PDA, Tablet or PC?: Selecting the size of device to use for electronic patient reported outcomes (ePRO)

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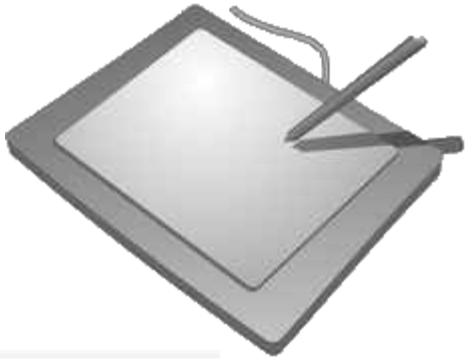
A wide range of devices are used in ePRO



- Technology (dedicated device, browser, IVR)
- Size of device
- Input (mouse or touch-screen)

I shall focus on issues raised by screen sizes of dedicated devices

Impact of Device Size

- Why device size matters
  - Cost
  - Portability
  - Fitting all the information on the screen
- Design principles for dealing with changes in questionnaire layout due to screen size
- The evidence – how much difference does it actually make in practice?

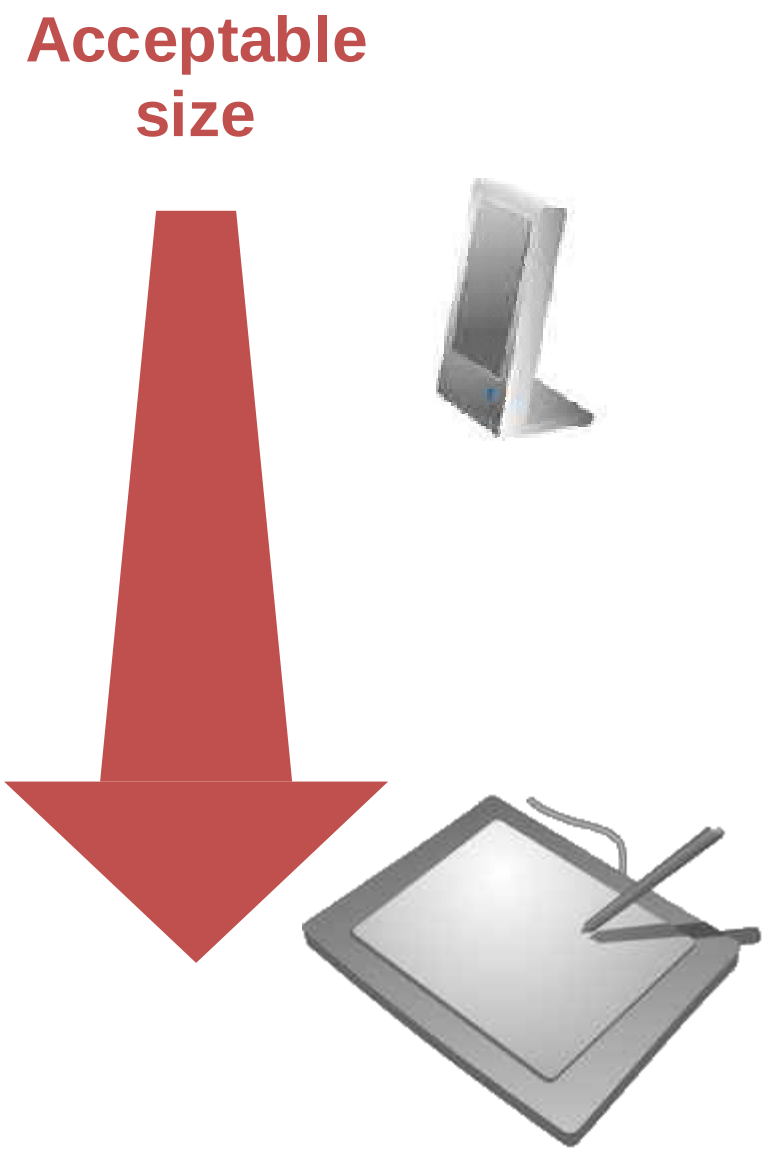
Cost

All else being equal, larger devices are more expensive than smaller ones, BUT:

- A 7" tablet with no mobile phone capability may be less expensive than a smartphone with a much smaller screen
- If data can be uploaded locally, e.g. using cable or Bluetooth, the tablet may be a cost effective option

Portability

- Frequent assessments:
  Patient may need to carry device around, at work, shopping.
- Home-based assessments:
  If once or twice a day, device may be used only at home, e.g. kept on bedside table.
- Clinic-based assessments



Fitting Information on the Screen

- Many paper questionnaires use A4/Letter paper, which is larger than most tablets
- Paper diaries may use smaller pages, but still larger than a handheld screen
- Reducing text size is possible, but only up to a point

In most cases layout must be modified to fit onto the device screen.

