

SUMMARY

Enormous efforts are being invested in producing clinical knowledge and making it available in practice via the clinical guidelines (CG). However, the increasing amount of knowledge and its complexity make it difficult to efficiently apply it to the benefit of the patient. The research question that arises is: which clinical knowledge is needed to support clinical guideline (CG) tasks while fostering knowledge reuse across them?

We propose a model called TMR (Transition-based Medical Recommendation) that has as core elements actions and transitions, where the actions can be both believed to cause a transition with some frequency and be recommended to be pursued or avoided for that reason. The applicability of the TMR is assessed for two GC-tasks: multimorbidity analysis and literature search. The multimorbidity analysis is necessary to support the treatment of patients that suffer from more than one disease at the same time. In this case, the medical best-practices, mostly established for addressing a single disease at a time, can interact in several ways, e.g. contradicting or repeating treatments. The more diseases involved, the more difficult it gets to identify all possible interactions. As a secondary task, literature search is necessary to gather the publications that serve as scientific evidence for the recommended actions to be performed or avoided. As new evidence is produced daily on a large scale, literature search is often necessary to keep the clinical guidelines up-to-date. Those tasks as well as other CG-tasks are called knowledge intensive tasks as they require large amounts of information to be processed.

By relying on the TMR model we provide (i) a fixed number of generic rules for detecting several types of interactions among several recommendations; (ii) generic reuse of medical data from heterogeneous medical datasets; and (iii) a flexible method to compose a search-query for medical literature that takes into account the semantic role of the medical terms and possible alternative descriptions. We have successfully applied this approach to case studies taken from the medical informatics literature as well as a case study developed in cooperation with healthcare-professionals. The case studies are (i) combining three (parts of) guidelines for Osteoarthritis, Diabetes and Hypertension; (ii) combining (parts of) guidelines for exercise ther-

apy for Breast Cancer Patients combined with Osteoarthritis, Hypertension and Congestive Heart Failure; and finally (iii) searching for literature to update the Dutch Breast Cancer Guideline of 2004.

This work is a step in the direction of investigating the knowledge underlying CGs that is necessary to address several tasks. The proposed approach is designed to be both task- and technology-independent, though the evaluation is performed through specific CG-tasks and technology. The Semantic Web provide a suitable environment for the implementation by allowing the reuse of large datasets as Linked Open Data, besides the provision of reusable knowledge. The evaluation for multimorbidity analysis and literature search show relevant contributions with respect to the state of the art.