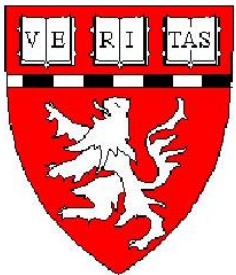


Leveraging Electronic Health Records (EHRs) in Large Simple Trials of Behavioral Interventions

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*National Heart, Lung, and Blood Institute
April 3, 2014*



MassGeneral Hospital
*for Children*SM

Goals of this Presentation

- Describe the uses of electronic health records to support research;
- Provide examples of two large randomized controlled trials and the use of electronic health records and decisions support tools in both;
- Lessons learned:
 - Pros and cons
 - Risks and tradeoffs
 - Stakeholder engagement
- Emerging uses of EHRs to integrate clinical and community resources

Research Partnership



- Harvard Vanguard Medical Associates

- Multi-site, multi-specialty group practice
- 14 locations across eastern MA
- Cares for members of all insurance plans
- Electronic medical record system (EPIC™)

- Actual medical record since 1969; includes height, weight, demographics, lab values, utilization data, appointments ...



Overview of Uses of EHRs for Research (1 of 3)

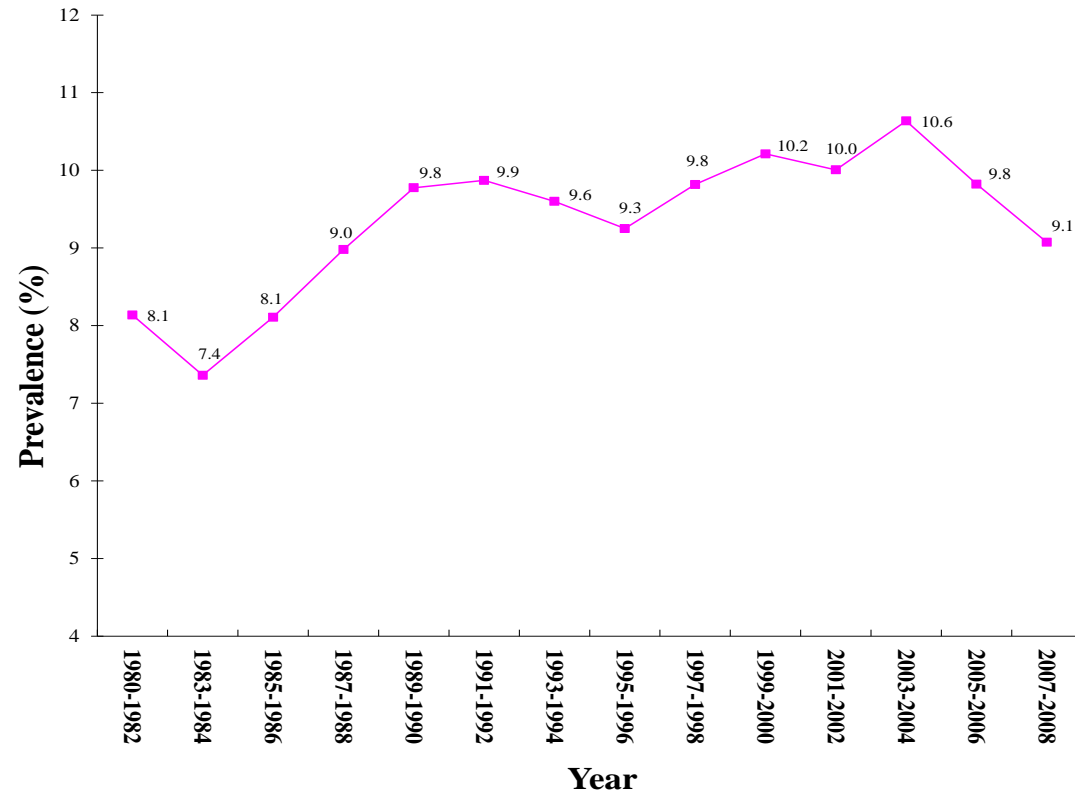
- Surveillance
 - Obesity trends in defined populations
- Etiology
 - Determinants of and potential targets for obesity

