Development and Implementation of Reference Models

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Overview

• Background
  – Reference models

• Clinical documentation
  – Efforts, challenges, lessons learned

• Knowledge management
  – Assets, lifecycle, tools

• Conclusions
BACKGROUND
Reference models

• Detailed **clinical models** that guide the implementation of robust and consistent **clinical documentation templates** within Electronic Health Record (EHR) systems

• Promote **standardization** of structured clinical data captured at the point-of-care – e.g. forms, flowsheets

• Compatible with different **EHR tools, clinical settings**, and **clinical professionals**
<table>
<thead>
<tr>
<th>Data Element</th>
<th>Data Type</th>
<th>Value Set List</th>
</tr>
</thead>
<tbody>
<tr>
<td>SET: Pain Assessment (ALWAYS INCLUDE)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Episode Duration</td>
<td>Numeric</td>
<td>NA</td>
</tr>
<tr>
<td>Pain Location</td>
<td>Category</td>
<td>abdomen</td>
</tr>
<tr>
<td>Pain Location Qualifier</td>
<td>Category</td>
<td>Right</td>
</tr>
<tr>
<td>Pain Quality</td>
<td>Category</td>
<td>Ache</td>
</tr>
<tr>
<td>Relative Temporal Context</td>
<td>Category</td>
<td>Post-operativeprocedure</td>
</tr>
<tr>
<td>Pain Assessment Severity Scale Selection for Cascade</td>
<td>Category</td>
<td>List of validated scales:</td>
</tr>
<tr>
<td>Pain Severity Score [using validated scale]</td>
<td>Category</td>
<td>Use Numeric 0-10 Scale Scores:</td>
</tr>
<tr>
<td>Is Pain Relief Acceptable?</td>
<td>Boolean</td>
<td>Yes</td>
</tr>
</tbody>
</table>
CLINICAL DOCUMENTATION
Acute Care Documentation (1/3)

• **Publication:**

• **Context:**
  – Large strategic initiative back in 2007 to develop **standardized acute care documentation** across two major academic medical centers: Brigham and Women’s Hospital and Massachusetts General Hospital
Acute Care Documentation (2/3)

• **Goals:**
  – **Highly structured documentation** to fulfill clinical needs, regulatory reporting, and data reuse
  – All **clinical disciplines** (e.g. nursing, medicine, social work, physical therapy, nutrition, occupational therapy)
  – Proactive **data standardization** in an effort to avoid ambiguity and duplication – e.g. naming convention for data elements, reuse of value sets, etc.

• **Results:**
  – Over **11,000 data elements** defined, used in over **1,000 documentation templates** – e.g. initial patient assessments, progress notes, procedure and perioperative notes, event notes, transfer notes, discharge notes, assessment scales, flowsheets, etc.
  – Bedside documentation system was **not** implemented
• **Challenges:**
  – **Clinical** requirements *well understood* by stakeholder groups - easily gained traction when cited as a rationale for content development requirements
  – **Knowledge management** and **informatics** requirements *not well understood* – formal processes to garner support and adherence
  – Limited resources, **expertise**, and competing priorities

• **Lessons learned:**
  – Assess **knowledge needs** and set **expectations** at the start of the project
  – Define an accountable **decision-making process**
  – Increase team **meeting moderation** skills
  – Ensure adequate **resources** and **competency training** with online collaborative tools
  – Develop **goal-oriented** teams and consultative **service-based** teams
Large-scale EHR implementation (1/4)

• **Publications:**


Large-scale EHR implementation (2/4)

• **Context:**
  – **System-wide** vendor EHR implementation (2012-2017) – replace existing clinical systems

• **Goals:**
  – Minimize *(resolve)* **inconsistent data definitions** across EHR applications and clinical settings, enabling and promoting **data reuse** and **interoperability**
  – **Practical** *(pragmatic)* approach to **governance** and **implementation** of structured data elements and reference models
    - Factors: resource allocation, implementation timeline, content refactoring, vendor best-practices, EHR limitations, etc.
Large-scale EHR implementation (3/4)

• **Process:**
  1. Identify clinical topics – align with strategic goals of the organization
  2. Create **draft** reference model(s) – find/consolidate/reuse models
  3. Quantify downstream data needs – reporting, regulatory requirements, clinical decision support, accurate billing, etc.
  4. Prioritize clinical topics – focus on high-value topics
  5. Validate reference model(s) – clinically accurate and complete
  6. Quantify gap with EHR content – prioritize revision/refactoring
  7. Disseminate **validated** model(s) – guide new content or revisions
  8. Request revisions to EHR content – change management process
  9. Assess reference model utilization – implementation and compliance
  10. Monitor for new evidence - revisions to reference model (**evergreen**)
Large-scale EHR implementation (4/4)

- **Results:**
  - Data elements: +15,000 (forms) and +45,000 (flowsheets)
  - Dedicated workgroup: +5 reference models (*discontinued*)
    - Pain Assessment: 47 data elements organized into 9 data groups
  - EHR system successfully implemented at all sites

- **Challenges:**
  - Implementation timeline **incompatible** with the development of detailed reference models
  - EHR **processes** and **tools** not designed to promote detailed, consistent, and reusable data definitions **across** applications and modules
  - EHR content & data refactoring is an **iterative** process that requires expertise and motivated individuals
KNOWLEDGE MANAGEMENT
Clinical Knowledge Management (CKM)

- Systematic and sustainable acquisition, adaptation (localization), and management of knowledge assets
  - Assets → data capture, clinical decision support (CDS), population management, analytics, etc.

- Includes the adaptation of reference knowledge sources to reflect local requirements, resources, and priorities

- Follows a well-defined lifecycle, including specific stages for documentation, testing, and monitoring – supported by skilled resources and integrated tools

Scope of CKM activities

- CDS
- Data Templates
- Data Definitions
- Terminology & Ontology Management
- Software Infrastructure

- alerts, reminders, medication warnings, duplication warnings, therapeutic alternatives, infobuttons, etc.
- forms, flowsheets, documentation templates, data fields, calculators, etc.
- value sets and classification rules for problems, medications, procedures, etc.
- master files, dictionaries, translation tables, and reference ontologies (e.g. SNOMED CT, ICD-10-CM, LOINC)
- editors, portals, repositories, virtual collaboration tools, knowledge retrieval services, rule execution engines
Focus on relevant clinical topics

Figure 1. Criteria to Prioritize Clinical Topic Refinement

KM lifecycle → Reference Models

- Request (new or update)
- Authorize & Prioritize
- Design
- Test & Deploy
- Implement
- Evaluate
- Monitor
Conclusions: implementation

• Early engagement of clinical leaders to set expectations of technical process, dependencies, and requirements

• Provision of formal training about informatics standards and governance processes

• Establish a KM (Informatics) team with proper authority and robust toolset – guide implementation and ensure compliance with processes and standards
Conclusions: models & assets

• Establish **governance** for essential asset types
• Define and optimize curation **processes** *(lifecycle)*
• Implement software **platform** integrated with knowledge **sources** and **consumers**
• **Monitor & evaluate** processes and interventions
• Seek alignment with **standards**, maximizing interoperability and external collaborations
• **Collaborate** with other institutions to help amortize operational **costs** and promote **innovation**
Thank you!

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