Using Wikis for Writing Discharge Summaries

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Objective

- To investigate how the collaborative concept of a wiki could open a new paradigm for clinical software applications
  - To propose a wiki platform for electronic discharge summaries (EDS)
    - How’s that *feel*?
    - What opportunities (and barriers) emerge?
Introduction

- Successful management of discharge from hospital requires:
  - a multi-professional collaboration and effective communication between care providers

- A Discharge Summary:
  - provides a snapshot of a specific patient and contains pertinent clinical, demographic, and administrative data
  - is written to provide smooth transition from one stage of care to the next (e.g., between hospital-based consultants and General Practitioners)
  - is expected to be generated by the clinician(s) involved in the care of the patient at discharge

References:
Current Approaches

- **HL7 messages** – for delivering clinical information

- **HL7 CDA** – for assembling clinical information in a document
  - A document mark-up standard for the structure and semantics of an exchanged "clinical document" using:
    - XML,
    - the HL7 Reference Information Model (RIM)
    - HL7 version 3 data types
    - and vocabulary (SNOMED, ICD, local,…)

- Can then be slipped into a V2 or V3 message

Reference:
Markup Transformations in CDA

XML Markup -> CDA Transformation

XML Schema Validation

CDA XML document

HL7 Specification Conformance

XSLT Transformation
CDA for Clinical Summaries

- Care Record Summary (CRS): As defined in CRS implementation guide.

  “...document contains a patient’s relevant health history for some time period. It is intended for communication between healthcare providers.” (published in March 2005)

- Constrained CDA document
- Summary of Care Provided for a Patient
- Summary of Episode
- Discharge Summary
- Transfer Summary

- Continuity of Care Document (CCD)
  - CCD = ASTM CCR* + HL7 CDA
  - implements the clinical requirements specified in the Continuity of Care Record (CCR) using the CDA architecture (published in April 2007)

References:

*ASTM’s Continuity of Care Record (CCR)- a core data set of the most relevant administrative, demographic, and clinical information facts about a patient’s healthcare, covering one or more healthcare encounters.
Message Based Network

Complexity in **integration**
Overwhelming **interoperability** issues
Fragmented **communication**
Lack of centralized **documentation**

(each arrow, in each direction, is a “project”)
Our Approach

- To use Web 2.0 software (a wiki) for authoring and distribution of Discharge Summaries
What is Web 2.0?

- Web 1.0
  - mostly read-only Web
  - users follow links to content

- Web 2.0
  - the read-write Web
  - users can also rate, comment, annotate, edit, create, mix and share content while following links to contents
Web 2.0 Based Health Information Network

Centralized documentation

Read-Write

Hospital

Imaging

Lab

General Practice

Patient

Community Nurse
What is a wiki?

Web pages anyone can create or edit

- Software that allows users to create and edit web page content using any web browser
- A Web 2.0 based collectively authored set of web pages
- Introduced by Bo Leuf and Ward Cunningham in 1995 to facilitate online collaboration about programming and design best practices
- Now being used in many fields to facilitate online collaboration and content management

References:
What you can do with a Wiki

- Easily create and edit web pages, including styled text, hyperlinks, pictures, audio, video, etc.
- Popular features of most wikis
  - Centralized documentation
  - Hypermedia linking
  - Automatic cross linking between internal pages
  - Wiki markup language - provides tags as the most fundamental way of text formatting and linking external documents and contents
  - WYSIWYG (what you see is what you get) editor- available in some wiki software to generates automatic wiki markup to provide some features of a word processor
  - Quick page creation/editing
  - History function - keeps track of changes made to an article
  - Search function - provides keyword based search for a specific topic
Linked Wiki Pages

Discharge Summary

Referral Form

Clinical Notes
Wikis in Health

Examples of wikis in the health domain:

- AskDrWiki (http://askdrwiki.com)
- WikiSurgery (http://wikisurgery.com)
- Ganfyd (http://www.ganfyd.org - a free medical knowledge base that anyone can read but only registered medical practitioners may edit)
- Wikicancer (http://www.wikicancer.org)
Methodology

- Analysis of the discharge summary data model and its content specification published by National E-Health Transition Authority (NEHTA), Australia was conducted.
- Prototype wiki page created for the discharge summary sample published by NEHTA.
- Discharge Summary created as a single wiki page using a wiki editor and markup language in TWiki – a free and open source package.

