, procedures, systems as well as the personnel skills, knowledge and expertise required to deliver them. T&E is routinely included in emergency planning and preparedness; for mass gathering events this should be expanded to cover normal daily operations and current practices, for example: • Standard T&E emergency planning and response arrangements within and across health organizations. • Routine response plans e.g. emergency response. • Experience of responding to disasters or major incidents; their learning from these should feed into the mass gathering event planning and exercise programme. T&E can be designed as table-top, functional, or full-scale exercises or drills.

▪ Table-top (refining procedures and plans), ▪ Functional (simulated, engaging stakeholders), ▪ Full-scale/live (engaging communities, operational capabilities, internal & external communication/coordination/cooperation).[35] Starting point for structured and focused training and exercising is the determination of operational needs such as: ▪ Emergency management functions, ▪ Related responsibilities and activities, ▪ Covering different incident's size and/or complexity. Translating these operational needs into target audience specific core competencies, training and exercising revolves around it.	T&E should be an on-going process in the build-up to the event and inform changes to the plans, creating an iterative and dynamic plan that is reviewed and updated by the recommendations from the exercises. The process should include an evaluation and learning element and should be started early enough to allow any lessons identified to be applied and challenged. It is important that the T&E programme reflects and provides assurance on one or more core components of the planning and operational delivery, including: • Increased demands: testing new or additional roles, organizations, capabilities and structures that are required to service the exceptional demands. • Roles and responsibilities: testing whether people understand their roles and reporting arrangements within and between organizations. • Integration across stakeholders: these include the potentially very broad group of stakeholders that could be involved. • ConOps: testing whether these are defined, in place and tested, both internally and across organizations. Lessons learned need to be embedded. • Communications: testing information flow and reporting processes. • Event systems: test these have been established and information and intelligence flows work. • Resilience: testing the capacity to meet event commitments, provide emergency response and support regular operations to non-event-associated incidents. • Breadth of incidents that could happen associated with the event; the

[35] Basic medical training is not in the scope of this project and is not covered in this chapter consequently.

	majority of these will have some public health impact e.g. a major transport problem may include inhalation of smoke or chemicals or people stuck in old and poorly ventilated tunnels. **Deliberate events and emergency response** Deliberate events should be explicitly considered, in particular for mass gathering events that are perceived to be of higher risk e.g. religious festivals, major international sport events, and for those host countries, which have a recognized risk of terrorism. Many countries will already have plans and T&E programmes associated with deliberate events and major incidents. However, these should be reviewed, revised and tested specifically with the mass gathering difference, including international arrangements

4.5.2 Implications for PULSE

SARS	Stadium
For PULSE to appropriately cover and support training and exercising, a sequence of goals, objectives, and other action items facilitate the development of a programme or framework which addresses: ▪ Professional medical/health responder, ▪ Health officials at different levels of administration, and ▪ Non-medical stakeholders integrated into medical support activities. Integrating lessons learned from real incidents, earlier T&E evolutions and best practices identified, this programme or framework also integrates the segment of medical support into the overall construct of emergency response and in addition it should consider the implied management of training and exercising resources itself. Clearly identifying the target audience, core competencies provide the fundamental basis of collective learning and exercising, and help ensure consistent application and translation of knowledge into practice. A hierarchical learning framework of competency sets in disaster medicine and public health presented below is adopted from the US source [36] referred to in the footnote. The structure it displays in principle has universal application and may lend itself as an example. The organizations and agencies depicted, including the work force of health professionals employed there, are examples of professional groups in the US that would	By its nature, the PULSE T&E programme will take place before the mass gathering event and should be an iterative learning process with each exercise informing improvements in the planning and delivery of a mass gathering event. The PULSE Exercises tools should have the capacity to address and assess: • Notification of a public health event. • Response to a public health event. • Communications between agencies / partners. • Internal notifications. • Procuring methods for required services. • Collection, use and disclosure of information. • Media relations. • Contingency plans. • Identification of operational issues. The goal of the PULSE exercise tool should: • Bring together those involved, inform and motivate staff, assess performance and identify training needs. • Assess whether there is a competent workforce able to deliver and meet their responsibilities and assess whether they have the capacity to function during the event and / or an emergency.

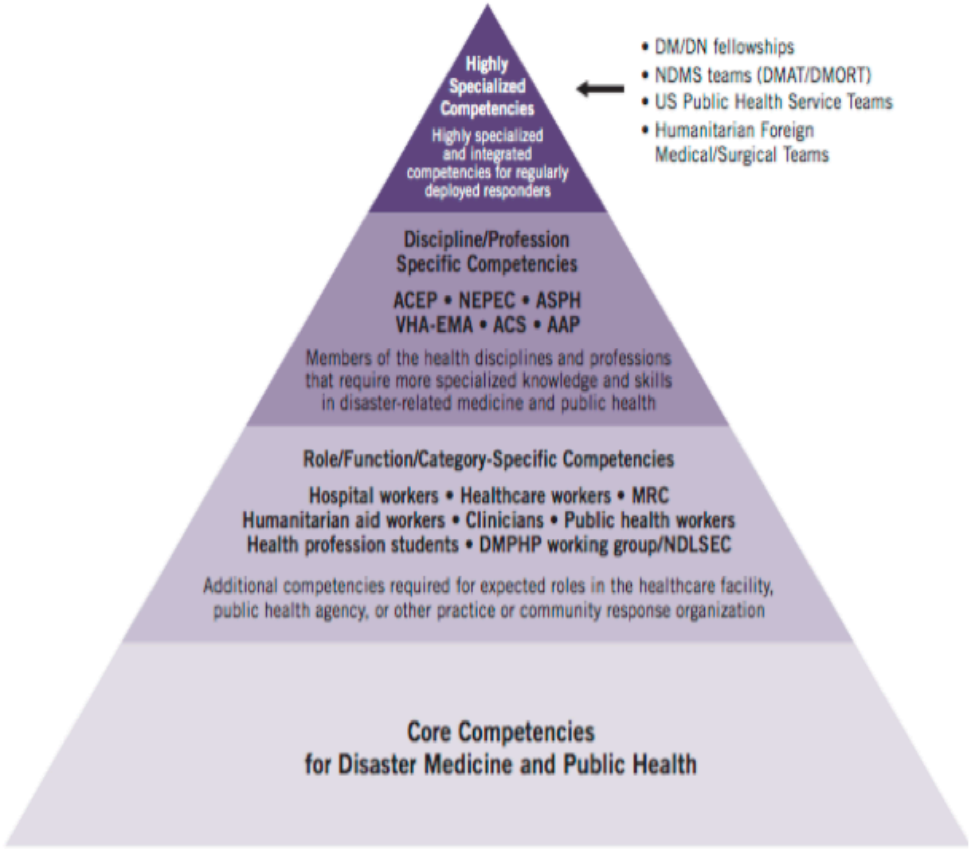
[36] Lauran Walsh, et al., „Core Competencies for Disaster Medicine and Public Health“, In: Disaster Medicine and Health Preparedness, Vol. 6/NO.1, 2012, page 46. https://ncdmph.usuhs.edu/Documents/Core-Competencies.pdf

be involved at each level of the multi-tiered learning framework. The four levels depicted in the Figure are meant as a " … useful starting point for delineating competency levels of health professionals … (in disaster management and public health) … as correlated with their expected role in a disaster."[37] An effective T&E construct developed and implemented by PULSE, which considers the different audiences, would have to factor in a similar breakdown of competency sets, which become more specialised from the base to the tip of the pyramid.	• Assess the decision-making and communication skills of both individuals and organizations to respond to the mass gathering event during an emergencies. •Test the ConOps (and / or emergency response plans). • Include a rapid debrief process to identify lessons and recommendations. This will ensure a rapid response to learning from exercises. • Ensure that these lessons have been embedded and are addressed in the planning. **Scenarios** The public health risks identified during the mass gathering event risk assessment should inform the scenarios used during the T&E programme. These risks scenarios should also include those incidents that occur frequently such as food-borne disease outbreaks to help stakeholders understand typical operations. There can also be an opportunity to raise awareness of more unusual incidents that may cause disproportionate concern if occurring during the mass gathering event but have a limited risk. **The learning process** After the PULSE exercise tools are completed/concluded, the strengths and weaknesses should be identified in an after-action report, together with an improvement plan, which outlines the actions the relevant author(s) will take to address issues. This plan outlines the recommendations, actions and the parties responsible for implementing them. Examples of possible recommendations include updates to existing plans, policies, procedures, protocols, systems, equipment, training, and facilities. **After the event** There can be a recognizable benefit and legacy from the PULSE T&E programme through improved working practices and the understanding of

[37] Ibid.

	roles and responsibilities across stakeholders and within organizations. It can also potentially improve emergency response arrangements. For those involved in smaller events, there can also be a benefit through further building relationships, networking and an understanding of other agencies' roles and responsibilities.

Figure: Core Competencies for Disaster Medicine and Public Health



As an example the competence set for ‚Health Officials' could amount to:

- Preparedness for major emergencies,
- Knowledge of response plans,
- Demonstration of situational awareness,
- Effective Communication with the public,
- Knowledge of personal safety measures,
- Knowledge of surge capacity assets,
- Knowledge of principles and practices for clinical management,
- Knowledge of public health principles and
- practices,
- Knowledge of ethical and legal principles,

AAP – American Academy of Pediatrics / ACEP – American College of Emergency Physicians / ACS – American College of Surgeons / ASPH – Association of Schools of Public Health / NEPEC – Nursing Emergency Preparedness Education Coalition / NDMS – National Disaster Medical System / DM/DN – Disaster Medicine/Nursing / MRC – Medical Reserve Corps / NDLSEC – National Disaster Life Support Education Consortium / DMPHP – Disaster Medicine and Public Health Preparedness

4.5.3 PULSE guidelines for training and exercising capability

SARS	Stadium
To facilitate preparedness for a spectrum of major emergencies, PULSE T&E programme needs to consider: ▪ Identification of exercise and training audiences, ▪ Deduction of respective core competencies, ▪ Development of a structured training programme ranging from directed reading to formal training opportunities including those on national and international level, ▪ Instituting e-learning formats and virtual exercise events facilitating multiple-role play ▪ Documenting scenario data, exercise templates and examples, ▪ Providing lessons learned and best practices, ▪ Promoting a planning module which includes the management of T&E resources. In order to formalize above considerations they need to be captured and maintained either in informative guidance documents or preferably in a more comprehensive T&E Framework. [38] The above guidelines shall be considered to the extent feasible under the current status/capability of PULSE tools. This relates to the linking of external T&E resources in particular where these resources must conform to	To facilitate full preparedness for all types of major emergencies, PULSE T&E programme needs to consider: ▪ Identification of exercise and training audiences. ▪ Deduction of respective core competencies. ▪ Development of a structured training programme based on established standards ranging from directed reading to formal training opportunities including those on national and international level. ▪ Instituting e-learning formats and virtual exercise events facilitating multiple-role play. ▪ Documenting scenario data, exercise templates and examples. ▪ Providing lessons learned and best practices. ▪ Integrating considerations on T&E resources. In order to formalize above considerations they need to be captured and maintained either in informative guidance documents or preferably in a more comprehensive T&E Framework. [39]

[38] As an example see: Gov.UK, „Emergency Planning and Preapredness: Exercises and Training“, up-dated 11 November 2014, https://www.gov.uk/guidance/emergency-planning-and-preparedness-exercises-and-training

[39] As an example see: Gov.UK, „Emergency Planning and Preapredness: Exercises and Training“, up-dated 11 November 2014, https://www.gov.uk/guidance/emergency-planning-and-preparedness-exercises-and-training

emerging advanced distributed training open standards. ### Supplementary Considerations for PULSE (SARS) The provision of a comprehensive Learning Management System provides the capability of the delivery of a structured training programme on an individual basis for a range of decision makers and related roles. The PULSE training courses are either delivered through the open standard SCORM compliant infrastructure or as scenarios, which are deployable and executable within the PULSE custom MPORG environment (includes simulation). Feedback to support documentation and lessons learnt are provided. The PULSE training infrastructure through the use of open standards can link and integrate to external T&E resources. The key requirements is that these external system support the emerging training TinCan API/ Experience API (xAPI) for advanced distributed learning.	

4.6 Knowledge Management

4.6.1 Overview of best practice

SARS	Stadium
In general: • Knowledge is "the whole body of cognitions and skills which individuals use to solve problems"[40]. • Knowledge Management (KM) process includes all the activities that ensure the capture, retention and sharing of knowledge from/among the people that need and/or generate that Knowledge. With reference to the SARS-like emergency management, in the context of the Pulse Project, the scope of the KM process is focused on • Extracting lessons from the management of pandemic events. • Ensuring that these lessons are diffused among the European decision makers. The knowledge managed by the KM process "is a fluid mix of framed experience, contextual information, values and expert insight … taken from previous experiences of decision making that may be applied to future decision making activities with the expressed purpose of improving the organization's effectiveness"[41] It does not include the management of the data/information providing situational awareness during the actual management of a pandemic.	In general: • Knowledge is "the whole body of cognitions and skills which individuals use to solve problems"[43]. • Knowledge Management (KM) process includes all the activities that ensure the capture, retention and sharing of knowledge from/among the people that need and/or generate that Knowledge. With reference to the STADIUM scenario, in the context of the Pulse Project, the scope of the KM process is focused on • Extracting lessons from the prevention and management of local incident with many casualties during a planned mass gathering (Stadium crush-like events). • Ensuring that these lessons are diffused among the National and European decision makers. The knowledge managed by the KM process "is a fluid mix of framed experience, contextual information, values and expert insight … taken from previous experiences of decision making that may be applied to future decision making activities with the expressed purpose of improving the organization's effectiveness"[44]

[40] G. Probst, S. Raub, K. Romhardt., *Managing Knowledge: Building Blocks for Success, Wiley*, 2000
[41] rephrased from S. Otim, *A Case-Based Knowledge Management System Disaster Management: Fundamental Concepts*, Proceedings 3rd ISCRAM Conference, may 2006
[43] G. Probst, S. Raub, K. Romhardt., *Managing Knowledge: Building Blocks for Success, Wiley*, 2000
[44] rephrased from S. Otim, *A Case-Based Knowledge Management System Disaster Management: Fundamental Concepts*, Proceedings 3rd ISCRAM Conference, may 2006

More precisely, referring to three key dimensions, the **scope** of the process is • Knowledge content: know-how to manage pandemics in every WHO stage (inter-pandemic, pandemic alert, pandemic, post-pandemic) in the European and National contexts; knowledge is referred to emergency management systems (made up of processes, tools, organizational settings and relevant regulatory framework) • Knowledge sources: every previous pandemic event impacting (actually or potentially) Europe • Knowledge generators and users: people/ organizations o In charge of managing pandemics, o In charge of improving the emergency management systems, o Performing every research/academic/consulting field related to pandemic management. The Knowledge captured, retained and shared by the process may be used at least for four **purposes**: • Updating the training of decision makers, • Improving the emergency management systems, • Feeding advances in related research/academic fields, • Providing reference cases during the actual emergency management, according to the Case-Based Reasoning approach[42]. KM process includes the extraction of lessons from previous pandemics; it doesn't include the activities implementing the purposes listed above (e.g. the updating of the material to be used in the trainings).	It does not include the management of the data/information providing situational awareness during the actual management of the pre-event preparation and of the incident management. More precisely, referring to three key dimensions, the **scope** of the process is • Knowledge content: know-how to manage Stadium crush-like events, in the pre-event stage (when the event is authorized and resources are deployed to face the potential incident) in National events and cross-border events: knowledge is referred to emergency management systems (made up of processes, tools, organizational settings and relevant regulatory framework) • Knowledge sources: every previous Stadium crush-like event or exercise for the same type of event; events with peculiar (e.g. big size, novelty) characteristics (e.g. Jubilee in Rome) might also be considered, even if no incident happens • Knowledge generators and users: people/organizations o In charge of managing Stadium crush-like events, o Participants and umpires of exercises, o In charge of improving the emergency management systems, o Performing every research/academic/consulting field related to management of Stadium crush-like event. The Knowledge captured, retained and shared by the process may be used at least for four **purposes**: • Updating the training of decision makers,

[42] S.Otim, A Case-Based Knowledge Management System Disaster Management: Fundamental Concepts, Proceedings 3rd ISCRAM Conference, may 2006

We assume that from an organizational point of view, the process has a European coverage, meaning that:

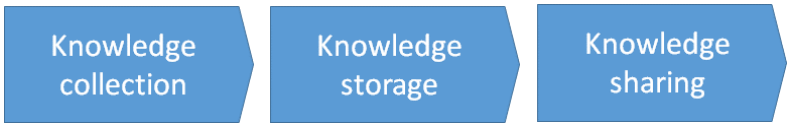
- the actors in charge for the management of the KM process are considered a European "virtual team", linked by the common agreement to respect the Decision 1082/2013/UE and the WHO International Health Regulations
- the key knowledge generators and users are the European operators, i.e. all the people/entities that are involved in Europe in the management of a SARS-like emergency

Knowledge Management Process is structured in three phases.

With respect to **actors**, our proposal is that

- ECDC and all National Authorities designate a "Knowledge Officer", in charge for ensuring that the process works, i.e. that after every pandemic event (or during it, if it has long duration) the knowledge collection is activated and experts that had been involved in managing the crisis work together to extract the lessons.
- ECDC "knowledge Officer" is the owner of the KM Process.
- ECDC partners with WHO Europe in order to ensure synergy with global knowledge bases.
- NAs should actively take part in the process, providing input to the knowledge collection and promoting knowledge dissemination in their Countries.
- Improving the emergency management systems,
- Feeding advances in related research/academic fields,
- Providing reference cases during the preparation for events, according to the Case-Based Reasoning approach[45].

We assume that from an organizational point of view, the process has a National focus (because the organizational setting for the emergency management is quite specific of each country), but also with mechanisms that allow knowledge sharing at European level. Coverage.
Knowledge Management Process is structured in three phases.



With respect to **actors**, our proposal is that

- In each Country "knowledge Officers" are identified at the "right" territorial level (in Italy, for instance, the Knowledge Officer may be positioned at the Regional Level).
- Knowledge Officers build a "Community of Practice" acting at European Level.

[45]S. Otim, *A Case-Based Knowledge Management System Disaster Management: Fundamental Concepts*, Proceedings 3rd ISCRAM Conference, may 2006

Additionally, we propose that the names of the individual experts that have “lived” the events are recorded (with their approval, of course), so that colleagues may consult them in case of future needs and clarification.	

4.6.2 Implications for PULSE

SARS	**Stadium**
PULSE tool contributing to the process is the **PCET** (Post crisis evaluation tool), that: • Facilitates experts in extracting the lessons, thanks to three key functionalities o Storage of the data managed during the crisis (via snapshots), o Data-mining of the stored information to support quantitative analysis, o Check list to support the qualitative analysis. • Facilitates the storage of the lessons, allowing to store the cases in a pre-structure way and to classify them with appropriate key-words (e.g. the WHO stages). • Facilitates the dissemination of the lessons, thanks to the “search” functionality. We also propose that PCET data-base is accessible via the **ECDC website,** where a “**knowledge portal”** might be implemented.	**PULSE tools** contributing to the process are: • **Mobile App**, that will allow the collection of a “hot-debrief” in the immediate aftermath of an incident or an exercise • **PCET** (Post crisis evaluation tool), that: o Facilitates experts in extracting the lessons, thanks to three key functionalities ▪ Storage of the data managed during the emergency (via snapshots), ▪ Data-mining of the stored information to support quantitative analysis, ▪ Check list to support the qualitative analysis. o Facilitates the storage of the lessons, allowing to store the cases in a pre-structure way and to classify them with appropriate key-words). We also propose that the Community of Practice create an internet forum and that PCET data-bases are accessible via the website of this forum. Lessons may also be diffused via the websites of already existing

	communities/associations (e.g. FEU- Federation of the European Union Fire Officer Associations, www.f-e-u.org)

4.6.3 PULSE guidelines for knowledge management

SARS

Table below summarizes the key features of each phase in terms of content (input, activities, output), actors involved (Process owner, others) and PULSE tools involved.

Knowledge Collection

Content	Actors (proposal)	PULSE tools
Input: Closed pandemic events data base Output: Lessons learned (cases), reference experts Activities: analysis of how the pandemic has been managed in its various stages	Process owner: • ECDC Others: • WHO (Europe) • National Authorities (NAs) • WHO (Local) • Country Regional and Local Authorities	**PCET** (Post crisis evaluation tool) facilitates extracting the lessons by experts, thanks to • Recording capability during the pandemic event, • Friendly information retrieval functions • A check-list stimulating the search for lessons in the event.

Knowledge Storage

Stadium

PULSE Guidelines for Knowledge Management (Stadium)

Table below summarizes the key features of each phase in terms of content (input, activities, output), actors involved (Process owner, others) and PULSE tools involved.

Knowledge Collection

Content	Actors (proposal)	PULSE tools
Input: Closed event data base Output: Lessons learned Activities: analysis of how the event has been prepared and how the emergency (if any) has been managed in its various stages	Process owner: • Knowledge Officer Others: • Actors involved in decision making role before and during the event or the exercise	**Mobile App** for "hot-debrief". **PCET** (Post crisis evaluation tool) supports actors in extracting the , thanks to • Recording capability during the pandemic event, • Friendly information retrieval functions, • a check-list stimulating the search for lessons in the event.

Knowledge Storage

Input: Lessons learned, Output: Availability of	Process owner: • Knowledge Officer	**PCET** stores the cases in the PULSE data base **LMS** (Learning Management System) stores the lessons

Input: Lessons learned, reference experts Output: Availability of retrievable lessons learned Activities: Structuring, classification and storage	Process owner: • ECDC	PCET stores the cases in the PULSE data base **LMS** (Learning Management System) stores the lessons learned in its repository of training material

Knowledge Sharing

Input: available lesson learned Output: potential knowledge users are aware of the Activities: • Announcement of new lessons • Feeding of a knowledge portal • Organization of conferences/meetings • Promotion of publications based on lessons learned	Process owner: • ECDC, NAs Others (recipients) • ECDC, WHO, NAs (operators) • DG SANCO • Country Regional and Local Authorities • Universities (researching in Emergency Management) • JRC, IT companies which are developing solutions for Emergency Management	**PCET** may be accessed via a knowledge portal (ECDC) **LMS** (Learning Management System) acts as diffusion channel, providing lessons learned that may be inserted in training paths

retrievable lessons learned Activities: Structuring, classification and storage		learned in its repository of training material **MPORG** may be updated to capture the lessons learned

Knowledge Sharing

Input: Available lessons learned Output: Potential knowledge users are aware of the lessons learned Activities: - Diffusion of the lessons inside the organization where the Knowledge Officer operates (e.g. in Italy: all the emergency management centers-118- of the Region) - Feeding of the "community of practice" web-site - Presentations in "community of practice" meetings/conferences	Process owner: • Knowledge Officer Others (recipients) inside the organization where the Knowledge Officer operates - In charge for managing Stadium crush-like events - In charge for improving the emergency management systems - Performing every research/academic/consulting field related to management of Stadium crush-like event Knowledge Officers (recipients) across Europe, as members of the "community of practice": it is expected that they analyse the lessons and diffuse them in their organization, if applicable.	In case of creation of a web-site of the "community of "practice", **PCET** may be accessed via this web-site. **LMS** (Learning Management System) acts as diffusion channel, providing lessons learned that may be inserted in training paths

4.7 Best practices/guideline development summary

Effective response to a crisis in its early stages depends completely on local community and health services. They are the basis for an efficient and well-structured EMS system able to deal with disasters no matter what the cause, dynamics, and consequences are. Developing and implementing PULSE, its platform and system must fit into the given reality of prevailing concepts and/or existing medical support and healthcare systems/tools. The parallel depiction of the SOP areas in question helped to identify commonalities and differences. As diverse as the different starting points were in the beginning (framework conditions), the more convergent the findings became when it reached the formulation of best practicesin the end. This finding not only identifies opportunities for PULSE to further develop its platform and tools, but it also strengthens the development towards a multi-purpose, multi-functional, non-nation specific medical support system for major emergencies.

5 Use Case procedures SOPs

Pulse D 2.2 (Scenarios and requirements) Chapters 6 and 7 circumstantiate the details of the 17 use cases in the two scenarios relevant for the conduct of the PULSE demonstrations and trials. Each of the use cases is described by:

- Identification number,
- Title,
- Related scenario,
- Description,
- Pre-conditions,
- Actors,
- Pulse tools involved,
- Trigger,
- Basic path, and
- Post-condition (output).

For further work conducted in this document, a standard has been agreed on describing the procedures[46] of the individual use cases of the scenarios, based on D2.2. The standard description includes an introduction to

- The purpose of the individual use case,
- The "Trigger(s)" which are initiating the Use Case, and
- The post-condition or main output of the actions taken in the individual use case.

The subsequent swim lane diagram (SLD) is a graphic representation of the main course of actions in the use cases. It is a workflow diagram and contains the major elements of processes, actions and information elements.

[46] Sometimes also the term "Workflow" is applied

Eventually, a workflow description depicts activity steps, owner of these steps, input, content of these activities and related outputs.