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Decreasing Prevalence of Obesity Among Young Children in Massachusetts From 2004 to 2008

Xiaozhong Wen, Matthew W. Gillman, Sheryl L. Rifas-Shiman, Bettylou Sherry, Ken Kleinman and Elsie M. Taveras



- Among children 0-6 years in MA, the prevalence of obesity substantially decreased during 2004–2008.
- Decrease was smaller among children insured by Medicaid than children insured by non-Medicaid health plans

Rapid Infant Growth – Later Obesity

ARTICLE

Crossing Growth Percentiles in Infancy and Risk of Obesity in Childhood

Elsie M. Taveras, MD, MPH; Sheryl L. Rifas-Shiman, MPH; Bettylou Sherry, PhD, RD; Emily Oken, MD, MPH; Jess Haines, PhD, MHSc, RD; Ken Kleinman, ScD; Janet W. Rich-Edwards, ScD; Matthew W. Gillman, MD, SM

Objective: To examine the associations of upward crossing of major percentiles in weight-for-length in the first 24 months of life with the prevalence of obesity at ages 5 and 10 years.

Design: Longitudinal study.

Setting: Multisite clinical practice.

Participants: We included 44 622 children aged from 1 month to less than 11 years with 122 214 length/height and weight measurements from January 1, 1980, through December 31, 2008.

Main Exposure: The number of major weight-for-

Results: Crossing upwards 2 or more weight-for-length percentiles was common in the first 6 months of life (43%) and less common during later age intervals. Crossing upwards 2 or more weight-for-length percentiles in the first 24 months was associated with elevated odds of obesity at ages 5 years (odds ratio, 2.08; 95% CI, 1.84-2.34) and 10 years (1.75; 1.53-2.00) compared with crossing less than 2 major percentiles. Obesity prevalence at ages 5 and 10 was highest among children who crossed upwards 2 or more weight-for-length percentiles in the first 6 months of life.

Conclusions: Crossing upwards 2 or more major weight-for-length percentiles in the first 24 months of life is as-

Overview of Uses of EHRs for Research (2 of 3)

- **Interventions**
 - Identification of eligible participants, delivery of intervention (e.g. electronic decision support tools), and assessment of outcomes
- Health disparities
 - Assessing differential effects of interventions
- Dissemination
 - Sharing of EHR programming code to assist with dissemination of best practices

Overview of Uses of EHRs for Research (3 of 3)

- Resource mapping
 - Linking patients and primary care to community and public health resources
- Electronic referrals to community resources for support of chronic disease conditions
 - MA Department of Public Health CMS Innovation funding for e-referrals



Goal: To accelerate adoption of childhood obesity comparative effectiveness research evidence among clinicians and parents

Characteristics	STAR
Study Design	Cluster-RCT
Age Group	6-12 year olds + obese
Setting	14 pediatrics offices
Sample size	550
Duration	1 year
Ix Components Health system Δ Individual Δ	Point-of-care alerts; decision support tools; text messaging, telephone coaching
Outcomes Health system Δ Individual Δ	Point-of-care HEDIS Change in BMI;behavior
Follow up	95% follow up at 1 year



Use of EHRs for recruitment in LSTs

- HIPAA Waiver of Authorization for recruitment
 - Access minimum necessary personal health information
- Identification of “pre-eligible” participants, e.g. all children 2-12 years with a body mass index $\geq 95^{\text{th}}$ %ile
 - Ability to exclude specific ICD-9 codes (chronic medical conditions)
 - Exclude patients on research ‘Do Not Contact’ list
- Clinicians sent a list of their pre-eligible patients and asked to exclude any families they do not want us to contact; *or*
- Clinicians are prompted at the point-of-care to refer pre-eligible patients to an intervention.

