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Electronic Health Records in Undergraduate Education

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AAIM Joint Plenary Session – October 24, 2009

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What people of my (and your) generation are facing …

"The past 25 years in technology have been the warm-up act. What we are now entering is the MAIN EVENT which is the era in which technology will truly transform every aspect of business, government, education and society of life."

Carly Fiorina, former – CEO of HP

internet devices in 1984 = 1000

internet devices in 2006 = 600,000,000

← Crossing the threshold

We are living in exponential times

http://www.youtube.com/watch?v=pMcfrLYDm2U (Did you know?)

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Exponential times

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Google "curriculum registries" Search Advanced Search

Web Show options... Results **1** - **10** of about **182** for

[PDF] Microsoft PowerPoint - Electronic Health Records in ...
File Format: PDF/Adobe Acrobat - Quick View
Curriculum registries and ANCA – demonstrating demonstrating competencies. Meaningful Use: Explicit Criteria. 9/17/2009 **...**
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EHR's and UME

1. Meaningful use criteria as discrete curricular elements for the UME as measured in an EHR "playground"
2. EHR's and competency based education (Curriculum registries)
3. Using EHRs to reinforce discrete curricular objectives

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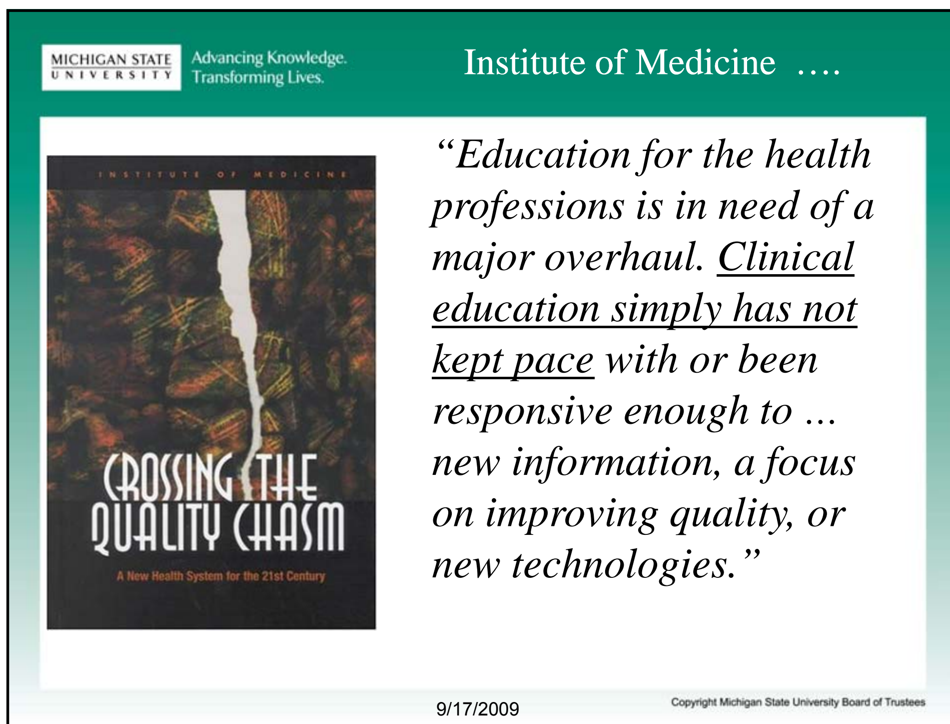

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EMR penetration 2008

- % US Hospitals
  - 1.5 (comprehensive)
  - 7.6 (basic)
  - larger, urban, teaching hospitals = more likely
- Roughly the same for ambulatory practices (early 2008)

NEJM 2009 16;360(16):1628-38. ; NEJM 2008 Jul 3;359(1):50-60

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PHNS
Innovative Solutions to Complex Problems

Reimbursement Incentive Eligibility

Physicians - Non-hospital-based physicians and physician groups can expect to receive up to $44,000 during the incentive period, including $18,000 the first year, if they have qualifying EHR systems in place by 2011.

The following table shows how the incentives and potential reductions are expected to work from 2010-2017:

First Payment Year	First Payment Year Amount, and Subsequent Payment Amounts in Following Years	Reduction in Fee Schedule for Non-Adoption/Use
2011	$18k, $12k, $8k, $4k, and $2k	$0
2012	$18k, $12k, $8k, $4k, and $2k	$0
2013	$15k, $12k, $8k, and $4k	$0
2014	$12k ,$8k, and $4k	$0
2015	$0	-1% of Medicare fee schedule
2016	$0	-2% of Medicare fee schedule
2017 and thereafter	$0	-3% of Medicare fee schedule

Note: Physicians in rural health professional shortage areas who adopt/use EHRs are eligible to receive a 10% increase on the incentive payment amounts described above.

