A Guide for the Safe Use of Electronic Clinical Handover Tools

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Clinical Handover

ACSQHC

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Please note that patient names and identifiers used as examples in this document are fictitious.

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Acknowledgements

Executive summary

Handover is 'the transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis' (Australian Medical Association, 2006).

Handover occurs at all transitions of patient care, from handover between shifts on a ward, handover between units within a facility, or handover between different facilities during patient transfer (Arora, Johnson, Lovinger, Humphrey, & Meltzer, 2005; Patterson, Roth, Woods, Chow, & Gomes, 2004).

Recently, clinical handover has been the focus of several national and international efforts to enhance quality and influence change. Of the many types of interventions that focus on improving clinical handover, the use of technology to support handover has been an issue of increasing relevance with recent advances in health informatics.

Much of the history of health informatics involves a specific focus on technical hardware and software issues involved in the development of clinical information systems and other aspects of the medical informatics landscape. Only in the last few decades has the focus shifted to include human factors perspectives. This has increased our understanding of the ways in which complex technological interventions interact with and influence the people and organisations at the heart of health care delivery (Lorenzi, Riley, Blyth, Southon, & Dixon, 1997). This perspective is often called the 'socio-technical' perspective as it seeks to understand the complex interface between the human and technological aspects of an intricate health system.

This guide is written within this context, and provides guidance to clinicians, medical administrators, quality and safety staff, and health informatics professionals with respect to the safe use of electronic tools to support clinical handover. This guide is also designed to assist at all stages of the design and use of electronic handover systems, from the investment in a new product right through to implementation and evaluation. In short, this guide covers the main considerations for ensuring the safe use of electronic tools to support clinical handover.

The major benefits of electronic tools

Electronic tools can assist a clinical team in the core functions of handover and contribute to safe and efficient handover practice. This section outlines the main areas where benefits to the safety and effectiveness of handover can be achieved through the use of electronic tools. These benefits include:

- enhancing continuity of care through transferring accountability and responsibility
- accessing and sharing information
- assisting with clinical task management
- supporting a structured approach to handover
- supporting the use of standardised operating protocols
- enabling the use of a minimum dataset
- helping to identify and track patients.

While electronic tools bring a number of tangible benefits, it is important to remember that the basic practice of safe handover in any clinical setting is largely independent of whether technology is used. Electronic tools, on their own, are neither necessary nor sufficient to undertake safe handover. Technology should not be adopted with the view that it will automatically make handover practices safe. Therefore, any decision to implement electronic tools to support clinical handover should be based on demonstrable safety benefits or other advantages to clinical practice.

Ensuring safe use of electronic tools

While there are a number of clear benefits from the use of electronic tools to support clinical handover, the day-to-day use of electronic tools must be undertaken in a manner that is safe. Within this context, the safe use of electronic tools can be defined as use that 1) manages the potential risks associated with technology in the clinical context; and 2) works within the limitations of that technology.

Safe use of technology to support clinical handover involves its seamless integration within clinical practice. The careful design of protocols for the use of the tool is critical to ensure the new technology does not provide an additional workload burden, or interfere with primary clinical tasks. Protocols need to:

- ensure alignment with clinical practice
- minimise additional workload burden
- embody the philosophy of 'flexible standardisation'
- create an appropriate environment in which electronic tools can support handover
- maintain communication between clinicians
- ensure the accuracy, relevance and timeliness of information used to support the continuity of patient care.

Consideration needs to be given to the ways in which electronic tools are implemented into the clinical environment to ensure a seamless and complete transition from previous practice to use of the electronic tool.

Considerations for technology and system design

The design of electronic tools to support clinical handover must embody the core standards relating to the specifications for health information systems. To this end, electronic tools should adhere to national and international standards for the exchange and management of electronic health care information.

The benefits of a stand-alone electronic tool to support clinical handover are limited, given the rapid development of clinical information systems and the progression towards a full electronic medical record. Ideally, an electronic handover tool should be fully integrated with other core functions of the clinical information systems of the facility. Key considerations include:

- adhering to national and international standards
- ensuring that existing information technology infrastructure supports the tool
- building interoperability with other core functions of clinical information systems
- embodying usability and user-centred design
- ensuring system accessibility and reliability
- building in redundancy and back-up protocols if the system is down.

System design can significantly influence the overall safety of an electronic handover tool. Safe technology needs to be designed for clinicians in the clinical context. It is therefore designed for the time-poor, frequently distracted and interrupted, fatigued, and sometimes stressed members of a team.

This document provides guidance for the adoption and implementation of electronic tools to support clinical handover.

Preface

Clinical handover – a patient safety priority

Health care involves many individuals and teams working together to provide quality care. Good care relies on all members of a patient's health care team and the patient/carer knowing the plan of care and their role in that plan.

Transitions of patient care have been identified as an area of considerable vulnerability from the perspective of patient safety and is a significant contributor to preventable patient harm (Beach, Croskerry, & Shapiro, 2003; Borowitz, Waggoner-Fountain, & Bass, 2007). The intent of clinical handover is to ensure continuity of patient care and mitigate risks associated with these vulnerable transitions in care. Such transitions are vulnerable to discontinuities in care that result from failures in communication between clinicians and/or failures in the transfer of responsibility and accountability.

Clinical handover as defined by the Australian Medical Association (2006) is the transfer of

professional responsibility and accountability for some or all aspects of care for a patient or group of patients to another person or professional group on a temporary or permanent basis.

A growing evidence-base provides us with some guidance on what constitutes safe handover. The main 'outputs' of safe handover (Australian Medical Association, 2006) and patient safety risks of poor handover (Arora et al., 2005; Bhabra, MacKeith, Monteiro, & Pothier, 2007; Borowitz et al., 2007; Clancy, 2008) are presented in Table 1. (over page).

Reducing patient safety risks that arise from poor approaches to clinical handover has become an international priority. The Australian Commission on Safety and Quality in Health Care has taken a lead role with the World Health Organization to advance improvements in clinical handover (Jorm, White, & Kaneen, 2009). Of the many types of interventions that focus on improving clinical handover, the use of technology to support handover has been of increasing relevance with recent advances in health informatics.

Table 1: Main outputs and risks of handover	
Main Outputs	**Risks**
Accepting responsibility and accountability for a patient's care	Unclear assignment in transfer of care
Prioritising tasks for individual patients	Poor quality information and critical information omitted
Establishing plans for further care	Lack of teamwork and continuity of care
Reviewing unstable patients in a timely manner	Reliance on written handover

Electronic clinical handover tools

There is a growing trend in the use of electronic tools to support clinical handover. It is attractive in that it can allow for patient lists to be generated, can auto-populate with important clinical information, eliminate the need to 'look up test results and jot down on a note', can display task lists, provide for electronic sign on and sign offs, and structure the delivery of clinical information to reduce risk of important information being forgotten. Importantly it has potential to allow for all members of the patient's health care team to have ready access to the latest clinical handover notes so the team can 'be on the same page' or have the same shared mental model for executing the plan of care.

Initial studies suggest that electronic clinical handover support tools may improve continuity of care, improve the quality of handover generally, reduce adverse events and reduce time taken for handover (Petersen, Orav, Teich, O'Neil, & Brennan, 1998; van Eaton, Horvath, Lober, Rossini, & Pellegrini, 2005).

It may be tempting therefore to look to electronic tools as a solution in resolving risks associated with clinical handover and indeed, they may have an important role in supporting effective clinical handover practice. However, one must look to history to understand the impact of electronic systems in health care before being 'overly enthusiastic' in assuming that electronic tools alone can provide the total solution for improving clinical handover.

Socio-technical perspective

Much of the history of health informatics involves a specific focus on technical hardware and software issues involved in the development of clinical information systems and other aspects of the medical informatics landscape. Only in the last few decades has the focus shifted to include human factors perspectives. This has increased our understanding of the ways in which complex technological interventions interact with and influence the people and organisations at the heart of health care delivery (Lorenzi et al., 1997). This perspective is often called the 'socio-technical' perspective as it seeks to understand the complex interface between the human and technological aspects of an intricate health system.

Reports of adverse clinical events resulting from failures of complex socio-technical systems are now appearing as the use of information technology has increased in health care. Many of the errors reported result from specific electronic tool design or implementation failures. These errors are often 'silent' or in isolation may be seemingly trivial (latent errors). They are not detectable when conducting technology checks but emerge later once systems are operational and stand the test of varying individuals and work practices (Ash, Berg, & Coiera, 2004). The science of human factors as it applies to health care informatics is maturing. Lessons learned from the introduction of clinical electronic support systems have allowed us to learn about the types of unintended consequences of their implementation (Ash et al., 2007). To ensure patient safety with the introduction of electronic tools for clinical handover, one must incorporate approaches that are sensitive to human factors and address the socio-technical issues. Such an approach needs to begin with planning and continue through design, implementation and ongoing monitoring and evaluation.

Nature of communication and the design of electronic handover tools

The complexity of designing and introducing technological solutions into health care is complicated by the nature of communication in the health care environment. Staff execute tasks and make clinical decisions across rich social networks (Ash et al., 2007). The social organisation, funding models, professionalism, trust, culture, and educational structure in health all contribute to professional and communication 'silos' (Friesen, Hughes, & Zorn, 2007). Structuring an electronic tool can be complicated by the very nature of handover involving teams within a professional discipline, across disciplines and hierarchies, between health care sectors and at all hours of the day or night using multiple manual and technological tools. Individual staff may possess a particular communication mode (face-to-face, written, electronic, phone) that is more effective for them and that mode may alter under stressful conditions. These factors mitigate simplistic technology-based models of information exchange based on standard

protocols because they highlight that the context of many clinical communications changes over time, place and personnel. This is not to imply that there is no structure or that information flows do not take place, but rather, when trying to identify information specifications suitable for electronic tools there needs to be a clear acknowledgement that contextual factors are very important elements in how decisions are reached (for example, where there are differences over treatments during clinical handover, mediation and discussion are often the only way to conclude decisions about the next steps for patient care and who should be responsible and accountable).

Working with structured representations of team interactions is useful for developing electronic handover tool design models but the models should not then become a substitute for going back to reality to test how well it works in practice.

Practical effectiveness and usefulness will be determinants of the value and safety of the electronic clinical handover tool. It is imperative that any design changes based upon practical usability testing are evaluated further, in terms of their impact on safety.

The patient is central to clinical handover.

The patient sits at the heart of the clinical handover electronic information. The role of the patient in designing patient information systems to reduce risk of medical error require consideration (Unruh & Pratt, 2007). Health consumers can contribute by advising on handover design and processes to allow the patient's key concerns regarding their transition of care to be considered. There is a move to include the patient/carer in bedside handover. Bedside and wireless technology provide opportunities for electronic tools to support handover at the bedside and allow patients to contribute to the process.

Introduction

The evidence-base: Tools for Electronic Clinical Handover (SafeTECH) project

The development of this guidance document was informed by research at three case study sites within South Australian hospitals as part of the 'Safe Tools for Electronic Clinical Handover' (SafeTECH) project. The research was oriented around the implementation of an electronic tool to support different forms of clinical handover in each of these sites.

The research at each case study site adopted an evaluative methodology, firstly collecting baseline data about existing handover practice, and then subsequently examining changes to handover post implementation of an electronic tool to support clinical handover. In particular, we considered changes to handover practice, communication and indicators of safety.

As research was carried out in natural, uncontrolled settings characterised by quality improvement processes, staff rotations and different approaches to information technology training, not all of the changes observed can be confidently attributed to the electronic handover tool. Nevertheless, specific findings from the three case study sites offer important considerations for the safe use of electronic handover tools in general. The specific findings of these research case studies are documented in a separate report entitled 'SafeTECH – Safe Tools for Electronic Clinical Handover – Summary of Research Findings' which is available from the ACSQHC website http://www.safetyandquality.gov.au.

Together, the three case study sites provided a diversity of handover practices, interpersonal handover dynamics, electronic tool legacy, intentions and expectations and periods of implementation. For example, two sites used the tool to support formal handover practices by using the patient handover screen. At those sites, we observed shift-to-shift handover. The other site used the tool to populate a list of sick and deteriorating patients for use by

night cover clinicians. At that site, we observed day to night shift handover. Implementation periods ranged from 11 to 28 weeks. As any research period is restricted to a 'snapshot in time' and the impact of introducing a handover tool is under constant negotiation, this modest variation in implementation periods adds a level of temporal depth to our data.

For each of the three case study sites the technology used to support clinical handover was a customised electronic handover module built into the South Australian public health system's electronic health record using Oacis. Oacis (Open Architecture Clinical Information System) is a clinical information system that is designed to retrieve, organise and centralise medical data and to provide a single point of access to online patient records. Data for the Oacis system is drawn from a range of different clinical and administrative data sources.

The electronic handover module within the Oacis Clinical Information System is a purpose built module. It is comprised of a single data entry and retrieval page to contain the handover notes for each patient. The handover screen contains six free-text boxes into which clinicians can enter and update patient data.

In addition to the case study projects, comprehensive review of the literature as well as consultation with other health care providers in Australia who are currently using electronic tools to support clinical handover informed the development of this guide.

An overview of the structure of this guide

This guide has been designed to assist clinical-leaders and managers across diverse health care settings ensure that electronic tools to support clinical handover are safe in their use. While the focus of this guide is primarily the acute care setting, it is anticipated that the principles herein have applicability across many health care settings. In short, this guide covers the main considerations for structuring safe use of electronic tools to support clinical handover, and is divided into two main sections.

Section one: Key questions for the safe use of electronic tools in clinical handover

This section will assist health care administrators, clinicians, managers, safety, quality and risk managers, and information technology officers consider the benefits, risks, and technological considerations associated with electronic clinical handover tools. This section is structured around three key questions:

What are the main benefits of electronic tools to support clinical handover?

Electronic tools can assist a clinical team in the core functions of handover and contribute to safe and efficient handover practice. This section outlines the main areas where benefits to the safety and efficiency of handover can be achieved through the use of electronic tools.

How do we ensure the safe use of electronic tools?

While there are a number of clear benefits to the use of electronic tools to support clinical handover, the day-to-day use of electronic tools must be undertaken in a manner this is safe. Within this context, the safe use of electronic tools can be defined as use that 1) manages the potential risks associated with technology in the clinical context; and 2) works within the limitations of that technology.

What are the important technical considerations for an electronic tool?

A set of fundamental requirements for the technological systems that are used as electronic tools to support clinical handover are presented. This section places these technical requirements in the national and international context of health information systems.

Section two: A guide for implementation and evaluation

This section builds on principles in the OSSIE Guide to Clinical Handover Improvement (ACSQHC 2009) and provides specific guidance on the introduction and evaluation of electronic clinical handover tools. This section structured around two key questions:

What do we need to think about when implementing an electronic tool?

Many aspects need to be considered, such as ensuring there is support from top management and adequate resources to be channelled into the project. An assessment on the appropriateness and readiness for the introduction of the electronic tool needs to occur. The tool's aim, implementation action plan and policy needs to be developed, and agreement on standardisation must be reached. Finally, training, supervision and coaching needs of staff must be addressed.

How do we evaluate the safety and effectiveness of an electronic tool?

Ensure baseline data is collected before implementation of the electronic tool. During and post implementation adopt a process to report and monitor patient safety while referring back to the baseline data. Over time, regular monitoring and maintenance will assist in sustaining safe use of the electronic tool.

Glossary of key terms and abbreviations

ACSQHC	Australian Commission on Safety and Quality in Health Care, the Australian body charged with the development of a national strategic framework and associated work program that will guide improving safety and quality across the health care system in Australia.
Adverse event	Harm to a patient caused by medical management rather than the underlying condition of the patient.
Clinical handover	The process of transferring accountability and responsibility for patient care.
Error	An occurrence where the intended actions or outcomes of a task are not achieved.
Failure	The breakdown of a system, the term failure is used to describe events where the desired state or goals of a system are not achieved.
Flexible standardisation	Flexible standardisation refers to achieving a balance between the benefits of standard approaches to clinical handover, and the need for remaining flexible across different clinical contexts.
Health Informatics	The application of information technology and computer science to health care.
Human Factors	The scientific discipline concerned with the understanding of interactions among humans and other elements of a system, that applies theory, principles, data, and other methods to design in order to optimise human wellbeing and overall system performance.
NEHTA	National E-Health Transition Authority, the Australian body charged with the development of better ways of electronically collecting and securely exchanging health information.
Risk	Something that has the potential to do harm, risk is defined in both terms of patient safety, as well as in terms of efficiency, productivity, and the other goals of health care delivery.
Risk management	The process of identification, assessment, and control of risk.
Safety	A system state in which the potential for harm is actively managed to an acceptable level.
Safety culture	The aspects of an organisation's culture that support safety. Concepts such as trust, justice, open communication, reporting, learning from near-misses and incidents, and sharing safety information are all critical components of safety culture.
Socio-technical system	Any system of work in which there are human (socio) and technological (technical) components working together to achieve a specific goal or outcome.

