



# Using Wikis for Writing Discharge Summaries

Mehnaz Adnan, Prof. Jim Warren, Dr. Martin Orr  
University of Auckland, New Zealand

# 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:

- Walraven, C. (1999). 'What Is Necessary for High-Quality Discharge Summaries?' American Journal of Medical Quality 14(4): 10.
- Barretto, S., Chu, S., et al. (2006). 'National Discharge Summary: Data Content Specifications Version 1.0', National E-Health Transition Authority Australia, retrieved from [http://www.nehta.gov.au/index.php?option=com\\_docman&task=cat\\_view&gid=164&Itemid=139](http://www.nehta.gov.au/index.php?option=com_docman&task=cat_view&gid=164&Itemid=139).

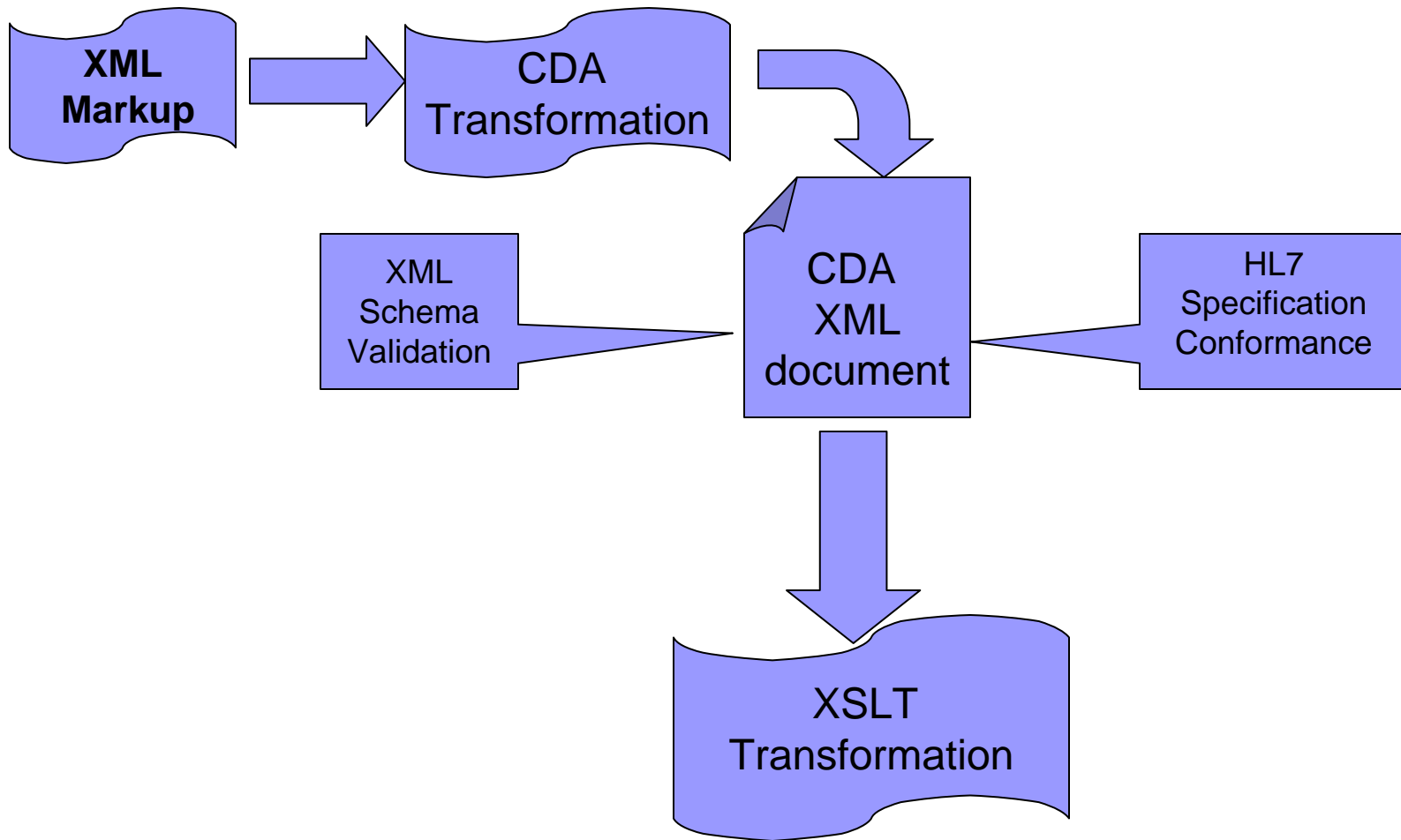
# Current Approaches

- 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:

- Dolin, RH., Alschuler, L., et al. (2006). ' HL7 Clinical Document Architecture, Release 2'. J Am Med Inform Assoc.;13:30–39.retrieved from (<http://www.jamia.org/cgi/reprint/13/1/30>)

# Markup Transformations in CDA



# 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:

- Health Level Seven, March 2005, Implementation Guide for CDA Release 2 – Level 2 – Care Record Summary (US realm).
- Continuity of Care Document, Press release.<http://www.hl7.org/documentcenter/public/pressreleases/20070212.pdf>

\*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**

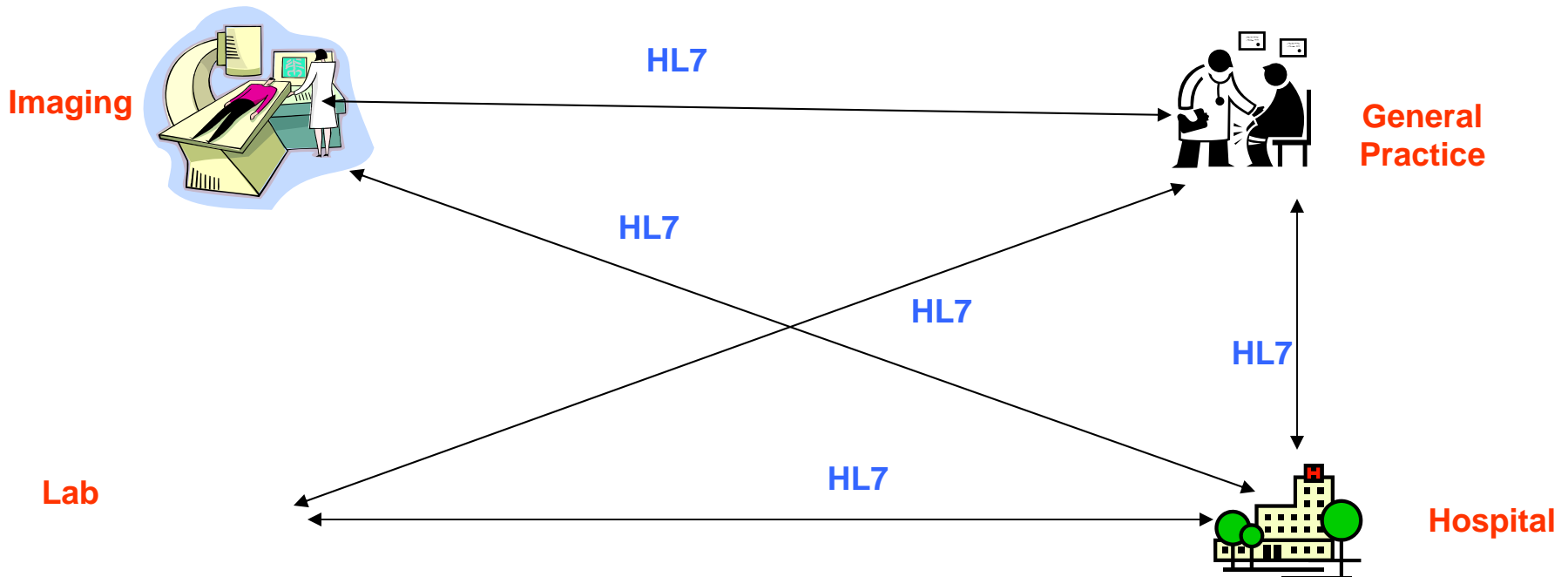
Lack of centralized **documentation**



Patient



(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?