Medicaid incentive may be available based on state funding formula. No reduction on Medicaid payment for non EHR use.

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Literature on EHR and undergraduate education

Research on EMR's for education is in its infancy.

- MESH Headings
  - Education, Medical, Undergraduate
  - Medical Records Systems, Computerized
- Hits = 22 (14 since 2000); 7 directly relevant to EMR (vs handheld computers)

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My first major point …

and assessed on their ability

All health professionals should be educated to deliver patient-centered care as members of an interdisciplinary care team, emphasizing evidence-based practice, quality improvement approaches and informatics.

Health Professions Education: A Bridge to Quality. Washington, DC, National Academies Press, 2003.

The mere presence of an EHR will not improve practice quality and will not make education better or more efficient. The EHR is only as good as its user. (Morrow and Dobie)

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Meaningful use criteria as discrete curricular elements for the UME

Reality of EMR's

- Enables
  - Accountability
  - Transparency

Goal of meaningful use 2011:

"Goal is to electronically capture in coded format and to report health information and to use that information to track key clinical conditions"

Health IT Policy Council Recommendations to National Coordinator for Defining Meaningful Use Final – August 2009

http://healthit.hhs.gov

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Meaningful Use: Explicit Criteria

Health IT Policy Council Recommendations to National Coordinator for Defining Meaningful Use
Final- August 2009

Health Outcomes Policy Priority	Care Goals	2011[1] Objectives — Goal is to electronically capture in coded format and to report health information and to use that information to track key clinical conditions		2011[1] Measures	2013 Objectives — Goal is to electronically capture in coded format and to report health information and to use that information to track key clinical conditions		2013 Measures	2015 Objectives — Goal is to achieve and improve performance and support care processes and on key health system outcomes	2015 Measures
		Eligible Providers	Hospitals		Eligible Providers	Hospitals			
Improve quality, safety, efficiency, and reduce health disparities	• Provide access to comprehensive patient health data for patient's health care team • Use evidence-based order sets and CPOE • Apply clinical decision support at the	• Use CPOE for all orders[2] • Implement drug-drug, drug-allergy, drug-formulary checks • Maintain an up-to-date problem list of current and active diagnoses based on ICD-9 or SNOMED • Generate and transmit permissible prescriptions electronically (eRx)	• 10% of all orders (any type) directly entered by authorizing provider (e.g., MD, DO, RN, PA, NP) through CPOE[2] • Implement drug-drug, drug-allergy, drug-formulary checks • Maintain an up-to-date problem list of current and active diagnoses based on ICD-9 or SNOMED	• Report quality measures to CMS including: o % diabetics with A1c under control [EP] o % hypertensive patients with BP under control [EP] o % of patients with LDL under control [EP] o % of smokers offered smoking cessation counseling [EP, IP] • % of patients with recorded BMI [EP]	• Use CPOE for all orders • Use evidence-based order sets • Record family medical history	• Use CPOE for all order types • Use evidence-based order sets • Conduct closed loop medication management, including eMAR and computer-assisted administration • Record all clinical documentation in EHR • Record family medical history • Generate and transmit permissible discharge prescriptions	• Additional quality reports using HIT-enabled NQF-endorsed quality measures [EP, IP] • % of all orders entered by physicians through CPOE [EP, IP] • Potentially preventable Emergency Department Visits and Hospitalizations [IP] • Inappropriate use of imaging	• Achieve minimal levels of performance on quality, safety, and efficiency measures • Implement clinical decision support for national high priority conditions • Medical device inter-operability • Multimedia support (e.g., x-rays)	• Clinical outcome measures (TBD) [OP, IP] • Efficiency measures (TBD) [OP, IP] • Safety measures (TBD) [OP, IP]

[1] The HIT Policy Committee recommends that incentives be paid according to an "adoption year" timeframe rather than a calendar year timeframe. Under this scenario, qualifying for the first-year incentive payment would be assessed using the "2011 Measures." The payment rate and phaseout of payments would follow the calendar dates in the statute, but qualifying for incentives would use the "adoption-year" approach.

