**HIT Policy Committee:**

**Meaningful Use Workgroup Request for Comments Regarding Meaningful Use Stage 2**

## I. Background

The Health Information Technology Policy Committee (HITPC) is a federal advisory committee that advises the U.S. Department of Health and Human Services (HHS) on federal HIT policy issues, including how to define the "meaningful use" (MU) of electronic health records (EHRs) for the purposes of the Medicare and Medicaid EHR incentive programs. The HITECH portion of the American Recovery and Reinvestment Act (ARRA) of 2009 specifically mandated that incentives should be given to Medicare and Medicaid providers not for EHR adoption but for "meaningful use" of EHRs. In July of 2010, HHS released that program's final rule, thus defining stage 1 MU and strongly signaling that the bar for what constitutes MU would be raised in subsequent stages in order to improve advanced care processes and health outcomes.

The HITPC held six public hearings in 2010 including testimony from several dozen stakeholders and received additional dozens of public comments via its blog. All of this input helped to inform its many hours of public deliberations regarding the future vision of MU (e.g., stage 3) as well as the interim stepping stone of stage 2 MU that will set expectations for 2013 and 2014.

The HITPC has developed a **preliminary** set of recommendations specifically designed to solicit additional public feedback. The goal of sending out this request for comment (RFC) early is threefold.

1. Provide some signal to the industry of potential new EHR functionalities that the HITPC may recommend to help the industry get a head start on developing new functionalities.

2. Extend the public discussion of future stage MU definitions through a more formal public comment process well in advance of its formal final stage 2 recommendations to be issued in the summer of 2011.
3. Request input on specific questions.

Following analysis of the comments received through the approximately 45-day public comment period, the HITPC intends to revisit these recommendations in its public meetings in the spring of 2011. At that time, the HITPC will be able to review public comments in the context of the early feedback from providers on experience with stage 1 MU. That input will come through many vehicles: the Medicare program, the Medicaid program (both federal and state constituencies), the HIT regional extension program, and other sources. **Note, this RFC solely represents the preliminary thinking of the HITPC and its Meaningful Use Workgroup.**

## II. Solicitation of Comments

### A. Instructions

1. To be assured consideration, comments must be received at one of the addresses provided below, no later than 5 p.m., Eastern Time, on February 25, 2011.
2. Because of staff and resource limitations, we cannot accept comments by facsimile (FAX) transmission. You may submit comments by any of the following methods (please do not submit duplicate comments):
    - Electronically: You may submit electronic comments on this request for comment at http://www.regulations.gov. Follow the "Submit a comment" instructions. Attachments should be in Microsoft Word or Excel, WordPerfect, or Adobe PDF.

- Regular, Express, or Overnight Mail: Department of Health and Human Services, Office of the National Coordinator for Health Information Technology, Attention: Joshua Seidman, Mary Switzer Building, 330 C Street, SW, Suite 1200, Washington, DC 20201. Please submit one original and two copies. Please also allow sufficient time for mailed comments to be received before the close of the comment period.
- Hand Delivery or Courier: Office of the National Coordinator for Health Information Technology, Attention: Joshua Seidman, Mary Switzer Building, 330 C Street, SW, Suite 1200, Washington, DC 20201. Please submit one original and two copies. (Because access to the interior of the Mary Switzer Building is not readily available to persons without federal government identification, commenters are encouraged to leave their comments in the mail drop slots located in the main lobby of the building.)

3. All comments received before the close of the comment period will be available for public inspection, including any personally identifiable or confidential business information that is included in a comment. Please do not include anything in your comment submission that you do not wish to share with the general public. Such information includes, but is not limited to: A person's social security number; date of birth; driver's license number; state identification number or foreign country equivalent; passport number; financial account number; credit or debit card number; any personal health information; or any business information that could be considered to be proprietary. We will post all comments received before the close of the

comment period at http://www.regulations.gov. Follow the search instructions on that Web site to view public comments.

