

Recommendations for Health IT Evaluation Training as a Key Prerequisite to Obtaining Evidence

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Background

- Health IT can improve quality and efficiency of clinical processes and health outcome [1].
- But health IT can also pose risks to patient safety [2].
- **Systematic health IT evaluation studies** are needed to ensure health IT quality and safety.
- Evaluation is part of an **evidence-based health informatics approach** [3, 4].
- Evaluation is complex, with multiple levels of evaluation of socio-technical systems, various stakeholder viewpoints, and multi-factorial outcomes,
- To guarantee that evaluation studies are conducted in accordance with highest standards, **well-trained health informatics specialists** are needed.

Objectives

- To provide **recommendations for the structure, scope and content** of health IT evaluation courses to train these specialists.

Methods

- Joint initiative by the **Working Groups on Health IT Evaluation of EFMI (European Federation for Health Informatics), IMIA (International Medical Informatics Association) and AMIA (American Medical Informatics Association)**.
- Analysis of already running health IT evaluation courses at universities [5].
- Analysis of textbooks on health IT evaluation [6, 7].
- Workshops at MIE 2014, MIE 2015, Medinfo 2015 and AMIA 2015 to develop and refine the recommendations.
- Recommendations were finalized by members of all three working groups.



The chairs of EFMI, IMIA and AMIA Working Groups on Health IT Evaluation

Results

The recommendations focus on health IT evaluation courses:

- **Scope:** Theoretical & practical introduction into health IT evaluation.
- **Level of the course:** Master or postgraduate level.
- **Course objective:** Students should be able to:
 - a) Plan their own (smaller) evaluation study;
 - b) Select and apply selected evaluation methods,
 - c) Perform a study and report its results; and
 - d) Be able to appraise the quality and the results of published health IT evaluation studies.
- **Scale of the course:**
 - 6 ECTS (European Credit Transfer and Accumulation System)
 - equivalent to 4 U.S. credit hours.
- **Format of the course:** Modular, in-class, online or hybrid
- **Participants:** Recommendations address multidisciplinary groups of students, including e.g. computer science, health informatics, medicine, nursing, social science, information sciences, or business.
- **Practical training:** Practical training on evaluation methods and approaches should be included.
- **Prerequisites to attend the course:**
 - Basic research topics, scientific evidence, research design;
 - Literature searching and critical appraisal;
 - Ethical principles;
 - Quantitative and qualitative research methods;
 - Management of research projects;
 - Clinical care delivery processes and health IT.

MANDATORY CORE TOPICS:

Theory	
A1	Need for evidence-based health informatics (i.e. health IT and patient safety, efficiency, quality, user satisfaction), and reasons for undertaking evaluations
A2	Theories of evaluation (e.g. inductive or deductive, formative or summative)
Practice	
A3	Building an evaluation study (e.g. information need, stakeholder analysis, tailor the evaluation, steps of an evaluation study, obtain permissions)
A4	Study designs for health IT evaluation studies (e.g. experimental, quasi-experimental, observational)
A5	Indicators for health IT quality (structure, process, outcome quality) and their relation to clinical indicators
A6	Practical training in health IT evaluation (e.g. write an evaluation plan based on a realistic case study; conduct a real evaluation project; discuss & criticize a published evaluation study). May comprise frontline evaluation work in health care organizations or health IT industry.
Methods and metrics	
A7	Measurement principles (e.g. objectivity, reliability, validity of measurements, types of bias)
A8	Quantitative data collection methods in health IT evaluation
A9	Qualitative data collection methods in health IT evaluation
A10	Multi-methods approaches and triangulation
A11	Quality of health IT evaluation studies
Reporting	
A12	Reporting and publishing of an evaluation study
A13	Finding, appraising and interpreting the evidence from published evaluation studies
A14	Answering “so what...” questions: What do evaluation results mean for IT management and for the quality and safety of clinical processes? How can evaluation results impact health IT practice?
Ethics	
A15	Obtaining ethical approval for evaluation projects and other required permissions

OPTIONAL TOPICS:

