Findings from the Yearbook 2010 Section on Decision Support Systems

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Summary
Objective: To summarize recent excellent research in the field of computer-based decision support systems in health and healthcare.

Methods: We provide a synopsis of the articles selected for the IMIA Yearbook 2010, from which we attempt to derive a synthetic overview of the activity and new trends in the field.

Results: while the state of the research in the field of medical decision support systems is illustrated by a set of fairly heterogeneous studies, it is possible to identify trends. Thus, clearly, the importance of studies related to computational prescription order entry (CPOE) systems and guidelines management systems for both medical decision making and care providers, occupies a central role in the field, with application affecting also EHR vendors. In parallel, we observe translational interests for developing bridges with results generated by molecular biology, where the mass of data generated by high throughput experiments and large-scale genome analysis projects, raise specific processing challenges.

Conclusions: The best paper selection of articles on decision support shows examples of excellent research on methods concerning original development as well as quality assurance of previously reported studies. This selected set of scientific investigations demonstrates the needs for computational applications to transform the biomedical data onflow into more operational clinical knowledge. Altogether these papers support the idea that more elaborated computer tools, likely to combine heterogeneous contextual contents, are needed.

Keywords
Medical informatics, International Medical Informatics Association, yearbook, decision support systems

Introduction
The five papers selected this year, clearly address different aspects of decision support. De Jong et al.’s paper reports on the observed impact of decision support systems on physicians practice patterns in the Netherland. Wright et al.’s uses a set of interviews to deliver a comparative survey of decision-support systems in commercially available Electronic Health Records. Ernesater et al. report on a qualitative study to assess the acceptance and perception of the teleunre decision support system by professionals. Goud et al. report on a trial trying to assess the impact of computer-aided decision systems to improve rehabilitation of patient suffering from cardiac pathologies. Finally, Kohler et al. propose an application to help diagnosis of genetic disorders using the Human Phenotype Ontology.

Best Paper Selection
The best paper selection of articles for the section on decision-support systems in the IMIA Yearbook 2010 follows the tradition of previous Yearbooks in presenting excellent research on methods used for the implementation of computer tools to help healthcare agents to make better decision at bedside, as well as at population levels. Four of the selected papers are directly related to the evaluation of instruments likely to improve concordance with guidelines and quality of care in general. A fifth paper attempts to derive a differential diagnosis application to help decision-making based on signs and symptoms of genetic pathologies, somehow similar to diagnosis association tools as described in [1, 2]. The objectives are to reduce errors, adverse effects, and costs in the care and/or diagnosis process [3, 4]. Table 1 presents the selected papers. A brief content summary of the selected best papers can be found in the appendix of this report.

Conclusions and Outlook
The best paper selection for the Yearbook section on decision support systems can by no means reflect the broadness of a field that is intrinsically heterogeneous. The selected papers, however, shed light on some special aspects deserving particular attention as they concern key methodological questions for the future of the field. In particular two papers are reporting on experiments which are also registered clinical trials. It is thus questioned whether DSS should be considered as therapeutic target like any other medicinal drugs or professional intervention, such as surgery of psychology. While decision-support system seems to effectively support experts in their daily practices, a specific regulation framework might be needed in order not to hinder exploratory and emerging initiatives in the field. Indeed, while recommendation systems are likely to significantly improve decision making, their promotion to the level of official „treatment” can result in two critical drawbacks: 1. a lower acceptance by professionals, who would feel replaced by machines; 2. a legitimate rejection by patients, who do not want to be treated by computers. In this context human-mediation shall soon appear as a must for future success stories of computerized decision support systems.
Acknowledgement

I greatly acknowledge the support of Martina Hutter and of the reviewers in the selection process of the IMIA Yearbook.

References


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Appendix: Content Summaries of Selected Best Papers for the IMIA Yearbook 2010, Section Decision Support Systems*

Table 1: Best paper selection of articles for the IMIA Yearbook of Medical Informatics 2010 in the section ‘Decision Support Systems’. The articles are listed in alphabetical order of the first author’s surname.

