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Appendix: Content Summaries of Selected Best Papers for the IMIA Yearbook 2017 Section "Clinical Information Systems"

Anderson AE, Kerr WT, Thames A, Li T, Xiao J, Cohen MS

Electronic health record phenotyping improves detection and screening of type 2 diabetes in the general United States population: a cross-sectional, unselected, retrospective study

J Biomed Inform 2016;60;162-8

A large fraction of type 2 diabetes mellitus (DM2) patients in the United States today remain undiagnosed. The selection of patients for screening currently relies on only a subset of known risk factors. In this paper, Anderson *et al.* carried out a cross-sectional, retrospective study to determine whether more comprehensive pre-screening criteria could be achieved using phenotyping of electronic health records (EHRs).

Multivariate logistic regression was used on a de-identified EHR dataset containing 9,948 US patients to predict current DM2. A "full EHR" dataset utilizing 298 features was compared with a limited "EHR DX" model excluding medications as well as to a "conventional" model containing only the risk factors used in current diabetes risk models (smoking status, sex, age, body mass index, hypertensive status). Out-of-sample validation was carried out using a random forests probabilistic model.

The EHR-based phenotypes performed significantly better than the conventional risk score, using both the logistic regression as well as the random forests model. The authors conclude that, even though EHR data is often incomplete and recorded unsystematically, it could be leveraged to cost-effectively identify patients with active, untreated, DM2 for further screening.

Badgeley MA, Shameer K, Glocksberg BS, Tomlinson MS, Levin MA, McCormick PJ, Kasarskis A, Reich DL, Dudley JT

EHDViz: clinical dashboard development using open-source technologies

BMJ Open 2016;6;e010579

While an increasing amount of longitudinal health data is being captured in electronic health records (EHRs), presentation is often restricted to tabular and textual views which are not conducive to recognizing trends (e.g. disease progression) in the dataset. Additional time-series data is increasingly being generated through mobile patient monitoring and quantified-self devices.

In this article, Badgeley *et al.* describe the concept and implementation of the extensible visualization framework "EHDViz" to create dashboards for longitudinal health and wellness data. The platform uses open source components like the R statistics package to ingest biomedical data sources and provides an intuitive user interface for interactively selecting relevant data items for static or near-realtime visualization. Data from multiple sources are merged and normalized, and it is possible to integrate further processing steps (e.g. calculation of risk scores) into the pipeline. Using simulated datasets, the authors provide several prototype dashboards to demonstrate a visualization of multi-source data for a single patient as well as a multi-patient visualization with interactive selection of EHR data items.

The authors conclude that the framework can support the rapid design and implementation of visualization dashboards, which can be applied in clinical care and research as well as teaching use cases.

Hadji B, Martin G, Dupuis I, Campoy E, Degoulet P

14 Years longitudinal evaluation of clinical information systems acceptance: The HEGP case

Int J Med Inform 2016;86;20-9

Active and meaningful use as well as user satisfaction are important success factors for the continuing success of a clinical information system (CIS) implementation. In this article, Hadji *et al.* describe a longitudinal evaluation of these aspects at the Georges Pompidou University Hospital in France. The long observation period of 14 years provided a unique opportunity to assess the evolution of CIS acceptance during early (4 years), late (8 years), and very late (>10 years) stages of CIS use.

The survey instrument covered items from multiple established acceptance models (TAM2, UTAUT, ISSM, ECM, ITPAM), considering six acceptance dimensions: CIS quality, facilitating conditions, perceived usefulness, confirmation of expectations, use, and global satisfaction. Relationships between these constructs were tested using multiple regression testing and structural equation modeling.

CIS acceptance increased over the study period. Perceived usefulness initially was lower in medical staff than in non-medical staff. While global satisfaction initially appeared to be determined by CIS use, CIS quality, and perceived usefulness, the association with CIS use disappeared over time.

The authors conclude that acceptance dimensions change significantly over time and that models should be adapted to the according phase of CIS use. They postulate that the decrease of the relationship between CIS use and satisfaction over time could be interpreted as a maturity indicator of a CIS project.