Efforts in the United States to Advance Adoption of e-Health

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Outline

- Problems in US healthcare system and a vision for fixing them
- Biomedical and health informatics is part of the solution
- Incentivizing use of the electronic health record (EHR)
- What have we accomplished?

2

Some problems in healthcare addressed by informatics

- Quality – not as good as it could be (McGlynn, 2003; Schoen, 2009; NCQA, 2010)
- Safety – errors cause morbidity and mortality; many preventable (Kohn, 2000; Classen, 2011; van den Bos, 2011)
- Cost – rising costs not sustainable; US spends more but gets less (Angrisano, 2007; OECD, 2011)
- Inaccessible information – missing information frequent in primary care (Smith, 2005)

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Some visions for solving these problems

- Action must be taken to address (Smith, 2012)
  - $750B in waste (out of $2.5T system)
  - 75,000 premature deaths
- Sources of waste – from Berwick (2012)
  - Unnecessary services provided
  - Services inefficiently delivered
  - Prices too high relative to costs
  - Excess administrative costs
  - Missed opportunities for prevention
  - Fraud
- One vision for repair is the IOM's "learning healthcare system" (Smith, 2012)

BEST CARE AT LOWER COST

The Path to Continuously Learning Health Care in America

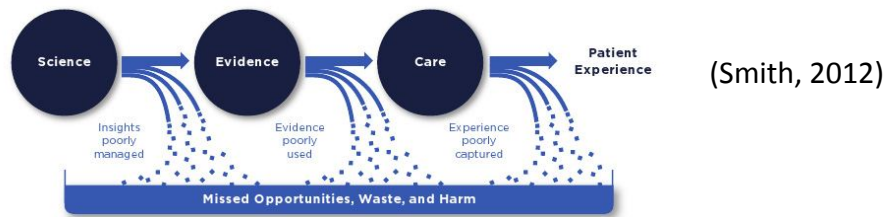http://www.iom.edu/Reports/2012/Best-Care-at-Lower-Cost-The-Path-to-Continuously-Learning-Health-Care-in-America.aspx

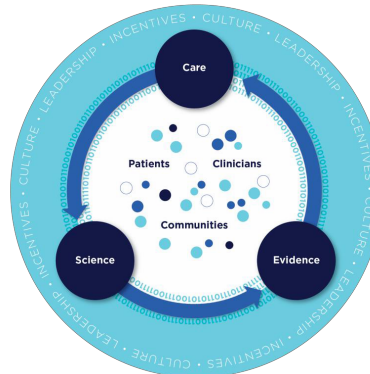Triple aim (Berwick, 2008)
- Better care
- Better health
- Lower cost

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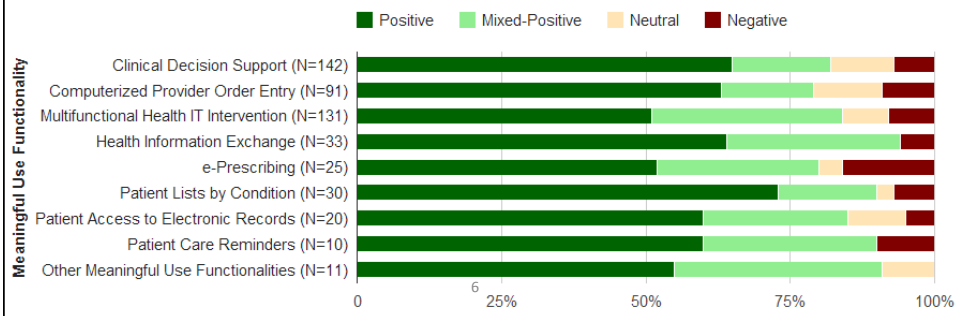
We need to go from:

(Smith, 2012)

To:

Growing evidence that information interventions are part of solution

- Series of systematic reviews (Chaudhry, 2006; Goldzweig, 2009; Buntin, 2011; Jones, 2014) have identified benefits in a variety of areas
  - Benefits aggregated by meaningful use categories
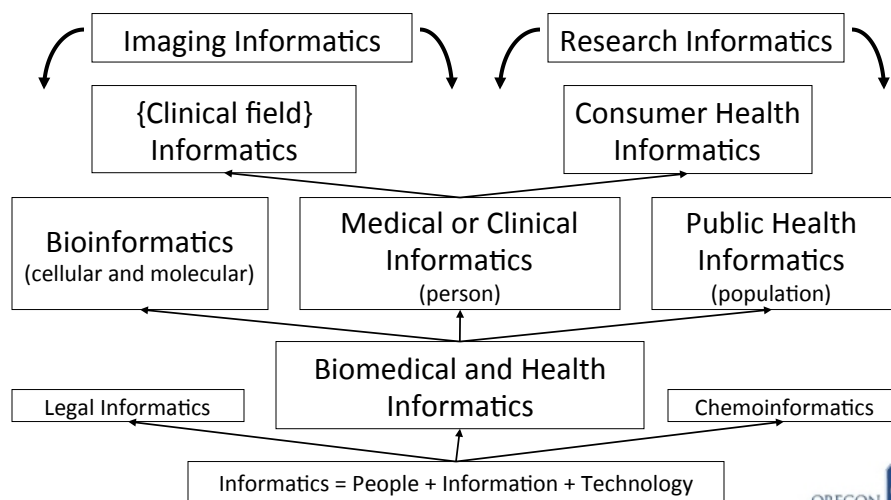 - Increasingly studies using commercial systems

What is biomedical and health informatics?

- Biomedical and health informatics (BMHI) is the science of using data and information, often aided by technology, to improve individual health, health care, public health, and biomedical research (Hersh, 2009)
  - It is about information, not technology
- Practitioners are BMHI are usually called informaticians (sometimes informaticists)

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Biomedical and health informatics

Imaging Informatics		Research Informatics

{Clinical field} Informatics		Consumer Health Informatics

Bioinformatics (cellular and molecular)	Medical or Clinical Informatics (person)	Public Health Informatics (population)

Legal Informatics	Biomedical and Health Informatics	Chemoinformatics

Informatics = People + Information + Technology

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Why are we not there? (Hersh, 2004)

Health Care Information Technology
Progress and Barriers

William Hersh, MD

IN THE 3 DECADES SINCE THE TERM "MEDICAL INFORMAT-
ics" was first used, individuals working at the intersec-
tion of information technology (IT) and medicine have
developed and evaluated computer applications aim-

in this issue of *JAMA*, Slack demonstrates the value that patient-
physician e-mail can have in improving patient care, and also
catalogs the incomplete but encouraging underlying evi-
dence.[11] As with many applications of IT, the technology can
improve the existing situation but also empower clinicians
and patients to think more fundamentally about how inno-
vation can lead to changes in the way medicine is practiced.

- Cost
- Technical challenges
- Interoperability
- Privacy and confidentiality
- Workforce

care IT.[8,9] It is no exaggeration to declare that the years ahead
portend the "decade of health information technology."[10]
   Informatics is poised to have a major impact in patient-
clinician communication. In the Clinical Crossroads article

See also p 2255.

ment. The rest goes to those who typically do not pay for

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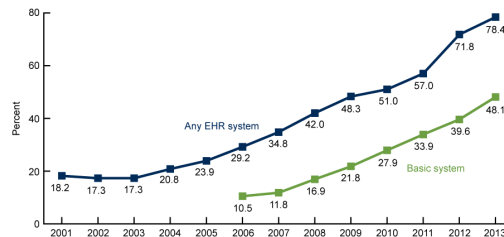
The US is a laggard, but improving (Schoen, 2012)