Key questions for the safe use of electronic tools in clinical handover

1

What are the main benefits of electronic tools to support clinical handover?

Electronic tools can assist a clinical team in the core functions of handover and contribute to safe, efficient and effective handover practice. This section outlines the main areas where benefits to safety and efficiency of handover can be achieved through the use of electronic tools. These benefits include:

- enhancing continuity of care through transferring accountability and responsibility
- accessing and sharing information
- assisting with clinical task management
- supporting a structured approach to handover
- supporting the use of standardised operating protocols
- enabling the use of a minimum dataset
- helping to identify and track patients.

While electronic tools bring a number of tangible benefits, it is important to remember that the basic practice of safe handover in any clinical setting is largely independent of whether technology is used. Electronic tools, on their own, are neither necessary nor sufficient to undertake safe handover. Technology should not be adopted with the view that it will automatically make handover practices safe. Therefore, any decision to implement electronic tools to support clinical handover must be based on demonstrable safety benefits or other advantages to clinical practice.

Before introducing an electronic tool to support handover, organisations should first have in place clear and well-defined handover processes. Electronic tools are fundamentally mechanisms to support, and not replace, good clinical handover practice. Resources are available to assist more generally with handover improvement. Some of these resources are outlined on the following page. Again, it is strongly advised that robust handover practices are in place, prior to introducing technology to support handover.

It is important to begin any discussion around the potential implementation of electronic tools to support clinical handover with a frank appraisal of expectations. It is important to dispel the myth that technology will optimise clinical handover with little effort. More importantly, it is critical to acknowledge the ways in which poor clinical handover can contribute to error and patient harm.

In considering the use of electronic tools to support clinical communications, where those communications are dynamic and context dependent, it is critical to recognise that these interactions involve more than simply the transfer of information content. Handover is not simply a matter of instructions being transferred but it is a dynamic conversation between individuals that generates new questions. In one sense then, the challenge faced is highly problematic as there is not necessarily any single solution but rather the need for a type of flexible standardisation in the development and deploying of electronic tools to support clinical handover (Australian Commission on Safety and

Quality in Health Care, 2009). Flexible standardisation refers to achieving a balance between the benefits of standard approaches to clinical handover, and the need for remaining flexible across different clinical contexts.

The introduction of electronic tools into the clinical environment has the potential to impact on well-established clinical practice. Whilst much of this impact might be positive in terms of more efficient practice and enhanced patient care, there is the potential for increased workload at least in the short-term, and increased risk associated with new technologies. Similarly, electronic tools have the potential to create new forms of error in clinical practice (Koppel et al., 2005). Incorrect patient selection, incorrect or omitted information, and redundant or out of date information have all been identified as potential risks associated with the increasing use of technology to support patient care. It is important to identify and mitigate these risks when adopting new technology. With the risks correctly managed, electronic tools are more likely to contribute to safe, efficient and effective handover practice.

In summary, any decision to use an electronic tool to support clinical handover must clearly define the anticipated benefits as well as identify and manage any potential risks. This section will examine the wide range of possible benefits and discuss how possible risks can be effectively managed.

Resources: Further guidance material

AMA clinical handover guide – Safe Handover: Safe Patients

The AMA has developed guiding principles for best practice in safe clinical handover. The guide provides practical guidance on best practice in clinical handover and provides examples of different models of good handover.

http://www.ama.com.au

Resources: Further guidance material

Clinical handover literature review

The eHealth Services Research Group at the University of Tasmania produced a comprehensive literature review commissioned by the Australian Commission on Safety and Quality in Health Care.

The literature review is structured around the following themes:

- High risk scenarios in clinical handover
- Interventions, critical success factors and effectiveness
- Evidence gaps in clinical handover.

http://www.safetyandquality.gov.au

OSSIE Guide to Clinical Handover Improvement

The Australian Commission on Safety and Quality in Health Care has developed a comprehensive guide to assist organisations in improving clinical handover practices (Australian Commission on Safety and Quality in Health Care, 2009). There are five phases in the OSSIE cycle:

O = Organisation leadership

S = Simple solution development

S = Stakeholder engagement

I = Implementation

E = Evaluation and maintenance.

http://www.safetyandquality.gov.au
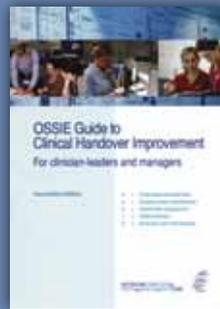
Resources: Further guidance material

The Medical Journal of Australia published a supplementary issue: Clinical Handover: Critical Communications

The supplementary reports on work conducted across Australia as a product of the Australian Commission on Safety and Quality in Health Care's Clinical Handover program. Medical Journal of Australia 2009; 190(11) suppl.

www.mja.com.au

ACSQHC clinical handover projects

The Australian Commission on Safety and Quality in Health Care funded a pilot program that involved the development of practical and transferable tools and solutions for improving clinical handover. Finalised tools, solutions and reports from the pilots are freely available for download at www.safetyandquality.gov.au.

Tools available include:

- protocols for improving medical and nursing shift-to-shift handover
- materials on using briefing techniques (SBAR, ISBAR, ISOBAR, SHARED) at handover
- tools to help clinicians redesign their own handover practices
- online education modules
- protocols for implementing bedside and whiteboard handover
- tools for handover from aged care facility to hospital
- materials on team communication
- tools for inter-hospital transfers
- tools for mental health to community practitioner handover
- handover tools in maternity care
- communication and team training.

Enhancing continuity of care – transfer of accountability and responsibility

Maintaining the continuity of patient care through the transfer of responsibility and accountability is the primary purpose of clinical handover. Electronic tools can be used to support this fundamental aspect of clinical handover.

Continuity of patient care is a critical factor influencing health care outcomes and patient safety, and transitions such as changes of shift, transfer of a patient, or discharge to community have been identified as possible gaps in the continuity of care (Cook, Render, & Woods, 2000). Clinical handover has been identified as a key strategy to bridge these gaps, and therefore enhance continuity of care.

The transfer of accountability and responsibility are critical concepts for clinical handover, which is much more than simply the transfer of clinical information. Recent research has highlighted that simply the transfer of information is meaningless, unless it results in action that is appropriate for a patient's care (Jorm et al., 2009).

Continuity of care is maintained by 'passing the baton' between clinicians – handing over the accountability and responsibility for the care of a patient. Three types of continuity of care have been identified from a recent review of the literature (Haggerty et al., 2003). The table below describes the way in which electronic tools can support each of these forms of continuity in patient care.

There are several key questions for ensuring the safe use of electronic tools so that they provide good support for the transfer of accountability and responsibility:

- Who is responsible for ensuring the data entered into the tool is correct?
- Does the information in the electronic tools have an electronic signature?
- In a multidisciplinary handover, do all disciplines sign?
- How is responsibility and accountability for the handover formally signed off?

Technically, explicit support for accountability and responsibility can be embedded within systems through the use of digital signatures. The issue of information security and digital signatures has been thoroughly examined in the domain of health informatics, and standard protocols exist (Lakovidis, 1998). In Australia, the National E-Health Transition Authority's (NEHTA) e-Health ID program is developing standards for the identification and authentication of everyone involved in each health care transaction, from the provider to the patient. These, along with other international initiatives provide guidance on the security of clinical information, and

Form of continuity	Definition	Support provided by electronic tools
Informational continuity	The use of information on past events and personal circumstances to make current care appropriate for each individual	Storing clinical notes and reminders Integration with clinical information system Facilitating access to laboratory/imaging results
Management continuity	A consistent and coherent approach to the management of a health condition that is responsive to a patient's changing needs	Recording decisions made at handover Facilitating access to referrals
Relational continuity	An ongoing therapeutic relationship between a patient and one or more providers	Assigning individual responsibility for actions Identifying accountable clinicians

the appropriate use of digital signatures to identify those responsible and accountable for patient care.

Consideration should also be given to the legal status of the handover notes in both their electronic and printed form. What legislation applies in your jurisdiction in relation to the status of the record, and what rules apply for the security, transfer and storage of this information?

At the very least, the use of electronic tools to support clinical handover can assist to make sure 'everyone is on the same page' and that the outcomes of the handover discussion are clear, transparent and accessible to the clinical team. As the case study on the next page demonstrates electronic tools can form part of a risk reduction strategy.

Responsible clinician identified

Consultant: Edwards, Richard

Author of information identified

Author, date and time displayed

Clinical Handover

Patient: 26/34 PERU, LEONIE

Age: 50 y

MRN: 99999999 FMC

Gender: Male

D.O.B.: 30/03/1959

Site: RAH

Consultant: Edwards, Richard

Admit Reason: UTI

Location: RENP

Type: Medical

Estimated Discharge Date:

Current Problems:
Hx Spina Bifida Hydrocephalus - VP shunt
Kyphosis - neurogenic bladder + bowel
Bicarbonate wasing from renal stones CRF
Came to OPD appt rapid breathing, acidotic, low HCO3 and low K
UTI - e Coli awaitng blood cultures

Current Management:
Drugs: Folic acid, KCL, NaHCO3 ,Vitamin D3 ,Phosphate Sandox, Thiamine + Timentin

Last edited: HANCOCK, EILEEN   27/10/2009 14:38

Management Plans:
IV with K H2PO4
6/24 ABG
8/24 IV Timentin
6/24 Cathetherisation
Daily weighs and regular turns

Discharge Plans:
Currently planning for transition to adult care ? when

Handover Notes:
27/10/09 Evening registrar to check K+ and blood cultures by 2300hrs
Order CXR before 9am - 28/10/09
Urine MC+S to be sent 28/10/09

Other Notes:

☐ Add to Handover Roster   ☑ Flag Patient As Urgent   Cover: Med Cover

Close   Alerts (1)   Save   Previous Admission   ?

Tasks allocated to individuals

27/10/09 Evening registrar to check K+ and blood cultures by 2300hrs
Order CXR before 9am - 28/10/09
Urine MC+S to be sent 28/10/09

Case study:
Lessons from practice

Assigning responsibility and accountability…

Morning handover involved detailed discussion between consultants about a patient with an acute condition. The discussion revolved around the relative benefits of further invasive imaging, or a more conservative approach to monitoring and discharge of the patient that day. The general consensus was that the conservative approach was indicated for this patient and that they should be prepared for discharge that morning.

However, the next morning the patient remained on the handover list and when the patients status was described as 'unchanged from yesterday' it was queried why that patient had not been discharged. Subsequent discussion revealed a lack of clarity in the actual decision made at

handover, and that no one had assumed responsibility for the patient's discharge.

The unit implemented an electronic tool and in doing so reduced the risk of lack of clarity in the outcome of a handover discussion, and reduced the risk of actions not being completed subsequent to handover. The electronic tool provided a written record of the agreed plan for each patient for the subsequent shift. Moreover, the electronic tool enabled individuals to be assigned tasks – simply by putting their initials next to the agreed action in the electronic system.

Rather than relying on memory or individual written notes, the electronic tool provided a shared record that could be accessed and referred to by any of the clinical team throughout the day, and importantly made the transfer of responsibility and accountability clear.

Accessing and sharing information

The use of electronic tools in clinical handover can provide better access to current clinical information about patients, and reduce the risk of omitting critical clinical information. Further, the use of an electronic tool can facilitate the process of sharing critical information between teams.

Up-to-date information is the basic 'currency' of good clinical handover. Electronic tools provide significant assistance by facilitating access to information and enabling that information to be shared.

One of the main benefits of electronic systems to support clinical handover is the integration with the overall clinical information system. Electronic tools to support clinical handover should aim to provide seamless access to patient lab results and other diagnostic results, clinical ordering systems, as well as other functionality of the clinical information system.

Electronic tools can also ensure that critical pieces of information are on hand, such as a patient's resuscitation status or clinical alerts. However, the duplication of information increases the risk of error, and to this end it is critical that electronic tools facilitate access to information that is stored in a secure and validated form within the formal clinical information system. While electronic tools facilitate the transfer of information, they also highlight the need to have in place protocols to ensure the veracity and security of clinical information.

An electronic tool can provide a permanent and shared record of handover. Rather than relying on memory or a series of handwritten notes, an electronic tool can provide a single summary of handover, including information about the current status of the patient, a list of tasks to be completed and the overall care plan

Clinical Perspectives...

"I think it aids safety actually, particularly because there's blood values... blood tests on there as well, you know, you've got it all in writing. So I think it improves safety."

"So it is now possible if you write the plan down that someone else who didn't make it to handover can access that information at any time during the day and see what the current plan is..."

for the patient that is legible. Multiple users can access the handover note, and being stored centrally means it can be referred to or updated across a shift. Electronic tools can assist with sharing information across the whole health care team and between disciplines.

Patient care is typically the responsibility of a multi-disciplinary team. When electronic tools are used to support clinical handover, it is possible for the information exchanged and decisions made at handover to be shared amongst the whole team, even if they are not present at handover. Electronic tools can be used to capture a more permanent record of the ephemeral discussions that take place at handover. To this end, electronic tools can be used to support the core philosophy of clinical handover improvement programs – such as 'Know the plan, Share the Plan, Review the Risks' concept embodied in TeamSTEPPS (Salisbury & Hohenhaus, 2008).

The archiving functions within the electronic tool can provide a brief summary of the patient's progress. Typically handover looks through the lens of a single shift, however, archived notes can provide a longer perspective of patient status.

Laboratory results
Results appear with mouse click

Radiology results
Results appear with mouse click

Handover - by cover

Practitioner ALGERIA, ANNA   Facility RAH   Roster Type: System

	Location	Patient Name	MRN	Attending	Admit Reason	Hnd	ENC	LAB2	RAD	SUM	Ren	GFR	RFL
HC	S5	ANKARA, AMANDA	T12334	DE RIO	DEGLOVING INJURY	U	6 mo	2 w	13 d	N			*
HC	S5	LIMA, RIKKI	T24683	BRAZIL	LEG HAEMATOMA	H	16 d	21 m	7 d	N			REQ
HC	S5	MALTA, ANDREA	T95000	SAO PAULO	ENDOMETRIAL CA	U	15 w	3 d	11mo	N	5 mo		
HC	S5	ONTARIO, PETA	T43381	ARGENTINA	LEFT BREAST RECONSTRUCTI	U	11 d	17 m	10 d	N			*
HC	S5	PERU, LEONIE	T10477	SAO PAULO	ENDOEMTRIAL CA	H	45 m	9 d	21 h	N			

Close Cleanup Pt. List... Census ... Roster Menu Pers. Roster Order Worklist..   00:04:21

Handover notes pre implementation

Patient List Summary Report

Patients on Report: 2

Patient Details	Notes	Results

WARD: WARD: HO: - HOPE

01 SURNAME, GIVEN NAME DOB: 29/02/2004 13 d Sex: M Day: 3 NEONATAL SEPTICAEMIA?	Attending: Edwards, Richard _[handwritten notes, illegible]_	Clinical Unit: DPT GEN. MEDICINE 1	Status: H	05/02/2007 19:31

05/02/2007 19:31
HB 163 g/L
PLT 680 x10*9/L
WCC 13.70 x10*9/L

K 5.1 mmol/L
CL 106 mmol/L
Ur 1.8 mmol/L
CREAT 27 umol/L

05/02/2007 19:31
NA 139 mmol/L

05 SURNAME, GIVEN NAME DOB: 30/06/2007 2 mo Sex: M Day: 3 FOR OBSERVATION	Attending: Edwards, Richard _[handwritten notes, illegible]_	Clinical Unit: DPT GEN. MEDICINE 1	Status: H

05/02/2007 23:30
HB 110 g/L
PLT 482 x10*9/L
WCC 12.20 x10*9/L

05/02/2007 23:30
NA 139 mmol/L
K 4.4 mmol/L
CL 108 mmol/L
Ur 2.6 mmol/L

CREAT 19 umol/L
05/02/2007 00:00
NA 139 mmol/L
K 4.4 mmol/L
CL 109 mmol/L
Ur 4.6 mmol/L
CREAT 24 umol/L
Gluc 4.2 mmol/L

Handover notes post implementation

Patient List Summary Report

Patients on Report: 2

Patient Details	Notes	Results

WARD: WARD: HO: - HOPE

01 SURNAME, GIVEN NAME DOB: 29/02/2004 13 d Sex: M Day: 3 NEONATAL SEPTICAEMIA?	Attending: Edwards, Richard **CURRENT PROBLEMS:** 10/7 boy, fever to 38.6 today, miserable, crying lots since birth, difficult feeding, spilling more, gained weight, first baby, otherwise well, septic screen (except failed LP) all N so far. **MANAGEMENT PLANS:** ?dehydrated chase tx - BC	Clinical Unit: DPT GEN. MEDICINE 1 **CURRENT MANAGEMENT:** observe and nursing support	Status: H

05/02/2007 19:31
HB 163 g/L
PLT 680 x10*9/L
WCC 13.70 x10*9/L

K 5.1 mmol/L
CL 106 mmol/L
Ur 1.8 mmol/L
CREAT 27 umol/L

05/02/2007 19:31
NA 139 mmol/L

05 SURNAME, GIVEN NAME DOB: 30/06/2007 2 mo Sex: M Day: 3 FOR OBSERVATION	Attending: Edwards, Richard **CURRENT PROBLEMS:** cold, cough 3 d fever on D1 ? Bronch 2/52 ago - LMH ?seizures ? apnoeic epi **MANAGEMENT PLANS:** NPA EEG, cranial U/S on 9/2/7 **HANDOVER NOTES:** neuro obs	Clinical Unit: DPT GEN. MEDICINE 1 **CURRENT MANAGEMENT:** O2 obs	Status: H

05/02/2007 23:30
HB 110 g/L
PLT 482 x10*9/L
WCC 12.20 x10*9/L

05/02/2007 23:30
NA 139 mmol/L
K 4.4 mmol/L
CL 108 mmol/L
Ur 2.6 mmol/L

CREAT 19 umol/L
05/02/2007 00:00
NA 139 mmol/L
K 4.4 mmol/L
CL 109 mmol/L
Ur 4.6 mmol/L
CREAT 24 umol/L
Gluc 4.2 mmol/L

Legibility of handover notes is improved with the use of electronic tools.
This facilitates correct transfer of information.