Health IT Policy Council Recommendations to National Coordinator for Defining Meaningful Use Final – August 2009

http://healthit.hhs.gov

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Millennial students and comfort with technology

"In this generation, *we are all fairly computer proficient, and learning how to do this (use and EMR) at a future job probably won't take too long.*"

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Meaningful Use as Curriculum

Data capture and sharing

- 2011 Objectives (Low hanging fruit)
  - Maintain/Record/Implement:
    - up-to-date problem list (ICD-9 or SNOMED)
    - active medication list
    - medication allergy list
    - advanced directives
    - smoking status
    - drug-drug, drug-allergy, drug-formulary checks, perform medication reconciliation
    - document a progress note for each encounter
    - capably exchange key clinical information among providers
    - provide clinical summaries for patients for each encounter

Provider and Hospital Objectives

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Measuring Meaningful Use Competencies

Student Tasks (EMR playground)

- Review 12 on-line tutorials
- Add the following to an existing chart on patient
  - Add a problem
  - Add and advanced directive
  - Add a drug to be taken once daily
  - Run a drug interaction search
  - Forward the updated document to me
  - Use the flag function to identify any identified drug interactions, and if so what your plan of action might be

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Meaningful Use as Curriculum

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    - → drug-drug, drug-allergy, drug-formulary checks, perform medication reconciliation
    - document a progress note for each encounter
    - → capably exchange key clinical information among providers
    - provide clinical summaries for patients for each encounter

Provider and Hospital Objectives

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Measuring “low hanging fruit” in an EMR playground

15% failed to accurately add structured data

19% failed to appropriately communicate with flag function

26% failed to identify a moderate drug interaction

Med 608
EMR Competency Registry

NavigationCompetency Registry						
StudentName	EMR Competency Registry					
	Added problem	Added Directive	Added Medication	Used Flag	ID Drug Interaction	Plan Reasonable
Student 1						
Student 2						
Student 3						
Student 4						
Student 5						
Student 6						
Student 7						
Student 8						
Student 9						
Student 10						
Student 11						
Student 12						
Student 13						
Student 14						
Student 15						
Student 16						
Student 17						
Student 18						
Student 19						
Student 20						
Student 21						
Student 22						
Student 23						
Student 24						
Student 25						
Student 26						
Student 27						

~ 10% of those who identified the drug interaction failed to address the interaction

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- As they advance thru training, students will encounter EHR documentation features that without proper training (and assessment of competency) could potentially pose patient safety issues
- Planning for EHR use should be orientated to measurement of standardized knowledge and skills assessments (and integrate into medical school curriculum) as opposed to surveys of students opinions of their experience

Peled JU, Sagher O, Morrow J, Dobbie, AE. PLoS Medicine,6:1; 2009

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RIME applied to EHR competencies

Discrete EHR Competencies	I	II	III	IV	Intern	Residency
Reporter; records/maintains:	**I**	**P**	**M**			
UTD Problem List (ICD-9)	I	P	M			
Active medication list	I	P	M			
Active medication allergy list	I	P	M			
Advanced directives		I	P	M		
Smoking status	I	P	M			

I = where skills introduced into medical education continuum

P = where students are expected to practice skills

M = where some degree of mastery expected

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RIME applied to EHR competencies

Discrete EHR Competencies	I	II	III	IV	Intern	Residency
Interpreter; uses/ implements:		**I**	**P**	**M**		
Prioritizes problem list		I	P/M			
Orders with specific structured indications		I	P	M		
CDS tool		I	P	P	P	M
Templated care forms		I	P	P	M	

I = where skills introduced into medical education continuum

P = where students are expected to practice skills

M = where some degree of mastery expected

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RIME applied to EHR competencies

Discrete EHR Competencies	I	II	III	IV	Intern	Residency
Manager; implements			**I**	**P**		**M**
CPOE		I	I/P	P	M	
Drug-formulary checks			I	P	P	M
E - prescribing			I	P	P	M
Responds to care reminders			I	P	M	
Exchange of key clinical information among care providers			I	I	P	M
Educator	**I**		**P**			**M**
Pt-specific educational resources			I	P	P	M
Provision of clinical summary to patient			I	P	P	M
Generate lists of patients by diagnosis			I	P	P	M

I = where skills introduced into medical education continuum

P = where students are expected to practice skills

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My second major point ..

EHR's and competency-based education

Aims to translate information and new technologies into safe and effective patient-centered care and to assure that a graduating trainee is ultimately capable of handling "**all job related tasks**".

(Sidhu, Grober et al. 2004)

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"Human memory is increasingly unreliable in keeping pace with the ever-expanding knowledge base on effective care and its use in health care settings." (Greiner, Knebel et al. 2003).

