

# Using Wikis for Creating Discharge Summaries

**Adnan M, Warren J, Orr M.**

*Department of Computer Science, University of Auckland, Auckland, New Zealand*

## Abstract

Discharge summaries contain important clinical information to provide a frame-work for post discharge care of patients. Effective communication and collaboration between care providers is necessary to ensure successful management of discharge from hospital. We propose that the wiki platform can be used in the process of creating discharge summaries and suggest that the collaborative concept of a wiki could open a new paradigm for the design of clinical software applications. A prototype wiki page has been created for the discharge summary sample published by National E-Health Transaction Authority (NEHTA), Australia. We conclude that wiki features and functionalities show promise to reformulate burdensome data entry tasks in discharge summary creation and promote improved quality of summaries. The present prototype represents a first stage in a process of iterative feedback and development to arrive at system functionality, user interface design and end-user interaction that successfully meshes with clinical workflow in the electronic discharge summary context.

## Introduction:

A Discharge Summary (DS) contains important clinical information which is recorded during a health care event to provide smooth transition from one stage of care to the next and to provide a post-discharge framework of care for a patient (Walraven 1999). A DS typically contains pertinent clinical data to provide a snapshot of a patient's condition at the time of discharge (Barretto, Chu et al. 2006). A multi-professional collaboration approach with effective communication between care providers is both effective and necessary to ensure the successful management of discharge from hospital (Walraven 1999; Bull and Roberts 2001). An Electronic Health Record (EHR) can automate the process of assembling and delivering clinical information in an Electronic Discharge Summary (EDS) (O'Leary, Liebovitz et al. 2006). EHR and EDS systems support asynchronous communications among healthcare providers, but their design fails to reflect explicit recognition of this role. Therefore, the need is intensively growing for exploring innovative design artifacts which can assist care providers in day to day practice.

The widespread availability of internet, its technological advances, and free and open source software have allowed wikis (see Background below) to be implemented successfully for collaborative content management in various domains, for example in education (Notari 2006; Pedro, M Rieradevall et al. 2006; Xu 2007). Few proposals of using wiki for implementing EHR are found in the literature (Boulos and Wheeler 2007; Weiss 2007), leaving the opportunity for use of wikis for managing clinical data still largely unexplored.

The aim of this paper is to describe how a wiki can be used as platform to support communication and collaboration needs in the process of creating discharge summaries. Furthermore, it will analyze how the collaborative concept of a wiki could open a new paradigm in design of clinical information system solutions.

Analysis of the DS data model and its content specification published by NEHTA (Barretto, Chu et al. 2006) was conducted. The focus was on identifying the layout and contents of a DS to create a prototype wiki based DS. A prototype wiki page has been successfully created using a wiki editor and markup language in TWiki for the sample DS published by NEHTA.

In the next section, we describe wiki technology with some examples of wiki usage in the health care domain. Then we discuss our experience in creating wiki based discharge summary and prospects of wikis in managing clinical data. The final section draws some concluding remarks.

## **Background:**

Web 2.0 is an umbrella term encompassing several new web technologies and any web-based software that lets users create and update web 2.0 associated content (Murugesan 2007). A wiki is a web 2.0 based collaborative-authoring (or content-management) system for creating and editing content which allows anyone to add a new article or revise an existing article through a web browser and provides automatic linking to other wiki contents (Klobas and Beesley 2006). The concept of wikis as a collaborative knowledge management platform was introduced by Bo Leuf and Ward Cunningham in 1995 (Leuf and Cunningham 2001). The most impressive success story of wiki system is Wikipedia which has more than 4 million articles in 100 languages, outnumbering all other encyclopedias (Voss 2005).

A wiki entry is a wiki page about a specified topic and a response is the modification to the existing page. A wiki entry can be linked to other wiki entries and web resources in a hypertext-style link to provide navigation. A wiki markup language (Wikitext) provides tags as the most fundamental way of text formatting and linking external documents and contents. In addition to markup, other plug-ins or extensions are available to enhance wiki features and functionalities. For example, WYSIWYG (what you see is what you get) editor plug-in generates automatic wiki markup to provide some features of a word processor. A history function keeps track of changes made to an article while a search function provides keyword based search for a specific topic (Klobas and Beesley 2006; Anderson 2007).

Wikis are now being used to support collaboration and content management in many fields including academic institutions, companies, and specific health communities. Some examples of using wikis for accessing and sharing specific health information by patients and clinicians are 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>) and Clinfowiki (<http://www.clinfowiki.org> - An encyclopedia of medical informatics sponsored by Informatics review). Recently, the World Health Organization has announced to use a wiki for the revision of the International Classification of Diseases to involve more people other than expert panels (CBC News 2007).

Some proposals of using wikis in clinical data management are also found in the literature. Weiss (Weiss 2007) asserts that many aspects of a problem list user interface in an EHR resemble a wiki, suggesting that a wiki can be used to create a problem list interface which can provide asynchronous data creation and modification by all care providers. Boulos (Boulos and Wheeler 2007) suggests that web 2.0 based collaborative EHRs would enable new ways of data entry and retrieval for clinicians.