Use of EHR for recruitment

- Using weekly EHR data pulls of upcoming appointments, we can identify visits for patients eligible for an intervention
- Upcoming scheduled visit triggers research staff to begin recruitment protocol
 - Letter describing study
 - Opt-out toll free number

Use of EHR for intervention delivery in LSTs

Electronic decision support can be an effective and highly scalable tool for improving uptake of comparative effectiveness research:

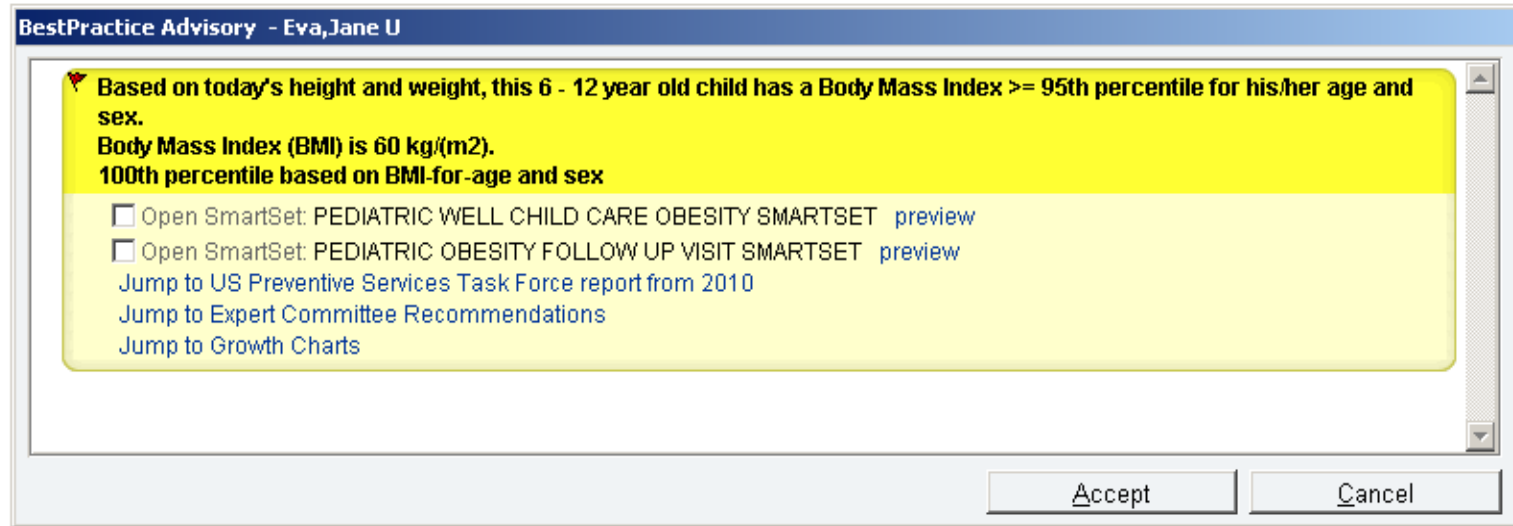
- Point-of-care alerts (Best Practice Alerts)
- Decision support tools (Smartsets)
- Electronic patient portals for communication with families/patients
- Tracking of quality of care



Electronic Point-of-Care Alert



- Pediatric Obesity Best Practice Alert



- The alert contains links to the Centers for Disease Control and Prevention growth charts, links to existing, evidence-based childhood obesity screening and management guidelines, and a link to a pre-populated, standardized note specific for obesity.



