

Data science in action to improve Quality, Safety and Costs for patient-centered care pathway

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INTRODUCTION

There is growing pressure on healthcare organizations to deliver higher-quality, and lower-cost care. Moreover, with the increased longevity of population and consequent increase in incidence of chronic diseases, challenges arise regarding the cost of health and the sustainability of the system. A general approach to address these challenges is to focus on improving operational efficiency of performed knowledge-intensive processes based on care lines. Because, the quality perception and patient experience are directly linked to the waiting time and effectiveness, impacting in terms of competitiveness in the health sector. However, the process improvement analysis must be carried out impersonally and at a reduced cost. The traditional process analysis is time-consuming, expensive and potentially influenced by sampling. Other issue comes from subjectivity involved in healthcare processes, insofar as they tend to describe ideal scenarios, which are only one of the many possible scenarios. Likewise, there is a growing demand for more effective analyzes of adherence to patient care related to medical protocols and guidelines. Thus, our goal was simplifying for hospitals and health insurance the usage of data science to improve the Patient's Journey, increase quality and safety. Conformance checking and compliance analysis promote operational efficiency, and better outcomes of referenced pathologies using standard ICHOM standard sets (STRUIJS; BANN, 2011) (PORTER; KAPLAN, 2014) (ZERILLO et al., 2017). Non-conformities depict unnecessary or absent achievements, as well as the presence of undesirable events. Automated follow-up allows patient-centered care to be effective and equitable (CHASSEN; GALVIN, 1998).

METHODS

Process mining allows generating objective suggestions for process improvement, exploring event data without human intervention. To this end, techniques for discovering process models from event logs were used. Effective analyzes of patient adherence to care are managed in terms of Patient's Journey. To support the Patient's Journey, process mining techniques were also used. The techniques allow assessing whether: a) the procedures submitted to patients were performed according to protocols and guidelines; b) patients followed the most appropriate care paths; and c) health technologies were adequately evaluated for Cost-effectiveness. Specifically, suggestions for improvement and Patient's Journey analysis used automatic discovery of process models and their variants, real-time conformance checking, and proactive monitoring based on the results of the compliance analysis. Figure 1 partially illustrates the Framework used and integrated in upflux.net.

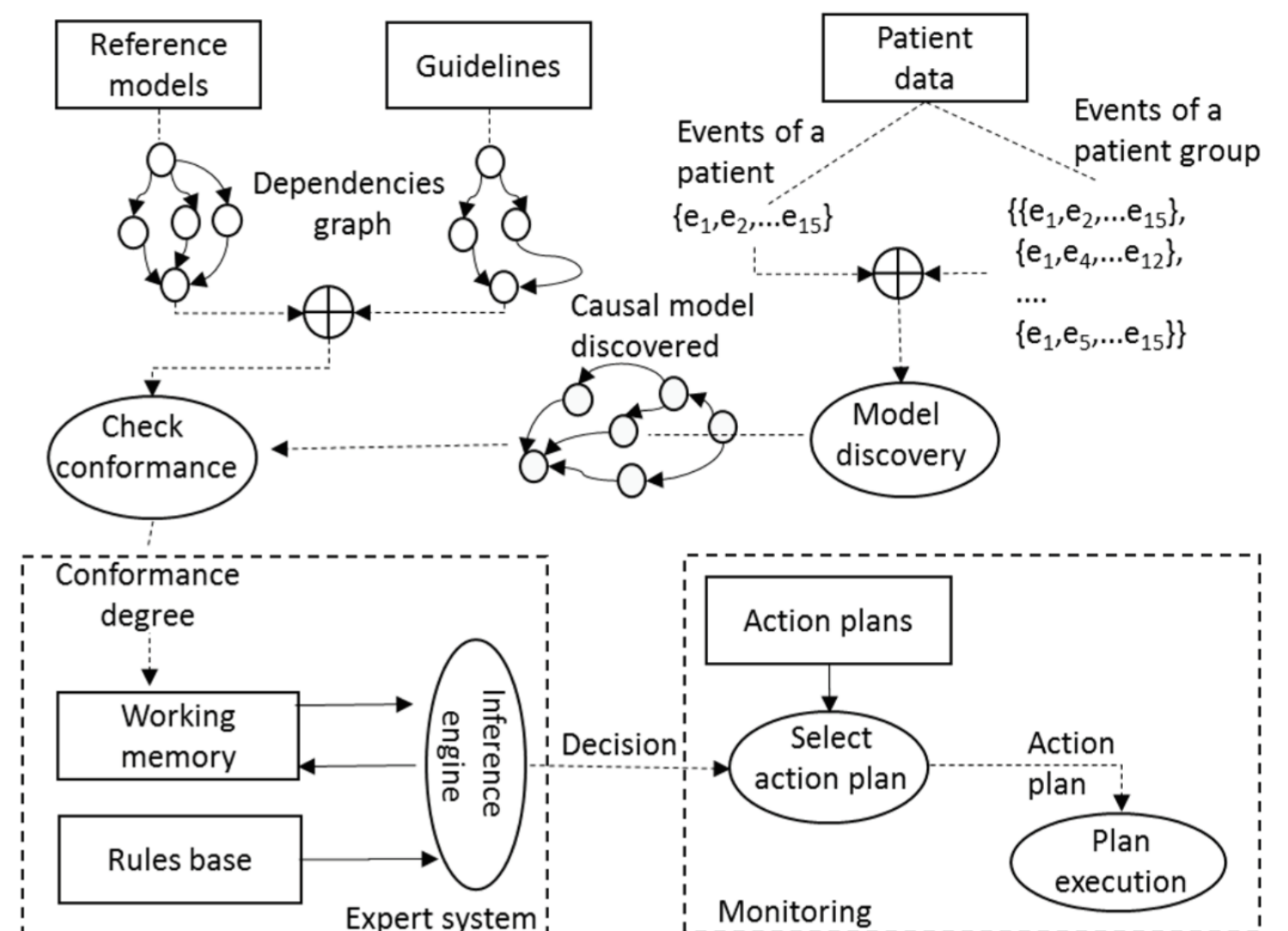


Figure 1. Patient monitoring involves four tasks: a) automatic discovery of the causal model from a set of events from one or more patients; b) calculation of the degree of conformity between the discovered causal model and the reference model; c) decision making based on the knowledge of specialists, considering the calculated degree of compliance; and d) selecting & applying an action plan based on the decision.

RESULTS

Analysis of the Patient's Journey can be analyzed more quickly by process mining, using real evidence readily available in electronic health records. Our contributions allow: (a) to increase efficiency, quality of care, patient safety and, consequently, reduce costs; and (b) support the lean healthcare, with the aim of reducing cycles and maintaining continuous monitoring and improvement. This support makes the hospitals quadrupling the capacity of managing protocols with the same team and, analyzing 100% of cases with violations (and not just working by sampling), increase safety by reducing of critical waiting times, and also improving the patient experience. In addition, health insurance auditors report 300% more productive due by dedicating efforts only where need human attention in checking of specific deviations.

CONCLUSIONS

The innovation presented is on the upflux.net Framework, which automates the discovery of process models, compliance verification, as well as the systematization and the patient's life trajectory, according to medical directives, protocols and guidelines. The results evolve towards a sustainable competitive advantage, resulting from the ability to manage and understand how, in practice, the processes occur, including, their improvements, in addition to automatically verifying compliance, reducing the manager's cognitive overload. Our future goals are predict and explain denouements, and prescribe paths.