



*Platform for European Medical Support
During Major Emergencies*

D7.2 Report on Trials Implementation





PULSE

Platform for European Medical Support during major emergencies

WP7 Trials & validation

Deliverable D7.2 – Report on trials implementation

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**Abstract:**

This document provides a detailed description of the PULSE trials implementation. The two trials have been performed on June 2016 and September 2016 to evaluate the PULSE platform in the context of two realistic emergency management situations: an Emerging Viral Disease (EVD)-SARS-like outbreak in Italy and a Mass Casualty Incident (MCI)-crowd crush in a stadium in Ireland.

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1 List of acronyms

Acronym	Definition
ARDS	Acute Respiratory Distress Syndrome
CDC	Centre for Disease Control and Prevention
DoW	Description of Work
DSVT	Decision Support Validation Tool
ECDC	European Centre for Disease Prevention and Control
ENSIR	ENhanced SIR
EVD	Emerging Viral Disease
GUI	Graphical User Interface
IAT	Intelligent Analysis Tool
ICU	Intensive Care Unit
ILI	Influenza like illness
IPS	In-Plane Switching
ISS	Istituto Superiore di Sanità
LT	Logistic Tool
MPORG	Multi-Player Online Roleplaying Game
MCI	Mass Casualty Incident
MEWS	Modified Early Warning Score
PCET	Post Crisis Evaluation Tool
SARI	Severe Acute Respiratory Infections
SARS	Severe Acute Respiratory Syndrome
SCGT	Surge Capacity Generation Tool
TTF	Thin Film Transistor
TTX	Table Top Exercise
WHO	World Health Organization



2 Introduction

2.1 Scope of the Document

This document provides a detailed description of the trials performed on June 2016 and September 2016 to evaluate the PULSE platform in the context of two realistic emergency management situations: an *Emerging Viral Disease (EVD)-SARS-like outbreak* in Italy and a *Mass Casualty Incident (MCI)-crowd crush* in a stadium in Ireland.

2.2 Structure of the Document

The document is basically divided in two main parts:

1. the first one related to the EVD Trial contains, in Chapter 3, an explanation of all the activities and material produced before the Trial execution such as the description of agenda, the list of participants, the meeting venue and the technical setup. The following Chapter 4 shows instead all the activities performed during the Trial execution with an explanation of the PULSE platform functionalities shown during the demonstration and a brief description of the questionnaires used to perform the evaluation of the platform (and that will be deeply investigated in D7.3);
2. the second one related to the MCI Trial replicates the same structure used before. In Chapter 5 shows all the activities and material produced before the Trial execution while in Chapter 6 shows all the activities performed during the Trial with a deep explanation of the provided PULSE platform functionalities.

2.3 Relation with other Deliverables

The work presented in this deliverable is mainly connected to D7.1 [2] that contains the basic specifics of both the trials. A direct link is also present with the deliverable D6.1 [3] that describes the technical specifications of the PULSE platform.



3 EVD Trial Preparation

3.1 Trial organization

The organisation of the PULSE EVD trial started many months in advance of the actual trial. Several meetings have been organized between the PULSE consortium members (e.g. FINM, UCSC and CESS) and the Spallanzani Hospital to agree on the management and logistic aspects of the trial. In particular, the following aspects had been deeply analysed:

- The background and the scenario details
- The trial planning, evaluation and validation process
- Duration, date and time of trial
- The exercise organisation and the roles and responsibilities of the main participants
- The evaluation methodology

During the trial preparation meetings great effort has been spent also in the definition of a proper agenda where it was necessary a good compromise between the time to be spent for the demonstration of the PULSE platform and the time instead necessary for the execution of the evaluation activities. The defined agenda can be found in 3.1.1.

Moreover, the involvement of important and expert end-users is a crucial aspect for the realization of a successful trial. For this reason, many possible stakeholders have been firstly evaluated and then contacted for the participation to the EVD trial. The list of the actual participants with a brief description of their curriculum vitae can be found in 3.1.2.

At last, part of the trial organization has been devoted also to selection and then the preparation of the meeting venue. More information about this aspect can be found in 3.2.

3.1.1 Agenda

Table 1: EVD Trial Agenda

Day	Time	Content
Day 1	12.00-14.00	Arrival and registration of participants

June 30 2016	14:00-15:00	<p>Welcome (<i>G. Ippolito - Scientific Director Spallanzani Institute</i>)</p> <p>Introduction to PULSE: purpose, logic, roles and dynamics (<i>P. Mari - PULSE Consortium</i>)</p> <p>Short presentation of the Table Top excise (<i>G. Ippolito</i>)</p> <p>The evaluation methodology (<i>Hans Kühl - PULSE Consortium</i>)</p>
	15:00-18:00 (TTx:Part 1)	Scenes 1, 2, 3 - Questionnaire filling (Actors and Observers) and discussion after each scene (Actors)
	20:30	Social Dinner
Day 2 July 1 2016	09:00-12:30 (TTx:Part 2)	Scenes 4, 5 - Questionnaire filling (Actors and Observers) and discussion after each scene (Actors)
	12:30-14:00	Lunch
	14:00-17:00 (TTx:Part 3)	Scenes 6, 7 - Questionnaire filling (Actors and Observers) and discussion after each scene (Actors)
	17:00-19:00 (TTx:Part 4)	<p>Questionnaire filling, to evaluate system performance and socio-political impacts</p> <p>Plenary discussion, involving Actors and Observers</p>

3.1.2 Participants

Participants to EVD Trial are hereafter divided into Actors, Observers and Participants.

3.1.2.1 Actors

The actors were expected to play the assigned institutional role in the Exercise. Most of the actors were the real life in charge representatives of the assigned role. When it was impossible to guarantee the participation of these institutional figures, the actor was recruited from professional people who had previously covered the role or had recently retired.

Actors did not receive previous training to the Platform assuming they were all professionals and consequently able to perform on tablets and PCs.

The Table 2 reports the Institutional Actors.

Table 2: EVD Trial Institutional Actors

Level ¹	Actor	Participant
EU/W	WHO	Manfred Green
EU/W	ECDC	Julia Heptonstall
N	Federal Ministry of Health Germany	Carsten Koehler
N	Italian Ministry of Health-CCM	Francesco Maraglino Anna Caraglia
N	Istituto Zooprofilattico-IZP	Antonio Fasanella
N	USMAF	Loredana Vellucci
R	Regional HC Director	Vincenzo Panella
R	Emergency Management (118)	Antonio Ientile
L	Head of Prevention Department	Maria Rosaria Loffredo
L	Head of Clinical Unit of Referral Hospital – Spallanzani Rome task force	Emanuele Nicastrì
L	Head of Referral Microbiology Laboratory Hospital- Spallanzani Rome	Antonino Di Caro Maria Rosaria Capobianchi
L	Medical Director Unit of Emerging and Reemerging Infectious Disease of Hospital Spallanzani	Vincenzo Puro
L	Head of Clinical Unit of Referral Hospital- Sacco Milan task force.	Giuliano Rizzardini
L	Head of Emergency Dept. of Major Hospital	Francesco Franceschi

Table 3 reports the profile of the players participating as Institutional Actors.

Table 3: Profile of the actors/players participants as Institutional Actors

Country	Name	Profile
Israel	Prof. Manfred S. Green	Prof Green is Head, School of Public Health, Faculty of Social Welfare and Health Sciences, University of Haifa, Israel Research interests include epidemiology, epidemiology of chronic diseases, emerging

¹ W = World, N = National, R= Regional, L = Local

		infectious diseases and the prevention and management of potential bioterrorism incidents.
England	Dr Julia Heptonstall	Dr Julia Heptonstall trained as a physician in the NHS and as clinical microbiologist with the PHLS in the 1980's. Her main areas of expertise include communicable disease surveillance, emergency preparedness and response (co-wrote UK CBRN manual), infection control and occupationally acquired infection. She has extensive experience of investigation and management of transmission of healthcare associated infections (co-wrote UK infection-specific national guidance and guidance on management of highly infectious diseases).
Germany	Dr Carsten Koehler	Dr Carsten Koehler is Director - Centre of Excellence of Tropical Medicine, Baden-Wuerttemberg, Medical Faculty, University of Tuebingen
Italy	Dr Antonio Fasanella	Dr Fasanella is the Director of the Zoo-prophylactic Institute, Foggia, Italy
Italy	Dr Francesco Maraglino Dr Anna Caraglia	Dr, Francesco Maraglino is the Director of the Division of Infectious Diseases and Health Prevention Italian Ministry of Health. Dr Anna Caraglia is medical officer at Dr Maraglino's Division
Italy	Dr Loredana Vellucci	Dr Vellucci is the Central Director of Health Controls at Borders, Italian Ministry of Health
Italy	Dr Vincenzo Panella	Dr Panella is the Director General Health and Social Policies of the Lazio Region
Italy	Dr Domenico Antonio Ientile	Dr Ientile is the Health Director of the Regional Health Emergency (ARES-118 Rome)
Italy	Dr Maria Rosaria Loffredo	Dr Loffredo is the chief of ID unit in a local Public Health District in Rome. Her specific field of interest is the prevention of infectious disease
Italy	Dr Emanuele Nicastrì	Dr Nicastrì is the Head of the Clinical Unit of Infectious Diseases at High Intensity of Care and Highly Contagious , National Institute for Infectious Diseases "L. Spallanzani" Rome
Italy	Dr Antonino Di Caro Dr Maria Rosaria Capobianchi	Dr Di Caro is the head of Laboratory of Microbiology, the head of Laboratory Virology and Director of the Diagnostic Department, Epidemiology and Research. National Institute for Infectious Diseases "L. Spallanzani" Rome
Italy	Dr Vincenzo Puro	Dr Puro is the Director of Emerging and Reemerging Infectious Disease Unit, National Institute for Infectious Diseases "L. Spallanzani"

		Rome. He is also responsible for the clinical risk management Unit.
Italy	Dr Giuliano Rizzardini	Prof. Rizzardini is the Director of the Department of Infectious Diseases at the Luigi Sacco Hospital Milan.
Italy	Prof. Francesco Franceschi	Prof. Francesco Franceschi is the Chief of Emergency Medicine at the Policlinico Gemelli, Catholic University of the Sacred Heart in Rome.

The EC has a number of incentives² to involve in European Projects senior professionals who have recently retired. We believe the EVD Trial in Rome has had the added benefit of involving senior professionals with a great benefit for the Exercise and Validation.

The Exercise was directed by an Exercise director who presented the scenario and coordinated the phases and the discussion.

Table 4: EVD Trial Exercise Director

Country	Name	Profile
Italy	Dr Giuseppe Ippolito	Dr Ippolito is Scientific Director National Institute for Infectious Diseases Lazzaro Spallanzani and Director (since 2009) of the WHO Collaborating Centre for clinical care, diagnosis, response and training on Highly Infectious Diseases at INMI. Co-coordinator of the Technical Committee for the management of risks related to the intentional use of biological, chemical and nuclear weapons. He served on a number of international committees with the World Health Organization, the USA Centers for Diseases Control and Prevention, Health Canada, OECD, United Nations, NATO, G7+ Mexico -Global health Security Action Group, ILO, European Commission,. Over the years, Giuseppe Ippolito's research interests have been focused on: the Surveillance and control of nosocomial and occupational infections; epidemiology and prevention of HIV, HBV, HCV, and Tuberculosis; Emerging and re-emerging infections; biodefense, biosecurity and biosafety; alert, preparedness and response.

² Afsarmanesh H, Msanjila S.S: ePAL Vision H2020 for Active Aging of Senior Professionals pag.60-63 in : Collaborative Networks for a Sustainable World: 11th IFIP WG 5.5 Working Conference of Visual Enterprises, St Etienne, France October 10, 2010 in Luis M. Camarinha-Matos, Xavier Boucher, Hamideh Afsarmanesh. Springer 2010.



Two of the Consortium Members acted as facilitators, describing PULSE utilization in the trial and setting the stage of each Use Case and facilitating the discussion to keep it consistent with the Use Case/ Phase intentions.

Table 5: EVD Trial Facilitators

Country	Name	Profile
Italy	Ing. Pasquale Mari	Pasquale Mari holds a University degree in Electronic Engineering and an MBA. Is an experienced business consultant, specializing in organizational systems and in project management. Has collaborated and still collaborates with leading international consulting firms (Deloitte, Capgemini, and PwC). In PULSE collaborates with UCSC providing system thinking and work package management.
Italy	Ing. Francesco Malmignati	Francesco Malmignati is a research software Engineer that currently works for Leonardo Finmeccanica Company, one of the partner of the PULSE project consortium. He has been involved in different European projects focusing, in particular, on the definition of decision support systems in the Health domain.

3.1.2.2 Observers

Observers who did not participate in the simulation were chosen according to the following criteria:

- Observers from the different countries of PULSE partners
 - In particular observers from Ireland were also partners of another similar project S-HELP.
- Observer from one of the Reviewer's Institution

Even though not participating to the Exercise, Observers illustrated their opinion during the Discussions following the Scenes of the EVD.

The Table 6 reports the list of the Observers for Ireland, Israel, Romania and Italy with past experience in Security and Emergency Management.

Table 6: EVD Trial Observers

Country	Observer	Profile
Ireland	Dr Pat O'Riordan	Pat O'Riordan is a civil engineer who worked for many years in Project Management. Since 1990 he has played a lead role in the development of Emergency Planning in Ireland, at both regional and national levels, within the health services and in the Inter-Agency field. He is the author of "Emergency Planning in Ireland", published in 1992, and joint

		author of “Before, During and after Radiation Emergencies”, published in 1997 following a period on secondment with the World Health Organization. He has been involved with a number of European Union initiatives including: from 2003 to 2007 he was a member of the Working Group on Chemical Threats of the EU Health Security Committee; for a period in 2004 and 2005 he was BICHAT point of contact for the Irish health services; he participated at European and national levels in a number of EU exercises, including in 2008 Exercise AEOLUS – a Public Health exercise involving 27 Member States – where he was a member of the International Planning Group as well as Exercise Controller in Dublin during the two days of the exercise. He participated again in “Exercise QUICKSILVER” an EU-wide exercise that took place on 24 – 25 September 2014 which was a “Response to serious cross border threats to health”
Ireland	Dr Karen Neville	Dr Karen Neville is a Senior Lecturer with Business Information Systems (BIS), University College of Cork (UCC) and director of the Centre for Security & Emergency Management Research (CSEM). She is co-director of the award winning MSc in Information Systems for Business Performance (ISBP), and she is also the coordinator of the S-HELP EU FP7 project. The central aim of S-HELP “Securing Health. Emergency. Learning. Planning” is the development of Decision Support Tools for improving preparedness and response of health services involved in emergency situations.
Ireland	Dr Andrew Pope	Dr Andrew Pope is Lecturer Business Information System University College Cork, Co-Director MBS e Business, Co-Director, The Centre for Security and Emergency Management, Work Package Leader, Fp7 Funded EU Project S-HELP
Ireland	Matthew Scott	Matthew Scott is Software Developer & Quantitative Analyst, Java Developer at the University College Cork, Ireland (UCC). Assisted in the design and implementation of a full stack architecture for multi-module client-server emergency management Decision Support Systems (S-HELP)
Romania	Corneliu Petru Popescu	Dr Corneliu Petru Popescu – MD Infectious Diseases Clinic - “Dr Victor Babes Hospital” Bucharest, “Carol Davila” Medicine and Pharmacy University Bucharest, Department of Virology
Israel	Tomer Kaplan	Tomer Kaplan, Israeli Dept of Public Health, is a member of the Disaster Response Team of Magen David Adom, graduate of advanced training courses

		of the International Red Cross in Maaters concerning health and Public Health in times of disaster. Paramedic training.
Italy	Valentina Sabato	Valentina Sabato is an Engineer with a degree in Engineering for the Territory. She is responsible for the Technical Secretariat of the Presidency and Counsellor of the Osservatorio per la Sicurezza e Difesa CBRNe. The Reviewer Roberto Mugavero is the president of this Organization. She is a member of the OSDIFE.

3.1.2.3 Consortium members

All partners of PULSE Consortium were represented at the EVD Trial in Rome.

Table 7 reports the participating members.

Table 7: Members of the PULSE Consortium participating to the EVD Trial

Participant	Country	Institution
Alessandro Borri	Italy	UCSC
Andrea De Gaetano	Italy	UCSC
Simona Panunzi	Italy	UCSC
Saverio Caruso	Italy	UCSC
Claudio Gaz	Italy	UCSC
Daniele Gui	Italy	UCSC
Sabina Magalini	Italy	UCSC
Lorenzo Marchesi	Italy	UCSC
Paolo Pucci	Italy	FINM
Francesco Malmignati	Italy	FINM
Antonio De Novi	Italy	FINM
Massimiliano Taglieri	Italy	FINM
Viorel Pectu	Rumenia	Onest
David Wright	UK	Trilateral
Reinhard Hutter	Germany	CESS
Hans Kuehl	Germany	CESS
Jacinta Bourke	Ireland	SKYTEK
Paul Kiernan	Ireland	SKYTEK
Peter Daly	Ireland	HSE/IAEMO
Cian O'Brien	Ireland	HSE/IAEMO
Francesco Vairo	Italy	INMI/UCSC

Francesco Fusco	Italy	INMI/UCSC
Francesco Lauria	Italy	INMI/UCSC
Pasquale Mari	Italy	UCSC

3.2 Technical setup

The Emerging Viral Disease (EVD) trial has been conducted in huge operations room, (located at the INMI 'Lazzaro Spallanzani') equipped with:

- video projector;
- 6 additional screens: 2 on the left side of the room, 2 in the centre and 2 on the right side of the room.
- sound system;
- microphone at each workstation;
- Conditioned air.

Figure 1 shows a picture of that room.



Figure 1 – EVD Trial Operations Room

During the trial the video projector and the screens on the left side of the room have been used to display the slides describing the different scenes of the simulation, whereas the screens in the centre and on the right side of the room has been used to show the injects accompanying the slides.

An Alcatel One Touch Pixi3 Tablet with a display IPS TFT of 10" has been provided to each institutional actor who participated to the trial. With this device, which is depicted



in Figure 2, the actors have had the opportunity to directly evaluate the PULSE platform functionalities presented in each scene of the EVD trial.



Figure 2 - Alcatel One Touch Pixi3 Tablet, Display IPS TFT da 10"

The operations room was also covered by two protected Wi-Fi LANs: the first one was devoted to the operations on the PULSE platform and, therefore, it has been used to connect the actors' tablets, the second one was available for all the other connectivity needs of the participants.

The PULSE platform has been deployed on a Leonardo Finmeccanica S.p.A. server located in the office in Rende (in the south of Italy) and it is available on the Internet after a proper user authentication.



4 Execution and activities during EVD trial

4.1 Introduction briefings

The first part of the EVD trial has been dedicated to (1) the introduction of the PULSE project, (2) the explanation of the exercise's objectives and (3) the description of the evaluation methodology.

The first presentation "*Introduction to the PULSE project*" consisted of few slides where the basic information related to the PULSE project had been described. They illustrated key topics were:

- What does PULSE mean?
- What is PULSE project?
- What is PULSE Consortium?

The second presentation focused instead on the explanation of the exercise's key concepts and objectives. In particular the following exercise **key concepts** had been described:

- The trials want to examine contexts or situations that are normally managed without PULSE and consider if the subsequent use of PULSE is the key difference with respect to the normal way of operating.
- There will be a reference to an epidemic management situation → Pandemic Influenza
- The trial will make reference to a proven operational scheme → Italian Pandemic Plan, based WHO pandemic phase (it is coherent with WHO guidelines, which are also adopted by other European countries)
- The exercise wants to involve actors, that have already managed similar situations in the proven scheme → actors with current or past roles in managing Pandemic Influenza applying WHO phase scheme
- There will be a reference to the decision making situations that are expected to be supported by PULSE tools → the trial runs along the Use Cases defined.

The third presentation showed the adopted evaluation methodology that consisted on the usage of specific questionnaires for the evaluation of:

- the system's effectiveness;
- the basic system performance;
- the expected impact of the PULSE system concerning ethical, societal, legal, political;
- the PULSE project as a whole, of the trial setup and execution, and of the scenarios and use cases applied.

4.2 Trial execution

4.2.1 Scenario description

The Emerging Viral Disease (EVD) Trial has been conducted as an Extended Table-Top Exercise (TTX2). This means that it was similar to classical Table-Top (TTX), where a realistic emergency is simulated in a meeting between expert members of

organizations operating in the simulated scenario, but in addition it was extended, meaning that each member was called to interact with the PULSE platform to evaluate and appreciate the functionalities that it makes available.

The EVD Trial has been organized in seven scenes, each of which has a particular relationship with (1) a specific Pandemic Phase of the National Pandemic Plan and (2) a PULSE Use Case defined in D2.2 [4]. All the scenes refer to a wider scenario where a new swine flu virus H1N1 (EAH1N1) originated from pigs, obtains the ability to infect humans and also causes the death of some infected persons.

The sequence of the scenes and the relationship between Pandemic Phases and Use Cases is shown in following Figure 3 (1-UC2 is the first scene, 7-UC8 is the last one):

USE CASE		PANDEMIC PHASE					
		3	4	5	6	1	2
1	Weak Signal detection and surveillance			4-UC1			
2	An airplane is landing in Italy. A probable case is now identified	1-UC2					
4	Identification of a new probable case in a community		3-UC4				
5	Assessment of the available medical resources during the pandemic phase			5-UC5			
6	ECDC recommendations	2-UC6					
7	National Authority periodic assessment				6-UC7		
8	Post emergency learning at national level					7-UC8	

Figure 3 - Use cases vs Scenes

In each of the following sub-sections a detailed description of the scene and the relative platform role is provided. **All the scenario's descriptions have been presented through the form of slides and video injects, whereas in the grey areas we report the platform functionalities that have been shown and accurately demonstrated to the end-users by the trial technical facilitator.** After each demonstration, the end-users had the possibility to directly interact with the platform by using a dedicated tablet provided by the PULSE consortium (see 3.2).

The following table shows the mapping between the use cases and the scene in which the use case is executed.

Table 8: Mapping of scenes to use cases during phases of trial event

When used	Scene	Scene Description	Use Case	UC Description
Pre-Event	Scene 1	An airplane is landing in Frankfurt	UC-02	An airplane is landing in Frankfurt
	Scene 2	ECDC Emergency meeting	UC-06	ECDC recommendations
	Scene 3	Identification of a new probable case in the community	UC-04	Identification of a new probable case in a community

During Event	Scene 4	Weak signal and detection surveillance	UC-01	Weak Signal Detection and Surveillance
	Scene 5	Spread of the infection in Italy - Resources assessment	UC-05	Assessment of the available medical resources during the pandemic phase
	Scene 6	Declaration of phase 6	UC-07	National Authority Periodic Assessment
Post-Event	Scene 7	Post crisis evaluation	UC-08	Post emergency learning at national level.

4.2.2 Scene 1: An airplane is landing in Frankfurt

In this scene, the flight MF 8302 takes off from Canton (China). On board, there are some passengers who have been infected by the new swine flu virus H1N1 (EAH1N1). The flight is directed to the Frankfurt airport where it is scheduled to land, before continuing its route for the Fiumicino airport, in Rome.

This scene allows (1) simulating the actions taken by flights board staff and airport's staff to manage the emergency and (2) to appreciate the functionalities made available by the PULSE platform when information related to the first assessment of the affected persons' health status is collected and communicated to the airport health authorities of Frankfurt. Moreover, the health information reviewed at the Frankfurt airport after the flight landing is immediately available also to the authorities at the Fiumicino airport, including the list of traced persons who have had contacts with the affected passengers.

As described in Figure 3, this scene includes the steps defined in Use Case 2 "An airplane is landing in Italy. A probable case is now identified".

4.2.2.1 Scene description and platform role

The general context where the scene takes place is that described below.

In December 2015, researchers from China identified a new swine flu virus H1N1 (EAH1N1).

In February 2016, veterinary surveillance activities in China reported the presence of EAH1N1 swine influenza in several livestock farms. An extensive influenza surveillance in pigs in 10 provinces has identified 2280 influenza cases due to the new virus from 36,417 pigs. Influenza-related clinical signs and symptoms among the pig farms employees are not reported. However, according Chinese researchers, the virus has obtained the ability to infect humans, and they believe that the EAH1N1 is the one most likely to cause next human pandemic flu.

Researchers form WHO and European CDC have confirmed this data and recommended to the member States to take appropriate actions according to their National Pandemic Preparedness Plan. The level of influenza pandemic declared in this phase is 2.

At the end of April 2016 the Chinese health authorities reported the onset of 65 flu

cases in humans by EAH1N1 swine influenza viruses, most of them (45 cases) in pig farms employees who has been exposed to pig affected by swine flu, but also 10 cases were among close contacts of the employees.

Most cases were clinically severe, and twenty were dead (among which 5 children). WHO warned the Member States of a new pandemic threat, and raised the level of influenza pandemic alert phase to 3.

From April 25th to 30th in Canton there was a trade fair of breeders from different countries of the world with approximately 200000 visitors. In this context, on May 3^d, an airplane with on board a group of 50 Italian farmers returning from the fair of breeders in Guangdong, is on the route from Canton to Frankfurt. This plane, after the Frankfurt airport, will continue the trip until the Fiumicino Airport, in Rome.

During the route for Frankfurt, some passengers have accused clear symptoms of malaise. At 20:30 the captain of the flight issues an urgent health notice to airport health authorities of Frankfurt where he communicates that on the flight there are 12 passengers who feel bad and, for this reason, he requires a medical evaluation of them at landing. The captain also announced that the crew is proceeding with a preliminary assessment of the passengers. Figure 4 shows the content of this communication.