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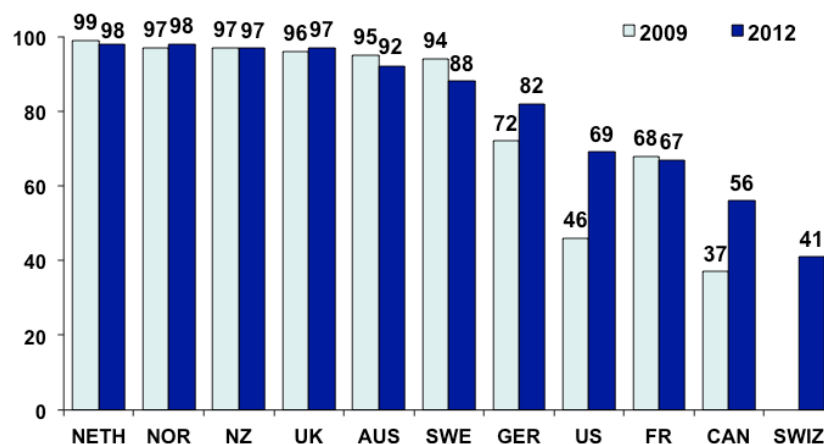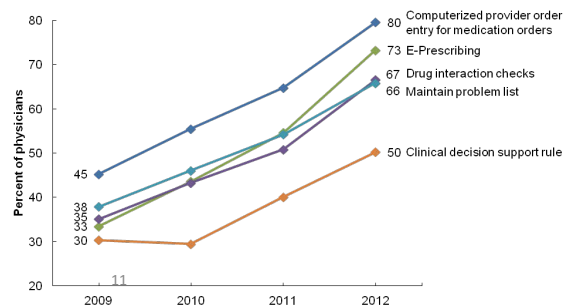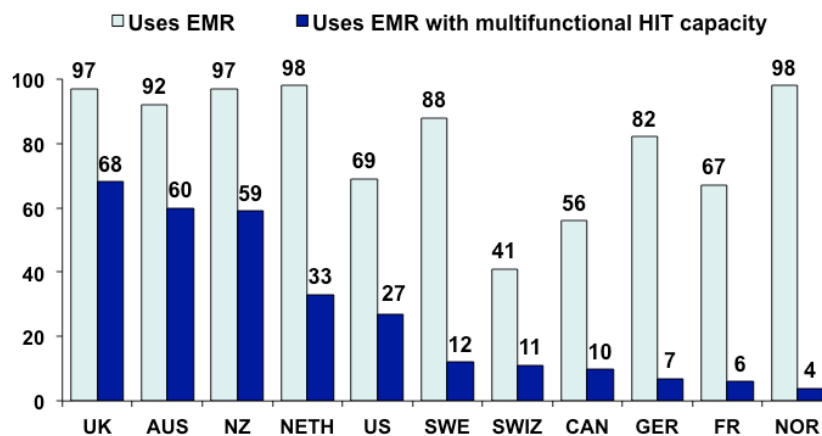
And catching up

(Hsaio, CDC, 2014)

(King, ONC, 2012)

Although advanced functionality is less common everywhere (Schoen, 2012)

Multifunctional health IT capacity – use of at least two electronic functions: order entry management, generating patient information, generating panel information, and routine clinical decision support

Non-Western countries are making progress too

ELSEVIER

INFORMATICS PROFESSOR

THIS BLOG MAINTAINS THE THOUGHTS ON VARIOUS TOPICS RELATED TO BIOMEDICAL AND HEALTH INFORMATICS BY DR. WILLIAM HERSH, PROFESSOR AND CHAIR, DEPARTMENT OF MEDICAL INFORMATICS & CLINICAL EPIDEMIOLOGY, OREGON HEALTH & SCIENCE UNIVERSITY.
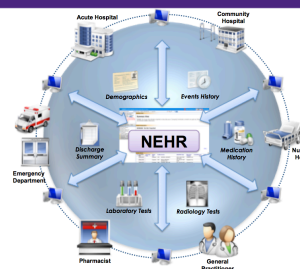
Rates, levels, and determinants of electronic health record system adoption: A study of hospitals in Riyadh, Saudi Arabia

*Bakheet Aldosari**

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SATURDAY, FEBRUARY 13, 2010

WILLIAM HERSH

Informatics is a Field of Global Truths

As all of my friends on Facebook know, I recently spent an enjoyable two weeks in Asia, with stops in Hong Kong, Singapore, and Bangkok. Certainly one of the things I enjoy most about my work is getting to interact with colleagues in the field from all over the world.

One thing I have definitely learned in my countless interactions with friends, colleagues, and others in Europe, South America, Asia, Africa, and elsewhere is that the principles of informatics apply no matter where you are on the planet. There are indeed global truths in the informatics field, just as there are in medicine, i.e., while different diseases occur with different frequencies and somewhat different manifestations around the globe, the same basic pathologies that afflict the human organism do so no matter where the human is located. Whether it is infectious diseases or chronic diseases, relatively similar approaches to diagnosing and treating disease apply universally.

http://www.billhersh.info/

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NEHR – Towards A Fully Integrated Care Record: Providers are "on the same page"

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US investment has been substantial

CNN.com

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updated 7:42 a.m. EST, Mon January 12, 2009

Obama's big idea: Digital health records

President-elect Barack Obama, as part of his effort to revive the economy, is proposing a massive effort to modernize health care by making all health records standardized and electronic. The government estimates about 212,000 jobs could be created by this program, CNNMoney reports. full story

