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# iPad use during ward rounds: An observational study

Elin C. LEHNBOM [a,1], Kristian ADAMS [b], Richard O. DAY [b,c], Johanna I. WESTBROOK [a] and Melissa T. BAYSARI [a,b]
[a] *Centre for Health Systems and Safety Research, Australian Institute of Health Innovation, UNSW Medicine, University of New South Wales*
[b] *Department of Clinical Pharmacology and Toxicology, St Vincent's Hospital*
[c] *UNSW Medicine, University of New South Wales*

**Abstract.** Much clinical information is computerised and doctors' use of mobile devices such as iPad tablets to access this information is expanding rapidly. This study investigated the use of iPads during ward rounds and their usefulness in providing access to information during ward rounds. Ten teams of doctors at a large teaching hospital were given iPads for ten weeks and were observed on ward rounds for 77.3 hours as they interacted with 525 patients. Use of iPads and other information technology devices to access clinical information was recorded. The majority of clinical information was accessed using iPads (56.2%), followed by computers-on-wheels (35.8%), stationary PCs (7.9%) and smartphones (0.1%). Despite having read-only access on iPads, doctors were generally happy using iPads on ward rounds. These findings provide evidence of the value of iPads as a tool to access information at the point of care.

**Keywords.** iPad, doctors, workflow, observational study, Australia

## Introduction

Early changes to clinical systems relied on replacing paper-based records with digital information accessible via computers. Computers allow easy storage, searching, retrieval, and sharing of large amounts of digital information. Years of research and development have resulted in electronic health records and decision support tools such as computerised provider order entry systems [1]. Despite the tangible value that these systems have been shown to bring to the delivery of health services [2], the adaptation and implementation of health information technology (HIT) has been slow [3, 4]. This is, in part, due to concerns about cost, patient privacy, clinician resistance and weak integration with backend systems [5, 6].

With the development and ubiquity of miniaturised devices that can match the mobility of paper, new forms of technology are meeting the challenge of improved access to information systems and greater integration with the demands of highly mobile clinical practice [7, 8]. The portability, connectedness and responsiveness that characterise tablet devices such as the iPad equip them for the task of data entry and retrieval in the clinical environment [9-11].

[1] Dr Elin Lehnbom, Centre for Health Systems and Safety Research, Level 1, AGSM Building, The University of New South Wales, Sydney NSW 2052 Australia. e.lehnbom@unsw.edu.au

Most published studies of iPad use are limited to pre and post qualitative surveys of doctors' and patients' opinions of the iPad in emergency or critical care settings in the United States [12-17]. To date, relatively little empirical research has been published examining the integration of the iPad into clinical workflow.

The aim of this study was to determine the how iPads were integrated in doctors' workflow during ward rounds.

## 1. Methods

### *1.1. Setting*

This study was conducted in a 326 bed tertiary teaching hospital in Sydney. At the time of the study, clinical notes were handwritten on paper but other clinical tasks, including medication management, and test ordering and results viewing were performed using computerised systems (Mediweb - a local web-based system used to order and display test results, and MedChart - an electronic medication management system developed by CSC). Doctors could access Mediweb and MedChart from central desktop stations or computers-on-wheels (COW). However, iPad use was enabled to provide read-only access to Mediweb and MedChart so doctors could review test results and medications. No access to radiology images was available through the iPad application.

### *1.2. Participants*

Senior consultants from all medical specialties were sent an email invitation to participate in the study. Doctors who expressed interest were contacted by one researcher (KA) who provided more information and obtained written informed consent. A total of 27 email invitations were sent to different consultants of which 16 were accepted. Of the 16 who agreed, consultants from ten teams who conducted regular ward rounds were selected. These teams were colorectal surgery, drug and alcohol, gastroenterology, geriatrics, haematology, heart transplant, infectious diseases, lung transplant, nephrology and vascular medicine. All ten consultants were given a 30-minute training session illustrating functionality of the iPad device (apple California – released on 02/11/2012) and were shown how to access Mediweb on the iPad. Each team was then observed on at least four ward rounds over a ten week period. For teams with smaller patient numbers, the number of observed ward rounds was increased so as to exceed 50 patient interactions per team.

