

# Mobile Working Case Study

This case study outlines the development and pilot process of delivering an electronic care record to clinical users using Blackberry devices.



Oxford Health   
NHS Foundation Trust

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*Informatics*

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# 1 Defining the need

Since 2002 the NHS in England has been preparing for a step change in the information technology capabilities offered to frontline services to better manage care at the point of delivery. The new national IT strategy set out in “Delivering 21<sup>st</sup> Century IT Support for the NHS” (DH; 2002) painted a bold vision for a traditional healthcare model supported by suppliers who appropriately took a fair share of risk in delivering the outcomes required.

Whilst the strategy clearly aimed to raise the NHS to a uniform minimum standard of support, the contractual process appeared to miss the mark in terms of recognising the different requirements of the range of service models within the NHS:

“...it has been advantageous for its designers to look upon mental healthcare, and other anomalous services, as simply a specialist secondary care service, with practices and processes readily aligned to an acute hospital model.”

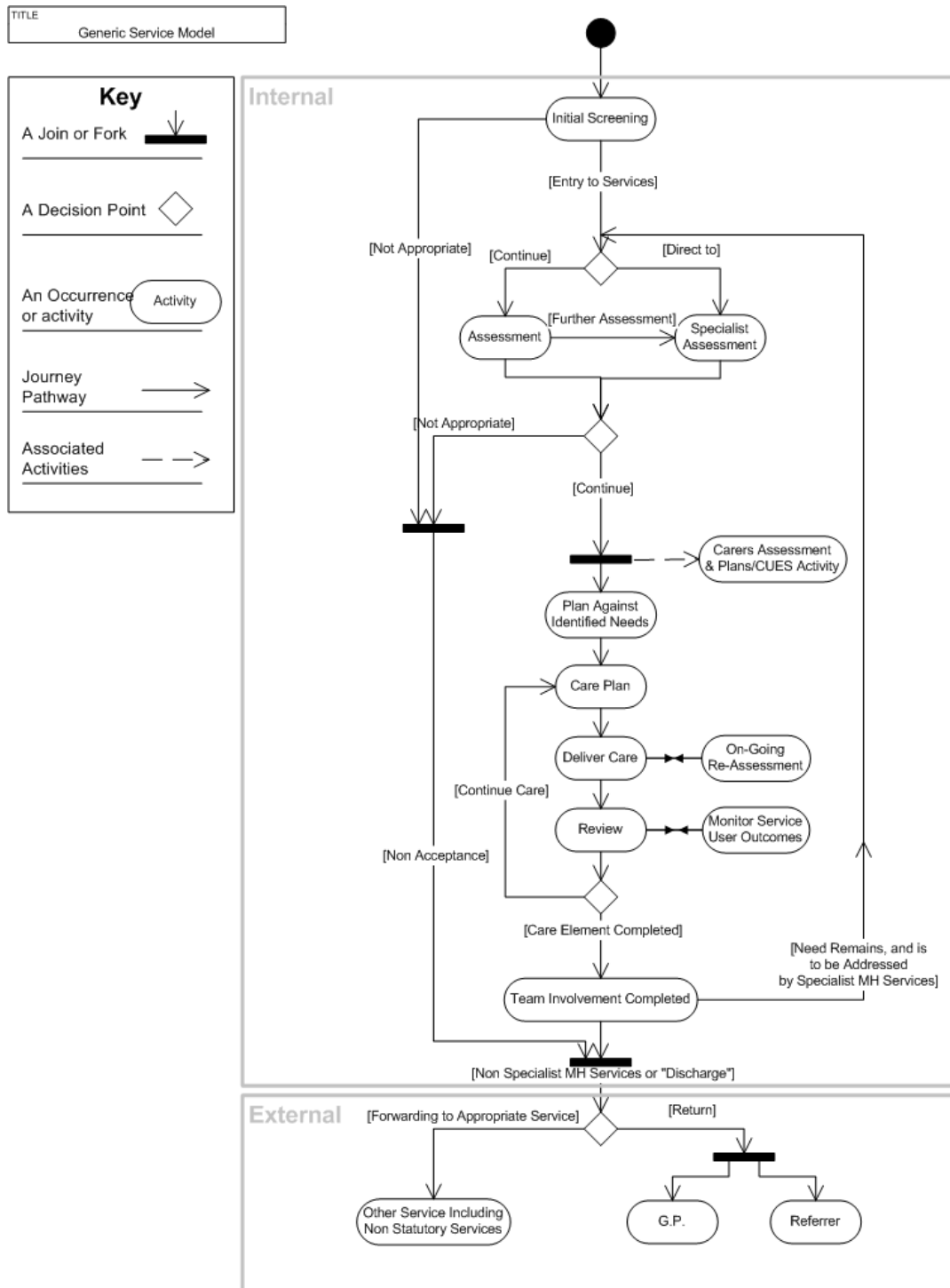
Sorribas & McKenny (2004) pg 32

Whilst it is not the intention to review the performance of the National Programme for IT (NPfIT), or the original suppliers, it must be noted that the former Oxfordshire Mental Healthcare NHS Trust (OMHT), soon recognised that the vision set out, was unlikely to be fully delivered for a number of years. The solutions offered at that time (IDX CareCast/Last Word) were also seen to be particularly Acute Hospital focussed. This led to an internal review of the opportunities and benefits that could be gained from the technology and capability in place within the Trust at that time.

There were two consistent needs being highlighted from attempts to move to an electronic care record:

- The move from paper records to electronic records must be supported by greater availability of key information at or near the point of care delivery
- Sharing of information with partner agencies was scheduled further in the future of the NPfIT timetable than expected (this is covered in a separate case study)

We mapped various clinical team processes in detail, and whilst wildly variable and ‘special’ at times, we found a level of commonality in the broad activities. Whilst much of the work recognised the thinking, models and processes in use some 9 years ago, the generic service model remains largely appropriate to this day.



