Medical Informatics: Past, Present, Future
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Past President of IMIA

German Japanese Medical Informatics Symposium (GJMIS) in 2013
history of this talk

• From 1999 to 2012 I have been serving in the Board of IMIA, the International Medical Informatics Association, among others
• from 2007 to 2010 as its President.
• The ideas presented in this talk have been presented
  • first in 2009 at CoMHI in Hiroshima, Japan,
  • then, revised, at 2010 at Medinfo in Cape Town, South Africa.
• A manuscript appeared in 2010 in the International Journal of Medical Informatics.
• It was may ‘fare well gift‘ as President.
structure

• medical informatics
  • past
  • present
  • future
• discussion

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- medical informatics
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Summary points

- The aim of this essay is to reflect about medical informatics as a discipline.
- Its main goal is to emphasize some promising future research directions which may become important parts of medical informatics.

structure

- PLRI
- medical informatics
  - past
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- The aim of this essay is to reflect about medical informatics as a discipline.
- Its main goal is to emphasize some promising future research directions which may become important parts of medical informatics.
1969
P.L. Reichertz became professor at MHH
(Development of the MSH)

1974
Foundation of the Institute for Medical Informatics at MHH

1975-1988
Minor subject medicine at computer science program of TU Braunschweig, organized by Prof. Reichertz

1986
D.P. Pretschner became professor at Univ. of Hildesheim

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1996
Foundation of the Institute for Medical Informatics at TU Braunschweig

1997
Prof. D.P. Pretschner moved to TU Braunschweig

2004
Retirement of Prof. D.P. Pretschner

2007
Foundation of PLRI

1930 - 1987
Prof. Reichertz

1938 - 2007
Prof. Pretschner

40 years
medical
informatics
PLRI – Peter L. Reichert Institute for Med. Informatics

≥ 25 faculty, 3 (full/assoc.) professors

- Location TU Braunschweig
  - Health-enabling technologies
  - eLearning in medicine and dentistry
  - Health information systems and management
  - Other projects

- Location TU MH Hannover
  - Medicine
  - Dentistry

Research

Education

- Computer science
- Medical informatics
- Business information technology
- Computer and communication engineering

≥ 25 faculty, 3 (full/assoc.) professors

- Computer science
- Medical informatics
- Business information technology
- Computer and communication engineering
- Medicine
- Dentistry
What are important future research fields for medical informatics?

... and so to reflect about medical informatics as a discipline
dedicated to IMIA (and so to you);
it is a ‘gift‘ which you may (or may not) like
biomedical, health, medical, ... informatics?
medical informatics

- **What are important – original and relevant – future research fields for medical informatics?**

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medical informatics – past

some (few) milestones of the past

• 50 years ago: Ledley/Lusted, dec.-supp.
• 25 years ago:
  Jan van Bemmel: structure of our field, ...
  Peter Reichertz: HIS and research, ...
  Edward Shortliffe: research methodology, ...
  Jos Willems et al.: ECG-database, ...
• 10 years ago:
  Reed Gardner et al.: 20 yearsHELP
  IMIA recommendations on education
Hospital Information Systems - Past, Present, Future

Peter L. Reichertz
Institut für Medizinische Informatik
Medizinische Hochschule Hannover

Figure 5: Conceptional model of hospital information system

3.1 THE CORE OF HOSPITAL INFORMATION SYSTEMS

The center of information systems and the levels, as they developed both in pioneer installations and in the gradually evolving industrial software, is a central data structure and a means for communication. The patient "enters" the system through the admission,
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medical informatics – present

analyses e.g. by Schuemie, Talmon et al.
Mapping the domain of medical informatics.
medical informatics – present

• their summary: current medical informatics research concentrates on
  • the organization, application, and evaluation of health information systems
  • medical knowledge representation
  • signal and data analysis
medical informatics – future

• What are important – original and relevant – future research fields for medical informatics?

