How to Use Information Technology to Improve Medication Safety

A. Winter¹; R.-D. Hilgers²; R. Hofestädtd; P. Knaup-Gregorid; C. Osee; A. Timmerf

¹Leipzig University, Institute for Medical Informatics, Statistics and Epidemiology, Leipzig, Germany;
²RWTH Aachen University, Institute for Medical Statistics, Aachen, Germany;
³Bielefeld University, Bioinformatics Department, Bielefeld, Germany;
⁴Heidelberg University, Institute for Medical Biometry and Informatics, Heidelberg, Germany;
⁵Duisburg-Essen University, Faculty of Medicine, Centre for Clinical Trials, Essen, Germany;
⁶Carl von Ossietzky Universität Oldenburg, Department for Epidemiology and Biometry, Oldenburg, Germany

Keywords
Medical informatics, medical statistics, epidemiology

Summary
The publication of a memorandum on improving medication safety by information technology in both the German journal GMS Medical Informatics, Biometry and Epidemiology (MIBE) and the journal Methods of Information in Medicine (MIM) gives reason to strengthen cooperation of MIBE and MIM and to report on more publications of MIBE here. The publications in focus deal with simulation-based optimization of emergency processes, handling of research data in publications, open access to research metadata, reliability of digital patient records in medical research, assessment methods for physical activity, using of insurance databases for epidemiological studies, certificates for epidemiological professionals, regression models, computer based training, and performance management in Swiss hospitals. Finally determining factors for scientific careers are discussed.

“Your risk to die of a pill today is six times higher than being killed in a traffic accident and up to 28.1% of hospital admissions are due to drug-related problems [1]” the head of our pharmacy department explains to our medical informatics students each year. At least since the year 2000, when the legendary report "To Err is human" [2] was published, a huge pile of papers in this and other journals have discussed measures to be taken in order to reduce the problem. But even very careful readers will have considerable problems summarizing all the aspects analyzed and deriving something like a guide for supporting the medication process and introducing e.g. a CPOE system in a hospital properly. The Drug Information Systems Working Group of the German Society for Medical Informatics, Biometry and Epidemiology (GMDS) reviewed nearly 60 papers on the use of information technology to improve medication safety and condensed the respective knowledge of 21 experts. The endeavor of Ammenwerth et al. resulted in a description of the typical functions and applications of health IT for medication safety and 11 concrete recommendations. They stress the importance of embedding the introduction of health IT for medication safety in a thorough system of systematic information management, ranging from strategic planning to systematic project management involving patients, for example. After having been issued by the e-journal GMS Medical Informatics, Biometry and Epidemiology (MIBE) [3] first, an international version could now also be published in this issue of Methods of Information in Medicine (MIM) [4] because of the close cooperation of MIBE and MIM [5].

Correspondence to:
Prof. Dr. Alfred Winter
Leipzig University
Institute for Medical Informatics, Statistics and Epidemiology
Haertelstr. 16–18
04107 Leipzig
Germany
E-mail: alfred.winter@imise.uni-leipzig.de

Methods Inf Med 2014; 53: 333–335
doi: 10.3414/ME14-10-0007

© Schattauer 2014
Last year editors in chief of MIM and MIBE started deepening their close cooperation by issuing a report of the MIBE editors on publications in MIBE [6]. We would like to continue this as a tradition in order to contribute to a more intense and better informed international scientific debate on how to achieve good information as a basis for good medicine and good healthcare [7]. Since MIBE is an open access journal a and access to MIBE articles is easy we want to introduce articles of the last 12 months again and hope it will be an additional benefit for the scientific work of MIM readers.

Medical Informatics not only deals with supporting processes in medicine but also with optimizing them. Besides the medication process one of the most crucial processes in a hospital is treatment in an emergency department. It is vitally important to minimize waiting times for patients with life threatening conditions. Schaaf et al. used an agent-based simulation model to predict waiting times after the introduction of a triage system [8]. They could show that the risk of overlooking life-threatening situations can be reduced to a minimum by consistent implementation of triage. This was the first MIBE paper using a new MIBE feature: We expect from our authors that relevant underlying data are submitted in addition to manuscripts for peer review and publication. This complies with demands of funding organizations like Deutsche Forschungsgemeinschaft (DFG) and European Research Council in terms of “Good scientific practice”. By cooperation with the Dryad repository, MIBE offers an easy way to achieve that. Dryad b is a repository for research data from life sciences being developed at the National Evolutionary Synthesis Center and the University of North Carolina Metadata Research Center. Using the MIBE-Dryad connection readers can now reproduce all triage simulation runs mentioned in [8] by using the data and software attached to the paper.