Assisting with clinical task management

Handover is a time where not only the status of a patient is updated but also involves identifying any outstanding clinical tasks, such as checking laboratory results, and often the handover discussion leads to changes to the patient's overall care-plan. Electronic tools should provide support for these clinical tasks management functions.

The failure to complete clinical tasks that have been handed-over between shifts, such as ordering or following up on pathology results, is a well-known cause of adverse events (Wong, Turner, & Yee, 2007). Typically clinicians track tasks through informal 'systems' such as handwritten notes kept in their top-pockets. Electronic tools can provide significant benefits to clinicians through task management functionality and formalise the practice of keeping a task list. Although not a feature of all current systems, electronic tools are able to assist in creating a personalised task list whereby tasks generated at handover or during a subsequent ward-round are clearly articulated and assigned to a clinician. A clinician should then be able to 'sign-off' on tasks as they are completed throughout a shift, and thus better keep track of outstanding actions to be completed for each patient.

The discussion of a patient's care plan that typically occurs at handover poses an interesting challenge for the development of an integrated electronic medical record. Handover is frequently more than the transfer of information between clinicians, and often the discussion at handover leads to changes to a patient's care plan. Currently, case notes contained within the formal medical record are the primary source of information relating to both the patient's progress and their specific care plan.

However, things change as handover practices become more standardised and more formalised. Information about the decisions that have been made, and the tasks requiring completion at handover, frequently resides in the formal medical record. From a human factors perspective, there are implications for duplication of workload in annotating these aspects of the care plan, as well as potential for conflict between the content of handover notes and the content of the case notes. While the case notes might be the primary source of information, the handover notes might reflect more recent status of the patient and more recent decisions relating to patient care. In short, more formal handover practices can lead to a duplication of documenting the care plan. Is the care plan formally documented in clinical handover notes or in the formal medical record?

This potential for duplication can be exacerbated by the use of electronic tools to support clinical handover, as the electronic format can be seen as more formalised, and also representative of a group decision, rather than just personal notes jotted down on a piece of paper. Therefore, when implementing electronic support for clinical handover, consideration needs to be given to the relationship between formal handover notes and the formal medical record. Ideally, an electronic system would be able to present the patient's care plan from the formal medical record within the handover tool, with any changes or updates automatically promulgated between both the electronic handover tool and the formal electronic medical record.

However, there is a need for care in ensuring that too much rigidity is not introduced. The case study on the next page is an example of how an electronic tool did not support the day-to-day task management processes that are typical of current clinical practice. This is a classic example of where a formal system disrupted individual task management practices. In system safety terms we refer to this as a brittle system, whereby the technology enforces a rigid structure that does not support the informal human processes that actually help keep the system safe (Dekker, 2005).

Clinical Perspectives...

"It makes it quite clear what the morning team has to do… now that you actually have to write what the plan is it's more direct. It goes in the system, and everybody sees it. If it's not right then whoever's made the plan can see that and they're going to tell you".

A lack of functionality…

Over the years, a senior registrar had developed a simple yet effective method for ensuring critical tasks for patients were not forgotten. Using a printed list of patients from the clinical information system, the registrar would take notes during handover and simply place a circle around any task for which they were assigned responsibility. As each task was completed the registrar placed a cross through the circle on their sheet of paper.

The shift to an electronic tool to support handover no longer supported this practice. The registrar could not make outstanding tasks salient, and the tool in its current form did not enable tasks to be 'crossed-off' once they were completed.

Rather than relying on the electronic handover tool, with its inherent limitations, the registrar reverted to a series of handwritten notes on a printed patient list which they were able to carry with them and update throughout the shift.

Helping to identify and track patients

Misidentification of patients is a prevalent form of error in health care. Electronic tools can provide excellent support for clinical handover by providing a comprehensive list of patients with a full set of patient identifiers that can help the clinical team to better identify and track patients.

Absent or misused protocols for patient identification are amongst the main causes of adverse events in health care (Chasin & Becher, 2002). Omissions in patient handover can cause patients to 'fall through the cracks' in the system. Safe handover ensures that no such patients are omitted from being handed-over. Technological tools used to support clinical handover should facilitate the process of creating a comprehensive list of patients.

Electronic tools can assist by providing a comprehensive list of patients for handover, such that patients are not missed during the handover discussion. This is especially relevant to patients on outlying wards. Electronic tools can offer different ways of structuring patient lists, which include sorting by priority or urgency, clinician responsibility, or by location. This can provide considerable benefits in terms of safety (not missing patients) and efficiency (creating a tailored list of patients for the current critical tasks). In any health care setting, ensuring that a comprehensive list of patients is available to the clinical team is not only critical but it is a complex process. Lists can be generated from most clinical information systems using a number of key search criteria – each of which has potential vulnerabilities. For instance, lists based on location of patient might list only key medical wards and therefore outliers can be missed. Lists based on admitting consultant can be confused where there are multiple co-morbidities or internal transfers such as between renal unit, Intensive Care or High Dependency Units. Lists based on current admissions omit expected patients who are currently being transferred into the facility.

Comprehensive patient list

Key identifiers on each page

The manner in which the electronic tool presents patient lists for viewing and printing needs to be considered organisationally and locally. From an organisational perspective, a list may need to be defined by 'urgency' so that 'deteriorating or at risk patients' for the whole health service can be identified at a single location. This could assist in the handover of the most vulnerable patients for senior

clinicians and managers in the organisation. At the local level consideration of how patient lists are defined is important to ensure patients aren't missed yet allow for identifying patients that require more discussion than those that are not exceptional in their care pathway. The process should be standardised as to the inclusion or exclusion of patients for discussion on the list. Similarly, new patients and those that are expected but not yet entered into the administration system need to be accommodated for.

Electronic patient lists can assist with positive patient identification by providing key patient identifiers such as patient names, age, date of birth, sex, Unit Record Number / Medical Record Number, bed number, and reason for admission, in a manner that minimises the risk of adverse events stemming from patient misidentification (Ye, Taylor, Knott, Dent, & MacBean, 2007).

While the principles of patient identification are relevant to handover with or without the use of electronic tools, the technology itself has the potential

Resources:
Further guidance material relating to patient identification

The Joint Commission – Universal Protocol

The Joint Commission has developed a Universal Protocol for patient identification. Although this relates specifically to performing procedures on patients, the principles of patient identification can be easily generalised to clinical handover, and the environment of clinical information systems.

http://www.jointcommission.org/ PatientSafety/UniversalProtocol

Australia – National Guiding Principles and Protocol

The Australian Commission on Safety and Quality in Health Care has worked with the Royal Australasian College of Surgeons (RACS) and the States and Territories to develop a protocol for the prevention of procedures performed on the wrong patient or part of the body. The protocol is in line with the RACS Correct Side and Correct Site Surgery Guiding principles.

http://www.safetyandquality.gov.au

The Royal Australasian College of Surgeons has adopted the WHO modified Surgical Safety Checklist available at:

www.surgeons.org

Australian Institute of Health and Welfare

The Australian Government specifies data elements to provide a framework for improving the positive identification of patients. The specifications can be found at:

http:/meteor.aihw.gov/content/index.phtml/itemid/374201

The sick list…

Across the hospital at night, Medical Emergency Team (MET) calls and Code Blue resuscitations were managed by a team of two general medicine registrars who undertook this work alongside their primary role of admitting new patients from the Emergency Department. A safety and quality initiative in the hospital had highlighted the need to better identify patients that had the potential to deteriorate overnight, such that early clinical intervention could take place where appropriate.

A process was developed to create a 'sick list' whereby all the general medicine teams would identify deteriorating patients and add them to an electronic list before leaving at the end of their day-shift. This list would then be used by the on-coming night team to prioritise tasks.

In designing this process, critical considerations included:

- What criteria are used to identify and prioritise patients?
- Does identifying a patient ensure subsequent follow-up takes place?
- What additional workload does the process create for a workforce already at capacity?

A trial of the use of an electronic tool to facilitate the identification of sick and deteriorating patients highlighted that current staffing levels would not support additional management of these patients, a finding which in turn prompted a facility wide review of night staffing levels.

In an ideal future, the clinical information system will have developed in a manner that electronic charting of observations and diagnostic laboratory results would feed into automated processes for the early identification of sick and deteriorating patients. These patients would then be flagged on a customised handover list – 'the sick list'.

to increase risk in certain areas. First, any electronic tools to support clinical handover should include a core set of primary patient identifiers on each screen. Second, multiple patient windows should not be able to be opened simultaneously. For instance, swapping between multiple windows that contain diagnostic results and handover notes for multiple patients increases the likelihood of potential for patient identification error. Third, the use of multiple clinical information systems that are not fully integrated also increases the likelihood that information from multiple patients will be combined inadvertently.

These basic interface design issues are examples of safety by design in electronic tools to support clinical handover.

Clinical Handover

Patient: 26/34 PERU, LEONIE
Age: 50 y
MRN: 99999999 FMC
Gender: Male
D.O.B.: 30/03/1959
Site: RAH

Consultant: Edwards, Richard
Admit Reason: UTI
Location: RENP

Type: Medical
Estimated Discharge Date:

Current Problems:
Hx Spina Bifida Hydrocephalus - VP shunt
Kyphosis - neurogenic bladder + bowel
Bicarbonate wasing from renal stones CRF
Came to OPD appt rapid breathing, acidotic, low HCO3 and low K
UTI - e Coli awaitng blood cultures

Current Management:
Drugs: Folic acid, KCL, NaHCO3, Vitamin D3 ,Phosphate Sandox, Thiamine + Timentin
Last edited: HANCOCK, EILEEN   27/10/2009 14:38

Management Plans:
IV with K H2PO4
6/24 ABG
8/24 IV Timentin
6/24 Cathetherisation
Daily weighs and regular turns

Discharge Plans:
Currently planning for transition to adult care ? when

Handover Notes:
27/10/09 Evening registrar to check K+ and blood cultures by 2300hrs
Order CXR before 9am - 28/10/09
Urine MC+S to be sent 28/10/09

Other Notes:

☐ Add to Handover Roster   ☑ Flag Patient As Urgent   **Cover:** Med Cover

Close | Alerts (1) | Save | Previous Admission | ?

Providing structural support for clinical handover

The use of electronic tools can provide significant support for the structure of handover.

There is considerable ongoing debate with respect to standardisation in clinical practice, and clinical information systems have been used as a vehicle to create standardisation through enforcing a structured approach to information storage and retrieval. Some flexibility in system design has been shown to be critical from a socio-technical perspective, where information technologies must be able to support the dynamic and inter-personal nature of clinical handover. This concept of flexible standardisation will be examined in more detail under 'Question two'.

When designing structure into a system, research has demonstrated the need to derive this structure from detailed empirical knowledge of the practice involved in the use of the system (Berg, Langenberg, Berg, & Kwakkernaat, 1998). Electronic handover tools can provide considerable support to the efficient structuring of handover, such that the risk of omitting critical information or specific patients is minimised.

The image above highlights a structured approach to information entry and presentation in an electronic handover tool. Each of the free text boxes provides prompts to the clinician to include critical information. This structure then prompts the discussion during the handover session, such that each patient is presented in a similar format. This structured approach minimises the risk of critical information being omitted.

Enabling a minimum dataset for clinical handover

Electronic tools can also support the use of a 'minimum dataset', which presents a standardised set of key information relating to each patient (Cheah, Amott, Pollard, & Watters, 2005). The use of a minimum dataset provides a prompt for critical information and helps make sure information is not missed. Ideally, much of this minimum dataset will be auto-populated from within the clinical information system to ensure validated and quality assured data

are used wherever possible. The minimum dataset will also provide guidance for additional pieces of information, such as the set of tasks to be completed, and assigning responsibility for follow up.

Ideally, an electronic tool should support the use of a minimum dataset by auto-populating critical information. This is especially important if the information already exists elsewhere in the clinical information system.

The table below illustrates a simple 'minimum dataset' for use in an obstetric department. The minimum dataset was agreed upon by the clinical team to represent the minimum information that needed to be highlighted at handover to ensure safe and effective handover. A useful approach to establishing minimum datasets is available in the OSSIE Guide to Clinical Handover Improvement.

Clinical Handover – Obstetrics

Current Problems: Profile	Current Management:
Age, gravida:parity, gestation Relevant past obs/med history Primary and 2nd diagnosis Rh status, GBS other relevant pathology Alerts	Progress Dilation Contractions Synto if used Orders over next shift Eg: argument if no progress

Management Plans:	Discharge Plans:
Populate if required	Populate if required

Handover Notes:	Other Notes:
Populate if required	Populate if required

The figure above represents the eletronic clinical handover screen template.

Summary of key benefits

Electronic tools can assist a clinical team in the core functions of handover and contribute to safe and efficient handover practice. This section outlines the main areas where benefits to the safety and efficiency of handover can be achieved through the use of electronic tools. These benefits include:

- enhancing continuity of care through transferring accountability and responsibility
- accessing and sharing information
- assisting with clinical task management
- supporting a structured approach to handover
- supporting the use of standardised operating protocols
- enabling the use of a minimum dataset
- helping to identify and track patients.

While electronic tools bring a number of tangible benefits, it is important to remember that the basic practice of safe handover in any clinical setting is largely independent of whether technology is used. Electronic tools, on their own, are neither necessary nor sufficient to undertake safe handover. Technology should not be adopted with the view that it will automatically make handover practices safe. Therefore, any decision to implement electronic tools to support clinical handover should be based on demonstrable safety benefits or other advantages to clinical practice.

Checklist – harnassing the safety benefits of electronic tools

Supporting the transfer of responsibility and accountability	
Does the tool identify responsible and accountable clinicians for a patient?	
Are outstanding tasks assigned to an individual?	

Accessing and sharing information	
Is the system integrated with the other clinical information systems?	
Does the system facilitate access to laboratory, imaging and other results?	
Does the system interface with ordering and referral systems?	
Is there a clear relationship between handover and the formal medical record?	

Assisting with clinical task management	
Does the system enable outstanding tasks to be recorded?	
Does the system enable completed tasks to be 'crossed-off'?	
Does the system create an individualised 'task list' for a clinician?	