In terms of recording effort, the map represents the areas of different record production, but does not reflect the volume of recording completed at each stage. The reality is that most recording processes around entry and exit of a service occurs very infrequently (or arguably only once). whilst other processes such as a full assessment may occur only once but over a period of time and then be updated periodically, along with care planning. The recording specifically around the delivery of care, and the less formal reassessment however, probably accounts for around 80% of all recording.

## 1.1 Previous mobile working pilots

The OMHT had previously had mixed results with piloting mobile solutions, though these concentrated on the use of PDA's, early Smartphone's, Laptops and the early Tablet PC's. At the time of the studies, Ultra Mobile PC's were first coming to market, but seemed particularly expensive in comparison to other devices. Whilst some success was demonstrated by a very small group 'evangelist' Tablet PC users, OMHT found that wider pilots in 2002 -2004 within community mental health teams concluded some interesting results:

- Simple replacement of paper with electronic means, did not address changes of process or role, conflict with staff ensued where loss of role was perceived
  - Some staff were typing up assessments, printing them out, then passing to Admin to type up...
- Tablet PC's were being used as Laptops, as handwriting recognition was difficult for some, or introduced an additional process of conversion and correction for others
- Those who had basic typing skills, improved these skills very quickly
- Clarity of records improved due to the additional time taken to record simple information
- A number of pre-pilot fears did not materialise:
  - Security of devices was not a considerable issue
  - Weight of device being carried was actually less than the average paper record
  - Loss of access to the full record didn't cause issues for staff who saw patients regularly, and the amount of information available at assessment were usually sparse enough to transport electronically
  - Patients did not perceive the device as a barrier to communication
  - Patients did not have concerns about information being recorded electronically
- Staff generally took rough notes within an interaction, and then refined these back in the office
- Some staff began to work differently in terms of refining notes or assessments at home, or spending time in the office in the middle of the day, rather than at each end of the working day
- Changes in working patterns were most noticeable in rural teams
- The outlook diary began to be used to schedule appointments and to track staff location

As is common with most IT projects, the reduction in administrative overhead or process cycle time is fairly limited, but other opportunities around performance, safety and better outcomes, whilst less tangible, were the reported successes.