STAR Obesity Structured Note "SmartSet"

6/20/2011 visit with Test for Office Visit

Images Questionnaires Admin Benefits Inquiry References Open Orders Care Teams Print AYS Media Manager More

Charting

Chief Complaint

Vitals

History

Problem List

Hearing/Vision

Allergies

Med. Document

MyHealth Sign-up

BestPractice

Developmental

Nursing Notes

Progress Notes

SmartSets

Annotated Images

Dx and Orders

Pt. Instructions

LOS

Follow-up

MyChart Msg

Close Encounter

Opened SmartSets

Associate Primary Dx New Dx Providers

Pharmacy

Pend Send Order Remove

PEDIATRIC WELL CHILD CARE OBESITY SMARTSET

Jump to US Preventative Services Task Force report from 2010

Jump to Expert Committee Recommendations

DIAGNOSES

MEDICAL DIAGNOSES

- ☐ Acanthosis Nigricans [701.2]
- ☐ Amenorrhea
- ☐ Asthma [493.90BZ]
- ☐ BMI, pediatric $\geq 95\%$ [V85.54]
- ☐ Depression [311F]
- ☐ DM TYPE 2 (DIABETES MELLITUS, TYPE 2)
- ☐ Diabetes, Type 2 -- Uncontrolled [250.02]
- ☐ Elevated BP Reading [796.2]
- ☐ Fatty liver disease, nonalcoholic [571.8BC]
- ☐ Feeding Problem [783.3]
- ☐ Gallstones [574.20W]
- ☐ GERD (gastroesophageal reflux disease) [530.81K]
- ☐ GTT -- Impaired [790.22]
- ☐ (Hyperglycemia) Blood Chemistry Abnormality [790.6]
- ☐ Hyperlipidemia -- Mixed [272.2]
- ☐ Hypertension --- Essential [401.9]
- ☐ Hypertriglyceridemia [272.1AH]
- ☐ Hypothyroidism [244.9Y]
- ☐ Insulin resistance [790.29S]
- ☐ Menstrual Irregularity
- ☐ Metabolic/Dysmetabolic/Insulin Resistance Syndrome [277.7]
- ☐ Obesity [278.00]
- ☐ Obesity -- Morbid (Consider if Med Complications; BMI $\geq 99\%$) [278.01]
- ☐ Overweight [278.02]
- ☐ Polycystic Ovaries [256.41]

The alert leads to a structured note for obesity management based on Expert guidelines.

Diagnoses

Lab Orders

Referrals

Patient Instructions

After Visit Summary



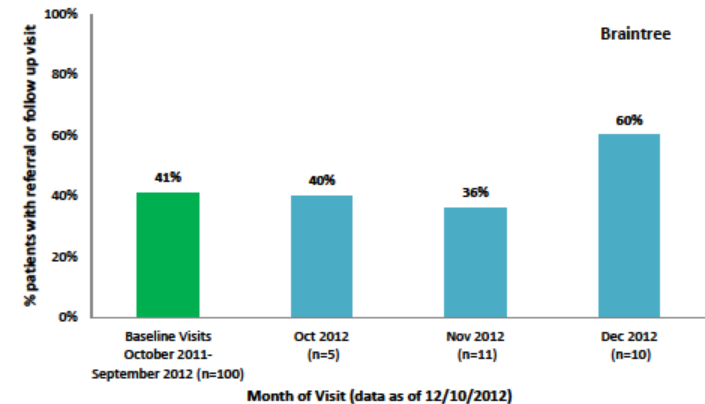
Clinician Reports: Tracking Quality of Care



- Reports to each practice on the percent of children who left their well child care visits with:
 - HEDIS code for BMI
 - HEDIS code for Nutrition and Physical Activity Counseling
 - Referral or follow up appointment documented



Percent of STAR patients with a BMI \geq 95th percentile who left their well child visit with a referral or follow up plan for weight management

