Using mobile technologies for assessment and learning in practice settings: A case study

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Summary The aim of this project was to explore the feasibility and identify the issues of using mobile technologies in the assessment of health and social care students in practice settings. We report here on a case study, which took place between a University department and varied clinical settings where students were on placement. Twenty-nine student midwives and five members of lecturing staff took part in the study and were issued with PocketPCs on which to record assessment documentation including action plans and evidence of achieving performance criteria. Qualitative data were obtained from three focus groups with student midwives and individual interviews with their link lecturers and quantitative data were gathered through short questionnaires to provide simple descriptive statistics. Findings indicated that students preferred the neatness and durability of the PocketPC to the paper based format, which became worn overtime. The ability to add to notes and references as and when appropriate was welcomed. However, anxiety about losing the device or material stored within it proved to be a major constraint. Lecturing staff found that synchronising the device with the University electronic diary system was extremely useful whilst clinical staff approached the change with varying levels of acceptance or dismissal. Introducing mobile technology into the clinical setting will require a significant shift in culture and a significant level of training and support.

KEYWORDS Mobile technology; Assessment; Practice settings; Student midwives

Introduction This paper reports the outcomes of one IT pilot project for Assessment and Learning in Practice Settings (ALPS), a collaborative programme
Mobile technologies in health and social care education and practice

The use of mobile technologies by health and social care providers is rapidly increasing. These include PDAs, computer tablets, Smart phones, Ultra Mobile PCs (UMPC) and other devices that can be easily transported and provide easy access to information by either direct storage on the device or internet access. There is reported use of mobile technologies among paramedics (Norman, 2005), doctors (Fischer et al., 2003; Scheck McAlearney et al., 2004) and nurses for such purposes as tracking medication, supporting preference-based care planning and research (Miller et al., 2005). The role of PDAs in improving practice by reducing medical errors is a common theme in the literature (Tooeey and Mayo, 2004; Hochschuler, 2001). Thompson (2005) enthuses about the potential of handheld computers and claims that they will transform nursing practice, making it more efficient, safer and of a higher quality. In particular he refers to benefits of data storage and retrieval, citing data bases of drugs and their administration and various clinical tools and calculators in addition to the decentralization of communications and decision making, which will “increase nurse autonomy” and allow “a deeper level of care for patients” (p. 312). These claims offer a glimpse of the potential of mobile devices for health care practitioners, but whilst Thompson’s enthusiasm is almost tangible, he provides no concrete examples of how they have been embraced by practitioners themselves. However, Altmann and Brady (2005) of California State University support Thompson’s vision. They conducted a survey of 190 student nurses and found that the software programme most used by students in the clinical setting was a drug guide, followed by a laboratory guide. Courtney et al. (2005a) report on a 2003 survey of 124 RNs (Registered Nurses) in which it was found that nurses using PDAs were doing so overwhelmingly to provide information at the point of care, rather than to document care (Courtney et al., 2005b). Garrett and Jackson (2006) completed a pilot study at the University of British Columbia which investigates the lived experiences of student nurses and doctors using PDAs in practice settings. Again functionality appears to have rested on data retrieval, with the devices being used as electronic reference tools rather than for data recording and communication. The sample in this study was small (10 students) yet Garrett and Jackson (2006) offer reasonable explanations for why PDA use appears to be limited to retrieval only. Primarily, entering data are problematic due to the size of the keyboard and screen, and practitioners/students are often too busy in practice to record notes or reflections in practice. They note students’ preference to enter data on their PCs rather than their hand held devices.

Walton et al. (2005) undertook an extensive literature review of current research/developments in health care/training and mobile technologies published since 2000. They found that development and use has primarily been focused in the United States; that the PDA was the most commonly used mobile technology; that use has been concentrated around doctors and the acute sector and that up to the time of their report there had been limited use in education. Fischer et al. (2003) published an extensive review of general information about handheld devices and their use in medical various fields. In addition to the data retrieval functions, they assert that using this technology can enhance student learning in practice settings and programme evaluation (Sullivan et al., 2001 in Fischer et al., 2003). Sandars and Pellow (2006) reviewed the literature related to handheld technology for work based assessment of health care practitioners and found only six related articles. These were from America and Australia and all had small samples and short durations. Benefits included making the experience more enjoyable and more interesting than paper formats (Kneebone et al., 2003). There is little evi-
dence of PDAs being systematically evaluated for their performance as assessment tools.