A flow or "Workflow" diagram called SLD[47] according to an agreed set of symbols, forming a graphic representation of the main elements and course of activities in the use cases, including

- The major elements of processes,
- Conditional bifurcation of flow,
- Actions description,
- information/document elements,
- The actors involved and the,
- Links between the elements,
- Elements outside the functionality of PULSE (dotted symbols).

For the standard notation of the SLDs, see Figure 6.

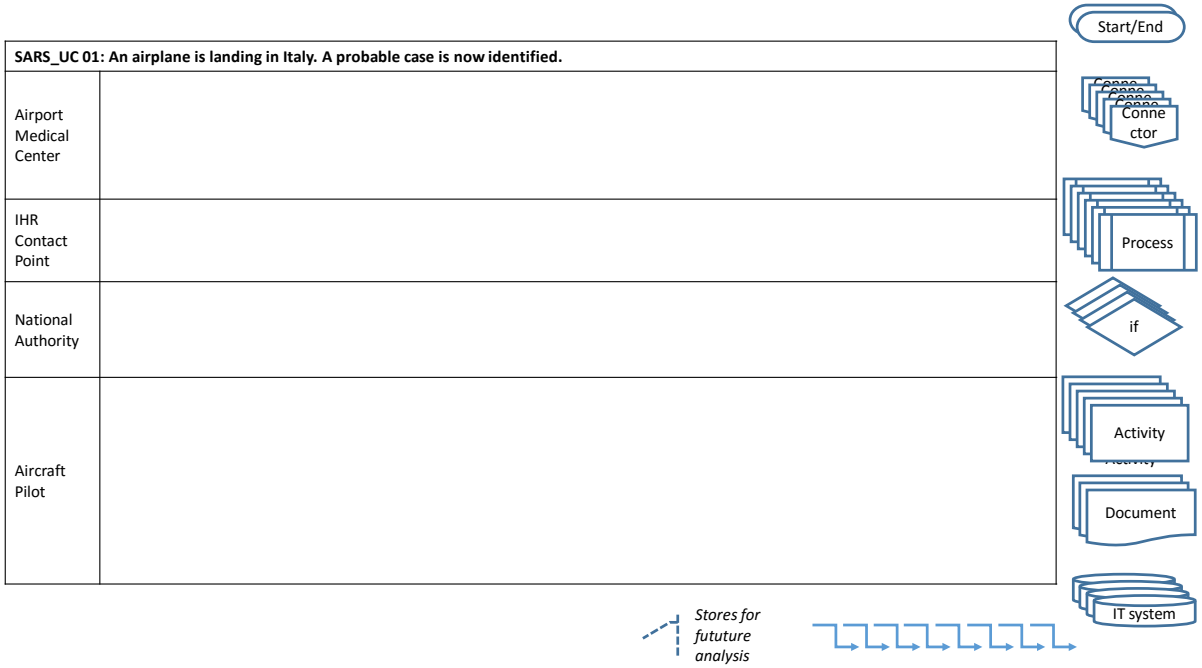
This information then, flows into tabular explanation of the PULSE tools

- Functionality performed and
- Benefits and values generated in contributing to and supporting the use case in question.

The latter is also an important source for deriving the methodology for evaluating the effectiveness of the PULSE system and its tools.

The approach to the evaluation is given in chapter 6).

Figure 6: SLD Notation and template[48]



[47] Swim Lane Diagram
[48] Left column in this template are only samples

For the purpose of transparent visualization, the

- introductory statements on purpose, trigger and output
- the SLDs and the
- describing tables

have been set on separate pages.

5.1 SARS Scenario

5.1.1 Weak signal detection and surveillance

Purpose

Initiated by the detection of a weak signal pointing to most likely SARS cases, the description of the flow of action in response to a potential epidemic starting on WHO/ECDC level down to related activities by national and regional authorities.

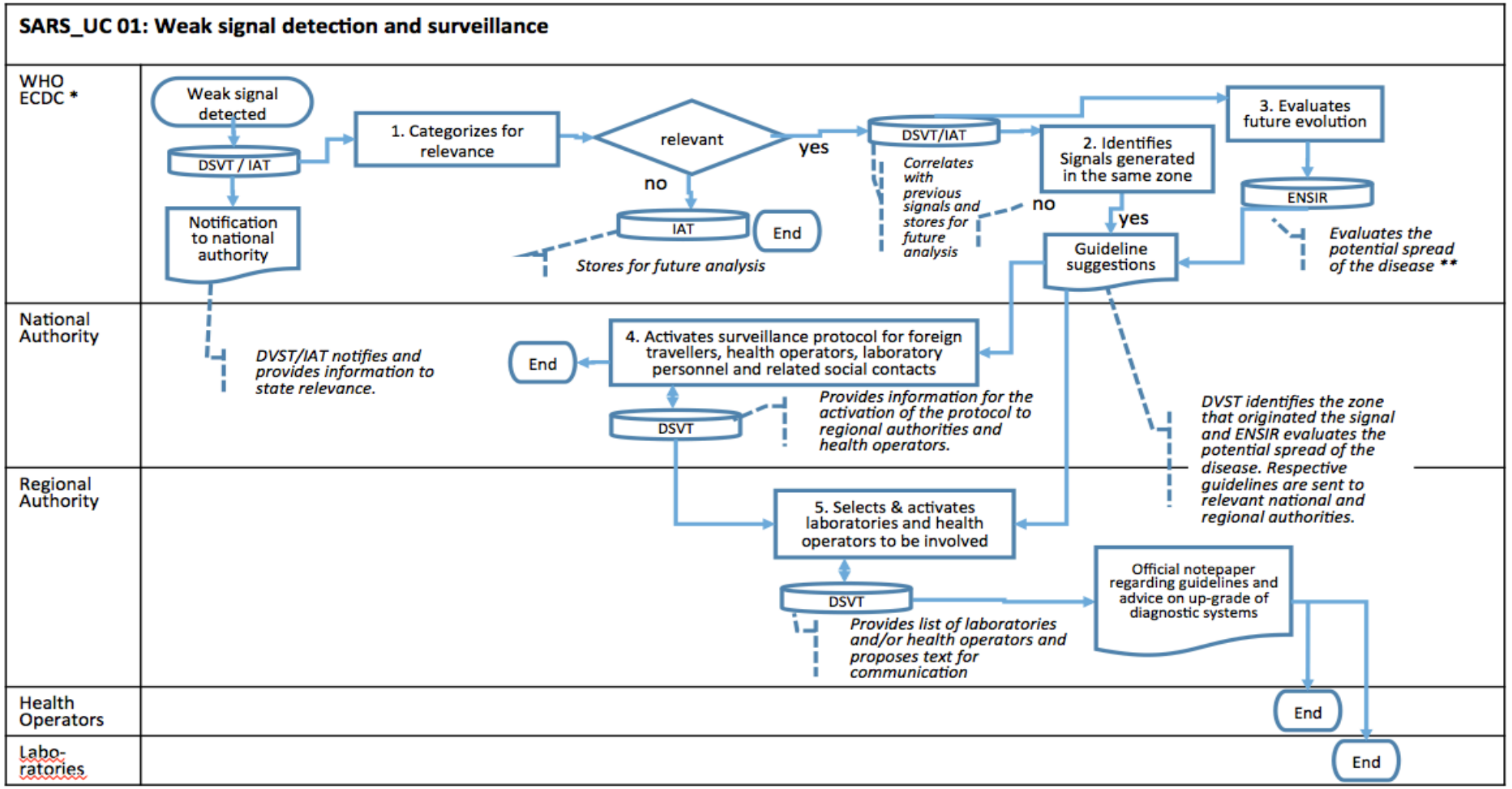
Trigger

A weak signal is detected in Italy by the PULSE system.
A weak signal is generated by analysing news articles from specialised official and unofficial medical sites, blogs, and online newspaper.
The analysis is based on the Natural Language Processing technique.

Output

The weak signal has been detected, classified and the suggested guidelines have been followed.

Figure 7: Use Case SA 01 SLD



- In order to prevent any delay the WHO and the EU Community Network should be notified at the same time. See: Commission Decision of of 28 April 2008, 2208/351/EC,
- amending Decision 2000/57/EC.

** It is assessed that the results of ENSIR would definitely feed into the WHO/ECDC guidelines suggestions.

Workflow Description **PULSE Tools Contribution**

Step	Owner	Input/ Tool applied	Content	Output	Functionality performed	Benefits & Values generated by PULSE Tools
1. Categorizes for relevance.	WHO	DSVT/IAT	Weak signal detected.	Notification to cognizant international and national authorities.	The IAT generates weak signals by analysing and classifying news articles from specialised official and unofficial medical sites, blogs and online newspapers. The classification states whether the documents are related to the SARS topic or not. The DSVT allows the user to classify the received weak signals as “relevant” or “not relevant”.	The PULSE tools allow the users to monitor and classify the relevant information available all over the web that could suggest the possible presence of epidemic weak signals in specific zones.
2. Identifies signals generated in the same zone	WHO	DSVT/IAT	Information correlated and corroborated with previous signals	Suggestion of guidelines to responsible and concerned national and regional authorities.	The IAT sends several signals in a specific zone. The DSVT maintains a history of all the received signals and send proper suggestions and guidelines to the user if the number of received signals in a specific zone overcomes some predefined thresholds.	The user accessing the PULSE platform can receive automatic suggestions based on the current status of the received weak signals.
3. Evaluates future evolution	WHO	ENSIR	Evaluates the potential spread of the disease over time and geographically	Suggestion of guidelines to responsible and concerned national and regional authorities.	The ENSIR simulates a possible spread of the disease according to the actual disease condition and the environmental conditions that could influence the epidemic evolution (e.g. the number of transport connections between different cities and countries).	The user can practically see the possible disease outbreak. This information can be used to better support the nations/cities that could mostly suffer in the future from the epidemic spread.
4. Activates surveillance protocol for foreign	National Authority	DSVT	Notifies cognizant authorities, medical staffs and personnel of the sharable disease-related	Surveillance protocol	The DSVT sends specific recommendations (e.g. surveillance protocol for foreign travellers, health operators, laboratory personnel and related social contacts) to the	The user can receive automatic suggestions from the PULSE platform based on the actual weak signals status.

travellers, health operators, laboratory personnel and related social contacts			health information in order to monitor, control, and prevent the occurrence and spread of notifiable infectious diseases and provides disease-specific information and guidelines		user according to the actual weak signals status.	
5. Selects & activates laboratories and health operators to be involved	Regional Authority	DSVT	Provides a list of laboratories & health operators and proposes text for communication	Official notepaper regarding guidelines and advice on up-grading of diagnostic systems	The DSVT sends specific recommendations to the laboratories and health operators according to the actual weak signals status.	Laboratories and health operators can receive automatic suggestions from the PULSE platform based on the actual weak signals status.

5.1.2 An airplane is landing; a probable case is identified

Purpose

The SOP describes the alerting chain that allows to confirm (or not) a case and to trigger actions that may identify other infected persons (if any) related to the suspect case.

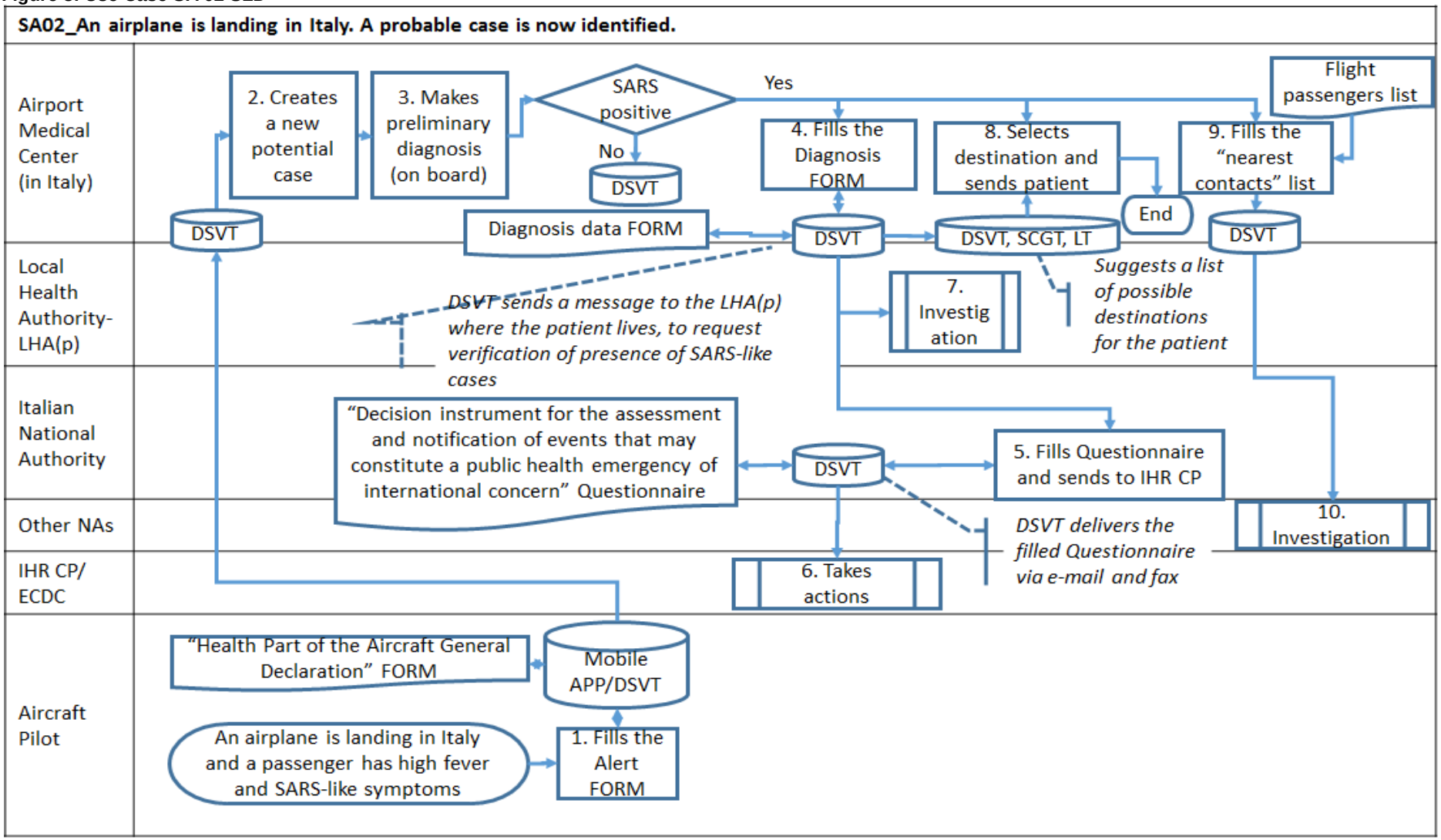
Trigger

The SOP is triggered by landing of an airplane with a passenger on-board suffering from the usual SARS-like symptoms.

Output

If the case is confirmed, patient is sent to the more suitable specialized centre (the nearest Specialized Hospital or the nearest Major Hospital with proper resources available).
Search for other related suspect cases is activated.
The operational picture is updated and WHO/ECDC is alerted.

Figure 8: Use Case SA 02 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1 Fills the Alert FORM	Aircraft Pilot	Crew report	Pilot fills the standard "*Health Part of the Aircraft General Declaration*" Alert Form in order to communicate that in the aircraft (just landed) there is a person with high fever and SARS-like symptoms	Filled Alert Form is in DSVT	Mobile App DSVT	• The pilot or a pilot's agent, in flight or upon landing at the airport, logs on to the system by using the system web interface (DSVT) or the Mobile App. • The system (DSVT) based on the provided credentials, detects the user's role (e.g. Pilot). • The pilot completes the module "*Health Part of the Aircraft General Declaration*" provided by the system (DSVT/Mobile App)	Easy access to the IHR communication procedure Lower risk of errors in the data input (vs paper forms)
2 Creates a new potential case	Airport medical centre	Filled Alert Form	Creation in the DSVT of a new "potential" case	Potential case is in DSVT and is visible to NA and IHR Contact Point	DSVT	The Airport Medical Centre • receives an alert, generated by the system (DSVT), via SMS, fax, e-mail and notification on the DSVT web interface. • views the panel called "Probable cases" and clicks on the button "Create a new case".	Immediate visibility of the potential case.
3 Makes preliminary diagnosis (on board)	Airport medical centre	Filled Alert Form	Preliminary diagnosis (on board) If the diagnosis is negative, the flow stops and DSVT is updated accordingly. Otherwise, the flow goes on with step 4.	Result of the diagnosis	N/A		
4 Fills the Diagnosis FORM	Airport medical centre	Result of the diagnosis	Filling of the Diagnosis data Form *DSVT sends a message to the LHA(**p**) where the patient lives, to request verification of presence of SARS-like cases*	Filled Diagnosis data Form in DSVT	DSVT	DSVT provides • a "Confirmed disease" drop-down menu list and selects "SARS" • a form where it is possible to fill out the actual person symptoms, his/her	Lower risk of errors in the data input (vs paper forms)

						personal information (e.g. name, last name, country, address etc.) and his/her travel history. DSVT automatically sends a notification to the nearest Local Health Authority (e.g. in Italy ASL) based on the confirmed case's address The notification contains the request to verify the presence of SARS cases.	Immediate communication to the right actors (DSVT has the mailing list of all the actors and immediately identifies the LHAs to be alerted/informed
5 Fills Questionnaire and sends to IHR CP & ECDC	Italian NA (National Authority)	Filled Diagnosis data Form	Filling of the "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" Questionnaire	Filled questionnaire in DSVT and visible for IHR CP & ECDC	DSVT	DSVT shows a form where it is possible to fill out on line all the information included in the "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" IHR questionnaire.	Lower risk of errors in the data input (vs paper forms)
6 Takes actions	IHR CP/ ECDC	Filled questionnaire	Takes actions if needed		DSVT	IHR CP receives all relevant information (Diagnosis, Questionnaire) via DSVT	Immediate and correctly structured information
7 Investigation (from step 4)	LHA Local Health Authority where the patient lives)	Message from Airport medical centre	LHA contacts people that may have had contacts with the patient and verifies presence of SARS-like cases				
8 Selects destination and send patient	Airport medical centre	Positive diagnosis	Airport Medical centre, with the support of DSVT, DSGT and LT, selects destination and sends the patient		DSVT SCGT LT	The system(DSVT, SCGT, LT) automatically generates, based on the patient symptoms, the possible patient destinations (e.g. specialized hospital, major hospital).	Immediate and optimal identification of applicable destinations (based on continuously updated information on the status of the potential destinations in terms of medical

							capability)
9 Fills the “nearest contacts” list	Airport medical centre	Flight passengers list	Identification of passengers that have been in contact with the patient	Message via DSVT to NAs where the “nearest contacts” live	DSVT	DSVT • provides a “Nearest contacts” menu that allows to add the passengers’ data (e.g. name, last name, address, phone number) • identifies the NAs where the “nearest contacts” live and sends them a message	Immediate communication to the right actors (DSVT has the mailing list of all the actors and immediately identifies the NAs to be alerted/informed
10 Investigation	Other NAs	Passengers list	NA contacts passengers that had been in contact with patient				

5.1.3 Ship arriving, with probable case

Purpose

The SOP describes the alerting chain that allows to confirm (or not) a case and to trigger actions that may identify other infected persons (if any) related to the suspect case.

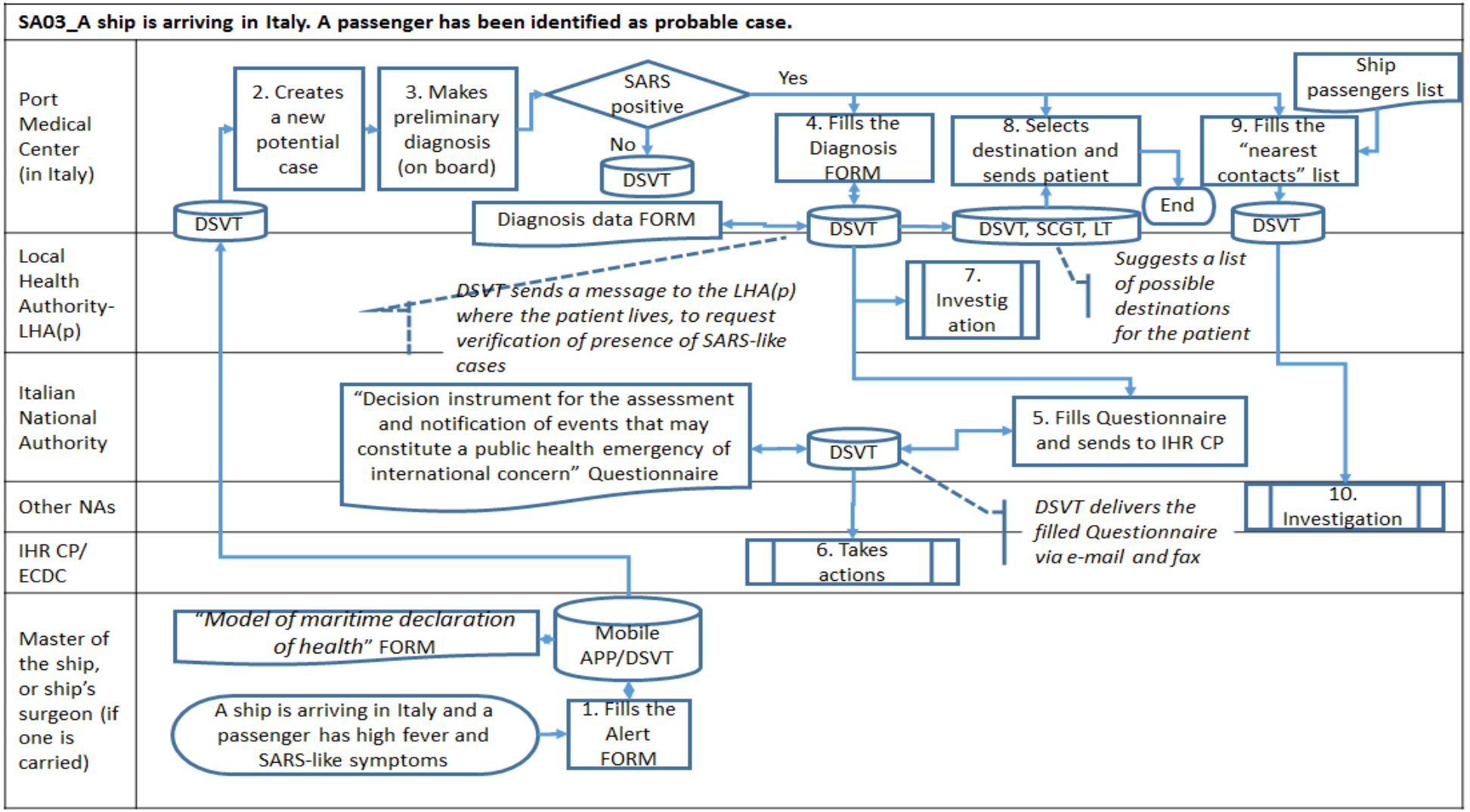
Trigger

The SOP is triggered by the arrival of a ship with a passenger on-board suffering from the usual SARS-like symptoms.

Output

If the case is confirmed, patient is sent to the more suitable specialized centre (the nearest Specialized Hospital or the nearest Major Hospital with proper resources available). Search for other related suspect cases is activated.
The operational picture is updated and WHO/ECDC is alerted.