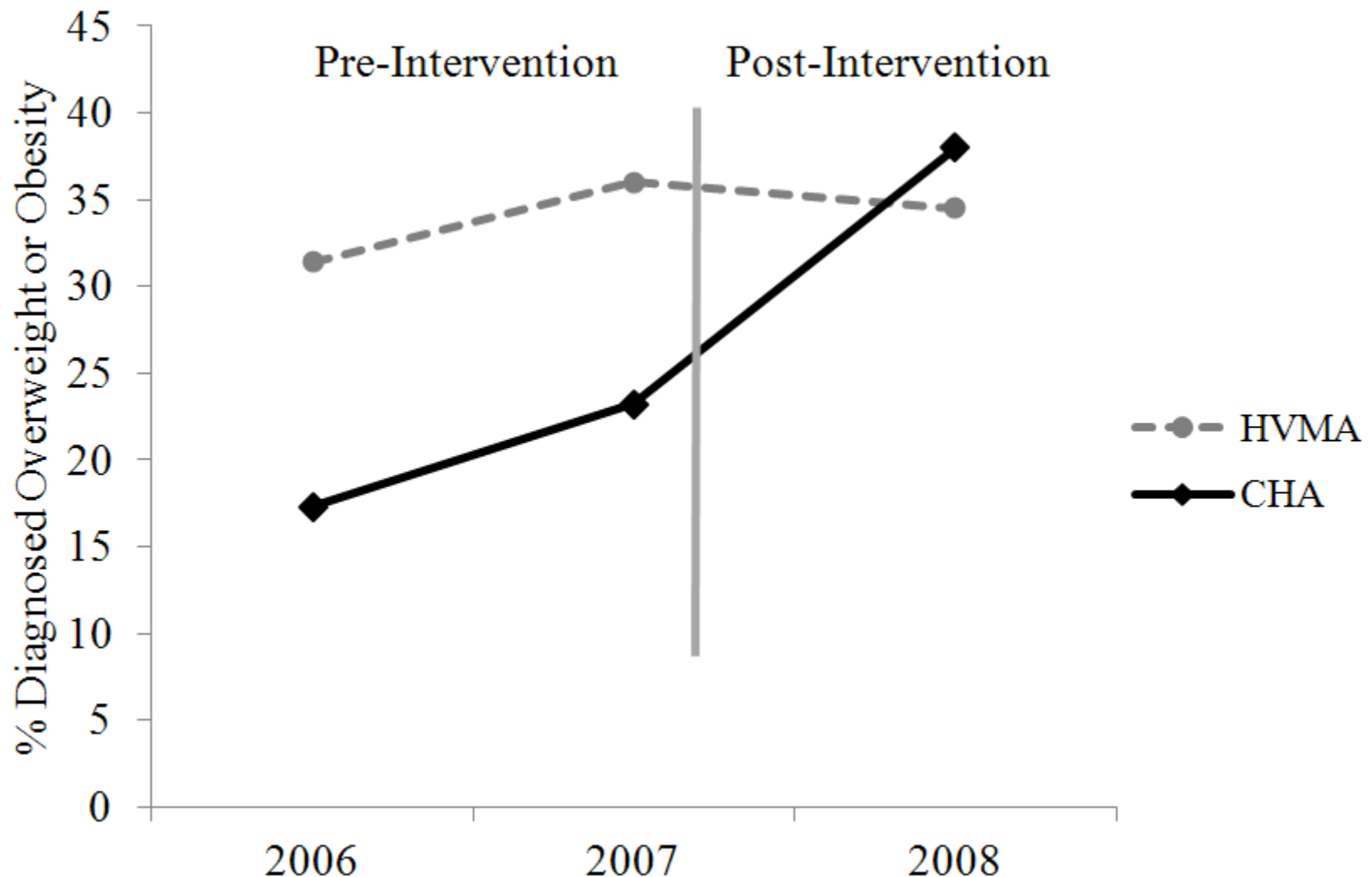


Rate is based on the percentage of STAR patients who completed a 1 year follow-up visit and had a weight management referral placed or a follow-up visit scheduled or completed within 90 days

The goal is for 100% of children with a BMI \geq 95th percentile to leave their visit with a referral for weight management or a follow up visit to be scheduled within 90 days

