

## Governance and Sustainability

- ***Towards Sustainability of Health Information Systems: How Can We Define, Measure and Achieve It?*** (PDF<sup>1</sup>)

- Sebastian Garde (a, b), Carola M. Hullina (b), Rong Chen (c), Thilo Schuler (d), Jana Gränz (a, e), Petra Knaup (f), Evelyn J.S. Hovenga (a)

a Health Informatics Research Group, Central Queensland University, Melbourne VIC & Rockhampton, QLD, Australia

bAustin Centre for Applied Clinical Informatics, Austin Health, Heidelberg VIC, Australia

c Department of Biomedical Engineering, Linköping University, Sweden

d Department of Medical Informatics, University of Freiburg, Germany

e Faculty of Computer Science, University of Applied Sciences Ulm, Germany

f Department of Medical Informatics, University of Heidelberg, Germany

- pp1179-1183 Proceedings MedInfo 2007, K. Kuhn et al. (Eds), IOS Publishing 2007.
- ***Abstract:*** Health information systems (HIS) in their current form are rarely sustainable. In order to sustain our health information systems and with it our health systems, we need to focus on defining and maintaining sustainable Health Information System building blocks or components. These components need to be easily updatable when clinical knowledge (or anything else) changes, easily adaptable when business requirements or processes change, and easily exchangeable when technology advances. One major prerequisite for this is that we need to be able to define and measure sustainability, so that it can become one of the major business drivers in HIS development. Therefore, this paper analyses general definitions and indicators for sustainability, and analyses their applicability to HIS. We find that general 'Emergy analysis' is one possibility to measure sustainability for HIS. Based on this, we investigate major enablers and inhibitors to sustainability in a highlevel framework consisting of four pillars: clinical, technical, socio-technical, and political/business.

## openEHR

- ***Towards a comprehensive electronic patient record to support an innovative individual care concept for premature infants using the openEHR approach*** (Elsevier pub site<sup>2</sup>)

- Buck J, Garde S, Kohl C, Knaup-Gregori P
- International Journal of Medical Informatics. 78(8): 521-531, 2009

- ***Graphical Overview and Navigation of Electronic Health Records in a prototyping environment using Google Earth and openEHR Archetypes.*** (PDF<sup>3</sup>)

- Erik Sundvall, Mikael Nyström, Mattias Forss, Rong Chen, Håkan Petersson, Hans Åhlfeldt Linköping University, Sweden

- pp1043-1047 Proceedings MedInfo 2007, K. Kuhn et al. (Eds), IOS Publishing 2007.

- ***Abstract:*** This paper describes selected earlier approaches to graphically relating events to each other and to time; some new combinations are also suggested. These are then combined into a unified prototyping environment for visualization and navigation of electronic health records.

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1. <http://www.google.com/publisher/health/medinfo2007-and-interaction-of-clinical-information-stored-using-openEHR-data-structures-and-archetypes>

2. <http://img.elsevier.com/locate/medinfo2009-521-531>

3. [http://www.openehr.org/publications/health\\_ict/MedInfo2007-graphicalEHR-Sundvall.pdf](http://www.openehr.org/publications/health_ict/MedInfo2007-graphicalEHR-Sundvall.pdf)

been combined with linear, polar and region-based views of clinical events related to time. The system should be easy to learn since all the visualization styles can use the same navigation. The structured and multifaceted approach to handling time that is possible with archetyped openEHR data lends itself well to visualizing and integration with openEHR components is provided in the environment.

- **The openEHR Java Reference Implementation Project.** ([PDF<sup>4</sup>](#))
  - Rong Chen (a), Gunnar O Klein (b).  
a Department of Biomedical Engineering, Linköping University, Sweden  
b Department of Medicine, Karolinska Institutet, Sweden
  - pp 58-62 Proceedings MedInfo 2007, K. Kuhn et al. (Eds), IOS Publishing 2007
  - *Abstract:* The openEHR foundation has developed an innovative design for interoperable and future-proof Electronic Health Record (EHR) systems based on a dual model approach with a stable reference information model complemented by archetypes for specific clinical purposes. A team from Sweden has implemented all the stable specifications in the Java programming language and donated the source code to the openEHR foundation. It was adopted as the openEHR Java Reference Implementation in March 2005 and released under open source licenses. This encourages early EHR implementation projects around the world and a number of groups have already started to use this code.  
The early Java implementation experience has also led to the publication of the openEHR Java Implementation Technology Specification. A number of design changes to the specifications and important minor corrections have been directly initiated by the implementation project over the last two years. The Java Implementation has been important for the validation and improvement of the openEHR design specifications and provides building blocks for future EHR systems.
- **Generic screen representations for future proof systems**
  - Helma van der Linden(a), Thilo Schuler(b), Rong Chen(c), Jan Talmon(a)  
a Medical Informatics, University Maastricht, The Netherlands  
b Department of Medical Informatics, University of Freiburg, Germany  
c Department of Biomedical Engineering, Linköping University, Sweden
  - Proceedings MedInfo 2007, K. Kuhn et al. (Eds), IOS Publishing 2007. ([PDF](#))
  - *Abstract:* Semantic interoperability should not only cover system interpretation of incoming information, but should be extended to include screen representation. This article describes a two-model approach to generate a screen representation for archetype-based information, which is inspired by the two-model approach used by openEHR for their archetypes. It provides a separation between software-related display knowledge and domain-related display knowledge and is designed with reuse of components in mind. This approach leads to a flexible GUI that can adapt not only to information structures that are not predefined within the receiving system and display them in a meaningful way, but also to novel ways of displaying the information. We are working on a proof of concept implementation to validate the approach.
- **Julius – a template based supplementary electronic health record system.** ([Biomed Central link<sup>5</sup>](#))  
Rong Chen, Gösta Enberg, Gunnar O Klein.  
BMC Medical Informatics and Decision Making 2007, **7**:10 doi:10.1186/1472-6947-7-10

## Regional Health

- **Regional Health Economies and ICT Services: the PICNIC Experience.** ([IOS Press page for this book<sup>6</sup>](#)).