Figure 9: Use Case SA 03 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1. Fills the Alert FORM	Master of the ship, or ship's surgeon	Crew report, on-board medical report	Ship personnel fills the standard "*Model of maritime declaration of health*" Alert Form in order to communicate that on the ship (just arrived) there is a person with high fever and SARS-like symptoms	Filled Alert Form is in DSVT	Mobile App DSVT	• Master of the ship, or ship's surgeon, logs on to the system by using the system web interface (DSVT) or the Mobile App. • The system (DSVT) based on the provided credentials, detects the user's role (e.g.Ship Surgeon). • The Maser/Surgeon completes the module "*Model of maritime declaration of health*" provided by the system (DSVT/Mobile App)	Easy access to the IHR communication procedure Lower risk of errors in the data input (vs paper forms)
2. Creates a new potential case	Port medical centre	Filled Alert Form	Creation in the DSVT of a new "potential" case	Potential case is in DSVT and is visible to NA and IHR Contact Point	DSVT	The Port Medical Centre • receives an alert, generated by the system (DSVT), via SMS, fax, e-mail and notification on the DSVT web interface. • views the panel called "Probable cases" and clicks on the button "Create a new case".	Immediate visibility of the potential case.
3. Makes preliminary diagnosis (on board)	Port medical centre	Filled Alert Form	Preliminary diagnosis If the diagnosis is negative, the flow stops and DSVT is updated accordingly. Otherwise, the flow goes on with step 4.	Result of the diagnosis			
4. Fills the Diagnosis FORM	Port medical centre	Result of the diagnosis	Filling of the Diagnosis data Form *DSVT sends a message to the LHA where the patient lives, to request verification of*	Filled Diagnosis data Form in DSVT	DSVT	DSVT provides "Confirmed disease" drop-down menu list and selects "SARS" a form where it is possible to fill out the actual person symptoms, his/her	Lower risk of errors in the data input (vs paper forms)

			presence of SARS-like cases			personal information (e.g. name, last name, country, address etc.) and his/her travel history. DSVT automatically sends a notification to the nearest Local Health Authority (e.g. in Italy ASL) based on the confirmed case's address The notification contains the request to verify the presence of SARS cases.	Immediate communication to the right actors (DSVT has the mailing list of all the actors and immediately identifies the LHAs to be alerted/informed
5. Fills Questionnaire and sends to IHR CP & ECDC	Italian NA (National Authority)	Filled Diagnosis data Form	Filling of the "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" questionnaire	Filled questionnaire in DSVT and visible for IHR CP & ECDC	DSVT	DSVT shows a form where it is possible to fill out on line all the information included in the "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" IHR questionnaire.	Lower risk of errors in the data input (vs paper forms)
6. Takes actions	IHR CP/ ECDC	Filled questionnaire	Takes actions if needed		DSVT	IHR CP receives all relevant information (Diagnosis, Questionnaire) via DSVT	Immediate and correctly structured information
7. Investigation (from step 4.)	LHA Local Health Authority where the patient lives)	Message from Airport medical centre	LHA contacts people that may have had contacts with the patient and verifies presence of SARS-like cases				
8. Selects destination and send patient	Port medical centre	Positive diagnosis	Port Medical centre, with the support of DSVT, DSGT and LT, selects destination and sends the patient		DSVT SCGT LT	The system(DSVT, SCGT, LT) automatically generates, based on the patient symptoms, the possible patient destinations (e.g. specialized hospital, major hospital).	Immediate and optimal identification of applicable destinations (based on continuously updated information on the status of the potential destinations in

							terms of medical capability)
9. Fills the “nearest contacts” list	Port medical centre	Ship passengers list	Identification of passengers that have been in contact with the patient	Message via DSVT to NAs where the “nearest contacts” live	DSVT	DSVT • provides a “Nearest contacts” menu that allows to add the passengers’ data (e.g. name, last name, address, phone number) • identifies the NAs where the “nearest contacts” live and sends them a message	Immediate communication to the right actors (DSVT has the mailing list of all the actors and immediately identifies the NAs to be alerted/informed
10. Investigation	Other NAs	Passengers list	NA contacts passengers that had been in contact with patient				

5.1.4 Identification of a new probable case in a community

Purpose

The SOP describes the alerting chain that allows to confirm (or not) a case and to trigger actions (if any) at WHO level.

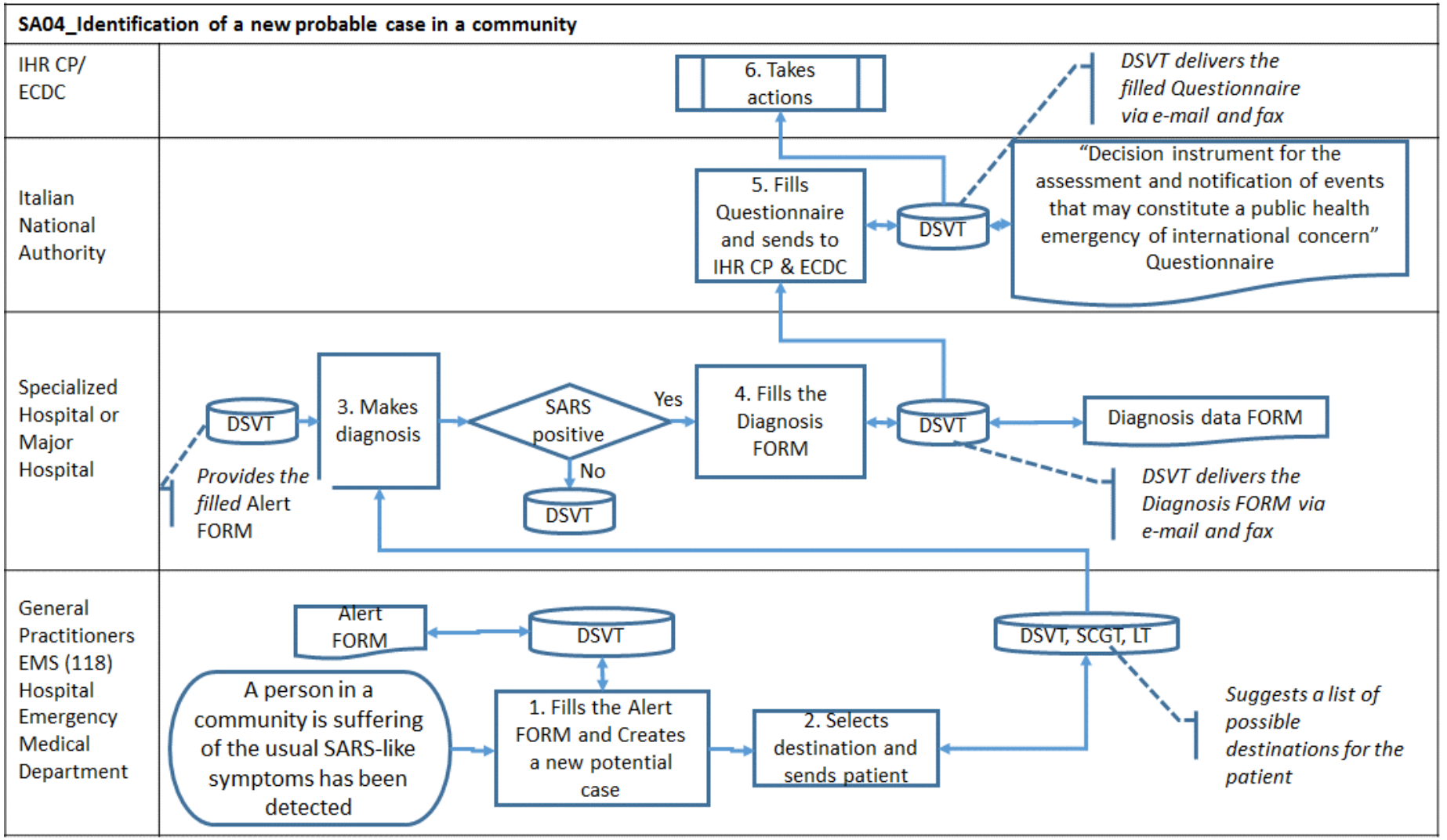
Trigger

The SOP is triggered by the arrival in a front-line health actor (GP, Emergency service, Hospital Emergency Medical Department) of a person suffering from the usual SARS-like symptoms.

Output

If the case is confirmed, the patient is treated in a suitable specialized centre (the nearest Specialized Hospital or the nearest Major Hospital with proper resources available), the operational picture is updated and WHO/ECDC is alerted

Figure 10: Use Case SA 04 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1. Fills the Alert FORM and creates a new potential case	General Practitioners EMS (118) Hospital Emergency Medical Department	Suspect of SARS-like related symptoms	Identification of SARS-like related symptoms Filling of Alert Form Creation in the DSVT of a new "potential" case	Filled Alert Form is in DSVT (with patient data and symptoms) Potential new case is created in DSVT	DSVT	DSVT provides the Alert FORM and the Case creation template (to be filled on line)	Easy access to the IHR communication procedure Lower risk of errors in the data input (vs paper forms) Immediate visibility of the potential case.
2. Selects destination and sends patient	General Practitioners EMS (118) Hospital Emergency Medical Department	Diagnosis Possible destinations	DSVT proposes possible destinations (Specialized Hospitals and Major Hospital); GP/EMS/Emergency Dept selects the most suitable and sends the patient for the final diagnosis	Patient is sent to selected destination	DSVT SCGT LT	The system (DSVT, SCGT, LT) automatically generates, based on the patient symptoms, the possible patient destinations (e.g. specialized hospital, major hospital).	Immediate and optimal identification of applicable destinations (based on continuously updated information on the status of the potential destinations in terms of medical capability
3. Makes preliminary diagnosis	Specialized Hospital or Major Hospital	Alert FORM with symptoms	Diagnosis	Case confirmed or not. If "not confirmed", stop (DSVT is updated). If "confirmed", go to 4.	DSVT	DSVT provides the Alert FORM already filled by the front-line operators	Lower risk of errors in the transmission of the information
4. Fills the Diagnosis FORM	Specialized Hospital or Major Hospital	Results of the patient exam	The Diagnosis FORM is filled and sent (via DSVT) to NA	Filled Diagnosis FORM in DSVT	DSVT	DSVT provides the Diagnosis FORM (to be filled on line) DSVT delivers the Diagnosis FORM via e-mail and fax to the NA	Lower risk of errors in the data input (vs paper forms)

							Immediate communication to the NA
5. Fills Questionnaire and sends to IHR CP & ECDC	NA (National Authority)	Filled Diagnosis data Form	The "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" Questionnaire is filled and sent to IHR CP & ECDC	Filled questionnaire in DSVT and visible for IHR CP & ECDC	DSVT	DSVT shows a form where it is possible to fill out on line all the information included in the "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" IHR questionnaire. DSVT delivers the filled questionnaire via e-mail and fax to IHR CP & ECDC	Lower risk of errors in the data input (vs paper forms)
6. Takes actions	IHR CP/ ECDC	Filled questionnaire	Takes actions if needed				

5.1.5 Assessment of available medical resources

Purpose

In consequence of a WHO declaration of a pandemic disease, national authorities require information on the availability of medical resources from health facilities and this SOP portrays the action to be followed.

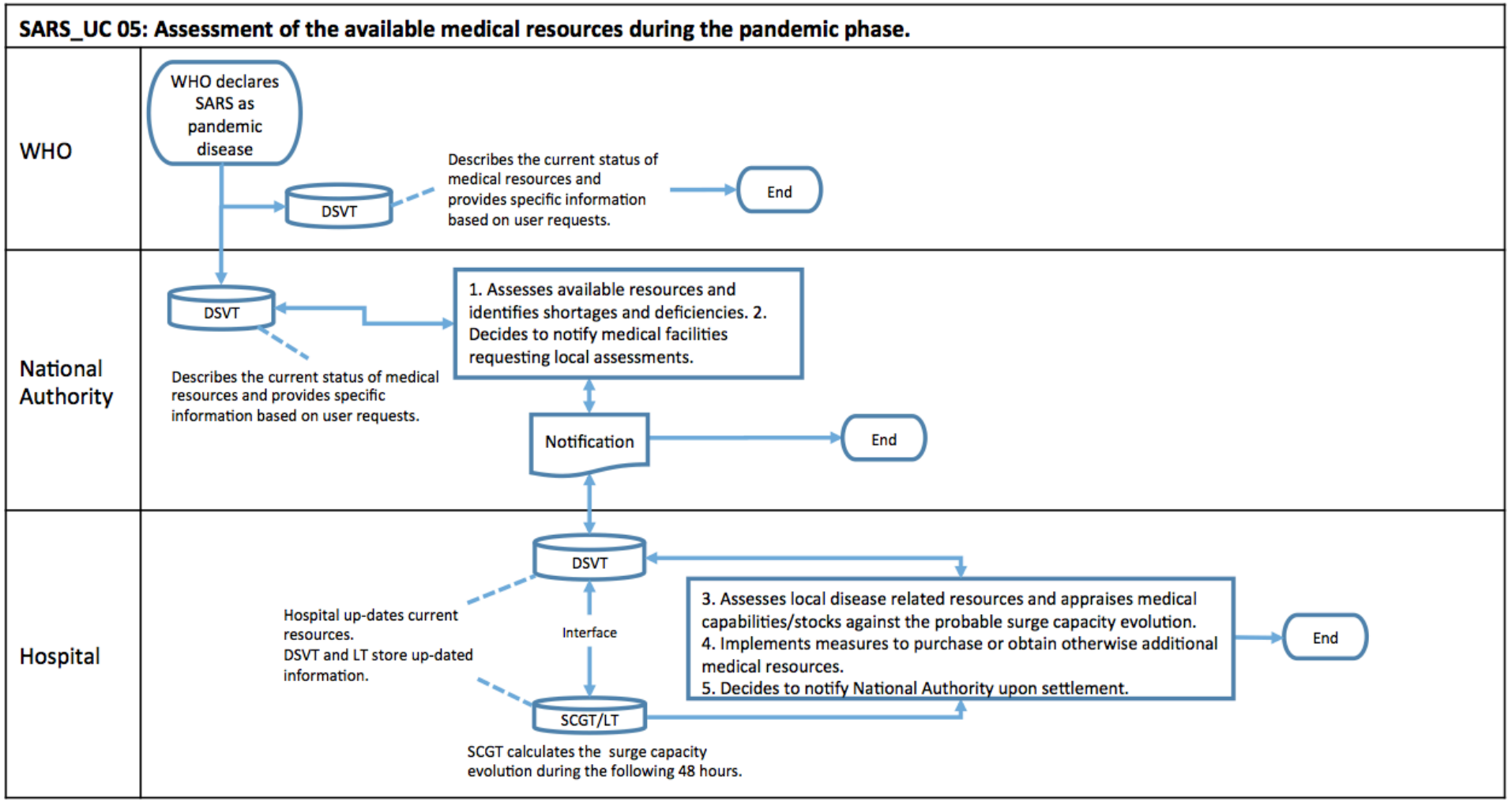
Trigger

WHO declares SARS as a pandemic disease.

Output

National and Regional authorities can take a decision on the social/economical/logistic impact of the pandemic current status.

Figure 11: Use Case SA 05 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input Tool applied	Content	Output	Functionality performed	Benefits & values generated by PULSE tools
1. Assesses available resources and identifies shortages and deficiencies	National Authority	DSVT	Description of the current status of medical resources and provides specific information based on specific user requirements	National level assessment on disease related medical resources	The DSVT shows the status of all the hospitals involved in the crisis. In particular the DSVT shows the status of the number of resources (e.g. rooms, ventilators) available in the structure in that specific moment.	A user is able to immediately assess the status of all the hospitals involved in the crisis. This information can help him/her to take the best decision according to the current status of the crisis.
2. Decides to notify medical facilities requesting local assessments	National Authority	DSVT	Identification of hospitals/medical facilities concerned and notification communication proposal	Notification to cognizant medical facilities requesting detailed local assessments	The DSVT can automatically suggest to re-assess the resources of some specific hospital if the available information has not been updated in the last period.	The PULSE platform tries to provide an always-updated status of the hospitals resources.
3. Assesses local disease related resources and appraises medical capabilities/stocks against the probable surge capacity evolution	Hospital	DSVT SCGT/LT ENSIR	Description of the current status of local medical resources and calculation against the estimated course of the probable pandemic	Local level assessment on disease related medical resources and its reach for treatment and handling of patients/victims	The DSVT can suggest to re-assess the resources of all the hospitals residing in a risky zone (e.g. the ENSIR shows that the disease will probably expand in that specific zone)	The PULSE platform considers the possible evolution of the epidemic in order to suggest the most-effectiveness solution for the re-assessment of the hospitals resources.
4. Implements measures to purchase or otherwise obtain additional medical resources	Hospital	DSVT SCGT/LT ENSIR	Listing of medical resources to be purchased or to be obtained from other sources including depiction of respective acquisition possibilities and requisite administrative regulations	Medical resources up-dated and re-stocked	The DSVT can suggest to increase the number of resources of all the hospitals residing in a risky zone (e.g. the ENSIR shows that the disease will probably expand in that specific zone)	The PULSE platform suggests the best distribution of medical resources among the hospitals involved in the crisis considering the possible evolution of the epidemic.
5. Decides to notify National Authority upon settlement	Hospital	DSVT	Reports up-dated and/or re-stocked medical capabilities	Hospital fully operational	The DSVT can suggest to notify the National Authority upon settlement.	The DSVT can facilitate a direct communication with the National Authority.

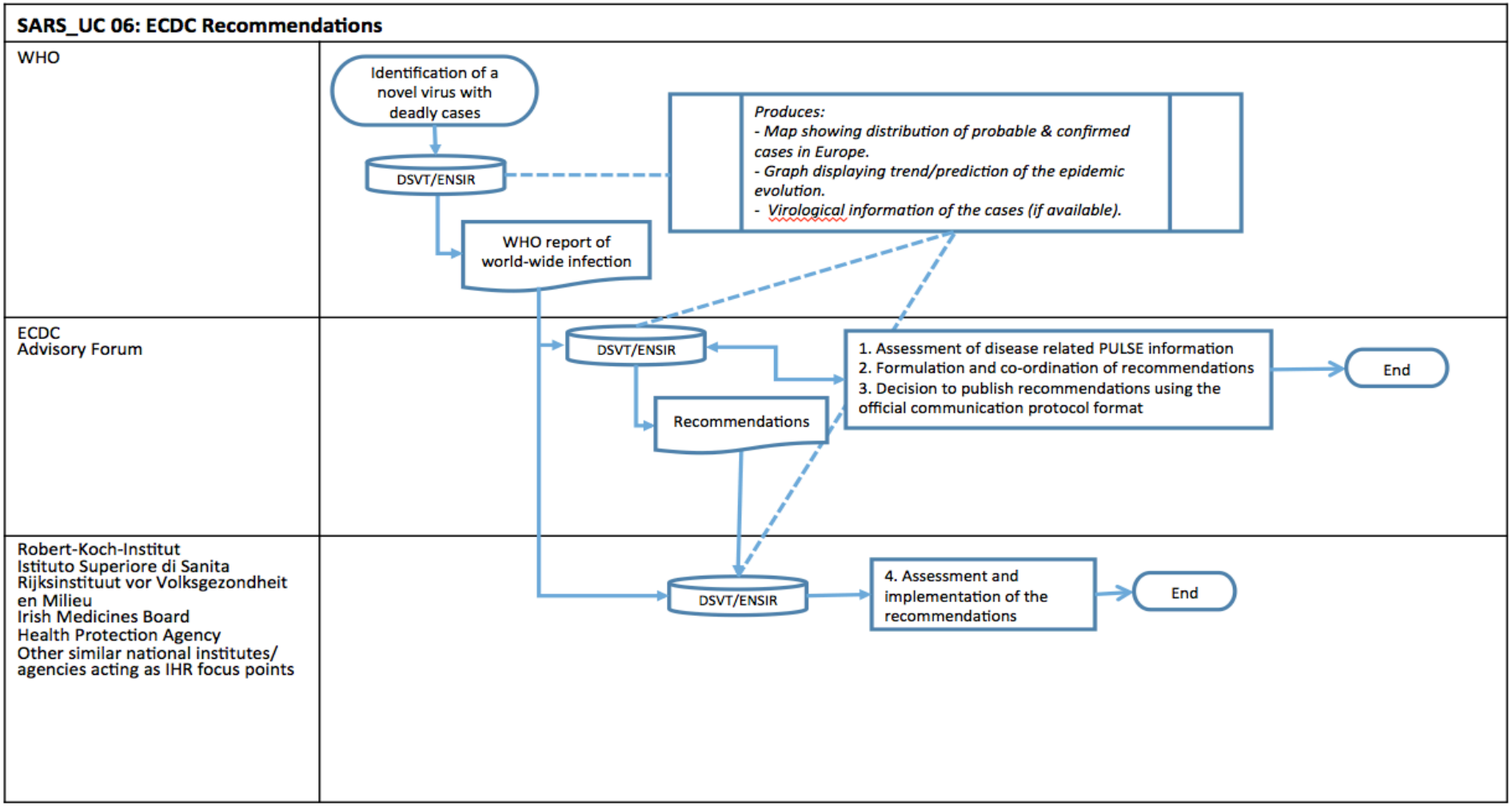
5.1.6 ECDC recommendations

Purpose
Assessment of the epidemic evolution during ECDC periodic meetings and creation of recommendations.

Trigger
Identification of a novel virus with deadly cases followed by a WHO report of a worldwide infection.

Output
The ECDC Advisory Forum issues recommendations published by using the official communication protocol format based on the results provided by the PULSE system.

Figure 12: Use Case SA 06 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input Tool applied	Content	Output	Functionality performed	Benefits & values generated by PULSE tools
1. Assessment of disease related PULSE information	ECDC Advisory Forum	DSVT/ ENSIR	Graphical display of disease cases in Europe and potential epidemiological spread supported by particular virological data	Up-to-date epidemic overview	The ENSIR simulates a possible spread of the disease according to the actual disease condition and the environmental conditions that could influence the epidemic evolution (e.g. the number of transport connections between different cities and countries)	The user can practically see the possible disease outbreak. This information can be used to better support the nations/cities that could mostly suffer in the future from the epidemic spread.
2. Formulation and co-ordination of recommendations	ECDC Advisory Forum	DSVT	List of guidelines accounting for severity of the disease, geographical or societal particularities, epidemic spread and eatiopathology	Focused guidelines	The DSVT, considering the actual disease information and the possible epidemic spread, creates and suggests guidelines that should be delivered to specific national agencies/institutes.	The PULSE platform can provide support to the ECDC to create proper recommendations.
3. Decision to publish recommendations using the official communication protocol format	ECDC Advisory Forum	N/A	Identification of national IHR Focus points concerned for the distribtuion of the communication protocol covering the confirmed recommendations	Co-ordinated and agreed communication protocol		
4. Assessment and implementation of ECDC recommendations	National Institutes Agencies IHR Focus Points	N/A	Transformation and implementation of recommendations according to the national or regional context	Collective European approach		

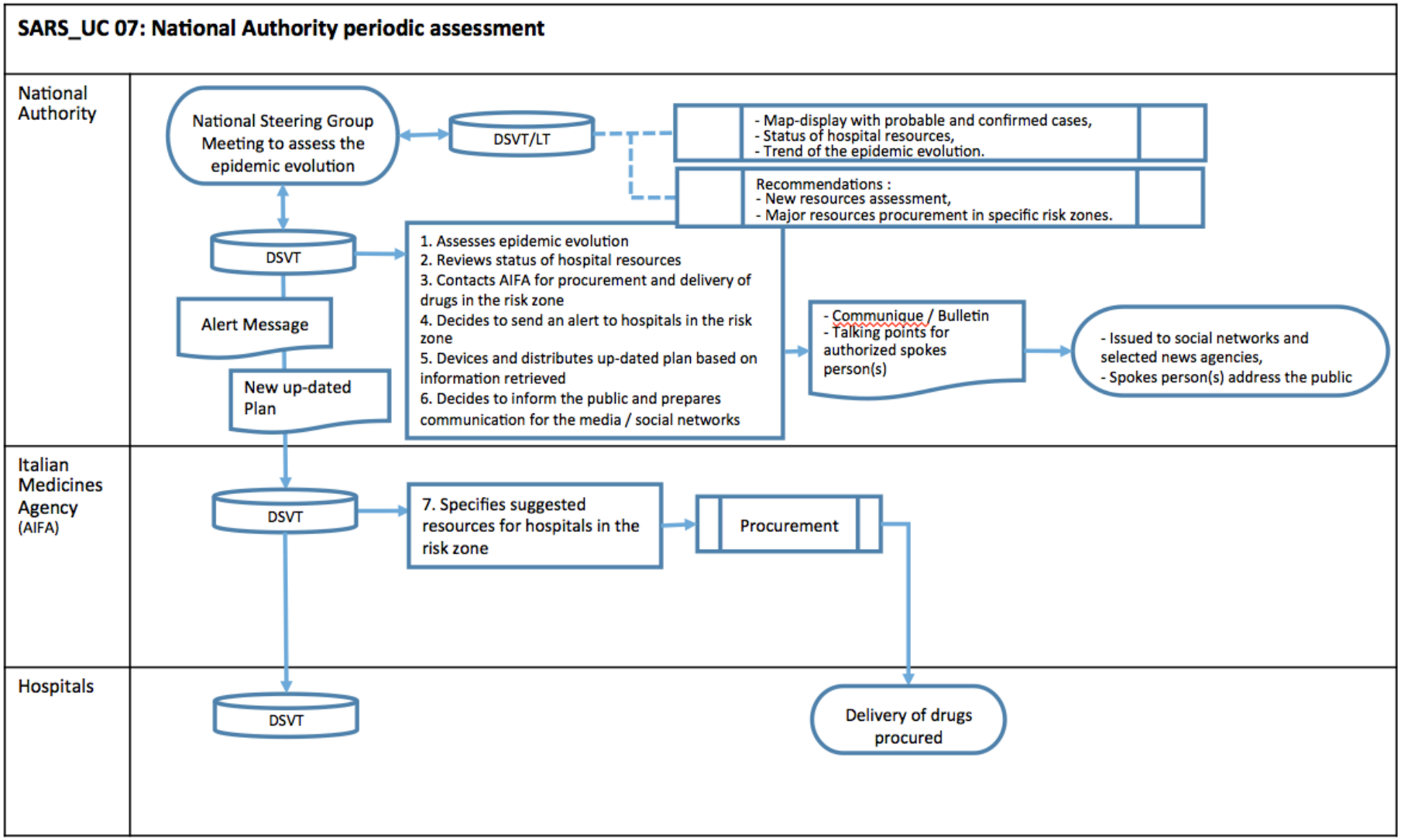
5.1.7 National Authority periodic assessment

Purpose
Assessment of the epidemic evolution during national meetings and communication to the media and public information.

Trigger
A meeting amongst the National Steering Group is organized during the crisis evaluation in order to assess the epidemic evolution.

Output
An optimization of the resources has been carried out, a new plan has been issued based on the information provided by the PULSE system and a communication has been delivered to the public, social and news media.

