Gathering and Designing a Multi-Disciplinary Surgical Clinical Ward Handover System at the SAN Hospital

Patrick Mumme
310262135

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Prof. Jon Patrick
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Surgical Clinical Ward Handover System

Abstract

Acknowledgements

Contents

Glossary

A Infection by Airbourne.

ACAT **A**ge **C**are **A**ssessment **T**eam.

AD **A**s **D**esired Diet (anything the patients wants to eat).

AIN **A**ssistant **i**n **N**ursing.

AMO **A**ccredited **M**edical **O**fficer.

Analgesia pain medication.

Anti-emetic medication against nausea.

Arthroplasty plastic surgery of a joint.

B **B**owels.

BD twice a day.

BGL **B**lood **G**lucose **L**evel.

Bolus a rounded mass of food or pharmaceutical preparation ready to swallow, or such a mass passing through the gastrointestinal tract.

BP **B**lood **P**ressure.

BSL **B**lood **S**ugar **L**evel.

C infection by contact.

CF **C**lear **F**luids.

CMO **C**areer **M**edical **O**fficer (doctor on call).

Comorbidity other illnesses that a patient has that are not part of the diagnosis but affect the health of the patient and possibly the treatment (ie. Diabetes, Hypertension).

Cont **C**ontinence (bowels).

CVC **C**entral **V**enus **C**atheter.

D infection by droplet.

DW **D**ry **W**eight (weight of patient before breakfast).

Dx diagnosis.

EDD **E**stimated **D**ate of **D**ischarge.

EEN **E**ndorsed **E**nrolled **N**urse. Have completed further medication endorsement. Allowed to administer Schedule 2,3, and 8 medications via all routes except intravenous, epidural, intraventriuclar and intrathecal. Any medication which requires checking prior to administration must be checked with a RN or Midwife. Excluded also from administering fluids or medications via CVC, PICC and femoral lines as well implanted devices or arterial lines.

EN **E**nrolled **N**urse. Nurses undertook 18/24 month course at TAFE or related health facilities). Even more restricted than EEN.

FF **F**ull **F**luids incl. milky drinks.

HITH **H**ospital **i**n **t**he **H**ome.

Hx history.

iCIMS **i**ntegrated **C**linical **I**nformation **M**anagement **S**ystem. A design application developed at the University of Sydney allowing the creation of information systems without the necessity of programming experience.

IDC **I**n-**D**welling **C**atheter.

IM **I**ntra**m**uscular (routed into muscle tissue).

IVC/F **I**ntravenous **C**annula (a catheter that is inserted into a vein for supplying medications or nutrients directly into the bloodstream) / **I**ntravenous **F**luids (fluids given through a vein inserted catheter.

L Light Diet.

LOS **L**ength **o**f **S**tay of a patient.

MO **M**edical **O**fficer.

MRN Medical Record Number.

MRO Methacilin Resistant Organism; an organism that shows resistance to Methicillin, a very strong antibiotic.

MRSA Multi Resistant Staphylococcus Aureus; any strain of Staphylococcus aureus that has developed resistance to beta-lactam antibiotics, which include the penicillins (methicillin, dicloxacillin, nafcillin, oxacillin, etc.).

N Neutropenic (very low white blood cell count). Caution must be taken by staff as they could pass something to a patient.

NBM Nil By Mouth.

NCR Nurse Care Record.

ND night shift.

NFR Not For Resuscitation.

NG Nasal-Gastric Tube.

NP Nurse Practitioner is a RN educated and authorised to function autonomously and collaboratively in an advanced and extended clinical role. Requires addition 1.5-2 years of study.

NUM Nursing Unit Manager.

OT Occupational Therapist.

PAC Pressure Area Care.

Palliative relieving or soothing the symptoms of a disease or disorder with effecting a cure.

PEG Percutaneous Endoscopic Gastrostomy tube; tube that is inserted into the stomach to give nutrition.

PICC Peripherally Inserted Central Catheter.

PRN as required medication; these are not part of the patients regular medications).

QID four times a day.

RN **R**egistered **N**urse. a graduate nurse who has been legally authorized (registered) to practice after examination by a state board of nurse examiners or similar regulatory authority, and who is legally entitled to use the designation RN..