"To improve the quality of our health care while lowering its cost, we will make the immediate investments necessary to ensure that within five years, all of America's medical records are computerized … It just won't save billions of dollars and thousands of jobs – it will save lives by reducing the deadly but preventable medical errors that pervade our health care system."
January 5, 2009

Health Information Technology for Economic and Clinical Health (HITECH) Act of the American Recovery and Reinvestment Act (ARRA) (Blumenthal, 2010)
- Incentives for electronic health record (EHR) adoption by physicians and hospitals (up to $27B)
- Direct grants administered by federal agencies ($2B, including $118M for workforce development)

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Centerpiece of HITECH is incentives for "meaningful use" (MU) of EHRs

- Driven by five underlying goals for healthcare system
  - Improving quality, safety and efficiency
  - Engaging patients in their care
  - Increasing coordination of care
  - Improving the health status of the population
  - Ensuring privacy and security
- Consists of three requirements – use of certified EHR technology
  - In a meaningful manner – criteria mapped to above goals
  - Connected for health information exchange (HIE)
  - To submit information on clinical quality measures

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Centerpiece of HITECH is incentives for "meaningful use" (MU) of EHRs

- Conceptually originated in legislation by Stark (2010)
  - Must use certified EHR connected for health information exchange and able to submit data on clinical quality measures
- All MU criteria must "map" to one or more of five goals for the healthcare system
  - Improving quality, safety, and efficiency
  - Engaging patients in their care
  - Increasing coordination of care
  - Improving the health status of the population
  - Ensuring privacy and security
- Examples
  - Implement drug-drug interaction checks → Improving quality, safety, and efficiency
  - Provide summary of care to patients → Engaging patients in their care

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Overall requirements for MU

- Use certified EHR technology in a <u>meaningful manner</u>
- Use certified EHR technology connected in a manner that provides for <u>health information exchange</u> to improve the quality of care
- Using certified EHR technology, the provider <u>submits information on clinical quality measures</u>

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Implemented in three stages – www.healthit.gov

Meaningful Use Criteria

2009 **2011** **2014** **2017**

HIT-Enabled Health Reform

HITECH Policies

Stage 1 Meaningful Use Criteria (**Capture/share data**)

Stage 2 Meaningful Use Criteria (**Advanced care processes with decision support**)

Stage 3 Meaningful Use Criteria (**Improved Outcomes**)
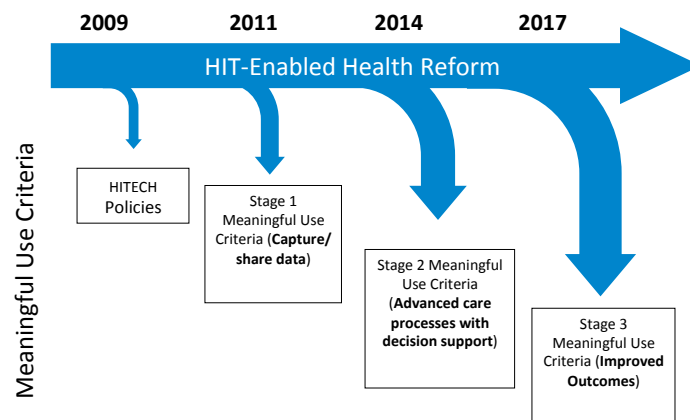
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MU operationalized

- Stage 1
  - Objectives announced in 2010
  - Program began payments on
    - January 1, 2011 for EPs
    - October 1, 2010 for EHs
- Stage 2
  - Objectives announced in 2012
  - Start pushed back one year to 2014
  - Raised the bar, with additional emphasis on patient engagement and health information exchange

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Warning: information overload ahead

Stage 1 MU

Stage 2 MU

MU objectives

MU objectives

Standards

Clinical quality measures

Clinical quality measures 2014
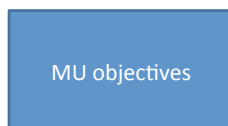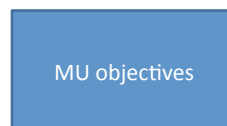
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Criteria for Stages 1-2 MU
(Blumenthal, 2010; Metzger, 2012)

