Handheld-based Data Collection in a highly distributed Clinical Study (PMS)

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Abstract: Electronic Data Capturing offers a significantly higher ad-hoc quality of study data at the time of entry, which is specifically important for post-marketing type studies where resources for subsequent data cleaning are limited. Internet-based tools provide a good solution to these scenarios as typically large numbers of centres and/or doctors are involved.

But while the deployment of Internet-based (online) studies on existing computer equipment is relatively easy, participants might find it sometimes difficult to integrate the electronic documentation effort into the clinical practice. This might be due to limited availability of Internet access, the location of the computers, security concerns etc.

The presented case study shows how the introduction of handheld computers can help to overcome these issues and provide for added flexibility and ease of use. Furthermore, actual data regarding the penetration of mobile devices in the medical community in Germany is discussed to give an outlook of the future potential for mobile studies.

1 The EDC challenge

Fast and reliable data capturing, high quality through integrated checks and queries, efficient study tracking and communication – Electronic Data Capturing (EDC) offers numerous advantages for clinical studies over the conventional paper-based case report form (CRF). Several reports have demonstrated the cost advantages that can be created by advances in speed and quality of the data acquisition process (e.g. [CNB02]). When EDC was first introduced into the clinical research process, typically dedicated PC systems have been deployed, often in combination with private dial-up networks to transfer the collected data.

To overcome the high set-up and support costs associated with the operation of these dedicated systems, the next logical progress moved EDC to the Internet. This has been made possible by the more widespread availability of adequate Internet-access, but even more importantly the advances in standard browser technology and security protocols (e.g. SSL). With Internet (or online) studies, EDC became a viable option for most types of clinical studies, including late-phase (III and IV) trials that involve a large number of centres or even individual doctors at their office.

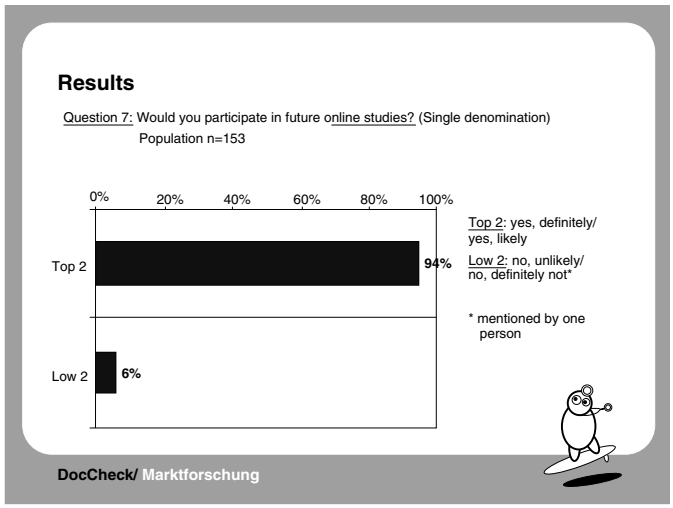

Figure 1: Acceptance of Online Studies, from [WS02] (German Doctors, Internet Survey)

Today, online studies have clearly evolved from the novice or experimental phase into a standard tool for clinical research. Most sponsors and many investigators have gained experience with the tool, and the technology risks are well manageable using a suitable approach. Recent data from our research shows high acceptance rates (94%) within the group of potential investigators (see figure 1).

For a given scenario, however, doctors might still find it difficult to integrate the task of electronic case documentation into the normal therapeutic process. The Internet-PC might not be easily available in the office (and certainly not at the bedside for studies in the clinic environment). This can create a delay in data entry, or tempt the doctor to postpone the documentation until several patients or visits have been completed. Also, build-in tools (e.g. for dose calculation) are less useful if not easily at hand when needed. From this perspective, there is a clear advantage of adding more flexibility and mobility to the data collection process.

2 Introduction of mobile handheld computers

By design, mobile computers have been created as a digital companion device that is small and lightweight enough to be at hand wherever information needs to be gathered or reference data (like contact and schedule information in the classical use) is required. Applying this metaphor to clinical trials, these devices can act as electronic study notepads to mobilize the centrally stored trial data and collect input as close to the patient as possible – right from the doctor's pocket.

