

## Theme 15. Electronic Health Record

There is no universally accepted definition of an EHR. As more functionality is added the definition will need to be broadened. Importantly, EHRs are also known as electronic medical records (EMRs), computerized medical records (CMRs), electronic clinical information systems (ECIS) and computerized patient records (CPRs). Figure 14.1 demonstrates the relationship between EHRs, EMRs and personal health records (PHRs).

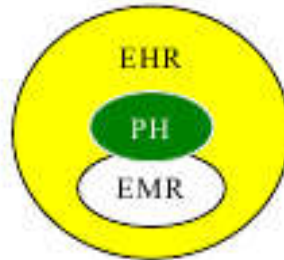


Fig. 14.1. Relationship between EHR (electronic health record), PHR (personal health record) and EMR (electronic medical record)

The consensus is that:

- The EHR is the larger system that includes the EMR and PHR and interfaces with multiple other electronic systems locally, regionally and nationally.
- The EMR, on the other hand, is the electronic patient record located in an office or hospital.
- The PHR is a collection of health information by and for the patient. There is overlap between the EMR and the PHR, since the PHR can be part of the EMR as will be pointed out in the chapter on patient informatics.

The following definitions to standardize terms of Health Information Technologies are used:

**Electronic Medical Record:** “An electronic record of health-related information on an individual that can be created, gathered, managed and consulted by authorized clinicians and staff within one healthcare organization”.

**Electronic Health Record:** “An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be created, managed and consulted by authorized clinicians and staff across more than one healthcare organization” (Fig. 14.2).

**Personal Health Record:** “An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be drawn from multiple sources while being managed, shared and controlled by the individual”.

Carte, Jam - Cone - SRSEHR

File Drawers View Mail Reports Tools Help

Appointments

10/12/2011 | Cone, Rodney

Time	Name	Appointment Type
09:15 AM	Harris, Richard	Follow-up
09:30 AM	Casper, Carolyn	Exam - New Pat
09:45 AM	Brown, Kevin	Exam - Est. Pat
10:00 AM	Skinner, Michael	Consult
10:30 AM	Cutting, Aaron	Exam - Est. Pat
10:30 AM	Meril, Leslie	Exam - Est. Pat
10:30 AM	Wang, Richard	Consult
10:45 AM	Copeland, Elizabeth	Consult
11:00 AM	Derek, Martin	Exam - New Pat
11:30 AM	Schnur, Bert L.	Consult
01:00 PM	Pattrow, Mary	Consult
01:00 PM	Simon, Carly	Exam - Est. Pat
01:15 PM	Gold, Alan	Exam - Est. Pat
01:30 PM	Dipiero, Drew	Consult
01:30 PM	Glass, Tyler	Exam - Est. Pat
02:15 PM	Thompson, Brian	Exam - Est. Pat
02:30 PM	Carter, James	Consult
02:45 PM	Morris, Philip	Exam - New Pat
03:00 PM	May, Jake	Consult
03:45 PM	Copeland, Elizabeth	Exam - Est. Pat
04:00 PM	Brown, Kevin	Exam - Est. Pat
04:15 PM	Newsome, Gina	Exam - Est. Pat

Mail Status

Normal 5

Rx 12

Clinical Summary

**Carter, James**

Demographics

Address: 124 Jackson Rd  
Groton, CT 06349  
Phone: (201) 565-4458  
DOB: 03.15.1925  
Age: 86  
Patient ID: 86009

Referring Physician  
Roberts, John  
300 Thames Street  
Suite 200  
Groton, CT 06349

Pharmacy Directions  
CVS Pharmacy #1475  
10233 OLD GEORGETOWN ROAD  
BETHESDA, MD 20814  
P (301) 530-1065  
F (301) 530-7394

Dictations

Appt Time Completed

10.12.2011 09:00 AM

Surgeries

Description	Date
Laser Retinopathy OS	2001
PhacoPCOL OS	2000
PhacoPCOL OD	1999
ALT OD	1995
ALT OS	1995

Intraocular Pressure

Date	Right	Left	Physician
01.29.2010	15	14	Rodney C...
01.12.2009	15	13	Rodney C...

Visual Acuity

Date	OD	OS	User
01.29.2010	20/40	20/30	Rodney C...
01.12.2009	20/40	20/40	Rodney C...