Access to research data can contribute to better medical research only if there is access to the respective metadata as well. Currently, most of the documentation forms and item catalogs in healthcare and medical research are not accessible to the public. Dugas et al. call for open access to medical documentation forms as a means for improving networked medical research [9].

But there are more barriers for medical research, especially at its translational interface to patient care. More and more hospitals replace their paper-based patient records by digital copies. However, at present it is unclear under which circumstances the records of patients taking part in clinical trials can be destroyed after digitization. Kohl et al. provide suggestions on how existing regulatory guidelines can be implemented to allow the digitized patient records being accepted as source documents and thus can replace paper-based originals [10].

Assessment of physical activity is needed in the field of ambient assisted living (AAL) but also in epidemiological research dealing with lifestyle associated diseases, for example. While in AAL usually technical devices for accelerometry are used, in epidemiological studies questionnaires are often preferred. Brühmann et al. found that both methods have their strengths and limitations and should be seen as complementary tools that assess distinct aspects of physical activity in epidemiological studies [11].

Another source of data in retrospective epidemiological studies is claims data of health insurance companies. Following a risk management plan mandated by the German regulatory authority Dörks et al. examined the databases of four statutory health insurances in Germany with respect to off-label use on lenalidomide (Revlimid®) [12]. The drug lenalidomide is indicated for the treatment of multiple myeloma. Off-label use in general has to be carefully controlled to ensure effective and safe use of the medicinal product. The authors found that off-label use of lenalidomide e.g. for the treatment of myelodysplastic syndromes in Germany was low. The study shows that health insurance databases are a valuable source for supporting risk management plans for new drugs.

The German Society for Medical Informatics, Biometry and Epidemiology (GMDS) states in its ethical guidelines, that professional expertise according to the state of the art in science and technology are the very prerequisite for responsible professional action. Hence GMDS provides certificates for each of its disciplines certifying high standard of education in that discipline for an individual professional. The certificate guidelines for epidemiology from 1992 have now been revised and Zeeb et al. presented the revision process and the current version of the guidelines [13], which may be of interest for an international audience as well.

Professional expertise needs life-long learning. However, available literature is often criticized to be too technical and hard to understand for end-users. This holds e.g. for regression models for ordinal response variables. Schlarman et al. help by an overview of popular ordinal regression models and outline the advantages of its model results [14].

During the last 12 months education and learning and respective IT-related tools were one hot topic in MIBE again. Due to the high popularity of mobile devices like smartphones, barriers for mobile learning are becoming less. Walther therefore showed general properties of so-called native, hybrid, and web applications, their advantages and various development options [15]. Riemer and Abendroth introduced “Virtual Patients” (VPs) enabling medical students to simulate a patient encounter before their first real patient contact. They report on evaluation results for five different approaches [16]. Evaluation of teaching methods in case-based teaching is the topic of von Müller et al. as well. They compared two ways of presenting medical cases in an empirical study among medical students and found better results for more structured e-learning systems [17]. IT-related tools may not only be used for teaching and practicing but also for examination. Muche et al. present a tool supporting short but frequently performed examinations during a term and reducing teachers’ workload [18].
As we discussed before, optimizing processes in medicine is one of our goals. Dealing with processes in patient care must not blind out their economic aspects and consequences. Therefore it fits well to MIBE – and MIM – that Walser et al. dealt with health economic aspects of information systems in hospitals. Based on a written survey of all Swiss hospitals in the German-speaking regions of the country they explored the question of how Swiss hospitals can establish a coherent performance management system with a long term orientation [19]. They found that the tools are in place but the challenge remains to make use of it.

Last but not least we would like to draw your attention to a very special paper. Last year the editor in chief of MIBE asked Reinhold Haux, editor in chief of MIM, who his most important teachers were. That was on occasion of Reinhold Haux’ 60th birthday. Well, he didn’t give a quick answer but – after a while – a manuscript. In this paper Haux finally provides a most interesting overview of his personal professional career, which in fact is and explains a considerable part of Medical Informatics history [20]. A little bit different from usual papers this one presents important insights not only at its end but especially in the preliminaries: Young scientists need encouragement for their career already in primary and high school, enough time for their professional development and patience on their teachers’ side, freedom to find their own way and finally opportunities to go on unusual paths. Later in 2013 Reinhold Haux received the ‘IMIA Award of Excellence’ and he took the MIBE paper as a basis for his lecture. Hence you can read most of his thoughts in an English version including these extremely motivating sentences: “Medical informatics is a wonderful discipline […] [it] has many facets, all of them are both, challenging and fantastic. Medical informatics is …” (continued in [21]).

References

20. Haux R. “Who were your most important teachers?” GMS Med Inform Biom Epidemiol 2013; 9 (3); Doc15. DOI: 10.3205/mibe000143. URN: urn:nbn:de:0183-mibe0001434.