Use of Clinical Decision Support and the Impact of Clinical Decision Support on Workflow

October 27, 2008

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Clinical Decision Support (CDS) and Workflow

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Agenda

- Very brief review of the effectiveness of CDS
- Interpretation of the mixed evidence from a workflow perspective
- Understanding workflow and workflow integration

State of the Evidence

"Nonetheless, there are **few CDS implementations** to date in **routine clinical use** that have **substantially delivered** on the promise to improve healthcare processes and outcomes, though there have been an **array of successes at specific sites** …Yet even these successes **have generally not been widely replicated**. There are many reasons for the lack of diffusion of these systems."[1]

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State of the Evidence
The Good

- Computerized Provider Order Entry (CPOE) with CDS can reduce medication error rates and increase the quality and efficiency of medication use[2]
- Using order sets as basic CDS within CPOE systems can, potentially, improve clinician efficiency[3]

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State of the Evidence
The Good

- CDS integrated into CPOE can improve the use of the order sets[4]
- Computerized clinical reminders can increase compliance with guidelines and even save time [5]

State of the Evidence
The Good

- Well-designed interruptive alerts can increase alert acceptance to 67%[6]
- CDS can lead to faster diagnosis[7]

State of the Evidence
The Less Good

- Systems did a poor job of identifying severe clinically significant drug-drug interactions[8]
- Drug safety alerts are overridden 49%-96% of the time[9]

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State of the Evidence
The Less Good

- Even allowing primary care physicians to customize drug alerts still resulted in 88% of alerts being ignored[10]
- Ambulatory CDS automation is criticized for being time consuming and unusable[11]
- Primary care physicians working for the Veteran's Health Administration (VHA) rated their CDS as average[12]

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State of the Evidence
The Less Good

- Reviews that have demonstrated CDS can improve physician outcomes have not been able to demonstrate improvements to patient outcomes[7]

Why are the Results Mixed?

Workflow integration problems

"Rather, the CDS should unobtrusively, but effectively, remind clinicians of things they have truly overlooked and support corrections, or better yet, put key pieces of data and knowledge seamlessly into the context..." [1]

"Systems that alter clinician workflow by not integrating all relevant information for informed decision making into one place run the risk of distracting already busy clinicians. …"[14]

A systematic review of CDS effectiveness found that CDS can improve clinical practice if there was workflow integration[15]

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Clearly workflow integration is key. But what do we mean by workflow and workflow integration?

Workflow

- Workflow can be defined as the flow of work through space and time, where work is comprised of three components: *inputs* are *transformed* into *outputs*.

What is Workflow?

- Inter-organizational workflow:
  - workflow between a primary care physician and a community pharmacy or
  - between an emergency department physician and a primary care physician to share information about a patient
- Clinic-level workflow:
  - flow of a physician, nurse or patient through physical space
  - and the flow of information, in paper or electronic formats, among people at a practice or clinic

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What is Workflow?

- Intra-visit workflow:
  - workflow during a patient visit, which involves the workflow of the visit (e.g. start by asking for a problem list, then do history and physical, then prescribe treatment)
- Cognitive workflow – the workflow in the head:
  - Sensation, perception, decision making, response execution
  - A clinician might be thinking “listen for any significant acute problems and deal with those first. Also, investigate my concern about spousal abuse. If I don’t hear any, focus on the chronic problems.”
  - This is unlikely to be observable

What is Workflow?

- People flow through space and time.
- Information flows through space and time in paper and electronic formats
- Objects, such as medications, flow through space and time
- The flow of all of those, information, people, and products and the different levels of workflow are necessary to consider when designing CDS to support workflow

What does it mean to integrate CDS into workflow?

