

Biomedical Informatics 2012 Year in Review

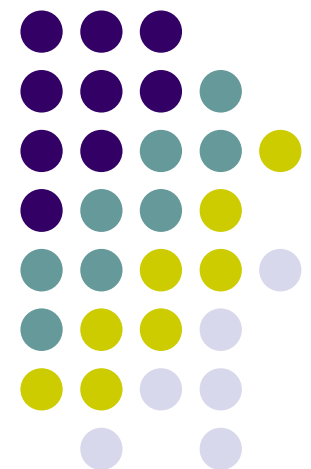
**Notable publications and events in Informatics
since the 2011 AMIA Symposium**

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Content for this session is at:

<http://faculty.washington.edu/dmasys/YearInReview>
or Google: “AMIA Year in Review”

includes citation lists and links
and this PowerPoint



The screenshot shows a Firefox browser window with the address bar displaying faculty.washington.edu/dmasys/YearInReview/2012index.html?r44b=no. The page content is as follows:

AMIA Informatics 2012 Year in Review

A compendium of notable publications and events in the field of biomedical informatics, November 2011 - October 2012
by
Daniel Masys, M.D.
Affiliate Professor
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Page updated as of 2 November 2012

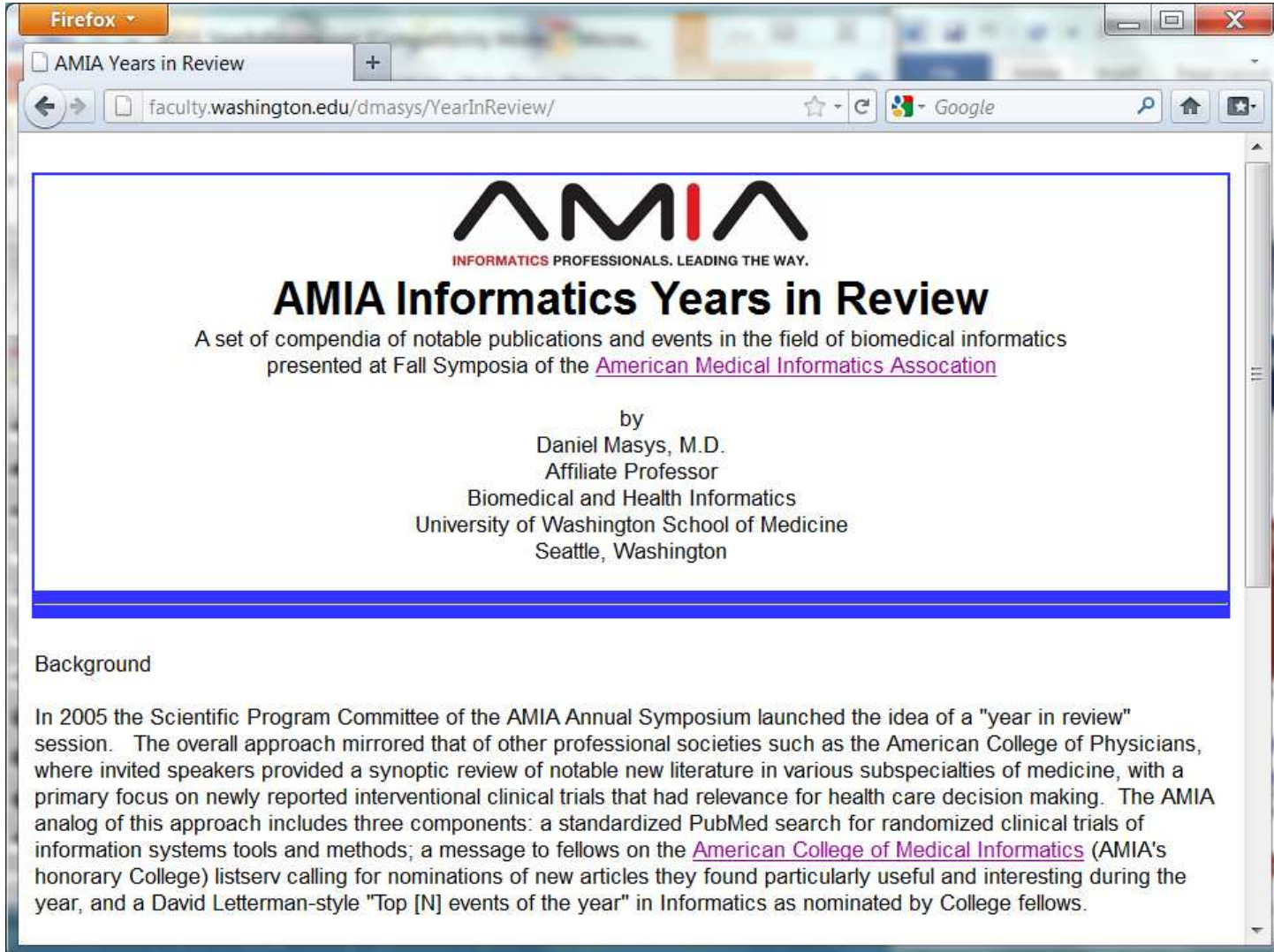
Presented here are the citations and events discussed at the **Year in Review session** at the **AMIA Symposium, Tuesday November 6, 2012.**

- Selected publications in [Clinical Informatics](#), November 2011 - October 2012 - (includes 107 randomized controlled clinical trials)
- Selected publications in [Bioinformatics](#), November 2011 - October 2012
- Notable [Events](#) since the last AMIA Symposium
- [Search methodology](#) used to identify literature
- Thanks to these [Fellows of the American College of Medical Informatics](#) who nominated both events and publications for inclusion in the 2012 session
- Links to other [Year in Review](#) sessions.

Candidate new literature in Clinical Informatics

Index to all Years in Review

<http://faculty.washington.edu/dmasys/YearInReview>



The screenshot shows a Firefox browser window with the address bar displaying faculty.washington.edu/dmasys/YearInReview/. The page content includes the AMIA logo, the title "AMIA Informatics Years in Review", a description of the compendia, and the author's name and affiliation.

AMIA
INFORMATICS PROFESSIONALS. LEADING THE WAY.

AMIA Informatics Years in Review

A set of compendia of notable publications and events in the field of biomedical informatics presented at Fall Symposia of the [American Medical Informatics Association](#)

by
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Background

In 2005 the Scientific Program Committee of the AMIA Annual Symposium launched the idea of a "year in review" session. The overall approach mirrored that of other professional societies such as the American College of Physicians, where invited speakers provided a synoptic review of notable new literature in various subspecialties of medicine, with a primary focus on newly reported interventional clinical trials that had relevance for health care decision making. The AMIA analog of this approach includes three components: a standardized PubMed search for randomized clinical trials of information systems tools and methods; a message to fellows on the [American College of Medical Informatics](#) (AMIA's honorary College) listserv calling for nominations of new articles they found particularly useful and interesting during the year, and a David Letterman-style "Top [N] events of the year" in Informatics as nominated by College fellows.

Design for this Session

- Modeled on American College of Physician “Update” sessions
- Emphasis on ‘what it is’ and ‘why it is important’
- Audience interaction for each category of item discussed

Source of Content for Session

- Literature review of RCTs indexed by MeSH term “Medical Informatics”, “Clinical Decision Support”, “Telemedicine” & descendents, or keywords “Internet”, “mobile” and Entrez date between November 2011 and October 2012.
- Further qualified by involvement of >100 providers or patients
- Poll of American College of Medical Informatics fellows list

Thanks to:

- Russ Altman
- David Bates
- Enrico Coiera
- Don Detmer
- Judith Effken
- George Hripcsak
- Betsy Humphreys
- Bonnie Kaplan
- Zak Kohane
- David Lobach
- Lucila Ohno-Machado
- Dean Sittig
- David States
- Peter Tarczy-Hornoch
- Mark Tuttle

Special Thanks to:

- Gunther Eysenbach
University of
Toronto



Literature search
profile refinement

- Xiaoqian Jiang
UC San Diego



Automated slide
construction from
PubMed citations

Session components

- Representative New Literature
- Notable Events – the ‘Top Five’ list

Notable changes in 2012 informatics literature in a nutshell

- The Year of the Cell Phone: mobile devices arrive in the randomized controlled clinical trial literature en masse
- Federal EHR investment supports systematic reviews of current state of technology and its adoption
- Unintended consequences literature grows disproportionately

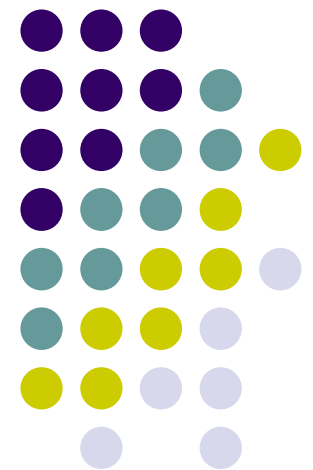


New Literature Highlights: **Clinical Informatics**

- Clinical Decision Support
- Telemedicine
- The practice of informatics

Clinical Decision Support

34 new RCTs published
meeting search criteria
November 2010 – October 2011



Clinical Decision Support for Providers: General

- **Reference**

- Bright TJ, et. al, Effect of Clinical Decision-Support Systems: A Systematic Review. Ann Intern Med. 2012 Apr 23. SP72-81.

- **Source**

- Duke Clinical Research Institute, Duke University School of Medicine, Durham, NC

- **Aim**

- To evaluate the effect of CDSSs on clinical outcomes, health care processes, workload and efficiency, patient satisfaction, cost, and provider use and implementation.

- **Methods**

- Literature review of 148 published RCTs.
- Extracted data about study design, participant characteristics, interventions, outcomes, quality and implementation.

- **Results**

- A total of 128 (86%) assessed health care process measures, 29 (20%) assessed clinical outcomes, and 22 (15%) measured costs.