Problems

Problem	Dx Day	ICD-9	Notes
Open Angle Glaucoma...	09.28.2011	365.01	

Smoking Status

Status	ID	Date
Former smoker	5	10.05.2011

Appointments

Date	Time	Doctor	Type
10.12.2011	09:00 AM	Cone, Rodney	Consult
10.12.2011	02:30 PM	Armstrong, Max	Consult
11.10.2010	02:30 PM	Armstrong, Max	Consult

Rx History

Status	Date	Drug	Strength	Instructions
+	01.19.2011	Lumigan	0.03 %	1 gtt OD qHS
+	01.19.2011	Cosopt	2-0.5 %	1 gtt OD BID
+	01.19.2011	TobraDex	0.3-0.1 %	1 gtt OS TID x 5 Days
+	01.19.2011	Patanol	0.1 %	1 gtt OD BID prn

Non-Drug Allergies

Description	Reaction	Notes
Latex	Hives	
Penicillin	Rash	
TobraDex	rash	Irritation
Lumigan	Redness and Rash	
Shellfish	Throat Swelling	

Current encounter: 10/12/2011 2:30:00 PM

Transfer Encounters

Chart Notes History Topography Flow Sheet Clinical Photos Visual Fields - Left Visual Fields - Right Angiograms

Fundus Photos HRT OCT/FANG/ICG IOL Consult Letters Sent Eyeglass Rx Op-Reports Patient Information

Fig. 14.2. Sample view of an electronic health record based on images

The following are the most significant reasons why our healthcare system would benefit from the widespread transition from paper to electronic health records.

- *The paper record* is severely limited. Much of what can be said about handwritten prescriptions can also be said about handwritten office notes. Fig. 14.3 illustrates the problems with a paper record. In spite of the fact that this clinician used a template, the handwriting is illegible and the document cannot be electronically shared or stored. It is not structured data that is computable and hence sharable with other computers and systems. Other shortcomings of paper: expensive to copy, transport and store; easy to destroy; difficult to analyze and determine who has seen it; and the negative impact on the environment. Electronic patient encounters represent a quantum leap forward in legibility and the ability to rapidly retrieve information. Almost every industry is now computerized and digitized for rapid data retrieval and trend analysis.