Reference:
NEHTA Discharge Summary Sample (Sectional View)

**DISCHARGE SUMMARY - Admitted patient**

**Episode ID:** XXXXX  **Date Sent:** 26/02/2006 2:58 PM  
**Version Number:** 1  
**Summary Status:** Final

**Facility Details:**
NEHTA General Hospital  
Department: Respiratory Medicine  
162 Grenfell Street,  
ADELAIDE SA 5000  
Tel: (08) 8205 3500  
Fax: (08) 8205 2300  
Email: nehta.general@somewhere.else  
Specialist: Dr Nehta Specialist  
Registrar: Dr Neville Registrar, Pager:  
Summary Author/RMO: Dr Neil Rmo

**Patient Details:**

**MRN:** 0952657  
**SMITH, John Michael**

12 Lavender Street,  
HAWTHORN SA 5566  
Sex: Male  DOB: 9/10/1924 Age: 81

**Patient's Usual GP:**

Dr Patrick GeneralPractice  
Good Health General Practice  
5 Good Health Street,  
HAWTHORN SA 5566  
Tel: (08)-8225 4579  
Fax: (08)-8225 4580  
Email: patrick-GP@goodhealth.net.au

**Referred by:** Dr Patrick GeneralPractice, (08)-8225 4579  
**Referral Reason:** Difficulty breathing and Haemoptysis  
**Service Requested:** To rule out malignancy  
**Admission Date:** 16/2/2006 17:47  
**Time:**

**Admission Reason:** Dyspnoea and Haemoptysis  
**Discharge Date & Time:** 26/2/2006 15:25  
**Discharge Reason:** Routine discharge  
**Discharge Destination:** Usual place of residence

**PROBLEMS/DIAGNOSES: THIS VISIT**

**Primary Problem/Diagnosis:**
Discharge Summary View in WYSIWYG editor

Sandbox.DischargeSummary

**-- Main MehnazAdam -- 11 Feb 2008**

**DISCHARGE SUMMARY-EXAMPLE**

<table>
<thead>
<tr>
<th>%TOC% Episode ID</th>
<th>xxxxxxxx Date Sent: 14/02/2008</th>
</tr>
</thead>
</table>

**Version Number:** 1

**Summary Status:** Final

**Facility Details** | **Patient Details**
---------------------|---------------------
NEHTA General Hospital | MRN: 09525657
Department: Respiratory Medicine | SMITH, John Michael
Tel (08) 8205 3500 Fax (08) 8205 3200 | 12 Lavender Street, Hawthorn SA 5566
12 Lavender Street, Hawthorn SA 5566 | Sex: Male
Email: nehta.general@somewhere_else | DOB: 09/10/1924
Specialist: Dr Nehta Specialist | Age: 83
Registrar: Dr. Neville Registrar, Pager | Summary Author/RMO: Dr Neil Rmo

**Patient’s Usual GP:**

Dr. Patrick General Practice
Better than a Passive Document!? 

- **Web annotation**
  - online annotation associated with a Web resource (e.g. Web page)
  - a layer on top of the existing resource with a Web annotation system
  - provides private and public annotation types
  - can be used as a collaborative tool
“In-line” annotation in Wiki

Please review the patient's anticoagulant therapy to maintain INR at 2.5 to 3.5. Discuss palliative care and issues with patient and family, monitor patient for risk of GI bleeding associated with Voltaren.