### *1.3. Observations*

Every interaction with any form of health information technology (HIT) on ward rounds was recorded by one observer (KA). The type of HIT used (desktop PC, COW, iPad or personal smartphone), the location (in patients' rooms or in the corridors) and the information accessed (test results, medications, radiology images, clinical reports, patient information, observations and patient notes) were recorded. No identifiable patient information was recorded. The observer also took field notes and recorded contextual information including system failures and patient records not being available. Observations were conducted during weekdays and each observation lasted

for the full duration of a ward round. Observational data were analysed using descriptive statistics.

### *1.4. Interviews*

Doctors who were observed using the iPad on ward rounds were invited to participate in a short semi-structured interview to assess their opinions of, and satisfaction with, the iPad. Interviews were audio-recorded and tapes were transcribed *verbatim*. Two researchers (KA, EL) independently analysed the interview transcripts for emerging themes. Content analysis was undertaken once saturation of themes had been achieved. A modified list of interview questions appears in Table 1.

**Table 1.** Semi-structured interview guide

| | |
|---|---|
| 1. | How did you find using the iPad on ward rounds? |
| 2. | What did you use an iPad for most? |
| 3. | Now that you've used an iPad on ward rounds for a couple of weeks, what would you say are the : |
| | a) Advantages? |
| | b) Disadvantages? |
| 4. | How likely are you to use an iPad on ward rounds in the future if one was provided to you? |

## 2. Results

A total of 19 senior hospital doctors from ten teams were observed interacting with 525 patients over 77.3 hours of observations. The ten teams used the iPad consistently throughout the ten week period. During several observation sessions, allied health staff and doctors other than the staff specialist who had been given an iPad were seen to use their own iPads while on the wards. For example, during one ward round as many as five team members (three registrars, one nurse and one pharmacist) used personal iPads to access information, test results and medication lists. On several occasions multiple team-members were seen to observe the iPad screen at the same time. No technical issues with iPad use were observed. However, on occasions doctors using an iPad were unsure how to perform a particular task.

There were 1074 observed interactions with any form of HIT. The majority of HIT use involved an iPad (56.2%), followed by a COW (35.8%), desktop PC (7.9%) and smartphones (0.1%). Doctors accessed HIT in the corridor (67% of all HIT interactions occurred here) more frequently than in patient rooms (33%). When accessing HIT in the corridor (n=715), iPads (n=379) were used as frequently as other computers. However, when HIT was accessed in the patient room (n=359), the majority of use occurred on an iPad (n=251). The most frequently observed task performed using HIT was accessing test results and reports (39.1% of HIT tasks), viewing and changing medications (37.1%) and accessing patient information (12.1%), Table 2. On average, doctors used HIT 2.1 times per patient (range: 0-11).

### *2.1. Doctors' Opinions of, and Satisfaction with, the iPad*

Doctors made several comments about the iPad during the ward rounds. These included complaints about their inability to access images and order medications, concerns about infection control and security as the mobility of iPads increased the potential for them to be misplaced. Doctors also commented on the size and weight of the device, stating a preference for the iPad mini over the iPad.

Doctors reported using the iPad principally to access test results and medication lists during the ward rounds. This was supported by our observations. They reported that it was "*as easy, if not easier"* to access this information on the iPad than on stationary PCs or COWs. The main cited advantage of the iPad was its portability which allowed access to information in places where COWs and PCs were not at hand, including lifts and meeting rooms. For example, one staff specialist said *"I found it really helpful if we were moving and we had an outlying patient or a consult in ED. We would be talking about the patient while we were moving and I could look up information about the patient while we moved. So it made it much more efficient once we got to the patient."*