Certain conceptual requirements, however, are crucial in order not to invalidate the au-

thenticity and security of the clinical data by the introduction of mobile devices:

- Mobile devices provide an additional path of feeding information into the central clinical database – they must not be used as local storage units
- Data transfer / synchronization should occur as frequently as possible (e.g. at least daily if updates have been made)
- Access to information and data edits must still be protected and clearly associated to the responsible person (e.g. password protection and tracking)
- Interactive checks on the device during data entry should minimize the number of entry-time errors, while server-generated queries must still be managed and reported back after synchronization

In general, these requirements are independent of the type of device used. A mobile trial platform should optimally be usable across specific vendors or systems (e.g. Palm OS, Windows CE, EPOC); certain optimisations, however, might be required to tailor an application to screen sizes and pen or keyboard input etc.

For the data transfer, two scenarios must be considered. Devices with wireless Internet access or build-in modems can exchange information directly with the central server, i.e. do not need any additional infrastructure. Classic PDA (personal digital assistant) type devices without these extensions need to be synchronized via an Internet-PC or similar computer.

Provided the requirements can be met, analysts like Roland Berger agree that Clinical Research is amongst the applications for mobile/wireless devices in the pharmaceutical industry with the highest gains of usability and efficiency (see figure 2).

3 Case Study: Implementation for a large cardio-vascular PMS study

In mid-year 2000, DocCheck was commissioned by an international pharmaceutical company to implement and manage a large-scale post-marketing surveyance (PMS) study with mobile data entry. Target figures were 1000 centres (doctors in Germany) with a total of up to 10000 patients within a 9-month period. All data collection and processing, including the handling of drug safety relevant events, was to be conducted electronically via the Internet.

In order to facilitate the data input and quickly recruit the projected number of centres, participants have been given the options of documenting via Internet-PC or provided handheld computers (or both). The device chosen in this project was the HP Jornada 680 (Windows CE Handheld PC Version 3.0), mainly because the integrated keyboard allowed for easy text input even by an untrained person (see figure 3). In addition, data could be transferred via the build-in modem without additional computer equipment.

The device was pre-configured with a standard Internet connection, customized desktop and shortcut icons to jumpstart the documentation. As the majority of participants opted

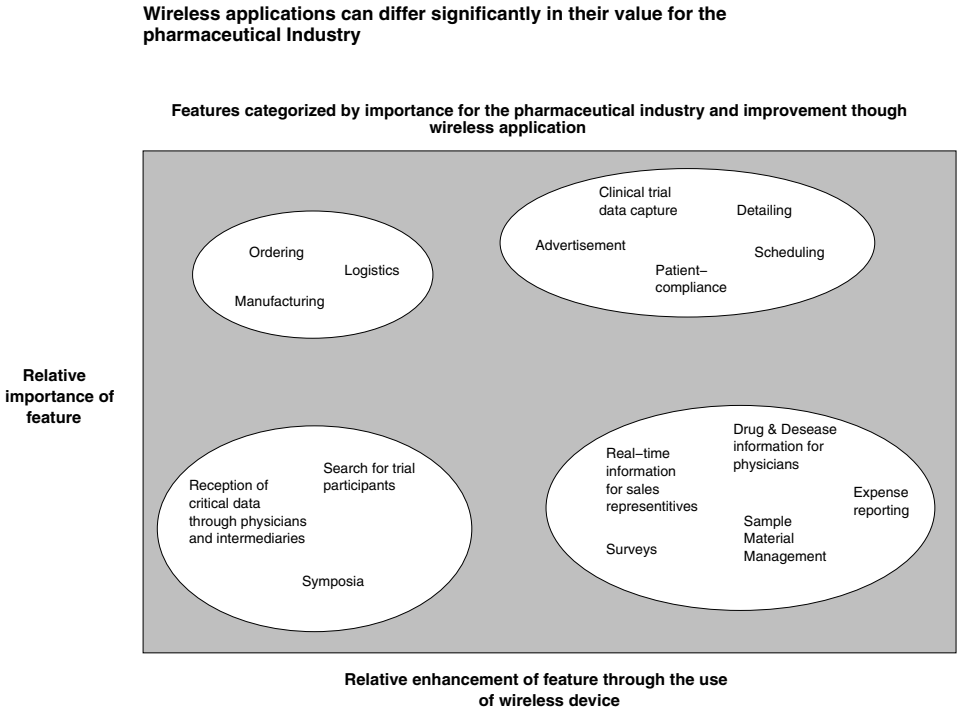

Figure 2: Source: Roland Berger [JSM01]