Supporting the identification of patients	
Does the tool provide a comprehensive list of patients?	
Can the list be sorted for location, attending physician, and other variables?	
Can the list be filtered for location, attending physician, and other variables?	
Does the tool provide core patient identifiers on each screen?	

2

How do we ensure the safe use of electronic tools?

While there are a number of clear benefits to the use of electronic tools to support clinical handover, the day-to-day use of electronic tools must be undertaken in a manner that is safe. Within this context, the safe use of electronic tools can be defined as use of electronic tools that 1) manages the potential risks associated with technology in the clinical context; and 2) works within the limitations of that technology.

Similarly, a range of risks exists with respect to poor handover, which can impact on patient safety (Arora et al., 2005; Bhabra et al., 2007; Borowitz et al., 2007; Clancy, 2008). Research has demonstrated the following risks to patient safety associated with poor handover.

Key risks:

- patients being omitted
- patients being misidentified
- critical information being omitted
- incorrect information being recorded.

Moreover, electronic tools have the potential to create new forms of error in clinical practice (Koppel et al., 2005). Evidence from the case study research that was used to inform the development of this guide suggests the following potential problems associated specifically with the use of electronic tools to support clinical handover.

Potential problems:

- increased workload
- only partial up-take of the technology
- removing communication from handover
- lack of context for clinical information
- duplication of the formal medical record
- irrelevant, incomplete or redundant information
- transposition errors resulting from manual data entry
- enforcing an inappropriate structure for handover
- missing patients from handover
- issues in patient identification.

All of these problems increase the risk of handover being a contributor to an adverse event from the perspective of patient safety.

Rather than viewing technology as an agent for change, the most effective way to utilise technology is to better support existing handover practices. If handover is not well established within a team, or between units, then efforts to implement technology to support handover will be unlikely to succeed. As much effort needs to be placed in developing good handover practice as in implementing technological support for handover.

Consideration needs to be given to the ways in which electronic tools are implemented into the clinical environment to ensure a seamless and complete transition from previous practice to use of the electronic tool.

Aligning the use of electronic tools with clinical practice

Safe use of technology to support clinical handover involves seamless integration of the technology use within clinical practice. The careful design of protocols for the use of the tool is critical to ensure the new technology does not provide an additional workload burden, nor interfere with primary clinical tasks.

Decisions to use technology to support clinical handover must ensure that the technology will be able to be integrated into clinical practice. As part of the implementation of electronic tools to support clinical handover, analysis of clinical workflow should take place that includes an assessment of how the technology will fit with current clinical practice. Issues such as additional workload and disruption to clinical workflow are significant barriers to the safe use of technology to support clinical handover. These barriers will lead to failed implementation, staff frustration or risks to patient safety.

If the technology is not easily integrated into the clinical workflow, there is the potential for significant interruption to the primary clinical tasks, as well as additional distraction and frustration for the clinicians. For instance, placing an additional burden on clinicians to enter information into the electronic handover system, on top of writing up that information in the clinical notes can disrupt existing clinical practice.

Research examining the impact of electronic health information systems on time efficiency in medical and nursing practice is scarce. Poissant et al. (2005) identified an increase in documentation time as a result of the introduction of components of an electronic medical record while Van Eaton and colleagues (2005) found a computerised rounding sign-out system decreased time for medical rounds by three hours per week.

Clinical Perspectives...

"I think you get used to what you like and what you know and, having said that, even though we've got this electronic tool now, I'm still hand-writing all my handover notes anyway. I mean, I'm a bit old school, so I'll probably still keep doing my old way…"

A decision not to implement technology-supported handover….

Handover was a well-established routine within the Neonatal Intensive Care Unit (NICU) of a large suburban hospital. At each change of shift the on-coming registrar would receive a detailed bedside handover of each patient from the off-going registrar.

Handover was facilitated by a paper-based patient list that was printed from the clinical information system. This printed list provided basic patient demographics and the most recent lab results, as well as providing space for handwritten notes to be made by the registrars. A system of colour coding in this handwritten information provided an extra dimension to highlight urgent tasks.

When offered the opportunity to implement an electronic handover tool that would replace the paper-based notes, the NICU reflected on their current practice and evaluated the potential impact the technological

tool might have on safe handover. Whilst there were some benefits, there were also a number of risk identified, including:

- The technology could not be used at the bedside, causing disruptions to handover workflow as the clinician would need to move from the bedside to update the system.
- The technology would increase the risk of infection, which was a particular concern in the neonatal intensive care environment.
- The technology would not support the system of colour-coding information used in the paper-based format.

As a result, the decision to refrain from implementing an electronic tool in this environment was made. The potential risks associated with the technology, such as disrupting the flow of the handover round and therefore forgetting critical tasks, outweighed the potential gains.

In some instances workload can be increased because clinicians have to duplicate aspects of documentation between the electronic handover tool and the progress notes within the formal medical record. Often however, the implementation of an electronic tool can highlight time taken on clinical administration tasks that otherwise have been taken for granted as they have become just 'part of the job'. To this end, the perceived increase in workload is simply due to certain tasks, like preparation for handover, becoming more formalised through the use of an electronic tool.

As illustrated by the case study above, sometimes the safe option is simply not to implement an electronic tool to support handover when the tool cannot be made to fit a ward or unit's clinical practices.

The primary risk mitigation strategies with respect to clinical workload involve developing clear protocols for what information is expected to be entered into the electronic handover tool, and delineating responsibility for the regular updating of that information.

Clinical Perspectives…

"I think that an electronic handover tool such as this can only be safe and useful if the workload is safe and useful."

"I feel a bit bad for some of the RMOs sometimes, because they do have to put aside a good half-hour to an hour before handover, particularly with a day like today where we did not stop all day. So she literally had to go and say, 'Okay, now I need to go and type up handover notes in the electronic tool for half an hour'. I like the initial idea which was to do it as you go around, but it's just not possible a lot of the time."

Compatibility with current practice…

Morning handover on a labour ward involved the night obstetric RMO and Registrar handing patients over to the day team of senior and junior obstetric staff, anaesthetists and midwives. This handover was typically a highly interactive discussion about each patient. The night team would present each patient in the order of their beds on the ward, and decisions would be made with respect to their care.

There were a number of difficulties observed in the implementation of an electronic tool to support this handover. First, the tool was not configured to support the traditional order by which patients were discussed (location on the ward) instead, forcing an alphabetical order. Whilst seemingly minor inconvenience to practice, this actually led to the handover jumping from patient to patient, with the potential to miss patients as a consequence.

Second, the handover notes for each patient were updated during the discussion. It was observed that the discussion frequently moved onto the next patient while notes for the previous patient were still being typed into the system. This meant some critical pieces of information could be missed. The practice of moving on to the next patient demonstrated a discontinuity between the information being updated in the electronic tool and the verbal discussion. The leader of handover needs to align the verbal flow of information with the use of the electronic tool. Once any task allocation or updates to clinical information is typed in, the process of having the clinical team confirm the information that is projected from the electronic tool can be a check point to ensure task allocations and potential patient risks are understood by all team members.

Third, the printout from the system did not allow space for empty beds, which typically would become occupied during the shift and traditionally a patient label would be placed on an individual's notes to facilitate the management of tasks for that patient.

In short, a series of relatively minor issues with integrating electronic support into an existing handover practice led to some difficulties in implementation, and overall did not yield the desired benefits to the safety or efficiency of handover in this unit.

Consideration needs to be made to the workload implications of the introduction of electronic tools, and the workflow needs to be designed to ensure the technology does not provide an additional workload burden. In the majority of circumstances, the patient's clinical notes should remain the primary source of information. Effective utilisation of these notes in the clinical handover process, rather than simply duplicating their contents, is the most effective mechanism to reduce the workload burden. Future opportunities for integration between the clinical handover tools and an electronic medical record should provide further opportunity to minimise any additional workload burden through the duplication of clinical documentation.

Strategies to anticipate the barriers to change in clinical practice, as well as monitoring for unanticipated consequences of the introduction of a new electronic tool are critical components of safe use of new technology in the clinical context. As illustrated in the above case study, it is possible that there will be unintended changes to clinical practice resulting from the introduction of technology. If these changes are not seen as beneficial, or if they require additional work, they are unlikely to be fully adopted.

Adopting the approach of 'flexible standardisation'

The use of an electronic tool can support the concept of flexible standardisation. It does this by assisting, in a standardised structure, the management of clinical handover content and process. However, the electronic tool must also allow flexibility for individual teams to adapt the content of handover to meet the specialised clinical needs of their patients.

There is considerable ongoing debate with respect to standardisation in clinical practice, and clinical information systems have been used as a vehicle to create standardisation through enforcing a structured approach to information storage and retrieval. Some flexibility in system design has been shown to be critical from a socio-technical perspective, where information technologies must be able to support the dynamic and inter-personal nature of clinical handover. When designing structure into a system, research has demonstrated the need to derive this structure from detailed empirical knowledge of the practice involved in the use of the system (Berg et al., 1998).

Within the context of clinical practises, mnemonic tools such as SBAR (Situation / Background / Assessment / Recommendation) to assist the structure of handover communication has been demonstrated to improve content and clarity of handover (Marshall, Harrison, & Flanagan, 2009). Further information on the use of mnemonic tools during handover is available in the OSSIE Guide to Clinical Handover Improvement.

However, problems can occur when the structure imposed by the electronic tools does not map directly onto the desired structure for clinical handover, as the case study (below) illustrates.

Any decision to implement an electronic tool to support clinical handover should consider whether the tool maps onto existing clinical practice, and whether the tool needs to be adapted prior to implementation. Similarly, interim fixes and work-arounds for systems need to be evaluated from a risk management perspective. The major consideration is whether or not the benefits of implementation of a tool outweigh the potential risks associated with the tool in its current form.

Case study:
Lessons from practice

System constraints…

The electronic handover tool was primarily built around six free text fields into which staff typed handover 'notes'. These fields were:

- Current Problems
- Current Management
- Management Plans
- Discharge Plans
- Handover Notes
- Other Notes.

The Department of Obstetrics and Gynaecology wanted to focus on a range of interventions to improve the quality of handover, and simultaneously undertook training the medical staff in the SBAR mnemonic for structuring handover of a patient, as well as implementing an electronic tool to support clinical handover. The SBAR mnemonic was structured as follows:

- Situation
- Background
- Assessment
- Recommendations.

The four-box structure of SBAR did not map onto the six-box structure of the electronic handover tool. Changing the state-wide electronic tool to accommodate the introduction of a four-box SBAR template would require state policy decisions for transition to a new electronic clinical handover template, technological change to the tool, and change management for all sites currently using the tool. As timelines for these system improvements were in the order of six months, the Department decided a complex work-around was the only short term option to enable implementation of the tool with SBAR.

Medical staff members were instructed to use the four SBAR headings designed by the Department rather than the headings that appear on the handover screen. Such strategies where clinicians must disregard the prompts built into the system and insert information at odds with the structure of the system, increase the risk of error in handover as a result of missing or inappropriate information.

The electronic handover tool 'six-box template' was modified to allow the SBAR clinical handover acronym to be used in this unit. A new state-wide template and SBAR policy would avoid local work-arounds.

There may exist inherent tensions between the use of a generic system at a health service or facility-wide level, and the individual handover needs of individual units. These tensions will be explored further in relation to the principle of 'flexible standardisation'.

One of the main strategies to ensure the safe use of an electronic tool to support clinical handover is to ensure there is standardisation in existing handover practice. As has been emphasised already, the primary foundation for safe use of electronic tools in clinical handover is to have a well-established and formalised process for clinical handover. In this way, existing clinical handover practice forms the foundation for safe use of electronic tools.

The introduction of electronic tools within the setting of clinical handover can lead to only partial up-take by clinicians, and therefore can lead to the existence of multiple handover practices within a particular unit. Whilst flexibility is an important part of clinical practice, standardisation brings considerable benefits in terms of risk reduction. Standardised clinical communications reduces the opportunity for misunderstanding (as everyone is speaking a common language) and makes errors more obvious by setting a shared benchmark (missing information is more obvious if you are expecting it).

The temptation to impose a new system from the 'top-down' remains strong in many Australian health care settings. In the case of clinical handover this

may create a risk of inhibiting a pre-existing effective handover process. For example, in many clinical settings, the use of language and terminology for communication processes is moderated by shorthand terms and local conventions that serve to increase the efficiency of communication within the team. These variations from any perceived 'standard' are likely to reduce the precision of communication between clinicians from different clinical specialities or organisations. However, within a cohesive team, the safety benefits of the resultant communication efficiencies need to be weighed against the risks of these communication inefficiencies with outside teams.

Choices must be made about the terminology that will be used to describe clinical events, intentions and observations, and the extent to which the terminologies available within the system will be constrained. At one extreme, an electronic system could allow uncontrolled entry of free text information; at the other, the system might rigidly enforce an accepted terminology such as Systematized Nomenclature of Medicine-Clinical Terms (SNOMED-CT). Either approach carries with it inherent benefits and risks.

On the one hand, uncontrolled free text entry may prove easier to implement, with less need to change existing clinician practice.

However, recording data as free text effectively 'buries' information within the text, making the selective re-use of previously entered details difficult or impossible.

Free text entry will also allow clinicians to use terms, which may create ambiguity for other participants in the handover process, especially when the handover involves a transfer between clinical units or wards.

On the other hand, strict application of fully structured data with standardised terminologies will ensure that data can be re-used, and will reduce the risk of misunderstanding. However, the concept the clinician has in mind may not be perfectly described within the terminology, or a precise term for the clinical concept may remain unused in preference for a less accurate term.

One solution for this problem has been used in places where there is a strong emphasis on standardised terminologies as a part of clinical documentation. In practice, the system uses concept mapping to maintain a number of intermediate lists of the preferred terms used by each clinician or clinical unit, and their relationship to the standardised terminologies

This may be handled either within the application that uses the terminology, or within the terminology tool itself. A solution allowing for 'synonym' terms can facilitate the sharing of information both inside and outside the organisations and/or their individual units.

The figure below illustrates one potential way to overcome issues with the granularity of terminology. However, too often decisions about the introduction of technology are based on assumptions that either radically overestimate or underestimate their potential impact on the delivery of health care. As a consequence, the role and significance of context dependent factors such as trust, learning over time, experience and differences in diagnosis, treatment and care are marginalised.
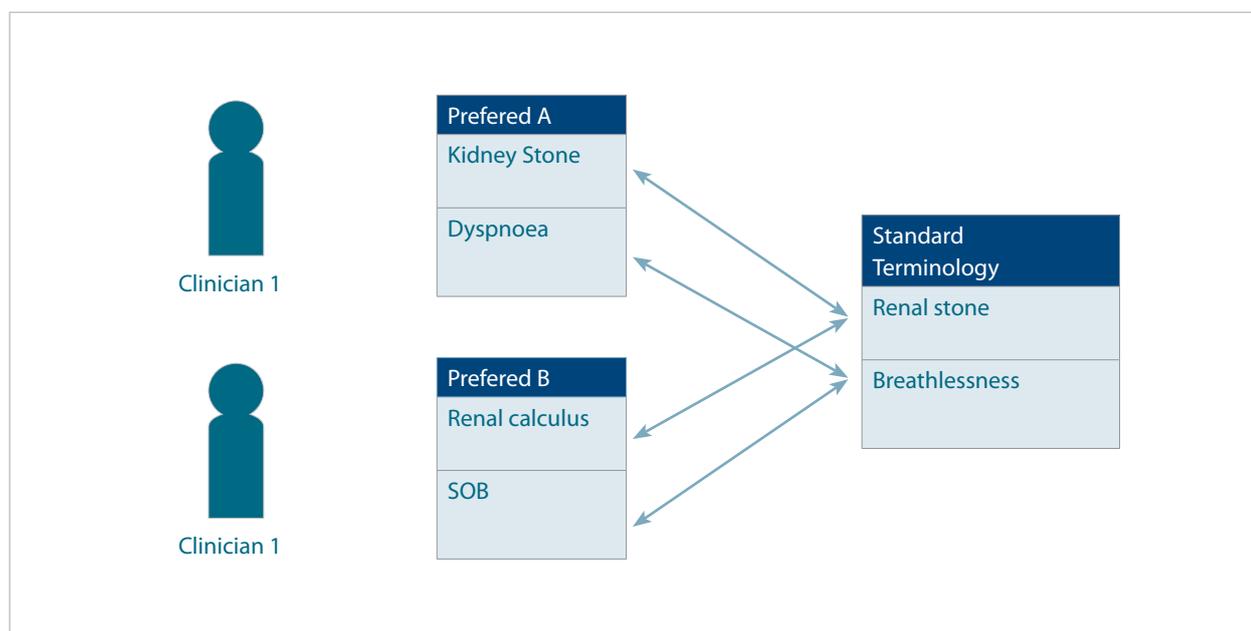
Creating the environment in which electronic tools are used

The environment in which handover takes place and in which the technology is deployed is a critical consideration in terms of the safety of clinical handover. Just as setting aside appropriate time and finding a suitable venue for clinical handover has been an essential element of traditional handover, the same principles apply when using technology to support handover.