Clinical Decision Support for Providers: General

- **Reference**

- Bright TJ, et. al, Effect of Clinical Decision-Support Systems: A Systematic Review. Ann Intern Med. 2012 Apr 23. SP72-81.

- **Results, cont'd**

- Both commercially and locally developed CDSSs improved health care process measures related to performing preventive services (n= 25; odds ratio [OR], 1.42 [95% CI, 1.27 to 1.58]), ordering clinical studies (n= 20; OR, 1.72 [CI, 1.47 to 2.00]), and prescribing therapies (n= 46; OR, 1.57 [CI, 1.35 to 1.82]).
- Few studies measured potential unintended consequences or adverse effects.

- **Conclusions**

- Both commercially and locally developed CDSSs are effective at improving health care process measures across diverse settings, but evidence for clinical, economic, workload, and efficiency outcomes remains sparse.
- This review expands knowledge in the field by demonstrating the benefits of CDSSs outside of experienced academic centers

Clinical Decision Support for Providers: General

- **Reference**

- Bright TJ, et. al, Effect of Clinical Decision-Support Systems: A Systematic Review. Ann Intern Med. 2012 Apr 23. SP72-81.

- **Importance**

- Confirms premise that CDSSs overall contribute to improved care
- Demonstrates the benefits of CDSSs are also found outside of experienced academic centers

Clinical Decision Support for Providers: Medication Management

- **Reference**

- McKibbin KA, et. al, The effectiveness of integrated health information technologies across the phases of medication management: a systematic review of randomized controlled trials. J Am Med Inform Assoc. 2012 Jan-Feb;19(1):22-30.

- **Source**

- Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada.

- **Aim**

- An AHRQ-funded evidence report to address seven questions on multiple aspects of the effectiveness of medication management information technology (MMIT) and its components (prescribing, order communication, dispensing, administering, and monitoring).

- **Methods**

- Literature review of 187 published RCTs.

- **Results**

- Most RCTs focused on CDS and CPOE systems, were performed in hospitals and clinics, included primarily physicians and sometimes nurses but not other health professionals, and studied process changes related to prescribing and monitoring medication.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- McKibbin KA, et. al, The effectiveness of integrated health information technologies across the phases of medication management: a systematic review of randomized controlled trials. J Am Med Inform Assoc. 2012 Jan-Feb;19(1):22-30.

- **Results, cont'd**

- Processes of care improved for prescribing and monitoring mostly in hospital settings, but the few studies measuring clinical outcomes showed small or no improvements.
- Studies were performed most frequently in the USA (n=63), Europe (n=16), and Canada (n=6).
- Many studies had limited description of systems, installations, institutions, and targets of the intervention.
- Problems with methods and analyses were found. Few studies addressed order communication, dispensing, or administering, non-physician prescribers or pharmacists and their MMIT tools, or patients and caregivers.

- **Conclusions**

- Study methods other than RCTs are needed to completely understand the effects of MMIT.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- McKibbin KA, et. al, The effectiveness of integrated health information technologies across the phases of medication management: a systematic review of randomized controlled trials. J Am Med Inform Assoc. 2012 Jan-Feb;19(1):22-30. .

- **Conclusions, cont'd**

- Almost half of MMIT interventions improved the process of care, but few studies measured clinical outcomes.
- This large body of literature, although instructive, is not uniformly distributed across settings, people, medication phases, or outcomes.

- **Importance**

- Confirms usefulness of MMIT
- A call for more standardized approaches to performing and reporting interventional informatics trials.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- Cox Z et al., Effects of clinical decision support on initial dosing and monitoring of tobramycin and amikacin., Am J Health Syst Pharm, 68(7):624-632, 2011.

- **Source**

- Pharmacy Dept., Vanderbilt University Medical Center, Nashville, TN

- **Aim**

- To determine impact of clinical decision support (CDS) on initial doses and intervals and pharmacokinetic outcomes of amikacin and tobramycin therapy.

- **Methods**

- Complex CDS advisor developed to provide guidance on initial dosing and monitoring of aminoglycoside orders, using both traditional-dosing and extended-interval-dosing strategies
- Integrated into CPOE system
- 216 cases where CPOE used evaluated and compared with a control group whose aminoglycoside orders were closely monitored by pharmacists.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- Cox Z et al., Effects of clinical decision support on initial dosing and monitoring of tobramycin and amikacin., Am J Health Syst Pharm, 68(7):624-632, 2011.

- **Methods, cont'd**

- Primary outcome measured was an initial dose within 10% of a dose calculated to be adherent to published dose guidelines.
- Secondary outcomes included a guideline-adherent interval, trough and peak concentrations in goal range, and rate of nephrotoxicity.

- **Results**

- Number of orders with initial doses consistent with reference standards increased from 40% in the preadvisor group to 80% in the postadvisor group ($p < 0.001$).
- Selection of the correct initial interval based on renal function increased from 63% to 87% ($p < 0.001$).

Clinical Decision Support for Providers: Medication Management

- **Reference**

- Cox Z et al., Effects of clinical decision support on initial dosing and monitoring of tobramycin and amikacin., Am J Health Syst Pharm, 68(7):624-632, 2011.

- **Results, cont'd**

- Number of orders with initial doses consistent with reference standards increased from 40% in the preadvisor group to 80% in the postadvisor group ($p < 0.001$).
- The changes in the initial dosing and interval resulted in an increase of trough concentrations at goal (59% in the preadvisor group versus 89% in the postadvisor group, $p = 0.0004$).
- No significant difference in peak concentrations in the goal range or rate of nephrotoxicity.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- Cox Z et al., Effects of clinical decision support on initial dosing and monitoring of tobramycin and amikacin., Am J Health Syst Pharm, 68(7):624{632, 2011.

- **Conclusions**

- An advisor for aminoglycoside dosing and monitoring integrated into a CPOE system significantly improved selection of initial doses and intervals and resulted in an improvement in the rate of trough serum drug concentrations at goal compared with standard provider dosing.

- **Importance**

- A contemporary example of effective provider decision support in an inpatient setting
- Extends literature showing the 'teachable moment' for decision support is during order entry.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- Tamblyn R, et. al, The effectiveness of a new generation of computerized drug alerts in reducing the risk of injury from drug side effects: a cluster randomized trial. J Am Med Inform Assoc. 2012 Jul-Aug;19(4):635-43.

- **Source**

- Department of Epidemiology & Biostatistics, McGill University, Montreal, Quebec, Canada.

- **Aim**

- To determine whether computerized prescribing decision support with patient-specific risk estimates would increase physician response to psychotropic drug alerts, reduce alert over-rides and reduce injury risk from falls in older people.

- **Methods**

- Cluster randomized controlled trial of 81 family physicians and 5628 of their patients aged 65 and older who were prescribed psychotropic medication.
- Intervention physicians received information about patient-specific risk of injury computed at the time of each visit using statistical models of non-modifiable risk factors and psychotropic drug doses.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- Tamblin R, et. al, The effectiveness of a new generation of computerized drug alerts in reducing the risk of injury from drug side effects: a cluster randomized trial. J Am Med Inform Assoc. 2012 Jul-Aug;19(4):635-43.

- **Methods, cont'd**

- Risk thermometers presented changes in absolute and relative risk with each change in drug treatment.
- Control physicians received commercial drug alerts.
- Main outcome measure was injury risk at the end of follow-up based on psychotropic drug doses and non-modifiable risk factors.
- Electronic health records and provincial insurance administrative data were used to measure outcomes.

- **Results**

- Mean patient age was 75.2 years.
- Baseline risk of injury was 3.94 per 100 patients per year.
- Intermediate-acting benzodiazepines (56.2%) were the most common psychotropic drug prescribed.

Clinical Decision Support for Providers: Medication Management

- **Reference**

- Tamblyn R, et. al, The effectiveness of a new generation of computerized drug alerts in reducing the risk of injury from drug side effects: a cluster randomized trial. J Am Med Inform Assoc. 2012 Jul-Aug;19(4):635-43.

- **Results, cont'd**

- Intervention physicians reviewed therapy in 83.3% of visits and modified therapy in 24.6%.
- The intervention reduced the risk of injury by 1.7 injuries per 1000 patients (95% CI 0.2/1000 to 3.2/1000; p=0.02).
- The effect of the intervention was greater for patients with higher baseline risks of injury (p<0.03).

- **Conclusions**

- Patient-specific risk estimates provide an effective method of reducing the risk of injury for high-risk older people.

- **Importance**

- An example of rule-based 'personalized medicine' within a CDSS environment that makes guidance more relevant and 'interesting'.

Clinical Decision Support for Providers: Diabetes and glycemic control

- **Reference**
 - Foy R al., A cluster randomised trial of educational messages to improve the primary care of diabetes., *Implement Sci*, 6:129, 20113
- **Source**
 - Leeds Institute of Health Sciences, University of Leeds
- **Aim**
 - To evaluate the effects of brief educational messages attached to laboratory test reports on diabetes care.
- **Methods**
 - Cluster randomised controlled trials in 32 primary care practices with 8690 eligible patients in England.
 - Phase one messages, attached to Haemoglobin A1c (HbA1c) reports, targeted glycaemic and cholesterol control. Phase two messages, attached to albumin:creatinine ratio (ACR) reports, targeted blood pressure (BP) control, and foot inspection.
 - Main outcome measures comprised practice mean HbA1c and cholesterol levels, diastolic and systolic BP, and proportions of patients having undergone foot inspections.

Clinical Decision Support for Providers: Diabetes and glycemic control

- **Reference**

- Foy R al., A cluster randomised trial of educational messages to improve the primary care of diabetes., Implement Sci, 6:129, 20113..