- Core objectives – all must be met
- Menu objectives – selected from set
- Stage 1
  - EPs must meet 15 core and 5 of 10 menu objectives
  - EHs must meet 14 core and 5 of 10 menu objectives
  - For EPs and EHs, one menu objective must be a public health measure
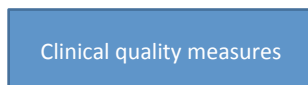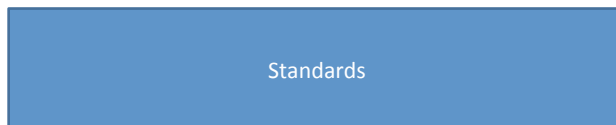- Stage 2
  - EPs must meet 17 core and 3 of 6 menu objectives
  - EHs must meet 16 core and 3 of 6 menu objectives

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New timeline for stages set in 2013

1st Year	Stage of Meaningful Use										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2011	1	1	1	2	2	2	3	TBD	TBD	TBD	TBD
2012		1	1	2	2	2	3	TBD	TBD	TBD	TBD
2013			1	1	2	2	3	3	TBD	TBD	TBD
2014				1	1	2	2	3	3	TBD	TBD
2015					1	1	2	2	3	3	TBD
2016						1	1	2	2	3	3
2017							1	1	2	2	3

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Stage 1 MU – core objectives
(Blumenthal, 2010)

Record patient demographics (sex, race, ethnicity, date of birth,preferred language, and in the case of hospitals, date and pre-liminary cause of death in the event of mortality	More than 50% of patients' demographic data recorded as structured data
Record vital signs and chart changes (height, weight, blood pressure, body-mass index, growth charts for children)	More than 50% of patients 2 years of age or older have height,weight, and blood pressure recorded as structured data
Maintain up-to-date problem list of current and active diagnoses	More than 80% of patients have at least one entry recorded as structured data
Maintain active medication list	More than 80% of patients have at least one entry recorded as structured data
Maintain active medication allergy list	More than 80% of patients have at least one entry recorded as structured data
Record smoking status for patients 13 years of age or older	More than 50% of patients 13 years of age or older have smoking status recorded as structured data
For individual professionals, provide patients with clinical summaries for each office visit; for hospitals, provide an electronic copy of hospital discharge instructions on request	Clinical summaries provided to patients for more than 50% of all office visits within 3 business days; more than 50% of all patients who are discharged from the inpatient department or emergency department of an eligible hospital or critical access hospital and who request an electronic copy of their discharge instructions are provided with it
On request, provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies, and for hospitals, discharge summary and procedures.	More than 50% of requesting patients receive electronic copy within 3 business days
Generate and transmit permissible prescriptions electronically (does not apply to hospitals)	More than 40% are transmitted electronically using certified EHR technology
Computer provider order entry (CPOE) for medication orders	More than 30% of patients with at least one medication in their medication list have at least one medication ordered through CPOE
Implement drug–drug and drug–allergy interaction checks	Functionality is enabled for these checks for the entire reporting period
Implement capability to electronically exchange key clinical information among providers and patient-authorized entities	Perform at least one test of EHR's capacity to electronically exchange information
Implement one clinical decision support rule and ability to track compliance with the rule	One clinical decision support rule implemented
Implement systems to protect privacy and security of patient data in the EHR	Conduct or review a security risk analysis, implement security updates as necessary, and correct identified security deficiencies
Report clinical quality measures to CMS or states	For 2011, provide aggregate numerator and denominator through attestation; for 2012, electronically submit measures

Stage 1 MU – menu objectives
(Blumenthal, 2010)

Implement drug formulary checks	Drug formulary check system is implemented and has access to at least one internal or external drug formulary for the entire reporting period
Incorporate clinical laboratory test results into EHRs as structured data	More than 40% of clinical laboratory test results whose results are in positive/negative or numberical format are incorporated into EHR as structured data
Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach	Generate at least one listing of patients with a specific condition
Use EHR technology to identify patient-specific education resources and provide those to the patient as appropriate	More than 10% of patients are provided patient-specific education resources
Perform medication reconciliation between care settings	Medication reconciliation is performed for more than 50% of transitions of care
Provide summary of care record for patients referred or transitioned to another provider or setting	Summary of care record is provided for more than 50% of patient transition or referrals.
Submit electronic immunization data to immunization registries or immunization information systems	Perform at least one test of data submission and follow-up submission (where registries can accept electronic submissions)
Submit electronic syndromic surveillance data to public health agencies	Perform at least one test of data submission and follow-up submissubmission (where public health agencies can accept electronic data)
Additional choices for hospitals and critical access hospitals	
Record advance directives for patients 65 years of age or older	More than 50% of patients 65 years of age or older have an indication of an advance directive status recorded
Submit of electronic data on reportable laboratory results to public health agencies	Perform at least one test of data submission and follow-up submission (where public health agencies can accept electronic data)
Additional choices for eligible professionals	
Send reminders to patients (per patient preference) for preventive and follow-up care	More than 20% or patients 65 years of age or older or 5 years of age or younger are sent appropriate reminders
Provide patients with timely electronic access to their health information (including laboratory results, problem list, medication lists, medication allergies)	More than 10% of patients are provided electronic access to information within 4 days of its being updated in the EHR