Interruption and distractions are common features of the clinical work environment, and have been identified as one cause of error in clinical settings (Westbrook et al., 2007). Therefore, providing an environment that limits the opportunities for distraction or interruption is critical to safe handover. When handover must utilise shared technology systems within the health care environment, this can be harder to achieve in practice.

Key factors that are important for facilitating the success of technology-supported handover include ensuring that:

- everyone can see the screen so information is shared if using a single terminal
- the font size and screen resolution is appropriate for all involved in handover
- everyone has appropriate access and is logged in if using hand-held devices
- the room for handover minimises interruptions and distractions
- patient confidentiality is not compromised when displayed on a large screen
- everyone can hear the handover discussion
- the handover room is close to the clinical work area.

The table on the next page highlights the range of environments in which electronic tools are used.

Environments for using technology to support clinical handover

Terminal and digital projector in handover room	One common implementation of technology-supported handover involves projecting the clinical information system onto a screen in the handover room. Consideration needs to be given to room layout, font size and screen resolution in this type of environment, as well as issues surrounding patient privacy and information security.
A shared terminal in handover room	For small groups, the use of a shared computer terminal and a small handover room is all that is required to access the technology. However, potential problems can arise when access to a shared terminal is difficult, of if the team is interrupted during handover. Similarly, if too many people are crowded around a small terminal to review lab results or images on a PACS (picture archiving and communications system), usability might be compromised as people are unable to view details on the screen.
Bedside terminals	Bedside terminals, or a terminal on the ward, can be used to support handover. It is critical that patient confidentiality is maintained in these environments, and that technologies to support quick login/logout and session portability exist to facilitate this form of handover. This type of technology is most conducive to patient involvement in handover.
Computers on Wheels (COWS)	Portable computer systems – commonly called Computers on Wheels (COWS) are an alternative solution to bedside terminals. These portable computers are cost-effective solutions to implement bedside health informatics.
Wireless devices	Wireless devices, such as PDAs (personal digital assistants) or Tablet PCs are quickly becoming part of the information technology landscape of health care facilities. This approach can ensure each clinician has access to electronic handover information in a flexible and portable manner.
Electronic whiteboard	Some environments, such as Emergency Rooms, utilise a traditional whiteboard format, but in electronic form. These systems draw information from the clinical information system and display it in a traditional 'whiteboard' patient list format. Patient privacy and information security are again potential issues with this form of technology-supported handover.
Access from other locations	Access to clinical information systems from places outside the facility, such as a clinician's home, is becoming part of normal clinical practice. Electronic handover tools should be aligned with a facility-wide policy on access using technologies such as a Virtual Private Network (VPN).

Maintaining handover as a process of communication between clinicians

One of the most important aspects of clinical handover involves communication between clinicians, and as such it is much more than just the transfer of information. Technology should not be used as the sole communication medium, but rather used as an adjunct to support the accurate transfer and recording of information shared during clinical handover.

In some environments, an electronic system to support handover has lead to a reduction in face-to-face communication, and the reliance on the electronic system to support messages being left for the on-coming team. This is by no means an ideal utilisation of electronic tools to support clinical handover, and whilst efficiencies might be obtained, the removal of face-to-face or other forms of verbal communication have implications for safety. Poor communication is often cited as a causal factor in adverse events in health care (Wilson et al., 1995). More specifically, a lack of face-to-face discussion has been identified as one of the main causes in adverse events stemming from failures in handover (Arora et al., 2005).

Electronic tools are not always an effective communication medium for clinical handover. 'Notes' left in an electronic handover tool should not be

the sole communication means between clinicians, as these decontextualised forms of information are extremely vulnerable to misinterpretation. Electronic tools should not be used as a replacement for verbal (and ideally face-to-face) formats for clinical handover.

The major communicative aspects of handover include:

- Questions are asked and aspects of care are clarified.
- Any confusion or misunderstandings are resolved.
- Agreement is reached between alternative courses of action.
- Verification of roles and responsibilities is achieved.

The use of technology to support clinical handover must not remove these critical communicative processes involved in clinical handover.

Research in the health care setting has highlighted that the majority of clinicians prefer to discuss patients with their colleagues, either face-to-face or over the telephone. These so-called 'synchronous communication modes' suggest a general preference for clinical information to be obtained through conversation rather than through other more static means such as notes within an electronic system (Coiera & Tombs, 1998).

Similarly, there is considerable evidence to suggest that the utilisation of electronic tools in health care doesn't solely provide benefits, and that a range of negative outcomes have been observed that have implications for patient safety. Such negative outcomes have been documented with respect to the use of electronic tools as a medium for clinical communication and relate to factors such as

information overload (critical or urgent communication is difficult to identify against the background 'noise') and failed communication (a message is sent but never received) (c.f.Safran et al., 1998).

This guide promotes the use of electronic tools to support, rather than mediate communication. Considerable research in a variety of domains have examined the ways in which so called 'communications technologies' significantly change the nature of communication (Campbell, Sittig, Ash, Guappone, & Dykstra, 2006; Thomas, 2002). For instance, communication technologies strip the communication of critical non-verbal components that means such

things as a clinicians sense of concern or urgency is not so easily conveyed. The term 'closing the communication loop' refers to the process of reaching agreement and verifying that the information received is accurate (Committee on Patient Safety and Quality Improvement, 2007). Typically, this process involves some form of 'read-back' where the recipient summarises their understanding of the discussion. Electronic tools can embed functionality to ensure the communication loop is closed, such as electronic sign-off and checkboxes. However, the most effective means of closing the communication loop involves integrating the use of an electronic tool within a well-established handover practice that maintains the interactive communication which should naturally be involved in any clinical discussion about patient care.

The practice of clinical handover is dynamic and interpersonal in nature. Whilst the function of clinical handover is primarily to transfer responsibility and accountability for patient care, in practice it is a process of communication between clinicians that involves interactive discussions about patient care. Handover meetings frequently support a range of other critical clinical dialogues. As the following case study illustrates, the ancillary functions that have emerged as features of handover, including the utilisation of handover as an educational opportunity for junior staff, risk being lost with a shift to electronic tools that provide a forcing function for the structure of handover dialogue.

Case study:
Lessons from practice

Keeping the other functions of handover…

Evening handover not only served to provide the night team with a clear brief on the status of patients on the ward, but was an opportunity for reflection. Not as rushed as morning handover, the consultant present was often able to discuss a treatment regime in depth, explore the evidence-base for various drug alternatives, or provide some guidance as to the complexities of certain co-morbidities.

To this end, there was an explicit educational

component to handover. The introduction of an electronic tool to streamline the transfer of information about patients had the potential to shift the focus from communication to simply information transfer at handover. While the electronic tool did simplify the transfer of the minimum dataset of information, the practice of discussing patients and the dialogue of handover remained.

It was an important consideration that the unit did not lose some of the ancillary functions of handover by using technology to make handover more safe and efficient.

Ensuring information is accurate and up-to-date

In the context of clinical handover, erroneous information has the potential to do significant harm. The introduction of electronic tools to support clinical handover can assist in ensuring the accuracy, relevance and timeliness of information used to support the continuity of patient care.

Erroneous information and internal inconsistencies in information within clinical information systems have both been identified as posing significant risks to patient safety (Singh et al., 2009). Several important risk mitigation strategies exist to protect the system against irrelevant, incomplete or redundant information. First, any electronic tool to support clinical handover should be transparent as to the origin of information, and should differentiate verified diagnostic results from user-entered data. Similarly, every piece of user-entered data should be 'stamped' with the time, date, and the name and professional role of the author of the information to assist in contextualising information and identifying old or potentially no longer relevant information.

Clinical Perspectives...

"It doesn't work if it's not kept up to-date-because you don't know what information is true or not. It's got to be continually updated otherwise it doesn't work."

"You don't know from reading it when it was written. But if people write things correctly and you put dates in there… it makes it a little bit easier so you know that information relates to a time five days ago so you can correct it – the most important thing is that it needs to be kept up-to-date."

Further, consideration needs to be made to new information literacy skills, such that clinicians are able to determine and prioritise what is relevant and critical information, as well as be aware of the ways in which information is interpreted based on the context. High levels of interoperability with other clinical information systems should be incorporated to ensure quality assured data are used wherever possible.

Potential risks for information in the electronic tool

Irrelevant information	The intrusion of irrelevant or superfluous information into clinical handover can lead to communication overload, and potentially critical pieces of information can be lost amongst the more salient yet less important information.
	Staff, and especially junior clinical staff, should be provided with specific guidance and training with respect to differentiating between salient, critical and superfluous information when handing a patient over. The use of structured mnemonics such as SBAR, as well as a 'minimum dataset' for handover can assist in structuring information to be handed over (Catchpole et al., 2007; Marshall et al., 2009). Further, any electronic tool can be designed to support this structured approach to clinical handover and thus contribute to minimising the risk of irrelevant information.
Incomplete information	Omissions of critical information at handover have been implicated as a significant risk for patient safety (Arora et al., 2005). Omissions such as allergy alerts, pending results, or actions to follow-up can lead to patient harm.
	Further consideration needs to be given to the interface between information in the electronic tool to support clinical handover and other aspects of the formal medical record, such that the risk of omitted information is reduced. Ideally, automatic links should be established between these systems and information should be auto-populated or promulgated between the various systems.
Redundant information	One of the difficulties in the use of electronic tools to support clinical handover involves the promulgation of information that is old and no longer clinically relevant. Whilst an INR value or potassium level for a patient jotted on a piece of paper will be disposed of at the end of the shift, in an electronic handover tool this piece of information may be perpetuated until it is manually deleted or updated.
	Electronic tools to support clinical handover should reflect the dynamic 'snap-shot' of critical handover information, and formalise processes to delete, archive, or flag old information. Similarly, systems that auto-populate the handover tool with the most recent laboratory results can automate the process and ensure relevant and up-to-date information is provided.

Repeating information across systems…

The adoption of an electronic tool to support clinical handover lead to the development of a 'minimum dataset' in the obstetric ward that included the following:

- history of previous pregnancies
- serology results for screening tests
- blood type (Rhesus status)
- GBS status
- relevant history.

Each of these pieces of information were already recorded elsewhere, either in the case notes for the patient or in the pathology results section of the clinical information system.

The lack of integration between the electronic handover tool and the case notes and other components of the clinical information system meant that clinicians had to manually type in the minimum dataset for each patient prior to handover. This not only increased workload through the duplication of information, but also increased the risk of transposition error.

Manual data entry is a well-known risk in a range of health care environments, and considerable research has established an underlying error rate greater than 1 in 100 (Smyth, McIlvenny, Barr, Dickson, & Thompson, 1997). Clinical documentation error rates have been found to be as high a 1 in 2 in settings such as the neonatal intensive care where the more complicated the patient the greater the potential for documentation errors (Carroll, Tarczy-Hornoch, O'Reilly, & Christakis, 2004).

For the safe use of technology to support clinical handover, consideration needs to be given to the potential for error when duplicating information between systems.

Ideally, many of the key pieces of information to be transferred at handover should be auto-populated from within the clinical information system. Consideration needs to be given to what information has been verified, what the primary sources of information are, and where this information can then be promulgated across the system.

As a result, an important consideration regarding information specifications for electronic handover tools is the need to be sensitive to the context of information use as well as to the information content and its currency. The process of 'sensemaking' (Weick, 1995) that occurs during handover means that in any local situation there will be a need for 'flexible standardisation' that will allow for the emergence of information and/or processes that are contingent on circumstances, experiences or levels of trust in any specific time or place (Australian Commission on Safety and Quality in Health Care, 2009).

There is a potential risk for incidents arising from misunderstanding of information in the electronic handover environment due in turn to a lack of sufficient context to the information, or through the use of non-standard abbreviations.

A general principle with respect to electronic information in the health care setting states that the further the information has to circulate the more work is required to disentangle the information from the context of its production (Berg & Goorman, 1999). For instance, a handwritten note created as a reminder is likely to make sense to the individual who wrote it but be entirely incomprehensible to anyone else who might read the note. In order for that note to make sense to others, considerable effort is required in providing context and clarity and expanding in detail.

From a human factors perspective, this problem speaks to the issue of balancing 'knowledge in the world' with 'knowledge in the head' of individual clinicians. Clear information for clinical handover needs to make any assumptions explicit and avoid too much knowledge in the head of the clinician.

The verbal handover environment allows for the clarification of any ambiguous or unclear aspects of information at handover. However, if solely relied upon, the use of electronic tools removes the ability for clinicians to clarify aspects of handover and increases the risk of misinterpretation.

The primary risk mitigation strategies with respect to lack of context and ambiguity in information within the electronic tool are to support appropriate information technology practice through local guides and training, alongside reinforcing the critical communicative processes that must occur between clinicians at handover.

The Joint Commission issued a Sentinel Event Alert, Issue 42, that describes vulnerabilities associated with the use of technology in health care and risk mitigation recommendations. This is a good resource that may complement this guide in identifying risks associated with the use of electronic clinical handover tools.

SNOMED-CT

The International Health Terminology Standards Development Organisation (IHTSDO) has established SNOMED-CT as the international standard for effective health information exchange.

http://www.ihtsdo.org

Australian readers may wish to access Snomed through NEHTA who have established a licensing agreement with Snomed.

www.nehta.gov.au/connecting-australia/clinical-terminologies <http://www.nehta.gov.au/connecting-australia/clinical-terminologies>

The Joint Commission – 'do not use' list of abbreviations

The Joint Commission has developed a list of 'high risk' abbreviations that should not be used in medical communication. These can be found at the following website:

http://www.jointcommission.org/PatientSafety/DoNotUseList

Australian national abbreviations and symbols

The Australian Commission on Quality and Safety in Health Care provides a list of appropriate abbreviations and symbols to be used in a standardised fashion within the Australian health care setting.

http://www.safetyandquality.gov.au

The Joint Commission Sentinel Event Alert Issue 42

http://www.jointcommission.org/sentinel/Events/SentinelEvents/SentinelEventAlert/sea_42.htm

Summary – ensuring safe use of electronic tools

While there are a number of clear benefits to the use of electronic tools to support clinical handover, the day-to-day use of electronic tools must be undertaken in a manner that is safe. Within this context, the safe use of electronic tools can be defined as use that 1) manages the potential risks associated with technology in the clinical context; and 2) works within the limitations of that technology.

Safe use of technology to support clinical handover involves seamless integration of the technology within clinical practice. The careful design of protocols for the use of the tool is critical to ensure the new technology does not provide an additional workload burden, nor interfere with primary clinical tasks. Protocols need to:

- ensure alignment with clinical practice
- minimise additional workload burden
- embody the philosophy of 'flexible standardisation'
- create an appropriate environment in which electronic tools can support handover
- maintain communication between clinicians
- ensure the accuracy, relevance and timeliness of information used to support the continuity of patient care.

Consideration needs to be given to the ways in which electronic tools are implemented into the clinical environment to ensure a seamless and complete transition from previous practice to use of the electronic tool.

Checklist – ensuring the safe use of electronic tools

Supporting clinical practice	
Can the tool be easily accessed as part of current clinical work?	
Is the use of the tool 'workload neutral'?	

Supporting flexible standardisation	
Does the tool provide a standardised structure for handover?	
Is the tool able to be re-configured for the local clinical context?	

Environment for clinical handover	
Can everybody who needs to participate in handover access the tool?	
Can everybody see the screen?	
Is the font size and screen resolution adequate?	
Does the location of handover minimise interruptions and distractions?	
Is patient confidentiality ensured?	
Can everybody hear the handover discussion?	

Enhancing clinical communications	
Is the use of the tool supported by verbal (ideally face-to-face) handover?	
Does using an electronic tool still promote discussion and clarification?	
Can educational discussions still occur when appropriate?	

