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Jordan P. Hilgefert
Marshall University

Sean Fitzpatrick
Marshall University

Dana Lycans
Marshall University, lycans@marshall.edu

Timothy Wilson-Byrne MD
Marshall University, wilsonbyrne@marshall.edu

Chad Fisher
Marshall University, fisher47@marshall.edu

See next page for additional authors

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Authors

Jordan P. Hilgefert; Sean Fitzpatrick; Dana Lycans; Timothy Wilson-Byrne MD; Chad Fisher; and Franklin D. Shuler MD, PhD

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Jordan P. Hilgefert, MSII

JCESOM, Marshall University, WV

Sean Fitzpatrick, MSIV

JCESOM, Marshall University, WV

Dana Lycans, MD

Orthopaedic Resident (PGY I), Depart. of Orthopaedic Surgery, Marshall University, WV

Timothy Wilson-Byrne, MD, MS

Research Fellow, Depart. of Orthopaedic Surgery, Marshall University, WV

Chad Fisher, ESQ

Department Administrator, Depart. of Orthopaedic Surgery, Marshall University, WV

Franklin D. Shuler, MD, PhD

Associate Professor, Orthopaedic Trauma

Vice Chairman, Orthopaedic Research

Medical Director, Senior Fracture Program, Marshall University, WV

Corresponding Author: Jordan P. Hilgefert, Marshall University, Department of Orthopaedic Surgery, 1600 Medical Center Drive, Suite G-500, Huntington, WV 25701; e-mail: hilgefert@live.marshall.edu

Abstract

Like other similarly situated rural states, West Virginia's patients and practitioners often experience access barriers to current medical expertise for multiple disciplines. This article was generated to help bridge this gap and highlights the best-rated mobile medical applications (Apps) for smartphone use. From finding drug interactions and dosing schedules to discussing patients in HIPAA-compliant formats, Apps are becoming integral to the practice of 21st Century medicine. The increased use of these Apps by physicians-in-training and established practitioners highlights the shift from reliance upon the medical library to the easy to use mobile-based technology platforms. This article provides our practitioners, physician extenders, medical trainees, and office staff a guide to access and assess the utility of some of the best rated medical and HIPAA compliant Apps.

Introduction

One seminal characteristic of the healthcare industry is the continuous focus on efforts to improve patient care. While the advent of various procedures and instruments has altered the scope of healthcare enormously over the years, no development may prove to be as significant and profound as the invention of the smartphone device; one which can assist the practice of medicine. The use of the smartphone, "specifically a type of mobile phone which incorporates the functions of a palmtop computer, personal digital assistant, or similar device," has already begun to alter how healthcare workers, in particular physicians, interact with patients.¹ The real benefit of mobile telecommunication devices in the clinical setting is beyond the incremental advance from one way pagers to two-way communication.

Smartphones have the capability of providing users with unlimited amounts of information through access to the internet, but more importantly, through mobile applications (Apps) -- self-contained software programs that can be downloaded and run on smartphones.² The most useful Apps are continually updated and provide a powerful tool for the practicing physician, physician extenders and medical trainees.

Because smartphones and their accompanying App software distribution platforms have existed for a relatively short period of time, there is minimal data which reflects the exploit of Apps as a tool within clinical practice. Nonetheless, a digital survey administered to all ACGME (*i.e.* Accreditation Council for Graduate Medical Education) training programs in 2011 found that of the residents, fellows, and attending physicians who responded, "over 85% use some type of smartphone and 56% use medical apps to aid with their practice. Of the three major operating systems (the iPhone's iOS, Android's Linux, and Blackberry's Blackberry OS), iOS was the most widely utilized".² This survey demonstrates that the vast majority of younger physicians do indeed possess smartphones, and slightly over half of all physicians currently utilize some type of App in their practice. Moreover, the implementation of this technology into everyday practice appears to be more prevalent among recent medical school graduates than experienced physicians, suggesting that the use of medical Apps will be increasingly employed as a new generation steps into the field of healthcare. Since App utilization rates are increasing, this article seeks to offer insight into some of the most useful medical Apps on the market today. This article reviews four of the most prevalent medical-service App categories (*i.e.* drug reference, disease reference, patient visual assistance, HIPAA compliant conversations) and provides ten top rated apps by industry reviewers. Of note, the Health Insurance Portability and Accountability Act (HIPAA) requires all "covered entities" (*e.g.* health care providers) to "have in place appropriate administrative, technical, and physical safeguards to protect the privacy of protected health information".³ In this regard, HIPAA mandates that disclosure of electronic protected health information be made in compliance with the requirements of its "Security Rule".⁴