**Context of the study**

The participants in this case study were first year students and lecturers from an undergraduate midwifery programme, which had an established system of practice assessment using a paper based portfolio. This contains action plans and evidence of achieving agreed performance indicators, which the students present at assessment interviews with link lecturers and clinical mentors.

The cohort involved in the study were 1st year students who had completed one clinical placement of eight weeks using the paper based portfolio. This study took part in their second clinical placement.

Windows Mobile® was chosen as the desired operating system for the mobile devices. Its similarity to Microsoft® Windows® made it desirable as it was hoped that this familiarity would lessen the impact of resistance to change from stakeholders. The applications and functionality available from Windows Mobile® such as the pocket office applications were believed to be of use to the project. It was also felt that Windows Mobile® offered a strong development platform with set standards. The devices themselves were then selected based on having a suitable screen size, keyboard and price. The type of device finally selected for use was the HP iPAQ 6500.

**Methodology**

The use of mobile devices to support practice based assessment is a relatively new intervention that requires detailed evaluation in a particular context. A case study approach was therefore taken to this project focusing on the circumstances, dynamics and complexity of the unit of study (Bowling, 2002), which was identified as being a cohort of student midwives, their lecturers and practice based mentors. Within the case, multiple research methods were employed to fully investigate events. Yin (1994) asserts that there are a number of reasons why a case study might be used: to test or explore a theory, to record and report on a unique event or to observe a phenomenon not previously studied. This case study falls within the latter two categories; providing student midwives with PDAs on which to record their practice assessments was a unique and time bound event and the impact this would have on the processes and outcomes of that assessment created a phenomenon to be investigated. It is not appropriate to generalise the findings but they may provide some insight into the possible benefits and caveats of using mobile devices in similar circumstances. Recommendations for undertaking similar activities are provided.

The overall aim of the project was

"To explore the feasibility and identify the issues of using mobile technologies in the assessment of health and social care students in practice settings".

Objectives were to

- Identify the readiness of ALPS partner institutions to adopt mobile technologies for assessment in clinical settings.
- Identify the infrastructure available and required for support in using mobile technologies.
- Explore the impact of using mobile technologies on current assessment processes and outcomes.

**The project plan**

The original intention was to create electronic forms using Microsoft® Word®, which students could work on using their personal computers or the mobile device. These forms would replicate, as far as possible, the paper based format with which students and staff were familiar.

Perceived benefits in using the electronic forms were that they could be prepared in advance of the assessment interviews on the students own computer, added to by link lecturers and mentors during assessment interviews, and beamed by Bluetooth technology from the students Pocket PC to the link lecturers upon completion of the interview. The link lecturer could then feedback the electronic form to a central database held by the divisional administrator. In this way both the student and the Midwifery Division would have a complete and verified record of the students’ placement experience.

Students and link lecturers were provided with a PocketPC and training sessions were provided. Individual support from the mobile technologist and a learning technologist was readily available in addition to an on-line discussion board, accessed by the project team.

**The plan in practice**

It soon became clear that Pocket Word® or Excel® did not have the functionality necessary to create user friendly mobile versions of the portfolio.
PocketPCForms™ a form creation package, was identified as a suitable alternative.

The cost and complexity of providing the full PocketPCForms™ programme to students was prohibitive, which meant that students could not complete their records on their own PCs as planned. Each student was given the client application of PocketPCForms™ which would only allow the viewing and filling out of forms on the PocketPC. All data, therefore, had to be entered through the PocketPC and could be synchronised with a PC for storage purposes only.

The issue of processing these individual forms into centrally held records was resolved by recruiting a freelance computer software consultant to design a bespoke central database which would accept the exported XML data from PocketPC-Forms™. This enabled the production of PDF versions of data from the forms for the students to keep as a permanent record. At the time of data collection for this study, the students had not received these PDF versions and this may have impacted on their views of the process.

Sample

Twenty-nine student midwives initially agreed to take part in the study. Five students subsequently withdrew leaving 24 student participants and five link lecturer participants.

Methods of data collection and analysis

Questionnaires were issued to students on completion of the study. These questionnaires contained qualitative and quantitative questions, were completed and returned by 24 students and specifically tested student reaction to the device itself. Similar questionnaires were given to five members of staff who had used the devices. Four staff questionnaires were returned.

Three focus groups with eight students in each group were conducted by different facilitators using the same question guide. These were recorded, transcribed verbatim and analysed inductively using QRS software for qualitative data analysis.