For general questions, please contact Judy Sparrow, Office of the National Coordinator, HHS, 330 C Street, SW., Washington, DC 20201, 202-205-4528

### B. Structure and Relevant Concurrent HITPC Activities

The HITPC has created a matrix of objectives and measures that it is considering for its recommendations to HHS. These objectives are organized into four of the five health outcome priorities that formed the stage 1 MU organizing structure. The HITPC approached its task of developing proposed stage 2 objectives by first developing a longer-term vision for MU and then determining what an appropriate stage 2 stepping stone is to get there. For this reason, the matrix includes possible stage 3 objectives, but they are only included in the matrix in order to provide context for the Stage 2 recommendations. Therefore, for the purpose of this Request for Comments, **the HITPC is primarily interested in comments on the proposed Stage 2 objectives at this time**.

The HITPC has a concurrent activity that is developing Stage 2 and 3 recommendations for the fifth health outcome priority — ensure adequate privacy and security protections for personal health information. The HITPC and its Privacy & Security Tiger Team will subsequently release recommendations for this domain.

In addition, the HITPC has a Quality Measures (QM) Workgroup that is concurrently developing a framework for the evolution of clinical quality measures to be electronically reported as part of Stages 2 and 3 MU. The HITPC recently collected public input through a request for comment on a set of proposed measure concepts, and it will provide more guidance on its measure development priorities in the near future following synthesis and analysis of those

public comments. Other recommendations about information exchange are being developed by the HITPC's Information Exchange Workgroup.

## C. **Proposed MU Objectives and Measures for Stages 2 and 3**

(Please note all proposed objectives include EPs and EHs unless otherwise specified)

| **Meaningful Use: Stage 1 Final Rule and Proposed Objectives for Stages 2 and 3** | | | |
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| **Improving Quality, Safety, Efficiency & Reducing Health Disparities** | | | |
| Stage 1 Final Rule | **Proposed Stage 2** | Proposed Stage 3 | Comments |
| CPOE for medication orders **(30%)** | CPOE (by licensed professional) for at least 1 medication, and 1 lab or radiology order for 60% of unique patients who have at least 1 such order (order does not have to be transmitted electronically) | CPOE (by licensed professional) for at least 1 medication, and 1 lab or radiology order on 80% of patients who have at least 1 such order (order does not have to be transmitted electronically) | |
| Drug-drug/drug-allergy interaction checks | Employ drug-drug interaction checking and drug allergy checking on appropriate evidence-based interactions | Employ drug-drug interaction checking, drug allergy checking, drug age checking (medications in the elderly), drug dose checking (e.g., pediatric dosing, chemotherapy dosing), drug lab checking, and drug condition checking (including pregnancy and lactation) on appropriate evidence-based interactions | Reporting of drug interaction checks to be defined by quality measures workgroup |
| E-prescribing (eRx) (EP) **(40%)** | 50% of orders (outpatient and hospital discharge) transmitted as eRx | 80% of orders (outpatient and hospital discharge) transmitted as eRx | If receiving pharmacy cannot accept eRx, automatically generating electronic fax to pharmacy OK |
| Record demographics **(50%)** | 80% of patients have demographics recorded and can use them to produce stratified quality | 90% of patients have demographics recorded (including IOM categories[i]) and can use them to | |

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| | reports | produce stratified quality reports | |
| Report CQM electronically | Continue as per Quality Measures Workgroup and CMS | Continue as per Quality Measures Workgroup and CMS | The HIT Policy Committee's Quality Measures Workgroup issued a request for comment in December; new measures will be considered after review of public comments |
| Maintain problem list **(80%)** | Continue Stage 1 | 80% problem lists are up-to-date | Expect to drive list to be up-to-date by making it part of patient visit summary and care plans |
| Maintain active med list **(80%)** | Continue Stage 1 | 80% medication lists are up-to-date | Expect to drive list to be up-to-date via medication reconciliation |
| Maintain active medication allergy list **(80%)** | Continue Stage 1 | 80% medication allergy lists are up-to-date | Expect to drive the list to be up-to-date by making it part of visit summary |
| Record vital signs **(50%)** | 80% of unique patients have vital signs recorded | 80% of unique patients have vital signs recorded | |
| Record smoking status **(50%)** | 80% of unique patients have smoking status recorded | 90% of unique patients have smoking status recorded | |
| Implement 1 CDS rule | Use CDS to improve performance on high-priority health conditions. Establish CDS attributes for purposes of certification: 1. Authenticated (source cited); 2. Credible, evidence-based; 3. Patient-context sensitive; 4. Invokes relevant knowledge; 5. Timely; 6. Efficient workflow; 7. | Use CDS to improve performance on high-priority health conditions. Establish CDS attributes for purposes of certification: 1. Authenticated (source cited); 2. Credible, evidence-based; 3. Patient-context sensitive; 4. Invokes relevant knowledge; 5. Timely; 6. Efficient workflow; 7. | |