- **Results**

- The BP message produced a statistically significant reduction in diastolic BP (-0.62 mmHg; 95% confidence interval -0.82 to -0.42 mmHg) but not systolic BP (-0.06 mmHg, -0.42 to 0.30 mmHg) and increased the odds of achieving target BP control (odds ratio 1.05; 1.00, 1.10).
- The foot inspection message increased the likelihood of a recorded foot inspection (incidence rate ratio 1.26; 1.18 to 1.36).
- The glycemic control message had no effect on mean HbA1c (increase 0.01%; -0.03 to 0.04) despite increasing the odds of a change in likelihood of HbA1c tests being ordered (OR 1.06; 1.01, 1.11).
- The cholesterol message had no effect (decrease 0.01 mmol/l, -0.04 to 0.05).

Clinical Decision Support for Providers: Diabetes and Glycemic Control

- **Reference**

- Foy R al., A cluster randomised trial of educational messages to improve the primary care of diabetes., Implement Sci, 6:129, 20113..

- **Conclusions**

- Three out of four interventions improved intermediate outcomes or process of diabetes care.
- The diastolic BP reduction approximates to relative reductions in mortality of 3% to 5% in stroke and 3% to 4% in ischemic heart disease over 10 years.
- The lack of effect for other outcomes may, in part, be explained by difficulties in bringing about further improvements beyond certain thresholds of clinical performance.

Clinical Decision Support for Providers: Diabetes and glycemic control

- **Reference**

- Foy R al., A cluster randomised trial of educational messages to improve the primary care of diabetes., *Implement Sci*, 6:129, 20113.

- **Importance**

- Changing practice patterns is a global challenge, not confined to the US healthcare system
- Modest performance improvements for common chronic diseases have substantial multiplier effects.

Clinical Decision Support for Providers: Psychiatric and Behavioral Health

- **Reference**

- Carroll AE, et. al, A randomized controlled trial of screening for maternal depression with a clinical decision support system. J Am Med Inform Assoc. 2012 Jun 28.

- **Source**

- Children's Health Services Research, Indiana University School of Medicine, Indianapolis, IN

- **Aim**

- To determine if automated screening and just in time delivery of testing and referral materials at the point of care promotes screening referral rates for maternal depression.

- **Methods**

- Adaptation of Child Health Improvement through Computer Automation (CHICA) system - a decision support and electronic medical record system used in IU pediatric clinics.

Clinical Decision Support for Providers: Psychiatric and Behavioral Health

- **Reference**

- Carroll AE, et. al, A randomized controlled trial of screening for maternal depression with a clinical decision support system. J Am Med Inform Assoc. 2012 Jun 28.

- **Methods, cont'd**

- All families of patients up to 15 months of age seen between October 2007 and July 2009 were randomized to one of three groups:
 1. screening questions printed on prescreener forms (PSF) completed by mothers in the waiting room with physician alerts for positive screens,
 2. everything in (1) plus 'just in time' (JIT) printed materials to aid physicians, and
 3. a control group where physicians were simply reminded to screen on printed physician worksheets..
- Main outcome of interest was whether physicians suspected a diagnosis of maternal depression and referred a mother for assistance.

Clinical Decision Support for Providers: Psychiatric and Behavioral Health

- **Reference**

- Carroll AE, et. al, A randomized controlled trial of screening for maternal depression with a clinical decision support system. J Am Med Inform Assoc. 2012 Jun 28.

- **Results**

- Referral for depression occurred significantly more often in both the PSF (2.4%) and JIT groups (2.4%) than in the control group (1.2%) (OR 2.06, 95% CI 1.08 to 3.93).
- Compared to the control group, more mothers were noted to have depressed mood in the PSF (OR 7.93, 95% CI 4.51 to 13.96) and JIT groups (OR 8.10, 95% CI 4.61 to 14.25).

- **Conclusions**

- Clinical decision support systems CHICA can improve the screening for and detection of maternal depression.

- **Importance**

- Example of CDS effect on co-morbidities that are not the main focus of the clinical encounter.

Clinical Decision Support for Providers: Clinical Documentation

- **Reference**

- Wright A, et. al, Improving completeness of electronic problem lists through clinical decision support: a randomized, controlled trial. J Am Med Inform Assoc. 2012 Jul-Aug;19(4):555-61..

- **Source**

- Division of General Internal Medicine, Brigham & Women's Hospital, Boston, MA

- **Aim**

- To determine whether a clinical alerting system, which uses inference rules to notify providers of undocumented problems, improves problem list documentation.

- **Methods**

- Inference rules for 17 conditions were constructed and an electronic health record-based intervention was evaluated to improve problem documentation.
- A cluster randomized trial was conducted of 11 participating clinics affiliated with a large academic medical center, totaling 28 primary care clinical areas, with 14 receiving the intervention and 14 as controls.

Clinical Decision Support for Providers: Clinical Documentation

- **Reference**

- Wright A, et. al, Improving completeness of electronic problem lists through clinical decision support: a randomized, controlled trial. J Am Med Inform Assoc. 2012 Jul-Aug;19(4):555-61..

- **Methods, cont'd**

- Intervention was a clinical alert directed to the provider that suggested adding a problem to the electronic problem list based on inference rules.
- Primary outcome measure was acceptance of the alert.
- Secondary outcome: number of study problems added in each arm.
- Data collected during 6-month pre-intervention (11/2009-5/2010) and intervention (5/2010-11/2010) periods.

Clinical Decision Support for Providers: Clinical Documentation

- **Reference**

- Wright A, et. al, Improving completeness of electronic problem lists through clinical decision support: a randomized, controlled trial. J Am Med Inform Assoc. 2012 Jul-Aug;19(4):555-61.

- **Results**

- 17,043 alerts were presented, of which 41.1% were accepted. In the intervention arm, providers documented significantly more study problems (adjusted OR=3.4, $p < 0.001$), with an absolute difference of 6277 additional problems.
- In the intervention group, 70.4% of all study problems were added via the problem list alerts.
- Significant increases in problem notation were observed for 13 of 17 conditions.

- **Conclusions**

- Problem inference alerts significantly increase notation of important patient problems in primary care, which in turn has the potential to facilitate quality improvement.

Clinical Decision Support for Providers: Clinical Documentation

- **Reference**

- Wright A, et. al, Improving completeness of electronic problem lists through clinical decision support: a randomized, controlled trial. J Am Med Inform Assoc. 2012 Jul-Aug;19(4):555-61..

- **Importance**

- Example of CDS effect on workflow consistency.

Clinical Decision Support for Providers: Graduate Medical Education

- **Reference**

- Holmboe ES, et. al, Comparative trial of a web-based tool to improve the quality of care provided to older adults in residency clinics: modest success and a tough road ahead. Acad Med. 2012 May;87(5):627-34.

- **Source**

- American Board of Internal Medicine, Philadelphia, PA

- **Aims**

- To determine whether residency programs can use a multicomponent, Web-based quality improvement tool to improve the care of older adults.

- **Methods**

- Exploratory, cluster-randomized, comparative before-after trial of the Care of the Vulnerable Elderly Practice Improvement Module in the ambulatory clinics of 46 internal medicine and family medicine residency programs, 2006-2008.
- Main outcomes were the deltas between pre- and post-performance on the Assessing Care of the Vulnerable Elderly (ACOVE) quality measures.

Clinical Decision Support for Providers: Graduate Medical Education

- **Reference**

- Holmboe ES, et. al, Comparative trial of a web-based tool to improve the quality of care provided to older adults in residency clinics: modest success and a tough road ahead. Acad Med. 2012 May;87(5):627-34.

- **Results**

- Of the 46 programs initially selected for the study, 37 (80%) provided both baseline and follow-up data.
- Performance on all 10 ACOVE measures was poor at baseline (range 8.6%-33.6%).
- Intervention clinics most frequently chose for improvement fall-risk screening and documentation of end-of-life preferences.
- Change in the percentage of patients screened for fall risk for the intervention clinics that targeted this measure was significantly greater than the change observed by the control clinics (+23.3% versus +9.7%, $P = .003$, odds ratio [OR] = 2.0; 95% confidence interval [CI]: 1.25-3.75), as was the difference observed for documentation of preference for life-sustaining care (+16.4% versus +2.8%, $P = .002$, OR = 6.3; 95% CI: 2.0-19.6) and surrogate decision maker (+14.3% versus +2.8%, $P = .003$, OR = 6.8; 95% CI: 1.9-24.4)..

Clinical Decision Support for Providers: Graduate Medical Education

- **Reference**

- Holmboe ES, et. al, Comparative trial of a web-based tool to improve the quality of care provided to older adults in residency clinics: modest success and a tough road ahead. Acad Med. 2012 May;87(5):627-34.

- **Conclusions**

- A multicomponent, Web-based, quality improvement tool can help residency programs improve care for older adults.
- Much work remains for improving the state of care for this population in training settings.

- **Importance**

- 21st Century medical education continues a frustrating cultural legacy of trying to improve consistency of care without much improvement.
- Ability to reason does not equate to reliability; medical education cultivates the former and seems to hope the latter will change.

Clinical Decision Support for Patients: Cardiovascular diseases

- **Reference**

- Hess EP, et. al, The chest pain choice decision aid: a randomized trial. Circ Cardiovasc Qual Outcomes. 2012 May;5(3):251-9. Epub 2012 Apr 10.

- **Source**

- Department of Emergency Medicine, Mayo Clinic College of Medicine, Rochester, MN.

- **Aim**

- To assess the effect of a patient decision aid on decisions to obtain cardiac stress testing.

- **Methods**

- 204 patients randomized to a decision aid or usual care and were followed for 30 days.
- Decision aid included a 100-person pictograph depicting the pretest probability of acute coronary syndrome and available management options (observation unit admission and stress testing or 24-72 hours outpatient follow-up).

Clinical Decision Support for Patients: Cardiovascular diseases

- **Reference**

- Hess EP, et. al, The chest pain choice decision aid: a randomized trial. Circ Cardiovasc Qual Outcomes. 2012 May;5(3):251-9. Epub 2012 Apr 10.

- **Methods, cont'd**

- Primary outcome was patient knowledge measured by an immediate postvisit survey.
- Additional outcomes included patient engagement in decision making and the proportion of patients who decided to undergo observation unit admission and cardiac stress testing.

