

Interventional Cardiology Apps in Clinical Practice

How everyday use of this technology can impact your practice of medicine.

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Computer and informational technology has advanced at a fast pace over the last 50 years. One of the easiest ways to conceptualize the extent of technologic advance is to compare the first computer and the modern cell phone. The first computer, called the electronic numerical integrator and computer, cost approximately \$6,000,000, was 8 feet high, 3 feet deep, and 80 feet long, weighed 30 tons, and was able to perform 5,000 instructions per seconds. On the other hand, the modern-day cell phone weighs 4.55 ounces and is able to perform 25 billion instructions. A more astounding comparison is between cell phone and human computing capabilities: cell phone computing costs 350 times less, weighs 480 times less, and is 12,960 times faster.¹⁻³ The practice of modern medicine has been highly impacted by the progression of technology. The use of electronic medical records has replaced paper charts and physicians are able to access patient records through their cell phones. Medical literature can be searched and perused within seconds, and cell phones are now used as the main source of communication between providers, replacing hospital pagers. In a way, cell phones have become a walking medical encyclopedia and serve as main communication lines between providers to make clinical decisions on a daily basis. Smartphones incorporate both communication and computing features, making their use easy and highly accessible.³

The global mobile health industry has risen quickly and is expected to reach \$58.8 billion by 2020.⁴ Digital health has now emerged as a separate field and developed into a sound business, attracting players from various industries, with 60% of stakeholders from health

care industry and the remaining 40% from outside the health care industry.⁵ The daily use of mobile phones has changed the day-to-day life and practice of providers, consumers, and patients. Health care was one of top three mobile trends in 2017.⁶

HEALTH CARE APPS

The impact of mobile phones is a worldwide phenomenon; approximately 5 billion people are predicted to have used a mobile phone in 2019 and 6 billion smartphones will be in circulation by 2020.⁷ A mobile application (app) is software designed to run on smartphones, tablets, computers, and other mobile electronic devices. Apps are usually distributed by the owner of the mobile operating system.³ The average smartphone user spends 2 hours and 15 minutes each day using apps, which is the equivalent of 2 months per year. The average person has 60 to 90 apps installed on their phone, using 30 of them each month and launching nine per day.⁸ In 2017, 325,000 health apps were available with 78,000 new additions in 1 year.⁵

Mobile devices and apps provide many benefits for health care providers, perhaps the most significant of which is increased access to point-of-care tools that can support better clinical decision-making and improve patient outcomes. A survey from 2012 to 2015 of smartphone use among physicians found that the use of smartphones among physicians had increased from 68% to 84%.⁹ An IMS Institute of Healthcare Informatics 2015 update of its 2013 study on health apps showed that more than 50% of apps had limited functionality, with only one in 10 apps having the capability to connect to a device or sensor, while the number of health care

apps that connected to social media increased by 8%. Furthermore, providers showed an increasing interest in apps and more than one-third of physicians reported recommending health apps to patients.¹⁰ The most popular apps for physicians include reference apps, such as *UptoDate*, the *New England Journal of Medicine*, *Epocrates*, and *Medscape*. According to industry estimates, 500 million smartphone users worldwide will be using a health care application by 2015, and by 2018, approximately 1.7 billion users would have downloaded a mobile application.¹¹

The 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. In July 2018, the FDA has approved more than 300 health apps.^{3,12}

APPS IN THE CARDIOLOGY SPACE

Several apps have emerged in the field of cardiology encompassing almost all of its disciplines, including imaging, heart failure, electrophysiology, and interventional cardiology. There are several useful apps that can have a role in the daily practice of an interventional cardiologist. For this article, several health care apps were initially selected and then specifically reviewed by two interventional cardiologists as most useful in their daily practice.



Twitter. Social media has opened new frontiers for easy communication between specialists. The interventional cardiology Twitter feed provides updates on the most recent trials, real-time updates on

the most important cardiology meetings, and can also serve as a platform for interventionalists to share challenging cases, divulge tips and tricks, and discuss the latest topics in interventional cardiology. There is currently a robust community of interventional cardiologists who frequently engage with each other in this space.

Calculators

There are several calculators and scoring systems that aid in clinical decision-making.



Calculate by MDCalc includes more than 200 calculator tools for decisional support, including some of the more common scoring systems used by cardiologists such as TIMI (thrombolysis in myocardial infarction) and GRACE (Global Registry of Acute Coronary Events) scores, dual antiplatelet therapy scores, and hemodynamic calculations (such as Fick cardiac output).