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4. [http://www.openehr.org/publications/health\\_ict/Medinfo2007-openehr\\_java-ChenKlein.pdf](http://www.openehr.org/publications/health_ict/Medinfo2007-openehr_java-ChenKlein.pdf)
    - Niilo Saranummi, David Piggott, DG Katehakis, M Tsiknakis, Knut Bernstein (Eds.).
  5. <http://www.biomedcentral.com/1472-6947/7/10>
    - Volume 115 in Health Technology and Informatics series. IOS Press 2005.
  6. <http://www.iospress.nl/loadtop/load.php?isbn=158603538x>

Includes a chapter by Dipak Kalra, Thomas Beale T, Sam Heard on *openEHR*.

## Health Information System Architecture

- A flexible model for the delivery of multi-facet information in patient–centric Healthcare Information Systems ([PDF pub link](#)<sup>7</sup>)
  - Iraklis Varlamis (varlamis AT aueb.gr)  
Athens University of Economics and Business, Department of Computer Science
  - published in eJETA.org [Special Issue](#)<sup>8</sup> on Interoperability & Security in Medical Information Systems, May 2007
  - *Abstract*: This paper suggests a new approach for the development of healthcare information standards, which is based on widely used and open frameworks. The paper attempts a review of existing standards for healthcare information, analyses their deficiencies and focuses on the need for interoperability. Healthcare information, in order to be useful, has to be well formed, valid and flexible. Healthcare information standards are the pre-requisites for well-formed ness and validity of information. Flexibility expects "plug-and-play" information, which will be operable in any system, any time and any place. A standard that will be accepted world-wide and will cover all possible aspects of healthcare information needs sounds both infeasible and inconvenient due to its size and complexity. A more practicable solution is to provide an interconnection mechanism on top of all existing and future standards. This work specifies the two fundamental problems of information interoperability, which are structure and semantics, and suggests a mechanism that facilitates the integration of existing information, the mutation and transfer of information between healthcare information systems and eases interoperability.

## Health Records

- *An Ontology-based Model of Clinical Information.* ([PDF](#)<sup>9</sup>)
  - Thomas Beale (a), Sam Heard (b)  
a CTO Ocean Informatics, visiting Senior Research Fellow, University College London  
b CEO Ocean Informatics, Adjunct Professor, University Central Queensland
  - pp760-764 Proceedings MedInfo 2007, K. Kuhn et al. (Eds), IOS Publishing 2007.
  - *Abstract*: In this paper we describe a model of clinical information designed to make health information systems properly interoperable and safely computable. The model is a response to a number of categories of requirements, ranging from the semantic to the performance of software at runtime. We argue that the starting point of a successful model must be an ontological analysis of the process of clinical care delivery, seen as a scientific problem-solving process. From this approach we develop a classification of types of clinical information called the Clinical InvestigatorRecord (CIR) ontology.
- *PhD thesis: Clinical foundations and information architecture for the implementation of a federated health record service* ([UCL ePrints link](#)<sup>10</sup> - includes abstract)
  - Dipak Kalra
  - UCL (University College London) deposited 24 January 2006

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7. [Person-Centered Health Records Toward Health People.](#) ([Springer page for this book](#)<sup>11</sup>).

8. [http://www.e-jeta.org/index.php?option=com\\_content&view=article&id=104&Itemid=404](#) Jim E. Demme/eds, Robert M. Rodner, Gary A Christopherson (Eds.)

9. [http://springer.com/publications/health\\_ict/MedInfo2007-BealeHeard.pdf](#)

10. [http://eprints.ucl.ac.uk/tech/600184/](#) Includes a chapter by Ken Rubin, Thomas Beale, Bernd Blobel on Modelling for Health Care.

11. [http://www.springer.com/health\\_ict/health\\_ict/implementation\\_of\\_a\\_federated\\_health\\_record\\_service](#) *Electronic Health Records and Communication for Better Health Care.* (IOS Press page for this book)

book<sup>12</sup>).

- François Mennerat (Ed).
- IOS Press 2002.  
Includes a chapter by Dipak Kalra, Thomas Beale, Sam Heard on *openEHR*.
- **Design and Implementation of a Federated Health Record Server** (PDF<sup>13</sup>)
  - Kalra D 1, Austin 1, A, O'Connor 1, A, Lloyd, D 1, Patterson, D 2, Ingram, D 1  
1 University College London, CHIME, Holborn Union Building, Highgate Hill, London, N19 3UA  
2 The Whittington Hospital, Highgate Hill, London N19 5NF
  - Reprinted from: TEHRE 2001 m-Health Conference Proceedings; Paper 001 11-14 November 2001 Page 1

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12. <http://www.iospress.nl/loadtop/load.php?isbn=1586032534>

13. [http://www.openehr.org/publications/health\\_ict/UCL-TEHRE01-Reprint.pdf](http://www.openehr.org/publications/health_ict/UCL-TEHRE01-Reprint.pdf)