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| | Integrated with EHR; 8. Presented to the appropriate party who can take action | Integrated with EHR; 8. Presented to the appropriate party who can take action | |
| Implement drug formulary checks* | Move current measure to core | 80% of medication orders are checked against relevant formularies | What is the availability of formularies for eligible professionals? |
| Record existence of advance directives (EH) **(50%)*** | Make core requirement. For EP and EH: 50% of patients >=65 years old have recorded in EHR the result of an advance directive discussion and the directive itself if it exists | For EP and EH: 90% of patients >=65 years old have recorded in EHR the result of an advance directive discussion and the directive itself if it exists | Potential issues include: state statutes; challenges in outpatient settings; age; privacy; specialists; needs to be accessible and certifiable; need to define a standard |
| Incorporate lab results as structured data **(40%)*** | Move current measure to core, but only where results are available | 90% of lab results electronically ordered by EHR are stored as structured data in the EHR and are reconciled with structured lab orders, where results and structured orders available | |
| Generate patient lists for specific conditions* | Make core requirement. Generate patient lists for multiple patient-specific parameters | Patient lists are used to manage patients for high-priority health conditions | |
| Send patient reminders **(20%)*** | Make core requirement. | 20% of active patients who prefer to receive reminders electronically receive preventive or follow-up reminders | How should "active patient" be defined? |
| (NEW) | 30% of visits have at least one electronic EP note | 90% of visits have at least one electronic EP note | Can be scanned, narrative, structured, etc. |
| (NEW) | 30% of EH patient | 80% of EH patient | Can be scanned, |

* menu option for Stage 1

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| | days have at least one electronic note by a physician, NP, or PA | days have at least one electronic note by a physician, NP, or PA | narrative, structured, etc. |
| (NEW) | 30% of EH medication orders automatically tracked via electronic medication administration recording | 80% of EH inpatient medication orders are automatically tracked via electronic medication administration recording | |
| **Engage Patients and Families in Their Care** | | | |
| Stage 1 Final Rule | Proposed Stage 2 | Proposed Stage 3 | Comments |
| Provide electronic copy of health information, upon request **(50%)** | Continue Stage 1 | 90% of patients have timely access to copy of health information from electronic health record, upon request | Only applies to information already stored in the EHR |
| Provide electronic copy of discharge instructions (EH) at discharge **(50%)** | Electronic discharge instructions for hospitals (which are given as the patient is leaving the hospital) are offered to at least 80% of patients (patients may elect to receive only a printed copy of the instructions) | Electronic discharge instructions for hospitals (which are given as the patient is leaving the hospital) are offered to at least 90% of patients in the common primary languages[ii] (patients may elect to receive only a printed copy of the instructions) | Electronic discharge instructions should include a statement of the patient's condition, discharge medications, activities and diet, follow-up appointments, pending tests that require follow up, referrals, scheduled tests [we invite comments on the elements listed above] |
| EHR-enabled patient-specific educational resources **(10%)** | Continue Stage 1 | 20% offered patient-specific educational resources online in the common primary languages[ii] | |
| (NEW for EH) | 80% of patients offered the ability to view and download via a web-based portal[iii], within 36 hours of discharge, relevant information contained in the record about EH | 80% of patients offered the ability to view and download via a web-based portal[iii], within 36 hours of discharge, relevant information contained in the record about EH | Inpatient summaries include: hospitalization admit and discharge date and location; reason for hospitalization; providers; problem list; medication lists; medication allergies; |