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Measuring discrete competencies - ANCA

Accreditation Council for Graduate Medical Education Competencies (ACGME)

Patient Care	Make informed decisions based upon pt info, preferences, evidence and judgment
	Gather essential and accurate information
Knowledge	Perform competently all procedures
Communication s	Provide preventive services with other health care professionals
Performance-bas Learning and Imp	Develop and carry out management plans
Systems-based P	Counsel and educate
Professionalism	Use IT to support decisions and pt education

Emphysema – History

- Cough
- Sputum Production
- Dyspnea
- Hemoptysis
- Wheezing
- Fever
- Abnormal sleep patterns
- Previous respiratory diseases
- Previous PPD, TB status
- Occupational exposures
- Smoking
- Fam Hx respiratory diseases
- Allergies
- Risks for alpha-1 antitrypsin deficiency

Emphysema – Physical

- Assess accessory muscle use
- Recognize and differentiate:
  - Wheezing
  - Rales
  - Rhonchi
  - Pleural friction rub
  - Normal breath sounds
  - Normal, dull and hyperresonant percussion notes
- Assess for egophony and whispered pectoriloquy

Emphysema – Communication Skills

Counsel for:

- Smoking cessation
- Proper inhaler technique
- Signs of exacerbation
- Proper use of medications
- Exercise
- Precautions when traveling by air

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MSU HEALTHTEAM
DIABETES REGISTRY

Patient Registry																						
Patients				HGBA1C		Renal		Observations								Comorbidities			Medications			
PatientName	MRN	AGE	NextAppt	A1C	ADate	Renal	RDate	Sys	Dia	LDL	Eye	Foot	Flu	Pnu	TOB	CHF	CAD	HTN	Statin	ACE	ARB	ASA
	42101	65	01/07/10	7.1	2008/07	10.0	2004/06	132	80	81	2008/11	2008/12	2008/11	1997/12	Q			HTN	SIMVASTATIN 40 MG TABS	PRINIVIL 10 MG TAB		YES
	43387	63	11/05/09	6.2	2009/08	11.0	2009/05	128	72	107	2009/02	2009/02	2008/10		Q			HTN	SIMVASTATIN 10 MG TABS	ZESTRIL 40 MG TABS		YES
	0494	51	01/21/10	9.8	2009/06	6.0	2008/02	116	82	98	2008/06	2008/09		2006/12	Q			HTN	SIMVASTATIN 20 MG TABS	LISINOPRIL 20 MG TABS		YES
ES R	01362	58	10/14/09	8.1	2009/02			136	80	91	2008/12	2009/04		2004/11	N					VASOTEC 5 MG TAB		NO
D	17206	62	10/19/09	6.6	2009/08	0.5	2009/08	134	94	56	2008/08	2009/08	2008/10	2003/12	N			HTN	SIMVASTATIN 20 MG TABS			YES
DE	42658	59	09/10/09	7.4	2009/05	144.0	2008/09	148	80	46	2008/08	2009/05	2008/10		Q			HTN	LIPITOR 10 MG TABS	VASOTEC 20 MG TAB		YES
MCCARTNEY	450739	49	09/10/09	6.9	2009/01	<5.0	2008/10	132	82	74		2008/10	2008/10		N							NO
DALE	453870	49	10/08/09	9.7	2009/07	218.0	2009/07	140	88	95	2009/04	2008/08	2008/10		Y			HTN	ZOCOR 10 MG TABS	ZESTRIL 20 MG TAB		YES
WA	419535	77	11/19/09	10.0	2009/05	1298.0	2009/02	127	78	95	2003/12		2008/10	2006/12	N	CHF			LIPITOR 10 MG TAB		COZAAR 50 MG TABS	ALT
JAN	429517	84	10/19/09	6.8	2009/07			102	62	50	2008/08	2004/03	2008/10	2006/12	Q		CAD	HTN	LIPITOR 10 MG TABS			YES
RA	50099	68	01/14/10	7.2	2009/08	43.0	2009/02	110	64	61	2009/01		2008/10	2004/10	N				LIPITOR 20 MG TABS	LISINOPRIL 5 MG TABS		YES
D W	427549	69	09/10/09	6.6	2009/04	45.0	2009/04	110	72	46	2008/12	2008/09	2008/12	2008/09	N			HTN	MEVACOR 40 MG TABS	LISINOPRIL 20 MG TABS		YES
ON	449687	61	10/29/09	7.4	2009/04	<5.0	2008/03	136	82	55	2008/09	2007/03			N			HTN	ZOCOR 20 MG TABS	ZESTRIL 40 MG TABS		YES
PA	06299	55	03/04/10	7.8	2009/08	13.0	2008/11	167	83	60	2008/09	2008/11			N			HTN	LIPITOR 10 MG TABS	ZESTRIL 10 MG TABS		YES

Page: 2

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Using EHR's to create …..

