Towards a realistic clinical-guidelines application framework: Desiderata, Applications, and lessons learned

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Abstract. Clinicians can benefit from automated support to guideline (GL) application at the point of care. However, several conceptual dimensions should be considered for a realistic application: 1) The representation of the knowledge might be through structured text (*semi-formal*), or specified in a machine-comprehensible language (*formal*); 2) The availability of electronic patient data might be partial or full; 3) GL-based recommendations might be triggered by a human-initiated (*synchronous*) session, or data–driven (*asynchronous*). In addition, several requirements must be fulfilled, such as an evaluation of the GL application engine by a GL simulation engine. Finally, to apply multiple GLs, by multiple users, in multiple settings, the GL-application engine should be designed as an enterprise architecture that can plug into any Electronic Medical Record (EMR). We present an architecture fulfilling these desiderata, describe application examples with different conceptual dimensions and requirements, using our new GL-application engine, *PICARD*, discuss lessons learned, and briefly describe a clinical evaluation of the current framework in the domain of pre-eclampsia/toxemia of pregnancy.

Keywords: Clinical Guidelines, Automatic Application, Telemedicine, Medical Decision Support Systems, Evaluation, knowledge Representation, Simulation.

1 Introduction

Clinical guidelines (GLs) are a powerful method for standardization and uniform improvement of the quality of the medical care [1]. However, there is a need for automated support for their specification and application at the point of care. Several survey studies summarized the area of automated complex GL-based care [2, 3, 4].

In this paper, we focus on the requirements for a *realistic* (real-world) application of GLs at the point of care, catering for the multiple contexts within such an application might occur, outline (Section 2) the requirements for a realistic application, review (Section 3) relevant background, propose (Section 4) a specific architecture that embodies these requirements, demonstrate (Section 5) our implementation of this architecture in several different clinical domains and tasks, and discuss the lessons and insights learned (Sections 6 and 7).