INTRODUCTION

Until recently Partners Healthcare used Longitudinal Medical Record system (LMR). This system had an add-on CDS system that would log every view of a CDS alert as well as log changes to the rules. 232 rules were implemented at various times for outpatient clinical support. Inpatient, imaging, and medication CDS was handled by a different platform and is not the focus of this study. Through prior work our group demonstrated various ways to identify failures. A failure in this context is when a rule is displayed when it was not supposed to be or when it is not displayed when it is supposed to be. Visualization is a key step in clearly displaying these failures and to aid in identifying the mechanism of failure.

METHODS AND MATERIALS

We extracted CDS rule firing data from LMR and visualized the data using the ggplot2 and lattice R packages. Although all rules were evaluated, we are focusing here on Rule 164 “CAD and no ASA” to demonstrate the depth and complexity of the visualization. The data was loaded into MySQL database where data reduction and some processing occurred. The analytics and visualization were done in R. The analytic path is shown in Figure 2.

RESULTS

Most failures can be seen in a simple analysis (Figure 3). We see a simple bar chart and a stacked bar chart of the Rule 164. Two failures are clearly seen in these bar charts. Figure 4 shows the final versions of the date visualization in a calendar format. The visualization clearly displays two known malfunctions in the CAD/ASA alert the first from 2009, a system-wide spike caused by a system update and the second from 2012, a corruption of the drug class manager resulting in excessive execution.

DISCUSSION

CDS implementation and monitoring is critical in maintaining patient safety and clinical trust. There exist multiple potential causes of failures of these systems. Clinicians have come to depend on these systems therefore identification of failures is important. Visualization of this complex dataset is helpful to identify the pattern of failure and facilitate with correction. In future work, we plan to expand our system to optimise for variation in seasonal trends and provide linkage to a real-time dashboard for detecting anomalies before they lead to widespread patient harm.

REFERENCES