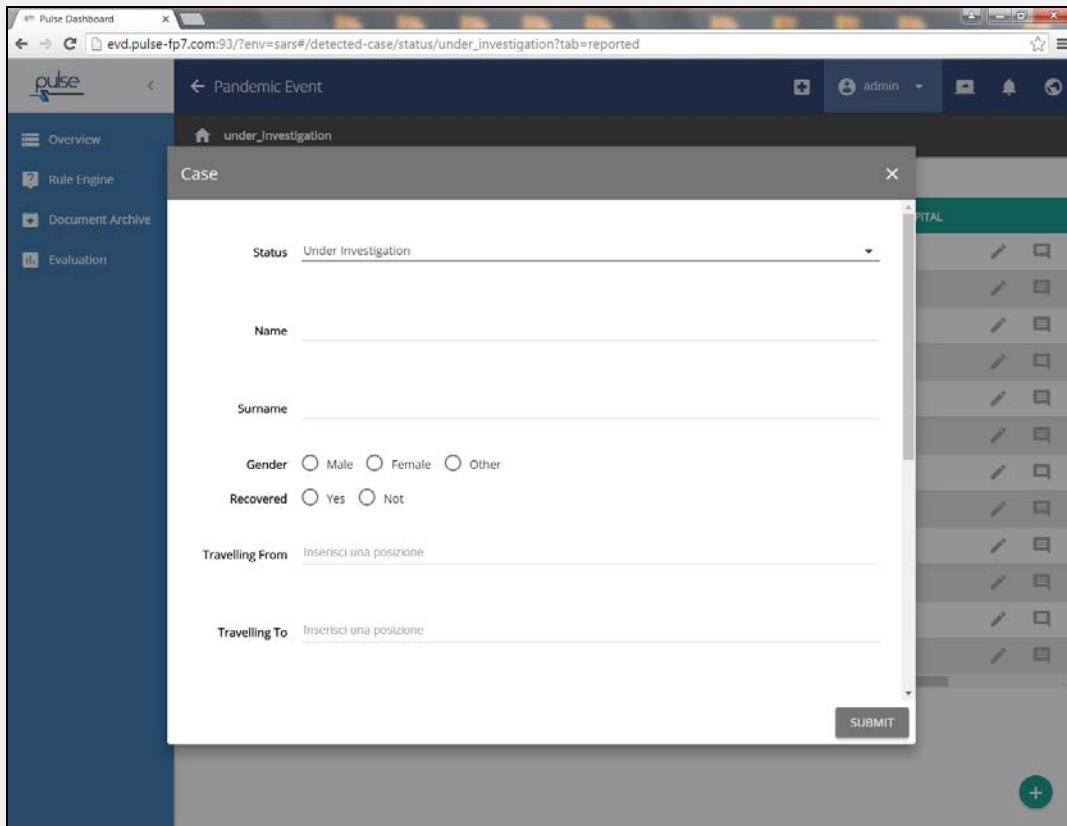
Figure 4 - First Health Notice issued by the Captain of the flight MF 8302

Platform role

This is the first stage where the PULSE platform can validly support the crew in the preliminary assessment of health state of the 12 passengers who feel bad.

During the EVD trial the technical facilitator demonstrated how the flight attendances can use the PULSE platform to collect information about the passengers who have accused symptoms of malaise. In particular, for each of these passengers, a new “Under Investigation” case can be inserted along with its related data such as name, surname, gender, date of birth, place of birth, residence and other information.

Figure 5 show a screenshot of the Graphical User Interface (GUI) used by the user to store the mentioned information.



The screenshot displays the PULSE Dashboard interface. A modal window titled 'Case' is open, allowing users to input passenger information. The form includes the following fields:

- Status:** A dropdown menu currently set to 'Under Investigation'.
- Name:** A text input field.
- Surname:** A text input field.
- Gender:** Radio buttons for 'Male', 'Female', and 'Other'.
- Recovered:** Radio buttons for 'Yes' and 'Not'.
- Travelling From:** A text input field with the placeholder 'Inserisci una posizione'.
- Travelling To:** A text input field with the placeholder 'Inserisci una posizione'.
- SUBMIT:** A button at the bottom right of the form.

The background shows the dashboard with a sidebar menu containing 'Overview', 'Rule Engine', 'Document Archive', and 'Evaluation'. The top navigation bar includes a 'Pandemic Event' link and a user profile for 'admin'.

Figure 5 - PULSE Platform - Insert Case

Once inserted, this information is immediately available to the health authorities of the Frankfurt airport that can predispose the medical evaluation on board after landing.

The PULSE tools that implement and make possible the insertion of a new case are DSVT and Logistic tool.

After the on board preliminary assessment of the passengers, the captain of the flight issues a second health notice where he communicates that the crew assessed the conditions of 12 passengers using the MEWS scale. A summary of the results is reported in Table 9. In addition, he confirmed the need for a deeper medical evaluation on-board at landing. Figure 6 shows the content of this communication.

Table 9: MEWS Score – Crew Assessment

Passenger	MEWS Score	Condition
1	3	Unstable
2	1	Stable
3	2	Stable
4	2	Stable
5	1	Stable
6	3	Unstable
7	2	Stable
8	3	Unstable
9	2	Stable
10	6	Critical
11	0	Stable
12	8	Critical



MAY 3, 2016

TO: FRANKFURT AEROPORTUAL HEALTH AUTHORITIES
 FROM: FRANCESCO SCHET-IN, CAPTAIN OF THE MF8302 FLIGHT

HEALTH NOTICE - URGENT

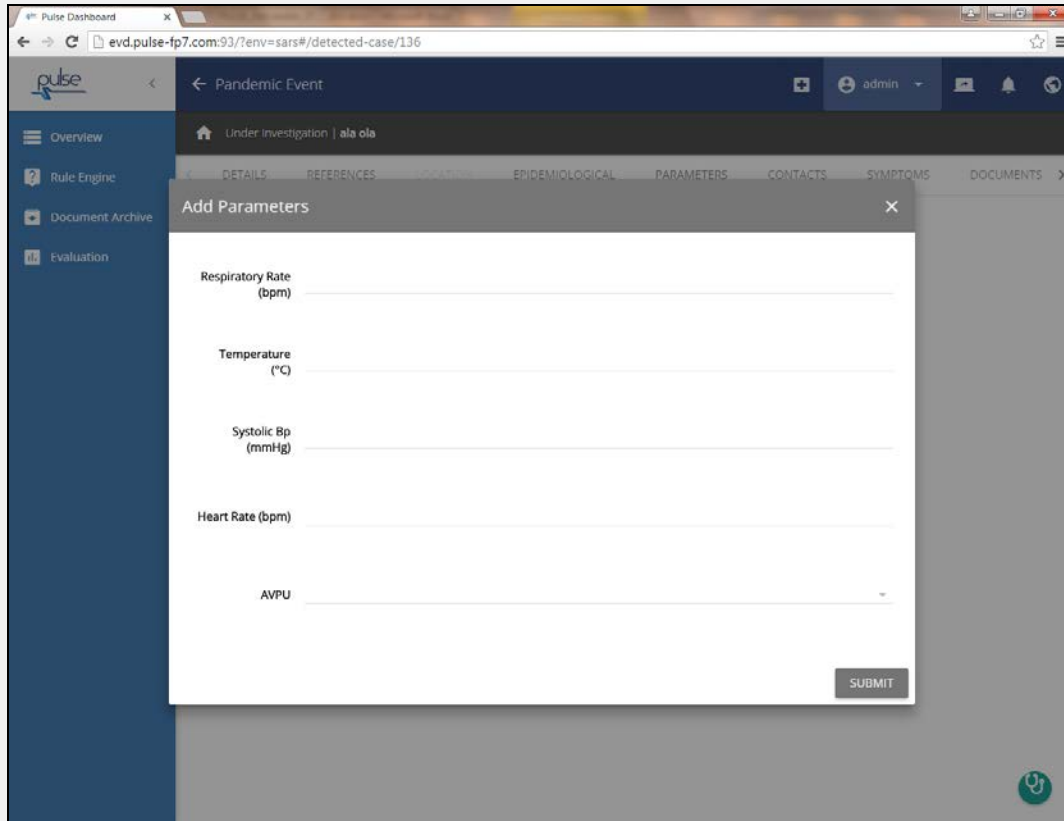
THE CREW ASSESSED THE CLINICAL CONDITIONS OF THE 12 PASSEGGERS USING THE MEWS SCALE. FIND A SUMMARY OF RESULTS. I CONFIRM THAT WE ASK FOR MEDICAL EVALUATION ONBOARD AT LANDING.

THE CAPTAIN
 FRANCESCO SCHET-IN

Figure 6 - Second Health Notice issued by the Captain of the flight MF 8302

Platform role

In this case it has been demonstrated how the PULSE platform supports the flight attendances in calculating the MEWS score for each passenger who has symptoms of malaise. The MEWS is a simple, physiological score resulting from the combination of respiratory rate (bpm), temperature (°C), systolic blood pressure (mmHg), heart rate (bpm) and AVPU score. These parameters can be measured by the flight crew and provided to the PULSE platform through GUI reported in Figure 7.



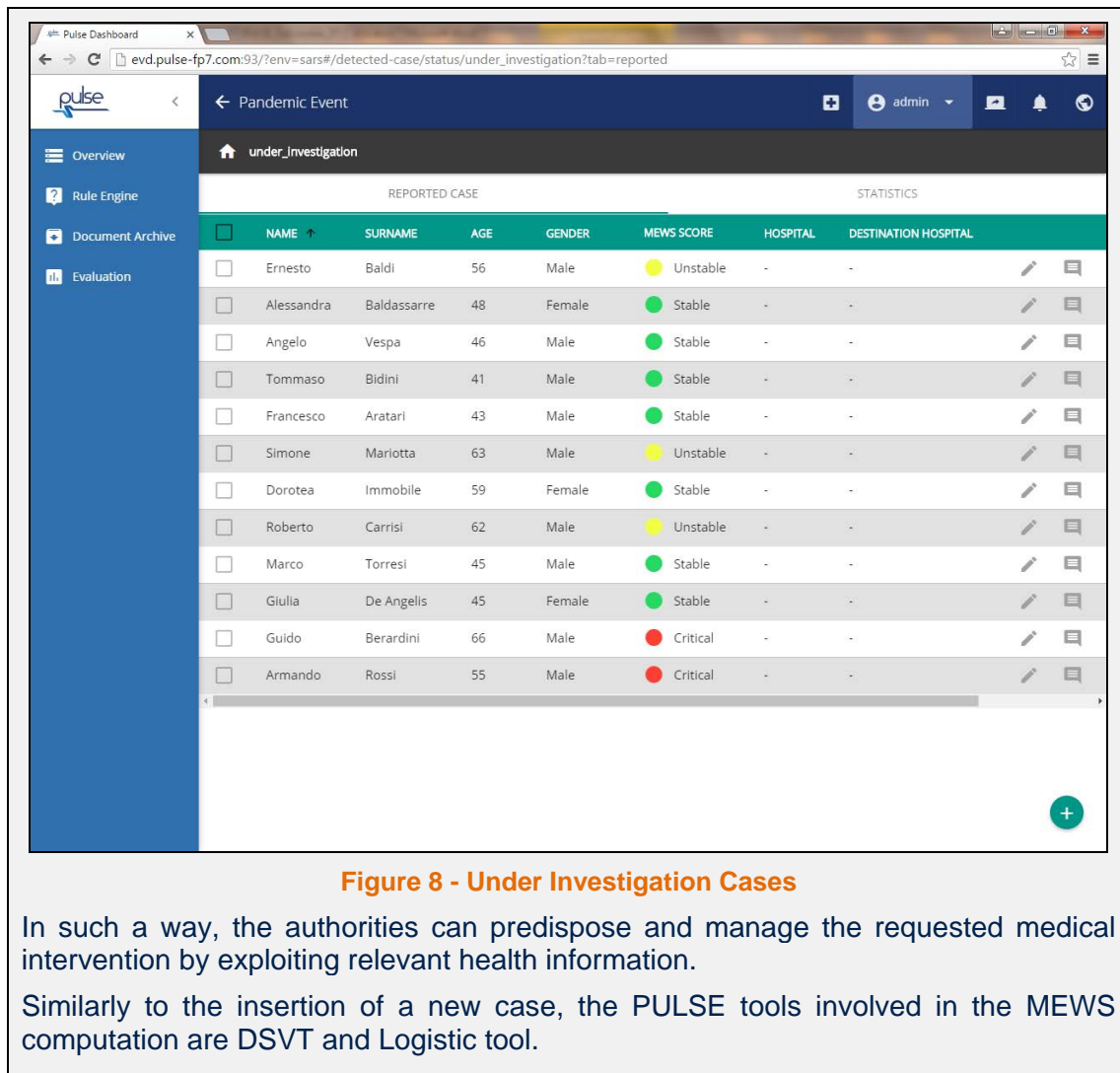
The screenshot displays the PULSE platform's 'Pandemic Event' interface. A modal window titled 'Add Parameters' is open, allowing users to input physiological data for a patient. The form includes the following fields:

- Respiratory Rate (bpm): A text input field.
- Temperature (°C): A text input field.
- Systolic Bp (mmHg): A text input field.
- Heart Rate (bpm): A text input field.
- AVPU: A dropdown menu.

A 'SUBMIT' button is located at the bottom right of the modal. The background interface shows a sidebar with navigation options (Overview, Rule Engine, Document Archive, Evaluation) and a top navigation bar with tabs (DETAILS, REFERENCES, LOCATION, EPIDEMIOLOGICAL, PARAMETERS, CONTACTS, SYMPTOMS, DOCUMENTS).

Figure 7 - PULSE Platform - Parameter of MEWS Score

The PULSE platform automatically computes the MEWS of the patient according to the provided parameters and then makes it available to the health authorities of the Frankfurt airport, as shown in Figure 8.



At 21:55 the flight MF 8302 lands to the Frankfurt airport. Soon after, two physicians intervene on board to conduct the medical evaluation requested by the captain. As a result, a bulletin of the Health Authority is issued with the following content:

- considering the origin of the flight and the symptoms of the passengers, the health authority suspected that the passengers are affected by a new influenza virus;
- consequently, the plane landed in an isolated area of the airport;
- two doctors of the airport health authority boarded on the plane and visited the passengers applying all the recommended infection control measures;
- passengers having final destination in Frankfurt, who are sitting out of the line 25 onwards and those seated from row 9 to scale and do not have fever, are disembarked;
- the severity score of the two passengers in critical conditions is confirmed and, according to the federal authorities, they are prepared to be transferred to High Level Isolation Unit in Frankfurt;
- the three passengers assessed as clinically unstable, the MEWS score is reevaluated, reclassified as stable and able to continue the journey. All other



passengers with fever are judged able to continue the journey.

The last information reported in this bulletin is that the MEWS score of three passengers has been reevaluated. Table 10 shows the result of this process.

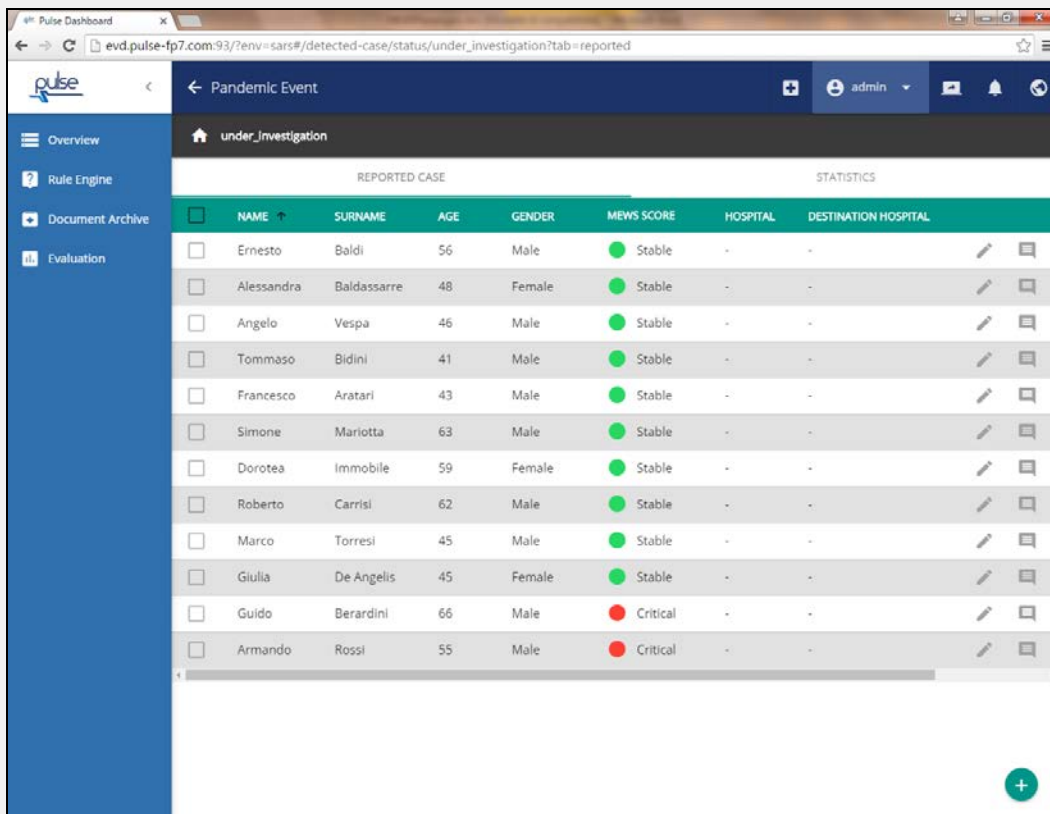
Table 10: MEWS Score – Physician of the Airport Health Authority

Passenger	MEWS Score	MEWS Update	Condition
1	3	1 (changed)	Stable
2	1	Confirmed	Stable
3	2	Confirmed	Stable
4	2	Confirmed	Stable
5	1	Confirmed	Stable
6	3	1 (changed)	Stable
7	2	Confirmed	Stable
8	3	1 (changed)	Stable
9	2	Confirmed	Stable
10	6	Confirmed	Critical
11	0	Confirmed	Stable
12	8	Confirmed	Critical

Platform role

In this phase of the scene, two doctors of the airport health authority boarded on the plane and examined the passengers.

The technical facilitator illustrated how the MEWS score of three passengers previously classified as unstable, can be simply changed in stable. The score can be easily edited and updated with new health parameters by using the GUI shown in Figure 7. As mentioned above, the PULSE platform automatically recalculates the MEWS according to the value of these parameters.



REPORTED CASE							STATISTICS	
	NAME	SURNAME	AGE	GENDER	MEWS SCORE	HOSPITAL	DESTINATION HOSPITAL	
<input type="checkbox"/>	Ernesto	Baldi	56	Male	Stable	-	-	
<input type="checkbox"/>	Alessandra	Baldassarre	48	Female	Stable	-	-	
<input type="checkbox"/>	Angelo	Vespa	46	Male	Stable	-	-	
<input type="checkbox"/>	Tommaso	Bidini	41	Male	Stable	-	-	
<input type="checkbox"/>	Francesco	Aratari	43	Male	Stable	-	-	
<input type="checkbox"/>	Simone	Mariotta	63	Male	Stable	-	-	
<input type="checkbox"/>	Dorotea	Immobile	59	Female	Stable	-	-	
<input type="checkbox"/>	Roberto	Carrisi	62	Male	Stable	-	-	
<input type="checkbox"/>	Marco	Torresi	45	Male	Stable	-	-	
<input type="checkbox"/>	Giulia	De Angelis	45	Female	Stable	-	-	
<input type="checkbox"/>	Guido	Berardini	66	Male	Critical	-	-	
<input type="checkbox"/>	Armando	Rossi	55	Male	Critical	-	-	

Figure 9 - Reclassified Under Investigation Cases

Figure 9 shows the overall situation of the passengers' health state after the reclassification of the unstable cases. This information is immediately available to the health authorities at Frankfurt and Fiumicino airport.

Also in this case, the PULSE tools implementing this functionality are DSVT and Logistic tool.

The Health Authorities in Frankfurt also traced the persons who have had contacts with the 12 affected passengers. Four separated lists of contacts have been prepared:

- *passengers sitting in 10, 11, 23 and 24 rows (30 persons) are considered at low-risk contacts;*
- *asymptomatic Italian passengers belonging to the same group of affected*



persons and sitting in rows 12-22, are considered at high-risk contacts (38 persons);

- airplane crew who have direct care to symptomatic passengers (3 persons) are considered as a high- risk contacts, the remaining crew (9 persons) are considered as a low-risk;
- moreover, from initial interviews to persons belonging to Italian group, other at risk contacts were identified among people who had contacts with symptomatic persons in China just before the departure; among these there are other persons who have taken different flights, for a total of other 10 contacts, considered as a low-risk.

These contact lists are sent to the health authorities of the countries where the passengers are headed.

At the end, the summary of the contacts includes 41 high-risk contacts and 49 low-risk contacts.

Platform role

The PULSE platform also supports the end-users in tracing the people who have had contacts with the symptomatic passengers on the flight. In particular, for each contact connected to a passenger, it is possible to store information such as for example name, surname, gender, contact date, contact duration and, if he/she is a flight contact, row, place and expected risk. This information can be viewed by the health authorities that have the responsibility to take appropriate countermeasures.

NAME	SURNAME	CONTACT DATE	CONTACT DURATION	FLIGHT CONTACT
Maria	Green	May 3, 2016	2.4	Flight Contact
Lorena	Green	May 3, 2016	2.4	Flight Contact
Ronald	Apple	May 3, 2016	2.4	Flight Contact
Frank	Peach	May 3, 2016	2.4	Flight Contact
Maria	Simpson	May 3, 2016	2.4	Flight Contact
Stefania	Simpson	May 3, 2016	2.4	Flight Contact
Alessia	Griffin	May 3, 2016	2.4	Flight Contact
Maria	White	May 3, 2016	2.4	Flight Contact

Figure 10 - PULSE Platform - Contact list connected to an Under Investigation case

For example, Figure 10 shows the list of contact related to a specific passenger of



the flight. Obviously, this functionality is available for all the cases stored on the PULSE platform, so that competent authorities can have an overall vision of the contacts situation.

Also in this case, the PULSE tools implementing the contacts tracing functionality are DSVT and Logistic tool.

The flight MF 8302 leaves the Frankfurt airport and proceeds towards the Fiumicino airport where it lands at 00:20. Here the USMAF officials assess the clinical status of the passengers and confirm all the MEWS scores and the other data collected.

The other involved actors, according to their own competences, are called to take appropriate and relevant decisions about:

- *notification of cases;*
- *contact tracing;*
- *allocation of patients;*
- *isolation and treatment of patients;*

Any other action derived by the occurrence of the event described above.

4.2.2.2 Discussion and questionnaires

Identifying a probable case on board the airliner, this scene should trigger:

- Instant determination, verification and constant up-dating of the epidemic situation on all public health levels concerned,
- Immediate communication and alerting of all actors in order to take appropriate steps, and to facilitate access to repositories storing relevant documents, regulations, procedures and the like,
- Efficient management of an emerging major health crisis.

Integrated into the course of action presented in this scene, the resulting answers to the questions formulated are captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes.

Below table presents the questions developed of the effectiveness criteria established for the respective use case.

Table 11: Airplane Landing Evaluation Questions

#	Effectiveness Criteria
1	Reduction of time and error rate in electronically filling and handling forms & documents
2	Immediate availability of documents, regulations and guide lines for the initial confirmation of cases, alert & operational procedures

3	Immediate establishment of communication with appropriate medical facilities, authorities, and respective national actors
4	Speedy allocation of patients to hospitals with disease and treatment specific capabilities
5	Continuous up-date of the epidemic situation on all levels concerned
6	Potential to comprehensively assess events that may constitute a public health emergency

4.2.3 Scene 2: ECDC Emergency meeting

In this scene, the ECDC conveys an international meeting of Health Experts to analyse the evolution of the epidemiological situation and provide recommendations about possible countermeasures. Similarly to the first scene, the meeting here described is a simulation of what might happen in a real ECDC meeting and it is built to appreciate specific functionalities of the PULSE platform. During the meeting some alerts are generated to the ProMED mail service and are immediately available to the attention of the participants as relevant discussion elements, by means of the PULSE platform. The platform also allows sharing in near real time, with the competent health authorities, the confirmation that the passengers of the flight MF 8302 are really affected with the EAH1N1 virus.

As described in Figure 3, this scene includes the steps defined in Use Case 6 “ECDC Recommendations”.

4.2.3.1 Scene description and platform role

The general context where the scene takes place is that described below.

The WHO alerts the Member States of a new pandemic threat and confirms the level of influenza pandemic phase to 3.

On May 3rd, due to the involvement of a new continent and to the frequent travels between Europe and USA, the ECDC conveys an international meeting of Public Health Experts in order to revise the epidemiological situation and provide recommendations to the Member States. The meeting is held in Stockholm with the possibility to participate by teleconference.

The list of authorities that is expected to attend the meeting includes:

- *representative of Ministry of Health of Member States;*
- *ECDC;*
- *Public Health Agencies of Member States;*
- *Relevant EU Authorities;*
- *WHO Europe;*
- *WHO Headquarters;*
- *Influenza Focal Point.*

The objectives of the meeting are:

- *review the global epidemiological situation;*
- *risk assessment for possible introduction and spread in Europe;*

- review of the strengths and weakness in the organization of each Member State;
- recommendations to Member States;
- re-evaluation of the Pandemic Phase.

During the meeting new alerts are received through the ProMED mail service; their content is as follows:

1. on April 28th 2016, the National Health and Family Planning Commission of China notified WHO of 17 additional laboratory-confirmed cases of human infection with avian Swine flu virus H1N1 (EAH1N1), including 5 deaths.
2. the Centre for Disease Prevention and Control (CDC) in Atlanta was notified of two cases of new swine influenza virus in USA. The index case is a returning traveller from China (Guandong). The second case is the traveller's wife with no history of recent travel in affected area.

Figure 11 shows a snapshot of these ProMED alerts received during the meeting.