At a similar time, Blackberry devices were being used by the Trusts executive team, largely to aid communication at the time of beginning to work in Buckinghamshire, prior to the organisational merger.

## 1.2 Modelling behaviour to be supported

Some teams compressed the time taken, or operated out of working hours on a shift routine, such as the Crisis Teams, and so had specific needs to quickly record information to facilitate a 'virtual' handover. At the time of the original study, staff were going back to offices out of hours, usually alone, to record handover information.

**Design Principle 1.** We needed to provide some teams with a method of recording information that was 'connected'.

We observed that there were some essential processes that could be better supported. Rarely, we observed staff returning to offices to collect information about clients, whilst on call/duty particularly, or phoning other colleagues who were, or had previously been, in contact with the patient. We also observed staff phoning up administrative colleagues to confirm details (such as address or telephone numbers), especially when doors were not answered.

**Design Principle 2.** Ready access to key information about the person and services and staff they were or are connected with.

Finally, we observed that every community worker had two common items to support their day to day activities. A mobile phone used extensively for texts and phone calls; and a paper diary.

**Design Principle 3.** Design a solution using simple navigation, and minimal text entry, if possible to converge with a diary function; it is likely to reinforce use.

## 1.3 Modelling record use

The pilot work had clearly shown the importance of reflection, and refinement of opinion and fact, when completing the clinical record, yet recognised that salient points were usually recorded at the time. This behaviour was common across professional groups, areas of practice and geographical location. We actively observed and shadowed staff performing their usual duties to determine some solution design principles.

**Design Principle 4.** We concluded that both the need to record salient points to aid recall, and the flexibility to refine later, were important considerations.

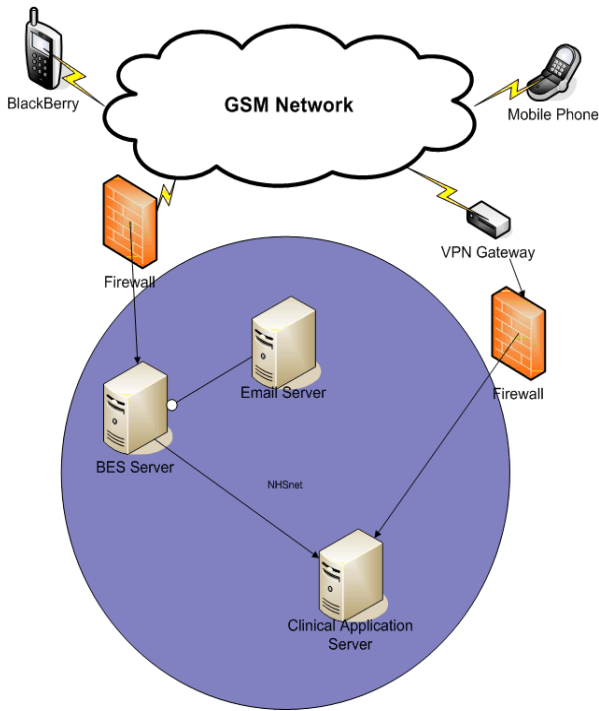
**Design Principle 5.** We noted that staff spent a significant amount of time recording activity information, and this reinforced the need to return to the office due to the recording timeliness performance targets in place.