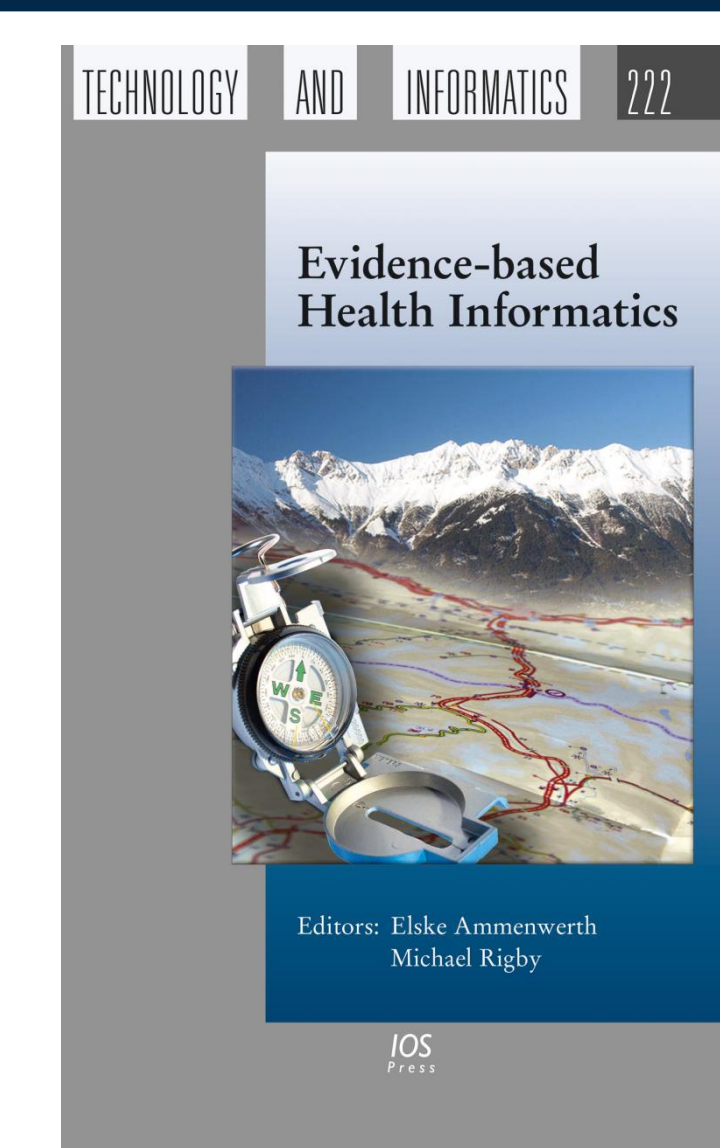
B1	Evaluation frameworks for health IT evaluation
B2	Evaluation of user and technology acceptance
B3	Evaluation of usability
B4	Technical evaluation (software testing)
B5	Evaluation of people and organizational impact
B6	Evaluation of clinical impact
B7	Economic evaluation
B8	Socio-technical and implementation-science approaches to evaluation
B9	Evaluation as part of quality and safety management and improvement frameworks
B10	Evaluation of data quality and data analytics
B11	Evaluation of health IT implementation
B12	Health Technology Assessment
B13	Systematic reviews and meta-analysis
B14	Simulation studies as an approach to evaluate health IT
B15	Regulatory issues impacting health IT evaluation

Discussion

- Recommendation describe 15 mandatory topics that can be covered by a 6 ECTS or 4 credit hours course, and 15 optional topics.
- More than 80 international experts and workshop participants contributed to these recommendations.
- Recommendations are not meant as a cookbook, but learning objectives and student background need to be considered when designing a course.
- Recommendations include practical training, on an individual basis or in an interdisciplinary student group.
- All of these efforts shall be seen as a step towards evidence-based health informatics, see [4].

We invite all teachers of health IT evaluation courses to use these recommendations when building or updating an evaluation course, to add their course description to [5] and to report on their experiences.

New book addressing the issue of evidence-based health informatics: E. Ammenwerth, M. Rigby, editors. *Evidence-based health informatics*. Stud Health Technol Inform 122; Amsterdam: IOS Press; 2016.



1. F. Lau, C. Kuziemsy, M. Price, J. Gardner, A review on systematic reviews of health information system studies, *J Am Med Inform Assoc* 17(6) (2010), 637-45.
2. Y.Y. Han, J.A. Carcillo et al, Unexpected increased mortality after implementation of a commercially sold computerized physician order entry system, *Pediatrics* 116(6) (2005), 1506-12.
3. M. Rigby, E. Ammenwerth, M. Beuscart-Zephir, J. Brender, H. Hyppönen, S. Melia, P. Nykänen, J. Talmon, N. de Keizer, Evidence Based Health Informatics: 10 years of efforts to promote the principle, *Yearb Med Inform* 8(1) (2013), 34-46.
4. E. Ammenwerth, M. Rigby, editors. *Evidence-based health informatics*. Stud Health Technol Inform 122; Amsterdam: IOS Press; 2016.
5. EFMI WG Eval, *Curricula of health IT evaluation courses*, Available from: <https://iig.umit.at/efmi/curricula.htm>.
6. C. Friedman, J.C. Wyatt, *Evaluation Methods in Medical Informatics*, 2nd ed, Springer, New York, 2006.
7. J. Brender, *Handbook of evaluation methods for health informatics*, Elsevier Academic Press, Burlington, MA, 2006.

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