

Virtual Patients

Virtuality and Virtualization in Health Care

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Abstract. In medical education and clinical care, representations of the patient help health care teams in planning and coordinating patient care, sometimes over geographic distances. This takes forms ranging from telemedicine consultations to using simulations and information and communication technology representations to plan, and at times, perform clinical procedures such as are done in intensive care units or in surgery. The increasing reliance on computer-mediated interaction in health care generally is considered the means to more efficient, equitable, and cost-effective care with reduced errors. Clinical work, then, may be carried out with simulated images and processes rather than through such physical processes as examining the patient directly. Instead of treating the actual person, one result may be that clinicians are treating computer-mediated representations of that person.

This session explores virtuality in health care environments, with a particular focus on the virtual patient. Panelists discuss treating representations of patients by addressing how: (1) usability studies reveal the extent to which physicians may pay more attention to representations of the patient condition rather than to the actual patient, (2) images may be considered as more real than the patient, (3) different graphic representations of patient data have different consequences, and (4) virtuality affects quality of care in virtual intensive care units. From different research and theoretical perspectives and studies in these different environments with different technologies, panelists discuss repercussions of virtuality on teamwork and service delivery in health care. Their presentations of developments leading towards virtual patients point towards significant issues of virtuality in other environments.

1 Introduction

Information technologies increasingly are being integrated into medical education and clinical care so that representations of "the patient," such as electronic health records and patient simulations, are becoming more prominent, and, in some cases, replacing the actual patient. These representations help health care teams in planning and coordinating patient care, sometimes over geographic distances. However, rather than treating the person, one result may be that clinicians are treating computer-mediated representations of the person. This trend takes forms ranging from telemedicine consultations to using simulations and information and communication technology (ICT) representations to plan, and at times, perform, clinical procedures. Clinical work, then, may be carried out with simulated images and processes, or in simulated environments, rather than through such physical processes as directly examining the patient.

The increasing reliance on computer-mediated interaction in health care generally is considered the means to more efficient, equitable, and cost-effective care with reduced errors. This techno-utopian perspective is counterbalanced by concerns over moving the locus of care from the actual patient to representations of the patient, and decision-making from the bedside to either the conference room or to health care team interactions mediated by the ICT.

Panelists explore virtuality in health care environments, with a particular focus on the virtual patient. They discuss the shift from treating the patient to treating representations of the patient. In particular, Peter L. Elkin will discuss how usability studies in health care reveal the extent to which physicians may pay more attention to representations than to actual patients, with significant consequences for organizational mission. Bonnie Kaplan will draw on ethnographic field research to present how the meaning of clinical images is negotiated, despite belief that the image represents "what's really there." She found that the image may be treated as more real than the patient. She will raise issues of objectivity and subjectivity in virtuality. Paul N. Gorman's studies of graphic representations of patient data explore the consequences of different ways virtual patients may be presented, to different effect, and, therefore, what different representations mean for team work and

organizational mission. Ross Koppel and Frank Sites will integrate these themes of how virtuality affects patient care by discussing how communication and coordination difficulties affect patient safety and quality of care change in a virtual intensive care unit.

From different research and theoretical perspectives and studies in different environments where different technologies were used, panelists discuss repercussions of virtuality on teamwork and service delivery in health care. Their presentations of developments leading towards virtual patients point towards significant issues of virtuality in other environments. Among these issues, the panel addresses general conference themes of:

- What is gained and lost by focusing on representations rather than actual individuals, including how creating the virtual may detract from interaction with the real;
- To what extent the medium matters, and how paper record representations and ICT ones compare in their effects and use;
- How individualized customer service and organizational mission can be enhanced or reduced by virtuality;
- How teamwork may change in virtual environments;
- What current trends towards increasing use of ICT in health care indicate about the nature, direction, and future of the technology, the work, and the organizations where this is occurring; and
- What virtuality in health care suggests about the dual nature of technology, in which human action and the social context in which the action takes place both shape the technology, while the technology simultaneously influences human action and social structures.

2 Panelists' Statements

Elkin: We do usability trials executed at Mayo to simulate how physicians would actually use different ICT applications that involve virtual representations of patients. Trials range from web-based teaching tools that train physicians to take their board examinations to accessing on-line medical records both to enter and obtain patient data. National policy recommends maintaining on-line medical records as an aid to coordinate patient care among various clinicians, while having physicians directly enter patient data is promoted as a way to reduce errors. The trials showed the medical records system caused the desk staff to turn their backs on patients. As a result, the system was revised substantially before implementation, and Mayo saved \$1,500,000 by not implementing a system that went against our culture.