## **Discharge Summary Wiki:**

The authors analyze the DS summary model content specifications published by NEHTA. The DS wiki was setup and prototype DS was created for a sample in (Barretto, Chu et al. 2006) to ascertain the potential of wiki in the process of creating a DS.

Discharge Summary wiki (DSWiki) uses TWiki, which is free and open source software. The DS is created in a single wiki page having different sections of a summary. Figure-1 shows a sectional view of the DS page in our system. The top page contains author's name and date of authoring the current version of DS which is followed by hyperlinked headings of DS sections. By clicking on one of the hyperlink a user can access the respective section. The summary contents starts with the section of patient, GP and attending doctor's information. This section is followed by the sections which contain discharge information, such as procedure performed this visit, investigations, medications, adverse reactions, clinical management and follow up. A user with sufficient privileges can use Edit or WYSIWYG buttons to edit the current page. A new DS can be created by using the 'Create New Topic' option.

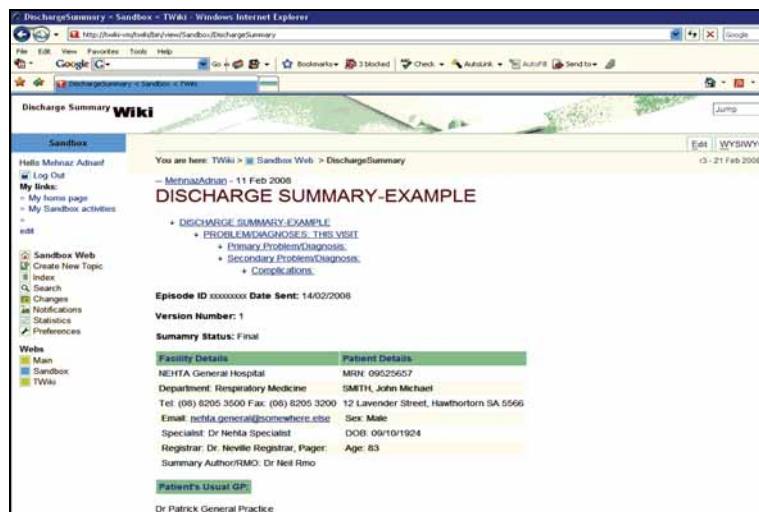


Figure 1. Discharge Summary view in wiki

The research is in an early prototype stage and the DS wiki page was created using the combination of WYSIWYG editor and Wikitext. A DS view in the WYSIWYG editor is shown in figure 2. The tool bar in the editor provides some text formatting tools. The WYSIWYG editor is easy to use and provides some basic formatting and linking options. Wiki markup was used to create structured contents like tables. A view of markup used in our page is shown in figure-3. Buttons at the bottom of the editor are used to save, preview or cancel changes being made in the wiki page.

## Discussion:

A wiki can provide asynchronous communication among health care providers and can be used to create and share information in a collaborative way. While there are a number of examples that indicate that patients, providers and researchers can share health information via a wiki interface, the feasibility of (and specific system requirements for) using wikis for production EHRs is less than clear. The collaborative concept of wiki systems and their availability as open source software have implications for cost-effective development of flexible clinical applications. In addition, the large number of available plug-ins holds promise to provide innovative user interfaces and to introduce new collaborative ways of data entry in EHRs.

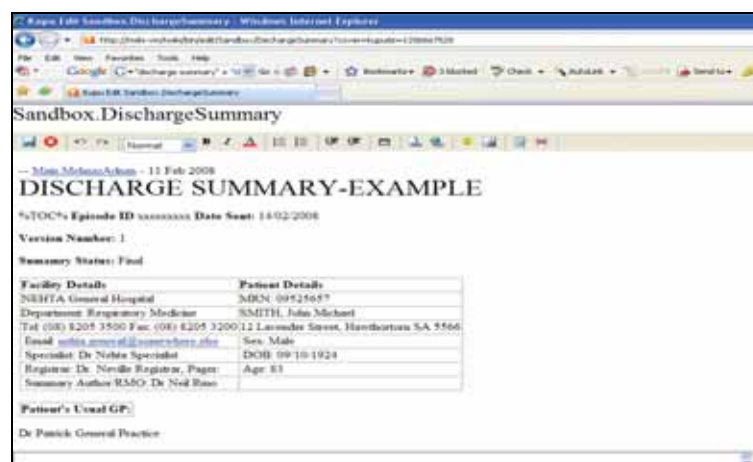


Figure 2. Discharge Summary view in WYSIWYG editor.

The DS wiki uses wiki markup for creating tabular contents. The processing of entering data using wiki markup can be challenging and time consuming. However, this limitation can be overcome by using a plug-in to provide a form interface for data input which may result in a more user friendly interface. The security measures necessary to implement an EHR are not explicitly addressed in the present prototype, but control of user read and write access by a system of roles associated by user network accounts is envisioned as a starting point.