Five members of the midwifery lecturing staff were interviewed individually. These interviews were recoded, transcribed and analysed thematically following the principles of content analysis.

Qualitative data from all sources were amalgamated and analysed inductively and deductively through the processes of comparative and content analysis. Initial open coding processes led to a large quantity of codes, which were then grouped into categories/themes. Quantitative data were grouped into simple descriptive statistics.

Ethics

A summary of the project proposal was approved by the School of Health Studies Ethics Panel. Students and staff were informed about the project and how it related to the overall ALPS plan. They signed consent forms to take part in the study and were informed of their rights to withdraw at any time. Consent to take part in interviews and for findings to be published was obtained. Heads of midwifery units where students would be on practice placements with the Pocket PCs were informed of the project.

Findings

Positive aspects — the student experience

Most students liked the fact that the Pocket PC was a convenient and neat tool as opposed to the large paper portfolio, which became worn with use over the three year period of their training. They preferred to be able to word process rather than write assessment documents in long hand and there was evidence that the Pocket PCs helped to instil some pride in their work. Several students made this point, which was articulated particularly well by the following statement:

"I like that it's neat, that its not your normal scruffy hand writing, I like that its all contained there in that one little thing, and it is all neat and tidy and readable".

Interestingly they did not appear to transfer this preference to the writing of notes, preferring generally to maintain pocket note books. This may
however, have been influenced by the practice environment (see Use in Clinical Practice).

Other functions that students liked however, were rarely related to learning. Some students talked about the use of various functions such as games, GPS, calendar and the sharing of photos and word documents. The final questionnaire to students revealed that the diary was the most popular additional feature, but this was only used by 46% of the sample and was closely followed in popularity by the Games function (37.5%). Worryingly one student said:

"I use the games on it I think more than anything, if you're waiting about, say on a dinner time or if everyone else is talking, say your mentors are talking to all the others, you can just get it out, think oh I'll have 5 minutes of solitaire on it, they don't know that I'm not working, or sometimes when I get here (University) early — so as a time filler I have used it for that".

This is a long way from the perceived benefits of mobile technology allowing students to make effective use of their 'spare' time in practice settings by accessing useful information to support their learning, writing reflective notes and generally establishing themselves as lifelong learners. Other functions of the PocketPC, such as the task facility, the alarm, music, photo storage and GPS were used minimally by students (see Fig. 1).

**Table 1**

<table>
<thead>
<tr>
<th>Function</th>
<th>Number</th>
</tr>
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<tbody>
<tr>
<td>Diary</td>
<td>10</td>
</tr>
<tr>
<td>Games</td>
<td>9</td>
</tr>
<tr>
<td>Tasks</td>
<td>5</td>
</tr>
<tr>
<td>Microsoft Word</td>
<td>5</td>
</tr>
<tr>
<td>Music</td>
<td>4</td>
</tr>
<tr>
<td>Photos</td>
<td>3</td>
</tr>
<tr>
<td>GPS</td>
<td>2</td>
</tr>
<tr>
<td>Alarm</td>
<td>1</td>
</tr>
<tr>
<td>Phone</td>
<td>1</td>
</tr>
<tr>
<td>Notes</td>
<td>1</td>
</tr>
<tr>
<td>Saving things from internet to read</td>
<td>1</td>
</tr>
<tr>
<td>Placement diary for reflection</td>
<td>1</td>
</tr>
<tr>
<td>Reminders</td>
<td>1</td>
</tr>
<tr>
<td>Writing, transferring and transporting files</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 1 Functions of PDA (other than the essential assessment documents) used by the 24 Students who took part in the study.

Positive aspects — the staff experience

There were many positive aspects reported by staff with an overall consensus that 'going mobile' was a 'good thing!' Particularly appreciated were the benefits of the calendar function, which synchronised with the electronic diary system used by the University. Two of the five had used satellite navigation system, one having purchased software for nationwide use. Four said that having used a PDA during the study they would now purchase one if these were taken from them. One member of staff who was quite new to the Division reported that it had helped to develop her IT skills. All felt that their use of the tool would increase with practice as they became more familiar with the functions.

**Negative aspects — the student experience**

The Pocket PCs seemed to cause a certain amount of anxiety among the students. They were anxious about the reliability of the device and the possibility of losing assessment data. This was reinforced by the experience of some students actually losing data by allowing the batteries to run completely down. Safeguards were available because they could synchronise the data with their own computer, but students were reluctant to invest time setting up the connection for a variety of reasons and genuine concerns. They could also save to an SD memory card which would retain the data, and many students did this.