Rx treatment pertaining to medication / subscriptions.

S strict precaution (Infection Risk).

SC **S**hower **C**omode (in chair).

SC Fluids **S**ub**c**utaneous Fluids; fluids administered just under the skin and not into a vein.

SH shower.

SP sponge bath in bed.

SPC **S**upra **P**ubic **C**atheter.

ST shower with trolley.

TB **T**owel **B**ath.

TDS three times a day.

TEDS brand of Anti-embolic Stockings that are used to prevent blood clots.

TKVO **T**o **K**eep **V**ein **O**pen.

TL **T**eam **L**eader.

TPN **T**otal **P**arenteral **N**utrition; all nutrition is given through a catheter.

Trainee Consultant/Registrar doctor learning his or her speciality.

U **U**rine **OR** MRO Risk (Unknown Status) mean a risk assumption has been made but not proven.

VTE **V**enous **T**hrombo**e**mbolism; i.e. blood clot in the vein.

Warfarin anticoagulant medicine; nurses need to be aware of patients receiving this due to higher risk of bleeding and in case of bleeds.

1. Introduction

1.1. Client Profile

Originally opened in Wahroonga on January 1 1903 as a 70 bed Sanitarium, the Sydney Adventist Hospital (SAH), known to the local residents as 'The San', is a not-for-profit hospital of the South Pacific Division of the Seventh-day Adventist Church. Today, the hospital is a private hospital offering acute care and currently has 358 licensed overnight beds. SAH is the largest single campus private hospital within NSW and was the first of its kid to be accredited by the Australian Council on Healthcare Standards. SAH is proud to have won the Australian Private Hospitals Association Award for Clinical Excellence in the category 70 beds and over in 2006.

The San prides itself on being the single biggest employer within the Hornsby-Kruing-gai area employing over 2,2200 staff and around 700 accredited medical pactitioners. Together, the SAN staff care for more than 50,000 inpatients and about 160,000 outpatients. The San is also known for its maternity wards and is proud to be bringing over 2,000 babies a year into the world. The SAN, being one of few private hospitals to offer emergency care, admits over 20,000 patients annualy making it NSW's largest and busiest emergency care department among private hospitals. The SAN offers medical services ranging from acute surgical, medical and obstetric care to complex cardiac and orthopaedic procedures. The SAN boasts cutting edge facilities that include a dozen operation theatre suites, 3 state-of-the-art Cardiac Catheterisation Laboratories and Australiaś first dual source CT scanner. The SAN is also responsible for operating the San Day Surgery Hornsby and Dalcross Adventist Hospital, located in Killara.

Having the mission statement "Christianity in Action", the SAN not only offers world class care to the patients within the hospital, but also to disadvantaged third world men, women and children as part of its HealthCare Outreach program. Since its inception in 1986, the HealthCare Outreach program has undertaken 100 trips to 13 different countries culminating in over 2,800 surgeries and lives saved.

1.2. Project Description and Scope

1.2.1. Project Description

The SAN Hospital Information System has to service many different clinical specialities and environments. This project will develop a prototype application in the form of a simulator of a novel HIT system for surgical patients. These patients typically have specific and predictable post-surgical outcomes and hospitalisation time-frames, as outlined in various surgical clinical pathways (e.g. Urology such as, Greenlight Laser Prostatectomy, Ear, Nose and Throat (ENT) and Plastics). Caring for these patients requires multidisciplinary nursing and allied health staff information systems. Constructing a requirements document will be a complex task but gives students the richest possible experience in understanding all the stages of requirements gathering, systems design and systems implementation. The project will use a research technology simulator that enables the process of requirements gathering and system design to be integrated as a single process and thereby enable validation of requirements by their implementation into a design simulator.

1.2.2. Scope

The project will commence with the gathering of requirements by meeting and interviewing various clinical staff fulfilling a variety of roles on the surgical ward, level 11. The student will also gather all paper based forms in use on the ward as references during the design process. Upon completion of the first phase of requirements gathering, a requirements document will be created and will represent the basis for design decisions. Throughout the rest of the semester, the student will update the requirements document as necessary. The student will design forms including the clinical handover in the simulator as well as obtain end user feedback during the majority of the semester. Towards the end of the semester, the student will undertake user acceptance testing as well as evaluations of the work done. The project will conclude with a first draft of the clinical handover form and a presentation to SAN staff. The project will finish at the end of the academic semester.