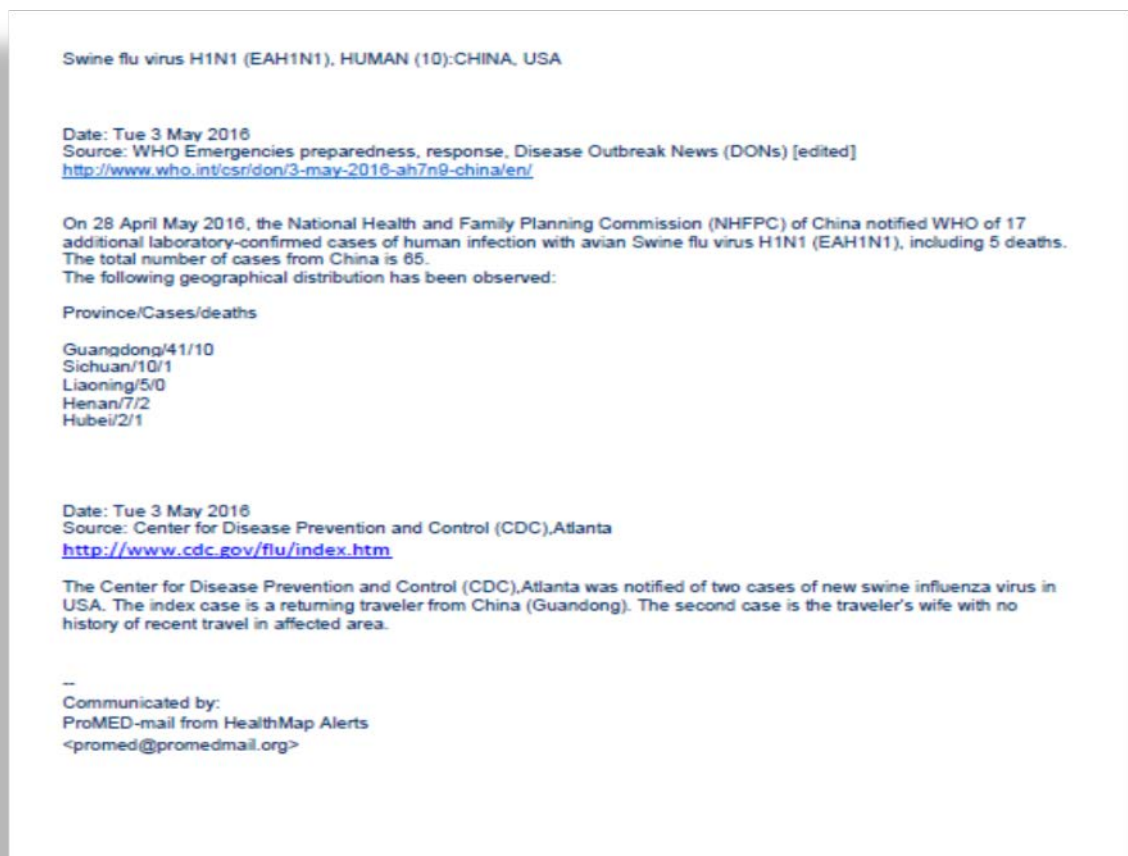
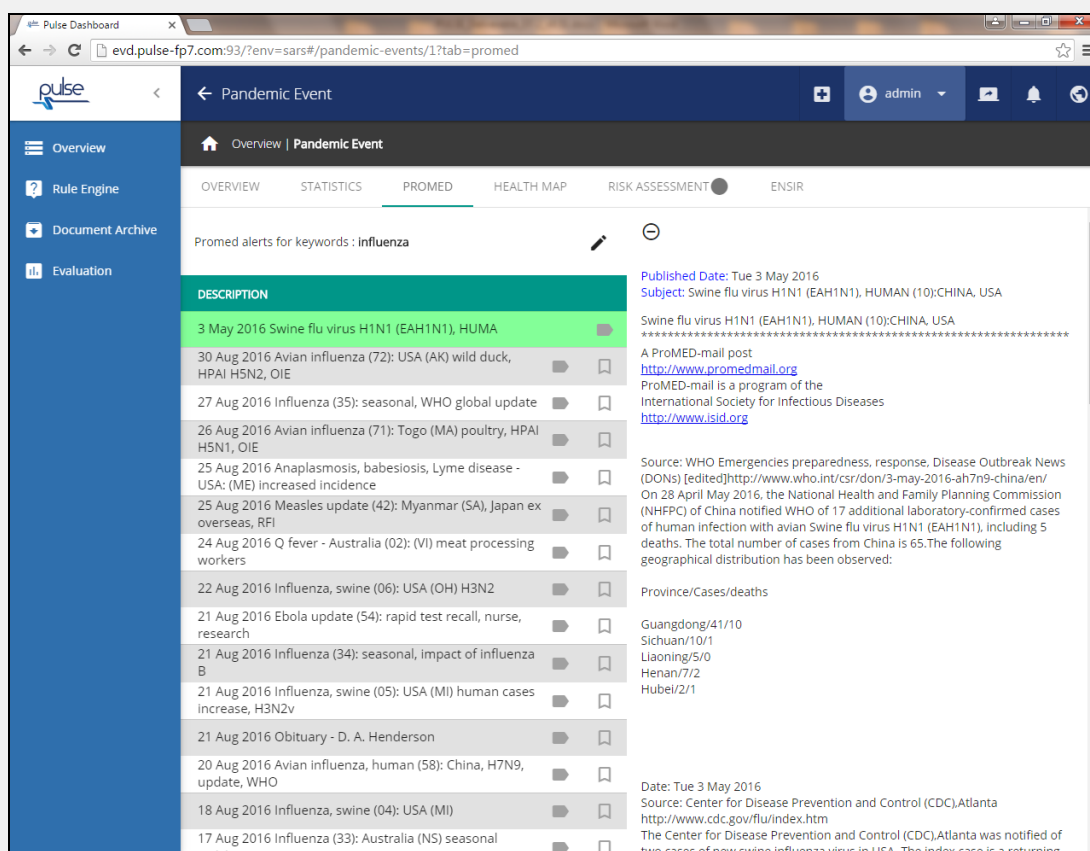


Figure 11 - Alert sent by the ProMED mail service

Platform role

In this case, the PULSE platform supports the end-users through the ProMED section of its GUI which has been directly integrated with the ProMED mail service. Each alert available on ProMED is immediately available on the PULSE platform as well.

Figure 12 shows, on the left-side, the list of the last ProMED alerts in chronological order and, on the right-side, the details of the mail message selected by the end-user. Here in particular it is reported the alert mentioned in Figure 11. During the EVD trial the technical facilitator demonstrated how to use this functionality and highlighted its potentials.



DESCRIPTION

3 May 2016 Swine flu virus H1N1 (EAH1N1), HUMA

30 Aug 2016 Avian influenza (72): USA (AK) wild duck, HPAI H5N2, OIE

27 Aug 2016 Influenza (35): seasonal, WHO global update

26 Aug 2016 Avian influenza (71): Togo (MA) poultry, HPAI H5N1, OIE

25 Aug 2016 Anaplasmosis, babesiosis, Lyme disease - USA: (ME) increased incidence

25 Aug 2016 Measles update (42): Myanmar (SA), Japan ex overseas, RFI

24 Aug 2016 Q fever - Australia (02): (VI) meat processing workers

22 Aug 2016 Influenza, swine (06): USA (OH) H3N2

21 Aug 2016 Ebola update (54): rapid test recall, nurse, research

21 Aug 2016 Influenza (34): seasonal, impact of influenza B

21 Aug 2016 Influenza, swine (05): USA (MI) human cases increase, H3N2v

21 Aug 2016 Obituary - D. A. Henderson

20 Aug 2016 Avian influenza, human (58): China, H7N9, update, WHO

18 Aug 2016 Influenza, swine (04): USA (MI)

17 Aug 2016 Influenza (33): Australia (NS) seasonal

Published Date: Tue 3 May 2016
Subject: Swine flu virus H1N1 (EAH1N1), HUMAN (10):CHINA, USA

Swine flu virus H1N1 (EAH1N1), HUMAN (10):CHINA, USA

 A ProMED-mail post
<http://www.promedmail.org>
 ProMED-mail is a program of the
 International Society for Infectious Diseases
<http://www.isid.org>

Source: WHO Emergencies preparedness, response, Disease Outbreak News (DONs) [edited]<http://www.who.int/csr/don/3-may-2016-ah7n9-china/en/>
 On 28 April May 2016, the National Health and Family Planning Commission (NHFPC) of China notified WHO of 17 additional laboratory-confirmed cases of human infection with avian Swine flu virus H1N1 (EAH1N1), including 5 deaths. The total number of cases from China is 65. The following geographical distribution has been observed:

Province/Cases/deaths

Guangdong/41/10
 Sichuan/10/1
 Liaoning/5/0
 Henan/7/2
 Hubei/2/1

Date: Tue 3 May 2016
 Source: Center for Disease Prevention and Control (CDC),Atlanta
<http://www.cdc.gov/flu/index.htm>
 The Center for Disease Prevention and Control (CDC),Atlanta was notified of two cases of new swine influenza virus in USA. The index case is a returning

Figure 12 - ProMED mail service

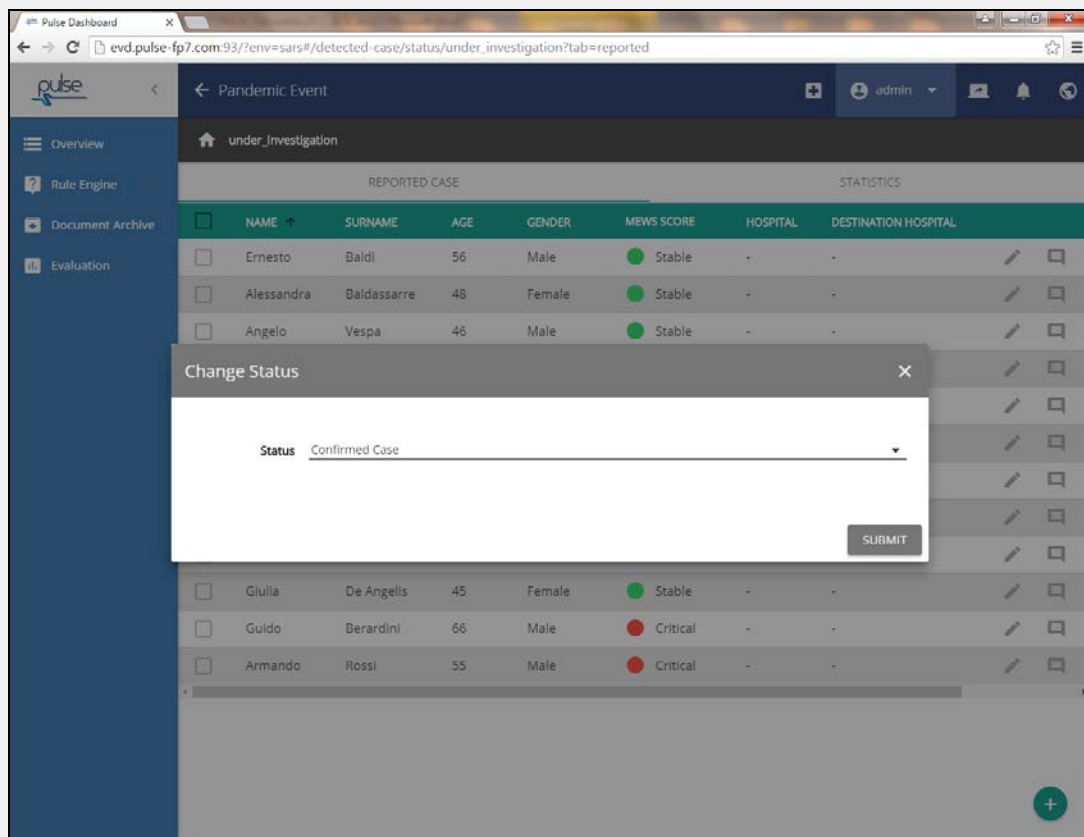
The PULSE tool that allows making available the information coming from the ProMED mail service is the DSVT.

The samples taken from suspected patients arrived in Fiumicino are resulted positive at Spallanzani Laboratory for the influenza A virus. Therefore, they have been sent to the Istituto Superiore di Sanità (ISS) for typing and characterization. This process has shown that the virus belongs to the same variant circulating in China i.e. EAH1N1.

At this point, the status of the 12 passengers of the flight previously classified as 'under investigation' become 'confirmed', since the sample taken from them demonstrated that they are affected with the EAH1N1 virus.

Platform role

In this phase, the technical facilitator showed as an end-user can simply update the health status of the patients previously classified as 'under investigation'. In particular, in the list of under investigation cases reported in Figure 9, it is sufficient to select the bottom 'change status' related to the patient whose the health status has to be modified and then choose 'confirmed case'. Figure 13 shows the form with the drop-down menu with the possible health status options.



NAME	SURNAME	AGE	GENDER	MEWS SCORE	HOSPITAL	DESTINATION HOSPITAL
Ernesto	Baldi	56	Male	Stable	-	-
Alessandra	Baldassarre	48	Female	Stable	-	-
Angelo	Vespa	46	Male	Stable	-	-
Giulia	De Angelis	45	Female	Stable	-	-
Guido	Berardini	66	Male	Critical	-	-
Armando	Rossi	55	Male	Critical	-	-

Figure 13 - Pulse Platform - Change Status form

The PULSE tools having an active role in implementing this functionality are DSVT and Logistic tool.

4.2.3.2 Discussion and questionnaires

ECDC convening a crisis meeting to assess the risk, to consider countermeasures in a collective European approach and support to nations affected by the pandemic, this scene is to:

- Generate an overview of disease cases in Europe, the potential epidemiological spread, and of available resources shared at ECDC level,
- Demonstrate the provision of particular virological data and suggestions for disease specific recommendations and guidelines, and
- To electronically assist the distribution of the ECDC communication protocol.



Integrated into the course of action presented in this scene, the resulting answers to the questions formulated are captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes.

Table 12: ECDC Recommendations Evaluation Questions

#	Effectiveness Criteria
1	Overview of disease cases in Europe and potential epidemiological spread
2	Overview of resources available to be shared at ECDC
3	Provision of particular virological data and suggestions for disease specific recommendations and guidelines
4	Speedy allocation of patients to hospitals with disease and treatment specific capabilities

4.2.4 Scene 3: Identification of a new probable case in the community

In this scene, it becomes clear that the EAH1N1 virus is circulating among humans without epidemiological links to pigs since an increasing number of cases are notified in different countries. In particular, it is simulated the case of a 68 years old man that arrives at the Emergency Department of the ‘Gemelli’ hospital with fever and dyspnea. The PULSE platform is used to (1) collect data related to the patient, (2) calculate his MEWS score, (3) transfer the patient to the ‘Spallanzani’ hospital when he becomes suspected to have the EAH1N1 virus and (4) send notifications to the competent health authority on procedures and guidelines related to the patient transfer.

This scene includes the steps defined in Use Case 4 “Identification of a new probable case in a community”.

4.2.4.1 Scene description and platform role

The general context where the scene takes place is that described below.

At the beginning of May, Chinese Health Authorities referred the onset of 10 severe EAH1N1 flu cases hospitalized in Canton Hospital, with no epidemiological links to pigs or to other cases. It becomes quickly clear that the new virus was circulating among humans.

From May 12th to May 20th several flu humans cases are notified in Hong Kong, Macao, Bangkok referred of new flu virus.

On May 25th, humans cases referred to new flu swine virus are reported from Japan, Philippines, Australia, New Zealand and USA.

On May 27th, the WHO raised the level of influenza pandemic to 4.

New cases of travellers returning from abroad are expected in Italy and, for this reason, a set of actions are required by Ministry of Health in order to improve rapid detection of potential infected cases, including the development and dissemination of a Case Definition³. According to National Procedures, suspected patients (or specimens from suspected patients) should be sent to the reference hospitals and laboratories.

On May 28th at 12:00, a 68 year old man refers to “Gemelli” Hospital Emergency Department in Rome with fever and dyspnea. He says that, in the last days, he has been in close contact with the 9 year old nephew, who had a mild respiratory illness just after a one-week visit to Disneyland, in Florida (USA). The physicians assessed the physiological parameters of the old man by using the MEWS scale and his score is resulted 3, therefore the patient has been classified as unstable. Table 13 reports, highlighted in red, the ranges including these parameters.

Table 13: MEWS Score – Physiological Parameters of the patient at Gemelli hospital

Score	3	2	1	0	1	2	3
Physiological Parameters							
Respiratory rate (bpm)		< 9		9-14	15-20	21-29	≥ 30
Heart Rate (bpm)		≤ 40	41-50	51-100	101-100	111-129	≥ 130
Systolic Blood pressure (mmHg)	< 70	71-80	81-100	101-199		≥200	
Temperature (°C)		<		35.1-38.4		≥ 38.5°C	
AVPU score				Alert	Reacting to Voice	Reacting to Pain	Unresponsive

³ A Case Definition is set of uniform criteria used to define a disease for public health surveillance. Case Definitions enable public health to classify and count cases consistently across reporting jurisdictions, and should not be used by healthcare providers to determine how to meet an individual patient's health needs.

**Platform role**

The technical facilitator explained how an end-user (i.e., in this case, the physician at the emergency department of the “Gemelli” hospital) can insert in the PULSE platform the data related to the 68 years old man with fever and dyspnea, classifying him as an ‘under investigation’ case. The reference GUI adopted to carry out this operation is the same showed in Figure 5. In addition to general data, the parameters needed to allow the computation of the MEWS score are also provided to the PULSE platform, so that it automatically recognizes that the patient condition is unstable. Figure 7 shows the form used to store these parameters.

At 13:30, the 68 years old man, who has diabetes and hypertension, is identified as a patient suspected to have the new virus EAH1N1 and he is sent to the Spallanzani Hospital, where diagnostic specimens are collected. On May 31st, the sample has been confirmed as the new EAH1N1 and the result has been communicated to the Ministry of Health.

Platform role

In this phase, the PULSE platform is used to keep trace of the transfer of a patient suspected to have the new virus EAH1N1 and moved from the ‘Gemelli’ to the ‘Spallanzani’ hospital. The technical facilitator demonstrated how the physicians at the ‘Gemelli’ hospital can use the platform to perform the transfer operation by using the GUI reported in Figure 14. The healthcare team at the Spallanzani hospital, through the PULSE platform, can immediately know that a patient with a suspected infection disease is arriving, so that they can appropriately prepare his reception.

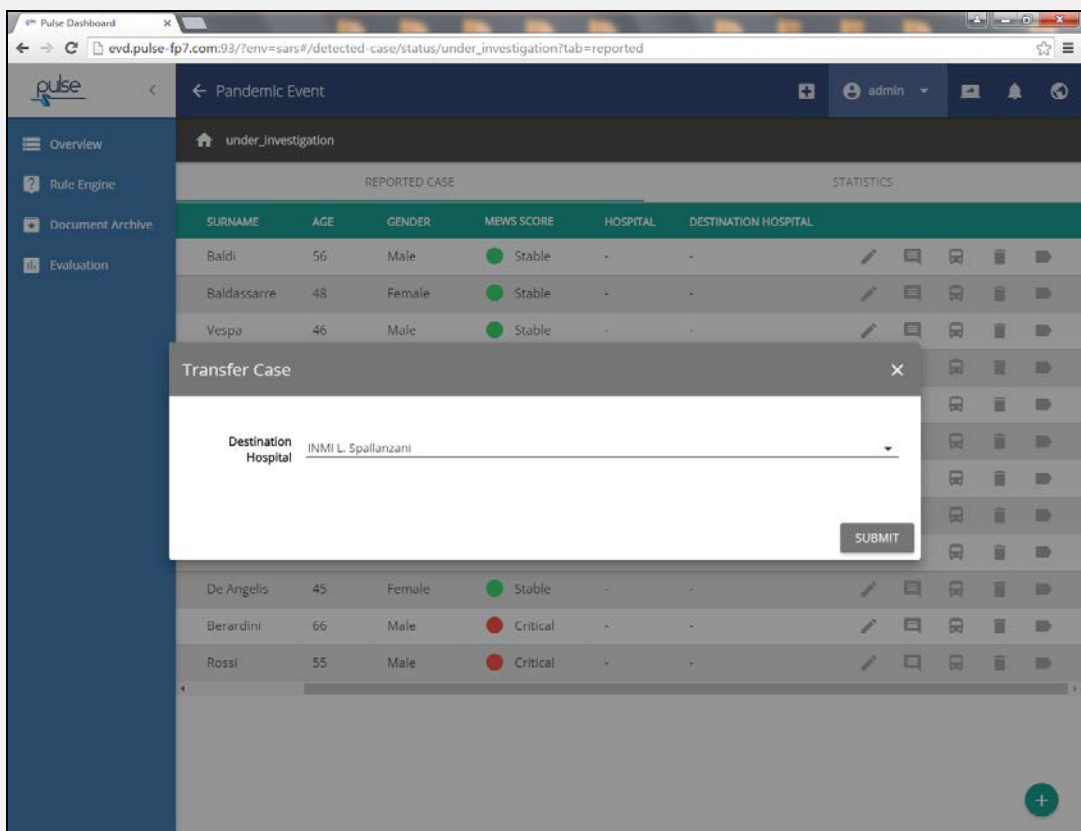
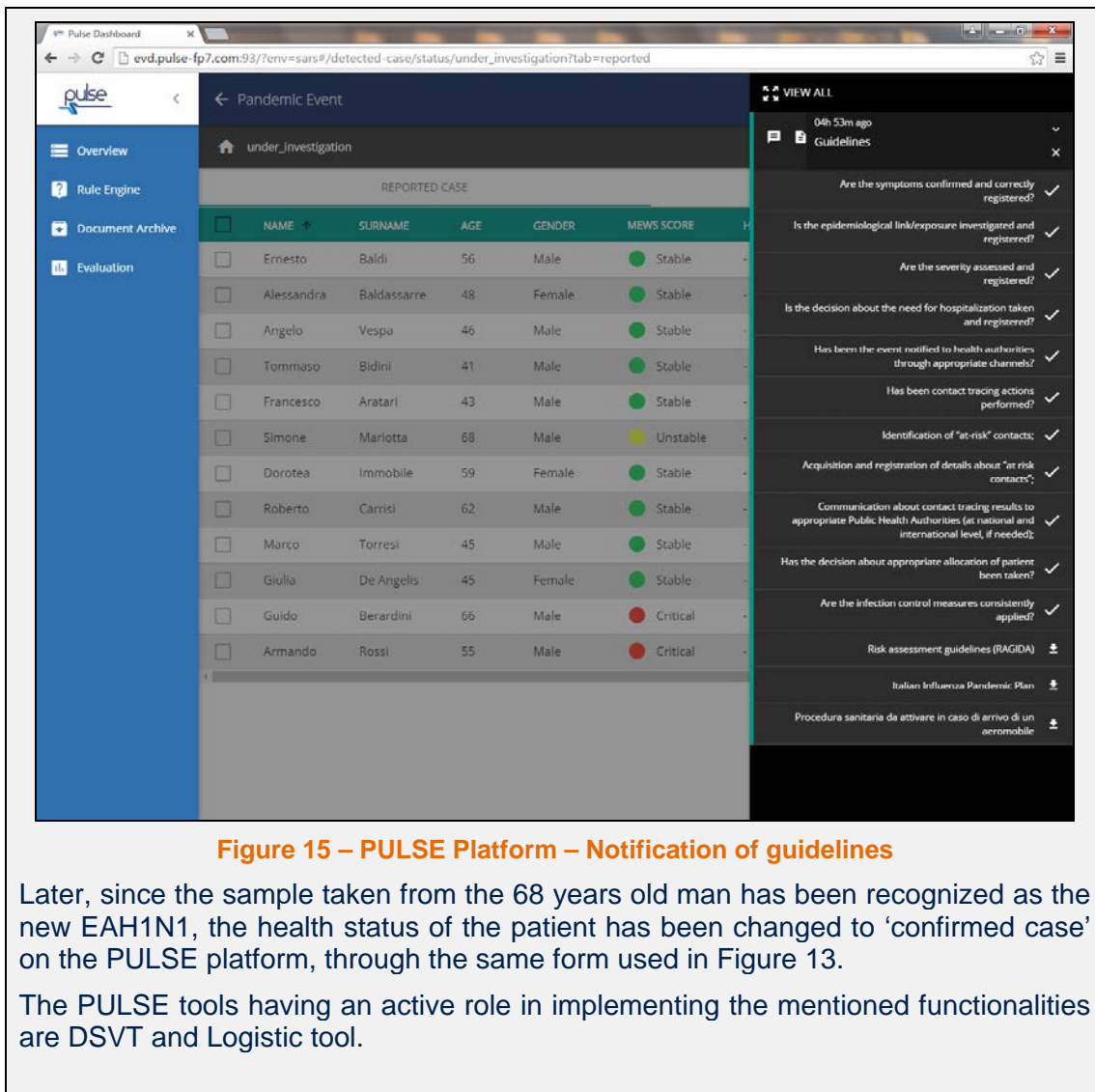


Figure 14 - PULSE Platform - Transfer Case

The transfer of a potential infected patient has to be performed by following specific procedures and guidelines. When the patient is transferred, the documentation where these procedures are described is immediately notified to the competent health authority through the PULSE platform. Figure 15 shows the list of notifications, guidelines and documentation that is made available to Spallanzani hospital for managing the situation and to coordinate the activities with the other involved health authorities.



At this point, different actors, according to their own competencies, are called to take appropriate and relevant decisions about:

- *notification of the case;*
- *contact tracing;*
- *appropriate isolation and treatment of the patient;*

further actions triggered by competent public Health Authorities as a consequence of the event described.

4.2.4.2 Discussion and questionnaires

Identifying a probable case in a community, this scene aimed at the instant determination and verification of an epidemic situation, followed by an immediate alerting procedure and other appropriate actions in order to efficiently manage an emerging major health crisis. Below activities supported by PULSE were demonstrated and practiced:

- Reduction of time and error rate in filling and handling forms,
- Immediate communication with appropriate authorities and access to disease relevant documentation and repositories,
- Speedy allocation of patients to disease specific medical facilities, and
- Continuous up-dated epidemic situation to comprehensively assess a public health emergency.