Data validity and security	
Does the electronic tool 'auto populate' data from existing systems?	
Does the electronic tool 'time stamp' information?	
Does the electronic tool identify the author of information?	
Does the electronic tool regulate and audit access?	
Does the electronic tool limit manual data entry?	
Does the electronic tool limit duplication of information across systems?	

3

What are the important technical considerations for an electronic tool?

Recently, a pervasive view that all health information technology is innocuous, and capable only of providing benefits in efficiency and safety for health care has been flagged and criticised within the literature as the syndrome of 'inappropriate over-confidence in computing' (Silverstein, 2009).

Information technology has certainly brought considerable benefits to patient safety, including facilitating access to information, assisting with alerts and error detection, providing decision-support, and assisting with monotonous monitoring or complex calculation tasks (Bates & Gawande, 2003). However, a wide range of unanticipated consequences of integrating technology into clinical practice has been observed. These negative consequences involve new forms of error, changes to clinical work patterns, and changes in information flow and communication between clinicians (Wachter, 2006).

The work environment and the technology utilised in this environment can have a significant impact on patient safety (Reiling, 2006). Research has established that poor system design creates error (Norman, 1988; Reason, 1990, 1997). Conversely, forcing functions that prevent the occurrence of error can be designed into systems. A classic example of such a forcing function in health care involves the different connectors used on oxygen and nitrous oxide leads, to reduce the likelihood of gasses being confused (Leape, 2006).

In this light, consideration needs to be given to the design of electronic tools to support clinical handover, and to ensure that the design of such systems minimises the potential for the generation of error.

System design can significantly influence the overall safety of an electronic handover tool. Clinical information systems can actually foster the occurrence of error. Two broad categories of error associated with the use of clinical information systems have been identified, namely: 1) errors in the process of entering and retrieving information; and 2) errors in communication and coordination processes that the technology is designed to support (Ash et al., 2004).

Clinical handover is first and foremost a communication process where responsibility and accountability are transferred. Technology should be designed to support this, rather than replace or be viewed as an alternative mechanism.

Safe technology needs to be designed for clinicians in the clinical context. It is therefore designed for the time-poor, frequently distracted and interrupted, fatigued, and sometimes stressed members of a team.

This section explores a range of considerations for safe technology design and use that are critical to ensuring the safe and efficient use of electronic tools to support clinical handover.

Integrating electronic tools within the clinical information system

The benefits of a stand-alone electronic tool to support clinical handover are limited, given the rapid development of clinical information systems and the progression towards a full electronic medical record. Ideally, an electronic handover tool should be fully integrated with other core functions of the clinical information systems of the facility.

One of the main benefits of using electronic tools to support clinical handover come from inter-operability of the handover tools with other systems, or other components of the clinical information system. The research case studies that informed this guide demonstrated that little benefit would be available from a stand-alone system to support clinical handover, as in essence all it would be is an electronic note-taking or task management device. However, when these core functions are integrated within the clinical information system, the true benefits of electronic support for clinical handover can be realised.

Stand-alone systems run the risk of duplicating both workload and clinical information. When multiple sources of clinical information are created, problems occur in updating that information, and ensuring that it is kept up-to-date and valid. Furthermore, multiple sources of the same information (such as a laboratory result or system introduced to support different professional streams) can lead to discrepancies and confusion over the most recent or correct piece of information. To this end, interoperability of the handover tool with the other components of a facility's clinical information system can assist with ensuring information is valid, verified and up-to-date.

The main considerations for interoperability with other systems include:

Interoperability with patient management systems –

the handover tool should provide for integration with the overarching patient management system, such that comprehensive lists of patients are created and individual patient data is available to the electronic handover tool.

Interoperability with diagnostic services –

the handover tool should provide access to results from radiology, pathology, and other diagnostic services. Handover discussion can then be informed by the most up-to-date and verified information about the patient.

Interoperability with electronic ordering systems –

the handover tool should provide access to electronic ordering systems, such that diagnostic investigations or changes to medication that are discussed at handover can be actioned easily.

Interoperability with referrals and booking systems –

the handover tool should provide access to electronic referrals and booking systems, such that referrals or subsequent clinic bookings can be initiated at the time of handover.

Interoperability with alerts systems –

the handover tool should provide access to patient alerts including allergies, multiple resistant organism status and other critical alerts such as occupational health and safety alerts for clinicians. This integration ensures accurate information is conveyed, and conveyed in a timely manner. The master slave relationships between systems need to underscore the safety of the patient foremost.

Integrating the electronic handover tool with other core functions of the clinical information system provides benefits in terms of both the efficiency and safety of patient care. These benefits include:

- seamless patient care – integrating handover with diagnostics and data
- auto-populating the minimum dataset for handover
- avoiding duplication of information in the handover system
- anticipating future functions of the electronic medical record.

Each of these benefits are explored in detail in the table on page 39.

As with all other components of the clinical information system, consideration needs to be given to redundancy and back-up systems in the event of technology or power failure. One of the unintended consequences of shifting to an electronic system is removing redundancy from systems. Two critical considerations arise:

Availability and reliability –

a system to ensure continuity of patient care requires a high degree of availability and reliability. A system which is periodically unavailable (either expectedly or as a scheduled event) is unlikely to gain clinician acceptance as a trusted tool to support patient care and in a worst case scenario may jeopardise patient safety. Technical support should be provided as a critical function. One must consider the necessary resource to support the system. If the required resources are not available to support the system to function in a manner that supports safe care, then implementation should not occur.

Effective back-up systems –

to enable access to critical information. Once effectively implemented, clinicians become extremely dependant on electronic clinical systems to provide critical patient care functions. This dependence increases over time. Back-up systems can be chaotic and affect productivity and safety (Ash et al., 2007).

Advantages of integrating electronic tools within the clinical information system	
Seamless patient care	The ability to undertake core clinical functions such as checking laboratory results, viewing x-rays and other imaging, ordering further diagnostic tests, or arranging a referral within a single system are important aspects of seamless patient care. This approach increases efficiencies and decreases clinician workload. There are numerous advantages to integrating the handover system within the overall clinical information system, such as minimising duplication, verifying the accuracy of information, and minimising the administrative burden of switching between different systems.
Auto-populating the 'minimum dataset'	The use of a standardised minimum dataset relating to patient identifiers, critical diagnoses, laboratory and other diagnostic results and the overall care plan can help make handovers safer. If the handover tool is integrated within the clinical information system, much of the minimum dataset can be automatically populated from within the clinical information system, reducing the need to duplicate information and reducing the risk of error. For example, auto populating the system with up-to-date haemoglobin results, direct from the pathology system, would remove the risk of both transposition error as well as out-of-date results being transferred at handover.
Avoiding duplication of information	If the electronic handover tool is not integrated into the clinical information system, there are potential issues in relation to the duplication of information. For example, information entered into the handover system may already exist in the clinical information system, or it may even be entered at a later time. Duplication of information can result in increased workload, and therefore inefficient patient care. Duplication of information also presents vulnerabilities in terms of errors in transcription, data verification and recency.
Future functions of the electronic medical record	The use of electronic tools to support clinical handover should anticipate some of the future developments of the electronic medical record. For instance, the use of electronic observation charts will enable the development of algorithms within the clinical information system to automatically identify of deteriorating patients. These patients can then be flagged and auto-populated into a handover list. Similarly, the auto-population of discharge summary reports could utilise aspects of the handover system to summarise patient progress.

Electronic tools should adhere to national and international standards

The design of electronic tools to support clinical handover must embody the core standards relating to the specifications for health information systems. To this end, electronic tools should adhere to national and international standards for the exchange and management of electronic health care information.

It is essential that new health information system developments are progressed in a way that incorporates recognition of emerging frameworks. The critical mass of health messaging (communications between clinicians and/or health systems) that is initiated and received, makes it is particularly important for developers, purchasers, users of electronic health tools to take note of national and international initiatives.

Internationally, bodies such as the World Health Organization, HL7, and the International Health Terminology Standards Development Organisation provide a range of standards for clinical information systems that relate to exchange of information, standardised terminology, message structure, as well as requirements for data security. Within Australia the National E-Health Transition Authority (NEHTA) provides a local conduit for these international standards.

Australian Health Ministers established NEHTA in July 2005 to develop national e-health standards and infrastructure requirements for the electronic collection and secure exchange of health information. NEHTA's underlying approach is based on the benefits that are anticipated to be delivered by the adoption and use of e-health systems.

The key focus of national and international initiatives is currently on standards for the exchange of electronic information between organisations. Health sector stakeholders are therefore not 'locked-in' to any specific choice of e-health system or particular technical system mix, rather they can use a standards-based approach to ensure that any new developments are 'future-proofed' and compliant with the emerging standards to ensure they can safely engage in electronic information exchanges beyond their organisational boundaries.

At the broadest level, NEHTA aims to achieve interoperability amongst e-health systems through the development of standards that can be used by health sector stakeholders responsible for improving care delivery through information technology [www.nehta.gov.au/connecting-australia/ehealth-interoperability]. NEHTA's standards work to-date has related to some specific categories of health care information and electronic health care communications, and to identifiers for individual patients, health care providers and medical products.

NEHTA has actively adopted (and where necessary extended) SNOMED Clinical Terms® (SNOMED CT), which is an international standard on clinical terminology. This standard now also guides the format of, and data contained in, referrals, discharge summaries, pathology results and prescriptions [www.nehta.gov.au/connecting-australia/clinical-terminologies]. NEHTA has also implemented these clinical communications in exemplar e-health services [www.nehta.gov.au/e-communications-in-practice].

In the context of guiding principles for safe use of electronic handover tools, NEHTA is not currently developing standards at the level of functionality within clinical systems and as such has not developed standards or guiding principles in the area of clinical handover. However, a number of NEHTA initiatives mentioned above, are of relevance and potential utility to organisations working in the area of electronic tools and clinical handover. Clearly, by using a standardised vocabulary to describe diagnoses, procedures, therapies and other terms, health care providers will be able to consistently interpret the clinical information that they share with others.

Electronic tools are most effective when they adopt user-centred design

User-centred design seeks user involvement in the critical stages of design, development, and implementation of the technology. Electronic tools are most effective at supporting clinical handover, when they are designed by clinicians for the clinical context.

A large number of health information systems projects fail, largely due to the lack of consideration of the human factors including usability, workflow, organisational change, medical error and process reengineering (Zhang, 2005).

The basic methods for user-centred design focuses on ensuring that systems are designed primarily around the user's needs in performing a specific task (Norman, 1988). In order to achieve this goal, a set of analyses needs to take place, which will inform system design and/or evaluation (Johnson, Johnson, & Zhang, 2005):

User analysis:

involves an analysis of the users of the system and examines characteristics such as user skill level and computer literacy, and their interaction with existing clinical information systems. With respect to clinical handover this process would involve an analysis of all the parties who contribute to clinical handover, including junior and senior staff, as well as the multi-disciplinary nature of the teams.

Environmental analysis:

involves an analysis of the place(s) and condition(s) in which the system will be used, and explores issues such as space, noise, light, available resources, as well as social and cultural issues. With respect to clinical handover this process would involve an analysis of the venue for handover, as well as access to the electronic handover tool during normal clinical work.

Task analysis:

involves an analysis of the specific system functions that need to be performed. With respect to clinical handover it would involve an analysis of the content of handover, the types of information that are transferred, as well as the interface between handover and the clinical activities that take place prior-to and resulting-from the handover discussion.

Representational analysis:

involves an analysis of the optimum way to display information to the user according to each specific tasks. With respect to clinical handover, this process involves an analysis of how critical information about a patient's current status, clinical history, as well as critical laboratory and medical imaging results are best presented.

Resources:
Further guidance material

User-centred design – tools and techniques

The IBM Technical Library provides extensive guidance on the overall process of user-centred design, and the specific tools and techniques that are involved. These processes include:

- audience definition
- task analysis
- heuristic review
- use case model
- iterative design
- design specification
- usability validation test.

More details can be found within the IBM Technical Library.

http://www.ibm.com/developerworks/library/us-ucd

Clinical Perspectives...

"It needs to be more obstetric-friendly and not just a generic product that we're having to adapt, we're having to basically just use the standard handover tool, which doesn't work that well for us, we're just expected to use the one that's really designed for physicians…"

Electronic tools must be easy to use and access

An electronic tool to support clinical handover must be designed for ease of use, such that implementation and take-up are not impacted upon by users' difficulties with the technology. Systems that are unintuitive, designed differently from other parts of the clinical information system, and are difficult to navigate and access will not be adopted in the clinical context.

The following three factors are critical to ensuring that any electronic tools are designed for ease of use in the clinical context.

Clinically intuitive –

the system mirrors traditional clinical practice, such that it seems natural to use and does not require additional effort to understand the meaning or role of components of the system.

Familiar –

the electronic handover tool is similar in 'look and feel' and functionality to other aspects of the clinical information system.

Integrated –

the system is easy to move in and out of from other elements of the clinical information system.

Ease of use reduces the risks associated with error, and also eases the training burden involved in the implementation of new aspects of the clinical information system.

Ease of access to the system is a major consideration that will drive uptake and sustainability in the use of electronic tools to support clinical handover. The main considerations with respect to accessibility of the system involve the ability to quickly login and logout of the system, and the time the system takes to load its various components.

A range of technological solutions to assist quick login/logout of systems and enable session portability between multiple computers in the health care setting are available. In several Australian hospitals these include Smart Card technologies that enable a clinician to move between terminals and simply login by inserting their access card. Compared to traditional methods of logging in and out of each computer, Smart Card technologies significantly reduce the time taken to move between computers. An alternative mechanism to enhance accessibility involves the use of hand-held devices such as PDAs or Tablet PCs.

Delays and other difficulties in accessing the system lead either to lack of adoption of the system, or problematic work-arounds which may create more significant detriments to safety than the potential benefits achieved through system use.

Case study:
Lessons from practice

Less is more – the 'handover mnemonic'…

Handover need not be a complex or overly sophisticated process. In the traditional clinical environment it is a process common across most disciplines that involves identifying a patient, providing brief background, updating current status and assessment, and identifying actions that are outstanding, incomplete, or still need to take place.

Traditionally, clinicians have used a short written note as a memory prompt or 'mnemonic' to be used to guide the handover discussion with the on-coming clinician.

In its simplest form, the electronic tool can be seen as providing a simple central repository for notes to jog memory during the handover discussion.

In turn, automated features of the electronic handover system, as a part of the overall clinical information system, provide additional aspects of risk management that serve to enhance the safety of handover. These include:

- Ensuring the list of patients is complete.
- Auto-populating a minimum dataset.
- Providing access to up-to-date pathology and radiology results.
- Seamless integration with referrals and ordering systems.

Thus, in its simplest form, the clinicians use the electronic handover tool as a simple repository for their notes to jog their memory during the handover discussion.

Case study:
Lessons from practice

Perils of a shared login…

Due to the limited number of terminals on the ward, the common practice between clinicians was to use a single shared login, and leave the clinical management system open after use.

However, when the electronic handover module was implemented, this practice caused potential confusion as to roles, responsibilities and accountabilities with handover.

Using a single shared login meant that it was unclear who had actually written a handover note, and to who it was directed. Whilst much of this was clarified during the face-to-face handover meetings, clinicians who checked the handover notes for a patient during the middle of a shift were sometimes confused as to who had entered data into the system.

Interface design should be appropriate for the clinical context

The overall design of the user interface has significant implications for the safety of electronic tools to support clinical handover. The interface must be appropriate for the clinical context and must facilitate access, navigation, data entry and data visibility.

With respect to clinical information systems, a number of categories of user interface considerations have been highlighted in the literature (c.f. Kushniruka, Triola, Boryckic, Steind, & Kannrye, 2005), including:

- data entry
- display visibility
- navigation and locating information
- system speed.

These considerations can easily be applied to the electronic tools that are used to support clinical handover, as shown below.