In summation, an increasing number of Apps are being developed to allow a physician's smartphone usage to be in compliance with the mandates set forth by HIPAA. These Apps are designed to provide safeguards

not available via standard text messaging (*i.e.* secure data centers, encryption, recipient authentication, audit controls, etc.).⁵ Although Apps such as TigerText Pro and Doximity are profiled within this article, numerous other Apps offering HIPAA-compliant text messaging capabilities are also currently available in the marketplace.⁶ In addition, cell phone companies themselves are now beginning to actively offer HIPAA-compliant text messaging services as a premium add-on to standard cellular phone service.⁷ Given the industry's heightened focus on this area of App development, it appears the HIPAA-compliant text messaging sector is poised to grow exponentially over the next few years. Such growth should provide physicians with a multitude of options to confirm that all mobile-based communications containing protected health information are transferred in a HIPAA-compliant manner.⁸

Downloading Mobile Apps

For new smartphone users, navigating within the various App software distribution platforms (*e.g.* the iPhone App Store, the Google Play Store, etc.) can be a daunting task. In order to facilitate this process, we've provided a short tutorial for those unfamiliar with downloading Apps onto a smartphone. The first step in this process requires accessing the platform utilized to download Apps. For the two most widely utilized smartphones, the iPhone and Android, these platforms are referred to as the App Store and the Play Store. These platforms are inherent on their respective smartphones and appear as such:

iPhone App Store



Google Play Store



Having accessed the appropriate platform, one can then proceed to search for Apps directly or choose from pre-determined lists of Apps. Videos with more detailed instructions of how to access and download an App from these two platforms can be found at the following two web addresses:

For the iPhone App Store⁹: <http://www.youtube.com/watch?v=q-w5vBdisw8>

For the Google Play Store¹⁰: <http://www.youtube.com/watch?v=0ET2E9tjm2k>

Nevertheless, even for experienced smartphone users, these platforms offer an ever-changing landscape making it difficult to select an appropriate App. Unfortunately, there is not an easy manner for

a user to test an App; at best, one can gather brief information and a few sample photos from the App's information page before committing to a full download. However, due to time constraints, few physicians have the ability to download multiple Apps and sift through their various features before determining if one is satisfactory for use within their practice. With the goal of circumventing this cumbersome trial and error process, the following is a direct comparison of some of the most widely used and best rated medical Apps available in the marketplace today.

Show me the Apps!

The following ten Apps are categorized in terms of their use, cost, publisher and individual functions to provide a quick overview of their relevant details and features.



1. Medscape¹¹⁻¹⁴ by WebMD

Use: Drug and Disease Reference, Medical News and Education

Cost: Free

Pros: Medscape has many useful features, including clinical disease, procedure and news and education sections. The App's interface is very streamlined and the search function is more user-friendly than many of its competitors. Furthermore, the drug section includes drug interaction, pill identification and formulary features.¹²

Cons: Medscape requires users to complete a one-time registration.¹²

Summary: Medscape is a very quick App that is excellent for referencing drugs and disease. The multitude of useful features possessed by this App make it very user-friendly and its free price tag renders it an attractive choice for all physicians. For the practitioner who is looking for an encompassing single app, Medscape would provide the best utility. It is compatible with iPhone, Android, and Blackberry devices.



2. MedPage Today Mobile¹⁵ by MedPage Today

Use: Drug and Disease Reference, Medical News and Education and CME

Cost: Free

Pros: MedPage Today Mobile is a comprehensive App that contains sections for drug and disease reference, as well as medical news and education. This App also possesses a user-friendly interface. The ability to obtain CME credit within this App is a unique and convenient feature not supplied by the majority of competing Apps.¹⁵

Cons: MedPage Today Mobile requires users to complete a one-time registration.¹⁵

Summary: MedPage Today Mobile is an excellent App that rivals Medscape as a practitioner's primary App. It is compatible with iPhone and Android devices, but not Blackberry devices.