## 2 Original options appraisal

Device	Pros	Cons
<b>Laptop with 3G Card or connectivity via mobile phone</b>	<ul style="list-style-type: none"> <li>Usable and highly comfortable to use</li> <li>Significant information entry capabilities</li> </ul>	<ul style="list-style-type: none"> <li>Cost of two devices</li> <li>Education required to connect the two devices</li> <li>Connection to NHSnet</li> <li>Bulk</li> </ul>
<b>Tablet PC with 3G Card or connectivity via mobile phone</b>	<ul style="list-style-type: none"> <li>Usable and highly comfortable to use</li> <li>Significant information entry capabilities</li> <li>Handwriting capabilities could be used to capture full assessment or review information</li> </ul>	<ul style="list-style-type: none"> <li>Cost of two devices</li> <li>Education required to connect the two devices</li> <li>Connection to NHSnet</li> <li>Bulk</li> </ul>
<b>UMPC with 3G Card or connectivity via mobile phone</b>	<ul style="list-style-type: none"> <li>Smaller form factor</li> <li>Medium information entry capabilities, and comfort</li> </ul>	<ul style="list-style-type: none"> <li>Cost of two devices</li> <li>Education required to connect the two devices</li> <li>Connection to NHSnet</li> <li>1<sup>st</sup> generation technology could be problematic</li> </ul>
<b>PDA with connectivity via mobile phone</b>	<ul style="list-style-type: none"> <li>Smaller form factor</li> <li>Mature technology</li> </ul>	<ul style="list-style-type: none"> <li>Cost of two devices</li> <li>Education required to connect and use the two devices</li> <li>Connection to NHSnet</li> </ul>
<b>PDA with 'docking' transfer of data</b>	<ul style="list-style-type: none"> <li>Single device</li> <li>No connectivity costs</li> </ul>	<ul style="list-style-type: none"> <li>Real time information not available</li> <li>Need to know who you may need information about</li> <li>Storage and security issues (e.g. holding a copy of clinical information on a handheld device)</li> </ul>
<b>Mobile or Smartphone, or BlackBerry device</b>	<ul style="list-style-type: none"> <li>Single device</li> <li>Low costs</li> <li>Device appropriate to information required</li> <li>Familiarity</li> </ul>	<ul style="list-style-type: none"> <li>WAP delivered views are required</li> </ul>

Whilst some terms have changed (NHSnet to N3), the prevalence and reliability of 3G speeds across the Trusts geographical area has not changed significantly in this time to amend this assessment. The preferred selection of a Blackberry or Smartphone device whilst secure due to the internal infrastructure it is not however compatible with the capability planned within the supply

contract for RiO in the NHS. The situation in 2011 is that of the wide variety of technology readily available, only laptop or similar device connected via a VPN gateway remains achievable as the contracted NHS configuration of RiO is not scaled for different sizes of devices.

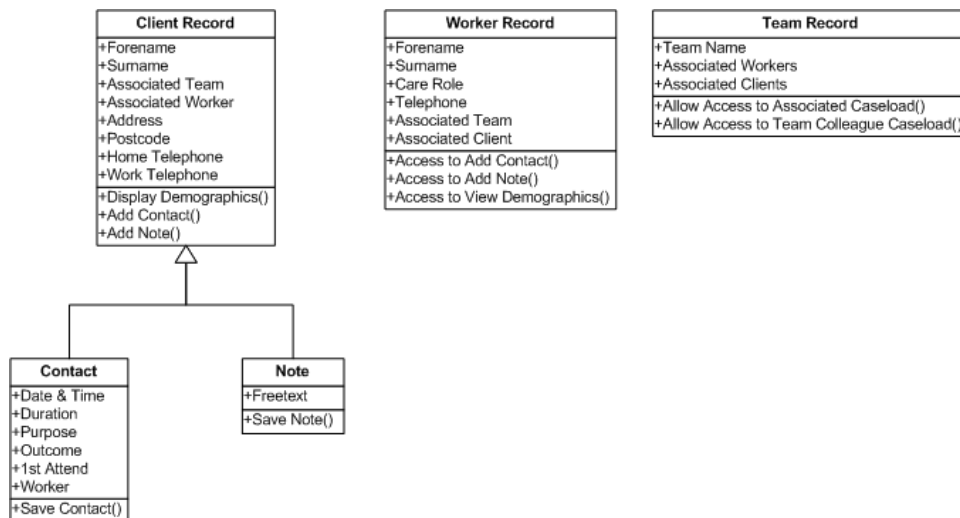


Of course almost a decade ago, there were not constraints such as warranted environments, nor did the source system require smartcard authentication. However the design recognised the importance of flexibility of the source system, to adopt mobile browser handling, and was therefore replicable as a commercial proposition to other organisations without Blackberry's. The solution excluded complex and expensive additional enabling technology such as software compression as the timeframes for system replacement were unclear at that time. However support for small footprint data transfer was still necessary as our business was not contained wholly within urban conurbations.