Figure 13: Use Case SA 07 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input Tool applied	Content	Output	Functionality performed	Benefits & values Generated by PULSE tools
1. Assessment of the epidemic evolution	National Authority	DSVT/ENSIR	Graphical display of disease cases in Europe and potential epidemiological spread supported by particular virological data	Up-to-date epidemic overview	The ENSIR simulates a possible spread of the disease according to the actual disease condition and the environmental conditions that could influence the epidemic evolution (e.g. the number of transport connections between different cities and countries). The DSVT shows the actual crisis situation including the probable and confirmed cases' health status and location.	The National authority can have a complete overview of the crisis. This capacity allows the National authority to better decide the steps that should be followed to come out of the crisis.
2. Review of hospital resource status	National Authority	DSVT/LT	Up-date on hospital resources in risk zone	Necessity for major resources procurement	The DSVT shows the resources status of all the hospital involved in the crisis. The resources are handled by the LT	The National Authority can see the actual resources status and according to them, take better decisions.
3. AIFA to procure and deliver drugs in the risk zone	National Authority	DSVT	Guidance for the procurement and delivery of specific drugs	Hospitals re-stocked and prepared for the provision of treatment according to the trend of the epidemic evolution	DSVT suggests to contact the AIFA to procure and deliver drugs to risk zones,	The National Authority can decide to increase the resources of hospitals located in risky zones considering the current status and the possible outcome of the disease
4. Sending an alert message to hospitals in the risk zone	National Authority	DSVT	Issuance of up-dated epidemic trend and operational planning and guidance provided for the procurement of drugs	Maintaining a current and consistent level of information and providing lead time for respective planning	DSVT suggests to send an alert to the hospitals located in a risk zone.	The PULSE platform automatically suggests the National Authority the steps (in this case an alert to the hospitals) that could help to better handle the crisis
5. Issues up-dated plan based on information retrieved	National Authority	DSVT	Reflecting current status of affairs regarding epidemic spread, future trend assessed and status of hospitals	Up-dated and improved plan	DSVT suggests to issue updated plans based on the current crisis situation.	The PULSE platform automatically suggests the National Authority the steps (in this case to re-issue updated intervention plans) that could

						help to better handle the crisis
6. Information of the public and communication for the media and social networks	National Authority	DSVT	Template for the communication to the public, media and social networks; a list of confirmed spokes persons and authorized talking points	Pro-active and anticipatory information campaign	The DSVT can help the delivery of official information by using social media accounts such as Facebook and Twitter.	The National Authority can inform the public regarding the status of the crisis directly from the PULSE platform.
7. Specification of suggested resources for hospitals in the risk zone	AIFA	DSVT/LT	List of detailed medical resources	Re-stocked medical supplies	The DSVT can suggest to increase the number of specific resources maintained by an hospital. The hospital resources are handled by the LT	A hospital can automatically receive suggestions by the PULSE platform to increase the managed resources.

5.1.8 Post emergency learning at national level

Purpose

The purpose of this SOP is to describe the flow of steps that the National Authority may go through to evaluate how the country responded to the epidemic and to identify the lesson learned, contributing to the European learning process.

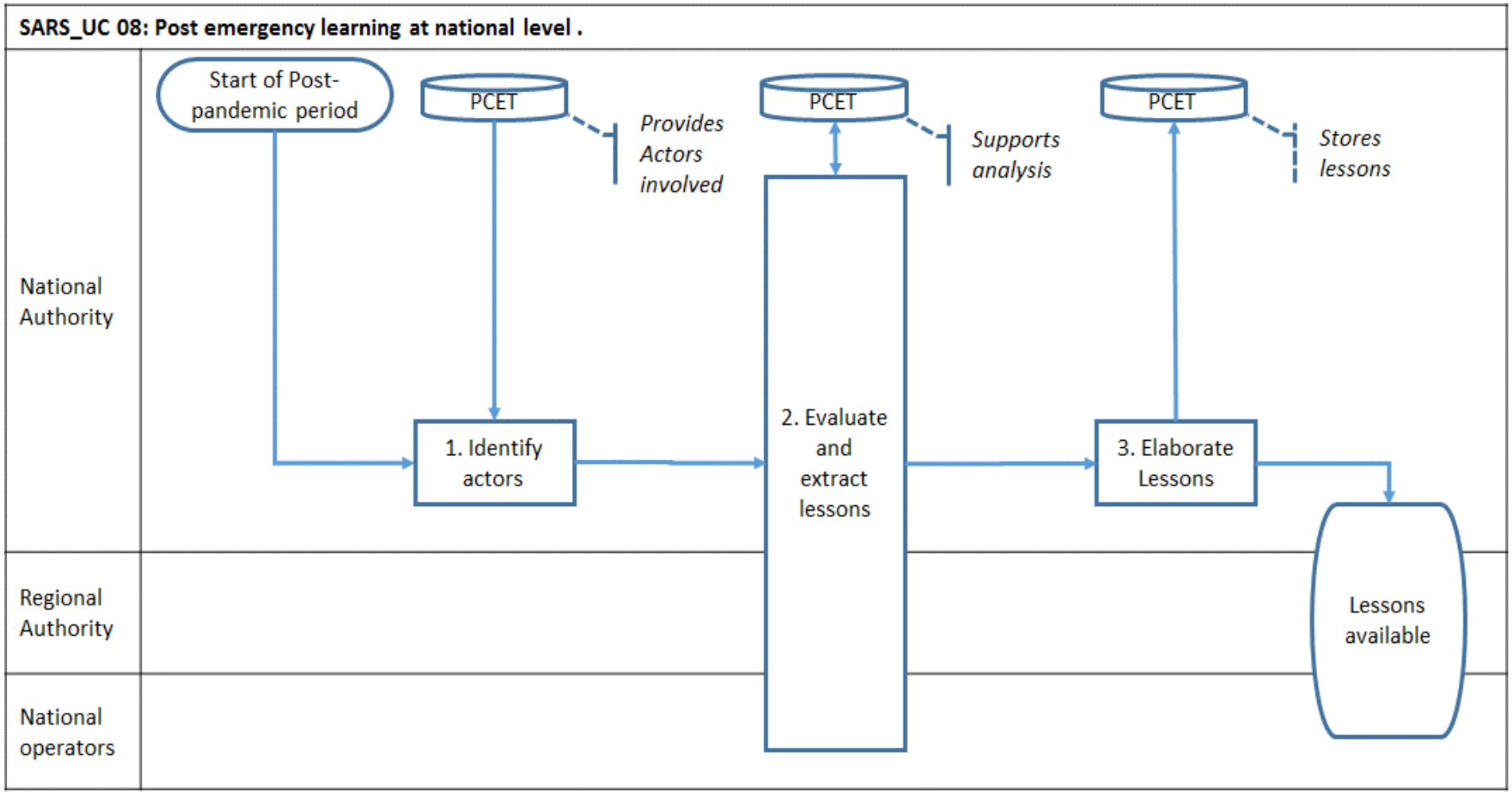
Trigger

This procedure is activated by the National Authority when the WHO post-pandemic period starts.
It is the National part of the more general learning process that should be orchestrated at European level by ECDC.

Output

Its output (lesson learned in the Country) becomes available: For common analysis at European level (led by ECDC), for access by other Regional/Local Authorities of the Country that have not been involved in the management of the pandemic, and for access by other authorities in other countries.

Figure 14: Use Case SA 08 SLD



Note: National Operators includes every person that has played a significant role in management of the pandemic; they may include person from Local Authorities, Laboratories, Hospitals and Local WHO.

Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1. Identify actors	National Authority	PCET records	NA Knowledge Officer, also accessing PCET, identifies the actors that may contribute to the evaluation and analysis of the pandemic just closed and invite them to joint analysis meetings	Actors and other experts that may contribute	PCET	PCET has recorded during the event the actors that have managed the pandemics as users of the PULSE tools. These actors may be searched in PCET	PCET facilitates the identification of the actors that may contribute to the evaluation and analysis of the pandemic just closed. Actors may be associated to specific phases/ problems/decisions : this allows to organize panels of actors on specific themes.
2. Evaluate and extract lessons	National Authority	PCET records	NA Knowledge Officers coordinate joint analysis meetings, with the support PCET snapshots and check list	Meeting minutes with draft description of lessons learned	PCET	• Storage of the data managed during the crisis (via snapshots) • Data-mining of the stored information to support quantitative analysis on cause-effect relationship • Check list to support the qualitative analysis. •	• Allows evidence-based evaluation • Improves productivity and completeness of the lesson learning exercise
3. Elaborate lessons	National Authority	Meeting minutes with draft description of lessons learned	NA Knowledge Officer systematizes, classifies and stores the lessons learned. NA Knowledge Officer gets authorization from experts to be associated to the lessons learned	Country lesson learned stored in PCET, Lists of experts that have “lived” the events and haver contributed to the extraction of the lessons.	PCET	• Classification framework • Storage	• Provides a common framework for classifying the lessons learned across Europe • Provides a repository of lesson learned and of experts (related to the lessons) accessible by every European pandemic event manager

5.1.9 Post emergency learning at WHO level

Purpose

The purpose of this SOP is to describe the flow of steps that ECDC, in coordination with WHO Europe, may go through to share the lessons learned by each European Country, and to extract lessons from how the European Countries, ECDC, WHO cooperated in managing the epidemic.

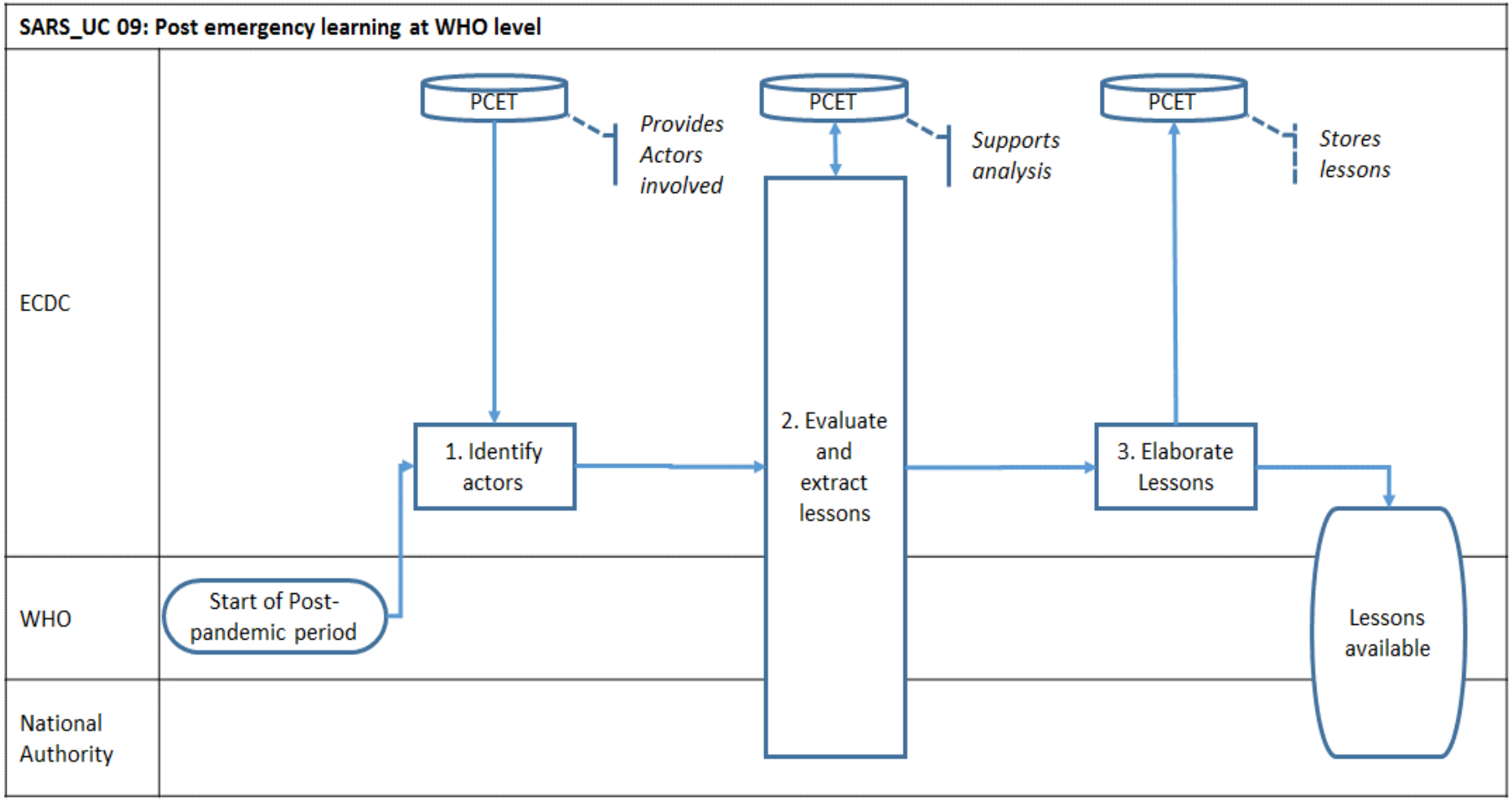
Trigger

This procedure is activated by the ECDC when the WHO post-pandemic period starts.

Output

Its output (lesson learned in the Countries and on the European cooperation) becomes available for all the participant National Authorities, ECDC, and WHO Europe, and by other authorities outside Europe.

Figure 15: Use Case SA 09 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits &values generated by PULSE tools
1. Identify actors	ECDC	PCET records	ECDC Knowledge Officer, also accessing PCET, identifies the actors that may contribute to the evaluation and analysis of the pandemic just closed and invite them to joint analysis meetings	Actors to be involved (Kos from National Authorities + actors that have been involved in the crisis management at European level.	PCET	PCET has recorded during the event the actors that have managed the pandemics as users of the PULSE tools. These actors may be searched in PCET	PCET facilitates the identification of the actors that may contribute to the evaluation and analysis of the pandemic just closed. Actors may be associated to specific phases/ problems/decisions : this allows to organize panels of actors on specific themes.
2. Evaluate and extract lessons	ECDC	PCET records Decision making experiences	ECDC Knowledge Officer, coordinate joint analysis meetings, with the support PCET snapshots and checklist, to extract the lessons. NAs share the lessons learned in their Country	Meeting minutes with draft description of lessons learned	PCET	Storage of the data managed during the crisis (via snapshots) Data-mining of the stored information to support quantitative analysis on cause-effect relationship Check list to support the qualitative analysis	Allows evidence-based evaluation Improves productivity and completeness of the lesson learning exercise
3. Elaborate lessons	ECDC	Meeting minutes with draft description of lessons learned	ECDC Knowledge Officer systematizes, classifies and stores the lessons learned.	Country lesson learned stored in PCET	PCET	• Classification framework • Storage	Provides a common framework for classifying the lessons learned across Europe Provides a repository of lesson learned and of experts (related to the lessons) accessible by every European pandemic event manager

5.2 Stadium Scenario

5.2.1 Scoring system in plan preparation

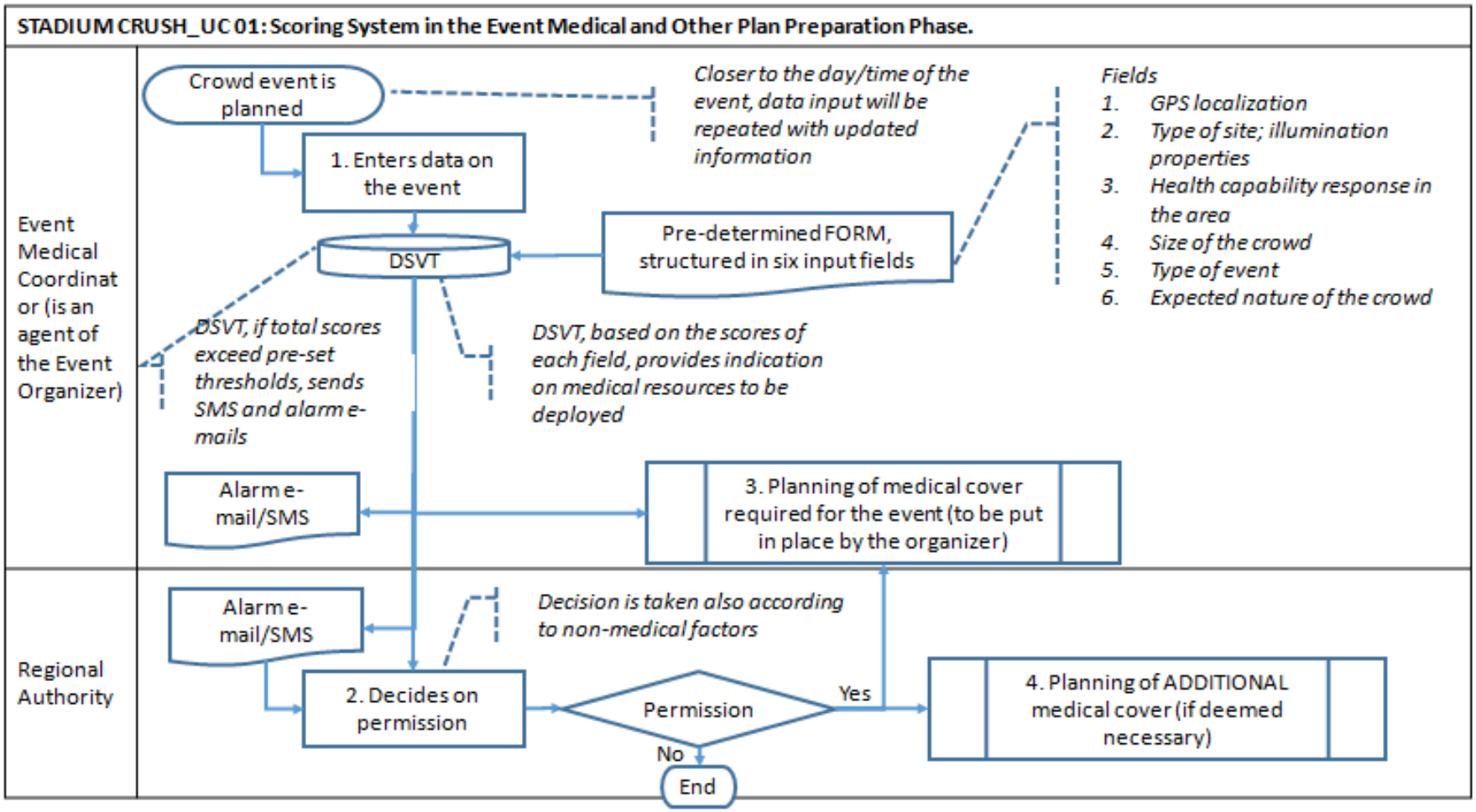
Purpose
The scoring of an event will be used to establish parameters for an event medical plan.
The PULSE platform will provide a combination of two tools to facilitate, web app to display the recognised current situation and DSVT.
The pre-conditions of the scoring system are as followed.
The crowd event is planned that requires specific medical plans to be prepared and submitted to a regional authority for permission and to provide the regional authority with a means of accessing the risk likely for a specific event.

Trigger:
Requirement to notify a planned event to the regional authority.

Output:
The output of this tool will be a scoring of the event medical plan based on the parameters provided by the event medical coordinator.
In turn, this will become available to the relevant national authorities and event medical providers.

Notes:
The scores to be applied are variable for class of event, location, county, region, and can be applied as required.
The current score can be displayed on the RCS as a colour code.
The increasing score can be used in the DSVT to prompt decisions.

Figure 16: Use Case SC 01 SLD



*Medical cover is the healthcare resources pre-deployed to the event based on the current score.

Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values Generated by PULSE tools
1. Data entry: Identify actors (event medical coordinators & regional authorities)	Regional Authority	Web app	Relevant actors input critical data that govern the creation of the event medical plan.	Current Score *Scoring systems includes historical event data	Web App	Providing the data capture form for the definition of the event medical plan	Automated system for generating a medical plan assessment based on the event medical coordinators definitions
2. Decisions on permissions	Event Medical Coordinator Regional Authority	DSVT	The PULSE platform governs the ability of the actor to modify the event medical cover based on the current score.	Recommended event medical cover	DSVT	Assigning role based access	Only relevant personnel can edit and review the plan
3 Planning of medical cover required.	Event Medical Coordinator Regional Authority	DSVT	The event medical coordinator analyses the event score	Agreed level of event medical cover	DSVT	Automated assistance in generating recommended level of event medical cover based on the current score	Immediate real time access to the event medical plan which is consistently updated, which reflects the real time threat level.
4 Confirming the medical cover is adequate & planning of additional medical cover (if necessary)	Event Medical Coordinator Regional Authority	Web app	By re-running the tool with revised data, this will generate the current score	Current updated score, which confirms if the allocated medical cover is adequate based on the score. Alert and/or confirmation is generated and sent by SMS. System will generate a cascade or alerts.	Web App	Event medical coordinator can consistently update the event medical plan	Automatic distribution of the current and any updated threat.

5.2.2 Use of MPORG simulation

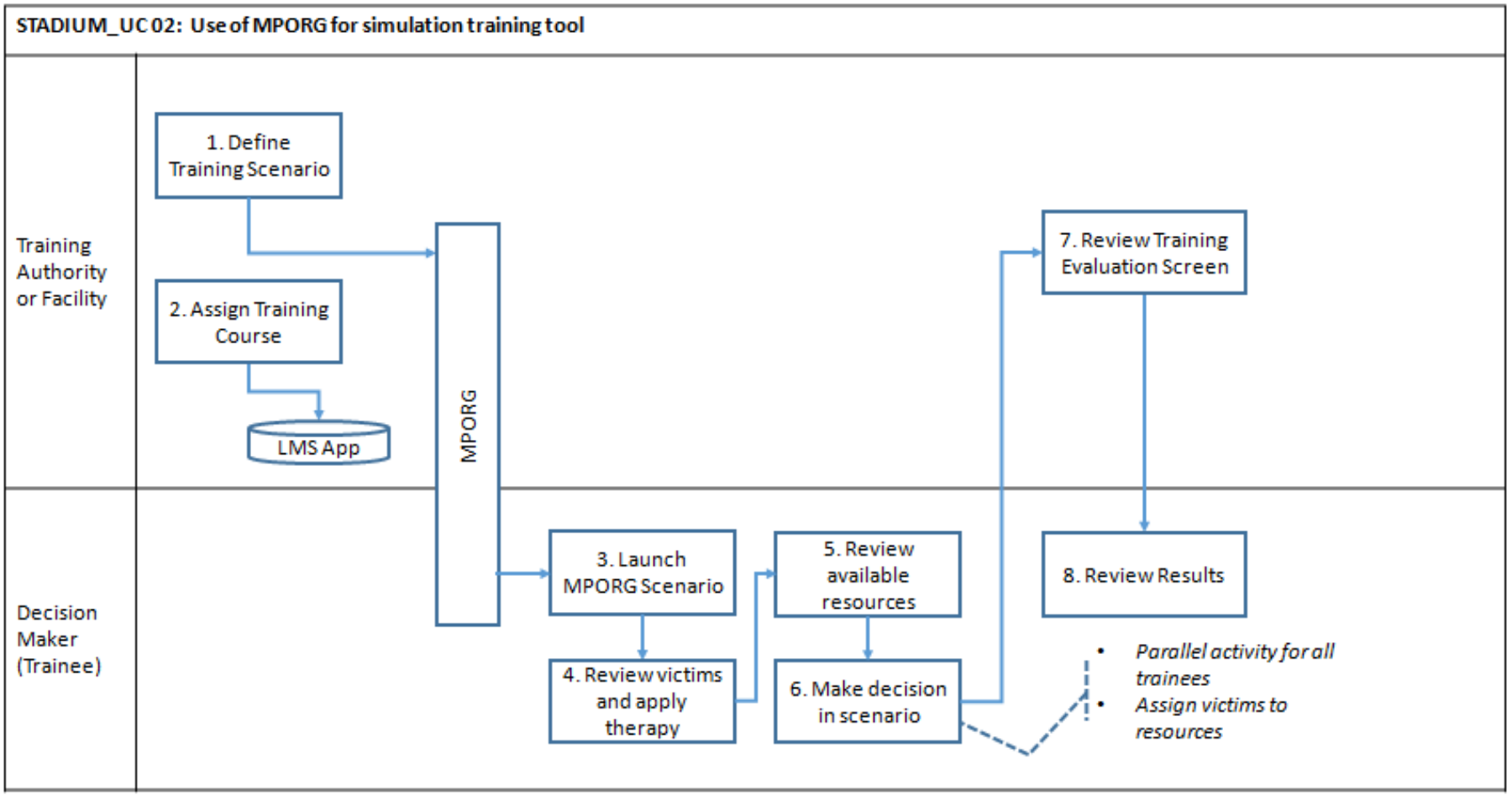
Purpose:
The MPORG training platform for personnel involved in crisis management and a training learning management system tailored for the emergency and health services to provide access to training.
The MPORG tool serves two major purposes:

- The first purpose is to train decision makers in managing healthcare resources in “Stadium crush- like” emergencies in the response phase, using a game like environment and shared game world with many actors playing different roles.
- The second purpose is to provide experts with a simulation tool that allow them to extract feedback information for SOPs updates or testing resource management heuristics.

Trigger:
Decision maker has a training assignment for a stadium crush like scenario.

