Health Technology Assessment

Findings from the Section on Assessing Information Technologies for Health

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Summary

Objectives: To summarize current excellent research in the field of health technology assessment.

Methods: Synopsis of the articles selected for the IMIA Yearbook 2006.

Results: Five excellent articles representing the research in four different nations were selected for the IMIA Yearbook 2006 from three international peer reviewed journals.

Conclusions: The best paper selection for the Yearbook section 'Assessing Information Technologies for Health' presents papers evaluating the benefit and side-effects of information technology in various settings. They clearly indicate that benefit of IT in health care can be achieved when the systems are appropriately designed, implemented and operated. Besides the presented quantitative studies, also qualitative study designs are of value to find unintended effects of IT, or to better explain found effects. IT evaluation supports a reflective practice on how health informatics influences health care, enabling the emergence of an evidence-based health informatics.

Haux R, Kulikowski C, editors. IMIA Yearbook of Medical Informatics 2006. Methods Inf Med 2006; 45 Suppl 1: S16-9.

Keywords

Medical Informatics, International Medical Informatics Association, Yearbook, evaluation, health technology assessment

Introduction

Nowadays, it is hard to imagine health care without information technology (IT). Introduction of IT can radically affect health care organisation and health care delivery and outcome. It seems evident that the use of modern IT offers great opportunities to increase efficiency, effectiveness and appropriateness of care [1-4]. However, there can also be hazards associated with information technology in health care: IT can be inappropriately specified, have functional errors, be unreliable, user-unfriendly, ill-functioning or the environment may not be properly prepared to accommodate the IT in the working processes, leading to sub-optimal support or even to negative effects on patient care [5]. It is therefore deemed good practice to identify both benefits as well as potential side effects of IT on quality of health care by conducting systematic evaluation studies [6]. Evaluation can be understood as "the act of measuring or exploring properties of a health information system (in planning, development, implementation, or operation), the result of which informs a decision to be made concerning that system in a specific context" [6].

The literature presents a large number of evaluation studies, such as evaluation of telemedical applications [7], of decision support systems and guideline-based systems [8], of computerized order entry systems [9], of electronic medical records [10] or mobile tools [11]. Evaluation studies have focused on various parameters such as usage patterns [12], user satisfaction [13], efficiency of working processes [14], appropriateness of care [15], organizational aspects [16], costs [17], patient satisfaction [18] or outcome of care [19]. Both quantitative as well as qualitative methods are applied to evaluate IT systems in health care. On overview on recent evaluation research is presented by [20].

Best Paper Selection

The best paper selection of articles for the section 'Assessing Information Technologies for Health' in the IMIA Yearbook 2006 reflects these trends.

Five excellent articles representing the research in four different nations were selected from three international peer reviewed journals in the fields of medicine and health informatics. Table 1 present 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 'Assessing Information

Table 1: Best paper selection of articles for IMIA Yearbook of Medical Informatics 2006 in the section 'Assessing information technologies for health'. The articles are listed in alphabetical order of the first author's surname.

Section Assessing Information Technology for Health
▪ Cappuccio FP, Kerry SM, Forbes L, Donald A. Blood pressure control by home monitoring: meta-analysis of randomised trials. BMJ 2004; 329(7458): 145.
▪ Garrido T, Jamieson L, Zhou Y, Wiesenthal A, Liang L. Effect of electronic health records in ambulatory care: retrospective, serial, cross sectional study. BMJ 2005; 330(7491):581.
▪ Kawamoto K, Houlihan CA, Balas EA, Lobach DF. Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success. BMJ 2005; 330(7494):765.
▪ Martinez A, Villarroel V, Seoane J, del Pozo F. A study of a rural telemedicine system in the Amazon region of Peru. J Telemed Telecare 2004; 10(4):219-25.
▪ Rood E, Bosman RJ, van der Spoel JI, Taylor P, Zandstra DF. Use of a computerized guideline for glucose regulation in the intensive care unit improved both guideline adherence and glucose regulation. J Am Med Inform Assoc 2005;12(2):172-80.