Interface design considerations for electronic tools to support clinical handover	
Data entry	With respect to electronic tools to support clinical handover, consideration needs to be given to how handover information is entered into the electronic handover tool, when and by whom. With multiple forms of devices used to interact with the clinical information system, there are a range of data entry techniques from typing, through to the use of a stylus on a hand-held device, or using a touch-screen keyboard on a Tablet PC. Each data entry device needs to be assessed in terms of the usability for its main user group, and whether there is good fit between the device, the users, and the clinical context in which it will be deployed.
Display visibility	Considerations for display visibility relate to the visual acquisition of information from the screen, and refer to both readability of text and the definition of images on a screen, as well as the overall visibility of the screen the environment of clinical setting. Font size and screen resolution is a critical issue, especially when an electronic tool is used in a group environment. All team members involved in handover need to be able to view the screen. Two other general issues are of relevance for handover, with the requirements to scroll to view information, and systems that create multiple cascading windows that are open simultaneously being two sources of potential error in handover.
Navigation and locating information	Considerations for navigation relate to the way in which a user can move between parts of the clinical information system. Issues such as moving backwards and forwards between the handover tool and other features of the clinical information system are key interface consideration. Safeguards to ensure positive patient identification are also critical considerations for electronic handover tools, and each screen should include key patient identifiers to ensure no errors are made with respect to patient identification.
Speed	Considerations for system speed refer to the time it takes for components of the system to load, or the time taken to switch between components of the system. With respect to electronic tools to support clinical handover, delays must not occur when logging on to the system, when loading a list of patients, when accessing an individual patient's records, when entering data, or when switching between components of the system such as an ordering module or a PACS viewer.

Summary of key technological considerations

The design of electronic tools to support clinical handover must embody the core standards relating to the specifications for health information systems. To this end, electronic tools should adhere to national and international standards for the exchange and management of electronic health care information.

The benefits of a stand-alone electronic tool to support clinical handover are limited, given the rapid development of clinical information systems and the progression towards a full electronic medical record. Ideally, an electronic handover tool should be fully integrated with other core functions of the clinical information systems of the facility. Consider the following:

- adhering to national and international standards
- ensuring that existing information technology infrastructure supports the tool
- building interoperability with other core functions of clinical information systems
- embodying usability and user-centred design
- ensuring system accessibility and reliability
- building in redundancy and back-up protocols if the system is down.

System design can significantly influence the overall safety of an electronic handover tool. Safe technology needs to be designed for clinicians in the clinical context. It is therefore designed for the time-poor, frequently distracted and interrupted, fatigued, and sometimes stressed members of a team.

Checklist – key technological considerations

National and international standards	
Is the tool HL-7 compliant?	
Is the tool SNOMED-CT compliant?	
Does the tool meet standards for data security?	
Does the tool meet standards for user authentication?	

Integration with clinical information systems	
Does existing information technology infrastructure support the tool?	
Is there access to the patient management system?	
Is there access to the diagnostic services?	
Is there access to the electronic ordering systems?	
Is there access to the referrals and booking systems?	
Is there access to the alerts systems?	
Is the system 'future proofed' to be part of an electronic medical record?	

Usability and user-centred design	
Has the tool been developed and implemented in consultation with clinicians?	
Has the tool been assessed for ease of use and ease of access?	
Does the tool support quick login/logout and session portability?	
Has the user interface been evaluated in the clinical context?	

System reliability	
Has the system been assessed for reliability?	
Is there redundancy built into the technology in case of system downtime?	
Are there back-up procedures in place if the technology fails?	

A guide for implementation and evaluation

4

What do we need to think about when implementing an electronic tool?

This section provides guidance on the implementation and evaluation of using electronic clinical handover tools. A primary reference for implementation and evaluation of clinical handover is the OSSIE Guide to Clinical Handover Improvement (Australian Commission on Safety and Quality in Health Care, 2009).

Key learnings that reflect specific experience in implementing the electronic tool in three study sites are discussed in this section.

An evidence-based and structured approach to implementation

An evidenced-based structured approach to planning and implementation of electronic clinical handover tools provides the foundation for the sustainable and clinically safe use of the tool.

Implementing a tool that supports communication relating to patient management must consider the potential for introducing unintended clinical risk, as outlined in the preceding sections of this guide. Careful planning that uses evidence-based project and change management practices; quality improvement methods; and which recognises the safety culture, will reduce the potential risk associated with practice change.

The OSSIE Guide is an evidence-based guidance document to support clinical handover improvement. The OSSIE Guide describes five phases:

O = Organisational leadership

S = Simple solution development

S = Stakeholder engagement

I = Implementation

E = Evaluation and maintenance.

The OSSIE Guide supports a user-centred approach to design and improvement. This concept of a 'bottom-up team approach' is supported by other health care safety improvement methodologies (Stead et al., 2009).

OSSIE Guide to
Clinical Handover Improvement
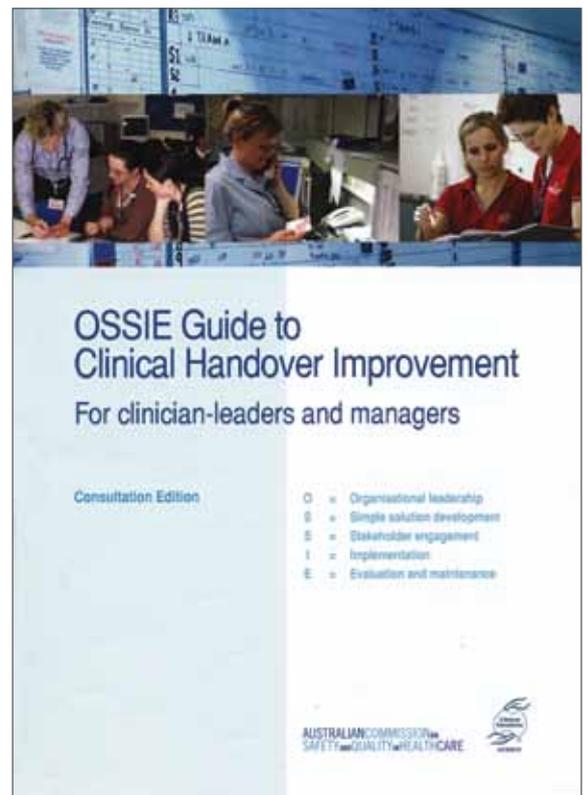
For clinician-leaders and managers

Consultation Edition

O = Organisational leadership
S = Simple solution development
S = Stakeholder engagement
I = Implementation
E = Evaluation and maintenance

AUSTRALIAN COMMISSION for
SAFETY and QUALITY in HEALTHCARE

Establish project governance and leadership

Establishing project governance ensures that organisational leadership is clearly identified, and structures are put in place to appropriately align decision-making and resources to meet the challenges of introducing the electronic tool.

Clinical handover improvement and the successful introduction of the electronic tools is more likely when there is support and resources from senior executive and alignment with the aims and values of the organisation. Reporting lines for the progress and outcomes of the initiative need to be clearly understood. The established governance processes for information technology need to be aligned with safety and quality. Information technology resources need to be timely with appropriate support for training and help desk support that reflects the service model of the organisation (in a hospital, 24 hours a day, and seven days a week.)

One approach could involve an organisational strategy that incorporates a 'ground-up' unit or specialty based change team model. This will allow for:

- flexibility in design and implementation of the electronic tool
- specialty specific patient risks to be defined in the minimum dataset
- accommodate local work and communication flow.

The local change team should be structured to reflect the professional disciplines responsible for direct clinical care and management, which will enable a team approach centred on the needs of the patient's safe care. Project governance should factor in a mechanism to ensure that a patient's chief concerns are communicated, and also how the consumer is included in the design of handover.

Case study: Lessons from practice

Identifying and overcoming barriers…

The introduction of the electronic tool had strong support by the clinical and managerial leaders of the medical team. It also had the support of senior executive. In this setting, the use of the tool was to support the identification and handover of 'sick' patients from the whole hospital from day to night shift.

Handover of patients that were known to be at risk by having had a medical emergency team call out during the day was not comprehensive enough to meet the aims of identifying all patients outside the medical division that might require follow-up by night staff. Further, the capacity for the medical division to coordinate a process for handover of sick patients to medicine from other specialties and to develop an appropriate strategy for assigning responsibility for aspects of care would require an organisational strategy for 'day to night' hospital.

Although the need for improved handover had been identified by key clinicians and the division of medicine was capable of proposing options that could provide solutions to current clinical risks, organisational wide clinical handover improvements and 'day to night' hospital strategies were not priorities in the organisation's clinical governance plan.

There was support and understanding for the need to further develop these improvements in clinical processes, and some work was being done on 'day to night' hospital, however the organisational wide clinical governance structure wasn't yet aligned to progress them in a coordinated manner. The use of the electronic tool could not be progressed until this was resolved.

Assessing appropriateness and readiness

Assessing the appropriateness and readiness for introducing the electronic clinical handover tool is a fundamental step in the planning for the introduction of an electronic tool into clinical handover.

In assessing readiness for the introduction of the electronic tool, an understanding of the safety culture in the area where the tool is proposed to be introduced should be gained. Tools are readily available for assessing safety culture, including the Safety Attitudes Questionnaire (SAQ) that has been subjected to considerable field validation (Sexton et al., 2006).

The safety culture assessment may indicate areas that may need strengthening to better support a safety critical change strategy. This may be in areas such as leadership, teamwork climate, working conditions or safety climate.

The introduction of an electronic tool to support handover safety will require leadership. Managerial and clinical team leaders will need to work constructively to resolve issues in an environment that is open to input from staff. This approach is central to introducing new processes that support critical clinical and team functions.

TeamSTEPPS™ is a teamwork framework centred on patient safety that can be used to assist with clinical handover improvement and the introduction of electronic tools. TeamSTEPPS™ provides health care teams with practical teamwork and quality improvement strategies such as 'Know the plan, Share the Plan, Review the Risks'. This approach dismantles the constraints that come with hierarchical and professional boundaries and places the emphasis squarely on the safe care of patients (Salisbury & Hohenhaus, 2008).

The use of team training and culture change methods may be used to set firm foundations in clinical handover improvement work prior to the introduction of an electronic clinical handover tool (Salas, DiazGranados, Weaver, & King, 2008).

Working conditions such as allocation and management of staff and logistical support need to be considered. Introduction of an electronic clinical handover tool during periods when essential elements to support implementation are absent will restrict implementation. The right people with the right skills and the essential equipment and technological infrastructure to support introduction of the electronic tool are required.

Another consideration is the presence of a solid understanding and support for introducing an electronic clinical handover system. There may be little acknowledgement from staff for the need to improve clinical handover and further to introduce technology to support it. Clinical handover practices vary widely across the health sector, within the same health service, within the same ward or clinical service and even over a 24 hour or seven day period. Opinions on what constitutes safe handover may also vary widely. Local along with state, national and international data will assist in articulating the case for change. Quality or risk managers can assist by reviewing local incident, root cause analysis, risk register, coronial findings and patient complaint data to better understand risks associated with clinical handover at the local level.

Providing education, data and resources that assist staff in understanding what constitutes safe handover is a first step to establishing a shared vision for clinical handover in their practice setting. The Medical Journal of Australia Supplement on Clinical Handover (2009;190(11) suppl.) and the ACSQHC (www.safetyandquality.gov.au) website can assist in providing resources for the readiness phase.

The table on page 54 provides a series of questions that aim to assist the reader to focus-in on their particular handover improvement needs as well as to assemble a holistic overview of their handover practices. The answers will help determine who are the critical team members, identify potential system risks, and identify local information requirements.

Observations, handover process mapping, reviewing quality data and interviewing staff all assist in the process of getting an accurate picture of requirements and also the type of changes that need to be planned. Observations by a multidisciplinary team with varying levels of hierarchy of handovers in the 24 hour period (where applicable) with feedback to staff of the findings are useful. This process will help define what gaps the electronic tool will help to resolve and what new issues it might introduce. It will also define any discrepancies between the perceptions of how handover occurs and how it actually does occur.

Core questions for needs assessment – electronic tools in clinical handover

Critical clinical team members	Who needs to attend handover, and who needs to have access to 'read' and 'write' information in the electronic handover tool? How are these individual players going to be coordinated?
	Is there a need to have uni-disciplinary handover? If so, how do the different professional teams handover relevant aspects of patient care to each other and ensure they are all on the 'same page' in knowing the current management plan for the patient?
	Do different members of the clinical team use different electronic tools and documentation currently?
	Should all clinical team members use the same tool or have interoperability between them? If they use the same tool, what rules would be required to know who has authority to enter/edit handover data and how would their professional role be exhibited in the electronic tool?
Information requirements	What information do members of the clinical team require to safely progress the care of the patients?
	Does the current handover process provide the necessary information or do they need to access information in other ways?
Workload assessment	Assess the current workload and examine if and how the electronic tool can be supported in peak workload periods and into either existing workflow or a redesigned workflow that aligns with safe practice.
	What is the benefit for patients and staff in proportion to the burden of using the electronic tool?
	Do the benefits for safe care justify the investment?
Strengths and weaknesses	What are the strengths and weaknesses of the current handover process?
	How will the electronic tool address these strengths and weaknesses?
	Will the introduction of an electronic tool affect current team member roles and responsibilities?

Case study:
Lessons from practice

Managing change…

At each shift change, the midwives provide the detailed handover at the bedside. Midwives handover detailed information about the progress of labour. The anaesthetist and the obstetrician are not interested in the level of information midwives handover to each other.

'If we put all of that information into the electronic handover, it would take too long, duplicate what we enter elsewhere, and would distract the doctors from seeing the information that is relevant to the whole team. Throughout the shift, we update the shift coordinator regularly and enter data into one clinical information system called 'Trace Vue'. We make written notes on our patient administration print-out of the patient list. The shift coordinator keeps the doctors informed and attends the multidisciplinary handover with the obstetricians and anaesthetists. This works well for us, it gets the right level of information to the right team members. We are going to be introducing a new clinical information system. We do not want to use the printouts that the doctors use from handover, we like our blank sheets that we use already and just write on them.'

In the readiness assessment for the introduction of the electronic clinical handover tool, the midwives declined to use the tool even though they saw the benefits and participated in the multidisciplinary handover. They had another clinical information system for ongoing data entry and another clinical information system soon to be introduced. There were competing electronic systems and a risk that the expectation would be for the midwife to enter information into the clinical handover tool for the multidisciplinary team.

Establish an aim and action plan

Establishing a clear aim and action plan that is manageable and measurable supported with a communication strategy is critical to the success of implementing electronic tools in the clinical environment.

A clear vision of what safe handover should look like in the service area needs to be defined and based on the findings of the clinical handover assessment as described in the previous section. Precisely articulating the aim of introducing the clinical handover tool will help in change management. The aim should be centred on outcomes for safe patient care, and will also assist to ensure the electronic tool is actually the right one for the organisation.

A planned phased implementation should be considered for large organisation to allow adjustment for any unintended risks that may be introduced and to ensure the magnitude of the change is manageable. A written action plan with timelines and assignment of responsibility for action should be established and regularly maintained to guide implementation. Processes for reporting and monitoring any unintended consequences associated with the implementation process should also be established (see Question five – How do we evaluate the safety and effectiveness of electronic clinical handover tools?).

'Plan–Do–Study–Act' change cycles are recommended to maintain staff input and feedback and facilitate a risk mitigation approach to behavioural and process changes.

Develop policy and standardisation

Health service policy and procedures to direct the safe use of the electronic tool in the health service need to be adopted. Clear roles, responsibilities and accountabilities for the overall management and clinical engagement in relation to the electronic clinical handover process need to be defined. User input, feedback and quality control procedures should be included.

A clinical handover policy that incorporates the addition of the electronic tool for the organisation should be in place. The policy should consider its application in a variety of contexts, from 'day to night' hospital cover, across different professional groups and the physical environment for clinical handover. The introduction of the electronic tool may affect other policies. Consider the impact on workflow and documentation. Electronic information entry may alter team members' roles and responsibilities, which may need to be reflected in job descriptions. Medical record policy may need to accommodate for changes and legal policy decisions may be required. A policy for the 'saving' and 'back-up process' of electronic handover notes and disposal of printouts from the electronic system need to be developed. Policy should also outline the process for the resolution of technical problems associated with the use of the electronic handover tool.

A clinical handover back-up process must also be developed and incorporated into the policy. This includes any related documentation and details on electronic information access issues in the event of electronic system failure The necessary training, manuals and process evaluations should also be included.

Any standardised handover processes to be introduced such as the mnemonic 'ISBAR' (Identification, Situation, Background, Assessment and Recommendation) should be agreed as standard across all services where the electronic tool is to be deployed. Such a decision will require significant change management processes with an effective communication and education strategy.

Where warranted minimum datasets need to be established by the local change team for the specialty area. Where like services are present in a large system, consider standardising minimum datasets as much as possible however, allow for the required elements to be added or modified to fit the local context.