The least favourite feature of the iPad was its limited functionality. One staff specialist said *"I think that utility is very limited because you can't order radiology, tests, and you can't make changes on MedChart* [the electronic medication management system]." However, the majority of doctors attributed this to lack of support by the hospital information technology support centre. All doctors felt that mobile forms of IT are important and that *"Any of the IT services deployed on this campus need to be mindful of mobile users and there needs to be easier access to the hospital network …it should be a simple point and click."*

**Table 2.** The type of health information technology used to access information.

| | Health information technology (HIT) | | | |
|---|---|---|---|---|
| | Number of HIT interactions | | | |
| **Information accessed** | **iPad** | **Desktop PC** | **COW** | **TOTAL (% of all interactions)** |
| Patient information | 58 | 12 | 60 | 130 (12.1%) |
| Test results | 314 | 30 | 76 | 420 (39.1%) |
| Medication | 181 | 21 | 196 | 398 (37.1%) |
| Images | 0* | 22 | 42 | 64 (6.0%) |
| Reports | 51 | 0 | 11 | 62 (5.8%) |
| **TOTAL** | 604 | 85 | 385 | **1074** |

Table 1 Note: PC=personal computer; COW=computer-on-wheels

*Not available on the iPad

## 3. Discussion

This is one of the first studies to examine how doctors use iPads during ward rounds. Observations of doctors during their daily ward rounds revealed that iPads were used to access information at the patient bedside and across a range of locations in which care

is delivered. The iPad was used most frequently to review test results and medication lists, and was the device of choice when accessing HIT in patient rooms.

The majority of HIT use was undertaken using an iPad (56.2%), and most HIT use occurred in the corridor (67%). This is inconsistent with previous findings. An observational study of mobile and fixed computer use by doctors on ward rounds found that the majority of observed tasks were completed using a COW (57.3%) while only 35.9% were completed using a tablet PC, and that the majority of clinical tasks were completed in a patient's room (49.1%) [18]. However, the tablet PC used in that study was much bigger and heavier than an iPad, which could explain why doctors preferred to use a COW instead of a tablet PC.

As medicine becomes more complex and time-pressured, there is increased need for and benefit from faster access to a greater range of diagnostic data and to the patient record during ward rounds [19]. Observations revealed doctors frequently move between patients and back and forth between the patient room and the corridor, and that using iPads on ward rounds facilitate quick access to clinical information in different locations. The qualitative component of this study showed that doctors were generally happy with using an iPad on ward rounds but were annoyed that they had read-only access to Mediweb and MedChart, and could not access imaging.

Introducing new technology in healthcare can have unintended consequences [20] and introduce new types of errors [21, 22]. No adverse events were observed related to doctors using the iPad. However, the iPad was configured to provide read-only access to the hospital's computerised systems (a limitation by the IT department) and it is possible that new errors would be introduced if doctors were able to use the iPad to order tests and medications because users may react in complex and unforeseeable ways when new technology is introduced [23].

Future research should focus on junior doctors' use of iPads as junior doctors have more patient contact compared to senior staff specialists, examine the use of iPads outside of ward rounds, and assess potential unintended consequences once the functionality of the iPad is moved beyond read-only functions.

### *3.1. Limitations*

Sometimes multiple clinicians in large teams were using more than one iPad simultaneously. When this occurred, the observer focused on the usage of the iPad provided to the team for this study and thus some usage of personal iPads was missed.

This observational study was conducted at a large teaching hospital with computerised systems for medication management, patient information and clinical tasks. The results from this study may not be directly generalisable to other hospitals where work practices may vary due to hospital size, region, protocols and current IT systems.

## 4. Conclusion

Clinicians used iPads on ward rounds more frequently than other HIT including desktop PCs and COWs, despite being configured to provide read-only access. These findings provide evidence of the value of mobile devices such as iPads in accessing information at the point of care. New devices should be integrated with existing back end systems to allow clinicians to use these devices to perform all their relevant tasks,

thus not limiting them to read-only functionalities, to improve user satisfaction and efficiency.

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