Integrated into the course of action presented in this scene, the resulting answers to the questions formulated are captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes.

Table 14: Community Case Evaluation Questions

#	Effectiveness Criteria
1	Reduction of time and error rate in electronically filling and handling forms & documents
2	Immediate availability of documents, regulations and guide lines for the initial confirmation of cases, alert & operational procedures
3	Immediate establishment of communication with appropriate medical facilities, authorities, and respective national actors
4	Speedy allocation of patients to hospitals with disease and treatment specific capabilities
5	Continuous up-date of the epidemic situation on all levels concerned
6	Potential to comprehensively assess events that may constitute a public health emergency

4.2.5 Scene 4: Weak signal detection and surveillance

This scene is dedicated to the detection of weak signals. In the original concept, this scenario is limited to the initial phase of a new human pandemic flu, with the idea that weak signals could be used to detect the occurrence of a new disease at its first appearance only. However, the detection of weak signals should be used, with different aims, at almost every phase during the emerging and the spreading of a new pandemic flu.

For example, weak signals could be used: (1) to detect first cases in a country that is free of disease, even when the same disease is spread in other parts of the world; (2) to detect the occurrence of severe cases of a disease that is supposed to be mild, or to identify “at-risk groups” for severe manifestation; (3) to detect the real impact and geo-localization of a disease already present in the country, but supposed to be



limited to few areas only; and these are only few examples of the possible use of the weak signals during the management of a pandemic influenza.

As described in Figure 3, this scene includes the steps defined in Use Case 1 “Weak signal detection and surveillance”.

4.2.5.1 Scene description and platform role

On May 29th, WHO raises the influenza pandemic alert from phase 4 to phase 5, reporting that a pandemic was imminent and requests that all countries immediately activate their pandemic preparedness plans and be on high alert for unusual outbreaks of influenza-like illness and severe pneumonia.

In the meanwhile, in Italy a number of imported cases occurred, with local secondary transmission. The Ministry of Health asks for the improvement of surveillance systems for early detection and geo-localization of cases and clusters, in order to promptly isolate cases and recognize chains of contacts.

In addition to the classical surveillance systems a new approach, which uses the so-called weak signals, has been experimented.

Platform role

During the course of the scene, several of the PULSE functionalities have been presented and then used by the trial's participants:

- *General overview:*

As specified in the previous scenes and described in D4.1 [5], the PULSE platform allows the user to have an immediate access to the information related to the crisis and to have a complete overview on the epidemic status.

During the scene the actors have been able to continuously assess the current epidemic situation and to update, when necessary, the information related to each single person suspected of suffering from the flu symptoms.

- *Twitter messages analysis:*

As described in D4.2 [6], one of the functionality provided by the PULSE platform and more specifically from the IAT is the ability to gather the messages posted on the Twitter social media and analyse and filter these messages in order to extract only those that contain specific keywords related to Influenza like illness (ILI) and Severe acute respiratory infections (SARI). An increase of messages containing these keywords in a certain location could represent a “proxy” of incidence of Influenza in that specific zone.

- *Emergency department accesses monitoring:*

This functionality, described in D6.1, allows any emergency coordinator using the PULSE platform to have a real-time access to the Lazio Hospital emergency department information.

Following the same approach used for the Twitter messages, an analysis of the number of people currently under observation in the hospitals' emergency departments could represent a “proxy” for the impact of the influenza on the health care facilities.

This functionality has two access modalities:

- External: during the scene the actors had the possibilities to see the current status of the Hospitals' emergency department by using the DSVT interface and by clicking on the Hospital details button.
- Internal: in a transparent way to the users, the DSVT automatically gathered, stored and analysed the information coming from the Hospitals.

- *Weak signal generation:*

As described in D4.2, the PULSE platform supports the generation of weak signals indicating the possible presence of an epidemic flu's breeding ground. In the context of the EVD trial, the generation of a weak signal is based on the monitoring of the number of Twitter messages containing keywords related to the influenza symptoms. If the number of messages overcomes a predefined threshold a new alert is shown on the PULSE interface and the user can assess the list of messages that actually triggered the signal.

During the trial an example of this interaction has been shown, allowing the user to see the list of Twitter messages that triggered the weak signal.

- *Risk assessment:*

The risk assessment is a crucial step for the evaluation of the emergency status and for the determination of the next steps necessary for an efficient management of the crisis.

In PULSE the risk assessment has been divided in two main steps:

- the first one, called *Probability evaluation*, foresees an automatic assessment based on the number of Twitter messages received (as explained above) and the number of person that are currently under observation in the hospitals' emergency departments. The logic behind this calculation is explained in Figure 16 where a different level of risk (e.g. low, medium, high) can be obtained by altering the number of Twitter messages and the Emergency department evaluation.
- the second one, called *Impact evaluation*, is based on the user self-assessment regarding the current status of the epidemic. This has been accomplished by providing a specific and risk-oriented questionnaire to the user and by analysing his/her answers. The questions and the procedure that must be followed to get the impact evaluation risk are provided in Figure 17.

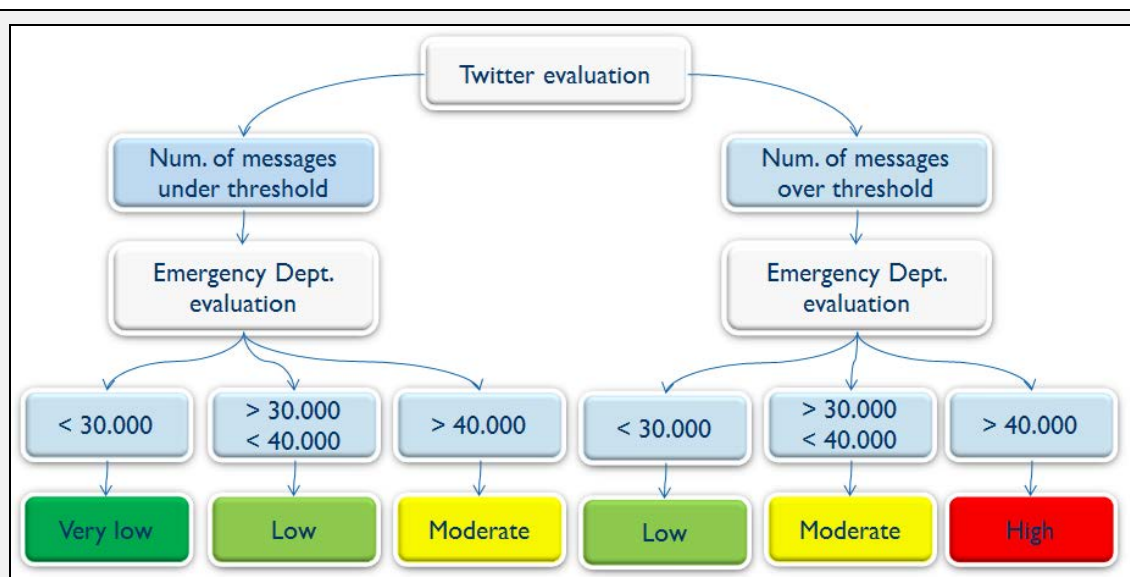


Figure 16 - Risk assessment - Probability evaluation

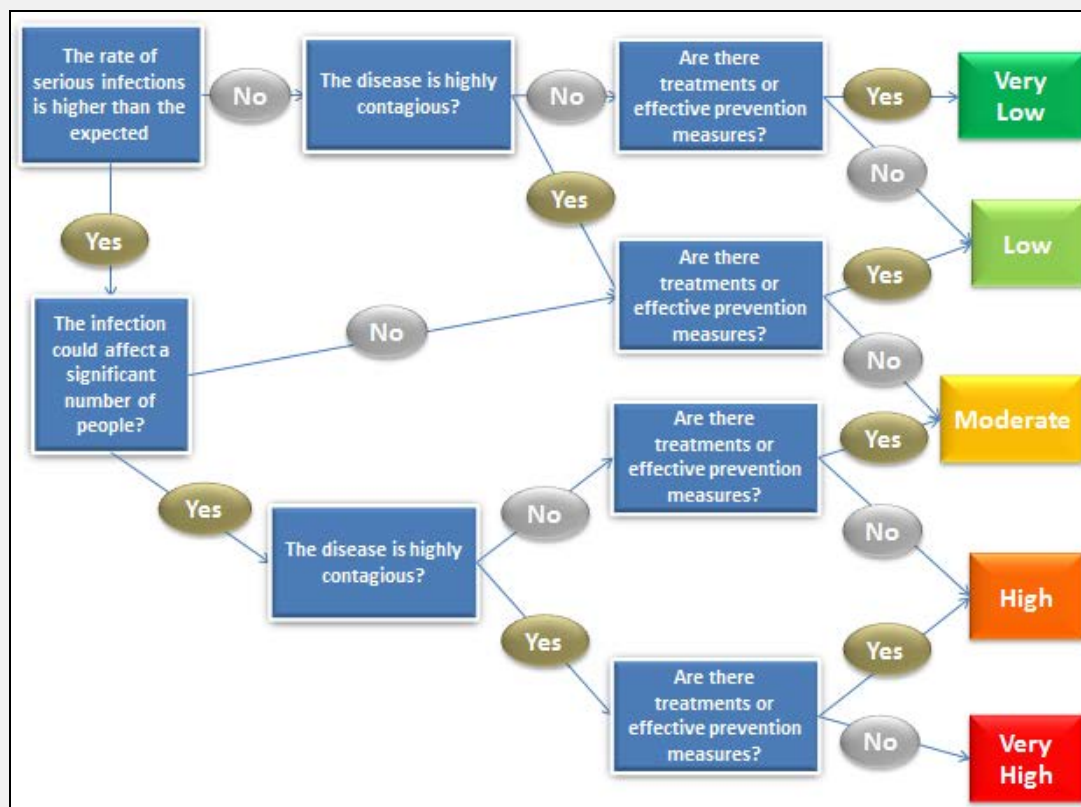


Figure 17 - Risk assessment - Impact evaluation

During the Trial the actors had the possibility to visualize the current risk assessment evaluation.

The result of the evaluation is generated by following the matrix table depicted in Figure 18 where the concatenation of the Impact and Probability evaluation results generates a general Risk Level (e.g. Very Low, Low, Moderate, High, and Very High).

Impact \ Probability	Very Low	Low	Moderate	High
Very Low	Very Low Risk	Low Risk	Low Risk	Moderate Risk
Low	Low Risk	Low Risk	Moderate Risk	Moderate Risk
Moderate	Low Risk	Moderate Risk	Moderate Risk	High Risk
High	Moderate Risk	Moderate Risk	High Risk	High Risk
Very high	Moderate Risk	High Risk	High Risk	Very High Risk

Figure 18 - Risk assessment – Final Evaluation

4.2.5.2 Discussion and questionnaires

An unusual biological event having alerted decision makers, this scene focuses on facilitating disease surveillance, providing an enhanced operational picture and support to decision makers, and resource management. The following was demonstrated in particular:

- Expected disease evolution and geographical spread,
- Timeliness notification sent to authorities and decision makers together with appropriate suggestion,
- Overview of medical resources, responder status and probable and confirmed cases, and
- Visualised epidemic information and screen sharing possibilities.

Integrated into the course of action presented in this scene, the resulting answers to the questions formulated are captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.



Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes.

Table 15: Weak Signal Detection & Surveillance Evaluation Questions

#	Effectiveness Criteria
1	Information on: <ul style="list-style-type: none">- Expected disease evolution,- Geographical spread,- Listing of zone-specific signals exceeding thresholds
2	Attention paid to social pattern and geographic characteristics
3	Timeliness of notifications to responsible authorities and suggestions automatically sent to decision makers and laboratories
4	Depiction of: <ul style="list-style-type: none">- Hospital resources,- Responder status,- Probable & confirmed cases
5	Visualised epidemic information and screen sharing possibilities

4.2.6 Scene 5: Spread of the infection in Italy - Resources assessment

In this scene, the number of cases suffering from the influenza symptoms starts increasing. For this reason the Ministry of Health asks Regional Health Authorities to perform an inventory on the availability of medical resources from the health facilities. The PULSE platform is used to perform this resources assessment, allowing an immediate and easy access to the number of available resources in the different Italian hospitals.

This scene includes the steps defined in Use Case 5 “Assessment of the available medical resources during the pandemic phase”.

4.2.6.1 Scene description and platform role

The general context where the scene takes place is that described below.

In Italy a few number of imported cases occurred, and all cases were promptly isolated in the two Italian referral hospitals for Highly Infectious Diseases (Spallanzani in Rome, Sacco in Milan), with apparently no secondary transmission.

On June 15th, the cases in Rome raises to 15. Of these, 5 persons were family members of the first detected case. During the infectious period, the case has been also in contact with other people for the participation to a veteran meeting held in Milan. The tracing of the workshop participants has shown symptoms of infection in 10 persons, 5 residing in Milan and 5 residing in Naples.

One case from Naples and one from Milan have been admitted to the ICU due to an



Acute Respiratory Distress Syndrome (ARDS), one case among the family members has been admitted for a severe Rhabdomyolysis. All admitted cases have been treated with Oseltamivir with no improvement of clinical conditions and all contacts had been vaccinated for seasonal influenza.

Considering the situation, the Italian Ministry of Health asks Regional Health Authorities to perform an inventory on the availability of medical resources from health facilities.

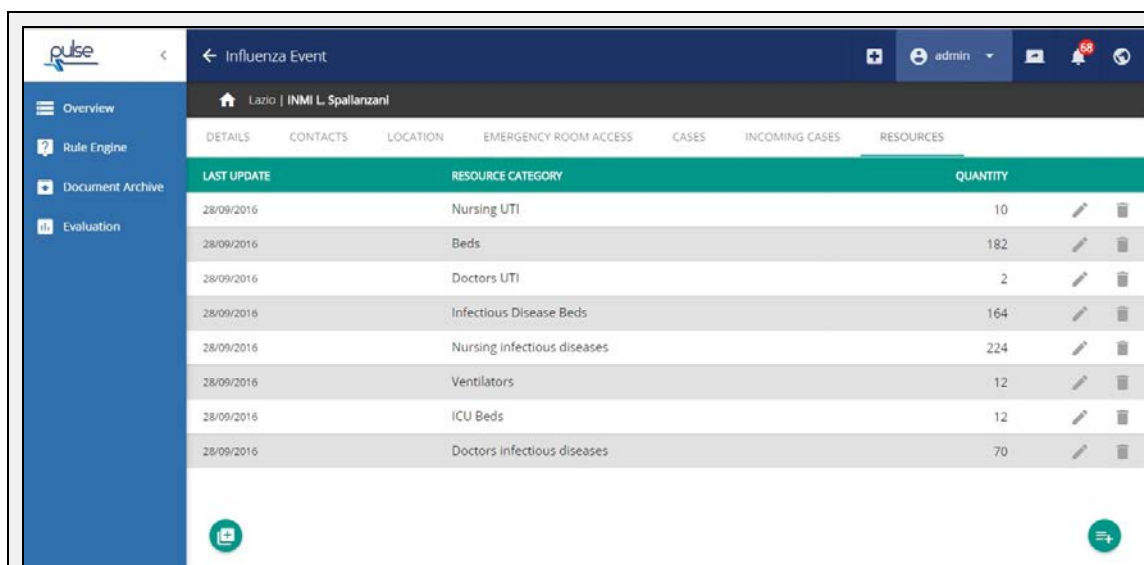
Platform role

During the trials it has been demonstrated how the PULSE platform can actually be used to perform an inventory on the availability of medical resources from the health facilities. As shown in Figure 19, PULSE provides a dedicated Overview section where the National Authority can assess, for each Italian region: (1) the number of available hospitals, (2) the number of DEAs, (3) the number of ICUs, (4) the number of ICU beds, (5) the number of infectious disease departments, (6) the number of beds, (7) the number of admitted persons and (8) the number of admitted person in the Intensive Care Units.

OVERVIEW	STATISTICS	PROMED	HEALTH MAP	RISK ASSESSMENT	ENSIR
Lazio	114	78	66	1395	12 42627 0 0 INMI L. Spallanzani
Abruzzo	25	23	21	256	82 505 6 2
Basilicata	29	26	26	165	46 405 3 1
Calabria	36	33	15	137	77 265 11 4
Campania	75	70	65	494	334 600 20 8
Emilia Romagna	90	88	87	341	233 698 34 17
Friuli Venezia Giulia	74	73	70	123	36 856 47 27
Liguria	80	78	69	177	140 605 29 18
Lombardia	91	90	87	336	444 865 49 36
Marche	3	3	2	28	71 220 3 1
Molise	6	4	4	31	17 160 4 1

Figure 19 - Hospitals overview

The assessment can require a more detailed report on the number of available resources for each single hospital. This is done by clicking on the desired hospital and selecting the Resources tab. Figure 20 shows for example the resources (e.g. beds, doctors, ventilators, etc.) available at the INMI L. Spallanzani hospital.



LAST UPDATE	RESOURCE CATEGORY	QUANTITY
28/09/2016	Nursing UTI	10
28/09/2016	Beds	182
28/09/2016	Doctors UTI	2
28/09/2016	Infectious Disease Beds	164
28/09/2016	Nursing infectious diseases	224
28/09/2016	Ventilators	12
28/09/2016	ICU Beds	12
28/09/2016	Doctors infectious diseases	70

Figure 20 - Hospital resources

The PULSE tools having an active role in implementing the mentioned functionalities are DSVT and Logistic tool.

4.2.6.2 Discussion and questionnaires

Subsequent the declaration of a pandemic disease, national authorities require information on the availability of medical resources from health facilities and the purpose of this scene is to portray and practice respective activities such as:

- Constant up-dating of the logistic situation on all public health levels concerned,
- Reliable forecast and efficient resource management.
- Real-time communication with appropriate authorities on the management of critical medical resources.

Integrated into the course of action presented in this scene, the resulting answers to the questions formulated are captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 [7] these data are captured, collated and assessed for the sake of final validation purposes.

Below table presents the questions developed of the effectiveness criteria established for the respective use case.

Table 16: Assessment of Available Medical Resources Questionnaire

#	Effectiveness Criteria
1	Direct access to real-time resources data and status of medical facilities concerned

2	Effective and reliable forecasting of medical resources requirements
3	Direct and instant communication with national authorities on the resources situation
4	Suggestions for distribution, re-distribution and/or acquisition of medical resources and stocks
5	Continuous up-date on the logistic situation and the measures taken to control the epidemic

4.2.7 Scene 6: Declaration of phase 6

4.2.7.1 Scene description and platform role

The general context where the scene takes place is that described below.

The new virus has also led to patterns of death and illness not normally seen in influenza infections. Most of the deaths caused by the pandemic influenza have occurred among younger people, including those who were otherwise healthy. Pregnant women, younger children and people of any age with certain chronic lung diseases or other medical conditions appear to be at higher risk of more complicated or severe illness.

Many of the severe cases have been due to viral pneumonia, which is harder to treat than bacterial pneumonias usually associated with seasonal influenza and many of these patients have required intensive care. Even in the case of previously healthy people, a small percentage will develop pneumonia or acute respiratory distress syndrome (ARDS). This manifests itself as increased breathing difficulty and typically occurs 3–6 days after initial onset of flu symptoms.

Due to increased mortality, the severity of the infection in high risk groups and the increased spread of infection in Italy, the Ministry of Health calls for a meeting in order to assess the epidemic evolution and the need for new resources.

The Civil Protection issues the following recommendations to the Regional Offices:

- *Activation of “ready to start” teams of the 118, the Police and the Fire Brigade;*
- *Establishment of a Director of the health rescue, triage and Director of the transport;*
- *Activation of the “chain of health relief” with the mobilization of all the local resources provided for maxi emergencies;*
- *Activation of teams' second start / delayed start, equipped with the special equipment;*
- *Opening of PMA - Advanced Medical Post;*
- *Planned actions to increase surge capacity in order to make available additional beds and medical equipment (e.g. ventilators)*

The Lazio Regional Civil Protection:

- *Mobilizes human resources to main hospitals in order to be ready to convert selected wards in isolation wards*
- *Mobilizes camp hospitals. Tents have been sent to the main hospitals in order*



- to be set up in the same compound and expand the number of beds
- Alerts emergency vehicles (ambulance, helicopter have been pre-alerted)

This scene includes the steps defined in Use Case 7 “National Authority periodical assessment”.

Platform role

In this phase, the PULSE platform is used to perform a surge capacity evaluation in order to assess the number of additional beds and vaccines that are required to efficiently handle the actual pandemic phase.

Figure 21 shows the vaccines surge capacity where the PULSE platform automatically suggests the number of required vaccines and antivirals doses according to population (separated in child, adult and old persons) and the estimated percentage of persons affected by the influenza virus.

Influenza Event							
Lazio							
REGIONAL HOSPITAL		REGIONAL RESOURCES		BEDS SURGE CAPACITY		VACCINES SURGE CAPACITY	
Population Child 11247060		Population Adult 36329478		Population Old 13219064			
Child At Risk (%)	6	Adult At Risk (%)	14	Old At Risk (%)	40	To Be Vaccined (%)	100
				Day Of Treatments Child	10	Day Of Treatments Adult	10
				Day Of Treatments Old	10	Day Of Treatments Old	10
						Vaccines Cost	0
	POPULATION	POPULATION AT RISK	VACCINE DOSES NEEDED (2 DOSES PER PTS)	VACCINE COSTS (EURO)	ANTIVIRALS	ANTIVIRAL COSTS	
0-17 years	11247060	674824	40489	242934	6748240	6748240	
18-64 years	36329478	5086127	712058	4272348	50861270	50861270	
>=65 years	13219064	5287626	2115050	12690300	52876260	52876260	
Total	60795602	11048577	2867597	17205582	110485770	110485770	

Figure 21 - Vaccines surge capacity

Similarly to Figure 21, Figure 22 shows the beds surge capacity where in this case the evaluation is done on the estimation of the required beds according to the number of admitted persons and the percentage of occupancy rate, day average hospitalization, the number of persons (adult and child) hospitalized in intensive care units.

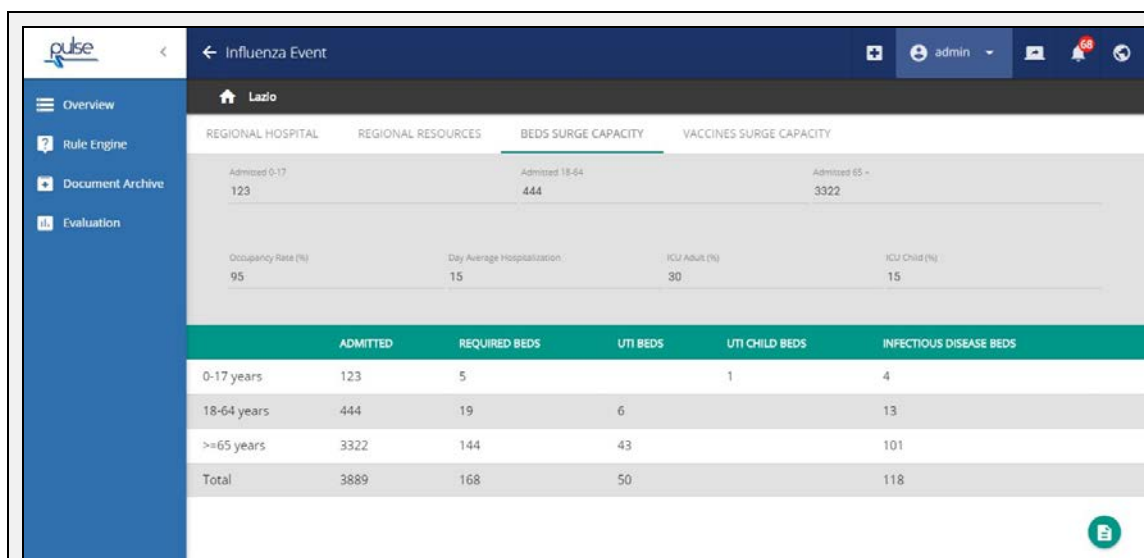


Figure 22 - Beds surge capacity

The PULSE tools having an active role in implementing the mentioned functionalities are DSVT and SCGT.

4.2.7.2 Discussion and questionnaires

Providing decision support to national authorities and to practice selected functions during a national level assessment meeting this scene is to demonstrate:

- Constant up-dating of the epidemic situation on all public health levels concerned,
- On-going medical resources overview, and
- The continual planning effort including public information policy.

Integrated into the course of action presented in this scene, the resulting answers to the questions formulated are captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes.

Below table presents the questions developed of the effectiveness criteria established for the respective use case.

Table 17: National Authority Periodic Assessment Evaluation Questions

#	Measurements of Effectiveness
1	Continuously up-dated trend on epidemic evolution and review of hospital resources
2	Instant overview of suggestions for procurements and delivery of medical resources to hospitals in risk zones

3	Survey of repeated reconsideration and redesign of plans and decisions taken
4	Provision of templates for information and communication purposes and lists of spokes persons and authorised talking points

4.2.8 Scene 7: Post crisis evaluation

4.2.8.1 Scene description and platform role

The general context where the scene takes place is that described below.

On August 1st 2017, The WHO has declared the end of the Pandemic emergency.

In the last month, no more cases have been reported in Italy and the Ministry of Health conveys a meeting to evaluate the downgrade of the response, to discuss the lesson learned and to revise and reactivate the preparedness actions.

This scene includes the steps defined in Use Case 8 “Poste emergency learning at national level”.

Platform role

In this case, the PULSE platform provides support during the post crisis evaluation phase. This support aims at simplifying the identification of past bad choices and, in such a way, it helps understanding where to intervene for addressing critical issues in future emergencies.

During the trial it has been demonstrated how the PULSE platform is able to elaborate the available historical data to calculate post crisis statistics. For example Figure 23 and Figure 24 shows the statistics related to number of persons that had been infected during the course of the crisis.



