From Clinical Practice Guideline to Clinical Pathway – Issues of Reference Model-Based Approach

Hannes Schlieter¹, Werner Esswein¹

Department of Business Management and Economics, Chair for Information Systems, esp. Systems Engineering, Dresden, Germany
Agenda

- Project Background
- Theoretical Foundations
  - Clinical Pathway (CP) vs Clinical Practice Guideline
  - Fundamentals of Reference Modeling
  - Framework for Clinical Recommendations
- Motivation
  - Prior Research
- The Reference Model-Based Approach
- Analysis & Results
- Future Research
Project Background
The SOS-NET

Department of Business Management and Economics, Chair for Information Systems, esp. Systems Engineering

From Clinical Practice Guideline to Clinical Pathway – Issues of Reference
Model-Based Approach
Project Background
The SOS-NET

Department of Business Management and Economics, Chair for Information Systems, esp. Systems Engineering

SOS-Net - Stroke Network of Saxony

- Founded in 2007
- 13 hospitals within the network
- Healthcare network for regional stroke care (most important stroke structure in Saxony)
- Based on tele-medical infrastructure
- Goal:
  - quality treatment of all stroke patients independent to the regional location
  - Lyse indication in small time slot
The Internal Quality as „Greybox“

Care process in a network

- The internal quality is not visible
- Fulfillment of requirements can be checked

**Implication:**

The processes in the network can not unified, however, a minimum standard of the processes, of coordination and communication of network members need to defined.
Characteristics:

- CPGs are recommendations for action (no binding instructions)
- Systematically developed recommendations to support clinical activities
- Classified into different development stages (Level 1 to 3)
- Aggregation of evidence-based medicine

Aim:

- Improvement of clinical care and cost reduction
- Faster dissemination of evidence-based medicine
- Patient information of the good clinical practice

Level 1:
- expert opinion

Level 2:
- consensus-based guideline

Level 3:
- evidence-based guideline
Characteristics:

- Instrument for clinical process management
- CPs are interdisciplinary and multi-professional aspects
- Creation at local level („From the hospital for the hospital“)

Aim:

- Improvement of cost and process transparency
- Facilitate an active quality management (process quality improvement processes)
- Improvement of medical outcome
- Support of clinical documentation
- Definition of local standards

[Roed+2003], S.20 ff
**Framework for Clinical Recommendations**

Department of Business Management and Economics, Chair for Information Systems, esp. Systems Engineering

**Scenarion I:**
- Derivation of CPs based on CPGs

**Goal:**
- Reduction of manual work
- Methodological adaptation
- => Improve Process quality

**Scenario II:**
- Revision of CPGs
- Integrations and alignment of CPG and CP
From Clinical Practice Guideline to Clinical Pathway – Issues of Reference
Model-Based Approach
From Clinical Practice Guideline to Clinical Pathway – Issues of Reference Model-Based Approach
Nomenclatur of MDM:
• Published modeling language of Society of Medical Decision Making
• Goal: Comparison of CPGs

Critics:
• Insufficient adequacy of modelling language
• No Methodic for Adaption / No Construction Techniques [Broc2003]
Computer-interpretable formalization:

- In discussion since 1980s
- Different language with (GLIF, GUIDE, Proforma, GEM...)
- Goal: Transformation in decision support system

Critics:
- Formal, not good human understandable
- Only parts of information system, which can formalized

---

Modeling of computerized CPG-content

Transformation in formal format

Integration in Hospital information system

Approach of Jacobs:
- First reference model based approach
- Applied for mamma carcinoma

Critics:
- Arbitrary design decision
  - No evaluation of modeling languages
  - Reduction on one construction technique
- Weak validity of results

[Jacobs2006], S. 74ff
The Reference Model-based Approach

Department of Business Management and Economics, Chair for Information Systems, esp. Systems Engineering

CPG

For Reuse

Rules

Standards

With Reuse

<abstract>

<not allowed>

Specific Models of CPs

Process

Goals

KPI

….

24.09.2010

From Clinical Practice Guideline to Clinical Pathway – Issues of Reference Model-Based Approach
In Information System (IS) research reference models are used to communicate best practice, common practice or normative rules [Becker2004].

They minimize the design risk and maximize the acceptance of model results. Reusing conceptual models or parts of models represent an integral area in research about effective and efficient software engineering and organizational design [Hammel1999].

The purpose of reference models usage is a reduction of development costs and of development time [Schuette1998].

Reference models specify rules and standards that guarantee the compliance to adaptability of a standardized application system or the compliance to organizational rules.

Characteristics of Reference Models:
- Generality
- Adaptability
- Recommendatory character
Fundamentals of Reference Modeling
Construction Techniques

Department of Business Management and Economics, Chair for Information Systems, esp. Systems Engineering

- Configuration { Generating adaptation

- Specialization
- Aggregation
- Instantiation
- Analogy { Not generating adaptation

[Br03]

24.09.2010
From Clinical Practice Guideline to Clinical Pathway – Issues of Reference Model-Based Approach
• Specialization of a general model

Free Modification
Selection of reference model components in respect of criteria

The way of composition is in general rule independent
• RM pre-defines model elements, which are needed to be concretize
• Concretion without limitation or with limitation of range
- Rule based adaptation
- Selection of forethought models
- Result: Projection of variant of the model

All variants of modification are defined ex ante
From Clinical Practice Guideline to Clinical Pathway – Issues of Reference Model-Based Approach
Analysis & Results

From Clinical Practice Guideline to Clinical Pathway – Issues of Reference Model-Based Approach

Preparation of Project
- Organizational Preparation
- Identification path-elements of CP
- Guideline search
- CP-Guideline assignment

Modeling CPG Content
- If not modeled:
  - Identify clinical algorithm (skeleton) of CPGs
- If modeled:
  - Check Models

Implementation of Construction Techniques
- Definition of RM-Construction Techniques
- Implementation of Construction Techniques to CPG models

Adaptation of Reference Model
- Adaptation of Reference Model
- Extension with new aspects

Issue 1: Many-to-Many Relation between CPs and CPGs
Issue 2: Different CPGs to one indication
Issue 3: No standardization CPGs in structure
Issue 4: No standardization of modeling language
Issues 5: No definition of RM-Grammar for clinical context
Issue 6: Network participant use different CP designs
Issue 7: CPGs are more abstract than CPs
Issue 8: CPs describe addition aspect than COGs
Further Research

- Tool support for reference model construction and application
- Definition of standards for conceptual modeling of clinical practice guidelines including the RM techniques
- Extension of reference model-language to a reference model-based method
Thank you for your attention!

Contact: Hannes.Schlieter@tu-dresden.de
References

Department of Business Management and Economics, Chair for Information Systems, esp. Systems Engineering


24.09.2010 From Clinical Practice Guideline to Clinical Pathway – Issues of Reference Model-Based Approach
Consequences

Issue 1: Many-to-Many Relation between CPs and CPGs
Issue 2: Different CPGs to one indication

Issue 3: No standardization CPGs in structure
Issue 4: No standardization

Issue Network participant use different CP designs

Method, which guarantees a comparable result
Reference Model

Specific Models of CPs

Issues:
- level of abstraction
- different aspects
- representation

Similarities:
- Clinical Algorithm