Technologies for Health' presents papers evaluating the benefit and side-effects of information technology in various settings. They clearly indicate that benefit of IT in health care can be achieved when the systems are appropriately designed, implemented and operated. All papers use more quantitative methods, applying e.g. randomized control trial designs. The chosen approaches allow to measure effects and to attribute them to the use of IT systems. However, as we learn from the literature [21-25], also more open, qualitative study designs are of value to find unintended effects of IT, or to better explain found effects. As the analysis in [20] shows, these approaches are still under-represented in health informatics, and should thus be strengthened. In any case, IT evaluation supports a reflective practice on how health informatics influences health care, enabling the emergence of an evidence-based health informatics.

Up-to-date information about current and future issues of the IMIA Yearbook is available at http://iig.umit.at/yearbook.

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Appendix: Content Summaries of Selected Best Papers, Section Assessing Information Technology for Health*

Cappuccio FP, Kerry SM, Forbes L, Donald A.

Blood pressure control by home monitoring: meta-analysis of randomised trials.

BMJ 2004; 329(7458): 145.

High blood pressure is one of the most readily preventable causes of cardiovascular complications. Blood pressure is mostly monitored in the clinical setting by healthcare professionals, but home monitoring of blood pressure is becoming popular. The authors provide a meta-analysis of the effect of home blood pressure monitoring on blood pressure levels. For their review, they analyzed 18 Randomized Controled Trials (RCTs) that either assessed changes in blood pressure control or the proportion of people with blood pressure above target. All studies together included 1.359 people in the study group (home or self blood pressure monitoring) and 1.355 patients in the control groups (blood pressure monitoring by healthcare professionals in clinical settings). The results show that the overall effect of home monitoring was 4.2 mmHg for systolic blood pressure (analyzed by 13 studies) and 2.4 mmHg for diastolic blood pressure (analyzed by 16 studies). The funnel plot shows some asymmetry which is seen as an indication for publication bias, preferring the publication of positive study outcomes. The authors summarize that their meta-analysis showed that self blood pressure monitoring results in better blood pressure control, even when the found effect is comparatively small. The paper provides clear evidence for the feasibility and effectiveness of home monitoring technology in the management of high blood pressure.

Garrido T, Jamieson L, Zhou Y, Wiesenthal A, Liang L.

Effect of electronic health records in ambulatory care: retrospective, serial, cross sectional study.

BMJ 2005; 330(7491):581.

Electronic health records (EHR) are expected to increase accessibility, accuracy, and completeness of clinical data and thus affect efficiency of care. To validate this assumption, the authors conducted a retrospective serial cross-sectional trial in two Kaiser Permamente regions in the United States. Those integrated healthcare delivery regions serve around 400.000 members and had both implemented electronic health records (EHR). The authors used available performance data such as age-adjusted office visit rates and the data on the use of emergency, radiology, and laboratory services. They assessed the quality of care by using available quality indicators such as the percentage of members receiving advice on stopping smoking or participating in cervical cancer screening. Data was compared some years before, during and after full EHR implementation. The results show that both regions had significant decreases in the use of ambulatory services. The percentages of members making more than two visits a year declined - in other regions, where no EHR was implemented, no comparable decreases could be found. The number of telephone contacts per member increased significantly, and doctors reported being able to resolve health issues by phone quicker with the EHR. Changes in age-adjusted rates of use of radiology or laboratory services were inconclusive. The selected indicators for the quality of care remained mostly unchanged after EHR implementation. The authors summarize that readily available EHR data allowed doctor to replace visits by telephone contacts and lead to a decreased use of primary and specialty services. These changes did not affect the quality of care. Confounding variables such as organizational pressure to reduce use of ambulatory care, or reduced practitioner availability, could not be identified by the authors. The paper shows how available longitudinal data can give information on possible effects of EHR implementation on the use of ambulatory care. It shows how EHR can help to increase efficiency of resource utilization.