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<th>Section</th>
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<td>de Jong JD, Groenewegen PP, Spreeuwenberg P, Wester GP, de Bakker DH</td>
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<td>Do decision support systems influence variation in prescription?</td>
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* The complete papers can be accessed in the Yearbook’s full electronic version, provided that permission has been granted by the copyright holder(s) using the DSS. However, prescription variation is the same for GPs using and for GPs not using a DSS. It is thus suggested that DSSs can be used to implement guidelines, but their impact on prescription variations is limited.

Wright A, Sittig DF, Ash JS, Sharma S, Pang JE, Middleton B

Clinical decision support capabilities of commercially-available clinical information systems


Decision Supports Systems (DSS) embedded into Computerized Provider Order Entry (CPOE) and Electronic Health Records (EHR) provide additional value to both CPOE and EHRs. The authors aim at describing the results of a study of decision support capabilities in Certification Commission for Health Information Technology (CCHIT) certified electronic health record systems. A series of interviews with representatives of nine commercially available clinical information systems is conducted to analyse their characteristics against a 42 different clinical decision support features. Six of the nine evaluated systems matched all the applicable event-driven, action-oriented, real-time clinical decision support triggers required to successfully perform clinical decision support interventions. Nearly half (5) could access all the patient-specific data items identi-
Findings from the Yearbook 2010 Section on Decision Support Systems

The authors report on a study, whose main aim is to describe telenurses' experiences of working with computerised decision support systems, with a focus on assessing the impact of such a system on nurses practice patterns. Telenursing is a fast growing service in many Western countries, and centralization of telenursing services is now observed in several countries such as Sweden. In parallel, the use of computer-assisted decision support has recently increased. Therefore, we decided to study via interviews the perception of eight Registered Nurses from three telephone call centres, who were using computerized decision support instruments. Collected data were then analyzed using qualitative content analysis along the following dimensions: decision support system were to be judged as supporting, inhibiting and quality improving. Further focusing on two of the dimensions - 'supporting' and 'inhibiting' - specific sub-features were identified: being strengthened, but simultaneously controlled and inhibited. Computer-assisted decision support tools were described as: simplifying their work, complementing their knowledge, providing them more security and credibility. As for negative outcomes, they also reported that decision support systems (DSS) are incomplete, inconsistent with their own opinions and controlling. The third category addressed organizational issues: the DSS were seen as ensuring better quality telenursing. Altogether, it is concluded that positive perception overcomes negative ones and nurses preferred working with it. Nevertheless, telenurses experienced computerized decision support as both supporting and inhibiting. Finally, it is also felt like computerized decision support systems are complementary but cannot replace telenurses' knowledge and competence.

Clinical diagnostics in human genetics with semantic similarity searches in ontologies

Differential diagnosis instruments can help physicians to identify candidate diseases that best explain a set of clinical features and to highlight those specific symptoms or diagnosis procedures likely to reduce the span of possible diagnosis. This process can be further complicated by the fact that discriminating features can have varying levels of specificity. In addition, several features can be observed, which are not directly related to the disease itself, but rather to co-morbidities. Depending on the experience of the professional and the set of laboratory and diagnosis tests available in the healthcare environment, clinical signs and symptoms may be described in greater or lesser detail. The authors have designed a specific semantic similarity metrics to measure phenotypic similarity between user information requests and descriptors of the Human Phenotype Ontology (HPO), directly linked to hereditary diseases. The resulting distance can be used to generate a probabilistic model, which can rank candidate diseases. Compared to term-matching approaches, the proposed approach performs better, especially for queries containing phenotypic noise or imprecise clinical descriptions. The semantic hierarchy defined by the HPO can be used to further refine the list of differential diagnosis. It is concluded that ontological distances can represent a useful approach to help physician to perform diagnosis procedures.