- **Results**

- Compared with usual care patients (n=103), decision aid patients (n=101) had significantly greater knowledge (3.6 versus 3.0 questions correct; mean difference, 0.67; 95% CI, 0.34-1.0),
- Decision aid patients were more engaged in decision making as indicated by higher OPTION (observing patient involvement) scores (26.6 versus 7.0; mean difference, 19.6; 95% CI, 1.6-21.6),

Clinical Decision Support for Patients: Cardiovascular diseases

- **Reference**

- Hess EP, et. al, The chest pain choice decision aid: a randomized trial. Circ Cardiovasc Qual Outcomes. 2012 May;5(3):251-9. Epub 2012 Apr 10.

- **Results, cont'd**

- Decision aid patients decided less frequently to be admitted to the observation unit for stress testing (58% versus 77%; absolute difference, 19%; 95% CI, 6%-31%).
- There were no major adverse cardiac events after discharge in either group. .

- **Conclusions**

- Use of a decision aid in patients with chest pain increased knowledge and engagement in decision making and decreased the rate of observation unit admission for stress testing. .

- **Importance**

- Example of eliciting informed patient preferences in diagnostic testing decision usually made by providers alone

Clinical Decision Support for Patients: Cancer clinical trials

- **Reference**

- Jacobsen PB, et. al, Effects of a brief multimedia psychoeducational intervention on the attitudes and interest of patients with cancer regarding clinical trial participation: a multicenter randomized controlled trial. J Clin Oncol. 2012 Jul 10;30(20):2516-21.

- **Source**

- Moffitt Cancer Center and University of South Florida, Tampa, FL

- **Aim**

- To evaluate whether a brief psychoeducational intervention is effective in improving patients' attitudes as well as their knowledge, self-efficacy for decision making, receptivity to receiving more information, and general willingness to participate in clinical trials..

- **Methods**

- 472 adults with cancer who had not been asked previously to participate in a clinical trial.
- Participants randomly assigned to receive printed educational information about clinical trials or a psychoeducational intervention that provided similar information and also addressed misperceptions and concerns about clinical trials.

Clinical Decision Support for Patients: Cancer clinical trials

- **Reference**

- Jacobsen PB, et. al, Effects of a brief multimedia psychoeducational intervention on the attitudes and interest of patients with cancer regarding clinical trial participation: a multicenter randomized controlled trial. J Clin Oncol. 2012 Jul 10;30(20):2516-21.

- **Methods, cont'd**

- The primary (attitudes) and secondary outcomes (knowledge, self-efficacy, receptivity, and willingness) were assessed via patient self-report before random assignment and 7 to 28 days later.

- **Results**

- Patients who received the psychoeducational intervention showed more positive attitudes toward clinical trials ($P = .016$) and greater willingness to participate ($P = .011$) at follow-up than patients who received printed educational information.
- Evidence of an indirect effect of intervention assignment on willingness to participate (estimated at 0.168; 95% CI, 0.088 to 0.248) suggested that the benefits of psychoeducation on willingness to participate were explained by the positive impact of psychoeducation on attitudes toward clinical trials.

Clinical Decision Support for Patients: Cancer clinical trials

- **Reference**

- Jacobsen PB, et. al, Effects of a brief multimedia psychoeducational intervention on the attitudes and interest of patients with cancer regarding clinical trial participation: a multicenter randomized controlled trial. J Clin Oncol. 2012 Jul 10;30(20):2516-21.

- **Conclusions**

- A brief psychoeducational intervention can improve the attitudes of patients with cancer toward clinical trials and thereby increase their willingness to participate in clinical trials.

- **Importance**

- Addresses and enduring challenge for institutions conducting clinical trials, particularly CTSA awardees

Clinical Decision Support for Patients: Immunization reminders (3 RCTs)

- **References**

- Suh CA, et. al, **Effectiveness and net cost of reminder/recall for adolescent immunizations.** Pediatrics. 2012 Jun;129(6):e1437-45. Epub 2012 May 7. [Childrens Hospital, Aurora, CO]
- Dombkowski KJ, et. al, **Seasonal influenza vaccination reminders for children with high-risk conditions: a registry-based randomized trial.** Am J Prev Med. 2012 Jan;42(1):71-5. [Pediatrics, Univ. Michigan]
- Lau AY, et. al, **Impact of a web-based personally controlled health management system on influenza vaccination and health services utilization rates: a randomized controlled trial.** J Am Med Inform Assoc. 2012 Sep-Oct;19(5):719-27. [Univ. New South Wales, Australia].

Clinical Decision Support for Patients: Immunization reminders (3 RCTs)

- **Interventions**

- Colorado: 2 letters and 2 telephone calls
- Univ. Michigan: Mailed reminders for immunization.
- Univ New South Wales: Tethered web-based PHR with immunization reminders

- **Results**

- All interventions showed statistically significantly improved rates of desired outcomes.
- Colorado group found equivocal effects on private pediatric practice net revenue (3 positive, 1 negative)
- Univ. of Michigan found 40% of children had undeliverable mail addresses.

Clinical Decision Support for Patients: Medication management

- **Reference**

- Vollmer WM, et. al, Use of health information technology to improve medication adherence. Am J Manag Care. 2011 Dec;17(12 Spec No.):SP79-87.

- **Source**

- Kaiser Permanente Center for Health Research, Portland, OR

- **Aim**

- To evaluate the effectiveness of an intervention based on health information technology (HIT) that used speech recognition software to promote adherence to inhaled corticosteroids (ICS) among individuals with asthma who were members of a large health maintenance organization.

- **Methods**

- Adults with asthma (N = 8517) were randomized to receive either usual care or an interactive voice recognition (IVR) intervention designed to prompt medication refills and improve ICS adherence.
- Primary outcome was ICS adherence as measured by modified medication possession ratio calculated from the electronic medical record (EMR)..

Clinical Decision Support for Patients: Medication management

- **Reference**

- Vollmer WM, et. al, Use of health information technology to improve medication adherence. Am J Manag Care. 2011 Dec;17(12 Spec No.):SP79-87.

- **Methods, cont'd**

- Secondary measures included survey- and EMR-based measures of asthma morbidity.

- **Results**

- ICS adherence increased modestly but significantly for participants in the intervention group relative to those in the usual care group ($\Delta=0.02$, 95% confidence interval 0.01-0.03), with a baseline adherence of 0.42 in both groups.
- No overall difference was observed in asthma morbidity measures.
- Participants receiving 2 or more direct IVR contacts or detailed messages, the intervention effect was more marked. The overall effect was triple that observed in the primary analyses (0.06 vs 0.02), and significant differences were observed between groups in asthma control.

Clinical Decision Support for Patients: Medication management

- **Reference**

- Vollmer WM, et. al, Use of health information technology to improve medication adherence. Am J Manag Care. 2011 Dec;17(12 Spec No.):SP79-87.

- **Conclusions**

- An IVR-based adherence intervention shows potential for supporting medication adherence in patients with chronic diseases such as asthma.

- **Importance**

- Telephonic interventions using interactive voice recognition have demonstrable positive effects and low operating cost for highly prevalent conditions

Clinical Decision Support for Patients: Psychiatric and behavioral health (3 RCTs)

- **References**

- Subramaniam K, et. al, **Computerized cognitive training restores neural activity within the reality monitoring network in schizophrenia.** Neuron. 2012 Feb 23;73(4):842-53. [UCSF]
- Jernelov S, et. al, **Efficacy of a behavioral self-help treatment with or without therapist guidance for co-morbid and primary insomnia--a randomized controlled trial.** BMC Psychiatry. 2012 Jan 22;12:5. [Clinical Neuroscience, Karolinska Institute, Sweden]
- Simon D, et. al, **Effectiveness of a web-based, individually tailored decision aid for depression or acute low back pain: a randomized controlled trial.** Patient Educ Couns. 2012 Jun;87(3):360-8. [Psychiatry Dept., Univ. Freiburg, Germany]

Clinical Decision Support for Patients: Psychiatric and behavioral health (3 RCTs)

- **Interventions**

- UCSF: 80 hr of computerized training of cognitive processes to schizophrenia patients vs. 80 hrs of computer games
- Karolinska: Bibliotherapy vs. Computer-based Cognitive Behavioral Therapy [CBT] +/- therapist support for insomnia.
- Freiburg: interactive web app vs. static patient information for depression or back pain

- **Results**

- UCSF: improved reality monitoring and social functioning 6 mos later.
- Karolinska: shorter sleep latency at 3 mo follow-up in CBT group
- Freiburg: less decisional conflict but large drop-out over time.

CDSS Unintended Consequences

- **Reference**

- Murphy DR, et. al, Notifications received by primary care practitioners in electronic health records: a taxonomy and time analysis. Am J Med. 2012 Feb;125(2):209.e1-7.

- **Source**

- Houston VA HSR&D

- **Aims**

- To create an asynchronous alert taxonomy and measure the impact of different alert types on practitioner workload.

- **Methods**

- Authors quantified and categorized asynchronous alerts according to the information they conveyed and conducted a time-motion analysis to assess practitioner workload.
- Reviewed alert information transmitted to all 47 primary care practitioners (PCPs) at a large, tertiary care Veterans Affairs facility over 4 evenly spaced 28-day periods.
- Created an alert taxonomy and used it to calculate the mean number of alerts of each type PCPs received each day.

CDSS Unintended Consequences

- **Reference**

- Murphy DR, et. al, Notifications received by primary care practitioners in electronic health records: a taxonomy and time analysis. Am J Med. 2012 Feb;125(2):209.e1-7.

- **Methods, cont'd**

- Conducted a time-motion study of 26 PCPs while they processed their alerts. Used these data to estimate the uninterrupted time practitioners spend processing alerts each day.