3. Micromedex^{11, 14, 16-17} by Truven Health Analytics

Use: Drug Reference (additional Apps from Micromedex Include Drug Interactions, IV compatibility)

Cost: Free

Pros: Micromedex allows users to search for drugs using inquiries independent from a drug's name. Accordingly, unlike many of its competitors, searches relying upon drug class, black box warnings, contraindications, pediatric dosing and drug interactions will all yield fruitful results.¹⁷

Cons: Micromedex does not provide pill identification, a dosing calculator or formulary functions. Furthermore, this App does not possess a disease reference section.

Summary: Micromedex is a very streamlined App with an intuitive user interface that provides up-to-date drug information. However, it unfortunately lacks some of the functions that other Apps provide. Notwithstanding the foregoing limitations, Micromedex provides concise drug information more efficiently than most of its competitors.¹⁷ It is compatible with iPhone, Android, and Blackberry devices.



4. Skyscape Medical Resources^{14, 18-19} by Skyscape

Use: Drug and Disease Reference, Decision Making, Medical News

Cost: Free

Pros: In addition to possessing a limited drug reference section, Skyscape provides free access to disease reference (Clinical Medicine), a decision making section (Archimedes) and a medical education section (MedAlert).¹⁹

Cons: The Skyscape user interface is cumbersome and searching can often be difficult. Similar to many of its competitors, Skyscape possesses a registration requirement.

Summary: Skyscape provides a plethora of general information and possesses a first-rate drug dosing calculator and is an excellent overall clinical resource. While its drug reference capabilities are limited, it is a useful tool for obtaining up-to-date information on various drug, disease and general medical issues. It is compatible with iPhone, Android, and Blackberry devices.



5. Epocrates Rx^{11, 14, 20-22} by AetnaHealth

Use: Drug Reference (Disease Reference with full version)

Cost: Free (Full Version \$159.99)

Pros: Epocrates Rx possesses a robust drug reference section and provides users with an intuitive and quick interface.²² In addition; this App contains one of the best pill ID features of any drug App.¹⁴

Cons: Epocrates Rx's disease reference feature is only available after the purchase of its full version.

Summary: Epocrates Rx is Epocrates' basic drug reference App that provides information about 8,000 referenced drugs. It also supplies users with a drug interaction, pill identification, dosing calculator and formulary list features. As noted above, the purchase of the full version is required to garner access to the App's impressive disease reference section, but carries a price tag of \$159.99, utilization of the free Medscape or Medpage Today Apps left to the discretion of the user. It is compatible with iPhone, Android, and Blackberry devices.



6. Calculate²³⁻²⁴ by QxMD

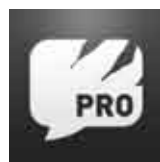
Use: Clinical Assessment and Decision Maker

Cost: Free

Pros: Relying upon user-provided clinical data, Calculate provides physicians with common clinical predictors, including CHADS2 scores, RANSON's criteria, total body burn percentage, abdominal cardiovascular risk, among many others. Subsequent to procuring the aforementioned clinical predictors, this App also provides the user with treatment recommendations. Furthermore, the App interface is extremely user-friendly and is easy to navigate.²⁴

Cons: While Calculate provides sufficient references for much of its clinical information, some of the links to the source data are difficult to access.²⁴

Summary: Calculate is considered one of the best clinical calculator Apps on the market and it has the capability to provide considerable assistance with clinical decision making.²⁴ It is compatible with iPhone, Android, and Blackberry devices.