1.3. Project Objectives

- Collect the requirements for a Clinical Handover for use by nurses, allied health and medical staff in the care of surgical patients
- Produce an accurate record of the information each worker needs access to in the form of a requirements document including process flows
- Design and develop a prototype which simulates an electronic clinical information system with handover processes for nurses, doctors and other clinical staff

1.3.1. Risks

Ref #	Probability	Impact	Description	Mitigation
R.1	High	Medium	Reduced performance through use of new technology	Increase allotted tool usage time
R.2	Low	High	Unable to complete project objectives due to simulator issues	frequent communication with simulator developers
R.3	Medium	Medium	Scope creep	Clearly outline scope at outset of project

1.3.2. Assumptions

Ref #	Description
A.1	The simulator will not need to connect to existing SAN applications
A.2	We will have access to a simulator developer
A.3	A project manager will be available to use to assist us in our work at the hospital
A.4	We are not developing a system for actual use

1.3.3. Issues

Ref #	Priority	Description	Owner
I.1	High	Simulator bugs & issues	Simulator Developer
I.2	Medium	Exposed to immense amount of information	Student
I.3	Medium	Sporadic staff availability	Student & PM
I.4	Low	Time constraints due to university courses	Student

1.4. Anticipated Outcomes / Results for the Project

1.4.1. First Draft Computerised Handover Form

At the conclusion of this project, the student should have designed a first draft of a computerised handover form. This draft does not need to contain all information required but should focus on the most important pieces of information especially in regards to nurses. It should convey all relevant design decisions and be capable of representing patients with varying degrees of complexity, the degree to which a patient is ill.

1.4.2. Understanding of IT/IS within the Health Domain

The student will have gained a general understanding of not only the health domain but also the role of IT IS systems within a hospital setting. The student should see the advantages of using computerised information systems to support the clinical staff in their daily work.

1.4.3. Requirements Analysis Complete

By the end of the semester, the student should have completed the requirements analysis for the project. This should include all relevant requirements up to the end of the academic semester. As part of the requirements analysis, the student should have creating as-is and to-be process diagrams for the nurse to nurse handover.

1.5. Benefits of the Project

1.5.1. Technology Evangelisation

Through the project, the student will be able to show the advantages and abilities of computerised information systems to clinical staff in particular nursing staff. Although the clinical staff at the SAN are using applications to record information already, not all aspects of their daily work are digitised; this includes handover. By working with staff throughout the semester, the student will be able to generate end-user buy-in and support for a computerised clinical handover.

1.5.2. Pilot Project

This project constitutes a pilot project in the sense that future students can build upon the achievements of this project. The foundation, both in regards to system design as well as end-user exposure, will provide future students with a lower entry barrier into the clinical domain and into the SAN.

1.5.3. End-User Driven Development

Mention the use of the methodology here

1.5.4. Trialing Designer Tool

This project allowed the student to use a novice health information system application developed at the University of Sydney called iCIMS. The project can thus be seen as a trial for the designer tool enabling the student to not only use a new technology but also to document bugs and suggest enhancements to the system. In essence, the student ran the application through its paces and noted shortcomings as well as possible additional features allowing the application to go through a maturation process.

2. Process

2.1. Overview

In order to take full advantage of the tools employed in this project as well as the opportunity to work at the hospital, an iterative and incremental user driven development process was chosen. This allowed the student to take advantage of the tacit knowledge of clinical staff and allow the end-user to actively participate in the design of the system. The iterative and incremental nature of the process allowed the student to start with one form and then incrementally adding more forms as well as managing iterative changes in existing forms through user feedback. The ultimate goal of any project is to supply an outcome that will be accepted by the stakeholders, in this case the end users. User driven development enabled the student to ensure that during all steps in the project, the system met stakeholder needs and requirements. The active feedback gained from clinical staff enabled the student to shape and form the system to meet user needs. It is important to note that sitting down with clinical staff will was not always possible as their priority lies with patient care. In order to facilitate a continued design process throughout the semester a number of methods were employed. The student utilised participative observations, interviews as well as feedback notes to gain an adequate understanding of the user needs and requirements. The student's work at the SAN was supported by a project manager from the SAN, Hannah Chong, that facilitated first meetings with clinical staff as well as offering feedback on relevant project management aspects of the project.