Curriculum Registries

- An organized system … to collect uniform data (curricular) to evaluate specified outcomes for a trainee defined by a particular disease, condition, or exposure, and that serves to assess attainment of competencies
- Harnessing the data mining capabilities of EHR's, it is possible to automate the assessment of competencies in EHR, creating dashboards and scorecards for the attainment of discrete problem focused curricular objectives

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Curriculum Registries

Using electronic templates reflecting key learning objectives

Heart Failure Objectives

HRSA CHF History: TestFebschick1 Test

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Reinforcing curricular objectives – structured data fields

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Using structured data to measure competencies

Med 608 Curriculum Registry

CHFCompetency Registry

StudentName	CHF Hx						CHF PE			
	Exercise Intolerance	Sx of Fluid Retention	Why Prone to CHF	Why Sx Now	Hx CHF	ECHO	Fluid Overload PE	Cardiac PE	Pulmonary PE	Peripheral Vascular PE
# items/competency	1	3	3	3	1	1	2	5	2	5
Student 1	1	3	3	3	1	1	2	5	2	5
Student 2		0	0	0			1	4	2	5
Student 3	1	3	3	3	1	1	2	5	2	5
Student 4	1	1	3	3	1	1	0	0	0	0
Student 5	1	3	3	3	1	1	0	0	0	0
Student 6	1	3	3	0			2	5	2	5
Student 7	1	3	3	3	1	1	0	0	0	0
Student 8	1	3	3	0			2	1	2	2
Student 9	1	3	3	0			0	0	0	0
Student 10	1	2	3	3	1	1	0	0	0	0
Student 11	1	3	3	0			2	4	2	5
Student 12	1	3	3	3	1	1	0	0	0	0
Student 13	1	3	2	0			2	5	2	5
Student 14	1	3	3	3	1	1	2	5	2	5
Student 15	1	3	3	0			0	0	0	0
Student 16	1	3	3	3	1	1	2	1	2	5
Student 17	1	3	3	3	1	1	2	1	2	5
Student 18	1	3	3	3	1	1	1	5	2	5
Student 19	1	3	3	3	1	1	2	5	2	5
Student 20		0	0	0			0	0	0	0
Student 21	1	3	3	3	1	1	2	5	2	5
Student 22	1	3	3	3	1	1	0	0	0	0
Student 23	1	3	3	3	1		2	5	2	3
Student 24	1	3	3	3	1	1	1	0	0	0
Student 25							1	0	2	5

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- Documentation of clinical skills via data mining tools with an EHR does not assure (anymore than the written record) that elements of the student – patient encounter were done well.

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Linking knowledge based content to the students workflow

- Delivering curricular information in context - during the documentation workflow

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Linking knowledge based content to the students workflow

INTERNAL MEDICINE CURRICULUM: CONTENT

CHF: Knowledge

STAGES OF HEART FAILURE

How would I establish the patient's stage of heart failure?

Compensatory Mechanisms In Heart Failure

What causes CHF in a patient with a normal ejection fraction?

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- The mere presence of an EHR will not improve practice quality and will not make education better or more efficient
- Learning to conduct patient care within the electronic medical record is a complex process that should begin in medical school

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EHR's

Use to learn

- Trade offs
  - Do CPOE, CDSS and templates enhance or hinder the acquisition of basic history and PE skills, data synthesis skills?
  - To what degree does performance on an EHR system (playground or otherwise) represent learning?

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EHR's

Use to learn

- When in training should students be taught basic vs. advanced EHR skills?
- What is minimal competence and how should it be assessed?
- To what degree are skills learned on one system transferrable?

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EHR's

Learning to use

- If EHR meaningful use technology is a means to the end →→ improving health
- Contingent upon educators to prepare (teach and assess) students competencies in this domain

Henry Chueh MD MS MGH, HRSA site http://www.ahrq.gov/about/annualmtg08/090808slides/Chueh.ppt#256,1,Slide 1

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Using EHR's to create …..

Disease Registries

- An organized system … to collect uniform data (clinical and other) to evaluate specified outcomes for a population defined by a particular disease, condition, or exposure, and that serves one or more predetermined scientific, clinical, or policy purposes

* Giklich, 2007 AHRQ Publication Number 07- HC001-1

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