

TITLE: A Platform for DRG development with seamless integration of medical decision trees and cost calculation

Introduction

The SwissDRG system is developed and adapted yearly by SwissDRG Inc., a private company whose goals are set by a troika of the state, health insurance companies and healthcare providers.

The goal of the SwissDRG system is to

- ...cover the average yearly health cost of all Swiss hospitals,
- ...such that cost variance within a DRG is minimal and mean differences between DRGs are maximized (in other words by minimizing R^2),
- ...and to be comprehensible and transparent, i.e. the system must make sense in medical terms (as opposed to a purely statistical rule system).

To achieve this, the set of rules assigning patient cases to DRGs is based on medical reasoning and patient/cost data.

To adapt the DRG system to medical and population changes, SwissDRG Inc. annually collects the inpatients' biographical data, procedures and diagnoses and the corresponding cost data from all Swiss hospitals. Based on changes in the data along with change requests from the Swiss healthcare community, modifications are simulated and, if useful, integrated into the SwissDRG system.

We present a platform used to edit the medical decisions trees defining these rules and to calculate their "fitness", i.e. R^2 and cost coverage, among other statistics.

Methods

The platform is implemented as a web application based on React in the front-end, Ruby on Rails in the back-end, and a couple of Java services. The services communicate via JSON REST APIs.

Results

The health experts can modify the DRG assignment rules presented as decision trees. They can, within seconds, calculate the modifications' impact on the fitness of the system, based on a large patient/cost dataset (~1m cases). Even complex rules can be edited via a logical language used to express medical conditions. The results of the calculations are represented in different dimensions: statistics for an entire system, individual DRGs, the cost coverage impact on hospitals or certain types of hospitals, comparisons of these statistics between system versions, etc. Users can drill down from aggregated results to individual patient cases affected by the system's modification with a few clicks.

The introduction of this platform sped up system development because logical modification and calculation are integrated: evaluating the impact of a modification is a couple of clicks away. The process is significantly less error-prone, since many manual steps were automated. Each time a version of the system is saved, a set of validations is run to ensure no involuntary changes were introduced, and to warn users of potential inconsistencies. User satisfaction increased due to faster interaction, less waiting time, support mechanisms for editing logical expressions (syntax highlighting, auto-complete, error reporting), simpler management of system versions, including integrated documentation.

Conclusions

The platform significantly facilitates responding to urgent challenges and requests posed by the healthcare system, as recently proven during the Covid19 crisis. The system could easily be adapted to the needs of other healthcare systems or integrate medical logic of existing refined DRG systems.