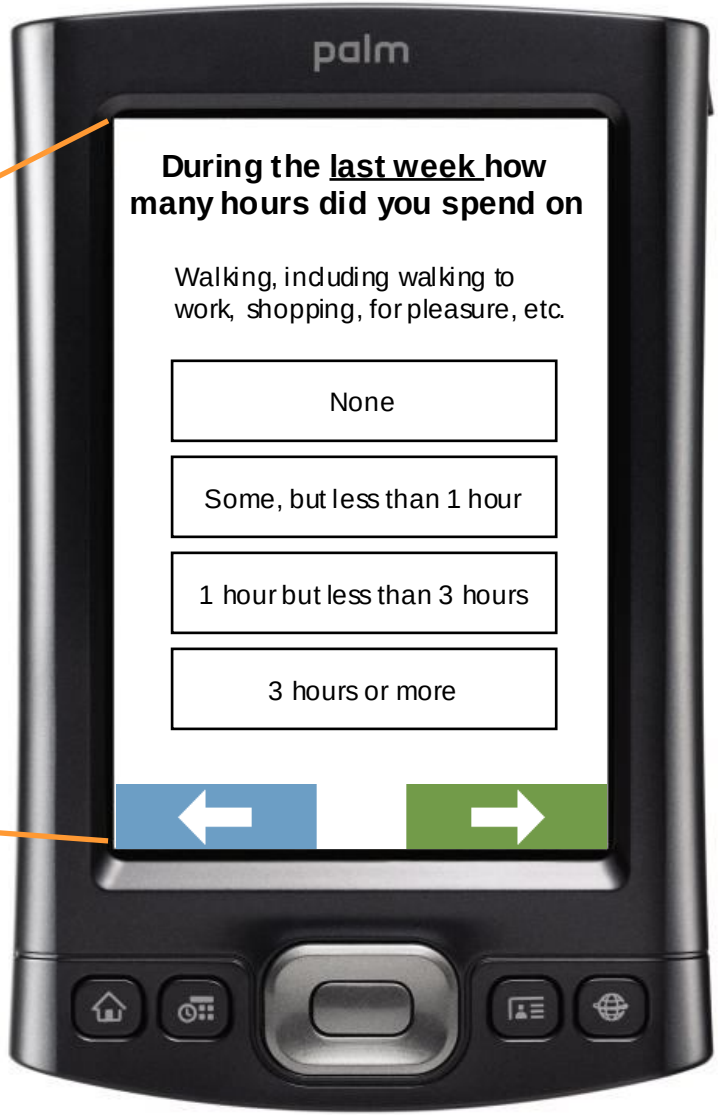
User Interface Design

- Don’t assume patients are familiar with computer interfaces
  - Computer use is widespread in developed countries, but is still not universal
  - Studies are not all carried out in developed countries
- Avoid scrollbars, drop-downs etc. These may make the patient’s task harder, or may not be used by some patients.