- **Results**

- 295,792 asynchronously generated alerts and created a taxonomy of 33 alert types categorized under 6 major categories: Test Results, Referrals, Note-Based Communication, Order Status, Patient Status Changes, and Incomplete Task Reminders.
- PCPs received a mean of 56.4 alerts/day containing new information.
- Based on 749 observed alert processing episodes, practitioners spent an estimated average of 49 minutes/day processing their alerts..

Unintended Consequences of CDSS: Alert Fatigue

- **References**

- Phansalkar S, et. al, **Drug-drug interactions that should be non-interruptive in order to reduce alert fatigue in electronic health records**. J Am Med Inform Assoc. 2012 Sep 25. [Partners Healthcare, Wellesley, MA]
- Embi PJ, et. al, **Evaluating alert fatigue over time to EHR-based clinical trial alerts**: findings from a randomized controlled study. J Am Med Inform Assoc. 2012 Jun 1;19(e1):e145-e148. [Ohio State, Columbus, OH]

Unintended Consequences of Clinical Systems: Alert Fatigue

- **Methods**

- Partners (Bates): expert panel to address 90% override rate of drug interaction alerts. Rated drug-drug interactions and decide which can be safely made “non-interruptive”
- OSU: observed response patterns of 178 physicians to patient specific alerts regarding clinical trial eligibility

- **Results**

- Partners: Development of 33 class medication knowledge base (comprising 36% of total alerts).
- OSU: declining response rate (about 1.5% per week from 50% to 35%) to clinical trial alerts over 36 week study period; differences between university and community-based system users.

Clinical System Unintended Consequences

- **Reference**

- Adelman JS, et. al, Understanding and preventing wrong-patient electronic orders: a randomized controlled trial. J Am Med Inform Assoc. 2012 Jun 29.

- **Source**

- Albert Einstein College of Medicine, Montefiore Medical Center, Bronx, NY

- **Aims**

- To evaluate systems for estimating and preventing wrong-patient electronic orders in computerized physician order entry systems.

- **Methods**

- Phase 1: effectiveness of a 'retract-and-reorder' measurement tool was assessed that identified orders placed on a patient, promptly retracted, and then reordered by the same provider on a different patient as a marker for wrong-patient electronic orders.
- Tool then used to estimate the frequency of wrong-patient electronic orders in four hospitals in 2009.
- Phase 2: a three-armed randomized controlled trial was conducted to evaluate the efficacy of two distinct interventions aimed at preventing these errors by reverifying patient identification: an 'ID-verify alert', and an 'ID-reentry function'.

Clinical System Unintended Consequences

- **Reference**

- Adelman JS, et. al, Understanding and preventing wrong-patient electronic orders: a randomized controlled trial. J Am Med Inform Assoc. 2012 Jun 29.

- **Results**

- Retract-and-reorder measurement tool effectively identified 170 of 223 events as wrong-patient electronic orders, resulting in a positive predictive value of 76.2% (95% CI 70.6% to 81.9%).
- Estimated that 5246 electronic orders were placed on wrong patients in 2009.
- In phase 2, 901,776 ordering sessions among 4028 providers were examined. Compared with control, the ID-verify alert reduced the odds of a retract-and-reorder event (OR 0.84, 95% CI 0.72 to 0.98), but the ID-reentry function reduced the odds by a larger magnitude (OR 0.60, 95% CI 0.50 to 0.71). 2516-21.

- **Conclusions**

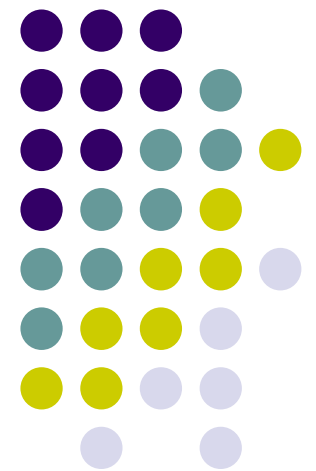
- Wrong-patient electronic orders occur frequently with computerized provider order entry systems, and electronic interventions can reduce the risk of these errors occurring.

6 New CDSS RCTs showing no difference for intervention vs. control

1. Manns B, et. al, **A cluster randomized trial of an enhanced eGFR prompt in chronic kidney disease.** Clin J Am Soc Nephrol. 2012 Apr;7(4):565-72. Epub 2012 Feb 16. [Univ. Calgary, Alberta, Canada]
2. Kripalani S, et. al, **Effect of a pharmacist intervention on clinically important medication errors after hospital discharge: a randomized trial.** Ann Intern Med. 2012 Jul 3;157(1):1-10. [Vanderbilt Univ Med Ctr]
3. Walter FM, et. al, **Effect of adding a diagnostic aid to best practice to manage suspicious pigmented lesions in primary care: randomised controlled trial.** BMJ. 2012 Jul 4;345:e4110. [Cambridge Univ., UK]
4. Boustani MA, et. al, **Enhancing care for hospitalized older adults with cognitive impairment: a randomized controlled trial.** J Gen Intern Med. 2012 May;27(5):561-7. doi: 10.1007/s11606-012-1994-8. [Indiana Univ.]
5. Friction J, et. al, **The effect of electronic dental health records on the use of clinical care guidelines for patients with medically complex conditions.** J Am Dent Assoc. 2011 Oct;142(10):1133-42. [HealthPartners Research Foundation, Bloomington, MN]
6. Wagner PJ, et. al, **Personal health records and hypertension control: a randomized trial.** J Am Med Inform Assoc. 2012 Jul-Aug;19(4):626-34. [Dept Fam Medicine, Georgia Health Sciences Univ., Augusta, GA]

Clinical Decision Support for Providers and Patients

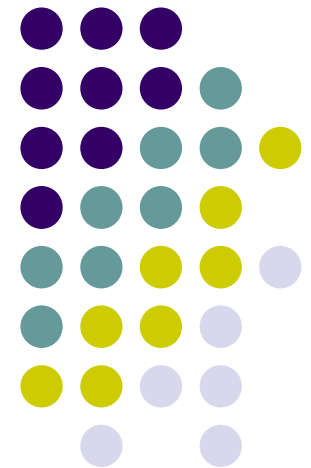
Questions and Comments



Telemedicine

36 new RCTs published
November 2010 – October 2011

- 7 cardiovascular diseases
- 2 diabetes
- 19 Psychiatric and behavioral health
- 1 each: fatigue syndrome, COPD, atopic dermatitis, asthma, hand hygiene, self care



Telemedicine – cardiovascular diseases

4 RCTs

- **References**

- Landolina M, et. al, **Remote monitoring reduces healthcare use and improves quality of care in heart failure patients with implantable defibrillators: the evolution of management strategies of heart failure patients with implantable defibrillators (EVOLVO) study.** Circulation. 2012 Jun 19;125(24):2985-92. [Cardiology Dept. Pavia, Italy]
- Mabo P, et. al, **A randomized trial of long-term remote monitoring of pacemaker recipients (the COMPAS trial).** Eur Heart J. 2012 May;33(9):1105-11. [Central Hosp. Rennes, France]
- Logan AG, et. al, **Effect of home blood pressure telemonitoring with self-care support on uncontrolled systolic hypertension in diabetics.** Hypertension. 2012 Jul;60(1):51-7. [Mt. Sinai, Toronto]
- Demaerschak BM, et. al, **Efficacy of telemedicine for stroke: pooled analysis of the Stroke Team Remote Evaluation Using a Digital Observation Camera (STRoKE DOC) and STRoKE DOC Arizona telestroke trials.** Telemed J E Health. 2012 Apr;18(3):230-7. [Mayo Clinic Phoenix, AZ]

Telemedicine – cardiovascular diseases

- **Interventions**

- Pavia: Remote Internet-based monitoring of implanted cardioverter-defibrillators in CHF patients. Evaluated unscheduled ED visits.
- Rennes: Remote internet-based monitoring of pacemakers. Evaluated scheduled & unscheduled visits, hosp. admissions.
- Toronto: BP remote monitoring and outgoing self care msgs on smartphones.
- Phoenix: Video stroke teleconsultation vs. telephone only consultation

- **Results**

- Remote monitoring was safe and effective for pacemakers and implanted defibrillators.
- Remote BP monitoring and feedback significantly lowered BP significantly but increased depression scores on standardized psych assessments.
- Video stroke teleconsultation more accurate Dx and Rx than phone.

Telemedicine – diabetes (2 RCTs)

- **References**

1. Fischer HH, et. al, **Nurse-run, telephone-based outreach to improve lipids in people with diabetes.** Am J Manag Care. 2012 Feb;18(2):77-84. [Denver Health & Hospital Authority, Denver, CO]
2. Ratanawongsa N, et. al, **Primary care provider perceptions of the effectiveness of two self-management support programs for vulnerable patients with diabetes.** J Diabetes Sci Technol. 2012 Jan 1;6(1):116-24 [Genl Internal Medicine, UCSF]

Telemedicine - diabetes

- **Interventions**

- Denver: algorithm-driven telephone care by nurses; measured LDL levels over time.
- UCSF: automated telephone self-management; assessed provider perspectives on patient engagement and quality of care.

- **Results**

- Denver: Statistically significant decreases in lipid levels, lower avg. cost/pt to healthcare system.
- UCSF: providers perceived that patients receiving telemedicine program managed medications better and had higher overall quality of care.

Telemedicine – Psychiatric and behavioral health 19 RCTs (!)

