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## ECR 2014: Are Smartphones and Tablets Usable in Radiology?



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A burning question for radiology is whether the ubiquitous smartphones and tables can be used in clinical practice for image interpretation in radiology. Are they all that is needed? Rachel Toomey from Ireland addressed this question in a refresher course at the recent European Congress of Radiology in Vienna.

Currently handheld devices are primarily associated with radiology departments. Radiographers may also use them, e.g. for portable x-rays to check patients' previous images.

Evidence from the literature shows that handheld devices are being used daily by many radiologists. There are now more than 80 apps for radiology, which include those for diagnostic reading, decision support, medical books and encyclopaedias as well as journal reading programmes. Uses include administration and data collection, teaching and education, patient consultation and navigation in interventional and surgical procedures.

### Viewing Images on Handheld Devices

There has been an explosion of literature comparing handheld devices to workstations and/or investigating clinical efficacy, However, there have been fewer formal reports on their clinical use, noted Toomey.

In formally adopting handheld devices there are several considerations. Only two tablet-based US devices have been cleared by the FDA in the USA, Teratech (tablet) & MobiUS. These devices are to be used only when a workstation is not available, and are not allowed for use in mammography. DICOM viewers are also available, but very few have been cleared for clinical use.

Other factors to consider are perceptual issues and display quality

There has been little research on the impact of image size. Results are conflicting: some studies found that image size degraded performance, some suggested it improved. It is likely to be different for different pathologies.

In terms of image display spatial resolution/ pixel pitch/ noise characteristics on handheld devices are as good as or even better than workstations.

There is little in the literature on brightness and contrast of handheld devices. Toomey's own department (University College Dublin, Ireland) found real variability in the luminance of iPads, for example. Consumer devices are not subject to the same standards as diagnostic devices, emphasised Toomey. In addition, conventional calibration is not possible with these devices. Some viewers and apps offer solutions to this. For example, Mobile MIM integrated a Tap test into their software and the user can adjust contrast of patterns. However, it is not known how well that achieves DICOM calibration. Barco's Medical QAWeb Mobile runs visual calibration and QA on mobile devices to achieve DICOM quality images.

Ambient conditions are an important factor in radiological image viewing. Conditions most likely to affect viewing are light, noise and temperature. There has been very little research on the effect of noise and temperature on viewing on mobile devices.

Ambient light has been well investigated in radiology, but there has been very little consideration of the effect of ambient light on handheld devices. Viewers need to consider conditions when using handheld devices.

In conclusion, Toomey warned that users of handheld devices should be cautious in interpreting results. The literature on handheld devices covers a wide range of image appearances with a variety of scoring and analysis methods. The numbers of images, viewers and pathology types are highly variable between studies.

Use of handheld devices should also consider infection control. There have been a few papers showing that physicians use these between patients, and infections, including MRSA have been found on these devices. However, tablets may be more hygienic than button-operated devices.

Users should also consider data protection and security, as these devices are particularly susceptible to loss and theft.

Toomey concluded that a smartphone is not all that is required, but it offers significant potential if used in the right circumstances.

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