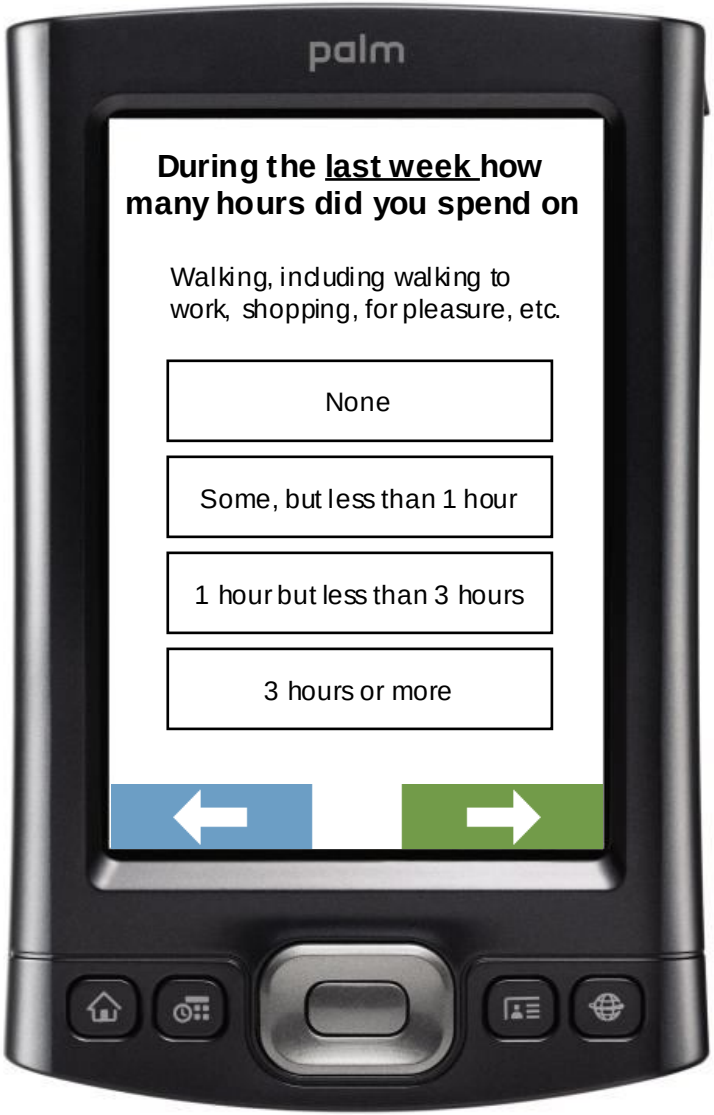
Multiple to Single

Question 3
During the last week, how many hours did you spend on each of the following activities? Please tick one box only on each row.

	None	Some but less than 1 hour	1 hour but less than 3 hours	3 hours or more
a. Physical exercise such as swimming, jogging, aerobics, football, tennis, gym workout, etc.	☐	☐	☐	☐
b. Cycling, including cycling to work and during leisure time.	☐	☐	☐	☐
c. Walking, including walking to work, shopping, for pleasure, etc.	☐	☐	☐	☐
d. Housework / Childcare.	☐	☐	☐	☐
e. Gardening / DIY.	☐	☐	☐	☐



User Issues: Memory Load



- Memory load is minimised if all necessary information is available on the screen, as in this example ☺
- This is not always possible

User Issues: Memory Load

- Instructions may be placed on a separate introductory screen
  - Often possible to repeat key information, such as assessment interval, on each screen
  - Information to be remembered is fixed 😐
- Placing questions and responses on separate screens
  - Information to be remembered is constantly changing, leading to a more substantial memory load ☹

User Issues: Navigation

- Larger screens allow groups of questions to be presented rather than single questions
- Fewer page turns are needed
  - May be easier for patient
  - Navigation can become more complex if there is question branching

The evidence

- Few studies have addressed issues related to screen size directly. Most evidence is indirect
- Comparison of different types of ePRO to paper
- Comparisons of different layout designs

Meta-analysis

- Gwaltney et al. (2009): Meta-analysis of 46 equivalence studies comparing 278 different scales.
- Good support for equivalence of paper and electronic versions of scales, with no evidence of systematic bias
- No effect of device size:
  - PDA vs paper, mean ICC = 0.91
  - Larger device vs paper, mean ICC = 0.90

Question Grouping

- Couper et al. (2001); Comparison of grouped versus individual questions in a web survey
- Grouped questions showed slightly, but not significantly, higher correlations than individual questions
- Proximity effect is small, if it occurs at all.

Question Grouping

- Tiplady et al. (2010): Equivalence study of paper and PDA versions of several scales, including EQ-5D, in rheumatoid arthritis
- In the paper version, the five questions are presented together on a single page. The PDA version presented one question per page.
- Cronbach's alpha was compared for the two versions:
  - Paper, $\alpha = 0.72$
  - PDA, $\alpha = 0.73$

Question Grouping

- Responses to questions in a group may be higher than when the same questions are presented singly.
- In many situations this correlation is spurious: making each question self-contained should if anything improve the veracity of the data.
- In general, these effects are small.