Kawamoto K, Houlihan CA, Balas EA, Lobach DF.

Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success.

BMJ 2005; 330(7494):765.

Clinical decision-support systems (CDSS) have the potential to increase the quality of care by providing evidence-based information and patient-specific recommendations. However, little is known on the system features that explain success or failure of CDSS. The authors conducted a quantitative literature review to identify specific CDSS features crucial for improving clinical practice. They included 70 randomized controlled trials (RCT) on both paper-based and computer-based CDSS directly used in patient care. Studies were assessed for significant improvement in clinical practice and for the presence of 15 potentially impor-

* The complete papers can be accessed in the Yearbook's full electronic version, provided that permission has been granted by the copyright holder(s)

tant system features. 68% of the found studies showed an improve in clinical practice. Multivariate logistic regression analysis identified four features as predictors for CDSS ability to improve patient care: the provision of decision support as part of clinicians' workflow, the provision of decision support at time and location of decision making, the provision of actionable recommendations instead of assessments, and the use of computers for decision-support. From those 32 CDSS that incorporated all 4 features, 94% were successful. The authors summarize that an effective CDSS must minimize the effort required by the clinicians to use the system. The paper presents quantitative evidence on system features important for CDSS success, based on a systematic analysis of available evidence from RCT.

Martinez A, Villarroel V, Seoane J, del Pozo F.
A study of a rural telemedicine system in the Amazon region of Peru.
J Telemed Telecare 2004; 10(4):219-25.

Health care in rural areas of developing countries is often sub-optimal due to insufficient communication infrastructure. The authors present a telemedical system that interconnects 39 isolated health care facilities in a rural area of Peru, most of them only reachable by river and not having telephone lines or stable electricity.
The system is based on radio for voice and data communication (to overcome the problem of missing telephone lines). Laptops were installed along with solar panels to overcome the problem of missing electricity. The telemedical infrastructure was used – among others - to provide distance education for the health professionals in the isolated facilities and to support voice and e-mail communication in case of emergency care. The telemedical system was evaluated 9 months of operation, using interviews with the involved health care professionals. The results show high satisfaction of the users e.g. with regard to usability of the system and effectiveness for distance education. In 645 clinical cases, the system was used for remote consultation. Users reported that in 58 cases, the system has saved the life of a patient due to improved decision making and quicker evacuation. Both amount and quality of communication between the involved health care facilities improved strongly. The monthly costs for maintenance of the system in all 39 involved facilities were around 700 US$, while the savings due to reduced number of trips (both of patients and health care professionals) were estimated to be around 1.700 US$ a month. The paper shows how cheap, reliable and easy-to-used technology can significantly improve both quality and costs of health care in underdeveloped areas.

Rood E, Bosman RJ, van der Spoel JI, Taylor P, Zandstra DF.
Use of a computerized guideline for glucose regulation in the intensive care unit improved both guideline adherence and glucose regulation.
J Am Med Inform Assoc 2005;12(2):172-80.

The adherence to clinical guidelines is often poor. Computerized systems are expected to increase guideline adherence. The authors implemented a guideline for glucose regulation as part of a clinical information system in an 18-bed intensive care unit and evaluated its effect on guidelines adherence. The study used a randomized control trial design with off-on-off design. In the main study period, the patients were randomized to either paper-based group or computer-based guideline group. In the computer-based group, alerts were used to increase guideline adherence. Data of 484 patients were analyzed. Results show that in the computerized guideline group, glucose measurement timing adherence was significantly higher both compared to the paper-based guidelines group and to the pre-intervention time period, with less number of samples taken too late and a reduced deviation from the advised measurement time. In addition, adherence to dose advice was much higher in the computer-based guideline group. The percentage of time patients' glucose levels were within target range was also significantly higher in the computer-based group. The authors conclude that guideline adherence can be considerably improved by computerized guidelines compared to paper-based guidelines with respect to timing and dosing.