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Development of Nursing Workflows and Device Requirement Principles with the Implementation of an Electronic Medical Record System

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Abstract. The past decade has seen the implementation of electronic medical record (EMR) systems being implemented across large-scale healthcare organisations throughout Australia. A first-time implementation of an organisational-wide EMR system required a multi-modal approach to the development of new nursing workflows and appropriate selection of hardware devices to ensure acceptance and adoption of the EMR. The aim of this work was to develop new nursing workflows and associated device requirement principles to allow for continuation of safe, high quality nursing care with an EMR implementation. The incorporation of multi-disciplinary consultations, an audit, observational study and clinical and governance stakeholder engagement was used to develop device requirement principles. This ensured development of standardised nursing workflows were successfully adopted throughout the organisation with the EMR implementation.

Keywords. Electronic medical record, nursing, workflow, medication safety

1. Introduction

The implementation of a new organisational-wide electronic medical record (EMR) system requires nursing acceptance and adoption in order for accurate and effective use of the system [1;2].

EMRs change nurses' work and workflows, and the major organisational and clinical changes and possible disruptions that occur with its implementation must therefore be anticipated and acted upon to minimise care quality depreciation and patient safety risks [3]. The requirements of appropriate hardware devices and development of nursing workflows must ensure clinical safety and risk prevention with medication management and medication administration. This would enable our nursing workforce to continue delivering high quality, safe, patient-centered care during an EMR implementation [4].

The aim of this work was to develop device requirement principles that supported new nursing workflows to allow for continuation of safe, high quality nursing care with an EMR implementation.

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2. Methods

Several methods of observation, evaluation and consultations were used to develop device principles, determine medication workflows and determine device types suitable for the organisational-wide EMR implementation. A range of activities including observations was chosen, based on previous research, to incorporate the multiple factors that affect nurses' workflows with the aim of increased adoption and acceptance of the EMR [5;6].

An audit of all existing information technology infrastructure including electrical outlets, all computer, printer and hardware devices, as well as internet and intranet connectivity, was done across all six sites of the healthcare organisation where the EMR was going to be implemented. In order to ensure the facilitation of safe, efficient and timely medication management and administration into new workflows to be used with the implementation of the EMR system, an observational research study included direct monitoring of medication administration practices and workflows. This study also assisted with decision-making for device principles.

A device evaluation against expected digitised workflows was completed by 23 nurses and midwives working throughout the organisation. Due to the lack of an available validated tool to assess this suitability within a healthcare organisation, questions were developed by the nursing and midwifery informatics leads. Questions assessed whether device components were suitable and safely facilitated the new digitised clinical workflows.

Consultations were also sought from other specialist groups within the healthcare organisation such as occupational health and safety (OHS) and infection prevention and control (IPC) using the same questionnaire.

The nursing and midwifery informatics team included clinical subject matter experts (SMEs) in all stages of the design, development and implementation of the EMR system. These experts were integral in providing clinical knowledge to assist with workflow development and visited clinical areas during key change activities to demonstrate future workflows pre and post-device selection and deployment [7].

3. Results

3.1. Existing Infrastructure Audit and Observational Research Study

The auditing of existing infrastructure across all clinical sites meant that governance and leadership teams were able to appropriately assess existing and future workflows for safe and timely medication administration and contemporaneous clinical care. The results of the ethics-approved pre-implementation observational medication administration study helped to identify current and future medication workflows and specific location and specific location and clinical requirements for devices. The administration of multiple medications via various routes to multiple patients within a medication round was observed over 28 different clinical areas from six separate hospital sites including adult, paediatric, acute (medical and surgical), sub-acute, maternity and critical care. The study findings will be published once repeated observations post-EMR implementation are completed.

