Chapter 157

Use of Smartphones and its Applications in Medical Practice

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INTRODUCTION
The digital revolution has significantly impacted all the spectrums of our life but health care delivery systems have not yet made the best use of the technology at least in India as on today.

Tech-savvy doctors are using a vast array of smartphones, other digital devices and medical applications to better communicate with patients as well as to streamline and improve treatment options, get data at the point of care, and practice evidence-based medicine easily. Tech-savvy physicians, especially recent graduates, increasingly rely on digital and internet-based tools to communicate with patients and improve the medical outcomes of the care they provide.

BASICS OF TECHNOLOGY
Considering basics, a smartphone is a high-end mobile phone built on a mobile computing platform with portable media player, compact digital video camera and GPS navigation units. Additional features include high-resolution touchscreens, web browsers standard web pages than just mobile-optimized sites, high-speed data via Wi-Fi and mobile broadband. It evolved from 1992-Simon IBM-touchscreen, which was the first smartphone introduced and then came models like 2000-Ericsson R380, Nokia communicator, 2007-Nokia N95, GPS 6110, 2008-iphone 3G, 2010-Nokia N8, iphone 4, 2011-iphone 4s, 2010-Nokia N8, iphone 4, 2011-iphone 4s, Win Nokia Lumia 710, and the latest can be a HTC auto stereoscopy-3D without glasses. These work on a basic operating systems, platforms include Android (by Google, used on Intel, HTC, Samsung, Ericsson, Sony, Galaxy nexus). Bada OS for Samsung, Windows Mobile (by Microsoft) iPhone OS (by Apple, used on iPhone). BlackBerry OS (by RIM). Palm OS (by Palm, used on Palm PC-which is obsolete now. Soon we expect an open handset alliance where the portability and choice to select platform remains with the user.

REAL LIFE SCENARIO AND DIFFICULTIES
Some practical problems for non techno savvy and senior generation physicians that discourage to use smartphones are:
- Size of the screen-small-refraction
- Getting adjusted to key pad: QWERTY
- Touch screen adjustments
- Hitting the nearby letter
- Thumb-index vs little finger: Scrolling
- Thick fingers or skin
- Gloves interfere with touch
- May have to use a special pen.

WHICH PHONE TO HAVE?
While selecting a smartphone please decide your expectations and requirements that are:
- Smooth transition from old to new unit
- Display: AMOLED screen—must see clearly lit even at mid sunny day
- Processor: Dual core
- Faster Connectivity: Wi-Fi, Direct Bluetooth version 3.0
- Printers, scanners compatible
- Cameras: Front-Back for video calling
- Storage: expandable memory
- Voice recognition: SIRI for iphone 4, ipad 3, using Google Voice Search on the Android HTC.

HOW IT WORKS—WHAT IS AN APPLICATION?
All activities done on a smart phone runs through applications—a software solution. Your resident may say there is an application for that all process you need in clinical medicine. We need to be very selective in choosing applications or software required on our mobile. Please check these things before buying, using and recommending an application:
- By whom the phone is created, can be checked by looking at the manufacturer’s CV
- Knowing the center, location and institute where it has been manufactured
- Credibility of the mobile can be checked through its past track
- Consumed by how many users
- Most important, look for its criticism by going through reviews including for and against.

Applications can be downloaded from application store or Android market. Many free applications exist but it is always advisable to purchase a reputed application. The price range is from 50 rupees to 28,900 rupees. One should always update high-end version.

Computer applications on the mobile device include simplified calculator, Qx calculator, e-books, interactive reference materials, training modules, medical software devices, data collection tools, interactive patient handouts, etc.

Other simple uses and applications by using basic free software are:
- Storing videos of recovered patients as testimonials
- Prior and changed progressed activities of the same patient
- High-end camera for medical photography
- Fast web browser and email scheduler.
- Scanner, visiting card reader
- Remote watch CCTV of your different working place
General

- Storing medical records
- Instant messaging service like BBM, Whatsapp, iPhone messenger eBuddy at time of emergency or hand overs of shifts
- Data applications for games exist which improve surgeons skills for certain procedures.

UTILITY IN OPD SERVICES OUTFIELDS

- Help in secretarial work like appointments and scheduling
- Two-way communication: Electronic
- Patient data base: if used judiciously and with own preference orientation
- Track on important health days like 14th November is World Diabetes Day
- Greetings-reminders-education-by daily autogenerated health SMS
- Making payment online by HCP gateway
- Keeping basic and primary data, can be entered by patient himself or by assistants, including
  - Body mass index (BMI): surface area
  - Epidemiological data
  - Reminder-allergies-deficiencies G6PD
  - Own set of contradictions-interactions in the protocols
  - Risk score utilization.

ROLE IN HOSPITAL WHILE EXAMINING PATIENTS

Numerous hidden equipment exist in a smart phone like itorch, pulse rate, SpO₂ measurement by pulse oximeter, NETRA for vision testing and color blindness that would be beneficial for patient’s examination.