<p><b>Date:</b> _____</p> <p><b>Reg. No.:</b> _____</p> <p><b>Name:</b> _____</p> <p><b>Date of Birth</b> ____/____/____</p> <p><b>Age:</b> ____ Yrs. ____ Months.</p> <p><b>SEX:</b> <input type="checkbox"/> M <input type="checkbox"/> F</p> <p><b>Next of Kin</b> _____</p> <p><b>Residence</b> _____</p> <p><b>Reasons for Visit:</b></p> <p><input type="checkbox"/> Antenatal care</p> <p><input type="checkbox"/> C W C</p> <p><input type="checkbox"/> Family Planning</p> <p><input type="checkbox"/> Peaditrics</p> <p><input type="checkbox"/> Adult Medicine</p> <p><b>Problems:</b> _____</p> <p>_____</p> <p>_____</p> <p><b>Vital Signs:</b></p> <p><b>Systolic BP:</b> _____</p> <p><b>Diastolic BP:</b> _____</p> <p><b>Pulse:</b> _____</p> <p><b>Weight:</b> _____ Kg.</p> <p><b>Height:</b> _____ cm</p> <p><b>Temperature:</b> _____ °C</p> <p><b>Family Planning:</b></p> <p><input type="checkbox"/> Counseling</p> <p><b>Method used:</b> _____</p>	<p><b>OB/Family Planning Notes:</b></p> <p>_____</p> <p>_____</p> <p>_____</p> <p><b>Ancillary Services Used:</b></p> <p style="text-align: center;"><i>Laboratory Results</i></p> <p><input type="checkbox"/> HB: _____</p> <p><input type="checkbox"/> Urinalysis _____</p> <p><input type="checkbox"/> Stool Exam _____</p> <p><input type="checkbox"/> Blood Sugar _____</p> <p><input type="checkbox"/> VDRL _____</p> <p><input type="checkbox"/> HIV - antibody _____</p> <p><input type="checkbox"/> Malaria Smear _____</p> <p><input type="checkbox"/> Pregnancy Test _____</p> <p><input type="checkbox"/> Pap smear _____</p> <p><input type="checkbox"/> Brucella Test _____</p> <p><input type="checkbox"/> HVS Test _____</p> <p><input type="checkbox"/> Widal Test _____</p> <p><input type="checkbox"/> Sputum for AAFB _____</p> <p><input type="checkbox"/> Blood Grouping _____</p> <p><input type="checkbox"/> X-ray: 1 _____</p> <p style="text-align: center;">2 _____</p> <p>Other services _____</p> <p><b>Antenatal Care:</b></p> <p><b>LMP:</b> ____/____/____</p> <p><b>Est. Delivery Date:</b> ____/____/____</p> <p><b>Fundal Height:</b> _____ Cm</p> <p><b>Gestation:</b> _____ Wks</p> <p><b>Fetal Movement:</b> YES   NO</p> <p><b>Parity</b> _____ <b>Fetal heart beat</b> _____</p> <p><input type="checkbox"/> TT1 <input type="checkbox"/> TT2</p>
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<p><b>Child Welfare Clinic:</b></p> <p><b>Head circumference</b> _____ cm</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Immunization</th> <th style="text-align: center;">0</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> </tr> <tr> <td>DPT given</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Polio given:</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Measles given:</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Hepatitis B</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Hepatitis A:</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Bc G: given:</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Scar (Present?)</td> <td style="text-align: center;">Y</td> <td style="text-align: center;">N</td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> </table> <p><b>Other:</b> _____</p> <p><b>Paediatric Notes:</b></p> <p>_____</p> <p>_____</p> <p>_____</p> <p><b>Adult Medicine Notes:</b></p> <p>_____</p> <p>_____</p> <p>_____</p> <p><b>Final Diagnosis:</b></p> <p>_____</p> <p>_____</p> <p>_____</p>	Immunization	0	1	2	3	DPT given	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Polio given:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Measles given:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hepatitis B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hepatitis A:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bc G: given:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Scar (Present?)	Y	N			<p><b>Treatment:</b></p> <p><i>Drugs/Injections &amp; Other:</i></p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>4. _____</p> <p>5. _____</p> <p><b>Referral:</b> _____</p> <p><b>Financial Office:</b></p> <p style="text-align: right;">Paid</p> <p><b>Item:</b> _____ <b>Ksh:</b> _____ <input type="checkbox"/></p> <p><b>Item:</b> _____ <b>Ksh:</b> _____ <input type="checkbox"/></p> <p><b>Item:</b> _____ <b>Ksh:</b> _____ <input type="checkbox"/></p> <p><b>Item:</b> _____ <b>Ksh:</b> _____ <input type="checkbox"/></p> <p><b>Item:</b> _____ <b>Ksh:</b> _____ <input type="checkbox"/></p> <p><b>Next Visit:</b></p> <p><b>Date:</b> ____/____/____</p> <p><b>Reason for next visit/clinic to visit</b></p> <p>_____</p> <p>_____</p>
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EHRs are much better organized than paper charts, allowing for faster retrieval of lab or x-ray results. It is also likely that EHRs will have an electronic problem summary list that outlines a patient's major illnesses, surgeries, allergies and medications. How many times does a physician open a large paper chart, only to have loose lab results fall out? How many times does a physician re-order a test because the results or the chart is missing?

EHRs allow easy navigation through the entire medical history of a patient. Instead of asking to “pull paper chart volume 1 of 3” to search for a lab result, it is simply a matter of a few mouse clicks. Another important advantage is the fact that the record is available 24 hours a day, 7 days a week and doesn’t require an employee to pull the chart, nor extra space to store it. Importantly, electronic health records are accessible to multiple healthcare workers at the same time, at multiple locations. While a billing clerk is looking at the electronic chart, the primary care physician and a specialist can be analyzing clinical information simultaneously. Moreover, patient information should be available to physicians on call so they can review records on patients who are not in their panel. Furthermore, it is believed that electronic health records improve the level of coding. Do clinicians routinely submit a lower level of care for billing purposes because they know that handwritten patient notes are short and incomplete? Templates may help remind clinicians to add more history or details of the physical exam, thus justifying a higher level of coding (Templates are disease

specific electronic forms that essentially allow you to point and click a history and physical exam). Lastly, EHRs provide clinical decision support such as alerts and reminders.