Figure 23 - Statistics

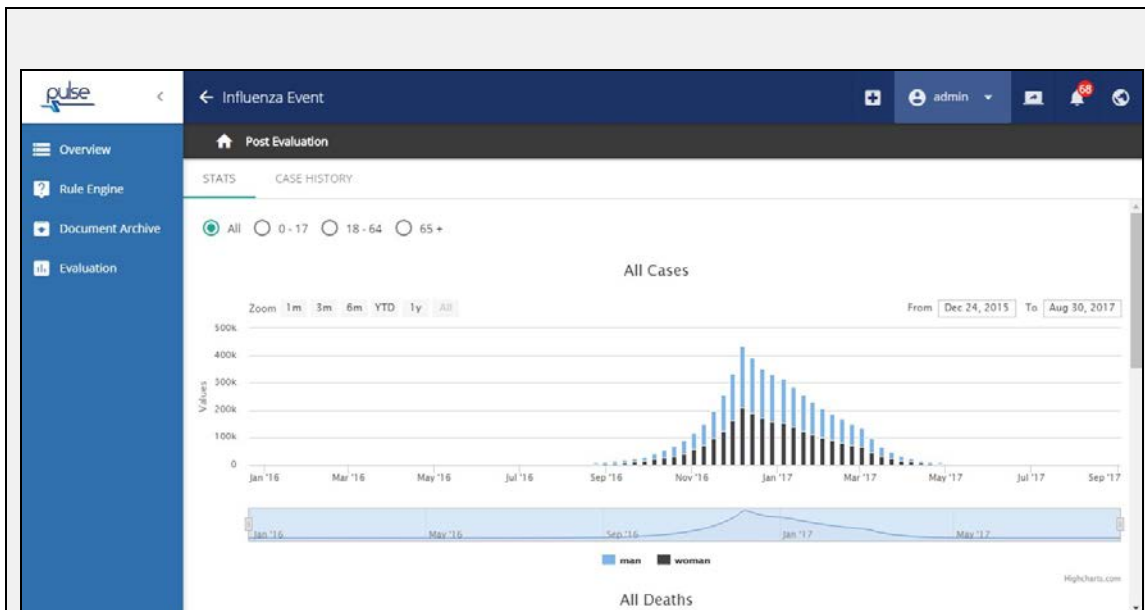
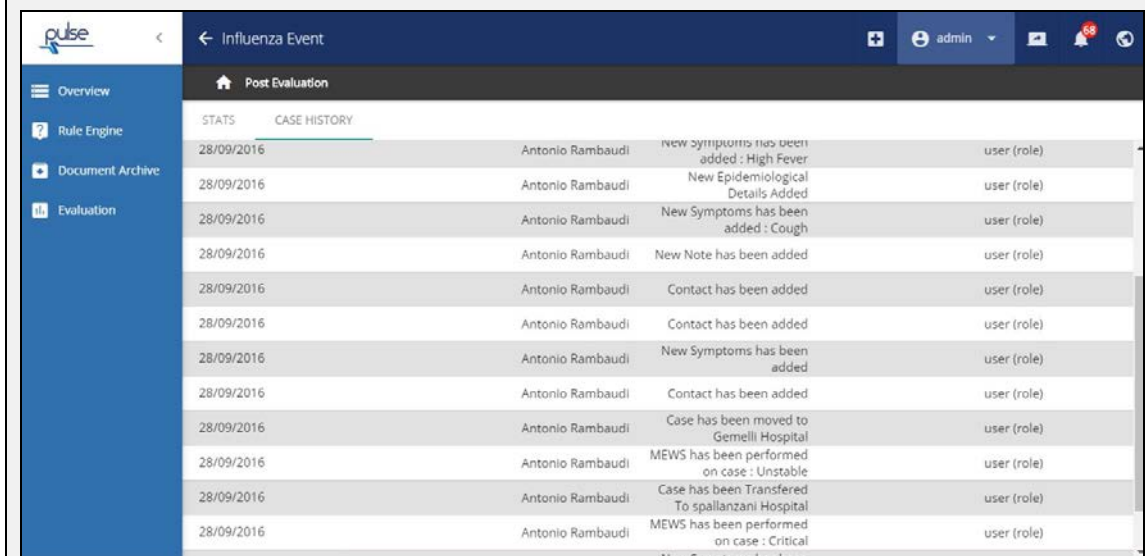


Figure 24 - Post Evaluation Stats

The PULSE platform is also able to provide a detailed report on all the updates and changes that had been performed on the monitored persons. For example Figure 25 shows all the updates done on Antonio Rambaudi, describing what has been changed and mentioning the person (and his relative role) that has done the update.



DATE	PATIENT	UPDATE	USER
28/09/2016	Antonio Rambaudi	New symptoms has been added : High Fever	user (role)
28/09/2016	Antonio Rambaudi	New Epidemiological Details Added	user (role)
28/09/2016	Antonio Rambaudi	New Symptoms has been added : Cough	user (role)
28/09/2016	Antonio Rambaudi	New Note has been added	user (role)
28/09/2016	Antonio Rambaudi	Contact has been added	user (role)
28/09/2016	Antonio Rambaudi	Contact has been added	user (role)
28/09/2016	Antonio Rambaudi	New Symptoms has been added	user (role)
28/09/2016	Antonio Rambaudi	Contact has been added	user (role)
28/09/2016	Antonio Rambaudi	Case has been moved to Gemelli Hospital	user (role)
28/09/2016	Antonio Rambaudi	MEWS has been performed on case : Unstable	user (role)
28/09/2016	Antonio Rambaudi	Case has been Transferred To spallanzani Hospital	user (role)
28/09/2016	Antonio Rambaudi	MEWS has been performed on case : Critical	user (role)

Figure 25 - Post Evaluation Case History

The PULSE tools having an active role in implementing the mentioned functionalities are DSVT and PCET.

4.2.8.2 Discussion and questionnaires

Following the downgrading of the response the purpose of this scene is to demonstrate and practice the flow of steps on how the response was conducted and to identify lesson learned.



- Establishment and access of a data log containing decisions taken and all relevant information and data generated in the course of the pandemic, and sharing it between authorised users.
- Preparation and drafting of respective reports and documents.

Integrated into the course of action presented in this scene, the resulting answers to the questions formulated are captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes.

Below table presents the questions developed of the effectiveness criteria established for the respective use case.

Table 18: Post Crisis Evaluation Questionnaire

#	Effectiveness Criteria
1	Automated generation of a data log containing disease surveillance measures, patient referral to hospitals, and medical resources data
2	Immediate access to all data related to the epidemic response
3	Considerable relief in the compilation of data and information for the purpose of producing a lessons learned report/document

4.3 Further cross-cutting evaluations

Systematically evaluating the PULSE platform during the EVD trial, the evaluation is structured into the following different aspects:

1. The evaluation of the effectiveness of the system in terms of benefits created, compared to a situation without PULSE.
2. The system performance focusing on inherent qualities, which comprises a set of criteria understood as Measures of Performance.
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.
4. Assessing the general characteristics of the PULSE trials also comprising its preparation and actual conduct.

Measuring the extent to which pre-determined objectives have been achieved the evaluation is exclusively concerned with the projected PULSE platform functionality and resulting benefits. The evaluation will not cover the behaviour of the exercise participants nor the impact of applied response standards or crisis management plans.



To facilitate the immediate on-line collection of evaluation data from all stakeholders and consortium members involved, Typeform [11] has been applied. The respective workspace screen for the EVD trial is shown below.

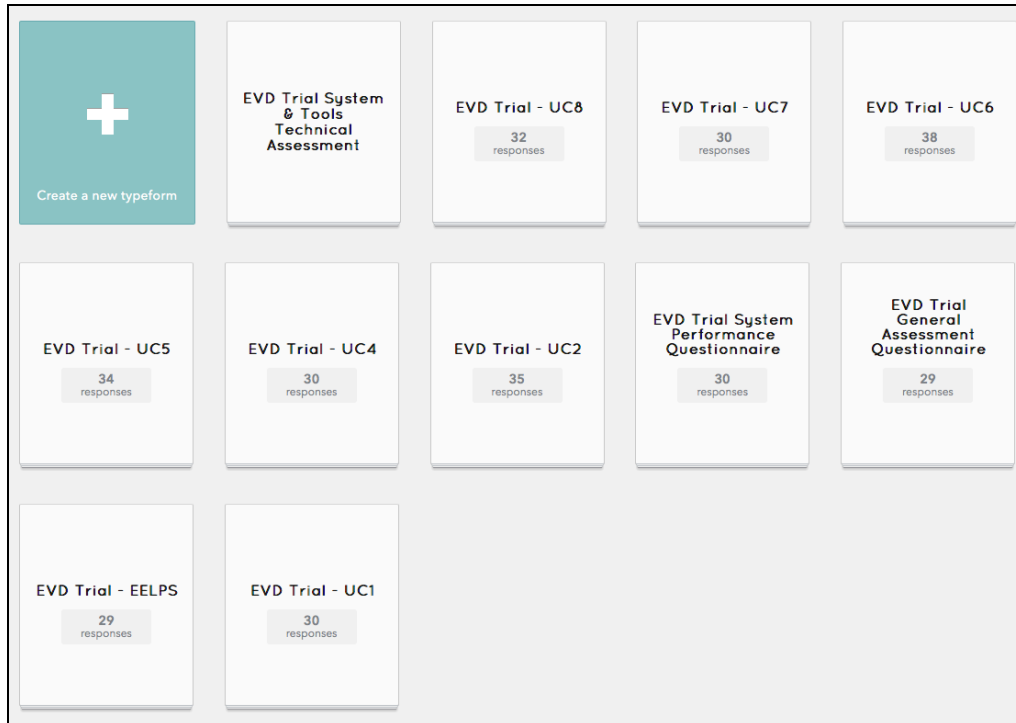


Figure 26 - Typeform Workspace

4.3.1.1 Performance

The second part of the evaluation was concerned with the inherent qualities of the PULSE platform, comprising a set of characteristics called Measures of Performance (MoP) focusing on:

- **Efficiency** - Human-computer interaction.
- **Flexibility** – Adjustable to new, different, or changing situations and requirements.
- **Dependability** - System maturity and readiness.
- **Scalability** – Smooth improvement of software and expansion of functionalities.
- **Extensibility** – Facilitating transfer to other crisis management domains & applications.
- **Usability** - Ease of learning, understanding and applying/using the system.

Evaluating the system performance across all use cases and/or scenes applied, the performance questionnaire was presented upon the conclusion of the EVD trial. The resulting answers to the questions formulated were captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes. In addition, supplementary



comments and recommendations were captured during the final discussion period.

Table 19: PULSE System Performance Evaluation Questions

#	Performance Criteria
1	Efficiency
	Timeliness and speed of the system's operation
	System's resources availability & ease of access
2	Flexibility
	System's adaptability to new or changing situations & requirements
3	Dependability
	System's development stage & readiness for operation
	Continuity of service without malfunctions or blocking errors
4	Scalability
	Ability to fit to different organisations/agencies requirements
	Ability to add new functionalities or to address new hazards
	Ability to expand from local to larger geographic environments
	Ability to manage and expand the system's resource pool
5	Extensibility
	Transferability & adaptability to other crisis management domains
	Transferability & adaptability to different national or international organisations and frameworks
6	Usability
	Time and effort necessary to learn and understand the system
	System ergonomics and ease of handling
	Provision of interactive and appropriate feedback to the user
	Ability to adopt & use the system in new operational end-user situations

4.3.1.2 General Assessment

The third part of the evaluation was concerned with the general assessment of the PULSE platform, comprising a set of evaluation criteria as shown in the table below.

Evaluating across all use cases and/or scenes applied, the assessment questionnaire was presented upon the conclusion of the EVD trial. The resulting answers to the questions formulated were captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes. In addition, supplementary



comments and recommendations were captured during the final discussion period.

Table 20: PULSE System General Assessment Questions

EVALUATION CRITERIA	
1	How do you rate the general preparation and setup of the Experiments?
1.1	Overall functionality of the PULSE trial
1.2	Transparency of the trial setup and preparation
1.3	Technical implementation
1.4	Technical presentation / run performance
1.5	Introduction/ training of the participants into the overall trial session
1.6	Description of the system application (was it clear and easily understandable?)
1.7	Clearness and appropriateness of the trial setup in respect to the PULSE's objectives
2	How do you rate the general concept of the PULSE project - the objective, rational and system approach?
2.1	Meets basic requirements (relevance)
2.2	Meets a well identified gap in healthcare planning and decision making
2.3	Is comprehensive and well targeted
2.4	Is easy to understand
2.5	Innovative character
3	Scenario: How do you rate the evaluation Scenarios and Use Cases in summary?
3.1	Adequacy to the problem
3.2	Degree of realism
3.2	Transparency of the underlying scenario
4	Expected future acceptance by user groups: How do you think the finally completed PULSE toolset will be appreciated and used by different groups?
4.1	Gov. policy decision makers
4.2	Healthcare/ responder organizations
4.3	Hospitals
4.4	Private service providers
5	Please briefly describe expected typical drivers and obstacles for future end-users to adopt and apply the PULSE system/ tools
6	<u>Special recommendations</u> Which were particularly positive/ convincing experiences/ findings from the trial?



7	<u>Special recommendations</u> What should be improved?
8	Special recommendations
	Final/ summarizing comment(s) and rating
8.1	Summary evaluation of the Exercise in total
8.2	Your satisfaction with the experiments compared to your expectations

4.4 End-user feedback & Debrief

A final debrief took place after the completion of all the scenes. All the actors and observers participating to the EVD trial had the opportunity to provide immediate feedbacks on the strength and weakness of the PULSE platform and to suggest possible improvements to facilitate the adoption of such system in a real context and scenario. Overall, the feedback was positive but further and more detailed information about the gathered feedbacks can be found in D7.3.



5 MCI Trial Preparation

5.1 Trial organization

Planning and organisation of the PULSE Mass Casualty incident (MCI) trial commenced many months in advance of the actual trial. The management and organisation of the trial was an ongoing live topic which was discussed, actioned and updated during weekly conference calls with all PULSE Partners.

In planning and organising the trial, consideration was given to several aspects including but not limited to the following:

- The aim, purpose, scope and objectives of the trial
- Background and scenario details
- Trial planning, evaluation and validation process
- Duration, date and time of trial
- Exercise organisation (Director, participants, end users)
- Roles and responsibilities of the main participants
- Rules for how the exercise is to be conducted.
- Health & Safety issues (for example action in the event of a real emergency, safety officers responsibilities, prohibited activities)
- Logistics (e.g., parking, assembly area, transportation and food)
- Security and access (e.g., identification / badges)
- Communications including all computer and related equipment
- Schedule of events (e.g. briefings and rehearsals)
- Maps and directions
- Media Management

A number of days prior to the trial, the technical teams from Skytek, Leonardo and the HSE attended at the hub centre for the trial, the Regional Co-ordination Centre at the Central Fire station in Cork City (see Figure 27) to facilitate the setup and testing of all the systems that were to be used during the trial to ensure that all were in proper working order for the trial.



Figure 27 - Regional Co-ordination Centre, Anglesea Street, Cork

A live two way video and data link was set up between the Regional Co-ordination Centre and the simulated crowd crush scene at the St Johns Ambulance Headquarters in Cork City.

Information was centralised in the Co-ordination Centre where a centre system for visualisation of information using mapping technology for a real-time operation view of the scene and overview of the casualties at the scene was set up.

Unfortunately, due to an unscheduled GAA championship match, the original planned venue for the trial, Pairc Ui Rinn in Cork had to be changed at short notice to an alternative venue, the St John Ambulance Headquarters in Cork City. Despite the late change no adverse consequences were experienced.

In advance of the trial, both the HSE and the Inter-Agency Emergency Management Office (IAEMO) were readily able to source an impressive list of highly experienced experts and end users who agreed to participate in the trial.

The MCI trial – was named exercise “Distant Rock” by the HSE as is standard practice in any trial/training exercise involving the HSE.

In order to prepare participants and observers to have a good understanding of the PULSE project and their role in the PULSE MCI crowd crush scenario, three separate on-line video briefings were prepared and uploaded to both the PULSE website and the IAEMO website. The video briefings included an introductory video explaining the PULSE project and its architecture together with a briefing of how the MCI crowd crush scenario would be conducted.

More detailed information about these video briefings can be found in section 6.1.

5.1.1 Agenda

Table 21: MCI Trial Agenda

14 th September 2016	
09:00 – 16:00	Trial Set up, preparation and rehearsal.

15 th September 2016			
Time	Event Phase	Content	Location
08.30 – 09:00 09:00 – 12:30	Pre –event	Registration Further Preparation, training.	Local Coordination Centre
Break & Refreshments for Consortium and any trainees			
PULSE Introduction			
14:00 – 14:30	Pre-Event	Use Case 1: Scoring System in the Event Medical Plan, IAT with Twitter and Other Plan Preparation Phases <i>Evaluation</i>	Local Coordination Centre
14:30 – 15:00	Incident	Use Case 3: User wishes to mobilise additional resources from Public, Private, Voluntary and Response Assets Repeat IAT with Twitter <i>Evaluation</i>	Local Coordination Centre
15:00 – 15:30	Incident	Use Case 4: Hospital Surge Capacity and Bed Management <i>Evaluation</i>	Hospital Group & Local Coordination Centre
15:30 – 16:00	Break & Refreshments		
16:30 – 19:00	Incident	Use Case 5 Triage in the Casualty Clearing Station Plus initial Casualty Bureau data input by Gardaí at site <i>Evaluation</i>	Incident Site & Local Coordination Centre & remote participants
17:00 – 19:00	Incident	Use Case 6: Input data for the RCS <i>Evaluation</i>	Local Coordination Centre Incident Site
17:30 – 18:30	Post Event	Use Case 8 : Casualty Bureau Operation <i>Evaluation</i>	Local Coordination Centre & remote participants
19:00 – 19:30	Post Event	Use Case 7 Post-Event, Post Exercise Evaluation	Local Coordination Centre
19:30 – 20:00	Feedback Session		



5.1.2 Participants

We were very fortunate that the MCI trial included some very senior and experienced professionals with a wealth of knowledge and experience in the area of major medical emergencies. This was a significant benefit to the trial both in terms of the exercise itself and the validation process. Evaluators were able to evaluate on designated functional areas of the exercise.

An Garda Síochána, the Health Service Executive and the Local Authorities are the agencies in Ireland charged with managing the response to emergency situations which arise either locally or regionally. They provide and operate Ireland's principal emergency services, which respond to emergencies on a daily basis. The Divisions and Regions of An Garda Síochána, the Health Service Executive Areas, and the principal Local Authorities are commonly referred to as the principal response agencies.

The MCI trial had participants from a range of the principle response agencies including:

- Senior Staff Officers – Local Authorities
- Assistant/ Chief Fire Officers – Local Authorities
- Consultants in Public Health Medicine – HSE
- Inspector & Superintendent level - An Garda Síochána
- Assistant Chief Ambulance Officers/Management team - National Ambulance Service
- Members of the Voluntary Emergency Services (St John, Irish Red Cross, Civil Defence and Order of Malta)
- Senior Hospital Management team members

The MCI trial was presented by an exercise Director who presented the scenario and coordinated the phases and discussion.

Two of the Consortium members acted as facilitators, describing PULSE utilisation in the trial and setting the stage of each Use Case and facilitating the discussion to keep it consistent and relevant with the Use Case.

Several consortium members acted as PULSE tutors throughout the Trial by explained the PULSE platform functionalities and by supported the exercise participants when using the PULSE system and tools.

The majority of PULSE Consortium partners were represented at the MCI trial in Cork. Participants for the MCI trial are contained in list below.

Table 22: MCI Trial Participants' list

Agency	Name and title
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Health Service Executive & National Ambulance Service	<ul style="list-style-type: none"> - Kevin O'Sullivan (<i>Operation Resource Manager, NAS</i>) - Anthony Byrne (<i>Ambulance Training Officer, HSE</i>) - Marie J McCarthy (<i>Director of Services, Cork University Hospital</i>) - Diarmuid Nolan (<i>A & E Department, Cork University Hospital</i>) - Mannix McAllister (<i>Emergency Management Office</i>) - Dr. Gerard O'Callaghan (<i>Chief Operations Officer, SSWHG</i>) - Jim Keena (<i>Emergency Management, HSE</i>)
Department of Public Health	<ul style="list-style-type: none"> - Dr Anne Sheahan (<i>Specialist in Public Health Medecine</i>)
An Garda Síochána	<ul style="list-style-type: none"> - Con Cadogan (<i>Chief Superintendent, AGS</i>) - William Dillane (<i>Chief Superintendent, AGS</i>) - Donal Ashe (<i>Inspector</i>) - Finbarr O'Sullivan (<i>Inspector</i>) - Sergeant Peter Murphy (<i>Chair of Communications & Media Liaison Sub-Group</i>) - Eammon O'Loughlin (<i>Inspector</i>) - Claire Mulligan (<i>Comms, AGS</i>) - F O'Sullivan (<i>Inspector</i>) - Donal Daly (<i>Garda</i>)
Cork County Council	<ul style="list-style-type: none"> - David Hikey (<i>Assistant Chief Fire Officer</i>)

Inter-Agency Emergency Management Office	<ul style="list-style-type: none"> - John M. Sheehan (<i>Inter Agency Emergency Management officer</i>)
Cork City Council	<ul style="list-style-type: none"> - Mr. Michael Burke (<i>Assistant Director of Services</i>) - David Spillett (<i>Assistant Chief Fire Officer</i>) - Declan O'Shea (<i>Third Officer Cork City Fire Service</i>) - Bryan Humphreys (<i>Cork City Council</i>) - Aidan O Riordan (<i>Cork City Council</i>)
Kerry County Council	<ul style="list-style-type: none"> - Charlie O'Sullivan (<i>Deputy Chief Executive, Kerry County Council</i>) - Maurice O'Connell (<i>SACFO, Kerry Fire & Rescue Service</i>) - Michael Hesson (<i>CFO Kerry County Council</i>)
Defence Forces	<ul style="list-style-type: none"> - Paddy Harkin (<i>Commander, Naval Headquarters</i>) - Laurence Egar (<i>Commandant, 1 Brigade</i>)
Order of Malta	<ul style="list-style-type: none"> - Pat Carroll (<i>Officer in Charge</i>) - Joan Mc Sweeney (<i>Order of Malta, Carrigaline</i>) - Paul Harrington (<i>Order of Malta, Carrigaline</i>) - Eoghan Harrington (<i>Order of Malta, Carrigaline</i>) - Richard Power (<i>Order of Malta, Carrigaline</i>) - Daniel Beaustang (<i>Order of Malta, Carrigaline</i>) - Beth Anne (<i>Order of Malta, Carrigaline</i>)

Irish Red Cross	<ul style="list-style-type: none"> - Jonathon Madden (<i>Unit Officer</i>) - David O'Donoghue (<i>EMT</i>)
Romania	<ul style="list-style-type: none"> - Corneliu Grigore (<i>Major General - Former Undersecretary of State – First Deputy Director of the Romanian Special Telecommunications Service, Architect and Manager of the Romanian 112 Service (EU Emergency Call System)</i>)
Cork City Civil Defence	<ul style="list-style-type: none"> - Veronica Forde - Aoife Keohane - Rory Conlon
PULSE EU Consortium Members	<ul style="list-style-type: none"> - Francesco Malmignati (<i>Facilitator, FINM</i>) - Paul Kiernan (<i>Facilitator, CTO, Skytek</i>) - Antonio Di Novi (<i>Tech Staff, FINM</i>) - Viorel Petcu (<i>Facilitator, ONEST</i>) - Shane Maloney (<i>Tech Staff, Skytek</i>) - Massimiliano Taglieri (<i>Tech Staff, FINM</i>) - Shane Carty (<i>Tech Staff, Skytek</i>) - Jacinta Bourke (<i>Project Coordinator, Skytek</i>) - Julieanne O Connor (<i>Support Staff, Skytek</i>) - Sabina Magalini (<i>Facilitator, UCSC</i>) - Daniele Gui (<i>Facilitator, UCSC</i>) - Peter Daly (<i>Exercise Director, Consultant European Projects</i>) - Cian O'Brien (<i>Researcher, Emergency Management</i>)



5.2 Technical setup

The technical setup within the MCI trial in Cork can be divided up into the following major subcategories, each of which required separate setup and configuration.

1. MPORG training centre
2. Social Media web application tool
3. Main PULSE central server for C&C Centre
4. Smartphone app showing the data entry system for triage deployed and used at the major incident site.

5.2.1 MPORG Technical Setup

The MPORG system is a web accessible application which is shared and executed in parallel by multiple trainees all of which are accessing the training course, making decisions and seeing in real time the response of other users and the decisions they have taken within a common scenario. In advance of the MCI trial the training scenario was created, the key elements covered in the scenario creation were:

- Real locations of hospitals as used in the MCI trial in Cork.
- Capabilities of identified hospitals.
- Ambulance and resources definitions for trial
- Definition of a range of injury categories as would be expected in a stadium crush scenario.
- Definition of 200 casualties for usage in the MPORG scenario.
- Creation of MPORG map with location of major incident reflecting scenario for the trial.
- Five MPORG trainee accounts for usage during the training sessions.

The MPORG system server with the trial scenario was implemented and deployed at the URL:

- <http://mporg.skytek.com/mporg>.

Upon login it provided the interface for the end user as shown in Figure 28 and Figure 29.