Output:
At the end of the usage of the MPROG training system and execution of the training scenario, the user is presented with a training evaluation screen which gives them feedback on their overall performance as well as a breakdown of the individual decisions made throughout the scenario, and whether they were optimal or not.

Figure 17: Use Case SC02 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1. Define training scenario by expert	Training Authority or Facility	MPORG	Expert define a realistic scenario which requires training. Real work information is gathered to simulate and core information entered into the MPROG environment.	New training scenario definition deployed within the MPROG environment.	MPORG	Trainer expert defines a new scenario to be presented within MPORG system. Criteria such as all resources are defined. E.g. Hospital locations, expertise, bed availability, emergency location, number of victims and range of injuries.	Flexible for defining a range of scenarios within the MPORG environment for training.
2. Assign training course to decision maker.	Training Authority or Facility	LMS	A training assignment is created by the trainer and assigned to decision maker to complete.	Assignment for training assigned within LMS tool.	LMS	Trainer selects an MPORG training simulation to be assigned to a decision maker. Decision maker informed about new assignment.	Structured means of assigning training courses to emergency response decision makers and tracking of trainees taking courses.
3. Decision maker launches MPROG scenario.	Decision Maker	MPORG	Decision maker starts training assignment. Launches and logs into MPROG environment.	MPROG system started with assigned training scenario and role assigned to decision maker.	MPORG	Trainee logs into MPORG environment and is assigned a role within the simulation.	MPORG environment can support multiple person be trained in parallel and each be assigned different roles.
4 Review injured personnel at scene and apply therapy.	Decision Maker	MPORG	Review the victims at the scene and apply therapy as needed to victims.	Real time updates of victims health status including application of selected therapy.	MPORG	MPORG can defined a range of victims with categories of injuries. Victims health automatically evolve based on mathematical modelling of health status. Assignment of treatments can be applied and change victims health status accordingly.	System accurately models multiple victims categories for a particular scenario and evolves the patient health.
5. Review available resources such as hospitals, expertise and ambulances	Decision Maker	MPORG	Review all available resources around simulated emergency.	Decision maker fully assessed resources and emergency.	MPORG	GUI availability of information on all current resources at hospitals, ambulances at scenes and in transit.	Real time updates on scenario evolution and current resource usage and capacity.

6. Make decisions, assign victims to resources and communicate to other players also making decisions.	Decision Maker	MPORG	Make decisions by deploying ambulances, assigning victims to hospitals etc.	Decision maker use resources and responds to emergency communicating with other players in real time about decisions.	MPORG	Assign of victims to deployed ambulances, deployment to assigned hospitals, update of usage of resources and health of patients.	Real time evolution of scenario based on decision taken by a group of decision makers under training. Multiple personnel supported in parallel.
7. Review Training Evaluation Screen	Training Authority or Facility	MPORG	Review the results of decisions against optimised solution.	Results of effectiveness of decisions reviewed by trainer.	MPORG	Comparison of decision undertaken by decision maker with computer generated optimised solution.	Automated report with comparison of decision made during exercise with an automated optimised solution.
8. Review results with trainer and trainee	Decision Maker	MPORG	Discussion on results with decision maker.	Analysis on effectiveness of decision made and suggestions on improvements.	MPORG	Feedback from analysis by expert with trainee.	Ability to improve decision making capabilities with feedback from training.

5.2.3 Mobilization of additional resources

Purpose:

A tool on the Pulse Platform to provide for mobilisation of additional response resources.
This will be for mobilisation of a pre-arranged "declared" resources and for an "as available" resource and for response to a general request and also for unsolicited offers that can be validated within agreed national legal and ethical parameters.
The main tool to be used is the mobile App but the Display RCS and the DSVT will also be employed.
The on-going data flow will turn the "estimate of demands" into an increasingly accurate list of needs versus availability.
One of the existing barriers to support is the early absence of detail in requests for assistance or mutual support.

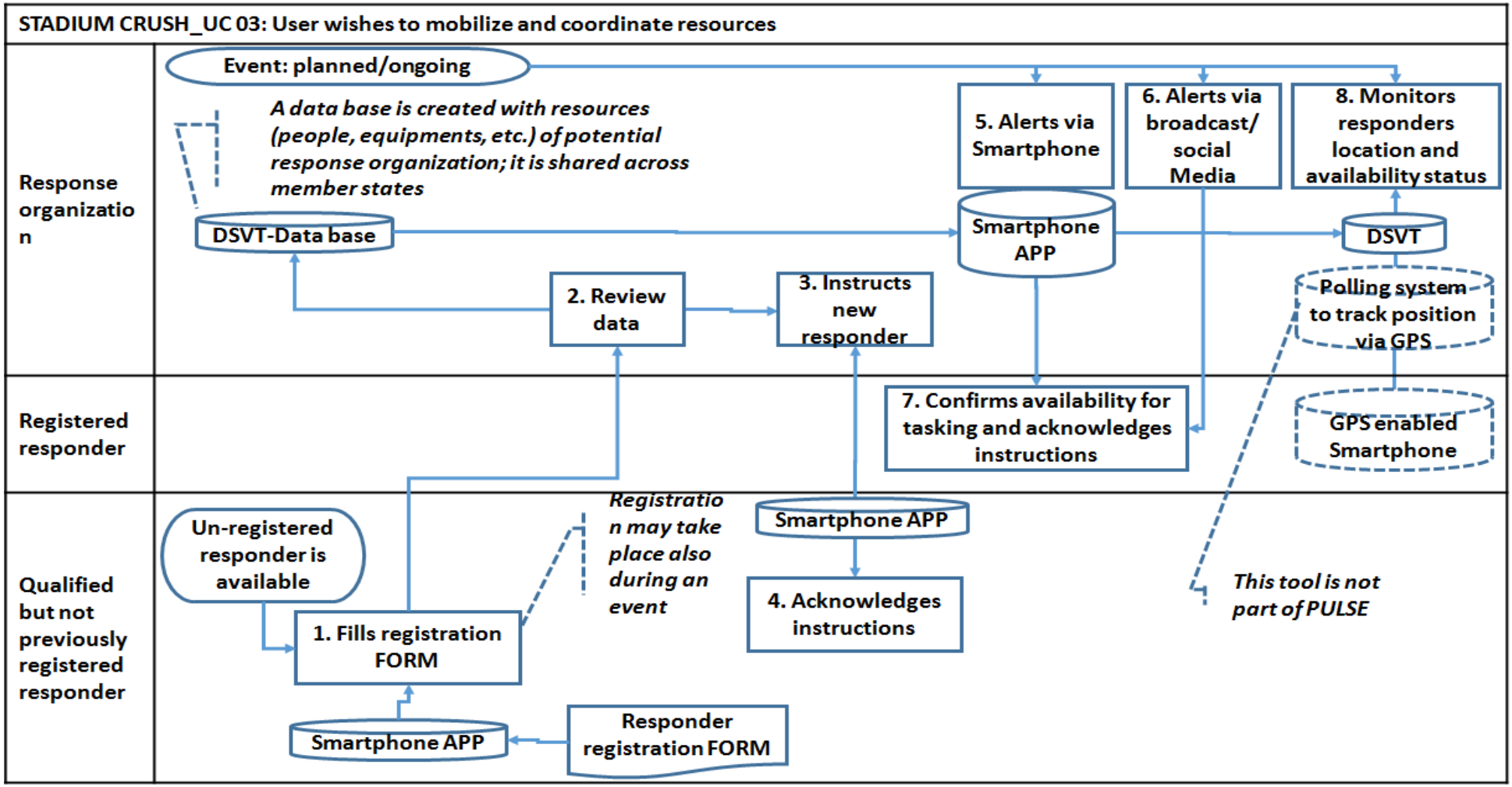
Trigger:

The decision/to recognise that significant additional resource is required to respond a major emergency.

Output:

The PULSE platform enables responder organisations to effectively and efficiently manage the mobilisation of additional resources during a declared major emergency.

Figure 18: Use Case SC 03 SLD



Notes: Software tools already exist to track multiple GPS enabled smart phones and this feature can also be exploited but does not form part of this PULSE mobilisation tool.

Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1. Fills in registration form	Resource Provider	Smartphone app	Responders qualification details	Capture data that is then stored in the DSVT	Smartphone App	The Smartphone app records the entered data that the resource provider has submitted	Ability for a mobile phone to be used to best used for professional responders.
2. Review data	National authority	Data submitted by resource provider	Responders qualification details	Confirmation/rejection of the responders skill level claim	DSVT	The database reviews the data and cross matches against national and international registration systems in near real time	Cross-matching against existing databases and stored national registration systems in near real time
3. Alerts & instruction via Smartphone or social medial/broadcast	National authority	Data from DSVT	Set of qualified and validated registered personnel	An alert request distributed	Smartphone App	The Smartphone app instructs registered responders based on the previous data input and location an current status	Automatic access to pre-populated database of registered responders and their current status.
4. Confirms availability of responder for tasking an acknowledges instructions	Resource provider	Availability status via Smartphone app	Time to scene, availability status, ETA, parent organisation permissions	An graphic and tabular representation of current responding resources	Smartphone App	Confirmation of availability and information of status and location details.	To be able to assign registered responders to specific tasks in near real time.
5. Monitors responders location and availability status	National authority	Smartphone app	Updated status and GPS locations	Common picture of resources availability	Web app	Graphical and tabular review of the recognised current situation. .	Real time view of the resources available and committed. Both for the incident and continuity of national cover.
6.	N/A				N/A		.

7. New registrations of not previously responders	Resource provider	Web/ Smartphone app	Personnel qualification details	Capture data that is then stored in the DSVT (invalidated)	Smartphone App or Web App	The Smartphone app records the entered data that the resource provider has submitted	Resources are not confirmed to pre-registration and allows for additional resources. It can also be used to register non-clinical support.
8.	N/A[49]				N/A		

[49] outside scope of this use Case

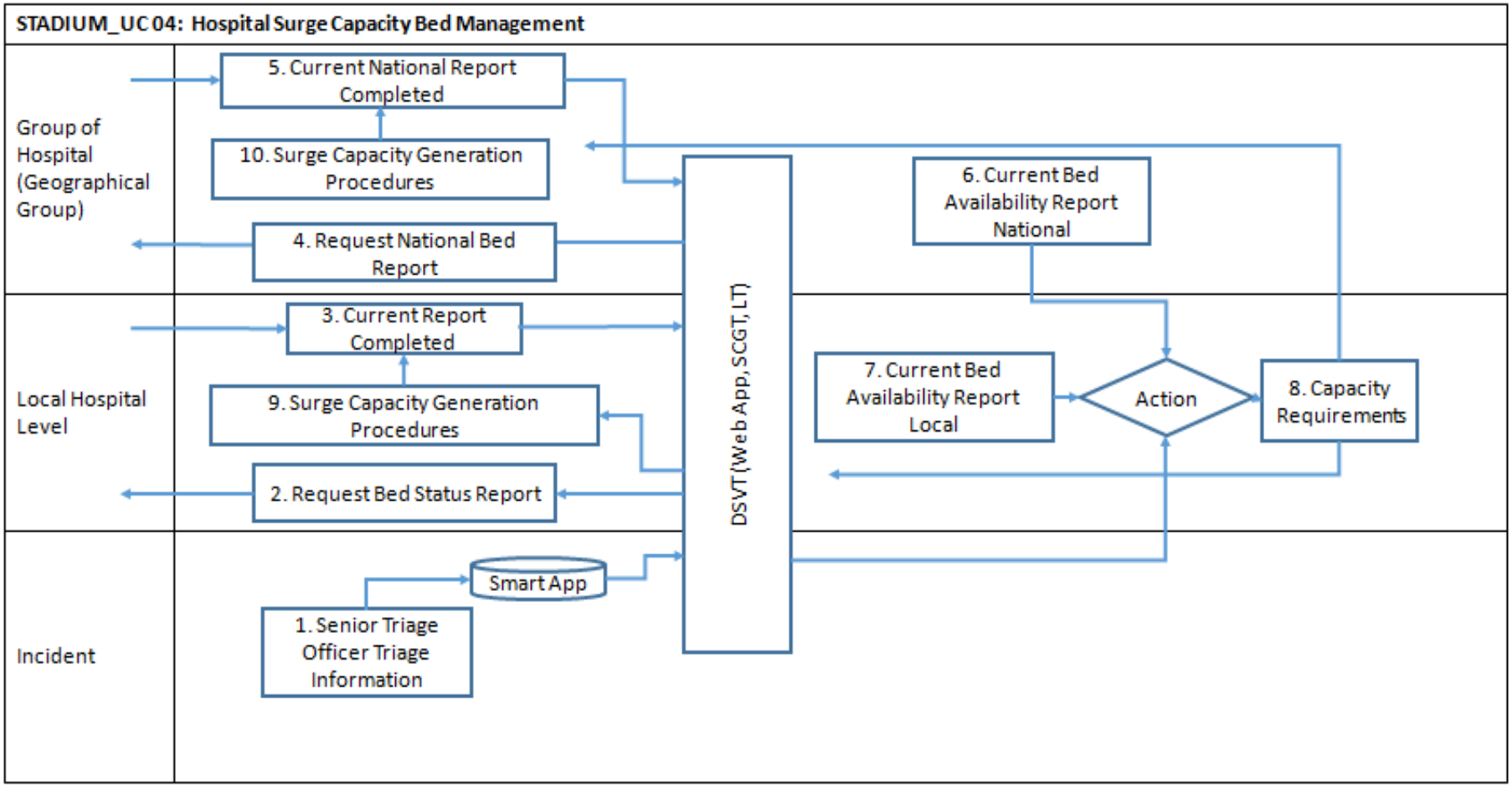
5.2.4 Hospital Surge Capacity and Bed Management

Purpose:
Usage of PULSE Platform tools which include a Web App, the LT, SCGT, the Display RCS Web App and DSVT to provide summarised information to support decision making by Hospital controllers and regional authorities and crisis management teams with regard to hospital admissions.
There are clear definitions of what constitutes a bed and the types of bed exist and are agreed in the application of the use case.
The types of bed will include: Critical Care Beds, Intensive Care Beds, General beds, and General beds suitable to decant exiting patients.

Trigger:
Major Incident or exercise required for the use of Hospital Surge Capacity and Bed Management.

Output:
The output of this tool will be that triage information is gathered from both the casualty clearing station and the hospital in order to determine the amount of available beds in a hospital in which they can receive triaged patient from the scene of a major emergency incident site.

Figure 19: Use Case SC 04 SLD



Notes: Some form of "person-in-loop" will be required to filter and update the final data that has been offered for display. In addition, the type of bed requested will always be the one actually required which may not be true for all situations. Patients can deteriorate or improve.

Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1. Senior triage officer triage information	Triage officer	Smart-phone App	Triage status photographic evidence, bar-coding information	Real time picture of triage information	Smart-phone APP	Capturing on site triage information	Real time and advanced warning of potential bed capacity
2. Request current bed status from local hospital level	Local hospital	Web App	Hospital defined bed availability	Current resource defined by hospital stored by DSVT system	Web App	Online capturing of current resources at local level	Real time and common display
3. Current report completed from local hospital	Local Hospital	Web App	Local hospital bed definitions	Resource definitions submitted to DSVT, LT tools	DSVT	Current resource Details submitted and stored on server	Central storage of current resources at a local hospital and a common definition.
4. Request current bed status from national hospital level	National hospital groups	Web App	National Hospital defined bed availability	Current national resource availability information stored by DSVT system	Web App	Online capturing of current resources at national level	Real time and common display
5. Current report completed from national hospital	National Hospital	Web App	National hospital bed definitions	Resource definitions submitted to DSVT, LT tools	DSVT	Current resource Details submitted and stored on server	Central storage of current resources at a national hospital and a common definition.
6. Current Bed availability report national	National hospital groups	Web App	Summary of bed availability	Report of current resource availability	Web App	Simultaneous access to the current resource information at national hospital level	Informed decisions on patient transport
7. Current Bed availability local	Local Hospital	Web app	Summary of bed availability	Report of current resource availability	Web App	Simultaneous access to the current resource information at onsite hospital	Informed decisions on patient transport
8. Capacity Requirements	National & Local	DSVT, SCGT, LT	Definition of surge capacity resources required	Reports on the level of discontinuity of the requirements and availability	DSVT, SCGT, LT	Generation of at scene surge requirements of response	Reliability of the estimate is significantly increased and available in a shorter time frame

9. Activates surge capacity generation procedures nationally	National Coordinator	DSVT Web App	National summary of needs vs. availability of national bed capacity	Capacity picture at national level	DSVT	Using the generated output will facilitate relevant surge capacity requirements	Improved patient care
10. Activates surge capacity generation procedures local	Local Coordinator	DSVT	Local summary of needs vs. availability of national bed capacity	Capacity picture at local level.	DSVT	Using the generated output will facilitate relevant surge capacity requirements	Improved patient care

Purpose.

Usage of PULSE Platform tools which include a Web App and the Display RCS Web App and DSVT to provide summarised information to support decision making by the on-site co-ordinators and commanders.

The Primary Actor is the CCS Officer who uses the PULSE Platform Web App to input specific patient information.

However, as Triage is on-going process and over- Triage or under- Triage is an on-going challenge and the patient condition may well deteriorate/improve.

Triage is dynamic, as the patient's condition progresses, so too will his/her need for intervention alters.

A precondition for the triage tool is that an exercise or an event has taken place and that the necessary hardware and communication pathways and networks are in place.

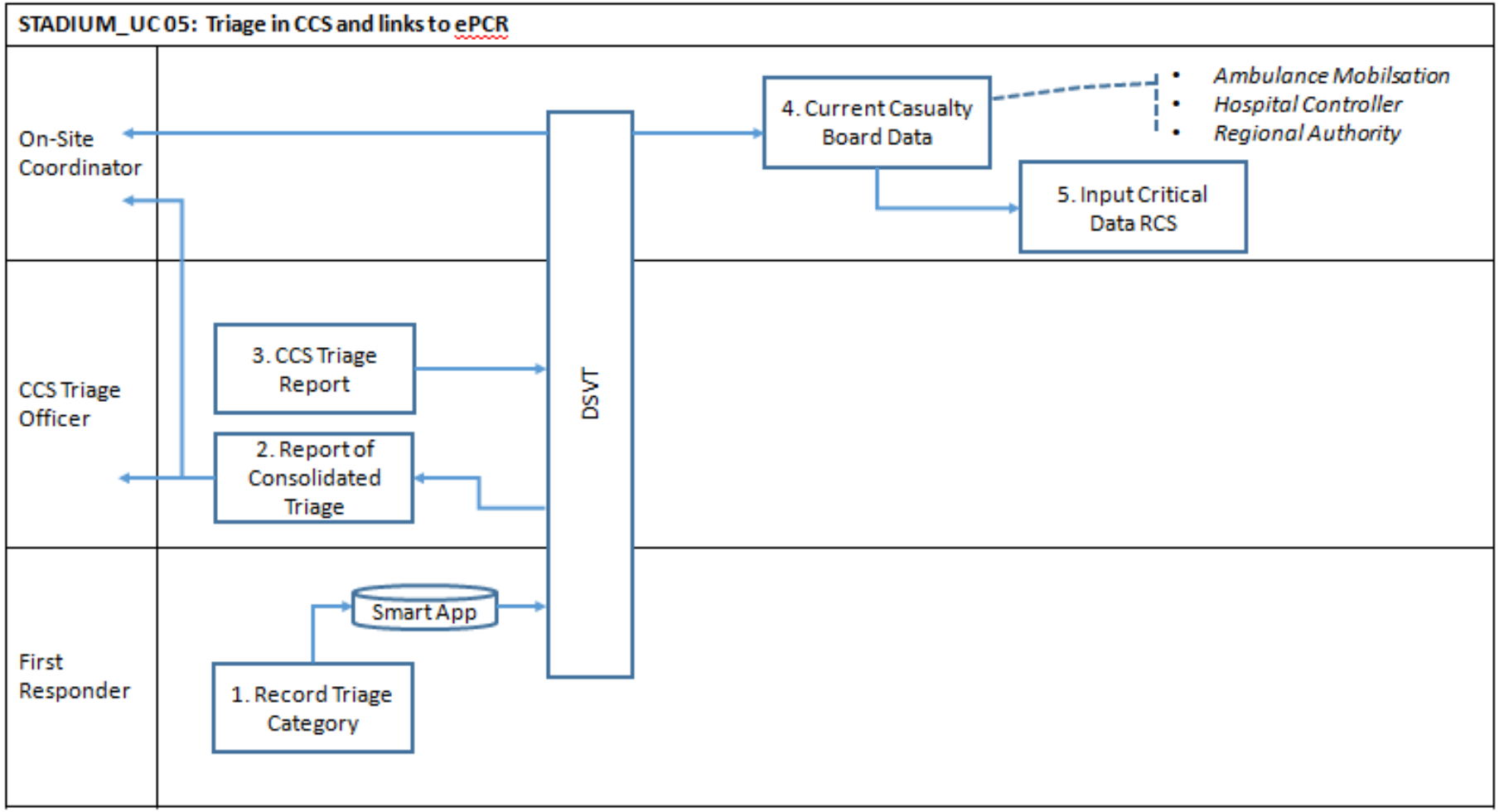
Trigger:

The setting up of a casualty clearing station.

Output.

The output of this tool will be an updated RCS of triaged patients at the scene of a major emergency or at the casualty clearing station with key input from the ePCR.

Figure 20: Use Case SC 05 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values Generated by PULSE tools
1. Record triage data for each patient	First Responder	Smartphone App	Current individual casualty triage status	Current patient triage status	Smartphone App	Triage data entry	Real time mobile capture of triage data and transmission to a central storage repository
2. Report of consolidated triage	CCS Triage Officer	DSVT Smartphone App	Consolidated triage status of identified patients	Graphical and tabular report on current casualty status	DSVT	Presentation of consolidated triage data from first responder	Automated
3. CCS Triage Report	CCS Officer	Smartphone App DSVT	Current consolidated triage list	Revised Graphical and tabular report on current casualty status	Smartphone App DSVT	Revision and review of the consolidated triage data	Automatically available for distribution
4. Current Casualty board data	On-Site Coordinator	DSVT	Description of the casualty data definition	Revised Graphical and tabular report on current casualty status	DSVT	Presentation of verified information	Available in near real time in graphical and tabular format.
5. Input critical data RCS	On-Site Coordinator	DSVT	Updated casualty data board	Graphical and tabular summary of the current casualty status	DSVT	Presentation of consolidated data at appropriate response levels	Available for input into a different environment.

I

5.2.6 Input critical data for the RCS[50]

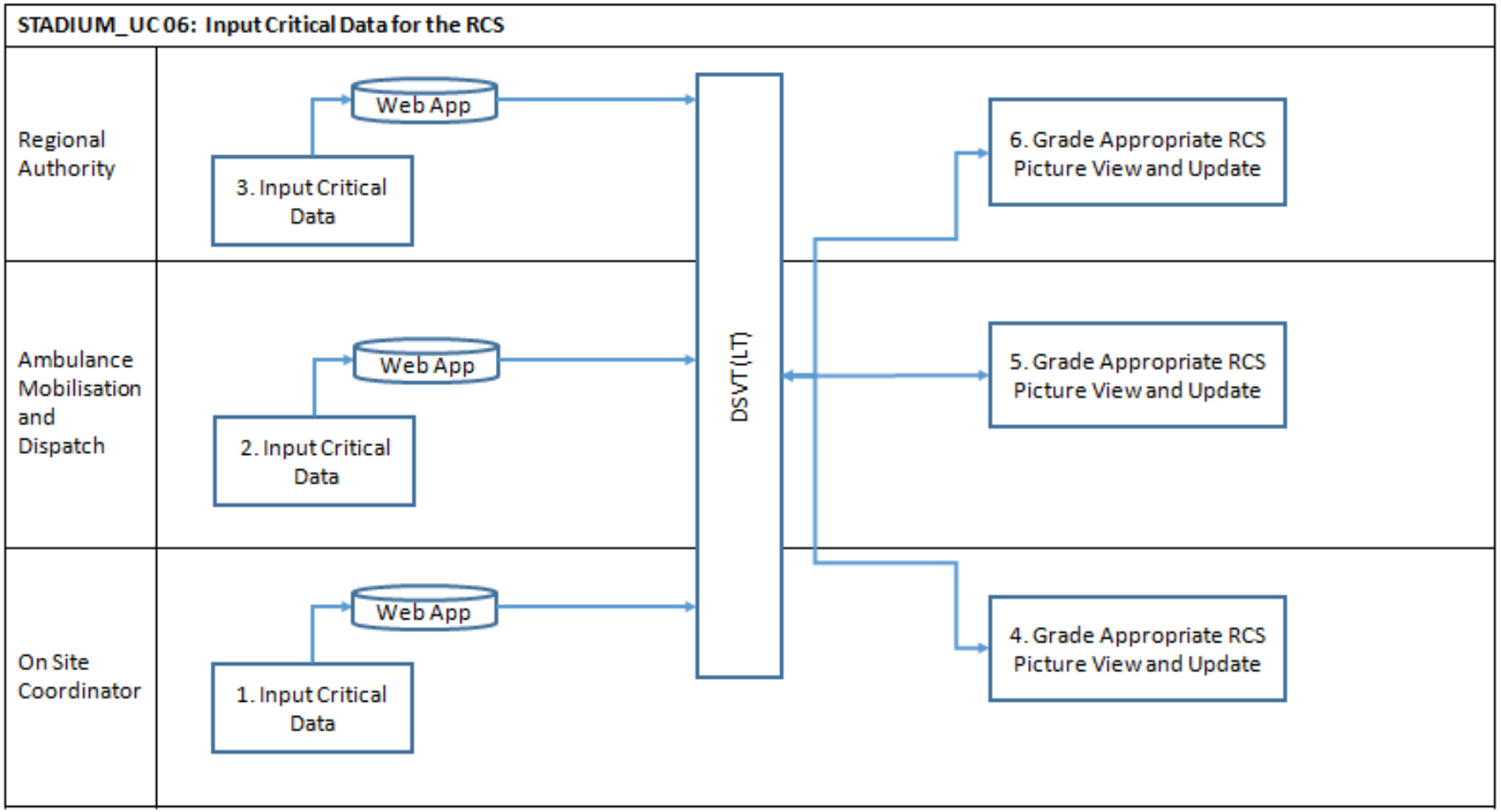
Purpose:
Usage of a PULSE Platform tools which includes a Web App and the Display RCS Web App and DSV-T to provide summarised information to support decision making by the on-site co-ordinators and commanders.

