

Mobile Device Apps for Interventional Cardiology

An overview of commonly used and clinically relevant medical apps that you can use to help facilitate and improve patient care.

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Computer and informational technology have advanced at a blistering pace over the past 50 years. Perhaps one of the easiest ways to conceptualize the extent of this change is by a comparison between one of the seminal technological achievements of the 20th century and a device that many of us carry in our pockets every day. The Apollo lunar lander guidance computer weighed 70 lbs, had 1-MHz processing speed, 4 kB of memory, and an estimated cost of \$150,000. In contrast, the Apple iPhone 4s weighs 4.9 oz, has a processing speed of 800 MHz, up to 64 GB of memory, and can be purchased for \$99 (with a 2-year contract, of course). The practice of medicine has been irrevocably changed on multiple fronts as a result. At a simplistic level, gone are the days of trudging to the library to find and copy articles. Even the venerable pager, once so closely associated with doctors, is rapidly giving way to new mobile technology.

The widespread availability of affordable, sophisticated, and connected mobile devices has already changed the day-to-day lives of clinicians, consumers, and patients. There are now estimated to be well over 1 billion smartphones and tablets worldwide, with projections reaching 2 billion within the next year.¹ A mobile application (app) is software designed to run on smartphones, tablet computers, and mobile devices. Apps are generally distributed by the owner of the mobile operating system, such as the Apple App Store, Google Play (Android), Windows Phone Store, and BlackBerry App World. The average worldwide smartphone user now has over 20 apps on his or her device.

ADOPTION OF MOBILE MEDICAL APPS

A recent report by the IMS Institute for Healthcare Informatics found that there were 43,689 mobile health care apps available for download through the United States Apple App Store as of June 2013, although only 54% were considered “genuine” health care apps. Of these, 69% targeted consumers and patients, whereas 31% were designed for use by clinicians.¹ Most of the consumer health care apps were simple in design and found to do little more than provide information. Only 159 of the consumer apps were designed to capture or track specific user data.

Of the apps designed for clinicians, the most downloaded are generally used for reference purposes. The most popular are Epocrates, Medscape, Micromedex, WebMD, and UpToDate. Some of the most clinically relevant and sophisticated medical apps targeted at clinicians are not even necessarily available for download in “app stores.” The US Food and Drug Administration (FDA) has delineated a critical distinction between health apps and wellness apps. Wellness apps enhance or track the overall health of the user, whereas health apps are categorized as mobile software that diagnose, track, or treat disease. Health apps can monitor patients outside of the hospital, track vitals, or even analyze medical images for physicians. There are now more than 100 FDA-approved apps, with the FDA reviewing an additional 20 apps per year for approval.

Some of the more sophisticated FDA-approved apps require integration with existing hospital electronic medical record and imaging systems. Apps such as Mobile MIM and ResolutionMD allow remote viewing of radiology, nuclear medicine, neuroimaging, and cardiac imaging

from smartphones and tablets. Because most processing is done outside the mobile device, no sensitive patient information is transmitted, making it a fundamentally secure process. AirStrip One allows for real-time integration of patient telemetry, electrocardiograms (ECGs; old and new), labs, and electronic medical records on a mobile device in a single view. In addition, participating emergency medical service units may transmit ECGs from the field, reducing door-to-balloon times.

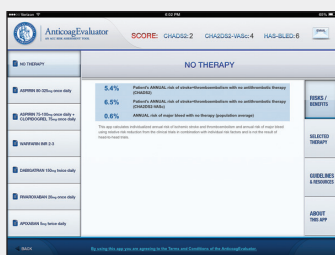
Several apps are particularly useful for valve disease. EuroSCORE II is an up-to-date risk calculator. CardioValve (Digital Medical Networks) is a compendium of metrics

and measurements on most of the mechanical and bio-prosthetic heart valves that are in clinical use. Valve In Valve (UBQO Ltd) will identify most surgical valves and provide information regarding their suitability for treatment with transcatheter aortic valve replacement devices. EchoCalc (British Society of Echocardiography) includes formulas for everything imaginable from echo data.

In the process of preparing this article, we conducted an informal survey of our cardiology colleagues to get a sense of which apps are commonly used. The majority used the aforementioned reference apps. In addition, a description of commonly used and interesting apps follow.

NOTEWORTHY INTERVENTIONAL CARDIOLOGY APPS

American College of Cardiology AnticoagEvaluator



This app is a combination risk calculator that uses CHADS2, CHA2DS2-VASc, and HAS-BLED. When on rounds recently with house staff, an intern presented a typical consult involving an elderly woman with new-onset atrial fibrillation. While mentally calculating the risk/benefit ratio of anticoagulation, the intern recommended for rate control but against anticoagulation. Sensing the inevitably forthcoming question as to why, she pulled out her smartphone and handed it to me.

AliveCor



AliveCor allows a smartphone to obtain a single-lead ECG. The specially designed monitoring device is attached to the phone, and then the user presses the device against the skin near the heart. The device has received much recognition for its mobility and the anticipation of its capability to catch irregular heart rhythms earlier. AliveCor works, and is FDA cleared, for both Android and iOS devices.



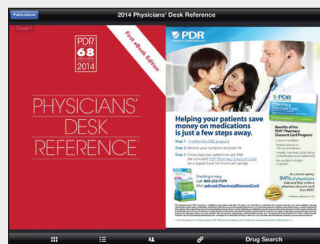
AliveCor users based in the United States can share their recorded ECGs with their physician or have the option of sending the reading to either a remote cardiologist or a remote cardiac technician via a direct-to-consumer service called AliveInsights. Each time a user sends their ECG for analysis, they have to pay a fee. The monitoring device costs \$199.