Gorman: Clinicians develop models or virtual representations of each patient, but the models of a given patient by different clinicians are different. One example of this is the list of medications each clinician-entity maintains for each patient. My most recent work on medication reconciliation indicates that some of these lists differ, and are more appropriate than others. These differences can make

reconciliation difficult and potentially contribute to miscommunication. Understanding these differences can help us understand care processes and communication.

Kaplan: Results from two ethnographic studies of clinical images at medical centers raise issues of objectivity and subjectivity in virtuality, and suggest the importance of face-to-face meetings to negotiate the meaning of shared virtual representations.

In the first study, I did interviews and observations at the alpha site for a new system that incorporated clinical images into on-line patient records. For the second study, I conducted a week-long observation of one clinician to investigate how images were used in clinical work. At the first site, clinicians talked of on-line images as showing "what's really there" and lauded their improved ability to base clinical decisions on the images. At the second, where an on-line imaging system was to be developed, images, too, were objectified, even though I observed the meaning of the images being negotiated through in-person meetings and consultations.

Koppel and Sites: In an on-going study, we find that patient care and staff interactions are different when patients are in traditional intensive care units (vs. when patients are also tended by clinicians in virtual or electronic intensive care units (e-ICU). In e-ICUs, information from cameras and patients' monitors is sent in real time to a remote location (perhaps thousands of miles from patients). e-ICUs are presented as safeguards for patient safety, but they require close cooperation between bedside-clinicians and remote-clinicians. Even with virtual representations of patients and presumably seamless connections between locations, there are powerful differences in the information's reliability, quality, timing, and format. Sub-optimal information flow, data integration, and varying system acceptance by bedside clinicians, contribute to variations in care.

About the Panelists

Peter L. Elkin, MD is a Professor of Medicine at the Mayo Clinic College of Medicine. He is the index recipient of the Homer R. Warner award for outstanding contribution to the field of Medical Informatics. He is a fellow of the American College of Physicians and of the American College of Medical Informatics. He chairs the International Medical Informatics Association Working Group on Human Factors Engineering.

Paul N. Gorman, MD is Associate Professor of Medical Informatics and of Clinical Epidemiology, School of Medicine, Oregon Health & Science University, as well as the Assistant Director of Medical Education at Providence Portland Medical Center. A fellow of the American College of Medical Informatics, he chairs the American Medical Informatics Association Education Working Group, and was chair of the Information Technology in Health Care conference in 2004.

Bonnie Kaplan, PhD is a Lecturer in Medical Informatics at the Yale School of Medicine, and Yale College, and is an Adjunct Clinical Professor of Biomedical and Health

Information Sciences at the University of Illinois at Chicago. A Fellow of the American College of Medical Informatics and recipient of the American Medical Informatics Association President's Award, she chairs the International Medical Informatics Association Working Group on Social and Organizational Issues. Bonnie Kaplan co-chaired the IFIP 8.2 conference resulting in the book *Information Systems Research: Relevant Theory and Informed Practice*, 2004.

Ross Koppel, PhD, is the Principle Investigator of the study of The Role of Hospital Workplace Culture and Medication Errors—a project based at The University of Pennsylvania's School of Medicine. He is the President of the Association for Applied and Clinical Sociology and recipient of Applied Sociology's major awards.

Frank Sites, MHA, RN has over 13 years of health care, research, and administrative experience. He has worked in the health information technology industry, helping to customize and implement technologies in parallel with workflow process. Now the Operations Director for the Penn E-lert eICU, the telemedicine system at the University of Pennsylvania Health System, he has been intimately involved in the implementations of a major computerized physician order entry system across the health system and has worked to identify process changes in workflow.

Jan Talmon, PhD has been leading an EU-funded concerted action on System Engineering in Health Informatics with a focus on evaluation, he was co-leader of the EU-funded concerted action on Assessment of information Technologies In Medicine (ATIM), participated in various EU-funded projects in which he contributed to the evaluation work packages. He is chair of the International Medical Informatics Association Working Group on Technology Assessment and Quality Improvement, and co-editor of the *International Journal of Medical Informatics*.