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| | inpatient encounters. Data are available in human-readable and structured forms (HITSC to define). | inpatient encounters. Data are available in human readable and structured forms (HITSC to define). | procedures; immunizations; vital signs at discharge; diagnostic test results (when available); discharge instructions; care transitions summary and plan; discharge summary (when available); gender, race, ethnicity, date of birth; preferred language; advance directives; smoking status. [we invite comments on the elements listed above] |
| Provide clinical summaries for each office visit (EP) **(50%)** | Patients have the ability to view and download relevant information about a clinical encounter within 24 hours of the encounter. Follow-up tests that are linked to encounter orders but not ready during the encounter should be included in future summaries of that encounter, within 4 days of becoming available. Data are available in human-readable and structured forms (HITSC to define) | Patients have the ability to view and download relevant information about a clinical encounter within 24 hours of the encounter. Follow-up tests that are linked to encounter orders but not ready during the encounter should be included in future summaries of that encounter, within 4 days of becoming available. Data are available in human readable and structured forms (HITSC to define) | The following encounter data are included (where relevant): encounter date and location; reasons for encounter; provider; problem list; medication list; medication allergies; procedures; immunizations; vital signs; diagnostic test results; clinical instructions; orders: future appointment requests, referrals, scheduled tests; gender, race, ethnicity, date of birth; preferred language; advance directives; smoking status. [we invite comments on the elements listed above] |
| Provide timely electronic access (EP) **(10%)** | Patients have the ability to view and download (on | Patients have the ability to view and download (on | The following data elements are included: encounter dates and |

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| | demand) relevant information contained in the longitudinal record, which has been updated within 4 days of the information being available to the practice. Patient should be able to filter or organize information by date, encounter, etc. Data are available in human-readable and structured forms (HITSC to define). | demand) relevant information contained in the longitudinal record, which has been updated within 4 days of the information being available to the practice. Patient should be able to filter or organize information by date, encounter, etc. Data are available in human readable and structured forms (HITSC to define). | locations; reasons for encounters; providers; problem list; medication list; medication allergies; procedures; immunizations; vital signs; diagnostic test results; clinical instructions; orders; longitudinal care plan; gender, race, ethnicity, date of birth; preferred language; advance directives; smoking status. [we invite comments on the elements listed above] |
| This objective sets the measures for "Provide timely electronic access (EP)" and for "Provide clinical summaries for each office visit (EP)" | EPs: 20% of patients use a web-based portal[iii] to access their information (for an encounter or for the longitudinal record) at least once.<br>Exclusions: patients without ability to access the Internet | EPs: 30% of patients use a web-based portal[iii] to access their information (for an encounter or for the longitudinal record) at least once.<br>Exclusions: patients without ability to access the Internet | |
| (NEW) | EPs: online secure patient messaging is in use | EPs: online secure patient messaging is in use | |
| (NEW) | Patient preferences for communication medium recorded for 20% of patients | Patient preferences for communication medium recorded for 80% of patients | How should "communication medium" be delineated? |
| | | Offer electronic self-management tools to patients with high priority health conditions | We are seeking comment on what steps will be needed in stage 2 to achieve this proposed stage 3 objective |
| | | EHRs have capability to exchange data with | We are seeking comment on what |

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| | | PHRs using standards-based health data exchange | steps will be needed in stage 2 to achieve this proposed stage 3 objective |
| | | Patients offered capability to report experience of care measures online | We are seeking comment on what steps will be needed in stage 2 to achieve this proposed stage 3 objective |
| | | Offer capability to upload and incorporate patient-generated data (e.g., electronically collected patient survey data, biometric home monitoring data, patient suggestions of corrections to errors in the record) into EHRs and clinician workflow | We are seeking comment on what steps will be needed in stage 2 to achieve this proposed stage 3 objective |
| **Improve Care Coordination** | | | |
| Stage 1 Final Rule | Proposed Stage 2 | Proposed Stage 3 | Comments |
| Perform test of HIE | Connect to at least three external providers in "primary referral network" (but outside delivery system that uses the same EHR) or establish an ongoing bidirectional connection to at least one health information exchange | Connect to at least 30% of external providers in "primary referral network" or establish an ongoing bidirectional connection to at least one health information exchange | Successful HIE will require development and use of infrastructure like entity-level provider directories (ELPD) |
| Perform medication reconciliation **(50%)*** | Medication reconciliation conducted at 80% of care transitions by receiving provider (transitions from | Medication reconciliation conducted at 90% of care transitions by receiving provider | |