### 3 Functional design work

From the design principles formed from understanding real world problems to be solved, came a design of a service that could be delivered to a Blackberry device, at sub 3G speeds.

The design simply set out to provide views of client details, involved worker details, and involved team details. The ability to record a progress note, either completed or left in draft format at the same time as completing activity recording, appeared to support the remainder of the requirements.



### 3.1 Build activities

Our clinical system supplier since 1998, Maracis Solutions Limited, agreed to develop the service with us as an additional service, and provided a great deal of advice and guidance about how data items could be delivered in the most effective manner. The key was to understand the behaviour of what the service needed to do, and not try to do anything else.

The solution was ostensibly a separate portal to the underlying data structure. The following use case represents the final structure of the service:



Final version screen shots are available at Appendix 1.

It is important to note that users of the service had to be registered to use the full application, and can log on to either using the same unique username and password.

## 4 Pilot observations

The pilot began with six devices within the South Buckinghamshire Crisis Resolution Team. The plan was to complete the pilot over three months, with an initial review after four weeks. The review highlighted a number of issues.

## 4.1 Device issues

- Lack of connectivity in the High Wycombe office – due to the location of the office (at the bottom of a steep valley) connectivity was indeed an issue, a site survey based upon the teams area of responsibility determined that connectivity was not an issue ‘at the point of care delivery’.
- Three users had lost access through the Blackberry browser – the issue was actually that each user had change the ‘skin’ of the device, which substituted the Blackberry browser icon for the Vodafone Live, icon (which is blocked). Reverting to the previous ‘skin’ resolved the issue, after much head scratching.

## 4.2 Usability issues

- Narrative – rather than a situation of “no access = not involved”, the volunteers felt it would be useful to have some statement about the teams and workers who were involved.
- Search facility - due to the volume of out of hours work, and the reliance on admin staff to update the team and worker associations, it was felt that a search facility would be useful, if only to view who was seen by other teams.
- Recording contacts without a legitimate relationship – again due to the out of hours work, and delay of admin staff entering data, it was felt to be useful to be able to record a contact anyway for clients seen but not yet recorded as being associated.
- Viewing other information – it was felt that viewing other information (such as notes others had created or documents held within the system) would be of use, as without it the service didn’t always stop the staff from going back to the office.

The ability to record notes in draft format was the subject of greatest division, some staff were very outspoken about the perceived reliability of draft notes, and others really enjoyed the ability to note a few key words to update later.

## 4.3 Early benefits realised

Today some of the results seem fairly anodyne but represented a significant step forwards:

- The CMHT reported that they were very pleased to be able to view notes created by the Crisis Team, and that this had made tracking progress easier
- Client feedback to staff was that they were “amazed” that they could record what was going on through their phone
- Crisis Team staff did think that the ability to search for information such as address and phone number was very useful