Stage 2 EP Core Objectives

Core Objective	Measure
1. CPOE	Use CPOE for more than **60%** of medication, **30%** of laboratory, and **30%** of radiology
2. E-Rx	E-Rx for more than **50%**
3. Demographics	Record demographics for **more than 80%**
4. Vital Signs	Record vital signs for **more than 80%**
5. Smoking Status	Record smoking status for **more than 80%**
6. Interventions	Implement **5** clinical decision support interventions + drug/drug and drug/allergy
7. Labs	Incorporate lab results for **more than 55%**
8. Patient List	Generate patient list **by specific condition**
9. Preventive Reminders	Use EHR to identify and provide reminders for preventive/follow-up care for **more than 10%** of patients with two or more office visits in the last 2 years

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Stage 2 EP Core Objectives

Core Objective	Measure
10. Patient Access	Provide online access to health information for **more than 50%** with **more than 5%** actually accessing
11. Visit Summaries	Provide office visit summaries for **more than 50%** of office visits
12. Education Resources	Use EHR to identify and provide education resources **more than 10%**
13. Secure Messages	**More than 5%** of patients send secure messages to their EP
14. Rx Reconciliation	Medication reconciliation at **more than 50%** of transitions of care
15. Summary of Care	Provide summary of care document for **more than 50%** of transitions of care and referrals **with 10% sent electronically** and **at least one sent to a recipient with a different EHR vendor or successfully testing with CMS test EHR**
16. Immunizations	Successful ongoing transmission of immunization data
17. Security Analysis	Conduct or review security analysis and incorporate in risk management process

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Stage 2 EP Menu Objectives

Menu Objective	Measure
1. Imaging Results	More than **10%** of imaging results are accessible through Certified EHR Technology
2. Family History	Record family health history for more than **20%**
3. Syndromic Surveillance	Successful ongoing transmission of syndromic surveillance data
4. Cancer	Successful ongoing transmission of cancer case information
5. Specialized Registry	Successful ongoing transmission of data to a specialized registry
6. Progress Notes	Enter an electronic progress note for **more than 30%** of unique patients

Stage 2 Hospital Core Objectives

Core Objective	Measure
1. CPOE	Use CPOE for **more than 60%** of medication, **30%** of laboratory, and **30%** of radiology
2. Demographics	Record demographics for **more than 80%**
3. Vital Signs	Record vital signs for **more than 80%**
4. Smoking Status	Record smoking status for **more than 80%**
5. Interventions	Implement **5** clinical decision support interventions + drug/drug and drug/allergy
6. Labs	Incorporate lab results for **more than 55%**
7. Patient List	Generate patient list by specific condition
8. eMAR	eMAR is implemented and used for more than **10%** of medication orders

Stage 2 Hospital Core Objectives

Core Objective	Measure
9. Patient Access	Provide online access to health information for more than **50%** with more than **5%** actually accessing
10. Education Resources	Use EHR to identify and provide education resources more than **10%**
11. Rx Reconciliation	Medication reconciliation at more than **50%** of transitions of care
12. Summary of Care	Provide summary of care document for **more than 50%** of transitions of care and referrals **with 10% sent electronically** and **at least one sent to a recipient with a different EHR vendor or successfully testing with CMS test EHR**
13. Immunizations	Successful ongoing transmission of immunization data
14. Labs	Successful ongoing submission of reportable laboratory results
15. Syndromic Surveillance	Successful ongoing submission of electronic syndromic surveillance data
16. Security Analysis	Conduct or review security analysis and incorporate in risk management process

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Stage 2 Hospital Menu Objectives