- **References**

1. Brenes GA, et. al, **Telephone-delivered psychotherapy for late-life anxiety**. Psychol Serv. 2012 May;9(2):219-20. [Wake Forest]
2. Ruehlman LS, et. al, **A randomized controlled evaluation of an online chronic pain self management program**. Pain. 2012 Feb;153(2):319-30. [Goalistics, Tempe AZ]
3. Chong J, et. al, **Feasibility and acceptability of clinic-based telepsychiatry for low-income Hispanic primary care patients**. Telemed J E Health. 2012 May;18(4):297-304. [Univ. Arizona]
4. Ruetsch C, et. al, **The effect of telephonic patient support on treatment for opioid dependence: outcomes at one year follow-up**. Addict Behav. 2012 May;37(5):686-9. [Health Analytics, Columbia MD]
5. Preschl B, et. al, **The working alliance in a randomized controlled trial comparing online with face-to-face cognitive-behavioral therapy for depression**. BMC Psychiatry. 2011 Dec 6;11:189 [Univ. Zurich, Switzerland]

Telemedicine – Psychiatric and behavioral health 19 RCTs, cont'd

- **References**

6. Jacobi C, et. al, **Effects of an Internet-based intervention for subthreshold eating disorders: a randomized controlled trial.** Behav Res Ther. 2012 Feb;50(2):93-9. [Dresden, Germany]
7. Ertelt TW, et. al, **Therapeutic factors affecting the cognitive behavioral treatment of bulimia nervosa via telemedicine versus face-to-face delivery.** Int J Eat Disord. 2011 Dec;44(8):687-91. [Univ. North Dakota]
8. Cunningham JA. **Comparison of two internet-based interventions for problem drinkers: randomized controlled trial.** J Med Internet Res. 2012 Aug 1;14(4):e107. [Toronto, Canada]
9. Postel MG, et. al, **Attrition in web-based treatment for problem drinkers.** J Med Internet Res. 2011 Dec 27;13(4):e117. [Netherlands]
10. Farrer L, et. al, **Web-based cognitive behavior therapy for depression with and without telephone tracking in a national helpline: secondary outcomes from a randomized controlled trial.** J Med Internet Res. 2012 Jun 27;14(3):e68. [Canberra, Australia]

Telemedicine – Psychiatric and behavioral health 19 RCTs, cont'd

- **References**

11. van der Zanden R, et. al, **Effectiveness of an online group course for depression in adolescents and young adults: a randomized trial.** J Med Internet Res. 2012 Jun 7;14(3):e86. [Utrecht, Netherlands]
12. Collins CE, et. al, **A 12-week commercial web-based weight-loss program for overweight and obese adults: randomized controlled trial comparing basic versus enhanced features.** J Med Internet Res. 2012 Apr 25;14(2):e57. [Univ Newcastle, Australia]
13. Elfeddali I, et. al, **Preventing smoking relapse via Web-based computer-tailored feedback: a randomized controlled trial.** J Med Internet Res. 2012 Aug 20;14(4):e109. [Maastricht, Netherlands]
14. Joseph AM, et. al, **Chronic disease management for tobacco dependence: a randomized, controlled trial.** Arch Intern Med. 2011 Nov 28;171(21):1894-900. [Univ. Minn., Minneapolis]

Telemedicine – Psychiatric and behavioral health **No difference between intervention & control (5)**

- **References**

1. Hansen AB, et. al, **Internet-based brief personalized feedback intervention in a non-treatment-seeking population of adult heavy drinkers: a randomized controlled trial.** J Med Internet Res. 2012 Jul 30;14(4):e98. [Copenhagen, Denmark]
2. van Genugten L, et. al, **Results from an online computer-tailored weight management intervention for overweight adults: randomized controlled trial.** J Med Internet Res. 2012 Mar 14;14(2):e44. [Rotterdam, Netherlands]
3. Wangberg SC, et. al, **Effect of tailoring in an internet-based intervention for smoking cessation: randomized controlled trial.** J Med Internet Res. 2011 Dec 15;13(4):e121. [Narvik, Norway]
4. Smit ES, et. al, **Effectiveness of a Web-based multiple tailored smoking cessation program: a randomized controlled trial among Dutch adult smokers.** J Med Internet Res. 2012 Jun 11;14(3):e82. [Maastricht, Netherlands]

Telemedicine – Psychiatric and behavioral health No difference between intervention & control

- **References**

5. Ferguson J, et. al, **Effect of offering different levels of support and free nicotine replacement therapy via an English national telephone quitline: randomised controlled trial.** BMJ. 2012 Mar 23;344:e1696. [Nottingham, England]

Additional New Telemedicine RCTs showing no difference for intervention vs. control

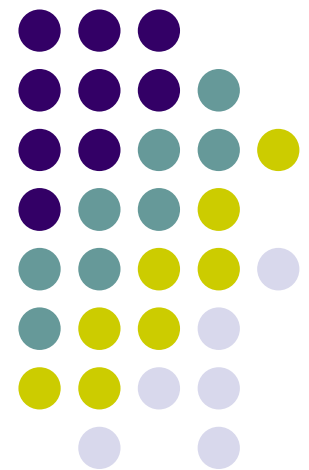
1. Wang V, et. al, **Economic evaluation of telephone self-management interventions for blood pressure control.** Am Heart J. 2012 Jun;163(6):980-6. [Dept. Medicine, Duke Univ., Durham, NC, VA Healthcare system]
2. Lynga P, et. al, **Weight monitoring in patients with severe heart failure (WISH).** A randomized controlled trial. Eur J Heart Fail. 2012 Apr;14(4):438-44. [Karolinska Inst., Sweden]
3. Pekmezaris R, et. al, **The impact of remote patient monitoring (telehealth) upon Medicare beneficiaries with heart failure.** Telemed J E Health. 2012 Mar;18(2):101-8. [Population Health, Great Neck, NY]

Health Applications of Mobile Electronics

18 new RCTs published

November 2010 – October 2011

- 7 featuring data acquisition via smart phones and SMS messaging
- 11 featuring healthcare interventions via iPads, smartphones, SMS text enabled phones.



Health Applications of Mobile Electronics

Acquiring data from study participants (7 RCTs)

- **References**

1. Seto E, et. al, **Mobile phone-based telemonitoring for heart failure management: a randomized controlled trial.** J Med Internet Res. 2012 Feb 16;14(1):e31. [Univ. Health Network, Toronto]
2. Blasco A, et. al, **Evaluation of a telemedicine service for the secondary prevention of coronary artery disease.** J Cardiopulm Rehabil Prev. 2012 Jan-Feb;32(1):25-31. [Univ. Hospital, Madrid, Spain]
3. Bradley J, et. al, **The feasibility of using mobile phone technology for sexual behaviour research in a population vulnerable to HIV: a prospective survey with female sex workers in South India.** AIDS Care. 2012;24(6):695-703. [Bangalore, India]
4. Barghouthi T, et. al, **The use of a camera-enabled mobile phone to triage patients with nasal bone injuries.** Telemed J E Health. 2012 Mar;18(2):150-2. [Beaumont Hosp., Dublin, Ireland]
5. Heinonen R, et. al, **Usability and feasibility of mobile phone diaries in an experimental physical exercise study.** Telemed J E Health. 2012 Mar;18(2):115-9. [Tampere, Finland]

Health Applications of Mobile Electronics

Acquiring data from study participants (7 RCTs)

- **References**

6. Macedo LG, et. al, **Feasibility of using short message service to collect pain outcomes in a low back pain clinical trial.** Spine (Phila Pa 1976). 2012 Jun 1;37(13):1151-5. [Univ. Alberta, Canada]
7. Ryan D, et. al, **Clinical and cost effectiveness of mobile phone supported self monitoring of asthma: multicentre randomised controlled trial.** BMJ. 2012 Mar 23;344:e1756. doi: 10.1136/bmj.e1756. [Univ. Aberdeen, Aberdeen, UK]

- **Summary outcomes**

- Cell phone use for data acquisition feasible and useful
- Health measures sent by phone showed favorable trends

Health Applications of Mobile Electronics

Delivering Healthcare interventions (11 RCTs)

- **References**

1. Spring B, et. al, **Multiple behavior changes in diet and activity: a randomized controlled trial using mobile technology.** Arch Intern Med. 2012 May 28;172(10):789-96. [Northwestern Univ., Chicago]
2. Stockwell MS, et. al, **Effect of a text messaging intervention on influenza vaccination in an urban, low-income pediatric and adolescent population: a randomized controlled trial.** JAMA. 2012 Apr 25;307(16):1702-8. [Columbia Univ., NYC]
3. Stockwell MS, et. al, **Text4Health: impact of text message reminder-recalls for pediatric and adolescent immunizations.** Am J Public Health. 2012 Feb;102(2):e15-21. [Columbia Univ., NYC]
4. Kunawararak P, et. al, **Tuberculosis treatment with mobile-phone medication reminders in northern Thailand.** Southeast Asian J Trop Med Public Health. 2011 Nov;42(6):1444-51. [Thailand]

Health Applications of Mobile Electronics

Delivering Healthcare interventions (11 RCTs)

- **References**

5. da Costa TM, et. al, **Results of a randomized controlled trial to assess the effects of a mobile SMS-based intervention on treatment adherence in HIV/AIDS-infected Brazilian women and impressions and satisfaction with respect to incoming messages.** Int J Med Inform. 2012 Apr;81(4):257-69. [Sao Paulo, Brazil]
6. Prasad S, et. al, **Use of mobile telephone short message service as a reminder: the effect on patient attendance.** Int Dent J. 2012 Feb;62(1):21-6. [Uttar Pradesh, India]
7. Soureti A, et. al, **Exploratory study of web-based planning and mobile text reminders in an overweight population.** J Med Internet Res. 2011 Dec 20;13(4):e118. [Bedforshire, UK]
8. de Tolly K, et. al, **Investigation into the use of short message services to expand uptake of human immunodeficiency virus testing, and whether content and dosage have impact.** Telemed J E Health. 2012 Jan-Feb;18(1):18-23. [Cape Town, South Africa]

Health Applications of Mobile Electronics

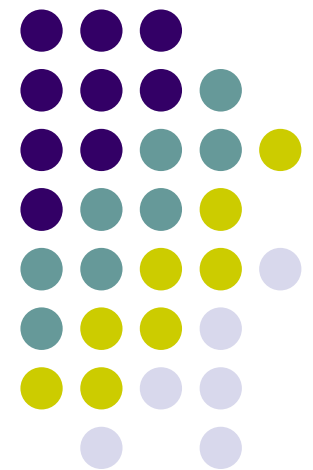
Delivering Healthcare interventions (11 RCTs)