- *The need for improved efficiency and productivity.* The goal is to have patient information available to anyone who needs it, when they need it and where they need it. With an EHR, lab results can be retrieved much more rapidly, thus saving time and money. It should be pointed out however, that reducing duplicated tests benefits the payers and patients and not clinicians so there is a misalignment of incentives. If lab or x-ray results are frequently missing, the implication is that they need to be repeated which adds to this country's staggering healthcare bill. The same could be said for duplicate prescriptions. EHRs are more efficient because they reduce redundant paperwork and have the capability of interfacing with a billing program that submits claims electronically. With an EHR, lab results can be forwarded via secure messaging. Electronic health records can help with productivity if templates are used judiciously. As noted, they allow for point and click histories and physical exams, thus saving time. Embedded educational content for clinicians is one of the newest features of a comprehensive EHR. Clinical practice guidelines, linked educational content and patient handouts can be part of the EHR. This may permit finding the answer to a medical question while the patient is still in the exam room. Several EHR companies also offer a centralized area for all physician approvals and signatures of lab work, prescriptions, etc. This should improve work flow by avoiding the need to pull multiple charts or enter multiple EHR modules.

- *Quality of care and patient safety.* As we have previously suggested, an EHR should improve patient safety through many mechanisms: (a) Improved legibility of clinical notes (b) Improved access anytime and anywhere (c) Reduced duplication (d) Reminders that tests or preventive services are overdue (e) Clinical decision support that reminds us of patient allergies, the correct dosage of drugs, etc. (f) Electronic problem summary lists provide diagnoses, allergies and surgeries at a glance. Use of an EHR decreased mortality.

Quality reports are far easier to generate with an EHR compared to a paper chart that requires a chart review. Quality reports can also be generated from a data warehouse that receives data from an EHR and other sources.

- *Public expectations.* According to a literature, 55% of adults thought an EHR would decrease medical errors; 60% thought an EHR would reduce healthcare costs and 54% thought that the use of an EHR would influence their decision about selecting a personal physician. The Center for Health Information Technology would argue that EHR adoption results in better customer satisfaction through fewer lost charts, faster refills and improved delivery of patient educational material.

- *Financial savings.* The Center for Information Technology Leadership (CITL) has suggested that ambulatory EHRs would save \$44 billion yearly and eliminate more than \$10 in rejected claims per patient per outpatient visit. This organization concludes that not only would there be savings from eliminated chart rooms and

record clerks; there would be a reduction in the need for transcription. There would also be fewer callbacks from pharmacists with electronic prescribing. It is likely that copying expenses and labor costs would be reduced with EHRs. More rapid retrieval of lab and x-ray reports results in time saving as does the use of templates. More efficient patient encounters mean more patients.

Electronic Health Records could be seen each day. Improved savings from medication management is possible with reminders to use the “drug of choice” and generics. It is not known if EHR adoption will decrease malpractice, hence saving physician and hospital costs.

- *Technological Advances.* The timing seems to be right for electronic records partly because the technology has evolved. The Internet and World Wide Web make the application service provider (ASP) concept for an electronic health record possible. An ASP option means that the EHR software and patient data reside on a remote web server that you access via the Internet from the office, hospital or home. Computer speed, memory and bandwidth have advanced such that digital imaging is also a reality, so images can be part of an EHR system. Standard PCs, laptops and tablet PCs continue to add features and improve speed and memory while purchase costs drop. Wireless and mobile technologies permit access to the hospital information system, the electronic health record and the Internet using a personal digital assistant, smart phone or laptop computer.

### **Electronic Health Record Key Components**

The following components are desirable in any EHR system. The reality is that many EHRs do not currently have all of these functions.

- Clinical Decision Support Systems (CDSS) to include alerts, reminders and clinical practice guidelines.
- Secure messaging (e-mail) for communication between patients and office staff and among office staff.
- An interface with practice management software, scheduling software and patient portal (if present).
- Managed care module for physician and site profiling. This includes the ability to track Health plan Employer Data and Information Set (HEDIS) or similar measurements and basic cost analyses.
- Referral management feature.
- Retrieval of lab and x-ray reports electronically.
- Retrieval of prior encounters and medication history
- Computerized Physician Order Entry (CPOE). Primarily used for inpatient order entry but ambulatory CPOE also important.
- Electronic patient encounter. One of the most attractive features is the ability to create and store a patient encounter electronically. In seconds you can view the last encounter and determine what treatment was rendered.

