

# Advances in Education and Consumer Health Informatics

## Findings from the Section on Education and Consumer Informatics

M. Marschollek, Managing Editor for the IMIA Yearbook Section on Education and Consumer Informatics

Technical University of Braunschweig, Institute for Medical Informatics, Braunschweig, Germany

### Summary

**Objectives:** To summarize current excellent research in the field of education and consumer health informatics.

**Method:** Synopsis of the articles on education and consumer health informatics selected for the IMIA Yearbook of Medical Informatics 2007.

**Results:** The consumer health informatics papers selected reflect the growing importance of communication and information retrieval systems in health care both for patients and professionals. Sound exemplary studies point out both the benefit for patients as well as the economic advantages of such systems. On the education sector, an intelligent tutoring system for medical students based on natural language dialogue serves as an example for the advancement and refinement of methods.

**Conclusion:** The selected articles demonstrate the potential of advanced communication and information systems in health care. The physician-patient relationship though must not be affected by the introduction of these systems in order to ensure acceptance by both patients and physicians. Therefore these tools should be used in addition to current processes, and not as a replacement.

### Keywords

Medical informatics, International Medical Informatics Association, Yearbook, education, consumer health informatics

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## Introduction

Communication in terms of conveying information between professionals and laypersons often is a problem. This applies especially to health care where rising costs often lead – among other things – to a reduction of conversation time between patient and doctor. ICT solutions, in particular using Internet-based communication and electronic health records [1, 2], are deemed to provide a solution, but several obstacles prevent their widespread use [3]. One of these obstacles is the lack of sound evaluation studies that not only demonstrate acceptance and benefits for both patients [4] and health care professionals, but also consider the cost effectiveness of the systems used [5]. ICT methods for the education of medical professionals have reached a level of advanced maturity in many countries [6] and are on the rise for patient education [7, 8]. Trustworthiness, relevance and quality of content on health-related websites are key issues here [9].

## Best Paper Selection

The selected best papers for the section *Education and Consumer Informatics*

(Table 1) address some important problems mentioned above. A brief content summary of each paper can be found in the appendix.

Three of the four papers describe systems used for improving either communication between patients and health professionals or patient information, stressing the growing importance of active patient involvement in the health care process. Baker et al. report on the results of a large study on health care spending using an Internet-based communication system, concluding that their system can effectively reduce overall costs [5]. Gaudinat et al. present an advanced health information search engine that combines several methodical approaches for retrieving relevant and reliable documents [9]. Van den Brink et al. show in a prospective study that their information support system not only is well-accepted by patients but also facilitates detecting unexpected health problems of post-surgical head and neck cancer patients [4]. The fourth paper describes the development, architecture and evaluation of an advanced natural language tutoring system for medical students which is able to adapt dynamically to the learner's abilities [10].

**Table 1** Best paper selection of articles for the IMIA Yearbook of Medical Informatics 2007 in the section 'Education and Consumer Informatics'. The articles are listed in alphabetical order of the first author's surname.

Section
<b>Education and Consumer Informatics</b> <ul style="list-style-type: none"> <li>▪ Baker L, Rideout J, Gertler P, Raube K. Effect of an Internet-based system for doctor-patient communication on health care spending. <i>J Am Med Inform Assoc</i> 2005;12(5):530-6.</li> <li>▪ Gaudinat A, Ruch P, Joubert M, Uziel P, Strauss A, Thonnet M, et al. Health search engine with e-document analysis for reliable search results. <i>Int J Med Inform</i> 2006;75(1):73-85.</li> <li>▪ van den Brink JL, Moorman PW, de Boer MF, Pruyn JF, Verwoerd CD, van Bommel JH. Involving the patient: a prospective study on use, appreciation and effectiveness of an information system in head and neck cancer care. <i>Int J Med Inform</i> 2005;74(10):839-49.</li> <li>▪ Woo CW, Evens MW, Freedman R, Glass M, Shim LS, Zhang Y, et al. An intelligent tutoring system that generates a natural language dialogue using dynamic multi-level planning. <i>Artif Intell Med</i> 2006;38(1):25-46.</li> </ul>

## Conclusions and Outlook

The paper selection reflects that consumer health and educational systems have moved well beyond the prototype level and are evaluated in large studies to prove benefits and cost effectiveness. Both are necessary in order to gain acceptance from patients and health care professionals on the one hand, and to justify funding by health care organizations on the other hand. The study conducted by Baker et al. [5] therefore is – despite its several limitations – a valuable contribution to the current research on health communication systems. The improvement of patient information, thus enabling informed decision-making, is one sublime aim in consumer health informatics research. But we need to bear in mind the key importance of the physician-patient relationship which cannot be replaced by automated systems. These may be used as additional offers to enhance current procedures [4].

Up-to-date information about current and future issues of the IMIA Yearbook is available at <http://www.schattauer.de/index.php?id=1384>.