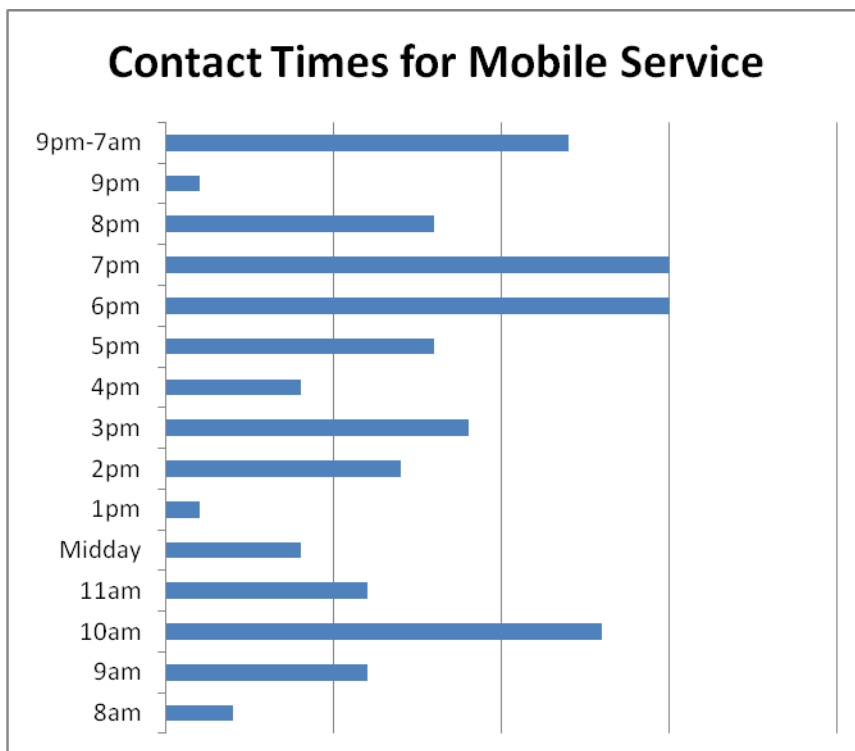
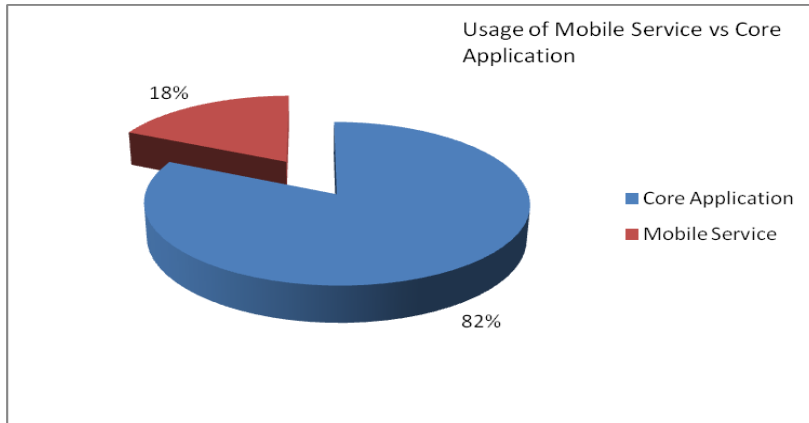
- Crisis Team staff reported that they felt they travelled to the office less out of hours

### 4.4 Full pilot results

After the 3 month pilot concluded, a number of other improvements were suggested:

- Displaying previously recorded notes was felt to be very beneficial, but was actually unlikely to be workable due to the connectivity speeds
- Changes to the details screens to narrative screens so that they made a bit more sense
- The inclusion of a “to see today” screen as the ‘homepage’ after login, which provides a list of:
  - anyone scheduled to be seen that day with a links through to demographic data
  - anyone who’s appointment has passed and activity has not been recorded with a link through to activity and progress note recording

We also reviewed how and when the mobile service was used:



## 5 Conclusion

The pilot was considered a great success, mainly due to the benefits of internal communication between teams. The pilot also delivered quite significant data quality improvements in terms of timeliness and completeness of data. All suggested improvements were made to the mobile service except the ability to view previously recorded notes.

The service was rolled out across Oxfordshire Adult and Older Adult services with over 500 staff using Blackberry's to view and enter information in May 2007. There was a significant amount of training effort required to complete this rollout within a few short weeks, and the Trust was provided with assistance from Vodafone's professional services team, who provided device training at our offices. This functionality was in use until the service transferred to RiO in January 2011.

During the almost four years of use, there has been a reduction in the amount of lone working asked of Trust staff, and the Outlook calendar and email has been used extensively to check and monitor staff movements to ensure their safety.

The Mobile Service was also instrumental in moving from paper records to electronic systems as the primary care record, where 1.2 million progress notes were added to the record in the last year.