Trigger:
Can be either as an on-going Recognised Current Situation (RCS) monitoring process for a planned event, or set up at scene with the arrival of a dedicated C3 vehicle or equivalent.

Output:
The output of this PULSE tool will be summarised information to support decision making by the on-site co-ordinators and commanders

[50] Recognized Current Situation

Figure 21: Use Case SC06 SLD



Notes: Some form of “person-in-loop” will be required to filter and update the final data that has been offered to form the display.

Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits and values generated by PULSE tools
1. Input critical data from the on-site coordinator	On-site coordinator	Web App LT DSVT	The onsite coordinator feeds in information from the incident to the DSVT, which is previously populated by the Web App and LT	Provides a common framework for identifying critical data from the on-site coordinator	Web APP LT DSVT	Data is collated from the web app, LT and DSVT from the on-site coordinator	The PULSE platform collates and displays current critical data from the on-site coordinator
2. Input critical data from ambulance mobilisation and dispatch services	Ambulance mobilisation and dispatch centre	DSVT	The ambulance mobilisation and dispatch team input data into the DSVT	Provides a common framework for identifying critical data from the ambulance mobilisation and dispatch services	DSVT	Data is collated from the DSVT from the ambulance mobilisation and dispatch services	The PULSE platform collates and displays current critical data from the ambulance mobilisation and dispatch services
3. Input critical data from regional authority	Regional authority	DSVT	The regional authority feeds in information into the DSVT	Provides a common framework for identifying critical data from the regional authorities	DSVT	Data is collated from the DSVT from the regional authorities	The PULSE platform collates and displays current critical data from the regional authority
4. Grade appropriate RCS picture view and update on-site coordinator	On-site coordinator	DSVT	The DSVT systematizes, classifies and stores the RCS from the on-site coordinator	A current RCS from the on-site coordinator	DSVT	The DSVT automatically generates the RCS in relation to the on-site coordinator	The PULSE platform tries to provide an always-updated status of the on-site RCS
5. Grade appropriate RCS picture view and update ambulance mobilisation and dispatch services	Ambulance mobilisation and dispatch centre	DSVT	The DSVT systematizes, classifies and stores the RCS from ambulance mobilisation and dispatch services	A current RCS from the ambulance mobilisation and dispatch services	DSVT	The DSVT automatically generates the RCS in relation to the ambulance mobilisation and dispatch services	The PULSE platform tries to provide an always-updated status of RCS to the ambulance mobilisation and dispatch services
6. Grade appropriate RCS picture view and update regional authority	Regional authority	DSVT	The DSVT systematizes, classifies and stores the RCS from regional authority	A current RCS from the regional authority	DSVT	The DSVT automatically generates the RCS in relation to the regional authority	The PULSE platform tries to provide an always-updated status of RCS to the regional authorities

5.2.7 Post-event evaluation

Purpose:

The purpose of this SOP is to describe the flow of steps that should be put in place in order to collect “hot-debrief” in the immediate aftermath of an incident or exercise.

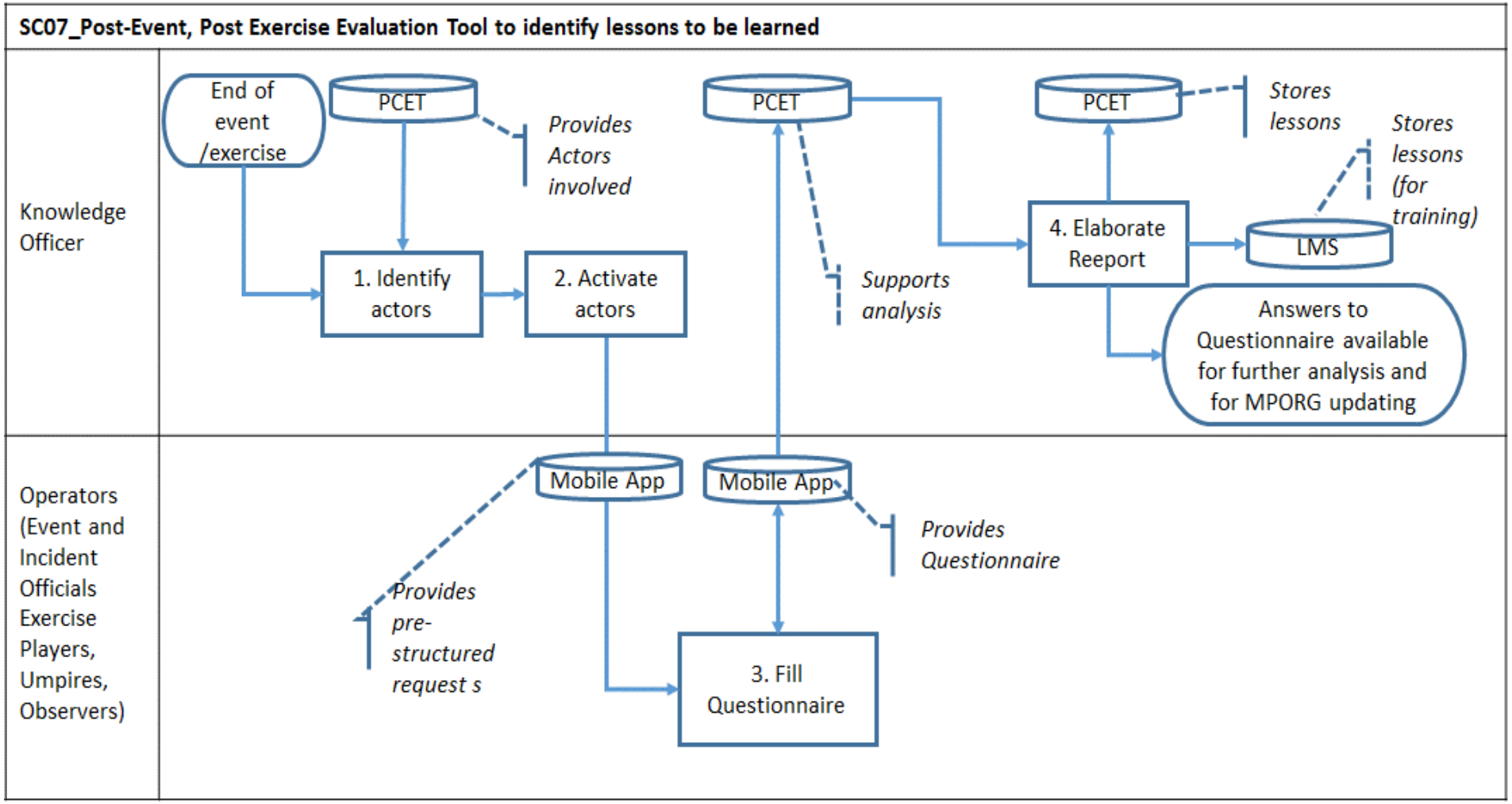
Trigger:

An exercise or event has taken place.

Output:

The output is a report containing the lesson learned.

Figure 22: Use Case SC 07 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1. Identify actors	Knowledge Officer	Data record by PCET	KO search in PCET all the actors that had been involved in the event/exercise with decision making roles	Actors to be activated	PCET	Provides names of the actors recorded during the event/exercise	Rapidity and completeness of sources
2. Activate actors	Knowledge Officer	Actors to be activated	KO sends an invitation to all the actors via Mobile App	Request to Provide evaluation	Mobile App	Automatic invitation to all the relevant actors	Rapidity and completeness
3. Fill questionnaire	Operators	Request to provide evaluation Questionnaire	Each operator fills the questionnaire directly in the mobile App	Filled questionnaire	Mobile App	The questionnaire may be filled on line via Mobile App.	Rapidity, completeness and standardization
4. Elaborate Report	Knowledge Officer	Filled Questionnaires	KO elaborates a report containing the lesson learned	Report on lesson learned	PCET LMS MPORG	PCET allows to store and analyse the responses to the questionnaire LMS allows to store the report MPORG may be updated to take into account the new lessons leaned	Rapidity and completeness Diffusion of knowledge

Purpose:

Usage of a PULSE Platform tool which is a Web App and Display RCS to meet the immediate requirement to create a central contact point for the matching of information available on casualties with requests from all those seeking or providing information about persons involved in the incident. In the event of a major emergency involving significant numbers of casualties, the appropriate authorities (usually the police) will establish a Casualty Bureau to collect and collate the details (including condition and location) of all casualties and survivors.

To facilitate this process, a liaison/casualty officer will normally be sent by the appropriate authorities to each location or facility where casualties are being treated or displaced persons are gathered.

All other services should ensure that any information collected on any casualty is transferred via the appropriate authorities to the Casualty Bureau.

The Pulse Platform Web App will be used to collect and collate the relevant data.

The average time to set up a 'help-line' or information line is more than two hours.

This PULSE tools can reduce that time lag to about 15 minutes from the decision to set up.

The system however will distinguish between types of disasters as all this data is not required at a very early stage in the aftermath of a major emergency such as a crowd crush where identification might be simpler than in a disaster like an earthquake.

This will provide a major improvement on the current situation whereby scarce call-taking resources can be re-focused onto data collation and proactive inquiries.

Trigger:

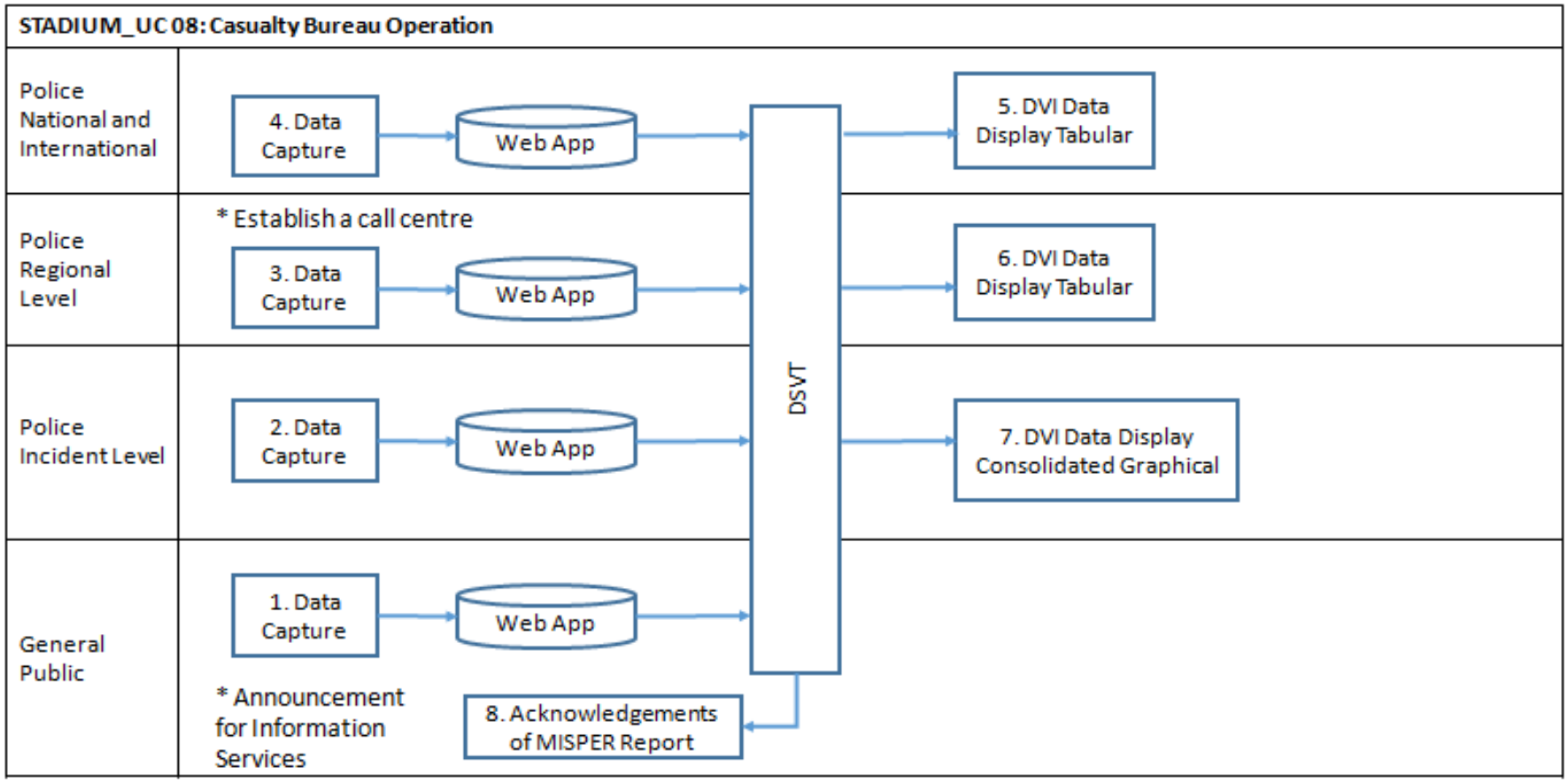
A requirement from the public and the police force to complete details in relation to casualties and missing persons in the case of a major emergency.

Output:

The output of this tool will be an online multi-access casualty bureau whereby the police force and the public will enter details of a potential casualty into the system which will be collected by a national contact point.

Notes: There will be a degree of decision support in the casualty bureau collation software, but it will always require a “person-in-loop” to confirm or reject what the database analysis proposes. An example can be multiple entries for the same casualty and the software would suggest that a number of casualties exist featuring the same characteristics.

Figure 23: Use Case SC 08 SLD



Workflow description **PULSE tool contribution**

Step	Owner	Input	Content	Output	Tool applied	Functionality performed	Benefits & values generated by PULSE tools
1 Data capture from the general public	General public	DSVT	A member of the general public inputs data into the DSVT in relation to a specific casualty	Creation of a unique casualty/missing person in the system	DSVT	The DSVT captures the data from the member of the general public creating a unique entry	The PULSE platform allows for an online single point of entry and collation of data for missing persons/casualties during a major emergency
2 Data capture from the police at incident level	Police at incident level	DSVT	A member of the police force at incident level puts data into the DSVT in relation to a specific casualty/missing person	Creation of a unique casualty/missing person in the system	DSVT	The DSVT captures the data from the member of police force at the incident in turn creating a unique entry	The PULSE platform allows for an online single point of entry and collation of data for missing persons/casualties during a major emergency
3 Data capture from the police at regional level	Police at regional level	DSVT	A member of the police force at regional level puts data into the DSVT in relation to a specific casualty/missing person	Creation of a unique casualty/missing person in the system	DSVT	The DSVT captures the data from the member of the police force at regional level creating a unique entry	The PULSE platform allows for an online single point of entry and collation of data for missing persons/casualties during a major emergency
4 Data capture from the police at national and international level	Police at national and international level	DSVT	A member of the police force at national and international level puts data into the DSVT in relation to a specific casualty/missing person	Creation of a unique casualty/missing person in the system	DSVT	The DSVT captures the data from the member of the police force at national and international level creating a unique entry	The PULSE platform allows for an online single point of entry and collation of data for missing persons/casualties during a major emergency
5 DVI Data display in	Police at	DSVT	A current real time picture	DVI Data display in a	DSVT	The DSVT creates a	The PULSE platform

a tabular format from international and national level	national and international level		of data from international and national input	tabular format from international and national level		current near real time view of casualty bureau	automatically generates a current overview of the casualty bureau
6 DVI Data display in a tabular format from police at a regional level.	Police at a regional level	DSVT	A current real time picture of data from regional input	DVI Data display in a tabular format from police at a regional level.	DSVT	The DSVT creates a current near real time view of casualty bureau	The PULSE platform automatically generates a current overview of the casualty bureau
7 Consolidated DVI Data display in a graphical format from police at regional level	Police at regional level	DSVT	A current real time picture of data from regional input	Consolidated DVI Data display in a graphical format from police at regional level	DSVT	The DSVT creates a current near real time view of casualty bureau	The PULSE platform automatically generates a current overview of the casualty bureau

6 Method for evaluating the PULSE platform and tools

Introduction

After the setup and during and after the trials, the PULSE platform will be systematically evaluated. The evaluation of the PULSE system and its components will be structured into three different aspects:

1. The evaluation of the effectiveness of the system in terms of benefits created, compared to a situation without PULSE (chapter 6.1)
2. The system performance in terms of usability, flexibility, growth potential etc. (chapter 6.2).
3. The "societal" evaluation, assessing the system with regard to its expected acceptance and appreciation by society and to the reservations or objections society may have against such a system (chapter 6.3).

These "Societal" views will include the possible attitude and reaction of individuals, societal groups, society as a whole, politicians, operators and users.

6.1 Benefits/Effectiveness and MoEs

The PULSE platform and its individual tools will be demonstrated in two realistic scenarios, which have been described in D2.2. These scenarios are further detailed in a total of 17 use cases in each of which selected scenario events and their processes are described. These processes are depicted in this D5.2 in detailed workflow diagrams using the "Swim Lane Diagram" (SLD) methodology (Chapters 5.x). Each diagram is further detailed by a table describing the functions to be performed in the use case and describing the application of the PULSE tools in the respective use case. A further column was created by the tool developers to describe the expected benefits the tools will facilitate when applied to the use case. From these expected benefits, the main measures of effectiveness (MoEs) will be derived by which the power of the tools will be proven and validated.

Measures of Effectiveness (MoE) are parameters by which the effects and benefits of the PULSE platform and its components can be described and validated.

Typically, MoEs can be

- quantitative (e.g. reduced reaction time in a given situation, better utilization of resources, saved lives, reduced numbers of injuries etc.) or
- qualitative (e.g. lowering the risk of abusing personal patient data, quality of decisions, quality of information etc.).

As the two PULSE scenarios were deliberately chosen and designed to be very different, there will be different effects created by the tools depending on how they will be applied in the scenario use cases.

The following Table 4 gives the summary of expected benefits as they are presented in the individual process diagrams (SLDs) and the corresponding evaluation tables of

chapter 5. The expected improvements to be achieved by the tools are listed below in the right column. At this stage of the tool development, most of the characteristics and attributes of these benefits are still qualitative. They are marked turquoise. During the process of further tool development and integration and the testing and experimenting, these benefits will be described more precisely and quantified whenever possible (e.g. in terms of output data, reaction times etc.). They will then finally serve as the MoEs in the final validation in WP7.

Table 4: Preparation of MoEs

TOOL[51]	Applied in UC-#	Values generated by PULSE tools	Criteria and Qualifiers for MoEs Source (if already known)
		SARS-Scenario (SA)	
	SA1	**Weak Signal...**	
DSVT	SA1	Classified weak signal information relevant for SARS Topic Automatic suggestions of signals exceeding thresholds Specific recommendations/protocols sent	Information related and relevant to the SARS topic List of signals Organizations informed in timely manner, e.g. for travellers, health operators, laboratories
IAT	SA1	Weak signals generated "zone-specific" weak signals data sent to DSVT	List of signals and classification information
	SA2	**Airplane arriving...**	
APP/DVST	SA2	Web based access to the APP Paperless on-board filling of diagnosis form	Easy access time to the IHR communications procedure Estimated reduction of pilot error rate (comp. to paper)
DSVT DSVT/SCGT/ LT	SA2	Electronic information to airport medical centre on "new case" Electronic filling of questionnaire for IHR CP Determination of passenger destination	Immediate visibility & communication to the "right" actors Reliable information; reduced error rate Allocation of the "optimum" hospital; alerting the right NA[52]
	SA3	**Ship arriving...**	
App/DVST	SA3	Web based access to DSVT and/or APP	Easy access time to the IHR communication procedure

[51] See acronyms in chapter 8
[52] National Authority

		Electronic completion of form ("module")	Reduced risk of error (compared to paper)
DSVT DSVT/SCGT/ LT	SA3	Electronic info to local health authority Electronic filling of questionnaire for IHR CP Determination of passenger destination	Immediate visibility & communication to the "right" actors Reliable information; reduced error rate Allocation of the "optimum" hospital; alerting of the right NA
	SA4	**Identification of a new ... case in a community**	
DSVT	SA4	Online alert and case creation form	Easy access Lower risk of errors (compared to paper)
DSVT/SCGT/ LT	SA4	Determination of passenger destination	Fast allocation of "optimum" hospital
DSVT	SA4	Alert form, diagnosis form, questionnaire	Lower risk of errors (compared to paper) Immediate communication
	SA5	**....Resources**	
DVST	SA5	Status of hospitals and resources update and re-assessment	Always updated status for "best" decisions
DSVT SCGT/LT/ ENSIR	SA5	Re-assessment of hospitals and resources in case of disease expansion Support purchase or other measures; notify NA	Effectiveness and reliability of forecasting ..and of acquisition & re-allocation of resources
	SA6	**ECDC recommendations**	
DSVT/ENSIR	SA6	Simulation of cross-national scenarios	Early information of possibly affected nations Reliability of forecast?
	SA6	Guidelines for possibly affected nations	Quality of support
	SA7	**Nat' auth. periodic ass'mt...**	
DSVT/ENSIR	SA7	Simulation of "national" epidemic expansion	"complete" overview and reliable forecast
DSVT/LT DSVT DSVT	SA7	Actual resources status and suggestion to increase Suggests to procure & deliver drugs Suggests to alert hospitals	Take "better" decisions... Decision support on ... ??? ...plans to "better" handle the

		Update & re-issue intervention plan	crisis
DSVT	SA7	Use of social media	Information "coverage" of society; timeliness, usefulness of information
	SA8	**Post-em. learning/ national...**	
PCET	SA8	Recording of "actors"	Flexibility to select the "right" actors depending on the evaluation subject
PCET	SA8	PCET support tools: Storage, mining, analysis checklists; Classification of LL & storage	"evidence based " evaluation Inprovement of Lessons Learned process; accessibility of LL-repository
	SA9	**Post-em. learning/ WHO...**	
	SA9	Recording of "actors"	Flexibility to select the "right" actors depending on the evaluation subject
	SA9	PCET support tools: Storage, mining, analysis checklists; Classification of LL & storage	"evidence based " evaluation Improvement of Lessons Learned process; accessibility of LL-repository
		Stadium Crush Scenario (SC)	
	SC 1	**Scoring..in plan preparation**	
App	SC1	Data capturing	Automation of medical plan generation
DSVT	SC1	Assigning role-based access	Selection of relevant personnel
DSVT	SC1	Assistance in generating recommended level of event medical cover	Immediate real time access ...
APP	SC1	...consistently update the event medical plan	Automatic distribution of the current and any updated threat
	SC2	**...MPORG for simulation for training**	
TT/MPORG	SC2	Define range of scenarios... Parallel training of multiple persons in different role Modelling victims health	Flexibility for defining a range of scenarios Numbers, variety, spec's, of trainees and roles Degree of realism of model

		categories and health status Real time update (scenario; resources), and updates based on decisions Automated reports with comparison of decisions... Improve decision making via feedback	and data Is "Real time" response sufficient? reaction to player decisions? Comparison logic?; "optimised solution" Degree of realism of model and data
LMS/ APP (?)	SC2	Structured means of assigning and tracking of trainees	Gained efficiency compared to present
	SC3	**Mobilization & coordination of...resources**	
APP[53]	SC3	Record entered data Alerting/ instruction of pre-registered responders; Confirmation of availability; assignment to specific tasks Recording of data submitted by resources provider	Availability to and utility for, responders Access and to "current" status Effectiveness of the process ???; Use for registering non-clinical support
Web APP	SC3	Review of RCS	Realtime view of resources ...
DSVT	SC3	Matching of data against nat'l & international registration syst.	Near real-time cross-matching
	SC4	**Surge capacity & bed mgm't**	
Web APP/DSVT	SC4	Capturing triage info Capturing and reporting resources, local & national level	Real time warning concerning bed capacity Real time display; common definition
Web APP	SC4	Simultaneous access, local & national level	"informed" decision on patient transports
DSVT/SCGT/LT	SC4	Generation of on-scene surge requirements	Increased reliability of estimates
DSVT	SC4	Generation of needed ("relevant") surge capacity	Relevant surge capacity and improved patient care
	SC5	**Triage in CCS & link to ePCR[54]**	
APP&DSVT	SC5	Triage data entry, consolidation, revision	Real time capturing and automated processing
DSVT	SC5	Verified & consolidated triage information (ePCR) for other	Quality of presentation (realtime, graphical, tabular)

[53] differnce between Smat Phone APP and Web APP needs to be clarified (request to Paul, 03.11.
[54] electronic patient care record

		authorities	
	SC6	**Input critical data for RCS**	
WebAPP/LT/DSVT	SC6	Critical data from on-site coord.	Quality of collation and display
DSVT	SC6	Data input from ambulance dispatch, regional authorities Generation of the RCS related to on-site coordinator and ambulance dispatch services and regional authority	Quality of collation and display Quality of "always updated" information and related to the different addressees
	SC7	**Post-event evaluation (LL[55])**	
PCET	SC7	Provides information on actors	Rapidity and completness
APP	SC7	Questionnaire	Adequacy; "standard"
PCET LMS MPORG	SC7	Analysis of response, reporting, update of MPORG	Type of analysis and interfacing
	SC8	**Casualty bureau operation**	
DSVT	SC9	Data capturing on missing persons & casualties from • General public • police...incident level • police...regional level • national & intern. level	Single point of entry & data collation; Reduction of setup time of casualty bureau & support
DVST	SC9	DVI data display from international, national, regional level Consolidated graphical data display	"automatic" generation of overview

This table will become the basis for the tool and system evaluation. Turquoise marked attributes will be refined during tool development and exercise setup. This includes the identification of data and information sources for the individual MoEs. Typical candidates of information sources in this type of system and test trials are:

- Data from result data repositories,
- Data from dedicated tool data files,
- Debriefings after trials,
- Structured/ facilitated discussions and brainstorming sessions,
- Dedicated expert statements (e.g. from interviews),
- Structured scoring system such as Questionnaires.

