Good Medicine and Good Health-care Demand Good Information (Systems)

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Summary
The demand for evidence-based health informatics and benchmarking of ‘good’ information systems in health care gives an opportunity to continue reporting on recent papers in the German journal GMS Medical Informatics, Biometry and Epidemiology (MIBE) here. The publications in focus deal with a comparison of benchmarking initiatives in German-speaking countries, use of communication standards in telemonitoring scenarios, the estimation of national cancer incidence rates and modifications of parametric tests. Furthermore papers in this issue of MIM are introduced which originally have been presented at the Annual Conference of the German Society of Medical Informatics, Biometry and Epidemiology. They deal as well with evidence and evaluation of ‘good’ information systems but also with data harmonization, surveillance in obstetrics, adaptive designs and parametrical testing in statistical analysis, patient registries and signal processing.

"Good medicine and good healthcare demand good information" [1] is the motto of Methods of Information in Medicine (MIM). According to Ammenwerth’s paper on evidence-based health informatics [2] in the last issue of MIM good medicine and good healthcare demand good information systems as well and we need evidence when assessing an information system as good or not good. Hussein complemented this in a related discussion paper [3] with a demand for benchmarking information systems in health care.

This gives reason to continue annual reporting to MIM readers on selected papers of MIM’s German sister, the e-journal GMS Medical Informatics, Biometry and Epidemiology (MIBE), because its most recent paper takes that suggestion. Jahn et al. provide a taxonomy for benchmarking projects for hospital information systems and use it as a basis for a comparison of benchmarking initiatives in German-speaking countries [4]. Since there are a lot of benchmarking initiatives they recommend to analyze precisely examined benchmarking subjects (e.g. clinical information processes, IT service processes, application systems) and parameter types (time, cost, quantities, quality) before joining an initiative.

But Ammenwerth’s paper and the motto of MIM gives also an opportunity to draw your attention to some papers presented in this issue of MIM. At last year’s annual conference of the German Association for Medical Informatics, Biometry and Epidemiology (GMDS) we identified excellent presentations and invited their authors to submit related papers to MIM. Those accepted are presented in this issue. The paper of Ammenwerth et al. shall be mentioned first, because their paper put the before mentioned one into action. The telemonitoring programme MyCor (Myokardinfarkt und Koronarstent Programm in Tirol) is a multi-modal intervention programme to improve lifestyle and medication management of patients with coronary heart disease (CHD). It includes patient education, self-monitoring with goal-setting and feedback, and regular clinical visits. Ammenwerth et al. evaluated the MyCor telemonitoring programme regarding technical feasibility, user acceptance, patient adherence, change in health status, and change in quality of life [5].
Piro et al. are also dealing with good information systems. Using standards for constructing them is accepted to be a necessary condition for good information systems in hospitals. This holds as well for telemonitoring scenarios if motion data from sensors in patients’ homes shall be sent via smartphones to a physician for assessment. Piro et al. elaborate in MIBE a concept on how continuously measured motion data can be transferred according to the guidelines of the Continua Health Alliance and IHE, and which adaptations are reasonable to achieve high efficiency [6].

IHE is in the focus of a MIM paper of Stäubert et al. as well. The authors address the huge complexity of IHE which much too often hinders application of IHE profiles in designing architectures of health information systems. They modelled IHE profiles using the information system modelling tool 3LGMS and thus offer templates for constructing IHE compliant information systems in health care [7]. On the other hand this approach may support IHE developers in avoiding contradictions in the complex IHE system of profiles.

Berlage et al. focus at critical situations at birth. Severe and very rare obstetric complications (e.g. eclampsia, postpartum haemorrhage or uterine rupture) typically culminate in a chaotic and dangerous situation. Outcome for mother and child depends on whether doctors and midwives are able to quickly take correct decisions and initiate optimal treatment. Here in MIM the authors introduce GerOSS (German Obstetric Surveillance System) which aims at generating deeper insight into relevant risk factors to improve diagnosis and treatment of those severe complications [8].