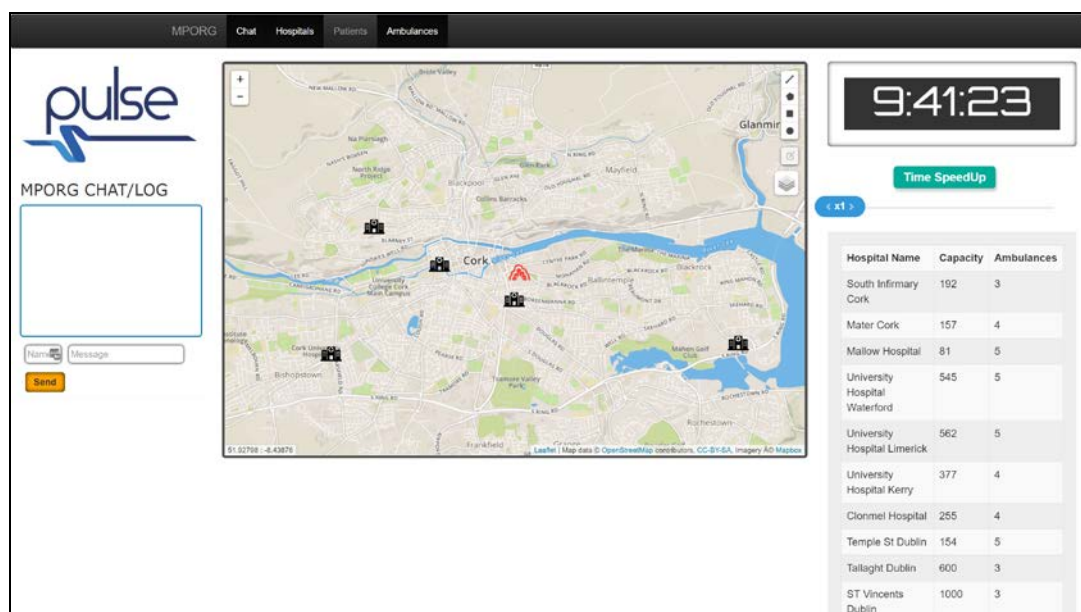


Figure 28 - MPORG with hospital setup

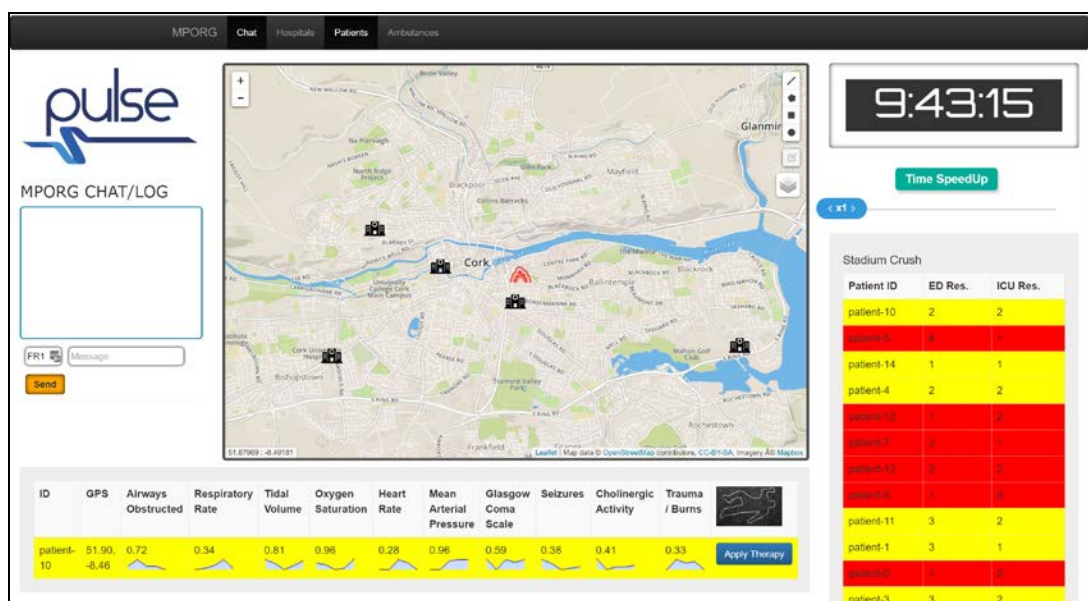


Figure 29 - MPORG with multiple casualty setup

Within the MCI C&C centre a separate MPORG training room was configured in which the training sessions were held. The training room consisted of four workstations each of which used a Wi-Fi connection to enable internet access. Each workstation had a Chrome browser configured to automatically connect to the MPORG URL and login as one of the preconfigured trainee end users. During training all logs of user decisions were captured and stored on the central MPORG server.

5.2.2 Social Media web application tool

The social media tool was deployed as a web based application for access by the attendees of the MCI trial through the persons own mobile device and/or laptop which



they brought to the C&C centre while attending the trial.

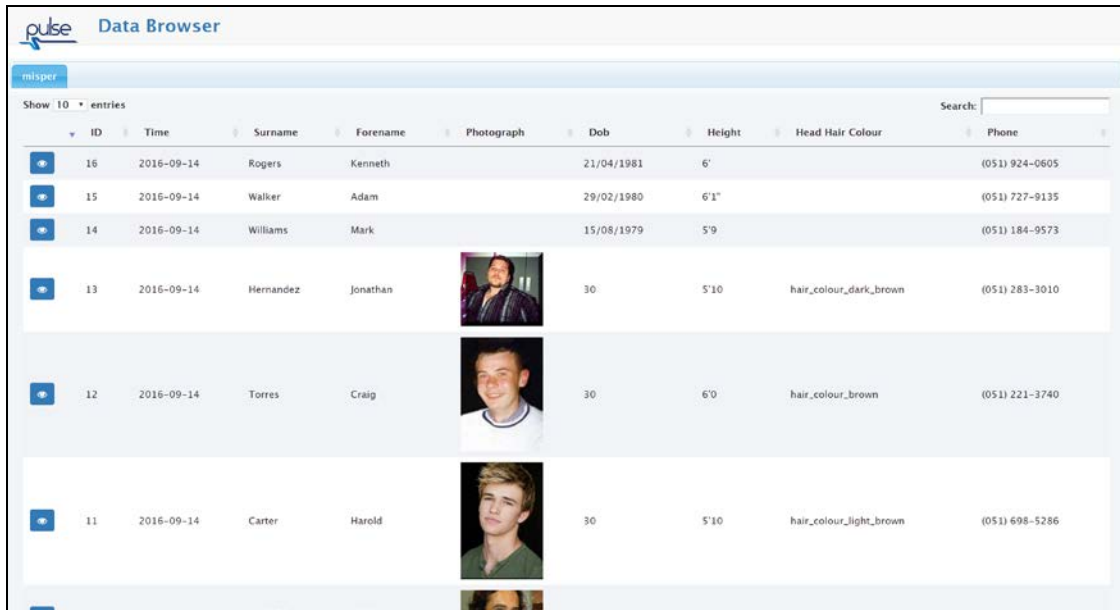
The two main URL's for access to the social media tool are:

- <http://mporg.skytek.com/webforms/missingperson.html>
- <http://mporg.skytek.com/webforms/databrowser.html>

The above URL's provide access to firstly the entry form for the social media missing persons form (see Figure 30). The second URL is for access to the Data Browser showing a summary of entered results and allows filtering of results for viewing (see Figure 31). These URL's were distributed to attendees during the trial for persons to enter sample data and to view in real time the entered results. Person attending the event were given a dedicated Wi-Fi connection point, so they could connect their personnel devices and access the social media URL's for both entries of information and review.

The screenshot shows a web form titled 'Missing Persons Form (MISPER)' with the 'pulse' logo in the top left. The form is organized into several sections. The first section contains fields for 'Surname', 'Forename', and 'Date of Birth (or approximate age)', along with a 'Sex' section with radio buttons for 'Male' and 'Female'. The second section includes 'Maiden/Other Name', 'Nationality', and 'Height'. The third section is a large text area for 'Current Address (and home address if different)'. The fourth section has 'Telephone Contact No.', 'English Understood?' with 'Yes' and 'No' radio buttons, and a field for '(if no, please state native language)'. The fifth section is 'Ethnic Appearance' with radio buttons for 'White European', 'Dark European', 'Afro-Caribbean', 'Asian', 'Oriental', 'Arab', and 'Unknown'. The sixth section is 'Believed to be with' followed by a large text area. At the bottom, there is a checkbox for 'Additional MISPER form(s) completed' and a section for 'Vehicle Details'.

Figure 30 - Social Media MISPER form






ID	Time	Surname	Forename	Photograph	Dob	Height	Head Hair Colour	Phone
16	2016-09-14	Rogers	Kenneth		21/04/1981	6'		(051) 924-0605
15	2016-09-14	Walker	Adam		29/02/1980	6'1"		(051) 727-9135
14	2016-09-14	Williams	Mark		15/08/1979	5'9		(051) 184-9573
13	2016-09-14	Hernandez	Jonathan		30	5'10	hair_colour_dark_brown	(051) 283-3010
12	2016-09-14	Torres	Craig		30	6'0	hair_colour_brown	(051) 221-3740
11	2016-09-14	Carter	Harold		30	5'10	hair_colour_light_brown	(051) 698-5286

Figure 31 - Viewing of entered social data

5.2.3 Main PULSE central server

The main PULSE server application from which the central C&C suite of tools were deployed and demonstrated during the MCI trial were available from the URL:

- <http://mci.pulse-fp7.com:93/>

In configuration of the central server for the MCI trial the following configuration was deployed.

- Remote setup of PULSE suite of tools on server accessible through the URL mci.pulse-fp7.com
- Fixed LAN connection of local workstation displaying PULSE C&C system within the trial C&C centre. The fixed LAN network was used to make available the Wi-Fi link to end users and to avoid congestion of the Wi-Fi network slowing down the running and display of the main PULSE central service.
- Connection of LAN to Internet through the HSE network. Firewall rules configured to allow remote access to MCI site and access to port 93.
- Configuration of Chrome browser for display of PULSE system.
- Installation and configuration of Skype browser for display of remote trial site to end users.
- Attachment of display card supporting 4 HDMI devices, allowing display of the system on 4 connected HD 42" screens deployed to the side of the C&C room.

Figure 32 and Figure 33 illustrate the main GUI provided by the PULSE platform that has been shown during the MCI trial.



Figure 32 - DSVT deployed in trial C&C Centre

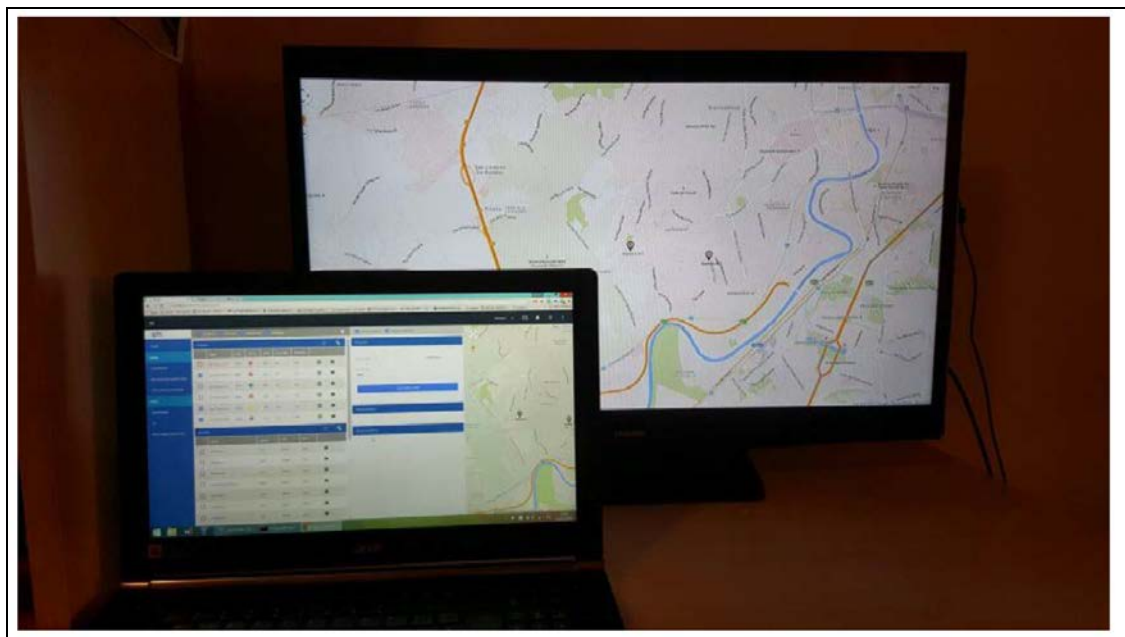


Figure 33 - Screen sharing feature of DSVT

5.2.4 Smartphone app

The Smartphone App allows approved volunteers to log into the PULSE system and use the advanced hardware features of the phone to collect and submit data. The smart phone application was deployed and preinstalled on a number of mobile devices which were given to first responders for the duration of the trial. The mobile devices offered the following means of connection to the central MCI PULSE server on which the data captured from the mobile apps was sent to and stored.

- 3G/4G



- Wi-Fi

The URL to which the mobile apps communicated during the trial for the storage of triage data was:

➤ <http://mci.pulse-fp7.com:93/>

The categories of data that were transmitted to the above URL for storage were:

- Voice (Audio recordings of notes)
- Text (notes from first responders),
- Images of Triage patients,
- Triage level

These categories can be easily detected on the Smartphone app main display shown in Figure 34.

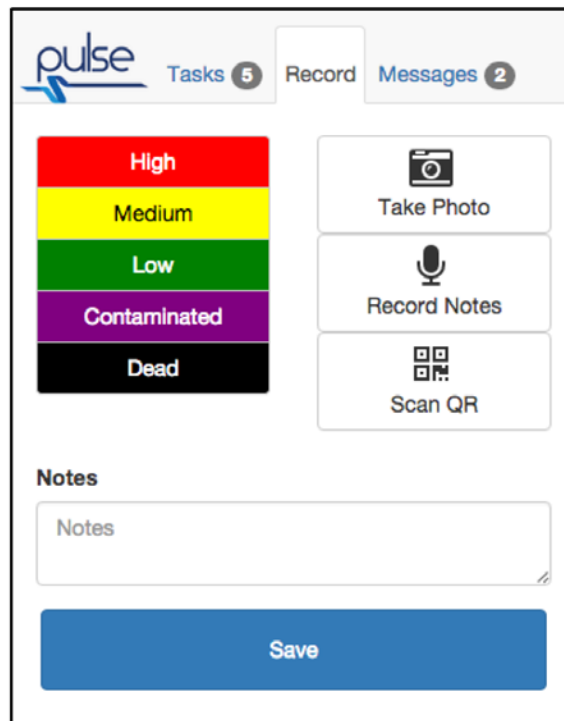


Figure 34 - Smartphone app display

The selected mobile hardware on which the mobile apps were deployed for the MCI trial were:

- 4 units of the Vodafone Smart Ultra 6 with a 5.5" display and 1080x1920 pixel resolution (see Figure 35).
- 2 units of an iPad Pro with a 9.7" display 2048x1536 pixel resolution.



Figure 35 - Vodafone Smart Ultra 6 used during MCI trial

At the Incident Scene trial location both mobile 3G/4G connectivity and Wi-Fi were configured and available for usage by the mobile devices for real time data transmission of triage casualties status and information.



6 Execution and activities during MCI trial

6.1 Introduction briefings

In order to prepare participants and observers to have a good understanding of the PULSE project and their role in the PULSE MCI crowd crush scenario, three separate on-line video briefings were prepared and uploaded to both the PULSE website and the IAEMO website. The video briefings included an introductory video explaining the PULSE project and its architecture together with a briefing of how the MCI crowd crush scenario would be conducted.

The text of each video is outlined in the following sections.

6.1.1 Video 1 – What is the EU project PULSE?

PULSE is a European research funded project that defines, develops and validates a set of decision support tools to improve preparedness and response of European Health services involved in emergency situations.

What is the EU project PULSE? The name PULSE was created as follows: The P in Pulse stands from Platform, the U comes from European, the L is the L in medical, the S is the first letter in the word Support and the final letter E is the first letter of the word Emergencies.

The project is driven by the 7th Framework Programme.

The development of decision support tools for improving preparedness and response of health services involved in emergency situations.

The PULSE project is coordinated by Skytek Limited from Dublin, Ireland. The PULSE consortium is comprised of seven partners from five European countries including Ireland, The UK, Germany, Italy and Romania.

The Romanian partner is Onest Solutions. The Italian partner are SELEX, now Leonardo and UCSC the Università Cattolica del Sacro Cuore at Gemelli in Rome. The German partner is the Centre for European Security Strategies, CESS. The UK partner is Trilateral Research Limited. The other Irish partner besides Skytek is the Cork based Inter-Agency Office for Emergency Management.

More details of each partner can be found on the PULSE website.

6.1.2 Video 2 – The PULSE Architecture

“Understanding the PULSE Platform structure is the key to understanding PULSE.

PULSE can be viewed as a system with inputs and outputs. Data is inputted into the PULSE platform and outputs are generated by the system and presented to the user.

The main outputs of the PULSE are:

- Models, and more about these later*
- Tools, these will be considered in detail*
- The third output is what are termed the SOP areas, such as logistics and stock piling, coordination and training and exercising. And again we will consider*



some of these in greater detail later.

It is important to understand that the PULSE platform is an integrated set and not discrete and stand-alone. The architecture of the PULSE platform is composed of several software modules distributed on a service based architecture.

The most obvious is what the users see, the PULSE presentation layer on which the various modules reside. However, beneath the presentation layer is the clever part of PULSE, which is the PULSE Smart layer, this is what is going on in the background. Beside the input that the user has in the PULSE presentation layer, there are other inputs to the PULSE Smart layer which can be captured from external sources such as social media. The social media tool with its complex event processing engine is a part of the IAT, the Intelligence Analysis tool, which is able to combine the incoming data streams. These feed into the DSVT, the Decision Support Validation Tool. A signal is thus delivered to the DSVT and is visualised on a GUI and allows the user to classify it as relevant or not relevant.

Other input sources beside hospital data and social media include news or blog news and whatever other data is selected for input. In this demo only tweets and clinical records are demonstrated. But for news it just needs to be hooked into a news feed forum or a similar source.

So to summarise there is the presentation layer for the users, the Smart layer which is the core of the PULSE System and the external sources which feed data directly into Pulse when they have been set up by the users and operate without any further input from the users.

The core of the PULSE platform is the DSVT. The DSVT or the Decision Support Validation Tool provides an innovative approach to accessing timely, key data, planning and decisions, categorising and visualising the information obtained during the emergency and automatically creating personalised suggestions to efficiently manage a major healthcare emergency.

The DSVT has a user interface, a recommendation tool and a rule engine. The PCET is the Post Crisis Evaluation Tool. The IAT and the PCET are linked to each other.

PCET, the Post Crisis Evaluation Tool provides integrated features that simplify the identification of past less optimal choices and in such a way it helps to understand where to intervene in addressing critical issues in future emergencies.

The simulation tool includes the SGCT, Surge Generation Capacity Tool, and the ENSIR models. The SGCT or the Surge Generation Capacity Tool is able to suggest the amount of resources that should be made available to efficiently manage the emergency situation.

The ENSIR tool is one of the modelling tools which compute the expected time evolution of the geographical spread of a biological event.

The models developed in PULSE are central to its key features as a decision support tool. They include:

- Patient model*
- Health care effect model*
- Health care facilities model*
- Scenario generation*

The MPORG allows the building of a game and virtual reality training backroom. The PULSE EMPORG is a web based virtual reality training environment where users play the role of an emergency coordinator reacting to an event. Using a multi-player online



role playing game engine a team of users can coordinate in real time resources, causalities, ambulances and hospitals. Each with their own specialities and unique situation. Each player can also experience the challenges facing another colleague's role thereby improving mutual understanding, cooperation and decision making.

The Logistic Tool manages emergency information enabling the storage and retrieval of all information on the status of the crisis resources. The tool also provides an innovative functionality to calculate the optimal dispatch of the causalities to available surrounding hospitals.

The PULSE smartphone app is deployable across all mobile platforms and the intention is that users will download the app from an app store, as with any app, but it will be password protected.

The smartphone app has a number of applications (e.g. the mobilisation of emergency medical service EMS personnel in a two-way communication pathway). The EMS personnel both own employees and voluntary emergency services VES personnel can be pulled for availability and then assigned tasking for a command and control centre.

The same smart phone app can be used by EMS personnel to report the triage status of their patients and photographs of them can be attached to the reports including that of the QR code of the triage card of each patient.

The app also transmits back to the DSVT the geo location of each patient each time a triage message is updated. If a connection is not available, the app works in an offline mode where info is stored locally until a network connection is available.

Complementing the smartphone app is the Casualty Bureau web app. This app can be used by any user over the internet to post information of disaster victim identification data collection purposes. This facilitates the rapid set up of a Casualty Bureau collection process.

Understanding the PULSE platform structure is the key to understanding PULSE. We hope that PULSE substantially improves the preparedness and response capabilities of the health services involved in major emergency situations, mitigating the loss of life and raising the survival rates among mass causalities”.

6.1.3 Video 3 – Exercise “Distant Rock”: the PULSE MCI crowd crush exercise – How the exercise will be conducted

“Welcome to a briefing on how this exercise for the PULSE project will be conducted. This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement number 607799.

The PULSE project is concerned with the development of decision support tools for improving preparedness and response of health services involved in emergency situations. A more detailed technological explanation is available in the download section of the PULSE website. The exercise places emphasis on the health response but it can be easily understood that the same platform can also be applied in fire and rescue and in police response.

This exercise has been given the name ‘Distant Rock’ and is based on a mass casualty incident or MCI. The aim of the exercise is a threefold demonstration of the PULSE toolset; do the tools work as described? Validation of the PULSE toolset; do the tools contribute to the response? And also exercising of the participants in



response to a crowd crush incident and some of the issues that might be involved.

The scenario is a mass casualty incident caused by a crowd crush at a concert featuring a pop group called UC43 and a crowd of 80000 fans. The location is Pulse Park which is a generic stadium.

As the evening closes in the UC43 concert gets underway but trouble breaks out at the event which leads to a disaster with significant casualties

A special appeal: Please do not fight the scenario. Unlike a normal emergency management exercise this scenario is not intended to be coherent and fully credible. It is just a backdrop to the use of the tools and to allow them to hang together and participants are not expected to solve the emergency management questions. The scenario is just so that the PULSE platform can be demonstrated for a crowd crush, an MCI or mass causality incident.

The crowd crush scenario has a number of focus points (see Figure 36). The intention is to provide an exercise style environment based on the scenario. This is to allow all participants and observers to be in a familiar situation and in a conventional exercise participation stance for view point. The agreed scenario will run right through the exercise, from exercise start to exercise end.

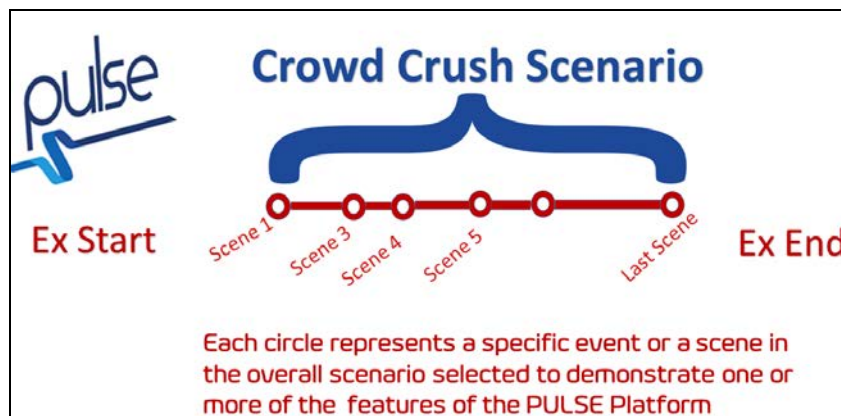


Figure 36 - Crowd Crush Scenario

Each circle also represents a specific use case whereby a requirement is set out. The exercise will run through each use case and apply the appropriate tools from the PULSE platform to that use case.

There are eight use cases and seven will be addressed in the exercise. Use case one is the scoring of an event to establish parameters for an event specific medical plan. Use case four is concerned with managing surge capacity in a hospital and how that might influence bed capacity. Use case number eight is the requirement of gathering data for the operation of a casualty Bureau and this solution will be demonstration validation and comment.

When you log into PULSE this is what the PULSE dashboard will look like (see Figure 37). You can see in this diagram how all the systems link together and how the decision support and validation tool or DSVT are the heart of an integrated system.

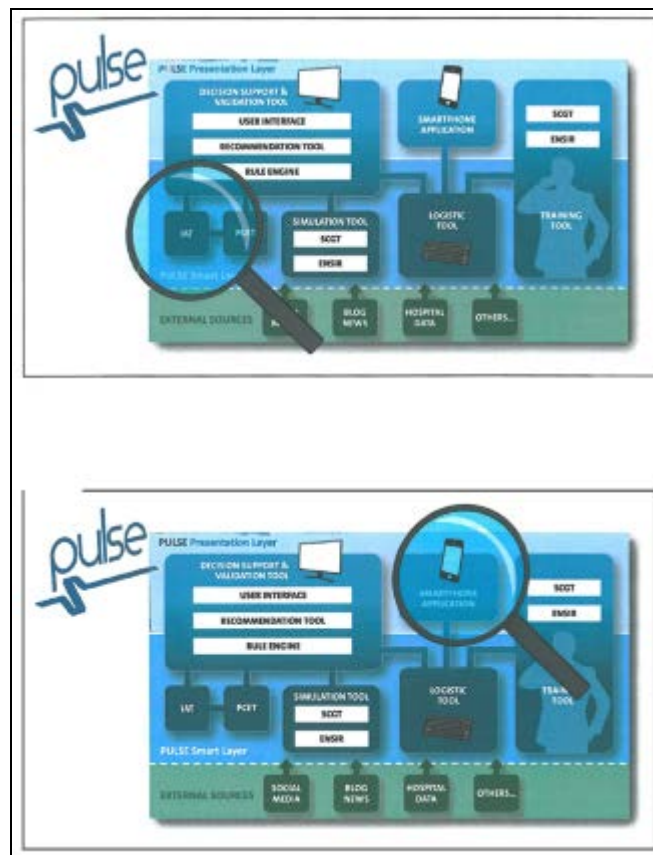


Figure 37 - PULSE Architecture

A casualty bureau supporting tool will be demonstrated as one of the final use cases to show how an online web app can be employed to gather data. Various tools from the PULSE platform will be demonstrated on their own and also together. This diagram shows how they might link to each other but each can also be viewed as running through the overall scenario.