DischargeSummary (edit)

----- PROBLEM/DIAGNOSES: THIS VISIT

----- Primary Problem/Diagnosis:

| *Problem/Diagnosis*  | *Date Start* | *Note*   | *Awareness* | *Person* | *Reason* |
|--|--------------|----------|-------------|----------|----------|
| Right bronchogenic carcinoma                                       | 19/02/2006   | Probable |             |          |          |
| <p />Diagnosed on bronchoscopic exam.                              |              |          |             |          |          |
| <p />Histology results pending.   no   Patient   Request of friend |              |          |             |          |          |

----- Secondary Problem/Diagnosis:

| *Problem/Diagnosis*  | *Date Start* | *Note* | *Awareness* | *Person* | *Reason* |
|--|--------------|--------|-------------|----------|----------|
| Iron Deficiency Anaemia  | 18/02/2006   | Detry; |             |          |          |
| <p />haemoptysis.  |              |        |             |          |          |
| <p />included   yes   &nbsp;   &nbsp;                          |              |        |             |          |          |
| Chronic Obstructive  |              |        |             |          |          |
| <p />Pulmonary Disease   2003   &nbsp;   yes   &nbsp;   &nbsp; |              |        |             |          |          |
| Atrial Fibrillation   &nbsp;   2003   &nbsp;   yes   &nbsp;    |              |        |             |          |          |

----- Complications:

| *Complications* | *Date Start* | *Note* | *Awareness* | *Person* | *Reason* |
|-----------------|--------------|--------|-------------|----------|----------|
|-----------------|--------------|--------|-------------|----------|----------|

Your signature to copy/paste: Max Melrose/Author - 28 Mar 2008

☐ Force new revision [help](#)

Action keys: S = Save, Q = Quiet save, C = Checkpoint, P = Preview, E = Cancel

Figure 3. Discharge Summary view in WikiText editor.

The EDS scenario is a particularly fruitful area for considering the communicative power of a wiki in particular, and web 2.0 approaches in general. A wiki based EDS for a specific patient can be distributed among different health care providers and wiki software can aggregate information entered by these providers across multiple health settings, asynchronously onto a single DS. These features can be used to implement a single EHR which can be accessed across geographic boundaries, with the potential to reduce data integration overhead and delivery time.

The present prototype represents a first stage in a process of iterative feedback and development to arrive at system functionality, user interface design and end-user interaction that successfully meshes with clinical workflow in the EDS context.

## Conclusion:

Wiki systems hold the potential of reformulating the burdensome data entry task of constructing the summative components of EDSs, such as management plans (which currently appears as a block of narrative text) by introducing an online collaboration approach. The authors developed a wiki based prototype DS to provide the foundation for user feedback and task analysis to determine the specific features required for use of such web 2.0 based technology in health care settings. Future directions for the development of wiki based EDS system might be to provide automatic linking to specific contents through hypermedia techniques and support to clinical coding based on underlying ontological knowledge.

## References:

- Anderson, P. (2007). 'What is Web 2.0? Ideas, technologies and implications for education.' Joint Information Systems Committee (JISC) Technology & Standards Watch Retrieved 12/02/2008, from <http://www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf>.
- Barretto, S., Chu, S., et al. (2006). 'National Discharge Summary: Data Content Specifications Version 1.0', National E-Health Transaction 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).
- Boulos, M. and Wheeler, S. (2007). 'The emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education.' Health Information and Library Journal 24(1): 20.
- Bull, M. J. and Roberts, J. (2001). 'Components of a proper hospital discharge for elders.' Journal of Advanced Nursing 35: 571-581.
- CBC News. (2007). 'WHO adopts Wikipedia approach for key update.' from <http://www.cbc.ca/health/story/2007/05/02/disease-wiki.html>.
- Klobas, J. and Beesley, A., Eds. (2006). Wikis : tools for information work and collaboration, Oxford.
- Leuf, B. and Cunningham, W. (2001). The Wiki Way, Addison-Wesley Longman.
- Murugesan, S. (2007). 'Understanding Web 2.0.' IT Professional 9(4): 8.
- Notari, M. (2006). 'How to use a Wiki in education: Wiki based effective constructive learning'. International symposium on Wikis, Odense, Denmark.
- O'Leary, K. J., Liebovitz, D. M., et al. (2006). 'Outpatient physicians' satisfaction with discharge summaries and perceived need for an electronic discharge summary.' Journal of Hospital Medicine, 1(5): 317-20.
- Pedro, X. D., M Rieradevall, M., et al. (2006). 'Writing documents collaboratively in higher education using traditional vs. wiki methodology: qualitative results from a 2-year project study'. 4th International Congress of University Teaching and Innovation, Barcelona, Spain.
- Voss, J. (2005). 'Measuring Wikipedia'. 10th ISSI Conference, Stockholm, Sweden.
- Walraven, C. (1999). 'What Is Necessary for High-Quality Discharge Summaries?' American Journal of Medical Quality 14(4): 10.
- Weiss, J. B. (2007). 'Blogs, Wikis, and Discussion Forums: Attributes and Implications for Clinical Information Systems'. Medinfo 2007;12(Pt 1):157-61.
- Xu, L. (2007). 'Project the wiki way: using wiki for computer science course project management.' Journal of Computing Sciences in Colleges 22(6): 8.