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| | another setting of care, or from another provider of care, or the provider believes it is relevant) | | |
| Provide summary of care record **(50%)**[*] | Move to Core | Summary care record provided electronically for 80% of transitions and referrals | |
| (NEW) | List of care team members (including PCP) available for 10% of patients in EHR | List of care team members (including the PCP) available for 50% of patients via electronic exchange | |
| (NEW) | Record a longitudinal care plan for 20% of patients with high-priority health conditions | Longitudinal care plan available for electronic exchange for 50% of patients with high-priority health conditions | What elements should be included in a longitudinal care plan including: care team members; diagnoses; medications; allergies; goals of care; other elements? |
| **Improve Population and Public Health** | | | |
| Stage 1 Final Rule | Proposed Stage 2 | Proposed Stage 3 | Comments |
| Submit immunization data[*] | EH and EP: Mandatory test. Some immunizations are submitted on an ongoing basis to Immunization Information System (IIS), if accepted and as required by law | EH and EP: Mandatory test. Immunizations are submitted to IIS, if accepted and as required by law. During well child/adult visits, providers review IIS records via their EHR. | Stage 2 implies at least some data is submitted to IIS. EH and EP may choose not, for example, to send data through IIS to different states in Stage 2. The goal is to eventually review IIS-generated recommendations |
| Submit reportable lab data[*] | EH: move Stage 1 to core<br><br>EP: lab reporting menu. For EPs, ensure that reportable lab | Mandatory test.<br><br>EH: submit reportable lab results and reportable conditions if accepted and as | |

[*] menu option for Stage 1

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| | results and conditions are submitted to public health agencies either directly or through their performing labs (if accepted and as required by law). | required by law. Include complete contact information (e.g., patient address, phone and municipality) in 30% (EH) of reports.<br><br>EP: ensure that reportable lab results and reportable conditions are submitted to public health agencies either directly or through performing labs (if accepted and as required by law) | |
| Submit syndromic surveillance data* | Move to core. | Mandatory test; submit if accepted | |
| | | Public Health Button for EH and EP: Mandatory test and submit if accepted. Submit notifiable conditions using a reportable public-health submission button. EHR can receive and present public health alerts or follow up requests. | We are seeking comment on what steps will be needed in stage 2 to achieve this proposed stage 3 objective |
| | | Patient-generated data submitted to public health agencies | We are seeking comment on what steps will be needed in stage 2 to achieve this proposed stage 3 objective |
| **Ensure Adequate Privacy and Security Protections for Personal Health Information** | | | |
| Stage 1 Final Rule | Proposed Stage 2 | Proposed Stage 3 | Comments |
| Conduct security review analysis & correct deficiencies | | | Additional privacy and security objectives under |

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| | | | consideration via the HIT Policy Committee's Privacy & Security Tiger Team |

**D. Additional Specific Questions for Public Comment**

The Health Information Technology Policy Committee welcomes public comment on all proposed objectives and their associated definitions. In addition, the Committee seeks specific input on the following additional questions.

1. How can electronic progress notes be defined in order to have adequate specificity?
2. For patient/family access to personal health information, what standards should exist regarding accessibility for people with disabilities (e.g., interoperability with assistive technologies to support those with hearing, visual, speech, or mobile impairments)?
3. What strategies should be used to ensure that barriers to patient access – whether secondary to limited internet access, low health literacy and/or disability – are appropriately addressed?
4. What are providers' and hospitals' experiences with incorporating patient-reported data (e.g., data self-entered into PHRs, electronically collected patient survey data, home monitoring of biometric data, patient suggestions of corrections to errors in the record) into EHRs?
5. For future stages of meaningful use assessment, should CMS provide an alternative way to achieve meaningful use based on demonstration of high performance on clinical quality measures (e.g., can either satisfy utilization measures for recording

allergies, conducting CPOE, drug-drug interaction checking, etc, or demonstrate low rates of adverse drug events)?