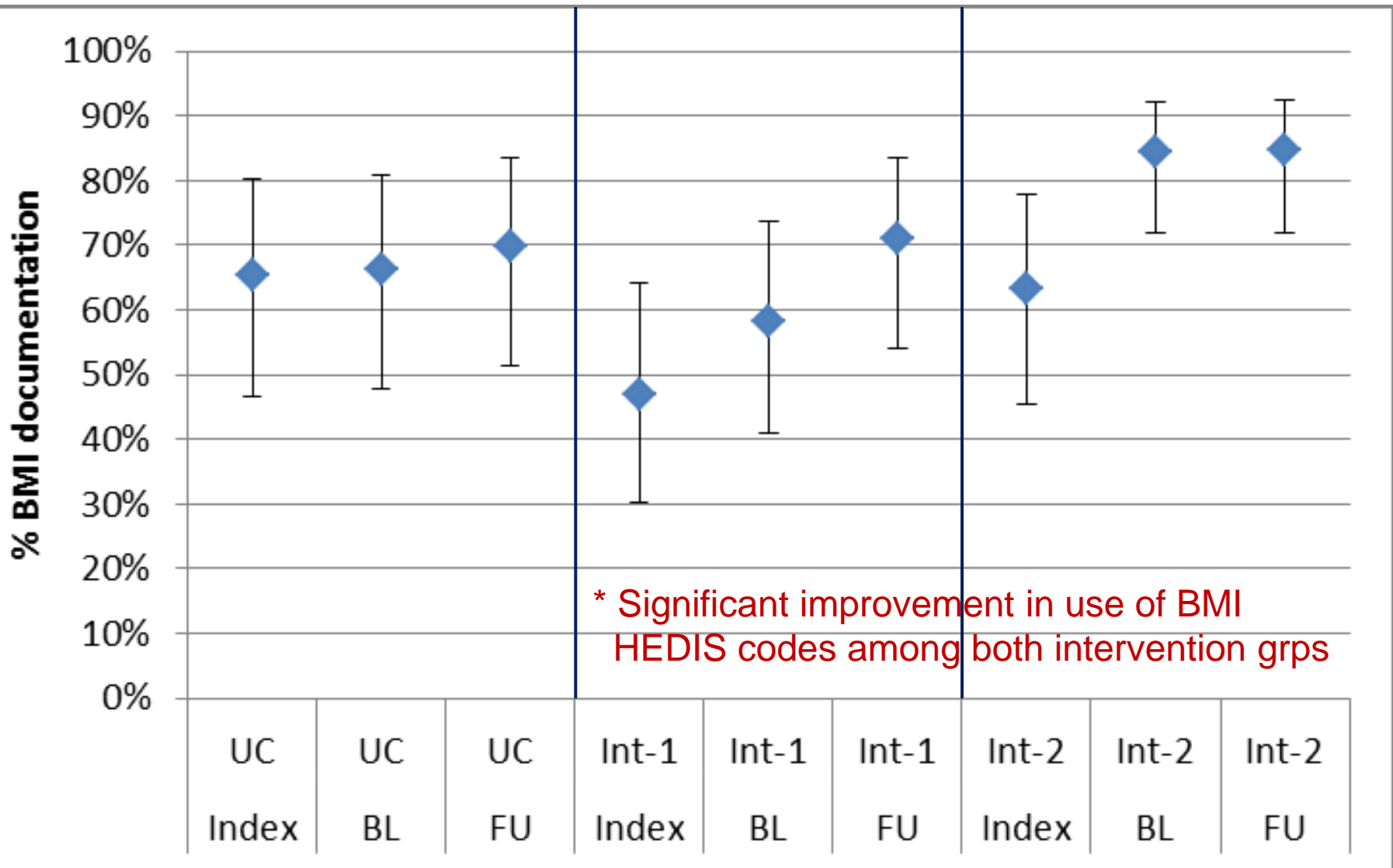


Evaluation of a Point-of-Care Alert for Obesity Diagnosis



Quality of Care Results: BMI

Documentation using HEDIS codes



Use of EHR for outcome assessment

- Tie intervention outcomes to scheduled, annual well child care visits
- HEDIS, point-of-care outcomes are available immediately following the visit
 - ICD-9 diagnosis codes; V codes; Billing; Orders for referral or follow up; Laboratory results
- Clinical measures of body mass index from annual visits (>95% follow up rate)

