VALIDATION OF MOBILE-TO-MOBILE ECHOCARDIOGRAM ACQUISITION BY HANDHELD ULTRASOUND AND INTERPRETATION ON WEB-ENABLED SMARTPHONE

ACC Poster Contributions
Ernest N. Morial Convention Center, Hall F
Sunday, April 03, 2011, 10:00 a.m.-11:15 a.m.

Session Title: Novel Approaches to Improve Outcomes
Abstract Category: 45. Biomedical Computing/Information Technology
Session-Poster Board Number: 1033-168

Authors: Brian Choi, Monica Mukherjee, Cynthia M. Tracy, Richard J. Katz, Jannet F. Lewis, George Washington University School of Medicine and Health Sciences, Washington, DC

Background: Handheld ultrasound has increased echo portability, but expert point-of-care interpretation may not be readily available. Using a HIPAA-compliant smartphone-based application that allows for secure transmission of echo images to any compatible device, we hypothesized that remote interpretation on a mobile handheld device with dedicated medical imaging software can be as accurate as on a workstation.

Methods: 89 patients in a remote Honduran village received echo using Vscan handheld ultrasound (GE, Wauwatosa, WI) by a Level-I trained cardiology fellow. Images were sent for verification of point-of-care diagnosis to 2 expert echocardiographers in the US reading on Vscan Gateway workstation v1.0.0.12 (GE). Studies were then anonymized, randomly ordered and re-interpreted with mVisum onDemand v1.0.0 (mVisum, Camden, NJ) on iPhone OS v4.1 (Apple, Cupertino, CA). Point-of-care diagnosis was considered accurate if abnormal ventricular function, any valvulopathy, chamber size and any congenital anomaly was matched and categorized at the same level of severity (mild, moderate, severe) by either expert interpretation.

Results: Mean age ± standard deviation was 54 ± 23; 57% were female. Most common indications for echo were hypertension (15%), chest pain (12%), dyspnea (10%), and Chagas cardiomyopathy (9%). 45% of studies had no identified abnormality. Using the workstation, point-of-care diagnosis was changed in 27% of cases by expert overread (42% left ventricular function correction, 25% valvulopathy correction, 21% poor image quality, 10% other). Expert interobserver agreement was excellent: 82% with Cohen's $\kappa$ of 0.82 (95% confidence interval 0.70-0.94). Intraobserver agreement comparing interpretation on workstation and smartphone was 90% with Cohen's $\kappa$ of 0.86 (95% confidence interval 0.76-0.97), signifying excellent inter-technology agreement.

Conclusion: Remote expert interpretation improves point-of-care diagnosis with no loss of accuracy when read on a dedicated smartphone-based app. Mobile-to-mobile consultation may improve access in previously inaccessible locations to accurate echo interpretation by experienced cardiologists.