2.1.1. Participative Observations

As this was the first time the student undertook a IT project within the health domain, it was important to learn how clinical staff worked. Participative observations facilitated this need through *shadowing* clinical staff during various points in their shift. This included sitting in on clinical handover, the process through which the nurse of the previous shift conveys patient information to the nurses of the oncoming shift. By sitting in on handover, the student was able to gain an understanding of the overall process of clinical handover as well as experience the shortcomings and inefficiencies first hand. This enabled the student to relate to the clinical staff when discussing the system design. The student did not actively participate in handover, that is to say that the student merely observed and did not give handover. Thus, the student acted like a 'fly on the wall', remaining in the background looking on. This method proved vital to the project as it provided a first hand experience of the current situation. One disadvantage of using participative observations is that the student was overwhelmed at first by the sheer

amount of information that he was exposed to. It took some time and effort on the part of the student to sift through, filter and understand the information in order to make the most efficient use of it. As the project progressed, this information overload continually decreased.

2.1.2. User Interviews

In order to supplement participative observation, user interviews were undertaken with various clinical staff fulfilling different roles within the hospital. This enabled the student to understand the viewpoints of various staff in regards to what they do as well as their view on clinical handover. The interviews lasted between ten and fifteen minutes and were held casually. During the interviews, the student asked specific questions about handover and the user's involvement. The interviews were held on the ward or in offices depending on the role of the staff being interviewed. The interviews also served the purpose of building a relationship with the clinical staff. The student's aim was to go back to the interviewed staff throughout the project and attain their feedback on the system design. This social component was very important in order to elicit staff support especially nursing staff as their time was extremely limited. Not undertaking this social component would have made the work of the student much more difficult.

2.1.3. Feedback Notes

During the course of the project, the student met with clinical staff at various times in order to show them the current status of the design as well as to get answers to open questions. During each of these encounters, notes were taken in order to preserve the exchange allowing the student to return to the notes at a later time to refresh his memory. In order to maximise the use of time with the clinical staff, the student was accompanied by another student who assisted with taking notes during the feedback sessions. This allowed the student to focus on the staff and not waste time trying to write down information as well as facilitating a smooth flow during the meetings with staff.

2.2. Tools and Skills

From the beginning of the project, one of the key aspects was the use of the iCIMS. Having been created at the University of Sydney recently, the project was meant to trial the tool in a real world scenario. The main ideology behind iCIMS is to use a graphic interface to build a system thus avoiding the necessity for programming skills. This means that end-users could actively participate in designing the system by creating the system together with the designer.

iCIMS aims to be applicable in any clinical situation and thus utilises Ockham's Razor of Design (Budd [2011]), which states that :

"a design should use the minimal number of entities with their maximal generalisations"

In conjunction with using iCIMS, the student utilised Trac, a bug and issue tracking system that also offers documentation functionality in form of a wiki. Two separate instances of Trac were used because the iCIMS project had an existing instance. All bugs and issues were documented in the iCIMS instance of Trac and all project documentation was created in a separate instance of Trac available for the project. All relevant project information, such as interview notes, process flows, etc., was documented on the Trac instance. Apart from playing a vital role in the completion of the project academically, the wiki will also serve as a starting point for future students continuing the project. This ensures that the student's efforts were not in vain and will allow future students to more easily find their way while undertaking future projects.

Apart from electronic tools, the student needed to use communication and people skills in order to successfully undertake this project. Communication and people skills played a vital role as the student was dealing with end-users that were very technology-adverse as well having a low computer-literacy. Inter-personal skills allowed the student to found common ground and terminology with which to communicate with end-user. It also allowed the student to quell most reservations that clinical staff had towards the project or its purpose.

2.3. Scope and Schedule

Although the project description outlines that the student undertake a design of the entire multi-disciplinary handover occurring at the SAN, this was deemed too big of a scope to handle within an academic semester. Below is a depiction that hints at the complexity and size of the entire clinical handover process.