Cons, Risks, and Tradeoffs

1. Privacy – requires a HIPAA Waiver of Authorization to access minimal amount of information from records.
2. Consent - Written consent required to access more detailed EHR outcomes.
3. Programming code for decision support tools are specific to the EHR vendor making dissemination to other vendors difficult.
4. Alert fatigue – competing demands of clinicians to respond to alerts

Cons, Risks, and Tradeoffs

5. Substantial effort required to develop tools, train and support clinicians
6. Accuracy of height and weight measurements
 - In-service training to standardize measurements
7. Careful to not interfere with clinical work flow
 - Point-of-care surveys are not feasible or well-liked
8. Difficulty using EHR to collect outcomes from non-discrete fields, free text, e.g. smoking, breastfeeding, and other behaviors.
 - Require natural language processing
 - Need for patient surveys

Physicians' Perspectives on Electronic Decision Support Alerts for Obesity Management



- In-depth interviews with 32 pediatric providers
- Examined barriers and facilitators to use of an existing electronic alert for obesity diagnosis and management
- Using a “test patient” in the electronic health record system, pediatricians gave real-time responses about
 - facilitators and barriers to the use of alerts and SmartSets
 - experience with obesity alerts and the Obesity SmartSet
 - perceptions of effective methods for improving obese patient outcomes.

Clinician Recommendations

- Design of point-of-care decision alerts should incorporate tools to assist physicians in providing behavioral interventions
- Alert and Smart Set should be streamlined
 - E.g. Alert should be very brief, not require clicks to other screens, and should include a specific clinical action to do during the visit.
- Automate tasks and integrate alerts and Smart Sets into physicians' natural work flow
 - E.g. if BMI triggers obesity alerts, should be automatically added to patient problem list; integrated 'obesity well-child' Smart Set should open if vitals suggest child is obese; add hotlinks to educational materials
- Provide greater visibility, education around SmartSets
 - Multiple methods should be implemented to introduce the staff to a SmartSet and its contents.

Overview of Uses of EHRs for Research (3 of 3)

- Resource mapping
 - Linking patients and primary care to community and public health resources
- Electronic referrals to community resources for support of chronic disease conditions
 - MA Department of Public Health CMS Innovation funding for e-referrals



Connect 4 Health

Individual RCT

2-12 year olds +
overweight or obese

6 pediatrics offices that
care for children from
obesity “hot spots”