6. Should Stage 2 allow for a group reporting option to allow group practices to demonstrate meaningful use at the group level for all EPs in that group?
7. In stage 1, as an optional menu objective, the presence of an advance directive should be recorded for over 50% of patients 65 years of age or older. We propose making this objective required and to include the results of the advance-directive discussion, if available. We invite public comment on this proposal, or to offer suggestions for alternative criteria in this area.
8. What are the reasonable elements that should make up a care plan, clinical summary, and discharge summary?
9. What additional meaningful-use criteria could be applied to stimulate robust information exchange?
10. There are some new objectives being considered for stage 3 where there is no precursor objective being proposed for stage 2 in the current matrix. We invite suggestions on appropriate stage 2 objectives that would be meaningful stepping-stone criteria for the new stage 3 objectives.

**E. Evidence Base/Rationale for Proposed New Objectives**

The HITPC identified proposed new objectives because of their potential impact on the five health outcome priorities to be achieved through the meaningful use of EHRs. Some of the relevant evidence to these proposed objectives is reflected below.

| Patient and Family Engagement |
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| In a randomized control trial assessing the efficacy of a home-based computer system in providing information and decision support as well as expert and other patient contacts to patients with HIV, findings were significant for improved quality of life indicators such as cognitive function, social support and participation in their health care, and also for decreased time spent during ambulatory visits, fewer phone calls to providers, and decreased number and length of hospitalizations.[iv] |
| Qualitative data analysis of provider impressions of a patient centered CDSS (Patient Assessment, Care and Education) designed to increase identification and treatment of chemotherapy related symptoms affirmed the increased awareness of underreported symptoms and additional benefits such as better communication with patients.[v] |
| A retrospective cross-sectional study analyzing the adoption of and patient satisfaction with a PHR reported 25% of patients registered with PHR and reported over 90% satisfaction with the PHR, with greatest satisfaction with test results, medication refills, and secure messaging.[vi,1] |
| A CDSS electronic checklist specifically aimed to improve delivery of evidence based discharge instructions for patients with heart failure (HF) or acute myocardial infarction (AMI) was evaluated to be effective in increasing delivery of discharge instructions (from 37.2% pre-intervention to 93.0% post-intervention). In addition, prescription of ACEI or ARB in patients with HF and AMI improved to 96.7% from 80.7% and to 100% from 88.1%, respectively.[vii] |
| An interventional study assessing the effect of patient messaging reminding patients of screening, diagnostic and monitoring tests in accordance with evidence based guidelines found an increase in adherence to clinical recommendations by 12.5% ($p<0.001$).[viii] |
| A randomized control trial of 246 patients who were newly diagnosed with breast cancer assessed the effect of a home-based computer system with information, decision-making and emotional support. The study found that patients in the intervention group were significantly more competent in seeking information, more comfortable participating in care, and more confident in their interactions with physicians at two months post intervention and had better social support and information competence at five months post intervention. Furthermore, the relative benefits in the intervention group were greater for patients in underserved populations.[ix] |

| Quality and Safety |
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| A randomized control trial evaluating effect of CDSS alerting physicians to order venous thromboembolism (VTE) prophylaxis showed the intervention resulted in 41% decreased risk for VTE at 90 days.[x] |
| Using CDS to alert physicians and pharmacists to 8 critical drug interactions resulted in 31% decrease in dispensed drugs known to have adverse interactions.[xi] |
| A prospective analysis of an antimicrobial surveillance system using evidence based guidelines in a children's hospital showed successful identification of prescribing errors allowing for early intervention.[xii] |
| Analysis of a CDS system intervention aimed at improving asthma documentation and management in the emergency department found that asthma severity, asthma precipitants, ICU admission history and smoking status were recorded significantly more often with the CDSS. Additionally, 76% of patients received a discharge asthma plan compared with 16% before the intervention.[xiii] |
| A prospective cohort study assessed efficacy of CDSS in identifying patients with acute lung injury (ALI) compared to physician diagnosis alone. This study is significant because early treatment of ALI is critical to overall prognosis. The CDSS had a sensitivity of 96.3% and specificity of 89.4% whereas physician diagnosis was 26.5% sensitive and 99.5% specific. Although the CDSS was less specific, physician diagnosis alone missed 239 cases while the CDSS missed 12.[xiv] |
| A survey of ambulatory care providers assessed attitudes toward CPOE and e-prescribing systems and found that the majority reported improved quality of care and efficiency, prevention |