### Acknowledgement

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8. Marschollek M. Methods to meet the informational demands of patients and health professionals. *Methods Inf Med* 2006;45 Suppl 1:88-9.
9. Gaudinat A, Ruch P, Joubert M, Uziel P, Strauss A, Thonnet M, et al. Health search engine with e-document analysis for reliable search results. *Int J Med Inform* 2006;75(1):73-85.
10. Woo CW, Evens MW, Freedman R, Glass M, Shim LS, Zhang Y, et al. An intelligent tutoring system that generates a natural language dialogue using dynamic multi-level planning. *Artif Intell Med* 2006;38(1):25-46.

### Correspondence to:

Dr. Michael Marschollek, MD MSc  
 Technical University of Braunschweig  
 Institute for Medical Informatics  
 Muehlenpfordtstrasse 23  
 D-38106 Braunschweig  
 Germany  
 Tel: +49 531 3919504  
 Fax: +49 531 3919502  
 E-mail: m.marschollek@tu-bs.de

## Appendix: Content Summaries of Selected Best Papers, Section Education and Consumer Informatics\*

**Baker L, Rideout J, Gertler P, Raube K**  
**Effect of an Internet-based system for doctor-patient communication on health care spending**  
*J Am Med Inform Assoc* 2005;12(5):530-6

The use of Internet-based services as a means for communication between patients and health care professionals is on the rise. The authors report on the effects of the introduction of a communication service offering free-text messaging and a structured patient interview on health care spendings. They compare claims data of a treatment group before and during the service period. Additionally, these data are compared with data of a matched control group. Although the usage of the service is limited, the authors find statistically significant differences in spendings, both when comparing preservice and service periods in the treatment group and in comparison to the control group. Considering the costs for the electronic service itself, a net

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

difference of 1.54\$ for MD office spendings per person and month was found, denoting 3.3% of the total average spendings. The authors conclude that, despite several limitations of the study, the use of a structured electronic communication service can reduce health care costs.

**Gaudinat A, Ruch P, Joubert M, Uziel P, Strauss A, Thonnet M, Baud R, Spahni S, Weber P, Bonal J, Boyer C, Fieschi M, Geissbuhler A**

**Health search engine with e-document analysis for reliable search results**

**Int J Med Inform 2006;75(1):73-85**

This paper describes a search engine for reliable health information called WRAPIN (*World Reliable Advice for Patients and Individuals*) which has been developed in an EU-funded IST project. Different strategies are combined to refine user search queries and retrieve relevant documents, e.g. spell checking, query reformulation, multilingual MeSH mapping, co-occurrences and spatial proximity measures. The system automatically identifies and displays a key sentence out of a found document, e.g. a MEDLINE abstract. The authors report on an evaluation showing that users perceive their system as more informative (65% vs. 59%) and trustworthy (72% vs. 41%) than other search engines. They conclude that their system, which will be enhanced further, is a good alternative to general-purpose search engines.

**van den Brink JL, Moorman PW, de Boer MF, Pruyn JF, Verwoerd CD, van Bommel JH**  
**Involving the patient: a prospective study on use, appreciation and effectiveness of an information system in head and neck cancer care**

**Int J Med Inform 2005;74(10):839-49**

This paper reports on the results of a prospective study on the use of an electronic health information support system for post-surgical head and neck cancer care. The system supports four functions: 1. communication between patients (n=36) and health care providers (n=25, among them hospital physicians, General Practitioners, nurses and speech therapists), and also among providers, 2. information on head and neck cancer, 3. contact among patients, 4. monitoring of the patients by means of structured questionnaires. All patients used the system for six weeks and the frequency of use, the acceptance and the effectiveness in discovering health problems at an early stage were evaluated. The authors report a high acceptance of the system in the group of patients with a rating of 8.0 on a 10-point Likert scale, whereas the participating GPs rated it only 5.6. Besides, only 25% of possible GPs used the service at all. The monitoring function led to 16 unscheduled hospital appointments, and in half of the cases immediate action was deemed necessary. In three cases the monitoring function could not identify an occurring health problem before a regular outpatient visit. The

authors conclude that their system not only allows for early detection of health problems, but also conveys a sense of security to the patients, and that such systems should be used in addition to current practice.

**Woo CW, Evens MW, Freedman R, Glass M, Shim LS, Zhang Y, Zhou Y, Michael J**

**An intelligent tutoring system that generates a natural language dialogue using dynamic multi-level planning**

**Artif Intell Med 2006;38(1):25-46**

This paper describes the development, architecture, functions and evaluation of an intelligent tutoring system – *CIRSIM-Tutor* – for teaching a physiological problem to medical students by means of an advanced natural language dialogue. Exemplary tutoring sessions were recorded and analyzed in order to extract strategies and rules for tutoring students. The system presents different problems, analyzes the student's input, detects error patterns and adapts itself to the individual needs and abilities accordingly by dynamically rearranging the lesson plan. Natural text is used as input and output. The authors report on former evaluation experiments showing a significant increase in problem-solving abilities with students using their system as compared to a control group using textual materials only. They conclude that using an intelligent natural language tutoring system produces better learning gains than reading text.