7. TigerText PRO²⁵⁻²⁶ by X Sigma Partners LLC

Use: Secure text-messaging

Cost: Monthly subscription fee required

Pros: TigerText Pro offers its users the ability to send text messaging and images, including CTs and EKGs, in a HIPAA-compliant manner. To accomplish this goal, TigerText Pro possesses a multitude of security features, including, but not limited to, delivery and read notifications, sender-controlled message lifespans and an integrated practice directory.²⁶

Cons: Per its sales representatives, the free version of TigerText is not HIPAA-compliant. Consequently, users are directed to upgrade to the HIPAA-compliant TigerText Pro version, which requires a monthly subscription fee.

Summary: TigerText Pro offers a user-friendly interface and allows users to send mobile text messages and images to their colleagues in a HIPAA-compliant manner. Said text messages and images can be automatically deleted after the expiration of a sender-defined period of time, which, along with other similar features, provides a significant safeguard to ensure such information is kept secure. It is compatible with iPhone and Android devices, but not Blackberry devices.



8. MobilePDR^{11, 27-28} by

Skyscape and MedHand

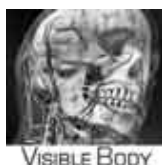
Use: Drug Reference

Cost: Free (requires a DEA number for providers)

Pros: MobilePDR provides a multitude of FDA-regulated drug reference information.²⁸

Cons: MobilePDR contains a smaller drug database than many of its competitors and requires user registration. Also, this App lacks a dosing calculator and formulary functions. Finally, use of this App is limited to DEA-sanctioned providers, thereby preventing utilization by a physician's support staff.

Summary: Unfortunately, MobilePDR's database contains fewer drugs than many of its competitors and it lacks functions possessed by many competing Apps. However, it is a user-friendly App that provides verified FDA-regulated data.²⁸ It is compatible with iPhone, Android, and Blackberry devices.



9. Human Anatomy Atlas²⁹⁻³¹

by Visible Body

Use: Patient Education

Cost: Full Version \$34.99

Pros: Via the utilization of the Human Anatomy Atlas App, users are able to annotate images and additionally print or email said images to their patients.²⁹ A 3D display allows the user to rotate, zoom and move images in order to look at them from different viewing angles.

Cons: The free version of Human Anatomy Atlas is no longer available. In addition, the labeling of anatomic structures within this App is occasionally deficient.³¹

Summary: Human Anatomy Atlas provides excellent image resolution and visually striking images in 3D. Such features make this App a very attractive tool for both physician and patient education. However, utilization requires the purchase of the full App.³¹ It is compatible with iPhone and Android devices, but not Blackberry devices.



10. Doximity³²⁻³⁴ by Visible Health

Use: Physician Contact Management, HIPAA-compliant fax/email/text-messaging

Cost: Free

Pros: Doximity possesses a physician contact directory, which allows users to search for physicians by both specialty and location. Similar to its competitors, Doximity possesses a multitude of features designed to ensure HIPAA-compliance (e.g. previously sent and stored messages are deleted after a fixed amount of time).³³ Consequently, Doximity allows users to fax, email and text message information, including high-resolution images, such as CTs or EKGs, in a secure, HIPAA-compliant manner.

Cons: Communication is limited to physicians who also subscribe to Doximity, which inherently excludes usage by non-physician staff.³⁴

Summary: For communication between physicians, Doximity is an effective App which streamlines communication and ensures said communication is sent in a secure, HIPAA-compliant manner. However, for larger practices necessitating HIPAA-compliant communication between physicians and non-physician staff, Doximity lacks the attractiveness of some of its competitors.³³ It is compatible with iPhone and Android devices, but not Blackberry devices.

Conclusions

At the time of this paper generation there are over 900,000 Apps in the iPhone App Store. The number of available Apps to answer a medical question is overwhelming. This article therefore provides a solid foundation to begin exploration of some of the best rated and most useful medical and HIPAA Apps available. Collectively, the requirements of HIPAA and its Security Rule are meticulous and outside of the purview of this article; to ensure compliance in their unique practice, physicians are encouraged to regularly discuss such issues with their compliance officer and/or attorney. Nonetheless, since West Virginia's patients and practitioners often experience access barriers to current medical expertise, use of the mobile smartphone Apps presented here will provide physicians, physician extenders and medical trainee's continually updated information that they can incorporate into daily clinical practice.

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Dr. Kerri Donahue
Pulmonary Medicine

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