Figure 3: HP Jornada 680

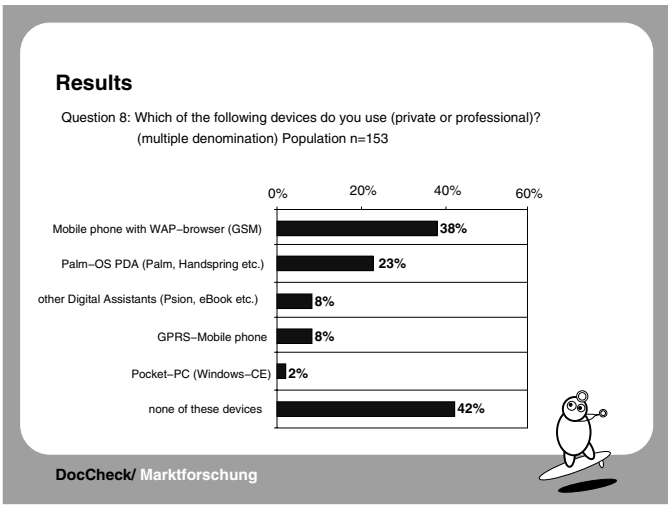

Figure 4: Current Usage of Mobile Devices, from [WS02]

for handheld-based data collection, more than 800 Jornadas have been supplied throughout the project. It should be noted that while the devices have been provided by the sponsor for the use within the actual study, participants were required to refund the sponsor if they wanted to keep them. With very few exceptions, most users decided to hold on to the device.

On the close of the study in 2001, over 1000 participating physicians had electronically documented a total of 9016 case records. Through interactive checks within the system, these records proved plausible and suitable for analysis at practically 100%. This is uncommon to conventional PMS studies, as these projects typically do not include a separate data-cleaning loop (thus implausible data is ignored for analysis).

4 Lessons learned and outlook

From the user acceptance perspective, mobile devices provide an attractive and useful extension to online studies, as they increase the individual flexibility for data entry. In combination with additional tools and services (e.g. risk calculators, guides) they can add value to the user and the project alike. Regarding Internet connectivity, the modem option in our example proved relatively support intensive (especially trough the high penetration of digital telephone services in Germany). Synchronization via the Internet-PC or even wireless access appears to be the overall more cost effective solution.

Actual survey data for Germany (see figure 3) suggests that the penetration of PDA-type devices amongst Internet-active doctors has reached approx. 33%. The biggest fraction (23%) uses Palm OS-devices, while other platforms account for less the 10% in total. From

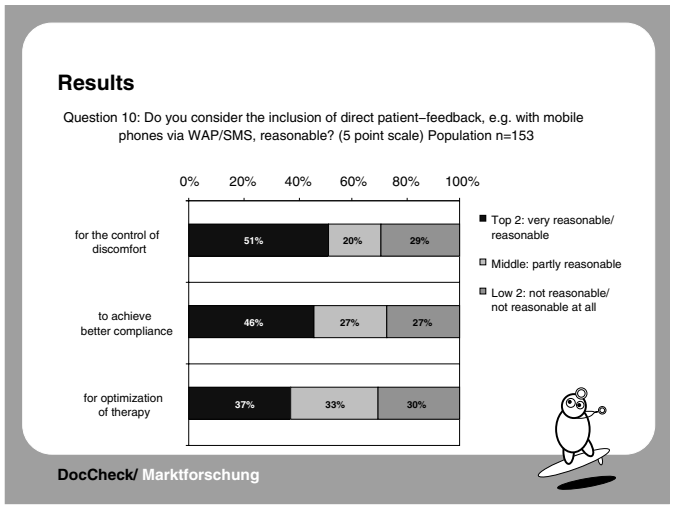

Figure 5: Expectations on Wireless Tools for Direct Patient Feedback, from [WS02]

these figures, we conclude that new projects applying mobile data capturing should still include the optional provision of these devices. This is emphasized by the fact that more than 2/3 of the respondents reported interest in using mobile computers going forward [WS02].

Another point to note is that most interviewees see potential in the widespread availability of wireless phone services like WAP and SMS, especially for direct patient feedback and compliance aids (see figure 4). This offers an interesting and cost effective alternative to the use of passive IVRS (interactive voice response systems) and telephone interviews.

Bibliography

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