The frequency and responsibility for updating the electronic clinical handover tool throughout the 24 hour period needs to be included in local policy. Consideration of workflow and accountability for who will update information needs to be clearly defined, including who is responsible for the 'sign-off' and 'sign-on' of the clinical handover process.

Electronic systems allow potential to restructure and evaluate some of our work processes. Leadership and supervision of junior staff may require consideration. In the hospital setting, medical consultants may not be on site. There is potential in electronic systems for senior staff to remotely view and join handover (via phone or video link out of hours). Any changes need consideration for their potential benefits to patient safety and any new risks they may introduce.

The process for assigning electronic authorities to access the electronic tool should be included in the policy with access only given once training in the safe use of the tool has been completed.

Computers and if required, data projectors, need to be easily accessible, have a simple login procedure, and be user friendly. Support services need to be in place to allow for local technological problem resolution by someone who can assess the clinical risk associated with the problem.

Establish training, supervision and coaching needs

A training needs assessment should be conducted. It should establish the training program, model and resources required for initial implementation and the ongoing training needs of rotating trainees, new and agency staff. It is likely that training in safe clinical handover principles may need to accompany the training of how to use the software system.

It would be ideal if health service trainers that already have an established role in training staff in electronic systems, were able to also provide training in general safe clinical handover practices and the customised local minimum dataset.

Training should be flexible enough to fit in with workload demands of clinical staff and take into consideration their experience with electronic systems. External trainers that do not have the local knowledge of clinical usability and its relationship to other processes of care may not be able to deliver the same level of training or its evaluation. Junior doctor rotations and agency nursing staff provide a constant flow of new staff. Training programs and timely assignment of electronic permissions need

to accommodate for these frequent changes in staff. An effective control for ensuring competency in the use of the system is to assign electronic permissions for use of the electronic clinical handover tool after successful completion of the training.

Staff may require supervision and mentoring in the correct use of the tool. Quality control measures with regular feedback via management to staff will help to monitor and manage compliance to a set standard (as defined by the minimum dataset and by policy).

One of the strongest motivators for compliance of staff using electronic systems is seeing clinical leaders (Clinical Director or Head of Unit) model the desired behaviour. These leaders need to demonstrate both entry of data into the system and leading the handover in a manner that integrates the electronic tool as a support to the handover discussion. Asking staff if the information is complete or for confirmation of their role in relation to a task on the handover task list before proceeding to the next patient on the list can also be an effective demonstration of the safe use of the electronic tool to support handover.

The use of a new electronic tool or new staff using the tool may require staff coaching or mentoring by senior staff. Accommodation for provision of mentoring and coaching at handover periods outside of normal business hours needs to be considered in the implementation plan.

Case study: Lessons from practice

Staff training and development…

ISBAR was chosen to be the standard mnemonic for clinical handover. The safety and quality electronic clinical information project officer trained all new staff in the use of the electronic tool, the use of ISBAR, and practise in the application of the local minimum dataset for the area in which the new staff were commencing work.

The project officer had insight into potential failure modes of existing electronic and clinical processes of care and could answer questions of new staff with that background. The role of the project officer is to establish a relationship with clinical staff, and to be available to provide support when things don't work as they should or if staff have ideas on how to further improve the system.

Summary of electronic tool implementation

The planning and actions required to implement electronic tools to support clinical handover should not be underestimated. An evidence-based approach to planning and implementation should be adopted. Effective application of change management methodology will guide effective introduction of the tool. Strong project governance and leadership, involving the clinical staff in assessing the appropriateness and readiness for using an electronic tool in a structured manner, will lay down the foundation for implementation and allow implementation barriers and risks to be anticipated. A clear policy for clinical handover that recognises workflow, legal issues, flexible standardisation, technological support and back-up need to be established. Training, supervision and coaching should be responsive to the needs of the workforce.

An adequately resourced and evidence-based approach to implementing an electronic clinical handover tool will improve success of adopting the safe use of the clinical handover tool.

Checklist for implementation of electronic tools

An evidence-based and structured approach	
Has the OSSIE guide been used to structure implementation?	
Has consideration been given to project management requirements?	
Has consideration been given to change management processes?	

Project governance and leadership	
Is there senior management commitment?	
Does the clinical leader model safe use of the electronic tool?	
Are all stakeholders engaged?	
Is there adequate resourcing?	
Does the project team have a clear structure and defined roles?	

Assessment of appropriateness and readiness	
Is there a strong culture that prioritises patient safety?	
Are there well-developed handover practices established?	
Has there been an assessment of clinical appropriateness?	

Project management	
Is there an aim and an action plan?	
Are there guidelines for the use of the tool in the clinical context?	
Have training and coaching needs been established and resourced?	
Are clinical handover policies established?	

5

How do we evaluate the safety and effectiveness of an electronic tool?

This section proposes methods for evaluation of the safety and quality of handover where electronic tools have been introduced. The OSSIE Guide to Clinical Handover Improvement should be used as the principal reference for evaluation of clinical handover (Australian Commission on Safety and Quality in Health Care, 2009).

Measurement can be divided into three phases, readiness assessment phase, implementation phase, and evaluation and maintenance phase. The measurement framework should establish whether or not the planned benefits of the introduction of an electronic tool have been achieved, and whether there have been any unintended consequences from the introduction of technology to support clinical handover.

Collect baseline data to enable evaluation post implementation

Establishing whether or not the planned benefits of the introduction of an electronic tool have been achieved, and whether there have been any unintended consequences of the introduction of technology to support clinical handover is a critical aim of evaluation. To this end, data should be collected to enable the evaluation of the electronic tool throughout and post implementation.

Some useful methods for baseline data collection and evaluation include:

- observation
- interviews
- safety culture surveys
- patient complaints and/or satisfaction
- teamwork assessment questionnaires
- incident data
- average time of handover
- number of times staff are called to clarify the plan of care
- audit of documentation of the management plan in the medical record
- video reflective ethnography.

Clinical Perspectives...

"I am worried that typing information into the electronic clinical handover tool will take too much time for staff and distract them from other critical work. There is no 'extra' time to go type! It's faster to write our handover notes on a piece of paper."

Any safety concerns from staff in the introduction of the electronic tool should be assessed for risk and if appropriate, measured or monitored.

When clinician or consumer concerns are raised about the new process, the strongest critics may have the most useful insights into potential risks. Concerns should be promptly addressed in a manner that assesses for potential risk and is inclusive and welcoming of team input. The concern, such as that expressed above 'the time to type in information distracting from clinical work' can be risk assessed. Time to type versus writing on paper can be measured and the risks and benefits of having handwritten notes versus electronic system notes can be assessed using a risk management framework.

Risk mitigation strategies may include limiting handover notes to the agreed minimum dataset, easy login and availability of computers or personal digital assistants (PDAs). Baseline measures and methods for monitoring the quality and volume of handover content in the electronic tool and/or measuring the time for typing can be built into the implementation.

Implementation and post implementation evaluation

A process for reporting and monitoring patient safety should be in place with the introduction of the electronic tool. Where there are existing incident reporting systems in place, these can be used to monitor for handover related incidents at the local level. Further, much can be learned from regular review of electronic tool technology support calls. An analysis of the issues logged may reveal usability issues that affect clinical care communication processes.

The action plan for implementation should assign specific measures with timeframes and accountability for managing. Breaking down changes into manageable timeframes with small improvement cycles is useful. A small sample of data that is easy to gather in the normal flow of work is recommended in the change cycles. Data should be provided to the change team initially on a frequent and regular basis at the start of the initiative (fortnightly or more frequently if a significant issue is identified). Incident management systems should be utilised as a mechanism for all staff to report potential and actual incidents related to the handover process. These should be investigated, evaluated and recommendations actioned in a timely manner by senior managers. Feedback of the data should be transparent and timely to staff. Consider posting run charts in the handover room as part of the communication strategy. Metrics for handover safety should be established and reported through appropriate clinical governance channels.

A combination of measures can be employed to measure structure, process and outcome.

Examples of structural measures for electronic handover include:

- number of clinical units where the tool has been deployed
- number of current authorised users of the electronic handover tool.

Examples of process measures include:

- number of persons trained in the use of the electronic clinical handover tool
- number and designation of person viewing the tool
- number and designation of person editing the tool
- frequency of use of the tool during what hour of day
- frequency in concordance in the content entered into the tool as matched to the agreed minimum dataset
- average time of handover
- number of 'technological' support calls in relation to the electronic handover tool
- number of handover sessions where the tool is used over the total number of handovers in a week
- percentage of correct sign-offs and sign-ins for handover.

Examples of outcome measures include:

- clinical incidents reported as a consequence of handover.
- patient feedback
- staff feedback
- length of stay
- number of delays in treatment/investigations as a consequence not being handed over.

Examples of graphical displays of data below may be posted in clinical handover rooms to provide feedback to staff on progress.
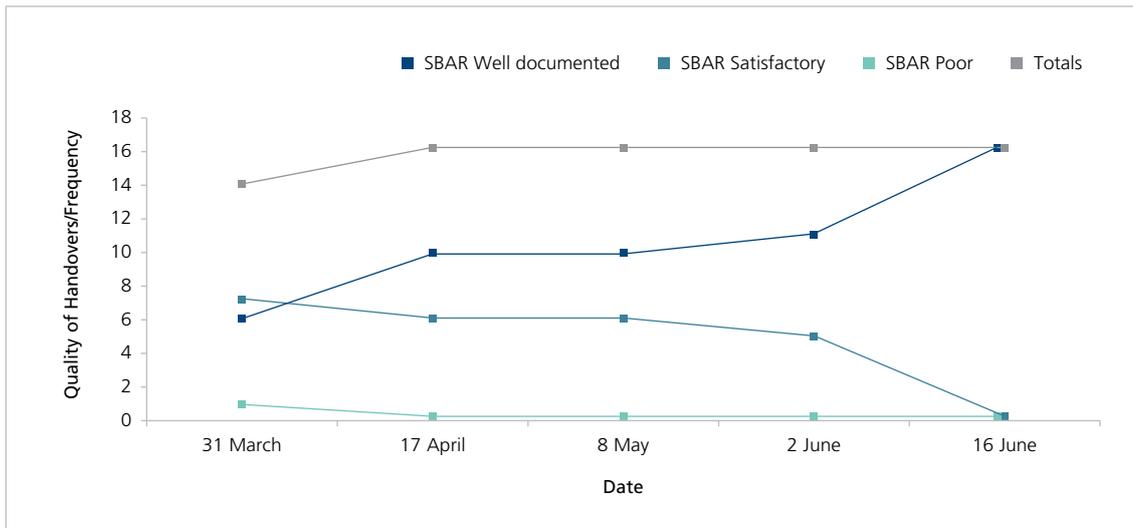
Total number of occurences handover used per month per site
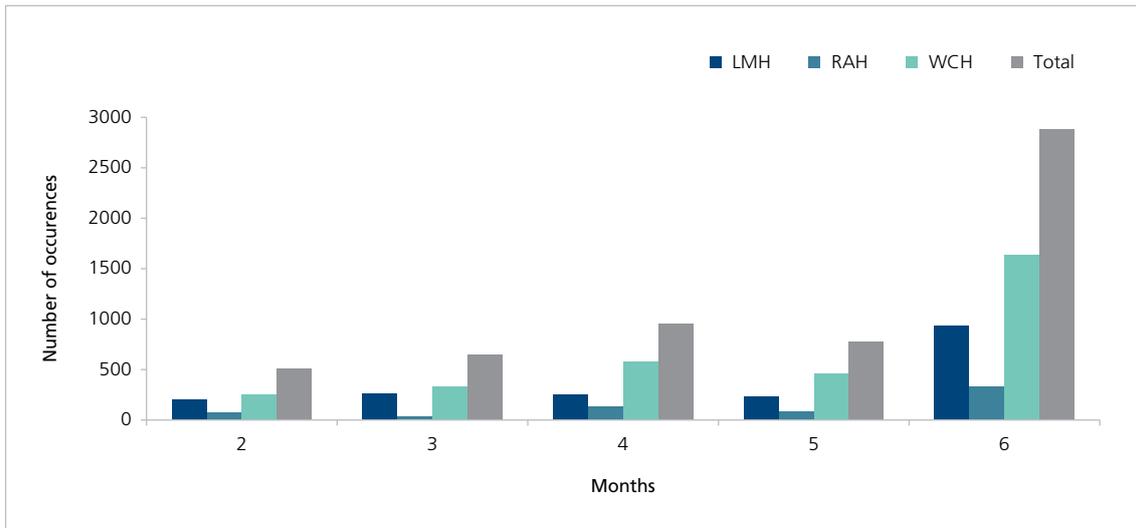
Total number of users in handover per site
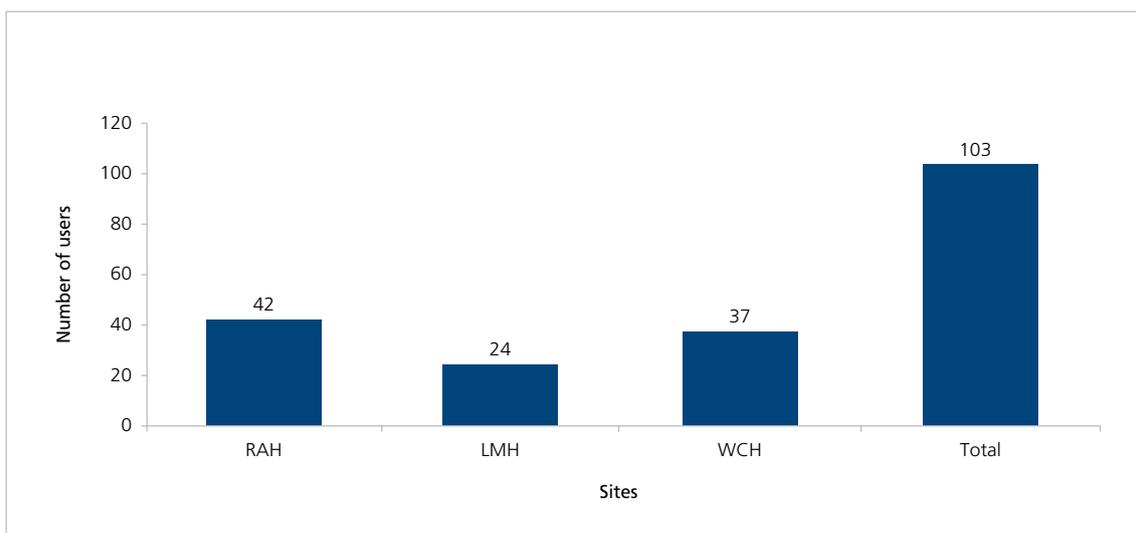
Lyell McEwin hospital SBAR review 2009

Maintain a safety focus through ongoing monitoring and maintenance

Ongoing monitoring of these measures over time will assist in sustaining safe use of the electronic tool. Assessing for the likelihood of sustainability can also be conducted at the post implementation phase. Providing clinical staff the results of an annual assessment will keep health care professionals thinking about and engaged in the use of technology to assist handover.

Outcome measures may be compared to original data from the readiness assessment, such as:

- local clinical handover incidents
- staff culture survey scores
- patient satisfaction/complaints.

Ongoing monitoring of these measures over time will assist in sustaining safe use of the electronic tool. Providing clinical staff the results of an annual assessment will keep healthcare professionals thinking about and engaged in the use of technology to assist handover. Assessing for the likelihood of sustainability can also be conducted at the post implementation phase. This assessment can guide what strategies may need to be put into place to ensure sustainability.

Summary

In summary, evaluation will facilitate the monitoring of clinical risk associated with handover generally, and can be specifically tailored to monitor the safe use of electronic clinical handover tools. Defined measures that are regularly reviewed and have feasible methods for the data to be readily collected in a timely manner, and then reported back to staff, will facilitate ongoing safety and improvement. Establishment of measuring reporting frameworks from the local level through clinical governance are structural components of ongoing safeguards and sustainability.

Checklist for evaluation of electronic tools

Baseline data and needs assessment	
Has baseline data been collected pre implementation?	
Have metrics for safe and efficient handover practice been established?	

Data during implementation	
Is there a strategy to monitor the safety of implementation?	
Have metrics been established to monitor change during implementation?	

Evaluation – monitoring and maintenance	
Will you periodically measure performance against baseline data?	
Have you assessed the sustainability of the change in practice?	
Are back-up systems practised and are they effective?	
How is the reliability and accessibility of the system measured and reported?	

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