Enhancing Health Emergency management and response following a fire disaster

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Emergency Medical Services

Preparedness and prevention plays a significant role in ensuring an efficient response to national and international crises. Emergency Medical Services (EMS) systems form an integral part of any public health care system: their primary function is to deliver emergency medical care in all emergencies, including disasters and crises. It is widely recognized that an effective disaster response is heavily dependent on pre-existing local system capacity and capabilities than on external assistance. An efficient and well-structured EMS system ensures the achievement and maintenance of the skills necessary to deal with disasters, while disaster preparedness not helps to identify organizational gaps (WHO, 2008) but in many cases helps to minimize the consequences of a hazardous event so mitigate the risk and avoid potential crises.

IMPRESS Proposed Framework

There are four main blocks in the IMPRESS architecture: Incident Management, Decision Support System, Data Storage, External medical devices and the Interfaces to external systems. Additionally, there are the Crisis Management Platform, the Training Component and the Message Bus.

These blocks are implemented to the following IT modules: **WARSYS** (WARehouse SYStem – a database with real time medical and logistics information from available repositories), **SORLOC** (SOuRce LOCalization – a source location tool interrogating – a source location tool interrogating hospital records and using model comparison techniques to improve on the rapidity and accuracy of contaminant source localization), **SICKEVO** (SICK patients physiological EVOlution forecast – addressing physiologic trajectory assessment and forecast), **LOGEVO** (LOGistics EVOlution – a s/w suite enabling the use of models for the logistics of health care resources), **INCIMAG** (incident management tool, connecting emergency agencies, responders, dispatch centers, etc) and **INCIMOB** (mobile version of INCIMAG).

Figure 1. IMPRESS System Architecture.

Fire Disaster and EMS: The Palermo Use Case

A historical fire, which developed in the Palermo (I) waste dump of Bellolampo between July 29 and August 7, 2012 is used for modeling purposes in IMPRESS. The fire released a variety of toxic compounds, which can represent an acute threat to local population. Liberation of compounds entering the food chain can also produce chronic intoxication with increased frequencies of tumors. In an industrial fire accident, large quantities of relevant toxic compounds, able to induce acute respiratory embarrassment and possibly death, are released. The data of the Palermo dump fire are used to model the dispersion of these toxicants, given their volatility, tendency to be absorbed by the vegetation etc. This information will be linked to emergency data concerning mass casualties' records and patient flow to the emergency department of local hospitals.