Prominent cardiologist Dr. Eric Topol has reportedly used AliveCor on two separate airline flights to diagnose both a myocardial infarction and atrial fibrillation.²

Pill Identifier

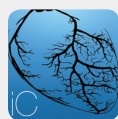


Not uncommonly, patients refer to medications by size, shape, and color, and many clinicians have no idea what the medication they commonly prescribe actually looks



like. Having a hard copy of the *Physicians' Desk Reference* on hand, however, is less common. Multiple paid and free apps, including the *Physicians' Desk Reference*, are available.

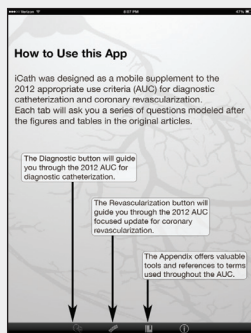
Appropriate Use Criteria for Percutaneous Coronary Interventions



Appropriate use criteria guidelines for percutaneous coronary interventions have increasingly become a fact of life for practicing interventionists, both in terms of appropriate patient care and reimbursement. At first glance, however, appropriate use criteria guidelines for

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NOTEWORTHY INTERVENTIONAL CARDIOLOGY APPS (Continued)

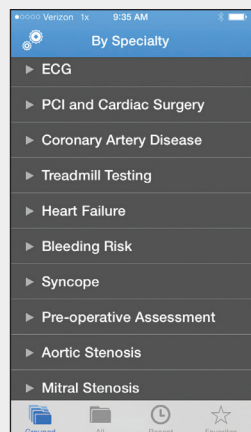


iCath, created by Weston Hickey, a cardiology fellow at the University of Oklahoma Health Science Center, is intuitive and comprehensive.

Calculate by QxMd



Calculate by QxMd is a calculator and decision-support tool for iPhone, iPad, Android, and BlackBerry that is freely available to the medical community. Calculate is focused on



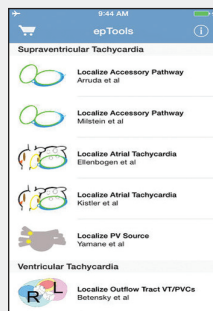
highlighting tools that are actually useful in clinical practice and serve to assist with diagnosis, treatment, or determining a prognosis. The user may tailor it to the specific area of practice. Useful cardiology tools include those to assess a cardiovascular risk and guide for lipid treatment, CHADS2 and CHA2DS2-VASc score, invasive hemodynamics/shunt fraction, coronary artery disease (Canadian Cardiovascular Society grading, TIMI risk score, Killip class), and preoperative patient assessment. There are many more calculators in this app, covering everything from body mass index to water deficit.

epTools



This free universal app runs on iPad, iPhone, and iPod Touch devices. It includes algorithms commonly used to localize arrhythmia substrates and reference guides to assist in the identification of clinical conditions. The algorithms are implemented via an intuitive user

percutaneous coronary interventions cover a seemingly multitudinous combination of symptoms, stress test results, medical therapy, and anatomical considerations (166 indications for catheterization and 180 clinical scenarios for revascularization). Several apps are available to help cut through the clutter. For IOS users,

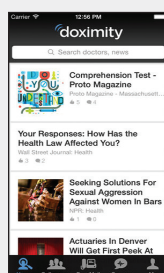


interface. Other features include assessment of localization of accessory pathways, atrial tachycardias, ischemic ventricular tachycardia, idiopathic ventricular tachycardia, premature ventricular contractions, and differentiation of supraventricular from ventricular.

Doximity



This app represents one of the largest medical networks, with one in three United States physicians as members (more than 295,000 verified physician members). It allows for



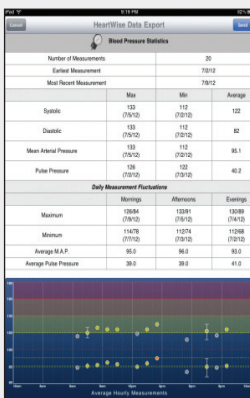
instant connection with other health care professionals, secure collaboration on patient treatment, practice growth, and discovery of new career opportunities. Doximity offers a searchable directory of 700,000 United States physicians, as well as HIPAA-secure case collaboration and physician-to-physician messaging. You can also use it to earn and track

CME credits. User profiles are searchable and viewable to the public (although the user may opt out).

HeartWise Blood Pressure Tracker



HeartWise Blood Pressure Tracker is a monitoring tool developed by SwEng LLC to help monitor patients' blood pressure in a visual manner that can be communicated



to health care providers. The app opens to a home screen where users input blood pressure data and may enter text notes. After the user inputs personal data into the app, it is displayed in chart format. This can be accessed at the bottom option bar of the app with the "Charts" or "Detailed Statistics" options. Data may then be forwarded for review by others.

The steady movement toward digitally assisted therapeutics seems inexorable and holds great promise for both promoting wellness and improving patient care.

CONCLUSION

Health care apps, once considered a novelty, have increasingly become part of the everyday life of many physicians and patients. That said, apps have, in general, not reached the mainstream of health care delivery. This may be partially due to the fact that a large proportion of medical apps have traditionally been relatively limited, rudimentary, and unregulated.

Given the power and sophistication of some of the newer apps, one can clearly see the promise they hold. However, validation of efficacy will be required. The steady movement toward digitally assisted therapeutics seems inexorable and holds

great promise for both promoting wellness and improving patient care. There is no doubt that we will continue to experience rapid expansion of the offerings in the app world and that our mobile devices will become an increasingly greater part of practice. The medical app is here to stay. ■

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