- Multiple ways to input information into the encounter should be available: free text (typing), dictation, voice recognition and templates.
  - The ability to input or access information via a PDA, smart phone or tablet PC.
  - Remote access from the office or home.
  - Electronic prescribing.
  - Integration with a Picture Archiving and Communication System.
  - Knowledge resources for physician and patient, embedded or linked
  - Public health reporting and tracking.
  - Ability to generate quality reports for reimbursement, discussed in the chapter on pay-for-performance.
  - Problem summary list that is customizable and includes the major aspects of care: diagnoses, allergies, surgeries and medications.
  - Ability to scan-in text or use optical character recognition (OCR).
  - Ability to perform evaluation and management (E & M) determination for billing.
  - Ability to create graphs or flow sheets of lab results or vital signs.
  - Ability to create electronic patient lists or disease registries.
  - Preventive medicine tracking that links to clinical practice guidelines
- Electronic Health Records.
- Ability to generate a continuity of care document (CCD) or continuity of care report (CCR), discussed in the interoperability chapter
  - Support for client server or application service provider (ASP) option

### **Computerized Physician Order Entry (CPOE)**

CPOE is an EHR feature that processes orders for medications, lab tests, x-rays, consults and other diagnostic tests. CPOE will:

1. *Reduce medication errors.* CPOE has the potential to reduce medication errors through a variety of mechanisms. Because the process is electronic, you can embed rules-engines that allow for checking allergies, contra-indications and other alerts. Advantages of CPOE compared to paper-based systems:

- a) CPOE overcomes the issue of illegibility
- b) Fewer errors are associated with ordering drugs with similar names
- c) More easily integrated with decision support systems than paper
- d) CPOE is easily linked to drug-drug interaction warnings
- e) More likely to identify the prescribing physician
- f) Able to link to adverse drug event (ADE) reporting systems
- g) Able to avoid medication errors like trailing zeros
- h) CPOE will create data that is available for analysis
- i) CPOE can point out treatment and drugs of choice
- j) Has the potential to reduce under and over-prescribing
- k) Prescriptions reach the pharmacy quicker

2. *Reduce costs.* Several studies have shown reduced length of stay and overall costs in addition to decreased medication costs with the use of CPOE.

3. *Reduce variation of care.* One study showed excellent compliance by the medical staff when the drug of choice was changed using decision support reminders.

### **Electronic Health Record Examples**

#### **Open-Source and Free EHRs.**

Wikipedia lists more than 10 national and international open-source EHRs.

- **OpenVista** is an open-source initiative based on the popular Vista program the VA system uses and is available for download without charge.

- **WorldVista** was released in October 2005. Features include:

- ✓ Patient registration
- ✓ Lab and vital signs graphing
- ✓ Clinical reminders for chronic disease management
- ✓ Clinical order entry
- ✓ Progress note templates
- ✓ Results reporting
- ✓ Ability to interface to existing practice management/billing systems, lab services and other applications
- ✓ Scanning and inclusion of scanned documents into the medical record
- ✓ Prescription filing and faxing
- ✓ Clinical quality measure reporting capabilities
- ✓ Support for disease management, using clinical reminders
- ✓ Templates for obstetrics/gynecology (OB/GYN) and pediatrics care

- **Medsphere OpenVista** is a vendor that will offer an open source version on a subscription basis that covers upgrades and support. Their program is offered in two configurations: enterprise for an organization and clinic configuration for smaller clinics and multi-specialty groups. The software will operate on a Linux or Windows operating system.

- **OpenEMR** is an open-source GPL license EHR with practice management, electronic billing, the ability to generate electronic prescriptions and HL7 support. It is intended for small ambulatory practices and available as a client-server or ASP model.

- **PracticeFusion.** The program includes scheduling, patient encounters, knowledge resources, growth charts, advanced directives, customizable templates, the ability to upload documents and a fee-based billing interface and fee-based document copying service.

- **MDBug** is another free web-based EHR that has a billing service, lab interfaces and a patient portal that includes secure messaging, access to lab results, online appointments, online bill payment and access to online forms.

### **Personal Health Records (PHRs)**

According to the American Health Information Management Association (AHIMA) the personal health record (PHR) is: *“an electronic, universally available, lifelong resource of health information needed by individuals to make health decisions”*.

The National Alliance for Health Information Technology defines a PHR as follows: *“an individual’s electronic record of health-related information that conforms to nationally recognized interoperability standards and that can be drawn from multiple sources, while being managed, shared controlled by the individual”*.