These data will be extrapolated to model industrial site fires and for the needs of IMPRESS will be used to simulate the sudden liberation of high concentrations of toxic compounds from a tank fire developing on-board a ship moored in the Palermo harbor. The test area sized 0.8 km2 is the Palermo District "Kalsa" that includes several institutional buildings such as the Nautical Institute, the Harbor Authority, the Customs Office, the administrative offices of the University of Palermo, a private hospital and a church, which will be involved in the scenario development. The areas immediately outside that involved by the contamination are suitable for triage facilities and for the landing of helicopters for the evacuation of most severe victims. The nearest hospital is 2 km away and is accessible directly through the seafront boulevard.
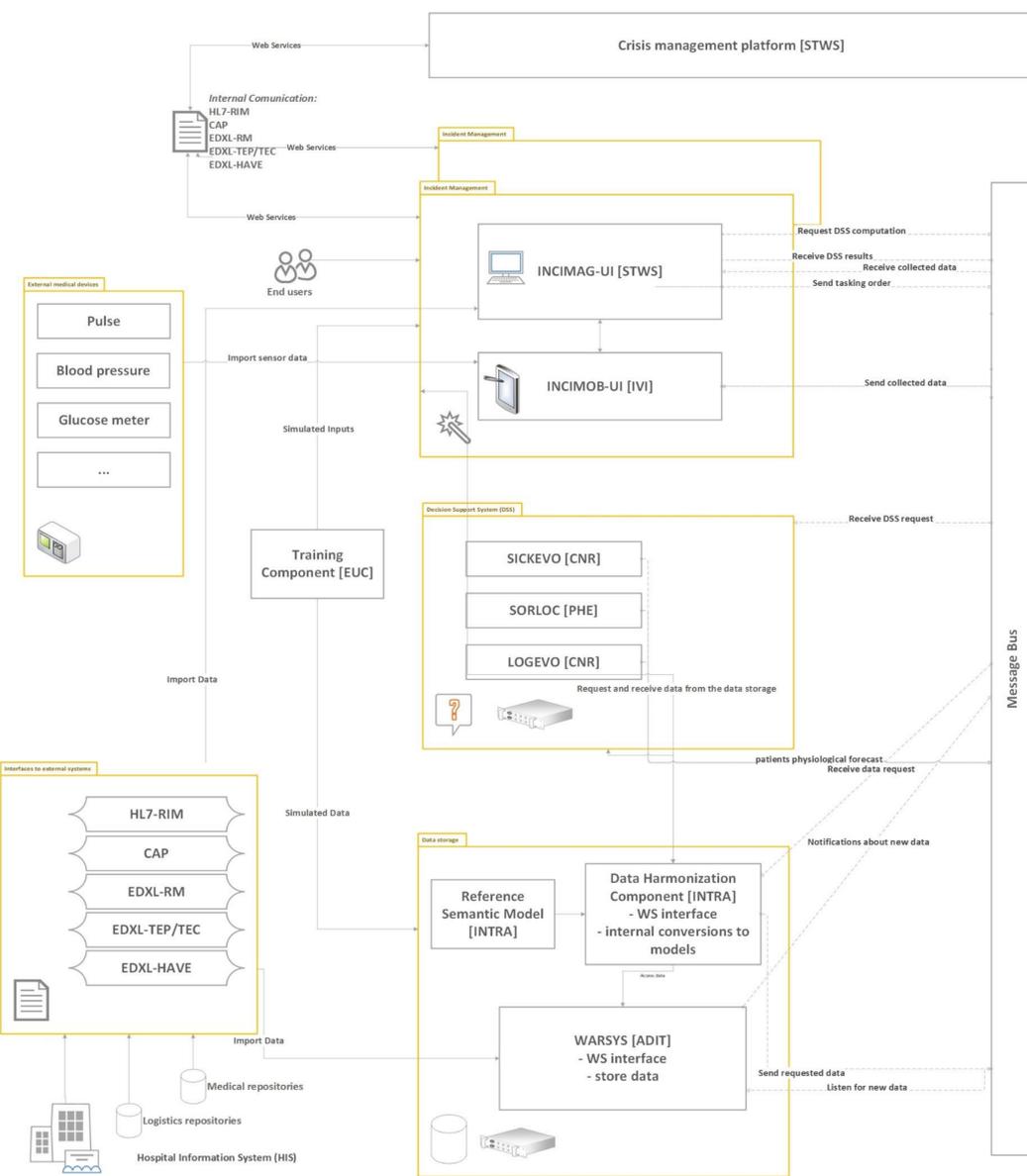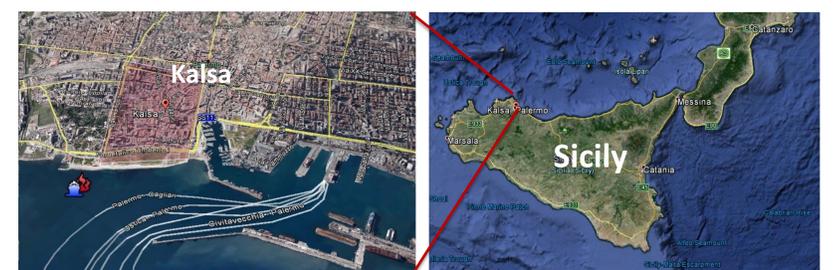

Figure 2. Palermo test area

According to the planned tests, the fire developing on-board the ship shall produce a toxic cloud, which due to the wind blowing from NE will be spread over the Kalsa district. The IMPRESS modules will be activated at the Emergency Service, Emergency Department of local hospitals and at the National Health Service Operation center for managing the public health aspects of the incident. The Italian Civil protection Agency (PCI) shall coordinate the operations that will be supported by the various IMPRESS modules as follows:

SORLOC module is used to identify the distribution of potential patient flow, linked with the distribution pattern of the toxic smoke cloud. Information will be shared with the NHS and the ED departments of the relative hospitals

WARSYS is accessed by authorized users of the involved authorities (NHS and EMS) to retrieve data concerning real time medical and logistics information.

SICKEVO shall provide physiological forecast of patients' status evolution to the EMS and to the ED of relevant hospitals in order to support relevant decisions

LOGEVO module will support at the NHS and EMS level the monitoring and logistics of health care resources

INCIMAG shall be used to exchange information regarding the incident/situation, receive data and develop the situational picture (victim health status resource availability) and receive prediction of the scenario evolution based on the taken decision (calls to SICKEVO, LOGEVO,….,)

INCIMOB will provide field data collection and management support allowing the insertion of patient data, exchanging and recording Triage data and displaying the actual situational picture

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