**StrokeTraker™: realtime stroke protocol monitoring and CDS**

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**Introduction**

Acute stroke is a devastating medical condition which occurs when a region of the brain suddenly loses its supply of blood due to the blockage of a blood vessel (ischemic stroke, 87% of cases), or rupture of a blood vessel (hemorrhagic stroke, 12%). The consequences of the disease can be limited, however, and its outcomes improved significantly if the condition is accurately diagnosed and the appropriate treatment is administered soon after the onset of symptoms. Imaging is essential in providing the differential diagnostic between ischemic and hemorrhaging stroke, and no intervention is done without an imaging result. The clinical guidelines suggest that a CT scan should be performed within 20 minutes of patient arrival, and a result should be available no later than 45 minutes. Here we present our approach based on process mining for monitoring and improving the efficiency of imaging examinations in the context of the acute stroke care process.

**Methods**

A data platform that will support the stroke care process, including a user-facing stroke dashboard, is presented in Figure 1. In this study, we assessed the feasibility of using a hybrid collection of manually documented and automatically generated event data for creating a comprehensive stroke dataset and the role of process mining as a complementary step to extract-transform-load (ETL). The first dataset was obtained by extracting from the EMR manually collected care steps for 80 suspected stroke cases presented at Emergency Department in 2018. The data collected included patient demographics (name, date of birth, gender), administrative data (medical record number MRN, visit number FIN), and care process information (arrival time and source, time imaging investigations were performed, time treatment was administered, etc). Computer generated event data consisted of 1305 records for 728 patients obtained from the during the same timeframe and included patient demographics, MRN, FIN, imaging accession number AN, imaging order time, exam start, complete, dictated and finalized. The two datasets were merged and processed using RStudio version 1.1.456 with R version 3.5.2. Process mining related to imaging stroke investigations was performed using the BupaR version 0.4.1 package.

**Results**

After the process mining supported ETL was performed, an analytic and operational stroke dataset was obtained which included not only the manually collected stroke process steps, but the radiology steps as well, and powered the StrokeTracker dashboard used to monitor processes and inform improvement projects. The process mining step was able identify several cases where process steps were performed out of sequence (exam started before patient arrival, exam dictated before started, etc). These cases were flagged as exceptions for further analysis, but were removed from the user-facing dashboard. They highlight the need for better, more consistent data collection methods and to systematically leverage computer generated logs.