[1] studies including proposed stage 2 measure(s) not in stage 1

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| of medical errors, and increased patient satisfaction as advantages to the system. More than one third reported that in the last month they had avoided a medication error because of system alerts In addition, slightly less than half reported better counseling of adverse effects and improved monitoring. (Despite this only 47% reported satisfaction with the system. Complaints included alerts regarding medications discontinued, alert fatigue, and alerts inappropriately identifying drug interactions.)[xv] |
| Implementation of a web-based laboratory information system to treat multi-drug resistant tuberculosis patients in Peru greatly improved timely access to lab results and user satisfaction. The system was expanded to other institutions based on its success to serve a network for over 3.1 million patients. The system is at relatively low cost amounting to 1% of National Peruvian Tuberculosis annual budget.[xvi,1] |

| Population Health |
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| Population based surveillance system in a large multicenter primary care network identified patients overdue for mammography screening. The interventional study showed that providers successfully contacted 63% of over 3,000 patients at risk.[xvii] |
| A computer based smoking cessation program designed after extensive review of the literature on the barriers associated with such a program, was found to be effective, inexpensive and required little time or skill from staff. The program was continued following the conclusion of the study because of the satisfaction rates from providers and patients.[xviii] |
| Study showed feasibility and reliability of EHR based chronic kidney disease (CKD) registry composed of 57,276 patients in accurately relaying demographics and most comorbidities when compared to individual EHR chart review ($\kappa > 0.80$). Study concluded such a registry has the potential to improve quality of care in this patient population and contribute to the development of a national CKD surveillance project.[xix] |

| Care Coordination |
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| A study assessing the effect of a medication reconciliation program in an ambulatory oncology clinic found at least one error in 81% of all patients' medication lists. In the group that received the intervention, 90% of incorrect medication lists were corrected, while only 2% were corrected in the control group ($p < 0.001$).[xx] |
| 2007 cross-sectional survey of US home health and hospice agencies found 33% increase in use of EHRs since 2000. The agencies used available EHR functionalities in general, including telemedicine and information sharing.[xxi] |

| Efficiency |
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| Antibiotic approval system guiding use of 28 restricted antibiotics improved appropriate use of antibiotics and led to increased susceptibility of S. aureus to methicillin and of pseudomonas to several antibiotics. Patients with gram negative bacteremia did not suffer increased adverse outcomes as a result.[xxii] |
| An interventional study (n=2200) compared RBC transfusions in critically ill patients before and after evidence based CDS intervention significant decrease in number of RBC transfusions per patient and percentage of patients transfused ($p = 0.045$ and $p = 0.01$ respectively) and net savings of almost $60,000 (n=1100 patients).[xxiii] |

[1] studies including proposed stage 2 measure(s) not in stage 1

[i] IOM categories as defined in: *Race, Ethnicity, and Language Data: Standardization for Health Care Quality Improvement* Institute of Medicine report, 2009. Of note, these categories are proposed to be used for stage 3, and are not required in proposed stage 2.

[ii] From the Office of Civil Rights: in a given region, a primary language defined as any language spoken by five (5%) percent of the total population eligible to be served or one thousand (1000) persons in that population, whichever is less

[iii] A web portal as defined as online access to health information. Therefore all web portals defined as such are subject to HIPPA rules and regulations.

[iv] Gustafson DH, Hawkins R, Boberg E, Pingree S, Serlin RE, Graziano F, Chan CL (1999) Impact of a patient-centered, computer-based health information/support system. *Am J Prev Med* 16(1):1-9.

[v] Mark TL, Johnson G, Fortner B, Ryan K. (2008) The benefits and challenges of using computer-assisted symptom assessments in oncology clinics: results of a qualitative assessment. *Technol Cancer Res Treat*. 7(5):401-6.

[vi] Ralston JD, Carrell D, Reid R, Anderson M, Moran M, Hereford J (2007) Patient web services integrated with a shared medical record: patient use and satisfaction. *J Am Med Inform Assoc*. 14(6):798-806.

[vii] Riggio JM, Sorokin R, Moxey ED, Mather P, Gould S, Kane GC. Effectiveness of a clinical-decision-support system in improving compliance with cardiac-care quality measures and supporting resident training. *Acad Med*. 84(12):1719-26.

