Sepsis Management

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Sepsis is a life-threatening syndrome characterized by physiologic and pathologic abnormalities induced by infection which may lead to organ damage, organ failure and death. Early identification and appropriate management in the initial hours after the event is associated with lower morbidity and mortality as well as a reduction in health care costs. The currently implemented data management systems are not capable of systematically identifying unnecessary time delays, bottlenecks and other weaknesses in the workflow.

Case study

Phillips and Incliva have come together to improve outcomes and reduce overall costs associated with Sepsis Care at the Emergency Department (ED) of the “Hospital Clínico Universitario” (HCU) in Valencia.

This Pilot monitors the current practices for Sepsis Care at the Emergency Department (ED) of the “Hospital Clínico Universitario” (HCU) in Valencia. After the assessment phase of the pilot we will implement resulting measures in order to fulfil the International Scientific Guidelines, which have established strict time periods for the recognition and initial management.

Assessment Phase

In this phase of the pilot the main goal is to identify possible time delays, bottlenecks and deviations of the expected paths used at HCU and defined by the Sepsis International Guidelines. This assessment makes use of 2 distinct sources of data: the Real Time Locating Systems (RTLS) and the Electronic Medical Record (EMR).

As a first step into this pilot Incliva and Philips worked together on defining the expected paths of Sepsis patients. Since RTLS does not use geolocation, it was necessary to define and equip the areas of the ED to be included in the paths. A total of 32 areas were defined to cover the complete ED including triage rooms, waiting areas, consultation rooms, observation area and corridors. For matters of relevance, also the transfer corridors to radiology and other inpatient departments were equipped with RTLS devices. Using these areas it was possible to create a Petri Net which includes all expected alternative paths a Sepsis patient can take from the moment of triage until discharge from the ED or transfer to another inpatient department of the HCU.

During the next months the location and movements of patients with Suspected Sepsis will be registered using the patient sensors that will be placed at Triage. By using this Petri Net, patients’ paths through the ED can be identified as well as deviating moves of tags within patient traces, ensuring high quality data.

Together with the EMR data, we will be able to discover the cause of the deviations and bottlenecks and then move into the implementation phase of this pilot.

Technology

RTLS and Process Mining

Real-Time Locating Systems (RTLS) are capable of providing accurate location, motion, and other data on equipment, staff and/or patients at update rates typically up to once per 3 seconds. At 4000-5000 mobile medical devices per hospital, tracking equipment alone can already generate up to 5 x 1010 location records per hospital per year. Big data solutions (e.g. running on Spark) will be used to process data streaming in from the hospital to visualize the location and area transitions of patients through the Emergency Department. Complex event processing using data cleaning and process mining algorithm will be performed on the streaming data to fuse location and motion data from the RTLS sensor tags. These algorithms will be used to generate reports regarding the location and movement patterns of Sepsis patients. This will also be used to raise real-time alerts regarding deviations from the expected paths and unexpected behavior regarding the use of the sensors.