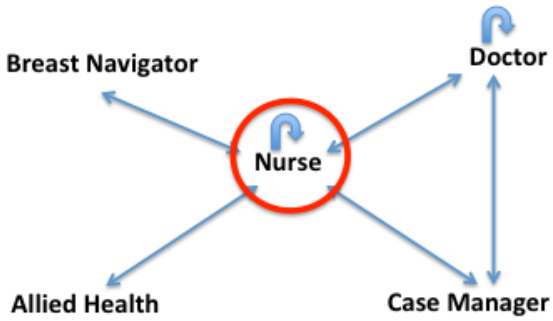

Figure 1: Clinical Handover Overview - All User Roles

As one can see, there are numerous roles involved in clinical handover each with their own needs and requirements. It was deemed unfeasible to undertake requirements analysis, system design and evaluation for all clinical staff involved. The sheer amount of information, communication complexity as well as immense design effort lead to the decision to focus on the nurse role for this project, denoted by the red circle in the figure above. Furthermore, the scope was defined as focusing on the clinical handover between nurses as this was deemed most important in discussions with staff. The nurse to nurse handover is also the most structured handover between clinical staff lending itself to be used in this project.

In regards to scheduling, the project was broken down into four major phases as depicted in the figure below. The week numbers are based on the academic semester timeframe.

Figure 2: Project Process and Schedule

Even though the project was broken down into four phases, all phases were undertaken at most times. The separation merely depicts where the focus lay at each point in time. The schedule of four weeks for requirements gathering was a good estimate and allowed the student to perform an adequate analysis allowing the student to proceed to the design phase. The design phase's projected timeframe of three weeks was too short and was actually the focus of the student's work until week twelve. This stems from the fact that the student had numerous issues with the designer in the form of bugs and it also took longer than expected to convert design ideas into reality within the designer. This was the case most notably because the student was not familiar with the designer or its components prior to commencing the project.

Due to the extensive design phase, the usability and acceptance testing phase was pushed back into the weeks twelve and thirteen after the student was at a point in the design that lent itself to such testing. Although the testing phase timeframe was reduced to two weeks and pushed to the very end of the academic semester, the student nevertheless managed to obtain testing data in coordination with staff. Due to availability issues with staff, not all clinical staff could undertake the usability and acceptance testing. It should be noted that these availability issues did not stem from bad time or appointment management on behalf of the student, but rather on issues surrounding staff being sick or having to take personal days.

The last phase, the reporting phase, was the focus of week thirteen of the project having been pushed back in order to allow for usability and acceptance testing. This did not pose a major issue as the majority of the reporting phase was in the form of the academic report. The other portion of the reporting phase where the weekly status meetings with Prof. Jon Patrick and the documentation of information in the wiki throughout the semester. At the centre of all phases and indeed of the project lay the communication with clinical staff as well as the project manager Hannah Chong and Prof. Jon Patrick.

3. System Design

mention that you chose to focus on nurse to nurse handover as the whole of multi-disciplinary handover is an immense undertaking

BABOK

3.1. Requirements Analysis

3.2. Form Gathering

3.3. Designing

4. Evaluation

4.1. Testing Procedures

4.2. Interpretation of Results

5. Future Work

6. Reflection

6.1. Contribution

6.2. Difficulties

6.3. Lessons Learned

6.4. Future Suggestions

7. Conclusion

think about taking out future work and moving concluding remarks to the end.

7.1. Concluding Remarks

7.2. Strengths and Weaknesses

7.3. A Second Time

7.4. Future Work

A. Bibliography

Alhir, S. S. (1998). *UML in a Nutshell*. O'Reilly & Associates, Inc.

Budd, P. (2011). *Generative Clinical Information Management Systems*. PhD thesis, The University of Sydney.

IIBA (2009). *A Guide to the Business Analysis Body of Knowledge*. International Institute of Business Analysis, 2nd edition.

B. Appendix

Include the following:

- Roles at SAN wiki page
- Scans of original questionnaires
- Screenshots of SANSURGIMS (Web and Designer)
- Scans of important forms (Nursing Care Record & Patient History)