We will focus on an example of the Casualty Bureau application; we will focus on it as the second last use case. It is important to note that it has been running right throughout the exercise but we are going to focus on it only at this second last stage. Taking a closer look at the casualty bureau web app we can see that the data as outlined by Interpol can be entered on the line for processing and collation.

The web app can be used by any user over the internet to post information for data victim identification or DVI data collection purposes.

Moving onto validation and to try to answer the question do the tools contribute to the response. That is done by asking the participants for their feedback on the PULSE platform. Feedback will be gathered by using an online feedback process. Taking the example of use case number 7 participants will be asked specific questions on that use case. Participants will be asked to answer each question based on a score between 0 and 5 or to enter not applicable if the question does not apply. This will all be done online, please note that there is also a free text area on the online form for general comments and feedback.

One of the features of the PULSE platform will be triage display with information fed from a smart phone app. The PULSE smartphone app is deployable across all platforms and the intention is that users will download the app from the app store, both android and apple, as with any app but the app will be password protected.



The app will feedback the triage status including the QR code of the triage card of each patient and the feedback can also include a photograph. This app will be demonstrated in the exercise in use case number five. Use case number five is related to triage reports from the scene of the incident and from the casualty clearing station.

The sequence of this mass casualty exercise will follow a well-established process. exercise injects will be used to set the scene for each of the use cases, then a specific aspect of the PULSE platform will be demonstrated and participants will have the chance to practice with that aspect of the PULSE platform. At the next stage participants will be asked for their feedback on what has just been demonstrated for the use of that specific tool or tools. The exercise will progress through each of the seven use cases one after the other, scene by scene and the appropriate part of the PULSE platform will be applied to ascertain if it improves the response at each step or focus point in the scenario.

It is important to remember that it is the PULSE platform that is being exercised and not the scenario and not the participants.

Thank you for your attention and please visit the PULSE project website now on your screen”.

The decision to utilise online video briefings proved extremely useful as many of the participants and observers advised that they had viewed the video briefings in advance of the trial, some on several occasions. This resulted in many of the participants having a proper understanding of the central aim of the exercise and being extremely well prepared in advance of the trial.

6.2 Trial execution

The stadium crush scenario was one of two scenarios selected to support the delivery of the PULSE prototype and help to build the “first frame” of the evolution of the synthetic simulated environment, on which the PULSE platform would eventually be evaluated by means of a mass casualty incident (MCI) trial.

The stadium crush scenario was selected as a representative scenario which would lead to a MCI but would also cover specific crowd crush type incidents with dozens of casualties similar to other mass casualty events which have occurred in soccer stadiums throughout Europe.

The scenario was designed to focus on various stages of a crowd crush incident: (1) pre-incident phase, (2) incident phase and (3) post-incident phase. This required that the actors involved in the response were expected to begin working collaboratively to monitor and establish preventive measures, and be ready for emergency response if an incident occurred in a stadium.

The aim of exercise was to demonstrate, test and evaluate the PULSE Platform in the context of a stadium crush scenario. In the scenario development process it was decided, on the basis of careful analysis, that it was more effective to carry out the demonstration and testing process at two levels:

- Level 1 – Demonstrate the capability of the platform feature or the tool being reviewed
- Level 2 – Demonstrate both the capability and the integration of the platform feature of the tool as the exercise progressed through each of the Use Cases.



The MCI trial run through numerous focus points, designed to cover all key use cases, all PULSE tools and all actions of the Stadium Event Medical Plan. The sequence of the focus points and the relationship between the pre-incident phase, incident phase and post incident phase and all associated use cases are detailed in Table 23 below.

Table 23: MCI Trial sequence of the focal points

Use Case		Stadium Crush		
		Pre-Incident Phase	Incident Phase	Post Incident Phase
1.	Scoring System in the Event Medical and Other Plan Preparation Phase	X		
2.	MPORG	X		
3.	User wishes to mobilise additional resources from Public, Private, Voluntary and Response Assets from other member states		X	
4.	Hospital Surge Capacity and Bed Management		X	
5.	Triage in Casualty Clearing Station		X	
6.	Input critical data for the RCS on Site and from other relevant off-site sources		X	
7.	Post-Event, Post Exercise Evaluation Tool to identify lessons to be learned.			X
8.	Casualty Bureau Operation			X

Two of the crowd crush use cases were demonstrated before the incident during the 'pre-event phase', UC 01 and UC 02, UC03 – UC06 were demonstrated during the incident at the 'incident phase', while UC07 and UC 08 were demonstrated at the 'post-incident phase'. Although only a minority of the PULSE platform is aimed at prevention with the majority of the tools being aimed towards the response and post incident analysis, prevention was considered as important.

The MPORG MCI UC 2 was validated in a separate session, before the MCI Trial day, with end-users who also participated to the MCI Trial.

Those who participated in the demonstration and test were very familiar with the traditional exercises used for testing and training for major emergencies.

End-users at every level of responsibility are familiar with exercises both within individual organisations or on an Inter-Agency basis or at member-state level.

Such experienced participants would expect good well stated objectives:

- That will be clear, concise and focus on the participant's performance of tasks;
- That will describe actions that can be observed;
- That will state the conditions under which the actions are to be performed by

the participants;

- That will state to what standard or level the actions will be performed.

The main aim and objective of this exercise were different in context to that of the planning and staging required for regular HSE/IAEMO exercises. Nevertheless, to reduce the impact of the requirements for demonstration and testing on the end-user participants it was necessary to provide them with a familiar exercise experience while at the same time focusing on the specifics of the PULSE platform. As already shown in Figure 36, the exercise was designed as a multi-layer scenario with key focus points.

The intention of this format was to provide a full “exercise-style” environment based on each phase of the scenario. This allowed all participants, the PULSE team, and the observers to be in a familiar situation and in a conventional exercise participation stance or viewpoint.

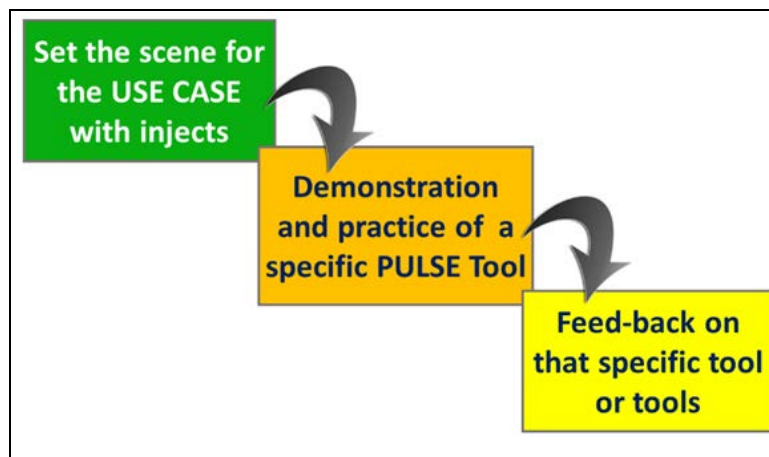


Figure 38 - Process followed during the demonstration and evaluation

Each use case was conducted using the system illustrated in Figure 38:

- Injects to set the scene
- Demonstration of a specific tool or feature of the PULSE platform
- Practice by the participants in using that specific tool or feature of the PULSE platform
- On-line feedback by the participants and observers

Injects were provided to all participants and observers who were also afforded an opportunity to see a demonstration of the PULSE Platform feature or tool. Each participant also had an opportunity to practice with the PULSE Platform feature or tool relevant to the scene.

Both the participants and the observers had the opportunity to provide feedback to the PULSE team via on-line feedback forms.

6.2.1 Audio-Visual Injects

A TV News developing storyline was used as the primary exercise inject throughout the exercise. These injects met a number of objectives:

- **Initiating Inject** – designed to kick off the exercise
- **Informational Inject** – provide information to the participants and observers



- **Instructional Inject** – to give specific direction to participants
- **Energising Inject** - a long exercise needs to be re-energised from time to time to get the cooperation of the participants
- **Re-focusing Inject** – moving from one scene to the next needs to re-focus participants on the task in hand

The audio visual injects were created as coming from a 24 hour News Channel which was named PULSE TV NEWS (see Figure 39) in order to avoid any issues with existing TV NEWS channels.



Figure 39 - PULSE TV NEWS Channel

Each audio visual inject was built on the previous inject and was linked with a live feed coming from the incident site.

There was a live two way video and data link between the Regional Co-ordination Centre (see Figure 40) and the simulated crowd crush. Personnel and ambulances from the National Ambulance Service, the Red Cross, Civil Defence, the St John's Ambulance Brigade and the Order of Malta were used in the trial.



Figure 40 - C&C centre

6.2.2 Moulage and data

An extensive system of moulage was used to simulate the casualties (see Figure 41 and Figure 42 for some examples) and this was supplemented by the use of a 200 person database which was used to demonstrate the capability of the PULSE platform to handle a high number of casualty reports in near real time.



Figure 41 - Examples of moulage



Figure 42 - Example of moulage

A fresh 200 person database was created to avoid data protection issues with real people but it included all data required by the electronic patient record system (ePCR) and by the Interpol Disaster Victim Identification System (DVI).

In order to facilitate the operation of the Smart Phone App as a data entry tool to the Pulse Platform, an individual QR code (abbreviated from Quick Response Code) was used. This is a machine-readable optical label that contains information about the item to which it is attached. The QR code was the associated with the data from the exercise casualty data base.

The participants were drawn from experienced practitioners in the HSE who would be very familiar with a different exercise aim whereby they themselves were being exercised and critiqued. In this case it is the PULSE Platform that was the subject of the exercise. It was critical that they understood the difference.

Although it was clear that PULSE was aimed and demonstrated against a medical or casualty scenario it was necessary to ensure that the other emergency services such as the Police and Fire and Rescue were in a position to appreciate how the Pulse Platform could be applied in all types of emergencies.

6.2.3 Scenario description

As described in Table 24, the MCI Trial was composed of 8 different Use Cases that will be further detailed in the following sections (from 6.2.4 to 6.2.11).

Table 24: MCI Trial Use Cases

When used	Use Case	Description	Participants
Pre-Event	UC-01	Scoring of an event to establish parameters for an event specific medical plan	1. Event Coordinator 2. Regional Authority
	UC-02	MPORG	Not part of this exercise
During Event	UC-03	User wishes to mobilise and coordinate	1. Resource Providers 2. Regional

		resources	Authority
	UC-04	Hospital Surge Capacity Bed Management	1. Regional Ambulance Dispatch or Control 2. Hospital Bed Managers 3. On-site Co-ordinators
	UC-05	Triage in Casualty Clearing Station (CCS) and link to PULSE proposal on ePCR	1. CCS Officer 2. Triage Officer
	UC-06	Input critical data for Recognised Current Situation	1. On-site Co-ordinators 2. Regional Authority
Post-Event	UC-07	Post-Event and Post-Exercise evaluation	1. Emergency Management 2. Regional Authority
	UC-08	Casualty Bureau Operation	1. Police 2. Civil Protection 3. Interpol FASTID (Fast and Efficient International Disaster Victim Identification)

6.2.4 Use Case 1

The scene was set by the use of an audit visual aid in the form of a News Bulletin. Zita is the News presenter.

TV News presenter Zita: "And now just before the weather forecast, an item of particular interest to UC43 fans. UC43 are to play Pulse Park on 15th, 16th and 17th of September.

Never far from controversy UC43 failed to get permission for the 5 sell out nights they were hoping for. Event promoters Tik Sale, in a statement said they knew that fans would be disappointed but it was an issue for the regional authorities that had refused permission for the five nights granting just a three concert licence. Tick Sale urged fans to contact info@tiksale.eu if they experience any difficulties in obtaining tickets.

Officials at PULSE Park today released a seating plan for the concerts, and said that they would transform Pulse Park with a new layout that would bring the performers



much closer to the fans. They said that they were working closely with The Gardai, the local authorities, Tik Sales Ltd and the emergency medical services to produce a comprehensive plan for Pulse Park concert.

The Gardai stated that although UC43 fans had a reputation for trouble this now was probably undeserved as now both the group and the fans were older and more mature. However, they say they will continue to monitor the event over the coming days and weeks. Although we cannot forecast what the weather will be like in a months' time at Pulse Park we can find out now what to expect over the next few days. Over to Met Éireann for the latest weather forecast"

Table 25: MCI Use Case 1

When Used	Use Case	Description	Participants
Pre-Event	UC-01	Scoring of an event to establish parameters for an event specific medical plan	3. Event Coordinator 4. Regional Authority

As described in Table 25, MCI Use Case 1 involves a scoring system for the creation of Event Medical and other Plans in the Preparation Phase.

Crowd Event planning requires that 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 likely risk of a specific event.

The Event Medical Co-ordinator is the person with the task of overall control and coordination of medical/first-aid provision at the event. They are the agent of the organisers and the point of contact between the Regional Authority and the event organisers in relation to the event medical plan.

The Regional Authority is the official organisation who grant permission for the crowd event, or who are required to make preparations for the events or which will be responsible for co-ordination of any emergency response.

The Basic Path or flow of the use case is that the Crowd Event organiser logs onto the PULSE Platform and begins to enter data about the proposed events following under a series of headings. These headings or fields cover such data as the type and location of the event, the numbers likely to attend, the nature of the event, and the type of crowd expected, police opinion of the likely behaviour of those attending and the like. A score is awarded and through an algorithm generates an overall score and suggests both to the event organisers and the regional authority a minimum level of medical resources required for such an event. This is based on the information known at the time that the tools are run. In this scenario the same tool was run in a simulated time frame of about one month before the event and again as a further demonstration in Use Case 2 on the "morning on the PULSE concert".

The data needed and associated resources required were provided to the participants by way of a paper inject to prompt their entries but each participant was allowed to score the event based on their own experience of similar events in the past.



6.2.5 Use Case 2

The MPORG MCI UC 2 was validated in a separate session, before the MCI Trial day, with end-users who also participated to the MCI Trial.

MCI Use Case 2 involved the usage of a serious MultiPlayer Online Role Playing Game (MPORG) or a computer game used as a simulation training tool.

The Pulse MPORG is a web-based virtual reality training environment, where users play the role of an emergency coordinator reacting to an event.

The usage of a serious MPORG as a simulation platform in the management of an emergency is seen as a means of acquiring the skills and thought processes needed to respond appropriately under pressure during a simulated crowd crush at a stadium. The MPORG is intended to be used for training and obviously would be used in the in the Preparation Phase.

In this scenario a number of less experienced EMS First Responders were encouraged to use the MPORG in advance of the main exercise. The specific game set up in the MPORG was to allow a team of users to coordinate in real-time resources casualties, ambulances & hospitals, each with their own specialties and unique situation. This mini-scenario mirrored what was planned for the later main scenario. The concept of the demonstration was to find the optimal solution for managing a number of casualties and send them to the most appropriate hospital. In the three players' game, one player was a manager of an emergency department in a receiving hospital, one player was an ambulance dispatcher and one player generated and orchestrated the triage category of the casualties. Each 'player' was also able to experience the challenges facing another players' role thereby improving co-operation and decision making.

A comparison was made at the final review stage to see if even the brief training using the MPORG given those who received it had any advantage over a cohort of 'players' who has not been exposed to the MPORG training.

Experienced EMS personnel were not exposed to the MPORG in order to gauge the impact on less experienced EMS personnel. That cohort of 'players' exposed to the MPORG performed better than those who had not been exposed to the MPORG but not as well as very experienced EMS personnel. However, even very experienced EMS personnel drawn from NAS Management saw real benefit in using the MPORG. This benefit would include specific geographic information since this data is pre-loaded in the PULSE platform which allows any number of configurable, repayable scenarios as defined in the PULSE system.

6.2.6 Use Case 3

The scene was set by an audio visual aid in the form of a News bulletin

TV News presenter Zita: *"All eyes are on Pulse Park for the first of the UC43 concerts due to take place this evening. There's a carnival atmosphere in the city and parking restriction are already in place in the area around Pulse Park. Some local people who are familiar with events of this scale, say more Gardai than usual are on duty and they welcome this as they say UC43 fans can be noisy and troublesome. Tik sales, in a statement just issued, said that the three concerts have been sold out for weeks and to be aware of any ticket touts. They say that Tik Sales have never sold tickets for five nights and any tickets that are in circulation for the so called extra nights are forgeries."*



The Gardai have not commented on rumours circulated on social media that die hard UC43 fans are out to cause trouble like the old days. A Gardai spokesperson said that if trouble occurs it will only be a minority and it will be dealt with promptly. The Gardai are encouraging people to come and enjoy themselves. Other local people said they do not regret making sure only 3 of the 5 concerts would get licenced. "Our lives are a misery for the week before and the week after large concerts. We will ensure that the curfew is enforced and that the noise levels are kept within the terms of the event licence".

So, mixed views there about the UC43 concerts but most people are looking forward to a fun weekend. In other news...."

Table 26: MCI Use Case 3

When Used	Use Case	Description	Participants
During Event	UC-03	User wishes to mobilise and coordinate resources	3. Resource Providers 4. Regional Authority

As shown in Table 26, MCI Use Case 3 involved the PULSE Platform feature or tool used for the mobilisation of additional resources from Public, Private, Voluntary agencies as well as Response Assets from other member states.

This feature is on the Pulse Platform to provide for mobilisation of additional response resources. This will be for mobilisation a pre-arranged "declared" resource and also for an "as available" resource. It will be for response to a general request for public assistance and also for unsolicited offers that can be validated with agreed legal and ethical parameters.

This scene also involved the use of the Social Media tool which is a part of the PULSE Platform Decision Support Validation Tool (DSVT) whereby a Complex Event Processing Engine is able to combine the incoming data streams and to infer patterns.

The data needed and associated resources required included a series of real-time 'tweets'. These tweets were made by both participants and observers using their personal twitter account. Although the 'tweets' were real the content was coded and anonymised but following the OCHA hashtag standards for emergencies.

These coded tweets were shown on the PULSE platform mapping tools giving their actual GPS location. The codes were pre-arranged to illustrate a plan by those attending the concert to disrupt the concert and this allowed the DSVT to infer a pattern in the tweets.

This inferred pattern was then used to modify the event score outlined in MCI use case 1 and the scoring system then produced a new score based on more up to date information "on the morning of the concert" where the police opinion of the likely behaviour of the fans was changed from an average score of 2 to a fairly constant score of 5. The algorithm is designed to change the overall score by a formula which is not simply an addition but rather it weights certain factors, such as the police opinion, giving it a greater impact on the overall score.

The final part of Scene 3 was the sending out of "are you available messages" to the smart phone app.



This “are you available” message was sent to the EMS first responders who were registered in the system and who were taking part in the exercise. This demonstrated the two way system in the smart phone app and those who indicated their immediate availability were mobilised to the simulated stadium venue.

6.2.7 Use Case 4

The scene was again set by an audio visual aid in the form of a News bulletin

TV News presenter Zita: “We are just getting reports about a developing incident at Pulse Park. In the last few minutes’ serious crowd trouble appears to have broken out at two of the entrances to the Pulse Park. The ambulance service say that more ambulances are been sent to the scene and these are in addition to an earlier spike in what seems to be a drug related incident.

The UC43 concert had been going on for about 45 minutes when there was a power cut. Initial reports based on social media seem to indicate that the noise level of the concert was quite loud and that the group refused to lower the sound level when requested by Pulse Park personnel. This was then followed by a short power cut and there are unconfirmed reports that the concert is suspended at the moment but should restart in about 15 minutes. It seems to be a very confusing situation; we will bring you more news as we get it”.

Table 27: MCI Use Case 4

When Used	Use Case	Description	Participants
During Event	UC-04	Hospital Surge Capacity Bed Management	4. Regional Ambulance Dispatch or Control 5. Hospital Bed Managers 6. On-site Co-ordinators

In this use case the features or tools of the PULSE Platform including the Logistic Tool, the Surge Capacity Generation Tool (SCGT) and the DSVT provide summarised information to support decision making by Hospital controllers, regional authorities and crisis management teams in regard to hospital admission planning. The SCGT provides support for the prediction of the evolution of the critical medical resources during a crisis. This tool is able to suggest the amount of resources that should be made available to efficiently manage the emergency situation.

At this stage of the exercise it was becoming possible for the participants to appreciate that although each scene in the exercise emphasised a specific PULSE Platform feature or tool it was also the case that each Use Case allowed for the usage of other feature or tools of an integrated platform to be utilised. However feedback was only requested on the specific tool or feature being demonstrated.

The data needed and associated resources required have been preloaded into the PULSE platform using actual data from hospitals across Ireland and Northern Ireland.



The types of bed were specifically identified as follows:

- Critical Care Beds
- Intensive Care Beds
- General beds in major hospitals
- General beds in minor supporting hospitals suitable to decant exiting patients

The geo referenced data base listing existing bed capacity was also pre-loaded into the system.

The demand data is the casualty information that arises from the major emergency and triggers the requirement capacity surge in hospitals across a region, country or countries. The specifics of the demand data also underline the requirement for bed management within each hospital.

For exercise operational reasons Use Case 4 could not wait until Use Case 5 was underway. The demands of setting up for a live exercise and the predicted long running time of Scene 5 meant that the demand data could not be generated for Scene 4 from Scene 5.

Because this Use Case ran before MCI Use Case 5 the demand data was randomly generated from the 200 person database and the casualties were geo located in the area of the simulated stadium crush.

To demonstrate the use case, one group of hospitals (the South, South West Hospital Group) and one major hospital (Cork University Hospital) practiced with the PULSE platform on this scene and use case.

It was demonstrated how the demand data when accurately assigned can deplete specify resources and highlight when capacity must be increased by location and by type.

At the end of MCI Use Case 5 it was clear to the participants involved in the Hospital Surge Capacity and Bed Management scene that the demand data would be rapidly available and was similar to that used in this scene.

6.2.8 Use Case 5

The scene was again set by the use of an audio visual aid News bulletin.

TV News presenter Zita: *"If you have just joined us to summarise so far of the tragic events at Pulse Park. At about 6:45 this evening a significant number of fans were refused entry to the UC43 concert on the basis that their tickets were forgeries. These fans then refused instructions of an Gardai Siochana to leave the area. They congregated at the entrances to both the indigo zone and the pink zones. UC 43 came on stage at 8 O Clock and played to a packed house. It would seem that they were aware that there were many disappointed fans outside the stadium and the band turned up the sound to the highest level to allow these fans outside of the stadium to hear and participate. The group refused to lower the sound level in compliance with their event licence when requested by Pulse Park personnel. We go over now to our reported David O'Sullivan who is at the scene.*

David I understand you have more details for us.

TV News reporter David: *"Yes, Zita. A number of flairs were wet off in the crowd but at the same time the power was cut to the stage. Unconfirmed reports indicate that the intention was only to cut the power to the sound but the entire stadium was blacked out for about 3 minutes maybe even a little more. But the blackout coupled*

with the flairs led to panic in a section of the crowd they then surged towards the entrances only to find their exits blocked by other fans determined to get in. The Gardai and the ambulance services say it's too early to have any exact figures to the casualties but they have said there are multiply casualties.

The emergency medical services are calling for volunteers and are immobilising all available resources and are requesting signal from Northern Ireland”.

TV News presenter Zita: *You can see how difficult the situation is, but we will do our best to get back to David as soon as possible. Now some other news....”*

Table 28: MCI Use Case 5

When Used	Use Case	Description	Participants
During Event	UC-05	Triage in Casualty Clearing Station (CCS) and link to PULSE proposal on ePCR	3. CCS Officer 4. Triage Officer

MCI Use Case 5 involved the use of the smart phone app as a data entry system for triage. This triage is on the scene, in Casualty Clearing Station (CCS) and in the transporting ambulances.

This scene also allowed the illustration of how the PULSE Platform data capture could link to any proposed electronic Patient Record System (ePCR).

The Smart Phone app was provided to the First Responders (see Figure 43) taking part in the exercise and to the CCS Officer.



Figure 43 - First Responders showing the Smartphone used during MCI trial

The Primary Actors are First Responders and CCS Officer who use the PULSE Platform Smartphone App to input specific patient Triage information. However, as Triage is an on-going process and over-Triage or under-Triage is an on-going challenge and the patient may well deteriorate.

A screenshot of a smartphone screen displaying the PULSE app interface. The status bar at the top shows "TestFlight", signal strength, time "17:05", and battery level "50%". The app's header bar is blue with the "pulse" logo on the left and navigation items "Tasks 4", "Messages 0", "Record", and a settings gear icon on the right. The main content area has a light green header "Perform Triage at Site" with a sub-header "Perform triage on site of the incident". Below this, there are two columns: "Risk:" and "Record:". The "Risk:" column contains five color-coded buttons: "P1: Immediate" (red), "P2: Urgent" (yellow), "P3: Delayed" (green), "P4: Expectant" (blue), and "Dead" (white). The "Record:" column contains three input fields with icons for a QR code, a camera, and a microphone. Below these columns is a "Notes" section with a text input field. At the bottom is a large blue "Save" button.

Figure 44 - Smartphone app display

The PULSE smartphone app, whose main display is shown in Figure 44, is deployable across all platforms and the intention is that users will download the app from the app store, both Android and Apple, as with any app but the app will be password protected.

A QR code (see Figure 45) was used as a unique identifier with an existing colour coded triage labelling system.