3.2. Establishment of Device Principles

As a result of the audit, observational study and consultations with multi-disciplinary clinical, governance and executive staff, nine device principles were developed to ensure safe, consistent and high quality selection of devices that support the new nursing medication workflows and daily work:

- Consideration of layout and specialty of the ward in device selection;
- Consistent user experience for clinicians with computing devices;
- Each nurse, midwife, allied health and medical staff member should not have to wait to access a device throughout the shift;
- Rapid tap-on tap-off (TOTO) functionality required for every device in clinical areas;
- Access to a range of mobile device types to facilitate access to the EMR at the point of care;
- Numbers of devices based upon activity or care type (e.g. one device per nurse dependent on patient ratio, two devices per ward rounding medical team);
- All computing devices at the point of care would have patient wristband scanners in order to facilitate safe medication administration;
- Sufficient number of pathology/specimen label printers per ward in order to maintain safe pathology/specimen collection practices; and
- At least two devices in every medication storage room.

The device principles were continuously used to ensure alignment between expected workflows and the EMR program principles overall. These were submitted and accepted by the nursing and midwifery organisational governance teams and endorsed by the EMR implementation committee.

3.3. Device Suitability

Executive and clinician involvement promoted the message of devices being fit for purpose from top-down and bottom-up for the future workflows. Organisational policies were rewritten to include the process of decanting imprest and non-imprest medications into the Workstation on Wheels (WoW) as replacements for the large medication trolleys. The benefits of scanning patients, as well as visual checks, for positive patient identification were endorsed by the senior leaders and sold to their professional groups.

3.4. OHS and IPC Consultation

OHS and IPC consultations were undertaken to ensure appropriate governance and recommendations were developed or adopted for the EMR nursing workflows. The OHS consultation included development of a local area checklist which provides a quick means of assessing OHS risks associated with the EMR devices. The checklist is to be completed in conjunction with the developed Standing Risk Profile relevant to each device in use. The WoW Ergonomic Guide was developed to provide guidance in setting up devices prior to use and outlines ergonomic principles that should be followed when using devices. An EMR ergonomics poster was developed for display in work areas and team noticeboards and support made available via intranet links.

Five specific IPC recommendations were established in order to provide clinical guidance and alignment with existing healthcare organisation protocols: 1) Perform hand

hygiene prior to using the WoW, as well as following the use of the WoW; 2) If the WoW is taken into the room of a patient with transmission-based precautions, clean the WoW when you remove it from the room; 3) The staff member assigned to the WoW should clean it after use. If you are a nurse with one WoW assigned to the patients you are caring for, then clean your WoW at the end of your shift; 4) Allied health and medical staff should clean the WoW straight after use; and 5) All WoWs should be on a documented cleaning schedule and cleaned at least once per day.

3.5. Device Type Selection

Incorporation of the observation, evaluation and consultation processes aided in selecting the type, number and location of a variety of devices for use with the EMR implementation. Devices decided upon included a variety of WoWs with medication drawers for nursing and midwifery staff, portable tablets and laptops.

3.6. SMEs

The SMEs were invaluable resources to both the nursing and midwifery informatics team and clinical management teams throughout the organisation. The dispersion of information and education regarding device selection, use, incorporation into workflows and specific medication administration practices gained positive feedback from managers, educators and clinical staff. SMEs facilitated the development, testing and implementation of the new and adopted nursing workflows.

4. Discussion

The scope and breadth of complexity within our healthcare organisation required an innovative and multi-layered approach to nursing workflows and device selection with the implementation of an EMR system. This was done by incorporating the audit, observational study, device principles and evaluation, consultations and selection of device types.

Our approach addressed facilitation of safe patient care, clinician requirements, accessibility and preferences, workflow changes including medication administration and consideration of cost implications.

The development of nine device principles allowed for diverse clinical environments and nurses and midwives' opinions to be integrated into workflow development and to establish suitable device types in order to provide safe, timely and quality patient care and contemporaneous documentation of clinical activities [3;4].

5. Conclusions

This was the first EMR implementation for this healthcare organisation. It was pivotal that clinician engagement, familiarisation and change activities were developed to ensure ongoing communication and understanding of new clinical workflows.

The development of the new standardised nursing workflows and device principles have aided in the ongoing established and embedded models of care. Since the EMR

implementation, medication workflows, including positive patient identification, have been successfully adopted due to the engagement and involvement of clinicians from the beginning of the device requirement process and workflow observations. The development of reference guides and SME support within all clinical areas have facilitated a thorough understanding and application of the nursing workflows with the EMR implementation.

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