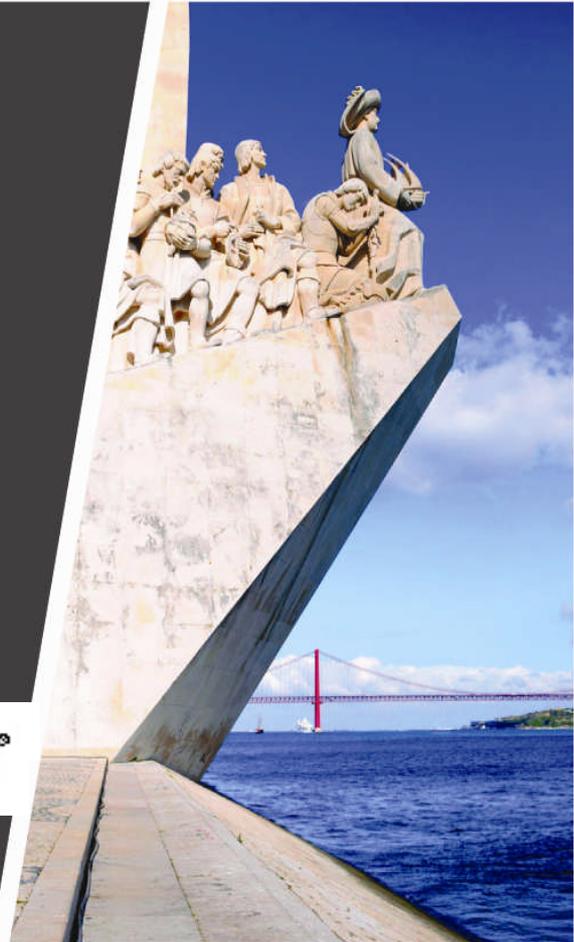


PDA, Tablet or PC?:  
Selecting the size of  
device to use for  
electronic patient  
reported outcomes  
(ePRO)

Brian Tiplady



## Disclaimer



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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:*

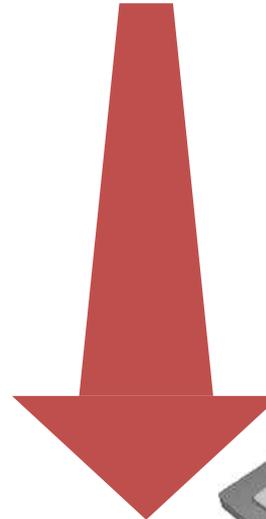
- A 7" tablet with no mobile phone capability may be less expensive than a smartphone with a much smaller screen
- If data can be uploaded locally, e.g. using cable or Bluetooth, the tablet may be a cost effective option

# 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

Acceptable  
size



- 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Cycling, including cycling to work and during leisure time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Walking, including walking to work, shopping, for pleasure, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Housework / Childcare.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Gardening / DIY.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

palm

**During the last week how many hours did you spend on**

Walking, including walking to work, shopping, for pleasure, etc.

None

Some, but less than 1 hour

1 hour but less than 3 hours

3 hours or more

← →



# 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



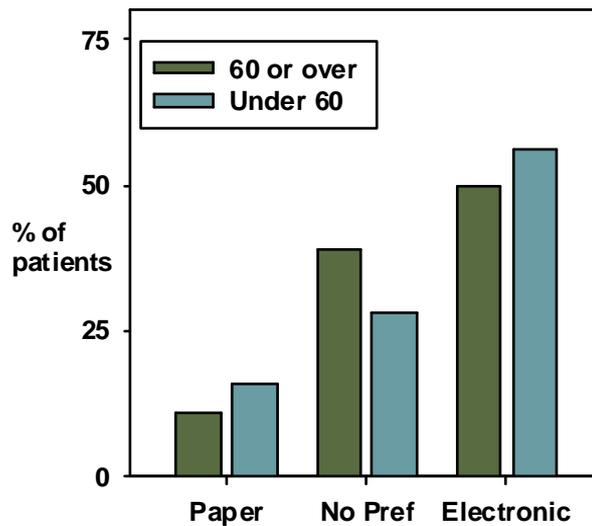
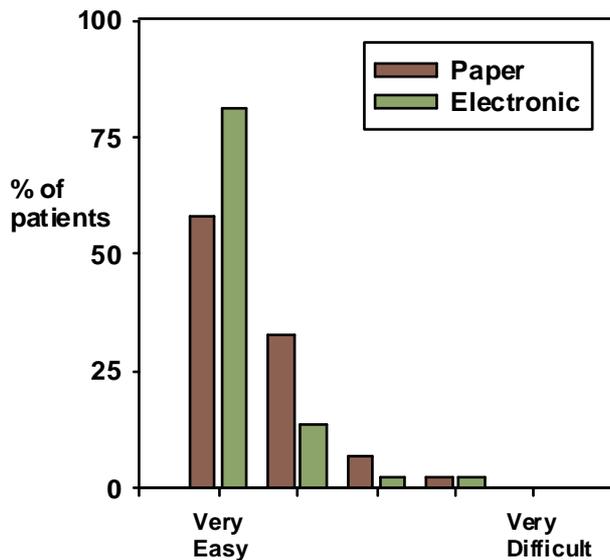
- Juniper et al. (2009): Equivalence study of paper and PDA versions of asthma scales, including AQLQ(S)
- PDA implementation split some items, with questions on one screen, and response options on the next
- Significant differences between paper and PDA scores, with electronic ratings tending to greater 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

# Contact

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