In order for good information to become meaningful to clinicians they must be presented in a manner that provides cognitive support. The paper of Flemming et al. proposes a new way of visualizing the core information of a clinical case in a graphical format. The so called cognitive maps of the clinical case are problem based and are meant to be used in time restricted communication scenarios such as patient handovers [9].

The next MIM paper comes back to Ammenwerth’s demand for evidence when assessing information and information systems as being ‘good’. Liebe et al. emphasize that health information systems’ main task is to support clinical workflows and clinical information logistics. They present a workflow composite score which helps measuring IT support of clinical workflows and to examine its quality based on reliability and validity [10].

Good information needs not only information systems and information technology but adequate methods for data analysis as well. A fundamental basis for decision making in cancer care and for clinical trials in this field is reliable knowledge about incidence rates on cancer. In MIBE Haberland et al. estimate German incidence by multiplying modeled national mortality with modeled incidence to mortality ratios obtained from regional German cancer registries [11]. To achieve a greater stability in the results the included indicators are previously estimated (smoothed) using joinpoint models. Doing so they found that German cancer incidence for men declined since the 1990s whereas for woman the rates are rising since years.

In clinical trials interim analyses are used in order to enable early decisions. However, it appears unfeasible to stop the patient recruitment during such an interim analysis. Therefore, new patients, so called interim patients will enter the trial while the interim analysis is ongoing. If the superiority of a treatment is shown in the interim analysis, the trial is stopped. But if a smaller or contrasting treatment effect is observed in interim patients, this might lead to a withdrawal of the earlier superiority proof. In this issue Schmidt et al. propose strategies of planning and analyzing group sequential and adaptive designs with discrete test statistics while accounting for interim patients and thus avoiding problems with interim patients [12].

But for clinical trials in particular and for medical research in general patient registries are crucial. There is a wide range of commercial, open source and self-developed software systems available. Therefore Lindoerfer and Mansmann performed a systematic review of the literature to define CIPROS, a catalogue of relevant criteria to construct a minimal appraisal standard [13].

In many cases medical research has to be undertaken in medical research networks and joint data analysis is a key requirement. But usually data are stored in heterogeneous formats at each network partner and their harmonization is a challenge to achieve good information. A generic approach for the harmonization process of heterogeneous data in research networks is presented by Firnknorn et al. Experiences with the method are reported from harmonizing data from three sites within the German Center for Lung Research and its Lung Cancer Phenotype Database. In this setting i2b2 is used as data warehouse [14].

Besides trials signal processing is another important aspect of data analyses. To analyze heart rate variability of children with epilepsy or EEG for diagnostic reasons, respective signals have to be decomposed. Empirical mode decomposition (EMD) is a frequently used signal processing approach which adaptively decomposes a signal into a set of narrow-band components. Schiecke et al. found that their decomposition method based on the Kuhn-Munkres algorithm has benefits in comparison to the state-of-the-art hierarchical cluster analysis such that it can be used for automated EMD-based processing concepts for biomedical signals [15].

Complementary to MIM there is a tradition at MIBE of discussing statistical methods for good data analysis in more detail. Therefore we would like to introduce as well a more methodological paper. In empirical research, the distribution of observations is usually unknown. This creates a problem if parametric methods are to be employed. The functionality of parametric methods relies on strong parametric assumptions. If these are violated the result of using classical parametric methods is questionable. Handschuh et al. [16] presented an approach considering deviations of data distribution without changing the hypotheses.

Last but not least I would like to remind, that health care has an economic and a political dimension too. In MIBE Elsner et al. examined health economic effects due to regulatory standards and hospital plan-
ning requirements like so called “minimum procedure quantities”. They present a method for simulating effects of such regulations based on data from the quality reports of German hospitals. Based on such simulation they predict benefits in “life years gained” (LYGs) per year as result of certain regulations [17].

References