750

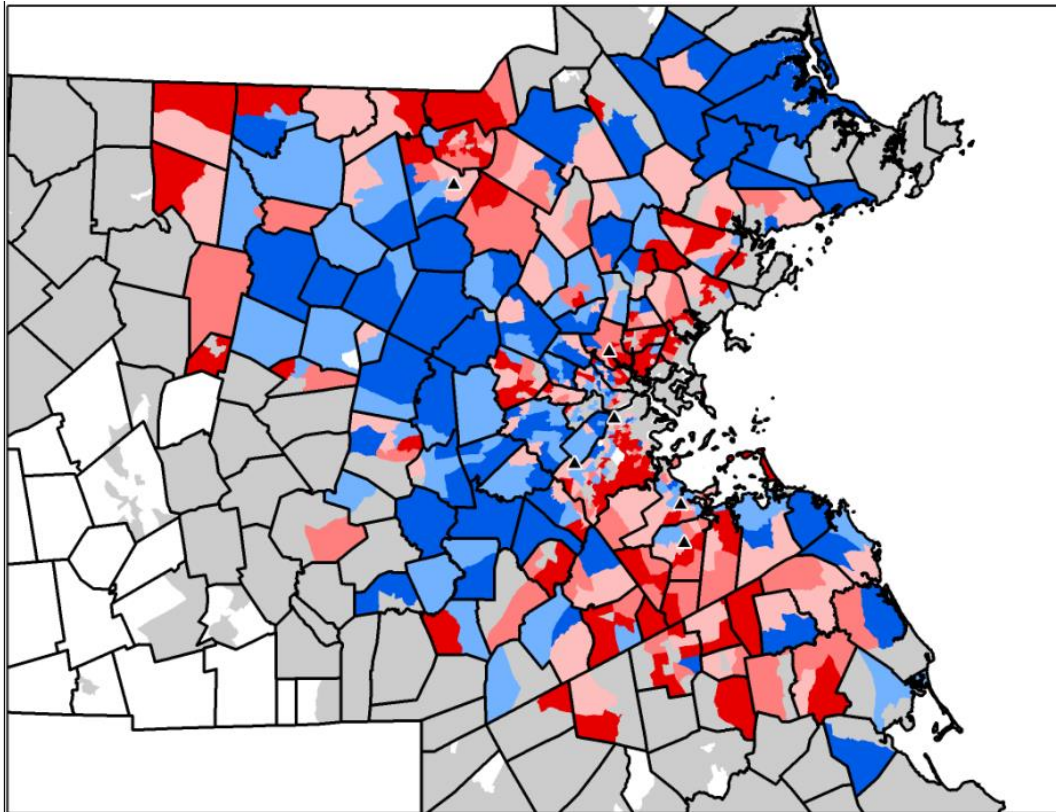
1 year duration

Electronic decision
support tools;
teleconferencing, GIS
mapping of community
resources

Change in BMI; QoL,
Behavior

Goal: To develop and test a system-level intervention that leverages clinical and community resources and addresses socio-contextual factors to improve obesity and family-centered outcomes.

Mapping Obesity Hot Spots and Identifying Positive Deviants



- >60,000, 4-18 years olds in all HVMA practices
- Residential addresses to identify obesity “hot spots” – neighborhoods with highest prevalence of obesity
- Identify children who have decreased or maintained their BMI

- Intervention built on a foundation of decision support tools in the electronic health record to improve screening and referral,
- Employ use of GIS tools to help provide targeted information on neighborhood resources available to support behavior change.
- Health coaches will link families to community-level resources provided by the Massachusetts Department of Public Health and use multiple support modalities including text messaging, teleconferencing, and social networking platforms.

Innovative uses of EHRs to support LSTs: Linking Clinic to Community Resources



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Feature

**And the Winner is ...
Streetlights, for Applying Big
Data to Community Health**

Robert Wood Johnson Foundation

Read the full article http://www.rwjf.org/en/blogs/culture-of-health/2014/01/knight_f_data_.html

47,835

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Community Rx creates electronic prescriptions for community services (Health-eRx), generated through an interface between a patient's EHR and a comprehensive community resource database.

Massachusetts e-Referral Program: Example of bi-directional referral from clinic to community resource



Outbound Transaction

Clinical Setting

CHC

Health care provider diagnoses Jane Smith with diabetes. Jane gives consent for referral to Tobacco Quitline and local CDSMP program.

Transmission from EMR

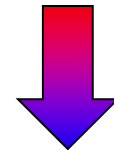
**e-Referrals from Provider to
(1) Quitline & (2) Council on Aging**

*Contact Information: Address, Phone
Other Health Data: Current smoker and
Type 2 Diabetes*

Community Resource

**Tobacco Quitline &
Local Council on Aging**

Jane is contacted by Quitline and starts counseling program to quit smoking. Jane is also contacted by Senior Center and begins 6 class CDSMP program.



Inbound Transaction

Clinical Setting

CHC

Automatic updates of smoking and exercise program added to EMR. At next appointment, health care provider is able to see the update of Jane's progress in Jane's own electronic health record.

Transmission to EMR

**Progress report from community
resources to provider
(Standardized HL7
Formatted Transaction)**

Jane Smith

*Smoking status at 6 months
post referral, CDSMP sessions
attended, and improvement
in FV intake and exercise*

Community Resource

**Tobacco Quitline &
Local Council on Aging**

Quitline calls back 6-months post referral for update. Senior Center prepares final CDSMP report on Jane's progress. Updates transmitted to provider as requested.



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