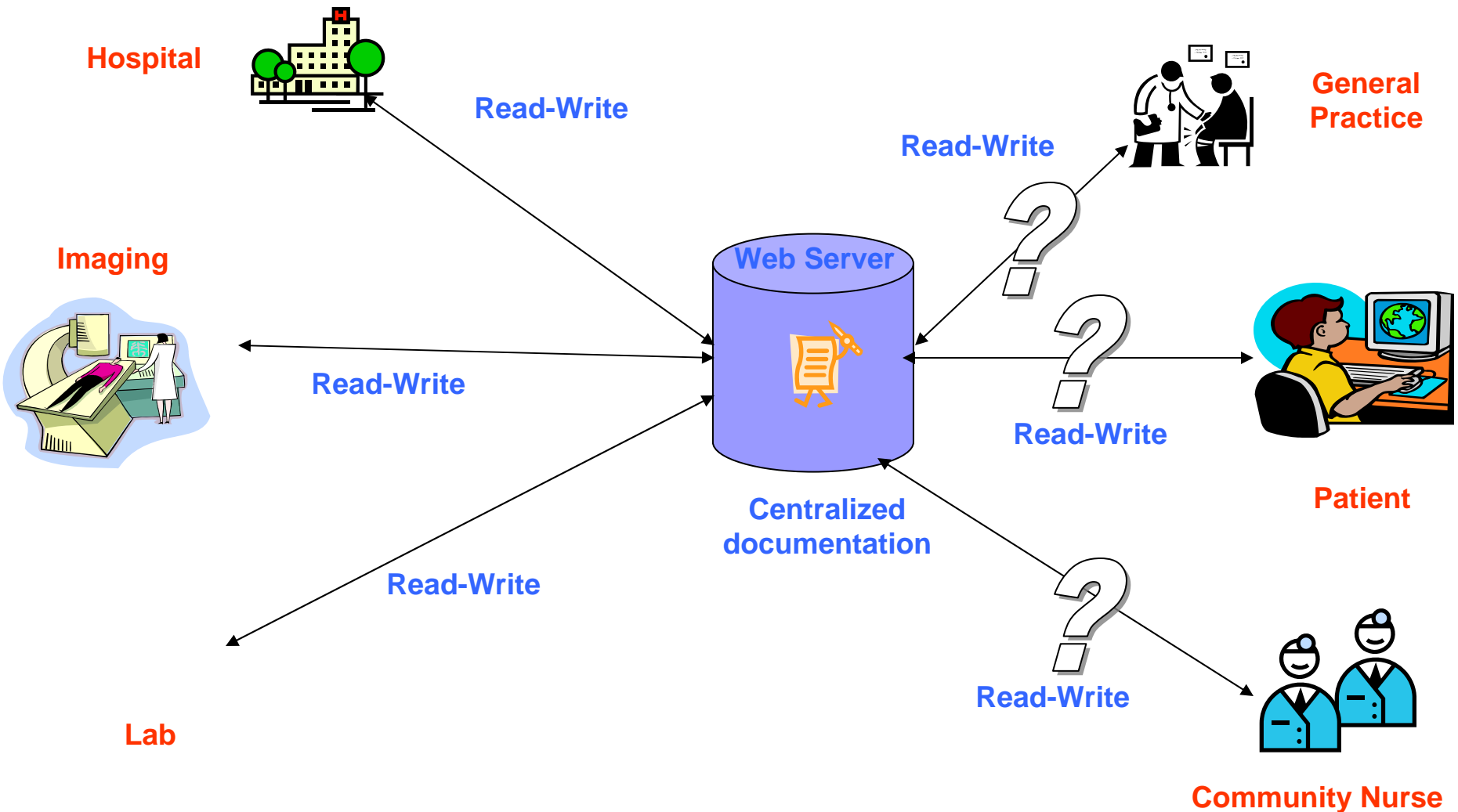
## ■ Web 1.0

- ☐ 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



# 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:

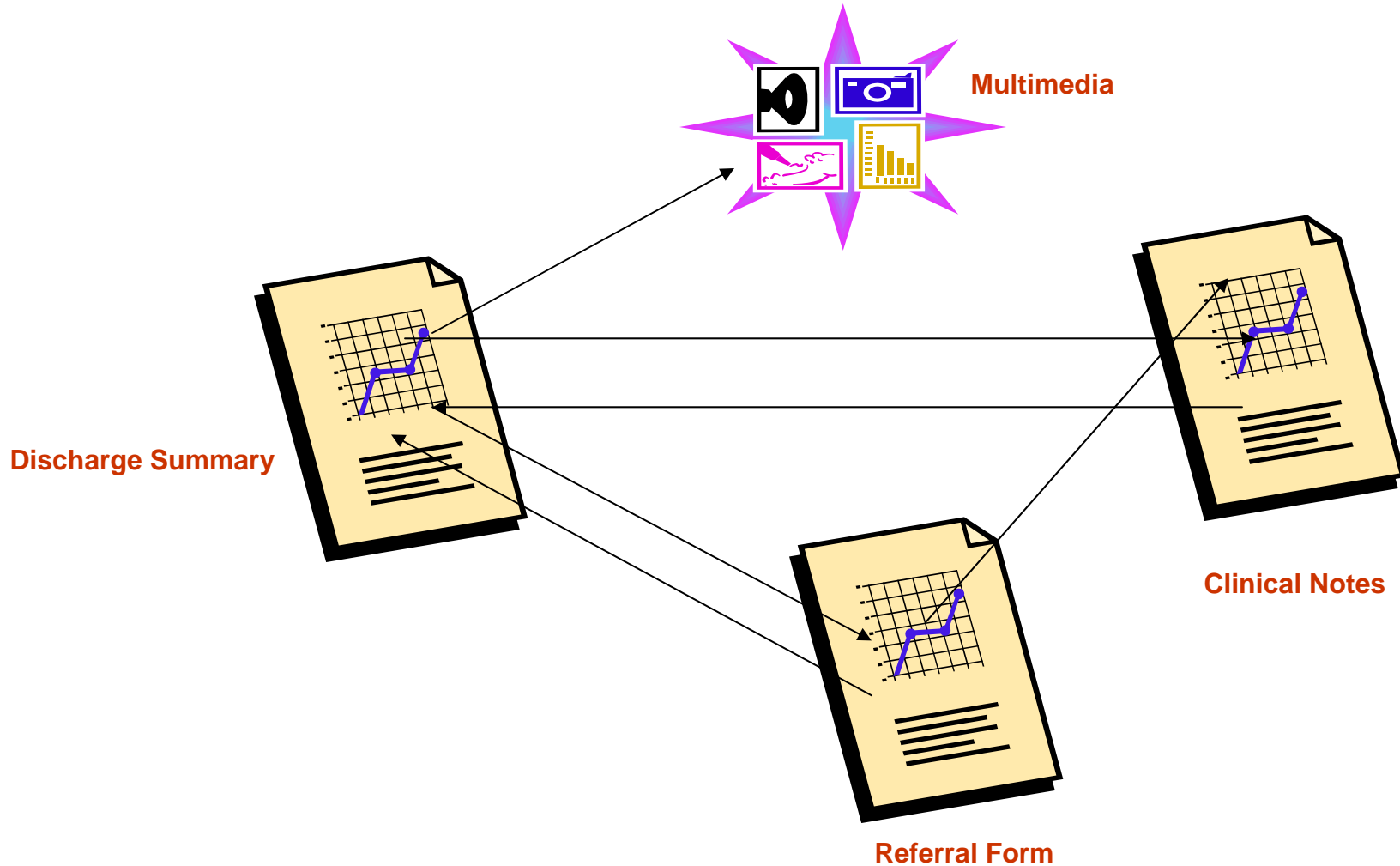
-Ward Cunningham - <http://www.wiki.org/wiki.cgi?WhatIsWiki>

-Leuf, Bo and Ward Cunningham. The Wiki Way: Quick Collaboration on the Web. N.J.: Pearson, 2001: 16.

# 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



# 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>)
  - Clinfowiki (<http://www.clinfowiki.org> – An encyclopedia of medical informatics sponsored by Informatics review).

# 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:

- Barretto, S., Chu, S., et al. (2006). 'National Discharge Summary: Data Content Specifications Version 1.0', National E-Health Transition Authority Australia, retrieved from [http://www.nehta.gov.au/index.php?option=com\\_docman&task=cat\\_view&gid=164&Itemid=139](http://www.nehta.gov.au/index.php?option=com_docman&task=cat_view&gid=164&Itemid=139).

# 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 General Practice  
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 General Practice, (08)-8225  
4579

Referral Reason: Difficulty breathing and Haemoptysis

Service Requested: To rule out malignancy

Admission Date/  
Time: 16/2/2006 17:47

Admission Reason: Dyspnoea and Haemoptysis

Discharge Date &  
Time: 26/2/2006 15:25

Discharge Reason: Routine discharge

Discharge  
Destination: Usual place of residence

Summary Recipient

Recipient Name:

Organisation Name:

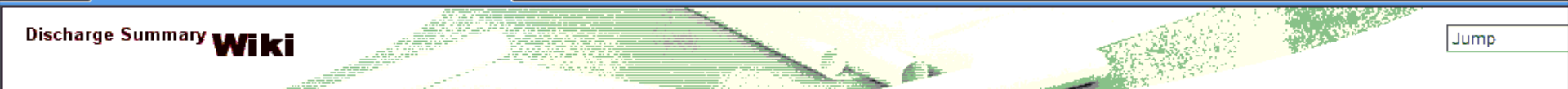
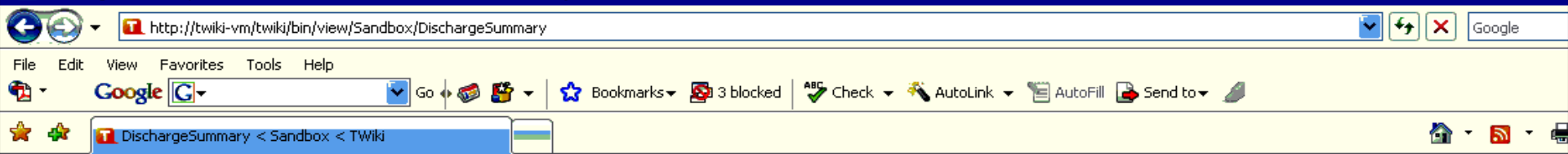
### PROBLEMS/DIAGNOSES: THIS VISIT

Primary Problem/Diagnosis:



# Discharge Summary Wiki

DischargeSummary < Sandbox < TWiki - Windows Internet Explorer



Sandbox

[Edit](#)
[WYSIWYG](#)

You are here: [TWiki](#) > [Sandbox Web](#) > DischargeSummary

r3 - 21 Feb 2008 - 2

— [MehnazAdnan](#) - 11 Feb 2008

Author's Name, Date of last edit

## DISCHARGE SUMMARY-EXAMPLE

- ↓ [DISCHARGE SUMMARY-EXAMPLE](#)
  - ↓ [PROBLEM/DIAGNOSES: THIS VISIT](#)
    - ↓ [Primary Problem/Diagnosis:](#)
    - ↓ [Secondary Problem/Diagnosis:](#)
      - ↓ [Complications:](#)

Internal Hyperlinks

**Episode ID** xxxxxxxxxx **Date Sent:** 14/02/2008

**Version Number:** 1

**Sumamry 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, Hawthortorn SA 5566
Email: <a href="mailto:nehta.general@somewhere.else">nehta.general@somewhere.else</a>	Sex: Male
Specialist: Dr Nehta Specialist	DOB: 09/10/1924
Registrar: Dr. Neville Registrar, Pager:	Age: 83
Summary Author/RMO: Dr Neil Rmo	

Hello Mehnaz Adnan!

[Log Out](#)

**My links:**

- » [My home page](#)
- » [My Sandbox activities](#)
- » [edit](#)

[Sandbox Web](#)

- [Create New Topic](#)
- [Index](#)
- [Search](#)
- [Changes](#)
- [Notifications](#)
- [Statistics](#)
- [Preferences](#)

**Webs**

- [Main](#)
- [Sandbox](#)
- [TWiki](#)

# Discharge Summary View in WYSIWYG editor

Kupu Edit Sandbox.DischargeSummary - Windows Internet Explorer

http://twiki-vm/twiki/bin/edit/Sandbox/DischargeSummary?cover=kupu&t=1206667528

File Edit View Favorites Tools Help

Google "discharge summary" + "cl" Go Bookmarks 3 blocked Check AutoLink AutoFill Send to

Kupu Edit Sandbox.DischargeSummary

## Sandbox.DischargeSummary

Normal B I A [List Icons]

-- [Main MehnazAdnan](#) - 11 Feb 2008

### DISCHARGE SUMMARY-EXAMPLE

%TOC% Episode ID xxxxxxxxxx Date Sent: 14/02/2008

Version Number: 1

Sumamry 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, Hawthortorn SA 5566
Email: <a href="mailto:nehta_general@somewhere.else">nehta_general@somewhere.else</a>	Sex: Male
Specialist: Dr Nehta Specialist	DOB: 09/10/1924
Registrar: Dr. Neville Registrar, Pager:	Age: 83
Summary Author/RMO: Dr Neil Rmo	

Patient's Usual GP:

Dr Patrick General Practice

Editor Toolbar

# 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

http://twiki-vm/twiki/bin/view/Sandbox/DischargeSummary#544dd5883bcbb4e7b1c86c76d2aabfdc-0 - Windows Internet Explorer

http://twiki-vm/twiki/bin/view/Sandbox/DischargeSummary#544dd5883bcbb4e7b1c86c76d2aabfdc-0