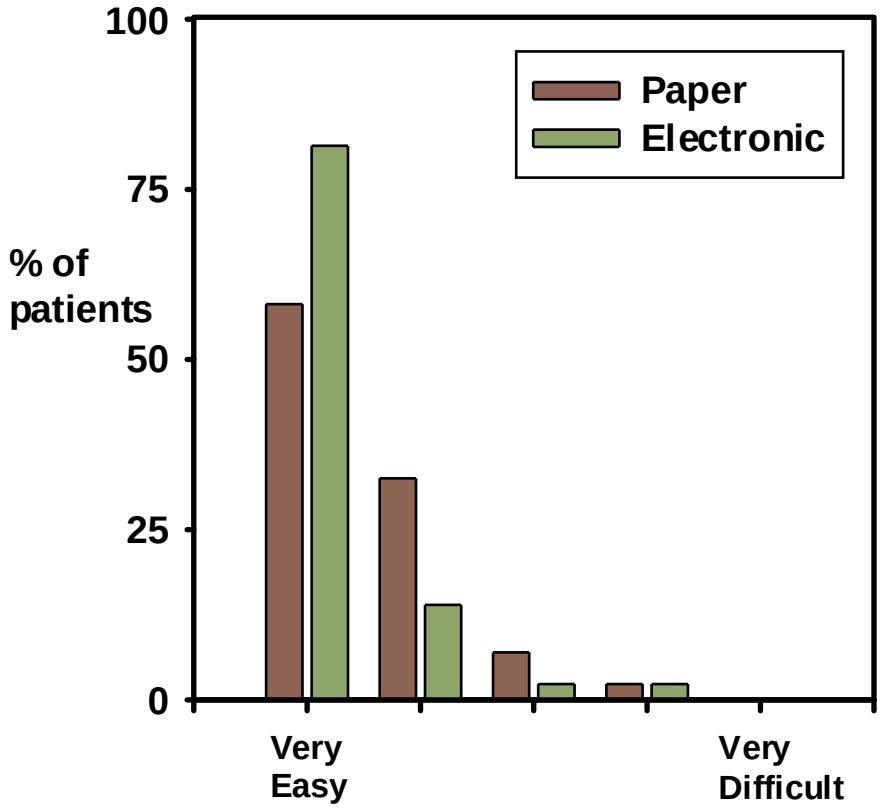
Splitting Questions

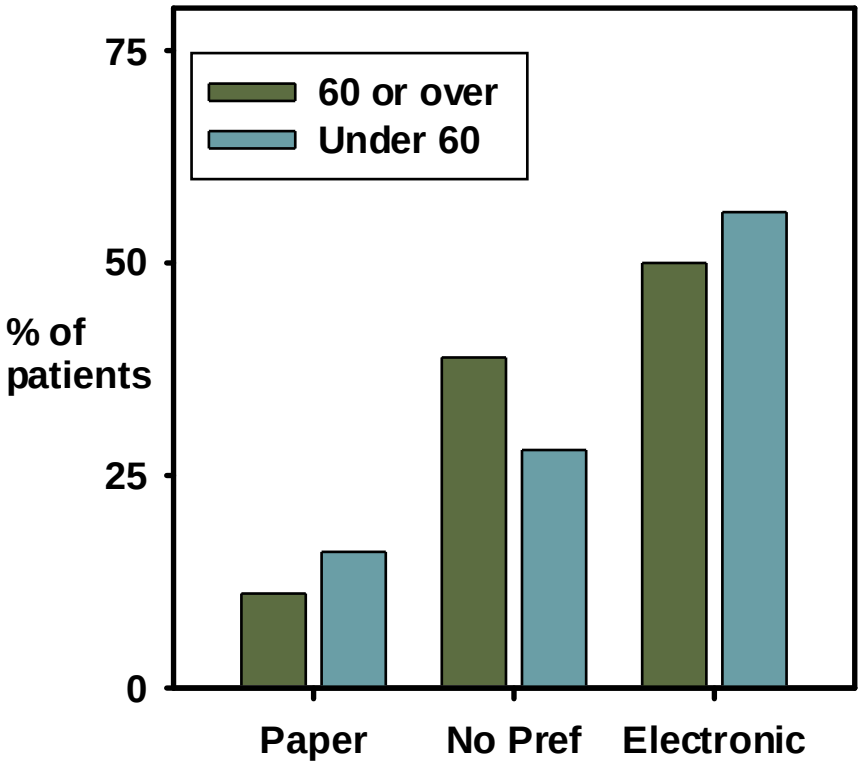
- Juniper et al. (2009): Equivalence study of paper and PDA versions of asthma scales, including AQLQ(S)
- PDA implementation split some items, with questions on one screen, and response options on the next
- Significant differences between paper and PDA scores, with electronic ratings tending to greater severity, though effect was small, and well within a MID
- Source of bias not clear, but question splitting considered a possible factor.

User Preferences

- No study has compared user feedback from devices of different sizes.
- It has repeatedly been shown that respondents find electronic diaries and questionnaires easy to use, and often prefer them to paper. (Drummond et al., 1995 ; Kvien et al. 2005; Heiberg et al. 2007). This is true both of larger and smaller devices.
- In the Rheumatoid Arthritis study, of the 43 patients in the study, 23 (53%) preferred electronic, while only 6 (14%) preferred paper. The remainder expressed no preference.

Patient Acceptability





Source: Tiplady et al. (2010). PDA vs paper in rheumatoid arthritis

Similarity to Paper

- Large screen devices may allow layouts to resemble paper more closely than smaller devices
- Some differences remain
  - Navigation
  - Correcting erroneous responses
- It is never possible to assume equivalence without addressing issues of what has changed in the migration process, and what effect this may have on responses

Conclusions

- There is no single ideal size for ePRO, even if cost and technical issues are ignored
- Consider the way in which the device will be used by the patient
  - Carried around
  - Used in single location
- Use a large enough screen to display all the information that the patient needs to answer the question

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