• always consider
  • the aims of medical informatics …
  • … and its driving forces (progress in inf. proc. methodology / ICT, medicine / health sc., society)

• two views to present the suggested research fields (details in the IJMI paper)
other references (excerpt)

- Sittig DF. Grand challenges in medical informatics? JAMIA 1994
- Haux R. Aims and tasks of medical informatics. IJMI 1997
- Greenes RA, Lorenzi NM. Audacious goals for …informatics … . JAMIA 1994
medical informatics – future

- research fields are grouped in medical informatics contributing to
  - good medicine and good health for the individual
  - good medical and health knowledge
  - well-organized health care
medical informatics – future

- research fields are grouped in medical informatics contributing to
  - good medicine and good health for the individual
  - good medical and health knowledge
  - well-organized health care
- MI / research fields with the aim to contribute
  - to progress in the sciences
  - to high-quality, efficient health care, and to quality of life
good medicine and good health for the individual

1) comprehensive electronic patient/health records combined with appropriate concepts for representing, accessing and visualizing health data

2) computer-enhanced decision support combined with appropriate concepts for reasoning and knowledge representation

3) comprehensive measurement and visualization of the human body

4) formal models for better understanding the functions or workings of the human body
medical informatics – future – view 1 (2/3)

5) comprehensive, easily accessible medical / health care knowledge bases

6) data mining and analysis for health reporting, health consulting and for identifying new medical knowledge

7) controlled medical vocabularies and their relation to models of health and disease
well-organized health care

8) effective architectures of HIS for patient-centered (not institution-centered) care and appropriate information management methods

with all these research fields being related to

9) understanding nature, properties and management of information in biological structures as well as in health care organizations

10) demonstration of effectiveness through evaluation studies
having in mind that today and in the near future

a) health has to be considered as integral part of life (not as disease episode(s))

b) medical informatics is addressing both, health professionals and individuals/consumers

c) the individual, is at the center of medical informatics research even though it can range in scale from molecules to populations

d) research, education and practice may shift more and more from local to global activities

the research fields can be structured into 16 groups
medical informatics – future – view 2 (2/6)

good medicine and good health for the individual

1) seamless interactivity with automated data capture and storage for patient care and beyond from perception to high-level semantic concepts, related to H-H, M-M, H-M interaction; not restricted to episodes

2) knowledge-based decision-support for diagnosis and therapy and beyond decision-support in its broadest meaning, context-aware, individualized

3) patient-centered data analysis and mining with representations of patient data based on appropriate semantic concepts
good medicine and good health for the individual

4) informatics diagnostics
   informatics tools form major part of the diagnostic entity

5) informatics therapeutics
   informatics tools form major part of the therapeutic entity

6) informatics capability-enhancing extensions
   both mental and physical
   implanted, immersive or external assistants
   providing a person with extended memories, senses, and connectivity
medical informatics – future – view 2 (4/6)

good medical and health knowledge

7) systematization of medical/health knowledge with formal representation, automated knowledge collection, beyond languages

8) analysis of medical and health knowledge incl. knowledge generation, quality assessing & certifying

9) identifying new disease patterns e.g. through pervasively measured sensor data, combined with molecular and clinical knowledge

10) modelling the virtual human more ‘in vitro experiments‘ through simulation
well-organized health care

11) elaborating concepts for appropriate health data bank architectures and for its organizations allowing a range of local to global offerings for storing and maintaining personal health data

12) elaborating concepts for patient-centered health information system architectures within and beyond health care institutions and its information management strategies considering data from ambient environments

13) automated, individualized health advice and education
with all these research fields being related to

14) analysing, creating and/or extending theories, concepts, and methods

15) systematic evaluation, from ‘phase 1’ lab experiments to ‘phase 4’ field tests

16) establishing and exploring the use of ‘living labs’
medical informatics - future

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• boundaries between disciplines may shift and as every discipline, medical informatics needs to be successful in the competition of sciences
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medical informatics - future

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medical informatics - future

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• and keep in mind: „life punishes those who delay” [Mikhail Gorbachev, 1989]
Many things have to be done and can be done, just let not sit back and let them happen by themselves. Don't let us only react to events which induce a change, let us actively prepare for a meaningful evolution.