PATIENTS: Anticoagulant therapy

Inpatient sticky note

Pathology:

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Performed Date</th>
<th>Requesting Provider</th>
<th>Reporting Pathologist</th>
<th>Result Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Blood Count</td>
<td>NEHTA Registrar</td>
<td>17/02/2006</td>
<td>Jones Haematologist</td>
<td>Final</td>
</tr>
<tr>
<td>Haemoglobin</td>
<td>130G/L</td>
<td>135-170</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>RBS</td>
<td>4.5*10^12/L</td>
<td>4.5-6.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCV</td>
<td>40.0 L/L</td>
<td>40.0-50.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCV</td>
<td>78.0 pg</td>
<td>80.0-98.0</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>MCH</td>
<td>28.0 pg</td>
<td>27.0-33.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCHC</td>
<td>320 g/L</td>
<td>315-350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDW</td>
<td>11.0%</td>
<td>11.5-15.5</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>White Cell Count</td>
<td>2.0*10^9/L</td>
<td>4.0-11.0</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Neutrophils</td>
<td>16.0*10^9/L</td>
<td>1.60-7.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutrophils%</td>
<td>80.0%</td>
<td>80.0-85.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>3.05*10^9/L</td>
<td>1.00-3.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphocytes%</td>
<td>15.25%</td>
<td>15.0-25.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monocytes</td>
<td>0.8*10^9/L</td>
<td>0.20-0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monocytes%</td>
<td>4.0%</td>
<td>4.0-10.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Iron deficiency cannot be executed in inflammation or chronic disease are present as these may elevate the ferritin into the normal range. Suggest other haematics screening if not known. Dr. Jones Haematologist.
“Floating” annotation in Wiki

FOLLOW UP:

Requested Service:

<table>
<thead>
<tr>
<th>Service Reason</th>
<th>Proposed Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient family requested palliative care instead of surgical or oncology intervention in view of age and frailty of patient</td>
<td>27/3/2006</td>
</tr>
<tr>
<td>Assess and advice on dietary intake</td>
<td>1/3/2006</td>
</tr>
</tbody>
</table>

RECOMMENDATIONS TO GP:

Please review patient’s anticoagulant therapy to maintain INR at 2.5 to 3.5; discuss palliative care and issues with patient and family; monitor patient for risk of GI bleeding associated with Voltaren.

INVESTIGATIONS - DETAILED REPORTS:

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<th>Reporting Pathologist</th>
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</thead>
<tbody>
<tr>
<td>Iron Studies</td>
<td>17/02/2006</td>
<td>NEHTA Registrar</td>
<td>Jones Haematologist</td>
<td>Final</td>
</tr>
<tr>
<td>Result Name</td>
<td>Value</td>
<td>Reference Range</td>
<td>Abnormal Indicator</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>5 umol/L</td>
<td>8-30</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Serum/Plasma Ferritin</td>
<td>23 ug/L</td>
<td>20-300</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>SATURATION</td>
<td>8%</td>
<td>10-50</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Transferrin</td>
<td>2.2g/L</td>
<td>2.0-3.6</td>
<td>L</td>
<td></td>
</tr>
</tbody>
</table>

Note: Iron deficiency cannot be executed in inflammation or chronic disease are present as these may elevate the ferritin into the normal range. Suggest other haematins screening if not known. Dr. Jones Haematologist.

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</tr>
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</table>
Wiki Potential in Health Information Management

- Provides centralized **communication** and **documentation** in one location
- Can be used to provide **online/distributed collaboration**
  - Can provide **asynchronous communication** among health care providers through open editing with history
  - **Can also include patient**
- Availability as open source software can be useful for **cost-effective development** of clinical applications
Conclusion

- Opens a new paradigm of **online asynchronous conversation rather than one-way message based communication**
- Straightforward approach for integration (easy to add “players” to the network)
  - Particular potential in NZ with established NHI and emerging HPI
  - Leaves open question of how to achieve semantic interoperability
- Can improve document with internal and external hyperlinks
  - And manage views of annotations
Ongoing Work

- Analysis of contents and layout of Electronic Discharge Summaries
- Have extracted 200 discharge summaries from North Shore Hospital, Auckland to investigate:
  - weaknesses of the current Discharge Summary documents (panel of GP, medical records and specialist)
  - improving the Electronic Discharge Summary (EDS) reading and writing process through a hypertext organisation
  - correspondence of EDS content to terminology in SNOMED Clinical Terms (for internal and explanatory linking)
Thank you!

Questions?

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