[viii] Rosenberg SN, Shnaiden TL, Wegh AA, Juster IA (2008) Supporting the patient's role in guideline compliance: a controlled study. *Am J Manag Care* 2008 14(11):737-44.

[ix] Gustafson DH, Hawkins R, Pingree S, McTavish F, Arora NK, Mendenhall J, Cella DF, Serlin RC, Apantaku FM, Stewart J, Salner A (2001) Effect of computer support on younger women with breast cancer.*J Gen Intern Med*. 16(7):435-45.

[x] Kucher N, Koo S, Quiroz R, Cooper JM, Paterno MD, Soukonnikov B, Goldhaber SZ (2005) Electronic alerts to prevent venous thromboembolism among hospitalized patients. *N Engl J Med*. 352(10):969-77.

[xi] Humphries TL, Carroll N, Chester EA, Magid D, Rocho B (2007) Evaluation of an electronic critical drug interaction program coupled with active pharmacist intervention. *Ann Pharmacother*. 41(12):1979-85.

[xii] Di Pentima MC, Chan S, Eppes SC, Klein JD (2009)Antimicrobial prescription errors in hospitalized children: role of antimicrobial stewardship program in detection and intervention. *Clin Pediatr* 48(5):505-12.

[xiii] Kwok R, Dinh M, Dinh D, Chu M (2009) Improving adherence to asthma clinical guidelines and discharge documentation from emergency departments: implementation of a dynamic and integrated electronic decision support system. *Emerg Med Australas*. 21(1):31-7.

[xiv] Herasevich V, Yilmaz M, Khan H, Hubmayr RD, Gajic O (2009) Validation of an electronic surveillance system for acute lung injury. *Intensive Care Med*. 35(6):1018-23.

[xv] Weingart SN, Simchowitz B, Shiman L, Brouillard D, Cyrulik A, Davis RB, Isaac T, Massagli M, Morway L, Sands DZ, Spencer J, Weissman JS (2009) Clinicians' assessments of electronic medication safety alerts in ambulatory care. *Arch Intern Med*. 169(17):1627-32.

[xvi] Blaya JA, Shin SS, Yagui MJ, Yale G, Suarez CZ, Asencios LL, Cegielski JP, Fraser HS (2007) A web-based laboratory information system to improve quality of care of tuberculosis patients in Peru: functional requirements, implementation and usage statistics *BMC Med Inform Decis Mak*. 7:33.

[xvii] Lester WT, Ashburner JM, Grant RW, Chueh HC, Barry MJ, Atlas SJ (2009) Mammography FastTrack: an intervention to facilitate reminders for breast cancer screening across a heterogeneous multi-clinic primary care network. *J Am Med Inform Assoc*. 16(2):187-95.

[xviii] Wolfenden L, Wiggers J, Campbell E, Knight J, Kerridge R, Spigelman A. (2009) Providing comprehensive smoking cessation care to surgical patients: the case for computers. *Drug Alcohol Rev.* 28(1):60-5.

[xix] Navaneethan SD, Jolly SE, Schold JD, Arrigain S, Saupe W, Sharp J, Lyons J, Simon JF, Schreiber MJ, Jain A, Nally JV (2011) Development and validation of an electronic health record–
based chronic kidney disease registry. *Clin J Am Soc Nephrol* 6: 000–000.

[xx] Weingart SN, Cleary A, Seger A, Eng TK, Saadeh M, Gross A, Shulman LN (2007) Medication reconciliation in ambulatory oncology *Jt Comm J Qual Patient Saf*. 33(12):750-7.

[xxi] Resnick HE, Alwan M (2010) Use of health information technology in home health and hospice agencies: United States, 2007 *Journal of the American Medical Informatics Association* 17(4):389-395.

[xxii] Buising KL, Thursky KA, Robertson MB, Black JF, Street AC, Richards MJ, Brown GV (2008) Electronic antibiotic stewardship--reduced consumption of broad-spectrum antibiotics using a computerized antimicrobial approval system in a hospital setting. *J Antimicrob Chemother*. 62(3):608-16.

[xxiii] Fernández Pérez ER, Winters JL, Gajic O (2007) The addition of decision support into computerized physician order entry reduces red blood cell transfusion resource utilization in the intensive care unit. *Am J Hematol*. 82(7):631-3.