- **References**

9. Castano PM, et. al, **Effect of daily text messages on oral contraceptive continuation: a randomized controlled trial.** Obstet Gynecol. 2012 Jan;119(1):14-20. [Columbia University, NYC]
10. Thornton JD, et. al, **Effect of an iPod video intervention on consent to donate organs: a randomized trial.** Ann Intern Med. 2012 Apr 3;156(7):483-90. [Case Western, Cleveland, OH]
11. Kauer SD, et. al, **Self-monitoring using mobile phones in the early stages of adolescent depression: randomized controlled trial.** J Med Internet Res. 2012 Jun 25;14(3):e67. [Royal Childrens Hosp., Parkville, Australia]

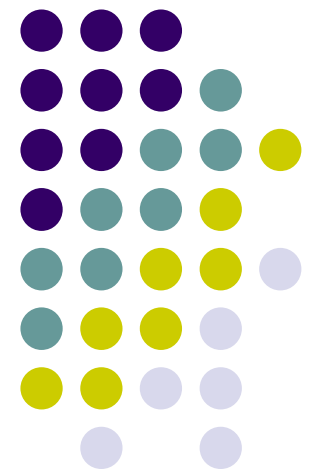
Telemedicine and Health Applications of Mobile Electronics

Questions and Comments



The Practice of Informatics

New methods, technologies,
position papers, reviews



Practice of Informatics:

Issues related to EHR use and adoption (3 articles)

- **References**

1. Sittig DF, et. al, **Rights and responsibilities of users of electronic health records**. CMAJ. 2012 Sep 18;184(13):1479-83. Epub 2012 Feb 13.

Summary: Sociotechnical issues and rules of the road in EHR go-lives.

2. Kern LM, et. al, **Electronic Health Records and Ambulatory Quality of Care**. J Gen Intern Med. 2012 Oct 3. [Cornell Med Coll, NYC]

Key finding: community based EHR use associated with improved quality of care. Effect not limited to academic centers.

3. Hripcsak G, et. al, **Next-generation phenotyping of electronic health records**. J Am Med Inform Assoc. 2012 Sep 30.

Key finding: genotypes are easy, phenotypes are hard, but not impossible, as extracted from EHR data.

Practice of Informatics: New technologies

- **References**

1. Eysenbach G. **Can tweets predict citations? Metrics of social impact based on Twitter and correlation with traditional metrics of scientific impact.** J Med Internet Res. 2011 Dec 19;13(4):e123 [Univ. Health Network, Toronto]

Key findings: Yes, tweets in first 3 days after publication predict later citations.

2. Srinivasan K, et. al, **Efficacy of a remote based computerised visual acuity measurement.** Br J Ophthalmol. 2012 Jul;96(7):987-90. Epub 2012 Apr 26. [Manipal Univ., Karnataka, India]

Key findings: Remotely controlled computer-based visual acuity testing as good as optometrist

Practice of Informatics: New technologies

- **References**

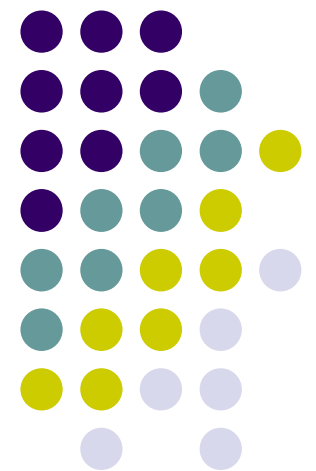
1. Ringel F, et. al, **Accuracy of robot-assisted placement of lumbar and sacral pedicle screws: a prospective randomized comparison to conventional freehand screw implantation.** Spine (Phila Pa 1976). 2012 Apr 15;37(8):E496-501 [Munich Tech Univ.]

Key finding: miniature robot for placing screws for spine stabilization screws up; takes too long and doesn't put screws in correct position



Practice of Informatics

Questions and Comments



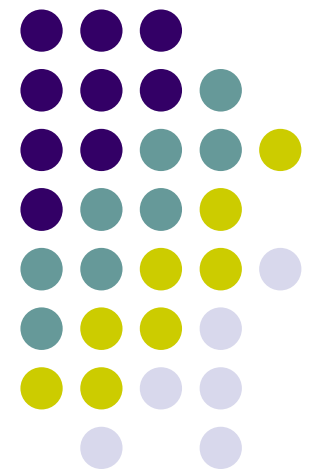
New Literature Highlights: **Bioinformatics and** **Computational Biology**

- Human Health and Disease
- The practice of bioinformatics

See 2012 Year in Review website:

Google: “AMIA Year in Review”

Top Ten List of Notable Events in the Past 12 months



Top 10 events

10 - Clinicaltrials.gov begins reporting results

Firefox

Comprehensive molecular po... x Google Trends - Web Search ... x +

www.google.com/trends/explore#q=clinicaltrials.gov

+You Search Images Maps Play YouTube News Gmail Documents Calendar More -

Google dmasys2@gmail.com

Trends Web Search Interest: **clinicaltrials.gov**. Worldwide, 2004 - present.

Explore trends

Hot searches

Search terms **clinicaltrials.gov**

+ Add term

Other comparisons

Limit to

Web Search

Worldwide

2004 - present

All Categories

Interest over time

The number 100 represents the peak search volume

News headlines Forecast

Embed

Regional interest

Related terms

Term	Interest Score	Category
clinicaltrials.gov website	100	Top
clinical trials.gov	90	Rising
clinicaltrials.gov login	85	Rising
clinicaltrials.gov registrat...	70	Rising
clinicaltrials	70	Rising
clinicaltrials.gov results	65	Rising
clinicaltrials.gov register	45	Rising

Top 10 events

- 10 - Clinicaltrials.gov begins reporting results
- 9 - The concept of “junk DNA” is junked (September 6, 2012)

Firefox

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NATURE | ARTICLE **OPEN**   






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An integrated encyclopedia of DNA elements in the human genome

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Nature **489**, 57–74 (06 September 2012) | doi:10.1038/nature11247
Received 24 November 2011 | Accepted 29 May 2012 | Published online 05 September 2012



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Abstract


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Selected feature



Decoding the cell
Sequencing DNA from individual human cells could reshape the way researchers think of

Top 10 events

- 10 - Clinicaltrials.gov begins reporting results
- 9 - The concept of “junk DNA” is junked
- 8 - Social Security Admin limits Death Index data

Social Security death-record limits hinder researchers

By Kevin Sack
New York Times

Posted: 10/14/2012 12:01:00 AM CDT

A shift last year by the Social Security Administration to limit access to its death records amid concerns about identity theft is beginning to hamper a broad swath of research, including federal government assessments of hospital safety and financial industry efforts to spot consumer fraud.

For example, a research group that produces reports on organ-transplant survival rates is facing delays because of the extra work it must do to determine whether patients are still alive. The federal agency that runs Medicare uses the data to determine whether some transplant programs have such poor track records that they should be cut off from government financing.

"We are not going to be on time until this problem is corrected," said Dr. Bertram Kasiske, a Minneapolis nephrologist who directs the research group, the Scientific Registry of Transplant Recipients. "It's a big deal. A lot of people look for these reports and depend on them."

Other medical researchers, including those conducting long-term federally financed studies of cancer and cardiovascular treatments, said the changes imposed last November were now slowing their work significantly. And a spokesman for financial industries like life insurance

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to opine on why one computer application

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¹Department of Biomedical Informatics and Medical Education, University of Washington, Seattle, WA 98195, USA. ²Department of Biomedical Informatics, Vanderbilt University School of Medicine, Nashville, TN 37232, USA. ³Center for Biomedical Informatics, Harvard Medical School, Boston, MA 02115, USA.
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ables (called metadata) using a Web interface or spreadsheet software. The REDCap application then automatically creates the underlying database tables, Web-enabled secure data entry forms, and utilities for conducting data quality control and to update and download in formats amenable to statistical analysis.

ing (www.i2b2.org/work/aug.html).

CASE 3: CABIG

The most ambitious case in terms of scope and complexity is that of the caBIG program, which began in 2004 as a high-profile research infrastructure initiative of NCI (5). caBIG sought to meet the “Tower of Babel”

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(Fig. 1) challenges of the growing volume and heterogeneity of research data by developing shared vocabularies, data models for research-data exchange, and a set of computer applications that embodied common data elements, standards, and methods for computers to communicate data via a grid architecture. Computer grids form a network that is capable of functioning as one large computer spread over many different machines at geographically dispersed sites connected by the Internet. An early caBIG survey effort to identify the kinds of computerized tools needed yielded a list of dozens of potential applications spanning basic, translational, and clinical research. caBIG has been managed as a set of contracts, with strong central guidance to contractors on the technical factors needed to make computer programs compatible with



Fig. 1. Negotiating the Tower of Babel. The climbing vel

data standards lower the barrier to data sharing and offer the hope that insights might be gained by linking dissimilar data types that are related to the same biological system. But standards are a double-edged sword when applied to partially understood complex systems because they not only embody the notion of an approved set of names for biological objects and concepts, but also can convey an explicit set of relationships between those objects and concepts that can be inhibiting to scientific creativity or, worse, found to be wrong as science progresses.

REDCap and the i2b2 workbench take a permissive stance on the use of data standards for both variable names and the allowable values that those variables can take. This makes the use of standards an optional, value-added activity that can be exercised when the

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(March 29, 2012)

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Thursday, March 29, 2012

Contacts:
[Kathleen Cravedi](#), NCBI, 301-496-6308
Tera Randall, Amazon Web Services, 206-266-0616
[Larry Thompson](#), NHGRI, 301-402-0911

1000 Genomes Project data available on Amazon Cloud
Project is Exemplar of New White House Big Data Initiative

The world's largest set of data on human genetic variation — produced by the international 1000 Genomes Project — is now publicly available on the Amazon Web Services (AWS) cloud, the National Institutes of Health and AWS jointly announced today.