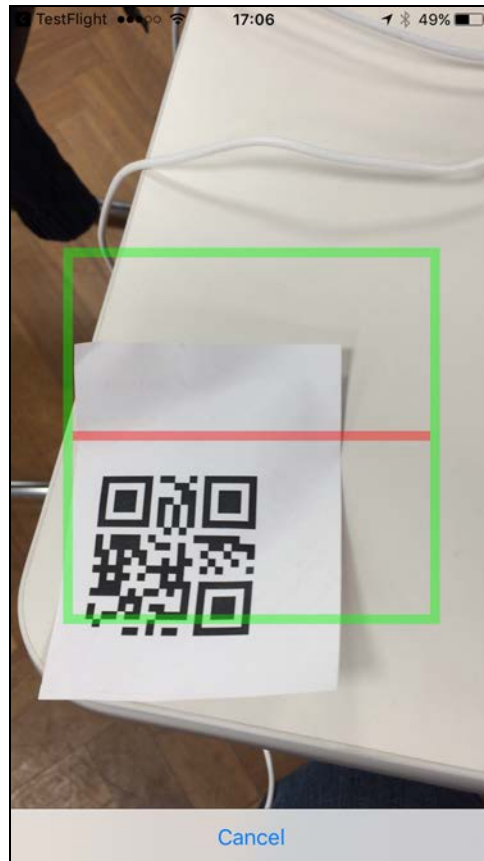


Figure 45 - Medical Emergency Triage Tags

The following actors were involved as participants:

- On-site Coordinator
- 16 Emergency Response Teams
- 6 Ambulances two of which were tracked in real time to the receiving hospital as a demonstration
- Ambulance Mobilisation and Dispatch Centre Control Centre as a station in the Regional Control Centre
- Hospital Controllers in the Hospital Group
- Manager in the Hospital Emergency Department
- Regional Authority

The data needed and associated resources required were as follows:

- 200 person database of potential casualties with all appropriate detail;
- 50 Patient Graphic Cards (A4) where the patient triage details are displayed graphically for the purpose of allowing Emergency Response Teams to complete an initial triage based on the listed symptoms and pictures;
- 20 Patients (volunteers) made up with moulage injuries for the purpose of allowing Emergency Response Teams to complete an initial triage;
- Updating paper injects to modify the triage details of key casualties to allow the Emergency Response Teams to update the triage status as required;
- 100 Medical Emergency Triage Tags which were fitted with an additional QR code (two dimensional barcode). These were attached by the Emergency.



As data was added to the PULSE Platform from the Smartphone App, the key information was extracted and presented to key users in the PULSE Display (see Figure 32 for an example of its interface). As each emergency responder entered data into the Smartphone App this was displayed in near real-time on a map giving the GPS location of the patient, the QR code reference, a picture of the casualty and/or a picture of the Emergency Triage Tag (+QR) attached to the casualty.

Figure 46 and Figure 47 show photos taken during the trial where First Responders enter data into the Smartphone app and send Triage assessments to the Command and Control Centre.



Figure 46 - First Responders using PULSE Smartphone App during MCI trial



Figure 47 - First Responders using PULSE Smartphone App during MCI trial

The Smartphone app can be prompted to push data every two minutes or will update when a revised entry is made. This allowed the system to monitor triage changes and the associated priority assigned to each patient in terms of their condition.

In this scene the potential integration of the Smartphone App with ePCR - Electronic Patient Care Reporting was illustrated as required in the DoW [1].

Most EU MS are in the process of adopting some form of ePCR whereby patient data is recorded in an electronic format and exchanged between users in a Health Information Exchange (HIE) format in a language they understand which is currently HL-7. It is important that initial data gathered by the EMS in the field together with their transport data can be passed from the PULSE Platform in a format compatible with the HL-7 requirements. This also relates to the Health Service Executive Standards and Recommended Practices for Healthcare Records Management issued by the HSE National Healthcare Records Management Advisory Group.

In Ireland and in some other MS an Individual Health Identifier (IHI) is planned or in use. An IHI is a number that safely identifies a person who has used, is using or may use a health or social care service in Ireland. The provision of an IHI for individuals was identified as a key enabler for “eHealth Strategy for Ireland December 2013”. The IHI number will be used to safely identify the individual and enable the linking of their correct health records from different systems to give a complete medical history. In moving to an ePCR system the IHI as used in various format across the EU need to be considered.

This requirement in relation future integration was understood and nothing in the platform design would prevent integration from being accomplished in the future.

6.2.9 Use Case 6

The scene was again set by another audio visual aid in the form of a News bulletin

TV News presenter Zita: *“David thank you for getting back to us I understand you have more up to date information from Pulse Park. We were looking at some aerial footage of the incident.*

TV News reporter David: *“Yes, Zita. And I can now tell you a major emergency has been declared. All hospitals in the region and beyond have been instructed to activate their major emergency plans. The casualty figures we have at the moment are that more than 200 people have been injured, many of them with crush injuries. We have unconfirmed reports that at least 11 people have lost their lives, and more than 20 are critical. We have been advised the Garda spokesperson will talk to the media shortly. I will get back to you later with that information. For the moment back to the studio”.*

Table 29: MCI Use Case 6

When Used	Use Case	Description	Participants
During Event	UC-06	Input critical data for Recognised Current Situation	3. On-site Co-ordinators 4. Regional Authority

As mentioned in Table 29, MCI Use Case 6 involved the input of critical data from the RCS on Site and from other relevant off-site sources onto the PULSE platform display.

The Recognised Current Situation (RCS) is a term closely related to the common operational picture (COP). A COP is usually a single identical display of relevant (operational) information shared by more than one agency and is the core of a situational awareness (SA) by the contributors. An effective COP effectively facilitates decision making, rapid staff actions, and appropriate mission execution. If it is an integrated SA application it supports the emergency response mission of responding to threats and hazards to the MS by collecting, sharing and displaying multi-dimensional information that facilitates collaborative planning.

The scene and the use case recognise the complexity and information overload that often arises as a result of a single COP for every level of command and every agency in a multi-agency response.

Decision makers at Regional, National and at EU level need to have relevant information presented to them in such a way as to enable them to have an SA appropriate to their role, response capability and level of responsibility. It was on this basis that the term RCS can be regarded as being a focused sub-set of a wider COP.

Data needed and associated resources required is as stored in the PULSE Platform.

The demonstration showed how individual patient data could be extracted from the Platform and presented in an RCS display but a simple cut and paste system.

Public Information such as weather, traffic and information from was added to the display. In relation to casualty location the triaged priority and GPS location will be uploaded by the users for display as a colour coded dot on the map. The zoom level then provides a snapshot of the number of casualties in the overall incident or at a



specific location. The same information was summarised in short tabular form for RCS display.

Information generated in Use Case 4 (see 6.2.7) and Use Case 5 (see 6.2.8) was summarised and presented to assist in SA for the decision-maker participants appropriate to their agency and level of responsibility.

The best example of this was the casualty board where totals only were presented and which has the following information displayed:

1. Total of Each Priority;
2. Total of each category still at scene;
3. Total of each category en route to Hospital 1, 2,3 etc.;
4. Total of each category in Hospital 1, 2,3 etc.;
5. Total of each category en route to health care facility A, B, C etc., [Priority 3-Minor Injury];
6. Total of each category in health care facility A,B, C etc.;
7. Diseased - Still at scene or in mortuary or en route to mortuary.

Whereas the underlying data was in the system the requirement for SA in the RCS display was only for aggregated information.

This scene was the longest and most complex scene and involved the largest number of participants. Those participants who were at the simulated stadium crowd crush were given an opportunity to view the displays of their inputted triage data at the end of the exercise by re-running information from the log of events.

6.2.10 Use Case 7

This scene was again set by an audio visual aid in the form of a News bulletin.

TV News presenter Zita: “We re-join our reporter David O’ Sullivan who is at the scene of this terrible tragedy in Pulse Park during the UC43 concert this evening, David’.

TV News reporter David: “Indeed, as I reported earlier a major emergency was declared at Pulse Park. All hospitals in the region and beyond have activated their major emergency plans. The most recent figures we have are that around 280 people have been injured”.

TV News presenter Zita: “David do we have any definite casualties figures yet?”.

TV News reporter David: “Still awaiting confirmation but we understand that at least 15 people are dead, and more than 20 are critical with a further 30 described as very serious. And this figure we are told includes a number of children.”

TV News presenter Zita: “Thank you very much for that David I know you are doing your best and exact figures are always hard to come by in this kind of incident.”

TV News reporter David: “I understand that the Garda helpline will be open shortly. I will give you that as soon as we get it.”.

Table 30: MCI Use Case 7

When Used	Use Case	Description	Participants
Post-Event	UC-07	Post-Event and Post-Exercise evaluation	3. Emergency Management



			4. Regional Authority
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As described in Table 30, MCI Use Case 7 involved the demonstration of a Post-Event, Post Exercise Evaluation Tool to review an incident or exercise and to help identify lessons to be learned.

The tool featured in this use case is the Post Crisis Evaluation Tool (PCET) The PCET provides integrated features that simplify the identification of past less optimal choices and, in such a way, it helps to understand where to intervene for addressing critical issues in future emergencies.

The Post Crisis Evaluation Tool functionalities can be subdivided in two categories:

- those used to store historical information,
- and those used to retrieve that information through the elaboration of ad hoc correlations, analytics and statistics.

The primary use of this tool was in the immediate aftermath of an exercise often referred to as a "hot-debrief". Of course it could also be used as a tool for more formal de-brief but that was not demonstrated as part of the PULSE exercise. It was demonstrated that usage of the PULSE Platform ensured feedback from participating players that would enable a final report to be completed promptly. It was also shown that it is an effective means of ensuring that lessons identified can be used to provide material from which the exercise or incident can be evaluated and lesson learned identified.

The primary actors involved were:

- Regional Authority
- Emergency Management Officers
- Exercise Players
- Umpires or Observers

The data needed and associated resources required was the log of activity recorded in the PULSE Platform.

The Basic Path is that each participant will be able to use the tool to complete a guided response to the exercise or incident. Each participant will be able to log on individually and complete a detailed review document.

It was demonstrated that the on-line system used to collect feed-back from observers and participants could also be used as an on-line document containing fields designed to elicit specific information such as:

- ✓ Were the documented procedures followed?
- ✓ Were the procedures adequate?
- ✓ Did personnel demonstrate a good knowledge of the procedures?
- ✓ Were Procedures readily available?
- ✓ Were contact details available and up to date?
- ✓ Were means of communications operational?

This feature provided an effective re-enforcement of how the tool could be used to create report. This report can contain the aims, objectives and planned outcomes of the exercise, along with an outline of the scenario and the planning process so that it can be cross-checked to see if these were met.



6.2.11 Use Case 8

This scene was yet again set by an audio visual aid News bulletin.

TV News presenter Zita: “Welcome back. As the details of the terrible tragedy at Pulse Park during this evening UC43 concert continues to unfold.

An Garda Síochána has issued the following contact details for people to report a missing family member or friend you are concerned about. The Garda casualty Bureau online form is at this web address which is now on your screen, mci.pulse-fp7.com. You may also call the Garda casualty Bureau emergency number on 1808112113.

We will keep that number and the online form web address on our screens for the rest of this evening’s programmes. Our next report from Pulse Park will be in the scheduled news bulletin in 45 minutes. Goodbye for now”.

Table 31: MCI Use Case 8

When Used	Use Case	Description	Participants
Post-Event	UC-08	Casualty Bureau Operation	4. Police 5. Civil Protection 6. Interpol FASTID (Fast and Efficient International Disaster Victim Identification)

MCI Use Case 8 involved the operation of a Casualty Bureau (CB) or Disaster Victim Identification process. The scene was confined to the Casualty Information Unit (CIU) and the Incident Contact Centre (ICC). The PULSE Platform feature or tools was the Missing Person Web based application (see Figure 30 for an example of its front-end interface).

The purpose of the scene was to demonstrate that it can be used by any and all of the following:

- Member of the general public, casualty, survivor or evacuee on-line from any device;
- Call-taker in a general purpose call-centre in response to any caller as above;
- Police in a police station, police call-centre or at an incident site, hospital, survivor reception centre or the like.

In extensive discussions with the end-users one of the areas identified for improvement is the initial operation of the Casualty Bureau (CB) which is a police (An Garda Síochána - Ireland's National Police Service) area of responsibility. For this scene An Garda Síochána provided personnel to input data at the crowd crush incident scene, the input of data at hospitals and from a call centre was simulated.

The process of identifying victims of major disasters such as terrorist attacks or earthquakes is rarely possible by visual recognition. Comparison of fingerprints, dental



records or DNA samples with ones stored in databases or taken from victims' personal effects are often required to obtain a conclusive identification.

However, this phase of DVI was not explored in the PULSE exercise as it is already being comprehensively addressed by the ICPO-INTERPOL General Assembly Resolution AG-2005-RES-07 in relation to FAST and efficient disaster victim Identification (FASTID).

The 200 person data base was used as the data source. This data based held not just names and injuries and triage status but it also have full contact details as set out in Annex 9 of the INTERPOL Disaster Victim Identification Guide⁴. As people are travelling more and more, there is also a high probability that a disaster will result in the deaths of nationals from many different countries. The data base included appropriate data of nationals from different countries.

The impact of tracing missing persons and matching casualties puts a significant both on Police and EMS resources so both police and EMS personnel were used as participants. Senior police personnel were mainly used as observers to maximise police oversight of the exercise.

Missing Person Web based Application allowed data to be captured in a standard format with almost no requirement to mobilise CB trained police manpower before the CB arrangements would be notified to the public. The feature whereby next-of-kin could upload a photograph of the missing person could be associated with the individual's dataset was demonstrated.

At the end of MCI Use Case 8 it was clear from the feedback received from both the participants and observers that they could see the real value that the Missing Person Web based Application has in streamlining and improving the overall efficiency and effectiveness of the disaster victim identification process.

6.3 End-user feedback & Debrief

A debrief (for facilitators and evaluators) took place immediately following the completion of all use cases. The debrief offered a forum for all participants to review and provide feedback on the exercise. It was a facilitated discussion that allowed each participant an opportunity to provide an overview of what they observed and to outline both the strengths and areas for improvement. The debrief was facilitated by the Exercise Director, the results of which were captured for inclusion in the final report.

Overall, the feedback was very positive.

The decision to utilise advance online video briefings proved extremely useful as feedback from many of the participants and observers confirmed that many of the participants had viewed the video briefings in advance of the trial, some on several occasions. This resulted in participants having a proper understanding of the central aim of the exercise and being extremely well prepared in advance of the trial.

Both participants and observers had the opportunity to provide feedback to the PULSE team via an on-line feed-back form.

Systematically evaluation of the PULSE platform occurred during the MCI trial, the evaluation was structured into the following different aspects:

1. The evaluation of the effectiveness of the system in terms of benefits created, compared to a situation without PULSE.

⁴ <http://www.interpol.int/Media/Files/INTERPOL-Expertise/DVI/DVI-Guide-new-version-2013>

2. The system performance focusing on inherent qualities, which comprises a set of criteria understood as Measures of Performance.
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.
4. Assessing the general characteristics of the PULSE trials also comprising its preparation and actual conduct.

Measuring the extent to which pre-determined objectives had been achieved was an important part of the evaluation together with the projected PULSE platform functionality and resulting benefits. The evaluation did not cover the behaviour of the exercise participants nor the impact of applied response standards or crisis management plans.

The MPORG MCI UC 2 was validated in a separate session, before the MCI Trial day, with end-users who also participated to the MCI Trial.

The basic evaluations were performed by the participants in the trial experiments, applying a number of evaluation tools.

Developed and tested by the consortium in the months before the actual MCI trial, the PULSE System was put to a test in order to obtain information for the evaluation and validation of the system's functionality.

Another part of the evaluation was concerned with the inherent qualities of the PULSE platform, comprising a set of characteristics called Measures of Performance (MoP) focusing on:

- **Efficiency** - Human-computer interaction.
- **Flexibility** – Adjustable to new, different, or changing situations and requirements.
- **Dependability** - System maturity and readiness.
- **Scalability** – Smooth improvement of software and expansion of functionalities.
- **Extensibility** – Facilitating transfer to other crisis management domains & applications.
- **Usability** - Ease of learning, understanding and applying/using the system.

Table 32 details the specifics of each characteristic.

Table 32: Performance Criteria

#	Performance Criteria
1	Efficiency
	Timeliness and speed of the system's operation
	System's resources availability & ease of access
2	Flexibility
	System's adaptability to new or changing situations & requirements
3	Dependability
	System's development stage & readiness for operation
	Continuity of service without malfunctions or blocking errors
4	Scalability
	Ability to fit to different organisations/agencies requirements

	Ability to add new functionalities or to address new hazards
	Ability to expand from local to larger geographic environments
	Ability to manage and expand the system's resource pool
5	Extensibility
	Transferability & adaptability to other crisis management domains
	Transferability & adaptability to different national or international organisations and frameworks
6	Usability
	Time and effort necessary to learn and understand the system
	System ergonomics and ease of handling
	Provision of interactive and appropriate feedback to the user
	Ability to adopt & use the system in new operational end-user situations

Evaluating the system performance across all use cases and/or scenes applied, the performance questionnaire was presented upon the conclusion of the MCI trial. The resulting answers to the questions formulated were captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes. In addition, supplementary comments and recommendations were captured during the final discussion period.

The final part of the evaluation was concerned with the general assessment of the PULSE platform, comprising a set of evaluation criteria as shown in the table below.

Table 33: Evaluation Criteria

EVALUATION CRITERIA	
1	How do you rate the general preparation and setup of the Experiments?
1.1	Overall functionality of the PULSE trial
1.2	Transparency of the trial setup and preparation
1.3	Technical implementation
1.4	Technical presentation / run performance
1.5	Introduction/ training of the participants into the overall trial session
1.6	Description of the system application (was it clear and easily understandable?)
1.7	Clearness and appropriateness of the trial setup in respect to the PULSE's objectives
2	How do you rate the general concept of the PULSE project - the objective, rational and system approach?
2.1	Meets basic requirements (relevance)



2.2	Meets a well identified gap in healthcare planning and decision making
2.3	Is comprehensive and well targeted
2.4	Is easy to understand
2.5	Innovative character
3	Scenario: How do you rate the evaluation Scenarios and Use Cases in summary?
3.1	Adequacy to the problem
3.2	Degree of realism
3.2	Transparency of the underlying scenario
4	Expected future acceptance by user groups: How do you think the finally completed PULSE toolset will be appreciated and used by different groups?
4.1	Gov. policy decision makers
4.2	Healthcare/ responder organizations
4.3	Hospitals
4.4	Private service providers
5	Please briefly describe expected typical drivers and obstacles for future end-users to adopt and apply the PULSE system/ tools
6	<u>Special recommendations</u> Which were particularly positive/ convincing experiences/ findings from the trial?
7	<u>Special recommendations</u> What should be improved?
8	Special recommendations
	Final/ summarizing comment(s) and rating
8.1	Summary evaluation of the Exercise in total
8.2	Your satisfaction with the experiments compared to your expectations

Evaluating across all use cases and/or scenes applied, the assessment questionnaire was presented upon the conclusion of the MCI trial. The resulting answers to the questions formulated were captured twofold:

- In a fixed response part containing scores ranging from 1 (not satisfied) up to and including 5 (fully satisfied), and
- In a section, which allowed to enter free text.

Documented in the follow-on deliverable D7.3 these data are captured, collated and assessed for the sake of final validation purposes. In addition, supplementary comments and recommendations were captured during the final discussion period.





7 Management of Ethical Aspects

7.1 Management of ethical aspects before the trial

The Legal, Ethical, Privacy and Policy Issues (LEPPI) team provided input on the legal and ethical considerations for the trial exercises in the planning phases and the trials definition. This information has been included in Deliverable 7.1 Trials Definition.

For both the trial exercises, the LEPPI team created an Information Sheet and Consent Form that was issued to the trial participants prior to the exercise.

In line with the need to get ethical approvals, the consortium sent Deliverable 7.1 Trials Definition to the external, independent PULSE Ethics Review Committee (ERC) on 4 May 2016 for ethical approval (form and responses are annexed in PULSE Deliverable 8.2 Review of ethical issues). All three ERC members approved the deliverable subject to recommended changes. The consortium took into account the ERC recommendations and revised Deliverable 7.1 accordingly. [See PULSE D7.1 for information]. The recommendations also helped guide the consortium partners in conduct of the trial exercises.

The LEPPI team created a trials monitoring checklist (Annex 1A.1) to monitor the ethical aspects identified in the planning and by the ERC for the trial exercises in Rome and Cork. In conjunction with the PULSE partners, the conduct of the following aspects were monitored (as applicable): provision of information to participants, informed consent forms, notice of recordings, sensitive issues, participants' safety and wellbeing, conduct of the exercise according to established processes, and responsibility of exercise leaders.

The LEPPI team approached the Data Protection Commissioner of Ireland to verify whether there was a need to notify her Office relating to any collection and use of personal data that might occur in the Cork trial. The Office reviewed the MCI trial Information Sheet and Consent form and the LEPPI team made changes to the form in line with their recommendations.

7.2 Management of ethical aspects during the EVD trial

During the trial exercise, the LEPPI was responsible for monitoring the ethical aspects of the trial. Annex 1A.1 documents the results of the monitoring.

Provision of information to participants

Participants were briefed by UCSC (Pasquale Mari) about the conduct of the trial, CESS (Reinhard Hutter) spoke about the various questionnaires to which experts were asked to reply and Trilateral Research (David Wright) spoke briefly about experts signing off the consent forms.

Information Sheets and Consent Forms

The trial co-ordinator issued the PULSE information sheet and informed consent forms in advance of the trial and most participants signed, scanned and sent them back in advance of the exercise. The remaining one-third of participants signed those



forms at the exercise venue. All participants accepted the informed consent forms except for one person from the UK, who refused to sign (to maintain anonymity), but gave verbal consent to participate in the exercise.

Video recording

Participants also completed a separate photograph and video release form (at the behest of the National Institute of Infectious Diseases IRCCS Lazzaro Spallanzani). The PULSE co-ordinator has the copies of the forms. Peter Daly, HSE IAEMO (co-ordinating the video), explained to participants why PULSE was making the video recording and that the intent was not to record facial images rather it was to record the use of the tablets during the exercise (for PULSE learning purposes). He also explained that people's faces, if any were caught, would be pixelated. No one objected to the video recording, except the aforementioned person who asked that their face be pixelated if it were to appear in the video.

Safety and wellbeing

There were no threats to the safety and wellbeing of participants.

Exercise responsibility

The exercise was conducted according to established processes and responsibility as indicated in trial planning. The PULSE partners introduced themselves (as did the participants) at the beginning of the exercise and Pasquale Mari (UCSC), followed by Francesco Malmignati (Leonardo Finmeccanica/Selex), made clear what was being done in the exercise, and why it was being done.

Any other sensitive issues

The principal one was the refusal by one person to sign the consent form. She explained why she did not want to sign and requested that her face be pixelated if her face appeared in the video and that no reference be made to her name.

7.3 Management of ethical aspects during the MCI trial

During the trial exercise, the LEPPI was responsible for monitoring the ethical aspects of the trial. Annex 1A.1 documents the results of the monitoring.

Provision of information to participants

At the outset of the Cork trial, Peter Daly (HSE IAEMO) explained to the 55 trial participants the purpose of the trial and how it would be conducted. Hans Kuhl (CESS) explained that participants would be asked to complete short questionnaires regarding each step in the trial exercise as well as some overall questionnaires. David Wright (Trilateral) drew participants' attention to key points in the information sheet and consent form.

Information Sheets and Consent Forms

All participants signed the consent forms before the trial began. The consent forms were placed on a table outside the room where the trial was taking place. As each



participant signed and completed the consent form, a secretary ticked off their name from a list of the participants.

Video recording

Peter Daly arranged for a video recording of the trial. In his introductory remarks to the Cork trial, he explained that the purpose of the video recording was to show how participants were managing with the PULSE platform and that there was no intention to record participants' faces.

Safety and wellbeing

There were no safety and wellbeing issues in the trial.

Exercise responsibility

The exercise was conducted according to established processes and responsibility as indicated in trial planning.

Any other sensitive issues

There were no sensitive issues raised by the Cork trial.



References

- [1] PULSE Project – Description of Work, version 1.0, October 2013.
- [2] PULSE Project Deliverable – D7.1 Trials Definition.
- [3] PULSE Project Deliverable – D6.1 Integration infrastructure description
- [4] PULSE Project Deliverable – D2.2 Use case specification
- [5] PULSE Project Deliverable – D4.1 Decision Support and Validation tool
- [6] PULSE Project Deliverable – D4.2 Intelligence Analysis Tool
- [7] PULSE Project Deliverable – D7.3 Validation Results
- [8] PULSE Project Deliverable – D4.7 Event evaluation for biological event
- [9] PULSE Project Deliverable – D3.1 Context models
- [10] PULSE Project Deliverable – D2.1 Requirements specification
- [11] Typeform website - <https://www.typeform.com>



Appendix A

A.1 PULSE Trials LEPPi Checklist

Item	Cork Trial	Rome Trial
Preparation for the trial exercise – ethical aspects and considerations addressed in trials definition	Complete – April-May 2016.	
Ethical approvals for trials definition – from Ethical Review Committee	Received and actioned in D7.1 and organisation of trials.	
Have Information sheets and Informed Consent forms been issued to, and collected from participants?	Yes	Yes
Has notice of recordings been given to participants/placed at the venue?	Yes	Yes
Are the exercise's leaders/researchers involved operating within clearly defined constraints to ensure that when sensitive issues are touched upon (such as national security or commercial confidentiality) that neither individuals nor organisations are put at risk?	N/A	N/A
Are the participants aware that the exercise is not a real emergency?	Yes	Yes
Does the scenario overwhelm the participants in any way?	No	No
Has prior information been given to members of the public in the surrounding areas of the exercise, to ensure that the public do not think it is a real emergency situation?	N/A	N/A
Has safety and well-being of participants been taken care of during the exercise?	Yes	Yes
Has the exercise leader ensured that the exercise has taken place in accordance with the established processes and protocols (i.e. those set out/outlined in D7.1)?	Yes	Yes
Has the exercise leader taken on the responsibility for the design, management and reporting of the exercise, and co-ordinating the investigators who take the lead at each site?	Yes	Yes



Add any other relevant items		
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Completed by: David Wright, Trilateral Research Ltd

Date: 1 July 2016 Place: Rome

Date: 15 Sept 2016, Cork