ASCVD Risk Estimator Plus is an app by the American College of Cardiology designed to estimate a patient's risk of a coronary event based on their specific characteristics, including gender, age, blood pressure, and cholesterol levels. It is also recommended by the most recent cholesterol guidelines for determining need for initiation of statin therapy.



AnticoagEvaluator is designed by the American College of Cardiology to aid in decision-making regarding starting, interrupting, and restarting anticoagulation. Included is the CHADS2-VASc score and the HAS-BLED score and other patient-specific characteristics. Each anticoagulant therapy is then evaluated with specific risk/benefit information provided based on the clinical scenario.

Other Apps



PCR Trials details the major randomized controlled trials for percutaneous coronary intervention within high impact factor journals. It serves as a great reference tool for interventional cardiologists looking for summaries of the seminal research trials within interventional cardiology.



The CARDIO3 Atlas of Interventional Cardiology includes more than 300 annotated videos of cardiac catheterization procedures, including coronary interventions and structural heart interventions with multimodality imaging. The app costs \$39.99 for the full library.



The Valve In Valve apps are vital for any structural interventionalist performing valve-in-valve procedures. The apps provide concise information regarding surgical aortic and mitral valves and offer sizing for transcatheter valve implantation within prior surgical valves. Fluoroscopic and bench photographs to aid in proper placement in these complex procedures are also included.



The SCAI AUC Tool app provides the 2012 appropriate use criteria (AUC) for diagnostic catheterization and 2016/2017 AUC for coronary revascularization. It allows the user to go on a step-by-step selection

process based on patient characteristics and provides appropriateness indications based on the AUC guidelines.



Adult Cardiac Surgery Risk is designed to estimate the risk of morbidity and mortality after the most common types of open heart surgery, including coronary bypass surgery, aortic and mitral valve surgery, and combined valve-bypass surgery. Using the Society of Thoracic Surgeons risk calculator, this tool can be used to guide patient discussions and assist in decisions regarding surgical versus percutaneous therapies.



Cath Source, a searchable database of more than 30 videos and 65 images, is an up-to-date medical reference for the interventionalist or interventionalist-in-training. It includes basic coronary angiography as well as hemodynamic waveforms and is helpful for studying for interventional cardiology board exams as well.



CIT United States and European Device Guides provide a comprehensive listing of the FDA- and CE Mark-approved devices

available in the United States and Europe for interventional cardiology. The apps include balloons, catheters, sheaths, stents, valves, and wires, with relevant sizing, configurations, and unique characteristics of each device. They also provide product links and web resources for more detailed information.



BifurcAid is an educational tool developed by Mount Sinai Heart that provides step-by-step illustrations for performing coronary bifurcation interventions. Specific anatomy is stratified into left main versus non-left main interventions and provides advice for different techniques depending on vessel sizing, acuity, and disease burden. A detailed slide show for each step of the procedure is helpful for procedural planning. The Mount Sinai Heart group has also released multiple other apps to aid in interventional cardiology procedures, including CalcificAID, OCTAID, TranseptAID, and TAVRCathAID.



Cardio Ex is video game developed by Level Ex, Inc., the makers of video game platforms for interventional pulmonology, gastroenterology, and cardiology.

Developers have created a video game experience based on percutaneous coronary interventions to enhance skills in the catheterization laboratory. Different features include rotating the fluoroscopic camera, performing coronary angiography, manipulating guidewires, and using balloons, stents, and atherectomy devices to treat simple and complex coronary disease. More advanced levels involve treating complications, such as coronary artery perforation. This app also has the benefit of providing continuing medical education for physicians.



Cardiovisual is a patient-friendly app that includes informational videos on common and uncommon interventional and structural cardiology procedures. It is ideal for demonstrating procedural technique through simplified videos to explain complex procedures to patients.



Vumedi is a video education platform for physicians that provides video presentations on a variety of interventional cardiology topics by renowned interventional cardiologists. Most presentations are recordings from national and international meetings. The platform offers educational videos on new advances and also explores challenging cases, rare pathologies, and complications. It also serves as a communication tool between physicians to discuss cases or privately contact experts on a case. Continuing medical education credits are offered at no cost and physicians can participate in live webinars.

CONCLUSION

Health care apps have increasingly become part of the everyday life of many physicians and patients. Apps are now incorporated into delivering care on a daily basis. Given the power and sophistication of the technology, their use in clinical practice will become even more common. However, validation of efficacy will be required. The rapid increase in digitally assisted therapies holds the promise to both promote wellness, assist in clinical decision-making, and improve patient care. With the rapid expansion of medical technology and ever-evolving apps, choosing the appropriate apps to best assist in delivering care will become a greater part of practice. ■

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