The acquisition of knowledge and the subsequent evaluation process will be subject to

[55] lessons learned

further substantiation in WP7 on "Trials & Validation.

6.2 Performance of the PULSE system (MoPs)

The second part of the evaluation will focus on the inherent qualities of the PULSE platform. This again comprises a set of characteristics we call Measures of Performance (MoP), which include fearures, such as:

- User friendliness,
- Transparency and understanding,
- Growth potential,
- Flexibility to adapt to new threats and the required countermeasures,
- Maturity of the software solution,
- Expected effort to introduce and operate the system.
- Interoperability of the system

There is a need for interoperability assessment of the PULSE system. Some methodology support on how to evaluate interoperability is given in Annex 3; also elaborated in [2].

At the present stage of development, these MoPs have a qualitative character. They will be scalable from "poor" to "excellent". The scoring will be done by external stakeholder and by team members in a pre-structured questionnaire. Scoring tables also ask to give verbal comments and explanations, to explain the scores or to ask questions.

The questionnaire will also ask for a summary evaluation of the overall quality of the PULSE project and of the experiments' setup and execution.

The Annex 1: Questionnaire contains a tentative version, which will be refined during trial preparation and filled by participants during and/or after the experiments. We will ask both groups to answer to the questionnaire

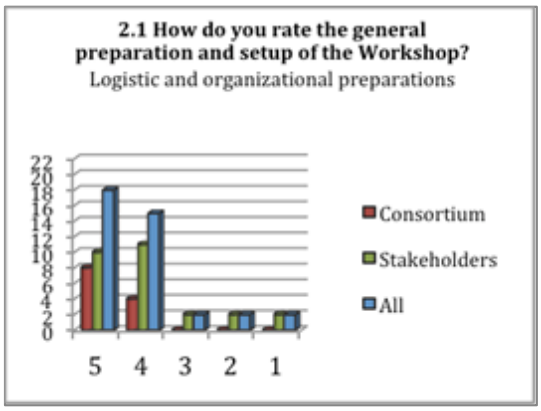
- External Stakeholders
- PULSE consortium members

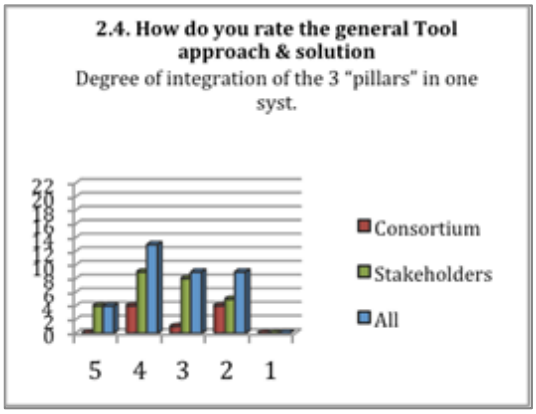
The questionnaire will be further detailed as the setup of the trials and the details of the scenarios and the tool characteristics further materialise. Then it also will be decided whether individual questions will be applied to the whole platform only or broken down to individual tools.

Depending on how far we can do this evaluation online or whether we have to rely on paper base and oral feedback, the evaluation can be done automated or semi-automated. Sample results from an earlier project are shown below. Figure 24: Sample evaluation charts

They interestingly show that the consortium members had evaluated their own system more critically than the external stakeholders did.

Figure 24: Sample evaluation charts





6.3 Ethical, societal, political assessment

6.3.1 The challenge

The discussion of qualitative criteria and related evaluation in security has been initiated in a preceding project[56] in order to get prepared for the evaluation of security measure with the focus on intangible factors in the area of society, ethics, legislation, politics etc. The motivation stems from the need that in reality, "Security Measure" (SM) should be planned and introduced by the need and motivation to reduce risks. In many cases, however, the evaluation against "socio-political" factors of influence is as important as risk reduction. However, either they are neglected or respecting them is deliberately avoided.

The security measures to be evaluated in case of PULSE will be the systems/platforms and the underlying tools which are being developed. Other projects ECOSSIAN[57] and CIRAS[58], both on critical infrastructure protection, will apply the same or similar methodology. In the CIPS project CIRAS, this type of assessment is called QCA - qualitative criteria assessment, a term we may also use in PULSE. A tool has been developed and is presently being enhanced.

6.3.2 Method and Tool

The basics of this QCA methodology and a criteria catalogue have been set in the project ValueSec, which has been used as a starting point for PULSE. Further tool modification is undertaken in the CIRAS project.

For experimenting with this methodology, a tool on the basis of EXCEL is also being

[56] http://www.valuesec.eu
[57] http://www.ecossian.eu
[58] http://www.cirasproject.eu

developed[59] by CESS. For the final evaluations, one of the tool versions will be applied.

Before doing further preparation of this methodology, however, we need to start with working on a few basic questions in WP8). Otherwise, the potential "space of evaluation"- the number and variety of parameters- is too large and the results may become blurred.

Issues may include but will surely not be limited to these questions:

1. Which will be the main objectives of such evaluation, e.g. benefit for society? Scepticism or mistrust of society? Security increase as anticipated by society? Political preferences? Potential conflicts with the rules of law (which ones)? Different "attitudes" of different societies/societal groups? Expected constraints to and limitations of, the application of the PULSE platform?
2. Depending on what we choose from 1., the criteria and methodology setup may differ substantially.
3. In-depth discussion and common definition of and agreement on, evaluation criteria.
4. Who will be the real or assumed evaluators: The project team? Society/societal groups; if so which ones? Political planners and decision makers? Operators or anticipated operators of the PULSE Platform? Beneficiaries of the platforms, e.g. hospitals, first responders, possible victims, infrastructure operators, politicians….? Just an example: Expectations of society will lead to completely different results than expectations of politicians than those of hospital operators than those of a CSO in a critical infrastructures, ….
5. How far can or should we break down and detail the evaluation; e.g. by individual PULSE tools (e.g. see PULSE D8.2, chapter 6.2)?
6. How far can and should we formalize and organize the evaluations? Do we prefer verbal discussion or scoring schemes? (We probably need both).
7. There will be more aspects to be discussed and decided upon.

The criteria scheme discussed in 6.3.3 below and attached at Annex 2 is a first cut of possible qualitative criteria that have been gathered from different sources. They are tentatively grouped into the categories

- Ethical,
- Social /personal,
- Legal and political,
- Economic and technical.

Further differentiation may become necessary for the final evaluations.

A detailed description of the existing methodology and tool can be visited in the public repository of ValueSec [4]. As agreed with the leader of PULSE WP8 on legal, ethical and societal impact, the next steps, should be

[59] In the ValueSec (VS) project, a more sophisticated QCA version has been developed and implemented in JAVA. In the CIRAS project, a modified VS version is being developed under the working title MAHP- modified analytical hierarchical process

- a more detailed discussion, definition and selection of those criteria which are deemed relevant for the project, and
- a first weighting and ranking experiment, which will be supported and demonstrated by the QCA tool

For a more detailed suggestion on the setup of and evaluation, see e.g.[60].

6.3.3 A Tentative Qualitative Criteria Catalogue

A first set of criteria has been derived from different sources. They are presently sorted into four categories.

- S= Societal
- E=Ethical incl. psychological
- LP=Legal & political
- Ec=Economic, technical

The set is still in working condition and therefore presented as Annex 2. Its structure and contents are forming the basis for further detailed work in WP7 and WP8.

6.3.4 Next steps

As agreed with the leader of WP8, the next steps will include

- a more detailed discussion, definition and selection of those criteria which are deemed relevant for the PULSE project, and
- this should include more detailed descriptions of the criteria, and of overlaps and dependencies between individual criteria
- a critical review of the so called utility functions in the tool
- a learning process for analysts involved, on the methodology and tool with first weighting and scoring experiments.

For a more detailed suggestion on the setup of evaluations with regard to. societal factors, we will also learn from the ASSERT project [5] and from the project SURPRISE [6].

7 Conclusions and Way Ahead

The main objective of the PULSE trials, according to WP7, will be the "...proof of concept of the technologies and scientific concepts developed..."

Within this context, the analysis of existing structures, organisations, and procedures in health care – due to their complexity and variety of actors, parameters and options – draws best practices from a selection of national and international sources. They have been analysed in D5.1. This D5.2 document, building on these findings, sets the functional stage for the continuing PULSE tool and system development, and for the generation of trials / experiments that allow adequate system operation, demonstration

[60] http://assert-project.eu/wp-content/uploads/2013/04/ASSERT_D1.2_KCL_final.pdf

and evaluation.

PULSE procedures developed here are mapped against the planned tool functionalities on one hand, and against the challenges, they will have to meet in concrete scenario applications on the other.

These SOPs comprise the basic functionalities against which the PULSE tools and the whole system will be exposed and mapped in the further development/ integration process and in the planned experiments. These experiments will be exercised within synthetic scenarios and a simulated flow of action. Nevertheless, the developed SOP best practice guidelines and related tools are also thought to be utilized and applied in the future for emergency preparedness purposes and, in liveoperational environments in particular. Strategies for future exploitation will be developed in WP8.

In summary, the results of WP5 form the logical and operational bridge between the PULSE system architecture and tools development process and their implementation and assessment in realistic scenarios and use cases.

Consequently, experiment setup and evaluations will be informed and guided by the results produced in the project so far. They are:

1. The scenarios and use case (D2.2),
2. The PULSE tools and the system framework (WP 3 and 4 results),
3. The analysis of existing national and international systems and procedures (D5.1), and
4. The SOP guidelines and practices, and the detailed workflow in the use cases and the support and value PULSE tools provide, as described in this D5.2.

The detailed use case procedures will help to set up the right trials, flow of activities and tool applications in concrete (simulated) events or event sequences. They also are the processes in individual "scenes" scenarios? in which the quality (effectiveness and performance) of the PULSE platform will be proven. This will support capturing and measuring quantitative and qualitative results essential for evaluating and validating the overall PULSE system as a whole.

8 Acronyms and Terms

8.1 Glossary of terms and definitions

Term	Definition
Actor/Action tables	Tables that for each action specify who are the actors and which role they play (e.g. accountable, responsible, consulted, informed). They are also known as RACI tables
Architecture	See: *System Architecture*
Best Practices	General: feature of accredited management standards such as ISO 9000 and ISO 14001 (Wikipedia). Here, features describing key functionalities needed in the PULSE system. Sometimes also used for "practices" as "best cannot always be proven at this stage?. Also the term →Guidelines is often used instead.
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.
Consequence	Mandatory measures taken in re-action to the effects of a particular action or set of conditions.
Consequence Management	To prevent the impact of an incident escalating. It manages wider consequences and services such as maintaining or restoring transport and communication networks, restoring other essential public services, providing emergency relief to administrations, businesses, and individuals affected by the consequences of an incident. Informed by crisis management at national (strategic) level, Consequence Management is understood to happen at regional (operational) level.
Crisis	A difficult or dangerous situation that needs serious attention.
Crisis Management	Preventing or averting an imminent emergency, to mitigate its effects, to prevent further damage or disruption. It also includes law enforcement operations, legislative provisions, assurance of public health, safety and welfare, the coordination of overall response efforts, disseminating public information, and national and international cooperation. Crisis management is understood to happen at national (strategic) level guiding Consequence Management at regional (operational) level.
Disaster	A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the community or society to cope using its own resources.
Disaster Response	The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and

	improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.
DoW	Description of Work The official document, version 2013-10-11, that states PULSE project scope and content
ECM	Event Medical Co-ordinator. The person with the task of overall control and coordination of medical/first-aid provision at the event. That person is the single point of contact in relation to the event medical plan.
Ethics	Ethics is the systematic reflection on right and wrong conduct according to norms and values that we think should be adhered to.
Ethical Impact Assessment	An EIA is a process during which an organisation – or project consortium, as in the case of PULSE – together with stakeholders (and, in particular, end-users) considers the ethical issues or impacts posed by a new project, technology, service, programme, legislation, or other initiative, to identify risks and solutions.
Ethical issues	Ethical issues refer to the issues concerning some aspects that raise ethical questions.
Functionality	Any service that a product or a software can do for a user.
Guideline	Guidelines are meant to guide emergency response to risks, threats or incidents. A guideline is a statement of policy and procedure or advice on policy and system functionality. In PULSE they formulate the basic procedures to be regarded for system functional development and implementation. Often also the term →best practices" is used.
IHR	International Health Regulations The International Health Regulations (2005) are legally binding regulations (forming international law) that aim to assist countries to work together to save lives and livelihoods endangered by the spread of diseases and other health risks, and avoid unnecessary interference with international trade and travel.
Incident	An occurrence that requires a response to protect life or property. Incidents include major disasters and public health and medical emergencies, and other occurrences requiring an emergency response.
Incident Commander	The person in charge with the incident overall management.
Incident Management	Measures to neutralize, isolate, contain and/or resolve a specific threat or act. The objectives are to stop and stabilize the incident and to minimize its effects, to limit the number of casualties, facilitate recovery, and to take all measures in order to support regaining normalcy as soon as possible.
Interoperability	A property of a product or system, whose interfaces are completely understood, to

	work with other products or systems, present or future. A more broad definition also takes into account social, political, and organizational factors.
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	Learning Management System 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.
LRS	Learning Record Store. Stores learning records, allows reporting against the records, and allows for exporting of raw learning data.
Meta-SOP	Specification of procedures for e.g. identifying and handling changes, managing information at international level, interoperability etc. In the context of PULSE they are called Meta-SOPs. In addition to and beyond the operationally required procedures (SOPs) these cross-cutting characteristics also need to be analysed and described.
Methodology	in PULSE project, methodologies are mainly procedures which will be adequate to improve the operation and success of the healthcare system in challenging disaster situations where combined operations are required at local, regional, cross border and international levels.
MIC	Medical Incident Commander Key task is to coordinate and organise the medical resources at the scene of an incident allocating tasks and roles.
Model	An abstraction of reality with the aims of better understanding it, mostly described in mathematical/ analytical, also sociological or philosophical terms and methodologies. (see also PULSE Model)
MPORG	Multi Player Online Role Playing Game 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

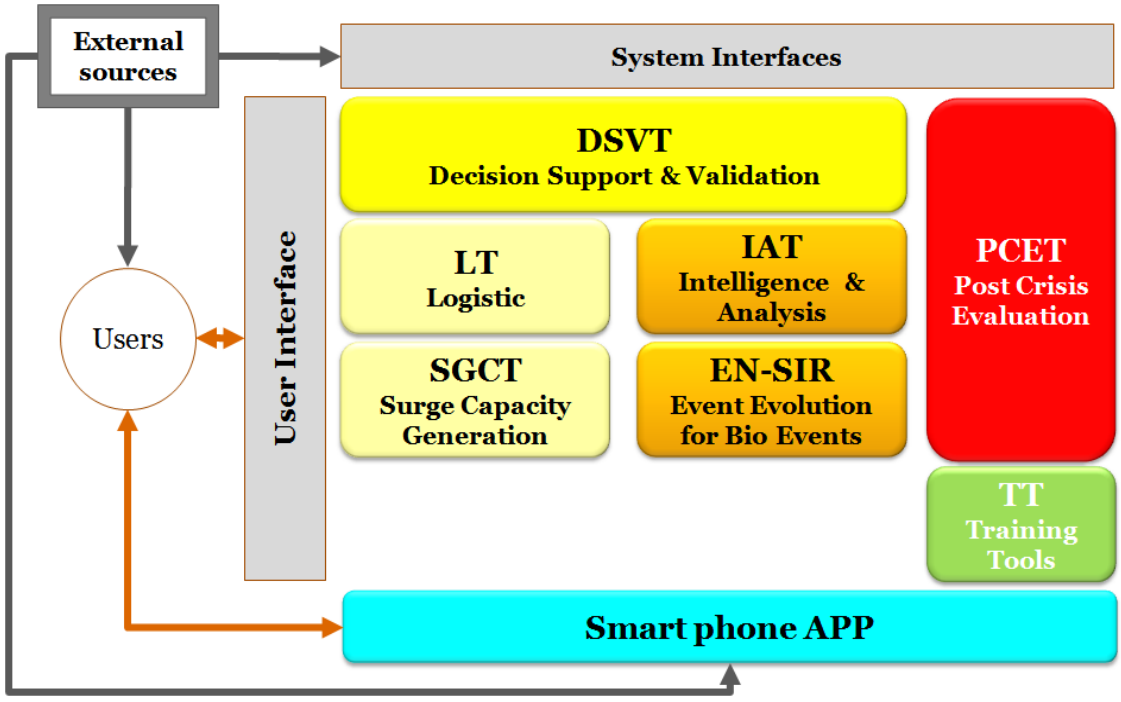
	locations. Within PULSE an MPORG system and environment will be used to train personnel within the stadium crush scenario where individuals will assume the roles of different resource personnel involved in such a scenario.
Phase	A subset of a Scenario. Each PULSE Scenario is split in two Phases: Preparedness and Response. 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)
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.
Preparedness	Response activities involve a combination of planning, resources, training, exercising, and organizing to build, sustain, and improve operational capabilities conducted well in advance of an incident. Preparedness is the process of identifying personnel, training, and equipment needed for a wide range of potential incidents, and developing specific preparations for delivering capabilities when needed for an incident. Preparedness activities should be coordinated among all involved agencies and stakeholders, as well as across the EU and Member States.
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.
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 Model (see also Model)	A software routine, based on mathematical models/algotythms for describing phenomena (e.g. processes, problems,...) and for helping to find solutions. In PULSE project, in order to avoid confusion with the genaral meaning of the term "Model" (see definition), the term "PULSE Model" is introduced.
PULSE Platform	The complete suite of PULSE outputs that can be utilised during all stages of emergency response. This includes all software components and →PULSE s´System.
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. The PULSE system term is used to reference all software components when used in a fully integrated solution, with all components communicating information.Similar to →PULSE Platform
PULSE Toolset	The toolset refers to all software components that are part of the PULSE system. The toolset ranges from mobile components, through to training, web apps, planning, decision support and simulation components. The PULSE toolset consists of the same software components that are available in the PULSE system. The difference is that the toolset can be used to refer to individual components without the implication that the components are deployed in a fully integrated environments as would be the case in the PULSE system.
REACT	Communication system that uses a variety of available technologies ranging from wireless broadband, TETRA, through to satellite communication.
Requirements	Justified characteristic needs, formulated by users and experts. For IT systems, usually one distinguishes between technical and operational (possibly strategic) requirements
Response	Ability to limit or inhibit effects of an incident. Effective response relies on disciplined processes, procedures, and systems to communicate timely, accurate, and accessible information on the incident's cause, magnitude, and current situation to the public, responders, and other stakeholders as appropriate. Well-developed command and control protocols, resource management arrangements, legal provisions, public information strategies, and communication plans help to ensure that response activities are coordinated and communicated to numerous diverse stakeholders and audiences in a consistent, accessible, and timely manner.
SARS-like	Infectious Respiratory Disease
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: A SARS-like epidemic and a Stadium crush-like incident.
SOP	Standard Operational Procedure[61] Established or prescribed methods to be followed routinely for the performance of designated operations or in designated situations.
SOP area	Function or process for which a set of SOPs is in place or may be produced. PULSE Platform includes 9 SOP areas

[61] This is the definition for Pulse. Other definitions used elsewhere: Standard Operating Procedure; Standing Operational Procedure

Standard	A standard provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose.
Stakeholder	A person or group that has a stake or interest in something.
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 relationships of the system to the environment. The level of detail of the description 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.
Tactical Preparedness sub-phase	Activities that prepare the response to a specific adverse event ; the sub-phase starts when the situation that may generate the event is announced and ends when the event happens or the situation is no more in place. Lesson learning after the end of the response phase are included in the Tactical Preparedness sub-phase.
Tool	Any helping software instrument, including input/output interfaces with users or other tools or systems (mostly software). A tool may use PULSE Models. A software tool may also be identified with a set of functionalities. PULSE Platform includes 8 tools.
Use Case	A sample materialization of a scenario or parts of a scenario quantitatively described, including hazardous event or attack event lines, organizations involved, response procedures, numbers and classes of victims, responder and health resources etc.

8.2 **The PULSE TOOL acronyms:**



DSVT	Decision Support and Validation Tool
IAT	Intelligence and Analysis Tool
PCET	Post Crisis Evaluation Tool
LT	Logistics Tool
SCGT	Surge Capacity Generation Tool
ENSIR	Event Evolution for Bio-events
TT	Training Tools, including
LMS	Learning Management system
MPORG	Multi Player Online Role Game (usedas TT and for Demo support)
APP	Smartphone APP

8.3 Acronyms

API	Application Programming Interface
ARI	Acute Respiratory Infections
C2 or C&C	Command and Control
CCS	Casualty Clearing Station
CDC	Center for Disease Control and prevention (USA)
CECIS	Common Emergency Communication and Information System
CIMIC	Civil-Military Cooperation
CM	Crisis Management
COP	Common Operational Picture
DM	Disaster Management
DoW	Description of Work (of the PULSE project)
DSVT	Decision Support & Validation Tool

DVI	Digital Victim Identification
ECDC	European Centre for Disease Prevention and Control
EEI	Essential Element of Information
EEMI	Essential Element of Medical Information
EHS	European Health System (as used in the FP7 Call Text)
EMS	Emergency Medical Service
EMT	Emergency Medical Technician
ENSIR	Event Evolution Model for Biological Events
EOD	Explosives Ordinance Disposal
ERCC	Emergency Response Co-Ordination Centre
EU	European Union
GMES	Global Monitoring for Environment Security
GOARN	Global Outbreak Alert and Response Network
GUI	Graphic User Interface
HEDIS	Health Emergency & Disease Information System
IAT	Intelligence and Analysis Tool
ICS	Incident Command System
ICT	Information and Communication technology
IED	Improvised Explosive Device
KM	Knowledge Management
LT	Logistics Tool
MERS	Middle East Respiratory Syndrome
MoD	Ministry of Defence
MoE	Measures of Effectiveness
MoP	Measures of Performance
MPORG	Multi Player Online Role Game
MRMI	Medical Response to Major Incidents
MS	Member State (EU)
NGO	Non-governmental Organisation
OODA	Observe-Orient-Decide-Act
OSCE	Organization for Security and Co-operation in Europe
PCET	Post Crisis Evaluation Tool
PIO	Public Information Officer
PPP	Public-Private Partnership
RCS	Recognized Current Situation, may be synonymously user with COP
SARI	Severe acute respiratory infections
SARS	Severe Acute Respiratory Syndrome
SCGT	Surge Capacity Generation Support Tool
SLD	Swim Lane Diagrams

SM	Security Measure
SOP	Standard Operational Procedure
TESSy	The European Surveillance System
TT	Training Tool
WHO	World Health Organization
WP	Work Package of the PULSE Project

9 References

The bulk of references used in WP5 are documented in D5.1. Hers only few additional references are named. References of not so general importance, in both documents, have been tracked as footnote

[1]. https://www.enisa.europa.eu/publications/articles/standards-for-cyber-security
[2]. WorkgPaper_on_Interop&Standardiz.docx (CESS, June 2015)
[3]. For SLDs search Internet, e.g. https://en.wikipedia.org/wiki/Swim_lane
[4]. http://www.valuesec.eu/content/d53-description-developed-tools-and-data
[5]. http://assert-project.eu/wp-content/uploads/2013/04/ASSERT_D1.2_KCL_final.pdf
[6]. http://surprise-project.eu
[7]. http://www.ecossian.eu
[8]. http://www.cirasproject.eu

Annex 1: Questionnaire

10 WORD Version

PULSE Use-Case-Tools Evaluation Workshop

Location/ Date/ ...