The public-private collaboration demonstrates the kind of solutions that may emerge from the Big Data Research and Development Initiative announced today by the White House Office of Science and Technology Policy (OSTP) during an event at the American Association for the Advancement of Science in Washington, D.C.

"The explosion of biomedical data has already significantly advanced our understanding of health and disease. Now we want to find new and better ways to make the most of these data to speed discovery, innovation and improvements in the nation's health and economy," said NIH Director Francis S. Collins, M.D., Ph.D. Dr. Collins is among agency leaders speaking in support of the initiative at the launch event.

The Big Data initiative will initially engage at least six federal science agencies — including the NIH, the National Science Foundation, and the Department of Defense and the Department of Energy — committing more than \$200 million to a collaborative effort to develop core technologies and other resources needed by researchers to manage and analyze enormous data sets.

Among the NIH components participating in the Big Data initiative are the National Human Genome Research Institute (NHGRI) and the NIH [National Center for Biotechnology Information](#) (NCBI), a division of the National Library of Medicine. NHGRI played a lead role in organizing and funding the international 1000 Genomes Project. NCBI, along with the [European Bioinformatics Institute](#), Hinxton, England, began making 1000 Genomes Project data freely available to researchers in 2008.

Since the project's launch, the data set has grown enormously: At 200 terabytes — the equivalent of 16 million file cabinets filled with text, or more than 30,000 standard DVDs — the current 1000 Genomes Project records are a prime example of big data that has become so massive that few researchers have the computing power to use them.

To help solve that problem, AWS has just posted the 1000 Genomes Project data for free as a public data set, providing a centralized repository on the Amazon Simple Storage Service. The data can be seamlessly accessed through services such as Amazon Elastic Compute Cloud and Amazon Elastic MapReduce, which provide organizations with the highly scalable resources needed to power big data and high performance computing applications often needed in research. Researchers pay only for the additional AWS resources they need to further

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(October 4, 2012)

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Comprehensive molecular portraits of human breast tumours

The Cancer Genome Atlas Network

Affiliations | Contributions

Nature 490, 61–70 (04 October 2012) | doi:10.1038/nature11412
 Received 22 March 2012 | Accepted 11 July 2012 | Published online 23 September 2012
 | Corrected online 03 October 2012

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Abstract

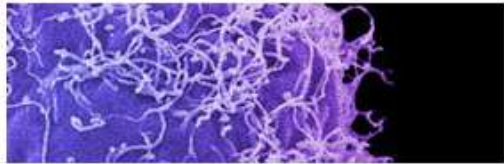
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Decoding the cell
 Sequencing DNA from individual human cells could reshape the way researchers think of humans as a whole.

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NLM-Funded Investigator Creates First Complete Computerized Simulation of an Organism

A team led by Markus Covert, PhD, a bioengineering professor at Stanford, used data compiled from more than 900 scientific papers to construct the first complete computer model of an organism, *Mycoplasma genitalium*. Dr. Covert was the recipient of a 2009 [NIH Pioneer Award](#), jointly sponsored by the National Library of Medicine (NLM) and the [NIH Common Fund](#). NLM is the world's largest biomedical library and a component of the National Institutes of Health.



Dr. Markus Covert

This ground-breaking achievement in computational biology earned the cover of the July 20, 2012 issue of *Cell* and represents a "[transforming approach to answering questions about fundamental biological processes](#)," according to James M. Anderson, MD, PhD, director of NIH's Division of Program Coordination, Planning and Strategic Initiatives. The single-cell bacterium was chosen for its relative simplicity; it has 525 genes, compared to *E. coli*'s 4,288. The model runs on 128 computers and:

- Describes the life cycle of a single cell from the level of individual molecules and their interactions
- Accounts for the specific function of every annotated gene product
- Accurately predicts a wide range of observable behaviors²



In a [July 20, 2012 article in *The New York Times*](#), Covert described the object-oriented approach his team used to design the 28 separate modules that represent *M. genitalium*'s biological processes: "The major modeling insight we had a few years ago was to break up the functionality of the cell into subgroups, which we could model individually, each with its own mathematics, and then to integrate these submodels together into a whole."

This approach uses more than 1,900 parameters observed experimentally and reported in 900+ articles, and integrates them in a manner that enables understanding and provides direction for real-world experiments. "If you use a model to guide your experiments, you're going to discover things faster. We've shown that time and time again," said Covert. NIH's Anderson is clear on the significance: "[Comprehensive computer models of entire cells have the potential to advance our understanding of cellular function and, ultimately, to inform new approaches for the diagnosis and treatment of disease.](#)"

To read the full article by Dr. Covert and team:

Karr JR, Sanghvi JC, Macklin DN, Gutschow MV, Jacobs JM, Bolival B Jr, Assad-Garcia N, Glass JI, Covert MW. A whole-cell computational model predicts phenotype from genotype. *Cell*. 2012 Jul

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- 3 - IOM report on safety of health IT systems released (November 8, 2011)

This PDF is available from The National Academies Press at http://www.nap.edu/catalog.php?record_id=13269





Health IT and Patient Safety: Building Safer Systems for Better Care

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- 2 - AMIA publishes Informatics Competencies guidelines

Downloaded from jamia.bmj.com on November 5, 2012 - Published by group.bmj.com

Perspective

AMIA Board white paper: definition of biomedical informatics and specification of core competencies for graduate education in the discipline

Casimir A Kulikowski,¹ Edward H Shortliffe,² Leanne M Currie,³ Peter L Elkin,⁴ Lawrence E Hunter,⁵ Todd R Johnson,⁶ Ira J Kalet,⁷ Leslie A Lenert,⁸ Mark A Musen,⁹ Judy G Ozbolt,¹⁰ Jack W Smith,¹¹ Peter Z Tarczy-Hornoch,⁷ Jeffrey J Williamson¹²

¹Department of Computer Science, Rutgers University, New Brunswick, New Jersey, USA

²Department of Biomedical Informatics, Columbia University, and New York Academy of Medicine, New York, New York, USA

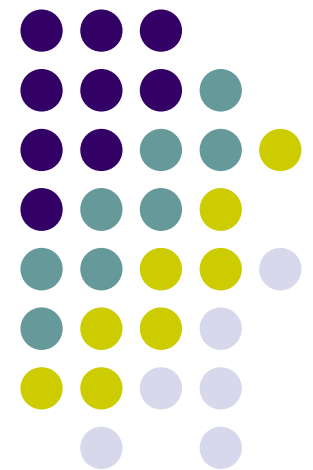
³School of Nursing, University of British Columbia, Vancouver, British Columbia, USA

ABSTRACT

The AMIA biomedical informatics (BMI) core competencies have been designed to support and guide graduate education in BMI, the core scientific discipline underlying the breadth of the field's research, practice, and education. The core definition of BMI adopted by AMIA specifies that BMI is 'the interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving, and decision making, motivated by

to provide guidance to students and curriculum developers when choosing, designing (and implementing), or re-designing graduate-level academic BMI programs. We recognize that the core competencies for certificate programs, undergraduate training, or non-degree fellowships in BMI would likely include only a subset of the skills that we have addressed here. In addition, the competencies identified are intended to communicate to others what BMI professionals know and do, serving as

**And the #1 top event of
2012 is...**




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- 3 - IOM report on safety of health IT systems released
- 2 - AMIA publishes Informatics Competencies guidelines
- 1 - ONC releases Stage 2 Meaningful Use criteria
(September 4, 2012)

www.gpo.gov/fdsys/pkg/FR-2012-09-04/pdf/2012-21050.pdf

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45 CFR Part 170
Centers for Medicare & Medicaid Services

42 CFR Parts 412, 413, and 495
Medicare and Medicaid Programs; Electronic Health Record Incentive Program—Stage 2; Health Information Technology: Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology, 2014 Edition; Revisions to the Permanent Certification Program for Health Information Technology; Final Rules

Top 10 events Nov 2011 – Oct 2012

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Content for this session is at:

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or Google: “AMIA Year in Review”

includes citation lists and links
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The screenshot shows a Firefox browser window with the address bar containing the URL faculty.washington.edu/dmasys/YearInReview/2012index.html?r44b=no. The page title is "AMIA Informatics 2012 Year in Review". The main content area has a blue header with the title and author information: "AMIA Informatics 2012 Year in Review", "A compendium of notable publications and events in the field of biomedical informatics, November 2011 - October 2012", "by Daniel Masys, M.D., Affiliate Professor, Biomedical and Health Informatics, University of Washington, Seattle". Below the header, it says "Page updated as of 2 November 2012". The main text states: "Presented here are the citations and events discussed at the **Year in Review session** at the **AMIA Symposium, Tuesday November 6, 2012.**" followed by a bulleted list of details. At the bottom, there is a blue bar with the text "Candidate new literature in Clinical Informatics".

AMIA Informatics 2012 Year in Review

A compendium of notable publications and events in the field of biomedical informatics, November 2011 - October 2012
by
Daniel Masys, M.D.
Affiliate Professor
Biomedical and Health Informatics
University of Washington, Seattle

Page updated as of 2 November 2012

Presented here are the citations and events discussed at the **Year in Review session** at the **AMIA Symposium, Tuesday November 6, 2012.**

- Selected publications in [Clinical Informatics](#), November 2011 - October 2012 - (includes 107 randomized controlled clinical trials)
- Selected publications in [Bioinformatics](#), November 2011 - October 2012
- Notable [Events](#) since the last AMIA Symposium
- [Search methodology](#) used to identify literature
- Thanks to these [Fellows of the American College of Medical Informatics](#) who nominated both events and publications for inclusion in the 2012 session
- Links to other [Year in Review](#) sessions.

Candidate new literature in Clinical Informatics