A key issue was that even if they set up this connection they would not be able to work on their portfolio on their home computer because of the limitations of the software. Students complained about the length of time it took to enter data that supported achievement of their performance indicators through the Pocket PC:

"typing it up, the Performance Indicators — takes for ever on those things, if you could open it up on the computer, type it all in on the computer, [it would be much better]"

As it was, many students found the task too daunting and so reverted to their paper based portfolios in preference. Interestingly, some students thought that even if they had a bigger keyboard, the screen size (70 mm) would still make the device unsuitable for viewing their evidence:

"You can get a key-board, but you can’t see every thing you’ve wrote even still because the screen is so small — it would be fantastic to type with [though]"

There were three options for entering data into the PocketPC, the small device keyboard, the onscreen keyboard or hand writing recognition. It was found that 50% preferred the device keyboard, 38% preferred the onscreen keyboard and the rest discussed using the various approaches although there was some frustration with the hand writing recognition when it failed to recognise words.
Another detrimental issue was that the project was seen by students as time limited and therefore they did not want to become too reliant or too attached to the tool; nor did they necessarily want to invest valuable time in learning how to use a device that might soon be taken from them. Linked to this was the problem that some students were afraid of losing or breaking the PocketPC and this led to minimal use in some cases. As one student said:

"I didn’t take it with me cos I thought I don’t really need it and I don’t want to take it and then lose it".

Similarly, the actual ‘value added’ by the electronic version was not clear and many students failed to fully engage in their use. This was possibly because for this stage of the study they were not actually required to use the PocketPC for accessing information. Some students did not perceive how a PocketPC might help them in practice, As one student said:

"Although we have sections in the [PDA] where it breaks it [assessment criteria] down you don’t actually need a mini computer to do that — you could break it down on a sheet as well".

Only one student used the phone facility on the PocketPC. Other students reported that they already had a mobile phone and did not want to change. They felt it was too large and cumbersome and that they preferred their "small sexy little numbers".

Negative aspects – the staff experience

Only one member of staff held particularly negative views about using the PocketPC. She could not see the benefits of it and described herself as ‘not a very technical person’. She did not use the University’s electronic diary system and therefore could not benefit by synchronising with this. As with some of the students a key issue for this staff member was the time factor and how long it would take to learn the new skills held against limited perceived benefits. The only other problems identified by staff related to the devices crashing and batteries running flat. It was generally acknowledged that with familiarity, these problems could be overcome.

Using the PocketPC in clinical practice

From the student perspective many mentors appeared reluctant to engage in the process. During interviews, when mentors were expected to add comments to student records some refused to type into the PocketPC, preferring to use a paper copy or dictate to the student or link lecturer. This problem might be resolved by an extending keyboard for use at placement interviews. Some mentors were happy to use the PocketPC, possibly because they were used to text messaging and they could transfer those skills here. However, technical systems cannot be considered in isolation from the social systems in which they reside (Coiera, 2004 in Courtney et al., 2005) and whilst the most frequent comment reported by students was ‘she didn’t like it’ it must be acknowledged that mentors in practice had no formal training to introduce them to the tools and that within existing heavy workloads the introduction of new technology requiring new skills is understandably daunting and we get a glimpse here of the sustained culture shift required in forthcoming years as mobile technologies infiltrate practice settings.

Some students reported that they had been told by practice mentors not to get the PocketPC out in front of clients; note book and pen was acceptable, a PDA was not. However, others appeared to have regulated the use of the tool in practice themselves. They discussed how they had explained its use and purpose to clients when ever they used it. Others, anticipating disapproval ("they might think I’m testing my boyfriend") simply did not use it in clinical areas; some not even taking it with them. An alarming figure derived from the final student questionnaire was that 45% of students did not regularly take the PocketPC with them into clinical practice. The most common reasons for this were the fear and anxiety of losing the device and the perception that it would not be acceptable to clinical colleagues and clients.

The staff reported that whilst there were some initial difficulties in getting used to the technology, their skills improved each time they conducted an assessment interview. Staff tended to think that as the eForms were based on the paper based formats, with which they were very familiar, they would not have any problems and training sessions to introduce the eForms tended to be usurped by staff anxieties to master the ‘Bluetooth’ process. In reality it appeared that link lecturers initially had varying levels of competence in using the PocketPC to facilitate interviews, based on their ability to access and utilise the appropriate software.