Please take a moment to complete this questionnaire. Your feedback is valuable and important for our continued work. The information gathered in this forms is *confidential* and will only be read by the PULSE project partners, and not forwarded elsewhere without your prior permission. Extracted information for PULSE deliverables will be anonymized.

We thank you very much for your collaboration!

Questionnaire for Participants

Purpose of the Workshop

- To demonstrate the intermediate status of PU tool development to stakeholders
- To discuss the tools' functionalities and performance
- To receive feedback which helps improve the tools and support further targeted development

Session No./ Subject you participated in

(only valid if we have different "sessions")

- ☐ Session 1 on ...
- ☐ Session 2
- ☐ Session 3

1. Personal data

1.1. Name (voluntary!) _____

1.2. Organization name (volunt.) _____

1.3. Your responsibility (volunt.) _____

1.4. Type of your organization

Type	X
• Government/ Crisis Management	
• Emergency Medical Service	

• Law enforcement (e.g. police)	
• Military medical service	
• Private MS (e.g. Red Cross, ...)	
• Hospital (pls State your role)	
• NGO	
• Medical and security industry	
• Research/ University	
• Other: please specify	

<u>Your Ratings:</u> On a scale of 1-5 please mark the most appropriate rating

5 = excellent

4 = good

3 = average/ o.k.

2 = fair

1 = poor/failed

2. Setup and general approach

2.1. How do you rate the general preparation and setup of the Experiments?

Your Rating	Excellent	5	4	3	2	1	Failed
Logistical and organizational preparations		☐	☐	☐	☐	☐	
Presentations		☐	☐	☐	☐	☐	
Working sessions (RA, CBA, QCA)		☐	☐	☐	☐	☐	

Final discussion & conclusions.	☐ ☐ ☐ ☐ ☐
Were the participants well introduced/ trained into the overall trial session?	☐ ☐ ☐ ☐ ☐
Was the description of the system application clear and easily understandable?	☐ ☐ ☐ ☐ ☐
Was the trial setup clear and adequate to the PULSE objectives as described?	☐ ☐ ☐ ☐ ☐
Remarks:	

2.2. How do you rate the general concept of the PULSE project, - the objective, rationale and system approach?

Your Rating	**Excellent 5 4 3 2 1 Fails**
Meets basic requirements (relevance)	☐ ☐ ☐ ☐ ☐
Meets a well identified gap in healthcare planning and decision making	☐ ☐ ☐ ☐ ☐
Is comprehensive and well targeted	☐ ☐ ☐ ☐ ☐
Is easy to understand	☐ ☐ ☐ ☐ ☐
Remarks:	

2.3. SARS Scenario: How do you rate the evaluation Scenario and Use Cases in summary

Your Rating	**Excellent 5 4 3 2 1 Failing**
Adequacy to the problem	☐ ☐ ☐ ☐ ☐
Degree of realism	☐ ☐ ☐ ☐ ☐
Transparency of the	☐ ☐ ☐ ☐ ☐

underlying scenario	
Remarks:	

2.4. Stadium Crush Scenario: How do you rate the evaluation Scenarios and Use Cases in summary

Your Rating	Excellent	5	4	3	2	1	Failing
Adequacy to the problem		☐	☐	☐	☐	☐	
Degree of realism		☐	☐	☐	☐	☐	
Transparency of the underlying scenario		☐	☐	☐	☐	☐	
Remarks:							

2.5. How do you rate the general Tool approach & solution

Your Rating	Excellent	5	4	3	2	1	Failed
Content and organization of tools and architecture		☐	☐	☐	☐	☐	
Functionality		☐				☐ ☐ ☐	☐
Transparency		☐	☐	☐	☐	☐	
Technical implementation		☐	☐	☐	☐	☐	
Technical presentation / run performance		☐	☐	☐	☐	☐	
Degree of integration of the differnt tools		☐	☐	☐	☐	☐	
Degree of maturity		☐	☐	☐	☐	☐	
Innovative character		☐	☐	☐	☐	☐	
Remarks:							

2.6. How do you rate the individual solutions (Rate only those which were demonstrated to you)

Your Rating	Excellent 5 4 3 2 1 Failed

DVST - Decision Support and Validation Tool	☐ ☐ ☐ ☐ ☐
IAT - Intelligence and Analysis Tool	☐ ☐ ☐ ☐ ☐
LT - Logistic Tool	☐ ☐ ☐ ☐ ☐
SCGT - Surge Capacity Generation Tool	☐ ☐ ☐ ☐ ☐
TT - Training Tool	☐ ☐ ☐ ☐ ☐
PCET - Post Crisis Evaluation Tool	☐ ☐ ☐ ☐ ☐
EN - SIR - Event Evolution for Bio Events	☐ ☐ ☐ ☐ ☐
APP - SmartPhone Applications	☐ ☐ ☐ ☐ ☐
Remarks:	

3. Usability and acceptance/present status

3.1. Usability(rate only of those tools which were demonstrated to you and those Raing criteria you received information on)

Your Rating	**Excellent 5 4 3 2 1 Failed**
1.Ease to understand tool functionalities and the assessment procedure	☐ ☐ ☐ ☐ ☐
2.Ease of handling and use of tool	☐ ☐ ☐ ☐ ☐
3.User interaction/ user interface	☐ ☐ ☐ ☐ ☐
4.Navigation through the systeml	☐ ☐ ☐ ☐ ☐
5.Effort to set up use cases[62]	☐ ☐ ☐ ☐ ☐
6Effort to generate input data	☐ ☐ ☐ ☐ ☐
7. Flexibility to adapt to other scenarios/use cases	☐ ☐ ☐ ☐ ☐
8. Flexibility to adapt to different (e.g. dedicated national) procedures	

[62] Points5; 6 and 7 may not be assessable by stakeholders not having been involved in the setup process. In that case you may not rate or you mark with a * and give a guess

9. Numerical and graphical results (transparent; easy to understand)	☐ ☐ ☐ ☐ ☐
10. Provides appropriate/ interactive feedback to the user	☐ ☐ ☐ ☐ ☐
Please briefly **describe** the positive and/or negative **performance and usability related** characteristics	

3.2. Expected future acceptance by user groups: How do you think the finally completed PULSE toolset will be appreciated and used by different groups

Your rating	**Intensively**	**5**	**4**	**3**	**2**	**1**	**Not at all**
Gov. policy decision makers		☐	☐	☐	☐	☐	
Healthcre/ responder organizations		☐	☐	☐	☐	☐	
Hospitals		☐	☐	☐	☐	☐	
Private service providers		☐	☐	☐	☐	☐	
Others (lease name)		☐	☐	☐	☐	☐	
Please briefly describe expected typical ***drivers*** and ***obstacles*** for future end-users to adopt and apply the PULSE system/ tools							

4. Special recommendations

4.1. Which were particularly positive/ convincing experiences/ findings from the Workshop?

_____

_____

4.2. What should be improved?

_____

4.3. Final/ summarizing comment(s) and rating

Your rating	**Excellent** **5** **4** **3** **2** **1** **Failed**
Summary evaluation of the Exercise in total	☐ ☐ ☐ ☐ ☐
Your satisfaction with the experiments compared to your expectations	☐ ☐ ☐ ☐ ☐
Final comments & recommendations:	
Do you need further information of the PULSE project / tools? Please leave your contact information and specify area of interest.	

11 EXCEL-Version

Purpose of the Workshop

To demonstrate the intermediate status of PU tool development to stakeholders
To discuss the tools' functionalities and performance
To receive feedback which helps improve the tools and support further targeted development

Session No./ Subject you participated in *(only valid if we have different "sessions")*

Session 1	
Session 2	
Session 3	

1. Personal data

1.1. Name (voluntary!) _____

1.2. Organization name (volunt.) _____

1.3. Your responsibility (volunt.) _____

1.4. Type of your organization

Type	X
• Government/ Crisis Management	
• Emergency Medical Service	
• Law enforcement (e.g. police)	
• Military medical service	
• Private MS (e.g. Red Cross, ...)	
• Hospital (pls State your role)	
• NGO	
• Medical and security industry	
• Research/ University	
• Other: please specify	

Your Ratings: On a scale of 1-5 please mark the most appropriate rating
5 = excellent
4 = good
3 = average/ o.k.
2 = fair
1 = poor/failed

2. Setup and general approach

2.1. How do you rate the general preparation and setup of the Experiments?	Excellent				Failed
	5	4	3	2	1
Functionality					
Transparency					
Technical implementation					
Technical presentation / run performance					
Degree of integration of the different tools					
Degree of maturity					
Innovative character					
Were the participants well introduced/ trained into the overall trial session?					
Was the description of the system application clear and easily understandable?					
Was the trial setup clear and adequate to the PULSE objectives as described?					
Remarks:					

2.2. How do you rate the general concept of the PULSE project, - the objective, rationale and system approach?	Excellent				Failed
	5	4	3	2	1
Meets basic requirements (relevance)					
Meets a well identified gap in healthcare planning and decision making					
Is comprehensive and well targeted					
Is easy to understand					
Remarks:					

2.3. SARS Scenario: How do you rate the evaluation Scenario and Use Cases in summary	Excellent				Failed
	5	4	3	2	1
Adequacy to the problem					
Degree of realism					
Transparency of the underlying scenario					
Remarks:					

2.4. Stadium Crush Scenario: How do you rate the evaluation Scenarios and Use Cases in summary	Excellent				Failed
	5	4	3	2	1
Adequacy to the problem					
Degree of realism					
Transparency of the underlying scenario					
Remarks:					

2.5. How do you rate the general Tool approach & solution	Excellent				Failed
	5	4	3	2	1
Content and organization of tools and architecture					
Functionality					
Transparency					
Technical implementation					
Technical presentation / run performance					
Degree of integration of the different tools					
Degree of maturity					
Innovative character					
Remarks:					

2.6. How do you rate the individual solutions (Rate only those which were demonstrated to you)	Excellent				Failed
	5	4	3	2	1
DVST - Decision Support and Validation Tool					
IAT - Intelligence and Analysis Tool					
LT - Logistic Tool					
SCGT - Surge Capacity Generation Tool					
TT - Training Tool					
PCET - Post Crisis Evaluation Tool					
EN - SIR - Event Evolution for Bio Events					

APP - SmartPhone Applications					
Remarks:					

3. Usability and acceptance/present status

3.1. Usability(rate only of those tools which were demonstrated to you and those rating criteria you received information on)	**Excellent**				**Failed**
	5	**4**	**3**	**2**	**1**
1.Ease to understand tool functionalities and the assessment procedure					
2.Ease of handling and use of tool					
3.User interaction/ user interface					
4.Navigation through the system					
5.Effort to set up use cases					
6Effort to generate input data					
7. Flexibility to adapt to other scenarios/use cases					
8. Flexibility to adapt to different (e.g. dedicated netional) procedures					
9. Numerical and graphical results (transparent; easy to understand)					
10. Provides appropriate/ interactive feedback to the user					
Please **briefly** describe the positive and/or negative performance and usability related characteristics					

*Points5; 6 and 7 may not be assessable by stakeholders not having been involved in the setup process. In that case you may not rate or you mark with a * and give a guess*

3.2. Expected future acceptance by user groups: How do you think the finally completed PULSE toolset will be appreciated and used by different groups	**Excellent**				**Failed**
	5	**4**	**3**	**2**	**1**
Gov. policy decision makers					
Healthcre/ responder organizations					
Hospitals					
Private service providers					
Others (lease name)					

Please briefly describe expected typical **drivers** and **obstacles** for future end-users to adopt and apply the PULSE system/ tools					

4. Special recommendations

4.1. Which were particularly positive/ convincing experiences/ findings from the Workshop?

4.2. What should be improved?

4.3. Final/ summarizing comment(s) and rating	**Excellent**				**Failed**
	5	**4**	**3**	**2**	**1**
Summary evaluation of the Exercise in total					
Your satisfaction with the experiments compared to your expectations					
Final comments & recommendations:					
Do you need further information of the PULSE project / tools? Please leave your contact information and specify area of interest.					

Annex 2

12 Tentative socio-political criteria

A set of criteria for societal, ethical, legal, political assessment has been drafted and is presented below. The catalogue itself, the definitions and descriptions still need to be discussed and agreed in further detail, as part of WP5 and WP8.

Legend for Table 5

Sources:

VS= ValueSec Project (http://www.valuesec.eu)

SP=SURPRISE Project on SOST[63] (http://surprise-project.eu)

D8.2= PULSE D8.2 V1.0[64]

O=other; own

ASSERT project = http://assert-project.eu

Special chapter 6.3Acronyms:

SM=Security Measure

tbd= to be defined, determined

QCA=qualitative criteria assessment

ECOSSIAN project http://www.ecossian.eu

PULSE project http://www.pulse-fp7.eu

CIRAS project http://www.cirasproject.eu

Categories

S= Societal

E=Ethical incl. psychological

LP=Legal & political

Ec=Economic, technical

Right column: Y= taken into first tool test setup, (Y)= taken but deactivated "No" in tool; blank: not taken

Table 5: Categories and criteria as input to a QCA tool experiment

	Categ.	Criterion	Description	Source	Possibly relevant for project[65]			for 1stTest
			Typically in the form of questions		**ECOSSIAN**	**PULSE**	**CIRAS**	

[63] SOST= Surveillance Oriented Security Technologies
[64] in particular from Table under 3.5.2; may be further explored
[65] similar or mutually supporting "QCA" evaluations are planned for PULSE and the projects ECOSSIAN [7] and CIRAS [8]

1.	E	Social values	Is there a potential for changing societal values (pos./neg.)	O	?	X		Y
2.	E	Privacy	Do security measures respect private and family life/ ensure physical privacy?	VS4.3	X	X		Y
3.	E	Equality, discrimination	Does the SM support equal treatment or rathe prefer certain groups or individuals	O D8.2		X		Y
4.	E	Freedom	Does the SM impact freedom (e.g.of information, communicatin, assembly, travel,...)	D8.2		?		Y
5.	E	Confidentiality	Does the SM enable/ endanger personal (e.g. medical: consumer) information?	D8.2	X	X		Y
6.	E	Trust	Does the measure enhance trust in institutions, infrastructure, ...?	VS5.3	X	X		Y
7.	E	Transparence/ privacy	Is the balance of security improvement vs. privacy intrusion fully transparent?	SP	X	X		Y
8.	E	Control of citizens	Will citizens be controlled by the SM?	VS1.7	X	X		Y
9.	E	Organizational/ grouping	Can the measure lead to formation and action of special societal groups and initiatives (positiv and/or negative)?	?	?	X		Y
10.	E	Integrity	Is the integrity of the decision maker on the SM verified?	VS5.2	?			
11.	E	Truthfulness	Is the SM a response to a real risk ore only/partially pretending it? Is it supposed to follow hidden agenda?	?				
12.	E	Transparency/ system	Are the procedures of the SM transparent to society?	D8.2	?	X		(Y)
13.	E	Controlling by citizens	Will citizens get better (feeling) of being empowered to control (...tbd)	VS1.7	?	?		
14.	Ec	Economic stability	Does the measure influence economic stabilities?	VS6.9	X			Y
15.	Ec	Compensation of side effects	Can (unwanted) side effects be controlled, tolerated or compensated (e.g. via insurance)	VS3.11	?	?		Y
16.	Ec	Cost-benefit	Is the benefit of the SM vs. cost clear/ transparent?	SP	X	X		Y
17.	Ec	Validation	Does the introduction of the SM foresee measurement of the SM's effectiveness and evaluation on a regular base?	SP	?	X		Y
18.	Ec	Environment	Does the SM have significant (pos./neg.) impact on environmental or other parameters valuable from societal view?[66]	VS8.x	?			Y
19.	Ec	Cooperation	Will the SM support or block/hamper cooperation (e.g. ammong peer stakeholders, between nations,	O	X	X		Y

[66] Environmental impact, depending on the type of SM, may be broken down into many more sub-criteria

			with international bodies)					
20.	Ec	Market	Does the SM support/increase/decrease market advantage?	VS6.4	X			(Y)
21.	Ec	"foreign" sectors	Will the SM require involvement of "other" sectors (e.g. private security org's., foreign org's)?	SP	X	?		
22.	Ec	Dependency	Is the measure dependent on "foreign technology"; how critical?	VS7.2	?			
23.	LP	Data protection	Does the measure enhance / endanger data protection & information privacy? Are private / personal data accessible and controllable by the individual?	D8.2	X	X		Y
24.	LP	Legal comformity/compliance	Doe the SM comply with existing regulations and rule of law	VS3.6 & 3.7	X	X		Y
25.	LP	International copliance	Does th measure comply with international guidelines, regulations, treaties etc.?	VS3.8	X	X		Y
26.	LP	Responsibilities	Is a shift of responsibility needed to implement the measure? with pos./neg. effects?[67]	VS5.19	X			Y
27.	LP	Strategy & political relvance	Does the SM fit into related security strategies (if existing); national, EU and other international	VS5.12 D8.2	X	X		Y
28.	LP	Media reactions	How will the media respond to the SM upon its introduction?	VS5.9	?	?		Y
29.	LP	Partnerships	Does the SM imply/ require special partnerships, particularly PPP including NGOs? Are risks of failure or misconduct of these partnerships to be expected?	O	X	X		Y
30.	LP	Reputation	Will the SM improve or reduce political reputation (e.g. locally, nationally, internationally)?	O	X	?		y
31.	LP	Acceptance	What is the potential for the measure to be politically accepted or to produce (counter-) movements/ scepticism?[68]	VS1.4	?	X		Y
32.	LP	Standards	Does the measure comply with standards (if reqested)	VS3.13	?	?		
33.	LP	Opportunism	Is the SM opportune to political agenda(s) & objectives other than strategy (e.g. pol. reputation, imminent elections)		X	?		
34.	LP	NGOs reactions	How will NGOs or other societal groups react?[69]	VS5.13	?	X		(y)
35.	LP	Political risks	Does the SM imply the potential of creating political risks? (specify case)	O	X	?		
36.	S	Fundamental	Does a measure respect or endanger fundamental	VS4.1 &	X	X		Y

[67] linked to the PPP criterion
[68] maybe redundat to "E"/grouping
[69] possibly linked to environmental criteria

		rights	rights, e.g. family life, personal dignity, liberty, health, integrity?[70]	4.2 & 4.4 D8.2				
37.	S	Technology intrusiveness to society	Does the SM support (in the positive sense) or enforce (in the negative sense) intrusion of technology into society / into the private sphere, e.g. dedicated HW/SWinstallations	SP	X	?		Y
38.	S	Culture of control	Does the SM have the potntial to increase contol over people/society[71],[72]	VS5.1	X	X		y
39.	S	Confidence or trust in institutions	Does the measure enhance further the trust in institutions?	VS1.3	X	X		Y
40.	S	Direct benefits to the needs of society	Will people/ society have direct benefits (or detriment) from the SM (subjective security)	SP D8.2	?	X		Y
41.	S	Perceived security	How does the measure influence societal feeling of security[73]? How will be the perceived effectiveness of the SM?	VS2.1	?	X		Y
42.	S	Health impact	Does/can the SM have (negativ/positive) impct on mental and/or physical health of individuals?	VS2.4 & 2.5		X		y
43.	S	Attitude towards technology	Will society reject / welcome the technology and processes wich would be implemented by the SM?	SP	X	X		Y
44.	S	Preparedness	Does the measure enhance preparedness of society to cope with (new; unexpected) risks?	VS1.5	?	?		(Y)
45.	S	Info./Knowledge	Are or can be citizens informed properly about the SM?	VS1.10	?	?		
46.	S	Risks to society	Beside its primary purpose: Does the measure imply or create additional risks to or additional positive impact on society or individuals? (e.g. social order)	VS2.3 D8.2		X		
47.	S	Exploitation	Does the SM exploit information (incl. personal info.) to the extent possible and/or necessary?[74]	D8.2	?	?		

[70] in D8.2, this criterion ins further broken down...(see 3.5.2)
[71] would be evaluated negative by people; may be evaluated positive by security organizations
[72] redundant to E/control
[73] maybe some overlap to 38
[74] example could be tele-medicine; medical surge capability

Annex 3

13 Standards and Interoperability (IO)

13.1 General PULSE Context

Interoperability is not an SOP. Therefore, this Annex gives only some metodological guideline of how to regard interoperability in the project. IO characterizes a number of system features which can cut across almost all functions of a system like PULSE. It is part of system architecture and design principles and driven by the requirements for

- Knowledge Management
  - knowledge management for standardized data collection (must)
  - knowledge management for Information/data sharing at European level (must)
- Change Management
  - Adoption of new regulations (should)
  - Alignment with new scenarios (should)
  - Communication with media and society (should)

It is facilitated by

- Standards
  - Standardization/ Standards (to be) used (should?)
  - Interoperability/interconnection with other systems (should?)

Interoperability in PULSE as offered in the DoW needs to be limited to providing interfaces to legacy systems which want to interact with the PULSE system. As thes systems are so different and heterogeneous, this is the maximum PULSE can contribute to interoperability.

Nevertheless, this Annex discusses IO from a wider perspective which must be regarded if and when the PULSE platform or parts of it will be implemented in a real healthcare environment.

13.2 Standardization/ Standards

ENISA defines the benefits of standardization in 7 areas [1]:

- Improving the efficiency and effectiveness of key processes;
- Facilitating systems integration and interoperability (IO)
- Enabling different products or methods to be compared meaningfully;
- Providing a means for users to assess new products or services;
- Structuring the approach to deploying new technologies or business models;
- Simplification of complex environments; and
- Promoting economic growth.

There are numerous concrete standards offered the ICT world wich can support ineroperability of PULSE.

13.3 Interoperability of PULSE

Generally, creating interoperability (IO) of complex tasks and systems like in PULSE in an international environment is a very tedious endeavour. We will concentrate on the IO of the tools within the PULSE system (which is part of the system architecture), and on "standard" interfaces the system will offer to external legacy software and data systems.

In both documents, the DoW as well as the D2.1, interoperability is not very clearly defined (which is quite usual in this kind of projects). Therefore we start with a systematic breakdown of the logic of interoperability and of the elements/entities and prerequisites which need to be regarded in an interoperability concept. For more details, a Working Paper on Standards and Interoperability in PULSE has been generated parts of which are used here.

13.3.1 Objectives of interoperability

Interoperability discussion of systems like PULSE often is limited to the pure technical connection between IT systems. A comprehensive IO concept, however, needs to regard subjects on all levels involved. This would theoretically include:

Policy & strategy oriented subjects

- Coordinated European response
- Set the basis for strategic procedures
- Raise awareness of standards committees
- Interoperability with existing "other"[75] systems

Operational subjects

- Standards for information exchange (e.g. between different agencies/ services) and reporting
- Interface with other "entities"
- Standard (response) procedures
- IO between action commander and response forces/resources
- Information exchange between authorities and people
- Security Classification conventions
- Standardization of training

Technical subjects

- Ontology; Vocabulary; Taxonomy; Dictionary; data structures
- Interfaces for communications and information exchange
- IO of tools/technical interoperability
- modularity of system and components
- IT security standards for ICT security

In summary, this means interoperability needs to support inter-operation of persons, organizations, processes and technical systems.

13.3.2 The PULSE Interoperability Concept

Many requirements for good IO are situated outside the scope of the project. As already worked out in D5.1 in detail, national and international crisis management and underlying healthcare systems and procedures are widely different in definitions of key terms, organization and procedures, and technical systems.

IO-effort in PULSE therefore will be limited to the PULSE system architecture and to the basic requirements of the use cases. Nevertheless, this may have some pilot character:

- It should offer the potential to be expanded to a more general standard for European healthcare systems IO.

[75] not further defined in PULSE

- A Meta-SOP for IO is by definition not a procedure implementable in the PULSE system. It rather is a guide for the project on how to treat IO in the PULSE project
- Within the PULSE project the process of involving real standardization bodies – if at all – needs to be kept to a minimum because of limited resources for that.

We distinguish here between

- internal IO, which describes the interoperation between the different PULSE tools
- External IO with other non-PULSE systems.

13.3.3 "Internal" Interoperability

Internal interoperability is meant to be the interoperability between PULS system tools. This concept is part of the system architecture which describes the connection and interfacing between the different system components as could be summarized in Table 6 and following the legend below.

Table 6: Possible scheme for internal interoperability

	DVST	IAT	EN-SIR	LT	SCGT	APP	PCETT	TT	
DVST							13.3.3.1.1.1.1		
IAT									
EN-SIR						X			
LT		X							
SCGT				X			XX		
APP			X						
PCET									
TT	X								
MPORG									

X: only samples here.

X= one direction IO

XX= both directions IO
Each X and XX needs to be described in the following terms:

- Type of IO needed
- Type of IO implemented (e.g. transfer of data or messages in agreed format; access to a common data base; offline handover of data sets; more ....)
- Technical means how this IO is implemented

13.3.4 External Interoperability

External interoperability should describe the "standard" interfaces the PULSE system

which will facilitate interoperability with "other" systems. This includes technical as well as procedural IO. The detailing will be described in the documentation of WP3 and WP4. Beside the technical interfaces, also the process needs to be described for adopting the PULSE system and experiment setup to different "legacy" systems and regulations.