File Edit View Favorites Tools Help

Diigo Bookmark Highlight Comment Send Message (0) Options

DischargeSummary < Sandbox < TWiki

Diigo Sidebar

My Bookmarks This URL Friends

DischargeSummary < Sandbox < http://twiki-vm/twiki/bin/view/Sandbox/DischargeSummary#544dd5883bcbb4e7b1c86c76d2aabfdc-0

Readers Annotations

See: All Annotations

Page Comments

Patrick Generalpractice 19 Public X

Needs CT scan chest to rule out disease extension status

Highlights & Sticky Notes

(floating sticky note)

Patrick Generalpractice 8 Public X

If heavy bleeding, transfer blood after complete screening - with close monitoring.

patient's anticoagulant

Patrick Generalpractice 14 Private X

If Patient is on NSAID and started GI bleeding started GI bleeding stop NSAID + anticoagulant therapy- check DT, ADTT, INR + complete bolld picture.

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.

INVESTIGATION

PATHOLOGY:

Test Name

Iron Studies

Result Name

Iron

Serum/Plasma Ferritin

SATURATION

Transferrin

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 haematinics screening if not know. Dr. Jones Haematologist.

Test Name	Performed Date	Requesting Provider	Reporting Pathologist	Result Status
Full Blood Count	NEHTA Registrar	17/02/2006	Jones Haematologist	Final

Result Name	Value	Reference Range	Abnormal Indicator
Haemoglobin	130g/L	135-175	L
RBS	4.5*10 <sup>12</sup> /L	4.5-6.0	
PCV	0.40 L/L	0.40-0.50	
MCV	78.0 pg	80.0-98.0	L
MCH	28.0 pg	27.0-33.0	
MCHC	320 g/L	315-355	
RDW	11.0%	11.5-15.5	L
White Cell Count	20.0*10 <sup>9</sup> /L	4.00-11.00	HH
Neutrophils	16.0*10 <sup>9</sup> /L	1.80-7.50	HH
Neutrophils%	80.0%		
Lymphocytes	3.05*10 <sup>9</sup> /L	1.00-3.50	
Lymphocytes%	15.25%		
Monocytes	0.8*10 <sup>9</sup> /L	0.20-0.80	
Monocytes%	4.0%		
Eosinophils	0.20*10 <sup>9</sup> /L	0.20-0.50	

Inline sticky note

patient's anticoagulant therapy

Private X

If Patient is on NSAID and started GI bleeding started GI bleeding stop NSAID + anticoagulant therapy- check DT, ADTT, INR + complete bolld picture.

Done

Local intranet

100%

# "Floating" annotation in Wiki

http://twiki-vm/twiki/bin/view/Sandbox/DischargeSummary#4efc44b2adcfb134ef99a64e2ca6cf9d-0 - Windows Internet Explorer

http://twiki-vm/twiki/bin/view/Sandbox/DischargeSummary#4efc44b2adcfb134ef99a64e2ca6cf9d-0

File Edit View Favorites Tools Help

Diigo Bookmark Highlight Comment Send Message (0) Options

DischargeSummary < Sandbox < TWiki

Settings

Home RSS Print Page Tools

## FOLLOW UP:

**Requested Service:**

**Floating sticky note**

(floating sticky note)

Patrick GeneralPractice less than a minute ago  
Public X

If heavy bleeding, transfer blood after complete screening - with close monitoring.

Requested	Service Reason	Proposed Start
are assessment, and placement	Patient family requested palliative care instead of surgical or oncology intervention in view of age and friality of patient	27/3/2006
Planning	Assess and advice on dietary intake	1/03/2006

agulant in particular and discuss options for support regarding probable lung malignancy. Watch out for y Voltaren and discuss options for support regrading probable lung malignancy. Return to emergency department g.

## 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:

### PATHOLOGY:

Test Name	Performed Date	Requesting Provider	Reporting Pathologist	Result Status
Iron Studies	17/02/2006	NEHTA Registrar	Jones Haematologist	Final
Result Name	Value	Reference Range	Abnormal Indicator	
Iron	5 umol/L	8-30	L	
Serum/Plasma Ferritin	23 ug/L	20-300		
SATURATION	8 %	10-50	L	
Transferrin	2.2g/L	2.0-3.6		

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

Test Name	Performed Date	Requesting Provider	Reporting Pathologist	Result Status
Full Blood Count	NEHTA Registrar	17/02/2006	Jones Haematologist	Final

# 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?*

*Contact: Jim Warren -  
jim@cs.auckland.ac.nz*