The first principle endorsed by the Personal Health Technology Council is that *“individuals should be able to access their health and medical data conveniently and affordably”*.

### **Ideal PHR Features**

In spite of the fact that PHRs are new and are available in many formats, experts believe that PHRs should have the following features in order to be successfully adopted:

- Portable, meaning that the information will follow you even when there is a job, insurer or clinician change.
- Interoperable, meaning the PHR format can be shared among disparate partners.
- Autopopulated, which would mean that clinical and test results would be inputted automatically.
- Controlled by the patient.
- Longitudinal record and not just a snapshot.
- Private and secure.
- Must fit into clinician’s workflow and not be a separate process.
- May benefit from being certified.

The reality is that no organization has the ideal solution, with all of the above features.

### **PHR Formats**

**Tethered.** The word tethered implies that the PHR is connected to one platform and not interoperable. The earliest and most common examples of this would be claims-based PHRs from insurers and healthcare organizations. Other examples would be PHRs tethered to an EHR or standalone patient portal. Payer-based PHRs have the advantages of being free to patients and easy to populate with claims data. They have the disadvantages of not being portable or interoperable and not controlled by patients. Moreover, claims data is always several weeks old and usually tells you that a test was ordered and does not provide the actual results. Furthermore, the payer-based PHR is not longitudinal because it is likely that it only covers patient encounters insured by their company.



**Untethered PHRs.** Untethered PHRs imply they are not connected to one platform and there have more interoperability potential. PHR programs are available in multiple mobile and static platforms. There are more than fifty untethered personal health record products on the market, giving consumers many choices but obvious limitations.

- **Web based.** Most are commercial sites that are secure and can be accessed from a distant site. A minority of PHRs reside in patient portals that connect to an electronic health record system.

- **Mobile technology.** Patient information can be downloaded to:

- ✓ *Secure digital cards and USB drives:* Most USB programs synchronize to a web based portal where patient information is also stored. Mobile technology offers several unique advantages. It is not dependent on the Internet for operation and is truly portable but not interoperable. In 2006 a new USB drive in the form and size of a credit card with memory up to 2 GB appeared and is now available as a PHR.
- ✓ *Smart Phones:* Given the soaring popularity and expanding features of smart phones they may become the mobile storage of choice. The information will be derived from claims data and patient input. The program will use MobiSecure Wallet and Vault to access the Internet and authenticate the user. Another example is MyRapidMD that downloads a client's emergency medical information to any Java enabled cell phone.
- ✓ *Smart Cards:* Most smart cards are used for patient authentication in the healthcare environment. Most smart cards can hold KB-144KB of information (60 plus pages of single spaced text). These cards have a small processor that can be programmed to do several tasks such as encryption and are re-writable. Cards can be read by contact or be contactless, using radio frequency (RF). The card is updated every time it is placed in a card reader and autopopulates with demographics, lab results, etc.

- **Personal Health Record Systems** is an arbitrary term to indicate an untethered PHR that is interoperable. The following are the major examples of these systems:

- ✓ **Google Health:** Google entered the PHR market in 2008 with a pilot project with the Cleveland Clinic and subsequently made their product available to the public in May 2008. Their product is known as Google Health and offers a very simple patient interface that includes a medical topics search engine, discussion boards, drug-drug interaction engine and a do-it-yourself PHR.

- **Microsoft HealthVault:** Microsoft announced in 2007 that they would offer a free service known as HealthVault. It is not a PHR, but is instead a means to upload and store health information. You must register for other free or fee-based programs to upload information such as blood pressure or glucometer results.

- **Dossia:** The system was founded by Applied Materials, BP America, Intel, Pitney Bowes and Walmart with data derived from insurers, pharmacies and physicians.

- **MiCare:** In 2008 the Military Health System began a pilot PHR program known as MiCare at Madigan Army Medical Center. They will download 24 months of demographics, med lists, allergy data, lab and x-ray results, appointments and visit documentation from the military electronic health record known as AHLTA for 250 test patients. At this point, patients have the choice of storing the information in Microsoft HealthVault or Google Health. They plan to expand to additional locations and add secure messaging.

### **Control questions**

1. What are Electronic Medical Record (EMR), Electronic Health Record (EHR) and Personal Health Record (PHR)?
2. What are advantages of using EHR over paper record?
3. What are Electronic Health Record Key Components?
4. What are the main features of PHR?
5. What are the formats of PHR?

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