The impact of the PocketPC on the assessment process

From the student perspective there were varied thoughts about how using the PocketPC had
impacted on the actual assessment process. There was some evidence that the tool allowed for greater student involvement in the process:

"with the PDA I just felt a lot more involved, I didn’t have any problems with it, my link lecturer and my mentor were quite Ok with it”

Lecturing staff supported this notion by describing how they had used the PocketPC. All had identified the danger that the device could become the focus of the interview rather than the student and had taken various measures to avoid this. Students were generally encouraged to use the eForms as a prompt as they discussed their clinical outcomes with their link lecturer and mentor allowing a three way dialogue to prevail. Clearly such an approach allowed the student to maintain their rightful position at the centre of the process.

For some students however, the benefits of using a PocketPC to document their assessment, rather than the paper based format, were difficult to see and there was some resentment:

"I just thought – there was me and my lecturer sat there for about half an hour and I just thought, I’m on delivery suit, I’m on placement I should be doing my placement and I’m sat here for half an hour trying to Bluetooth”.

Discussion

In readiness for adopting mobile technologies for assessment in clinical settings a number of issues have been identified. Training for students and staff has emerged as a central tenet. Training, for lecturing and clinical staff, is critical because when supervising staff are not fully competent, extra strain is placed on the students as responsibility for managing the assessment process is transferred to them.

There are huge implications here in terms of strategic planning. McNeil et al. (2004) recognised the complexity of a situation in which health care increasingly focuses on timely information to drive decision making, thus necessitating the use of informatics to support practice, whilst the majority of educators are primarily at the novice or advanced beginner level with use of electronic tools. Cheng and Miles (2003) assert that on-line learning and teaching are the future and stress the importance of changing the mind set of educators, from what was traditionally seen as good practice to what can be done better now, using new technologies. Dearnley et al. (2006) identified IT skill deficit as an obstacle to learning for non-traditional students and recognised similarities in some teaching staff. These issues must be addressed.

A limitation of this study was that some students either did not see the personal benefits of using a PocketPC or were too afraid of losing the device, or material contained within it, to take it with them into the clinical area. These issues were compounded by the students’ perception of the initiative as being short term and not worth investment of their time. Miller et al. (2005) discuss how students in their study were instructed to view their PDA as they would a stethoscope, i.e. always with them and not stored away in a locker or at home. Glasgow and Cornelius (2005) advocate the thorough integration of the PDA by its introduction to the students at the same time as their nursing (professional practice) skills; in this way they suggest it will be viewed as ‘just another tool’. Given that 45% of students in the current study did not routinely carry their PocketPC with them it clearly would have been beneficial to have given similar advice, and perhaps clearer directions about how the tool could be used, for example, for reflective notes.

In terms of identifying the infrastructure available and required for support in using mobile technologies a key finding from this project was that it is vital that students have a named person, with the technological ‘know how’ to address any problems that arise in the use of mobile technology. This can be addressed to some extent by the use of an on-line discussion board but this needs backing up. Both students and staff reported the effectiveness of the high level of support for this project by telephone, electronic discussion forum and onsite provision of technical assistance. The feasibility of extending such high levels of support will have to be considered seriously by HEIs that plan to ‘go mobile’. Despite this support there were instances where data was lost and it is recommended that future data stores should be web-based to overcome this problem.

The impact of using mobile technologies on current assessment processes and outcomes has been generally positive. This study has identified the potential for increasing the student centred nature of clinical assessment by increasing perceptions of involvement and control in the process. In addition, because the PocketPC was small (115 mm × 65 mm × 18 mm), neat and unobtrusive, the focus of the assessment process appeared in many cases to be removed from the assessment tool to the student with positive effect. However, as Glasgow and Cornelius (2005) recognised, what has yet to be demonstrated is the extent to which providing stu-
students with mobile technology impacts on their development as lifelong learners proficient in using technology as a tool for clinical decision making.

Conclusion

Mobile technologies are being increasingly introduced to health and social care practice and their increased use by practitioners across the sector is inevitable. This case study indicates that electronic portfolios supported in a PDA format may have some benefits in terms of supporting the assessment process and encouraging students to record and reflect on their practice experience. The introduction of mobile technologies into undergraduate courses for health and social care students may enable the value and skill of seeking current information to become a routine that students will take into their professional practice. However, the introduction of mobile technologies into both the learning and clinical environments will entail a significant shift in existing cultures and a significant development of skills. These must be underpinned by adequate training and support mechanisms and by resolute adherence to acknowledged pedagogical principles.

References