Oxfordshire Health NHS Foundation Trust continues to explore alternative ways to replicate this support within its remaining technology stack, including the ability to refer to data recorded originally within RiO, and data that was not able to be transferred to RiO due to limitations of the supply contract. There are however a number of limitations to this approach which would be ameliorated by direct mobile device access, and alternative authentication methods:

- With no ability to upload/record data, the service would only view recorded information
- Information would be at least 24 hours out of date
- The update would be reliant upon download processes, which are not believed to be planned to be dynamic at any point in the contract

# 6 Appendix 1 – Screen shots



Simple log in screen with three active areas, the username, password fields and the login button.



The initial screen shows the two routes of data entry, either by worker record or patient record.



Non patient activity screen, only the input fields are 'active', date/time is entered using numeric keys (secondary use accessed by ALT key)



By pressing the ALT key in a drop down field, the reference fields are shown as a 'pop-up', in this case the ALT key should be released to scroll to the bottom of the reference list, using the scroll post.



Dropdown values can be selected by hitting the return key, or depressing the scroll post.



By scrolling to the bottom of the screen the Save button can be activated by hitting the return key.



The save is confirmed as successful, clicking the continue hyperlink returns you to the initial screen.



Scrolling and clicking on the Search for Patient hyperlink will take you to the patient options screen.



The three options available in the final version are to search by LPN (Local Patient Number), but you must know the LPN for the patient (this is shown below)...



... or you can search by the caseload (either worker or team)...



... the personal option will take you to your own caseload only...



... and is displayed in alphabetical order by surname...



Team caseload will show every client associated with the team, but in practice this is prohibitively slow, as average CMHT caseloads are around the 400 mark. It is mainly of use for specialist teams (such as a Crisis Team) where caseloads are around 40-50



Searching by other criteria only includes forename, surname and date of birth...



...all fields are mandatory, and a polite message is displayed if one is missed.



The Local Patient Number search is very straightforward



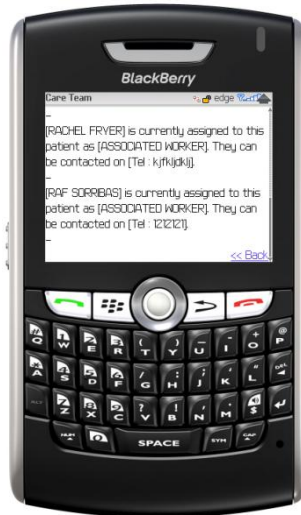
If incorrect a "no records found" message is displayed, if it is correct, the name and LPN are displayed.



After selecting the client, three options are presented, the client narrative is the improved way of finding out who is involved...



...This can be by care team (workers involved), or the involved team/s...



...data in inverted straight brackets is pulled from the database fields, and presented in the middle of pre-specified text...



... a back button is provided to return you to the Narrative menu.



The involved team narrative is very similar to the care team screen, though no contact numbers are displayed (due to the changeover of phone numbers during the study...)



Again the back button returns you to the patient menu, the Demographics option can be selected...



...which displays available information. If as is the case here with the home and work telephone numbers, details are not present in the database they cannot be displayed.



Once again the back button returns you to the patient menu, the Demographics option can be selected...



Recording a contact is very similar to the non patient activity, with date fields, and dropdown options...



However for the second phase, we moved the notes box to the end of the contact screen...



...and whilst there is not a great deal of space, many thousands of characters can be recorded, if your eyes and thumbs can take it...



As this is a recording screen, there are options to save, and to cancel (which will simply return you to the previous screen).



Again confirmation that the data was successfully saved...



... the continue button takes you back to the patient menu, as the workflow maps suggested staff were unlikely to view anything else for that person, but rather move onto the next client record.



Finally, if there is no browser activity for ten minutes, session expiry occurs, this ensures that connections do not remain active indefinitely.

## 7 References

Department of Health (2002) *Delivering 21<sup>st</sup> Century IT Support for the NHS: National Strategic Programme*. London. Department of Health.

Sorribas, R. McKenny, D. (2004) Towards Person Centred Computing: NCRS and Mental Healthcare- A Question of Conformity? *Br J Healthcare Computing & Information Management*, 21(9): 32-33.



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