CellScope takes a standard cell phone and transforms it into a compact, high-resolution, handheld microscope with the capability of these:
- On-site disease diagnosis wireless transmission of patient data to clinical centers for remote diagnosis and treatment
- GlucoPhone for diabetes management
- Nanosensors Medical tattoos Na/K/Glucose/Oxygen, electronic skin to sense as multifunction electrodes
- Dictation software applications: Text to speech for records.
- An effective tool in community gastroenteritis breakdown—food poisoning. It has cell phone-based fluorescent imaging and sensing platform. Microelectrodes detect the presence of the bacterium *Escherichia coli* in food and water. It has combined antibody functionalized glass capillaries with quantum dots as signal reporters to specifically detect *E. coli* particles in liquid samples. This is a lightweight, compact attachment to an existing cell-phone camera.
- Handheld ultrasound: Doppler uses commercial USB ultrasound probes with Microsoft Windows smartphones. Along with the traditional uses of clinical ultrasound imaging, its convenience can be utilized for imaging veins arteries for starting IVs and central lines, as well as for gathering data in remote regions of the developing world for analysis on the spot, or sending that data back to a centralized service if needed for a second opinion and review. Like these many more gadgets are in pipeline and will ease our job as clinicians.
- Remote monitoring all vital signs, ECG diagnosis of AMI and arrhythmias—Air strip cardiology
- Interpreting radiology investigations by sharing screen with use of team viewer a friendly software.

INFORMATION AT POINT OF CARE

Preferred source for information at point of care include Epocrates, Skyscape E-Medicine, Pubmed Medscape, UpToDate, and other nonspecified but selective applications for a disease condition.

Application like Skyscape gives detail clinical and drug references, clinical resources, coding resources, constellations, drug information, interactions, toxicity treatments, drug identification evidence-based medicine, lab or diagnostic resources, and medical calculators, dictionaries and news or journals “NEJM This Week”. It also offers etymology-dictionary-short forms, peer review-indexed daily new happenings, ongoing trials, conferences, and future directions in any selected topics. Animations of medical procedures add a lot to the life of a resident in reducing his learning curve. Teaching and demonstrating CPR-Heimlich Maneuver can all be done through an application of smart phone-CPR and choking by stone meadow development LLC.

Research-Publications-Medical Informatics

In research and database management activities many programs and formulae base applications exist that we have to select it according to our needs.

INDIAN SOFTWARE AND APPLICATIONS SCENARIO

Many health applications are devised by Indians but marketed by others. One Indian application suits to all needs in m-medicine by “mmedicine.mobi” that has features like Indian drug reference, interactions, prescription, patient data, etc.

VALUE FOR OUR PATIENTS

Patient himself can track record of important values, such as
- Checking hemoglobin, blood glucose, A1c, body weight, body mass index, etc.
- Graphs-bar charts impress all
- Medical calculators for risk scores
- Preventive aspect for first order relatives
- Mailing further progress-plan
- E-prescription can transmit and receive electronic prescriptions. After writing a prescription, you can save the drug and the specific way you prescribe it to your “favorites list” for faster future prescribing.

Role in Enhancing Your Practice

- Register in Google Maps and have your own website
- Get noticed in different searches of medical database or doctors list
- From the locality—people can locate you—in google search or service like Just-Dial, Find a Doctor, etc. will increase your Web presence and actual practice.

CONCERNS

No technology is free of drawbacks and hassles and cell phones also come with their pros and cons that are:
- Cell phone radiation leads to hyperactive offspring in mice and many unknown toxicities
- Threats of malignancy exist
- Proneness for accidents
- Behavior problems, loneliness, web dependence and depression, etc.
- Cyber health crimes: teratogenicity in long run may raise an alarm.

GET TUNED TO THE FUTURE

Opportunities are endless. It is up to us how we take and use it. Do not get lost in the maze of applications or get trapped in the cobwebs of Internet. Aim at what you want to know, learn or practice but use your peripheral handheld brain.
GLIMPSE OF FUTURE

- Hospital information services for the mobile
- Specialized services and the near-field communication
- Cloud-based services integrated into a server
- Complete digitalization of medical care, universal accessibility of medical records
- Specially designed phones with hardware calibrated to special needs like stethoscope, Doppler, USG, fundoscopy
- Special software for ECGs, X-ray’s interpretation, diagnostic charts, etc.

CONCLUSION

Wireless technologies in the medical device market will continue to expand in the next several years. Telehealth, med health, home healthcare and new use of smart handheld devices will drive the growth of healthcare in general. More devices will be connected together as reliable and secure end-to-end connection slowly evolves. Home-remotely monitored health care will remain a fast growing market to meet the demands of our large aging population, point-of-care and handheld devices may go through what was experienced when the PC was first introduced—a lot variety and volume. As digital devices put more critical information in the hands of physicians, “the potential applications are virtually limitless”.

BIBLIOGRAPHY