Menu Objective	Measure
1. Progress Notes	Enter an electronic progress note for **more than 30%** of unique patients
2. E-Rx	**More than 10%** electronic prescribing (eRx) of discharge medication orders
3. Imaging Results	**More than 10%** of imaging results are accessible through Certified EHR Technology
4. Family History	Record family health history for **more than 20%**
5. Advanced Directives	Record advanced directives for **more than 50%** of patients 65 years or older
6. Labs	Provide structured electronic lab results to EPs for **more than 20%**

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Clinical Quality Measures (CQMs)

Provider Type	Prior to 2014	2014 and Beyond Stage 2
EPs	Complete 6 of 44 3 core (or alternate) 3 menu	Complete 9 of 64 At least one measure in each of three National Quality Strategy (NQS) domains
EHs and CAHs	Report all 15 measures	Complete 16 of 29 At least one measure in each of three NQS domains

http://www.cms.gov/Regulations-and-Guidance/Legislation/
EHRIncentivePrograms/2014_ClinicalQualityMeasures.html

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EP CQMs – prior to 2014

- Core
  - Hypertension: Blood Pressure Measurement
  - Preventive Care and Screening Measure Pair
    - Tobacco Use Assessment
    - Tobacco Cessation Intervention
  - Adult Weight Screening and Follow-up
- Alternatives – if denominator of any core measures = 0
  - Weight Assessment and Counseling for Children and Adolescents
  - Preventive Care and Screening: Influenza Immunization for Patients 50 Years Old or Older
  - Childhood Immunization Status
- Must report on 3 of 38 additional measures

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EH CQMs – prior to 2014

- Anticoagulation overlap therapy
- Emergency department throughput – admission decision time to ED departure time for admitted patients
- Emergency department throughput – median time from ED arrival to ED departure for admitted patients
- Incidence of potentially preventable venous thromboembolism
- Intensive Care Unit venous thromboembolism prophylaxis
- Ischemic or hemorrhagic stroke – antithrombotic therapy by day 2
- Ischemic or hemorrhagic stroke – rehabilitation assessment
- Ischemic or hemorrhagic stroke – stroke education
- Ischemic stroke – anticoagulation for atrial fibrillation/flutter
- Ischemic stroke – discharge on anti-thrombotics
- Ischemic stroke – discharge on statins
- Ischemic stroke – thrombolytic therapy for patients arriving within 2 hours of symptom onset
- Platelet monitoring on unfractionated heparin
- Venous thromboembolism discharge instructions
- Venous thromboembolism prophylaxis within 24 hours of arrival

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2014 CQMs

- http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/2014_ClinicalQualityMeasures.html
- Each CQM has electronic specification (eCQM) that uses HQMF (XML-based) and NLM value set
  - Repository at http://www.lantanagroup.com/especnavigator/
- Beginning in 2014, Medicare EPs and EHs must electronically report CQM data to CMS (Medicaid EPs and EHs to state)

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NQS domains

- Patient and Family Engagement
- Patient Safety
- Care Coordination
- Population and Public Health
- Efficient Use of Healthcare Resources
- Clinical Processes/Effectiveness

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Results of Stage 1 adoption through end of 2013

Category	Registered	Paid	Amount
EP Medicare	291,368	213,033	$4.1B
EP Medicaid	144,927	110,260	$2.6B
Hospitals	4,693	2,611	$12.3B
EP Medicare Advantage		12,353	$315M
Total	440,988	340,046	$19.2B

http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/DataAndReports.html

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Conclusions

- A growing body of evidence supports EHR and other IT to improve health and healthcare
- The US and rest of the world are adopting EHRs and other IT
- The next step is to make use of the increasing data achieve the learning healthcare system
- There are challenges, but also benefits, to this use data-driven, information-driven evolution

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For more information

- Bill Hersh
  - http://www.billhersh.info
- Informatics Professor blog
  - http://informaticsprofessor.blogspot.com
- OHSU Department of Medical Informatics & Clinical Epidemiology (DMICE)
  - http://www.ohsu.edu/informatics
  - http://www.youtube.com/watch?v=T-74duDDvwU
  - http://oninformatics.com
- What is Biomedical and Health Informatics?
  - http://www.billhersh.info/whatis
- Office of the National Coordinator for Health IT (ONC)
  - http://www.healthit.gov
- American Medical Informatics Association (AMIA)
  - http://www.amia.org
- National Library of Medicine (NLM)
  - http://www.nlm.nih.gov

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