- Making sure CDS supports the flow of work desired at the multiple levels

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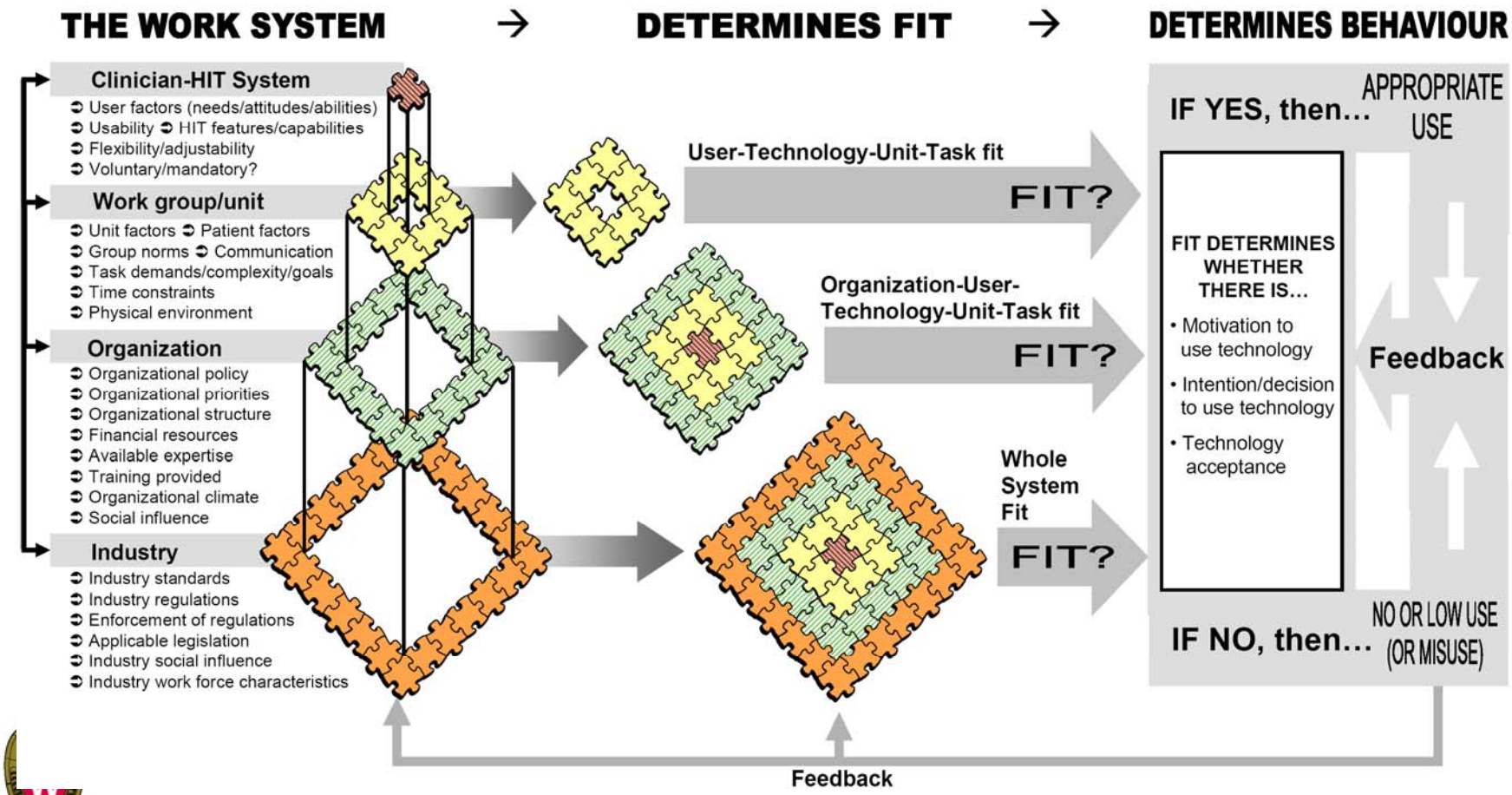
HIT-workflow integration[16]



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Thank you!

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Clinical Decision Support (CDS)

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University of Pennsylvania

From EBM to CDS: *Salto Mortale*?

Salto Mortale:

- deadly jump
- full somersault
- dangerous or crucial undertaking

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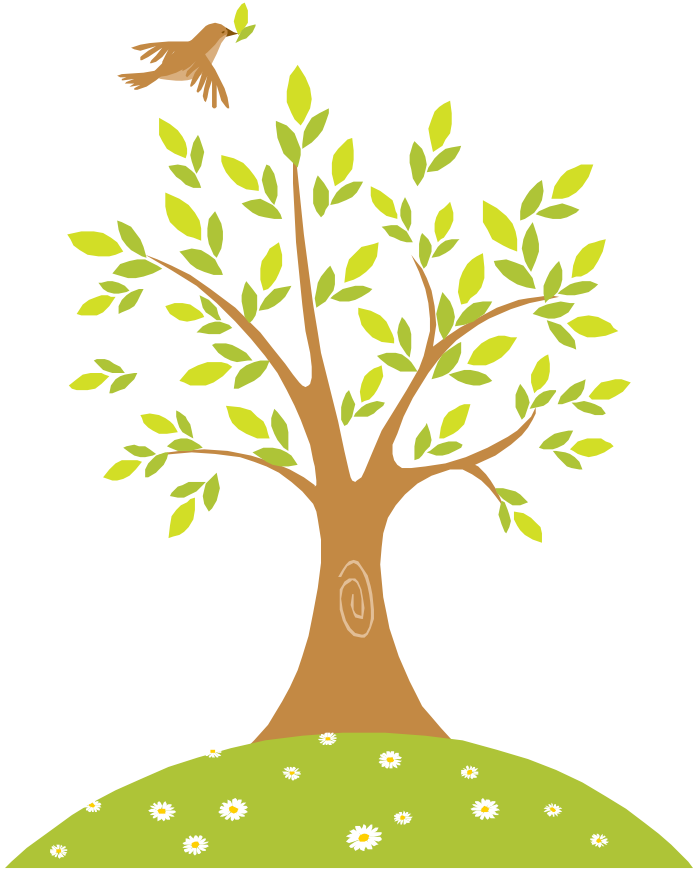
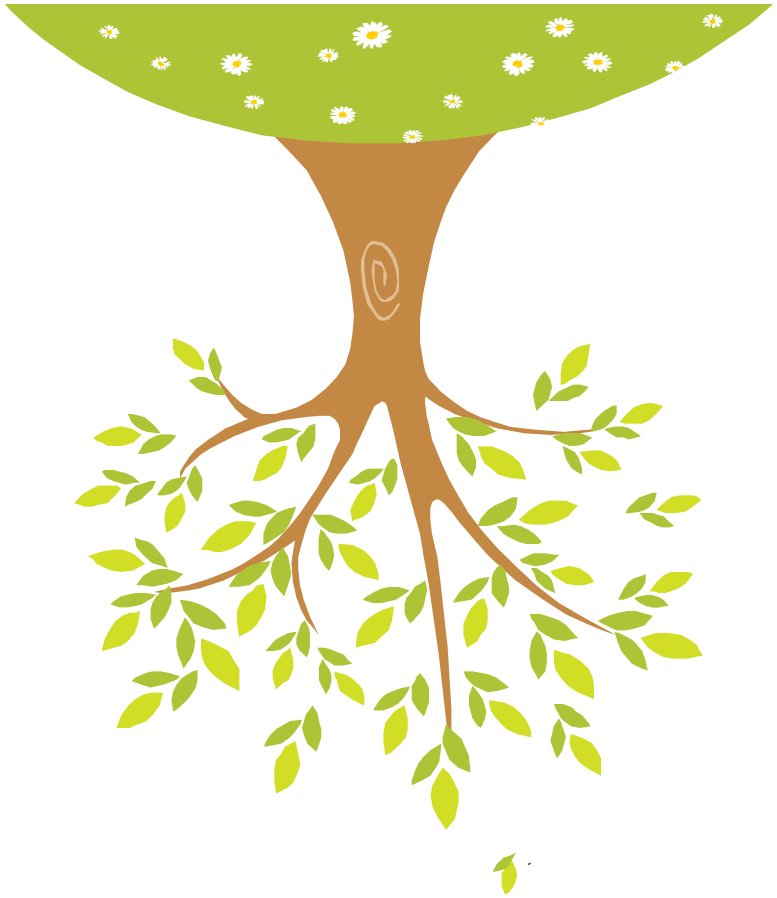
From EBM to CDS: Underlying Logic of Alerts

The Decision Tree



Alerts, Underlying Logic

The
Decision
Tree



Correct
direction?

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Reality: A Simple Decision Tree

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More Reality: Decision Trees

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Data bases on which CDS are created

- Evidence on the Evidence

- Evidenced-Based Medicine: Promise and potential

Decision Trees: Still Simplified

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Some Data

- 80-90% of alerts overridden

  Fewer if tiered (i.e., increasing levels)

  In study of 300 Overrides, 300 were medically correct.

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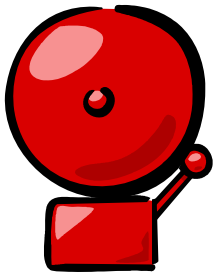
Types of CDS

Range of types and intensities: Linkage to CPOE and EMRs

1. Requesting help (e.g., click to see more)

2. Alerts/Alarms



3. Order sets

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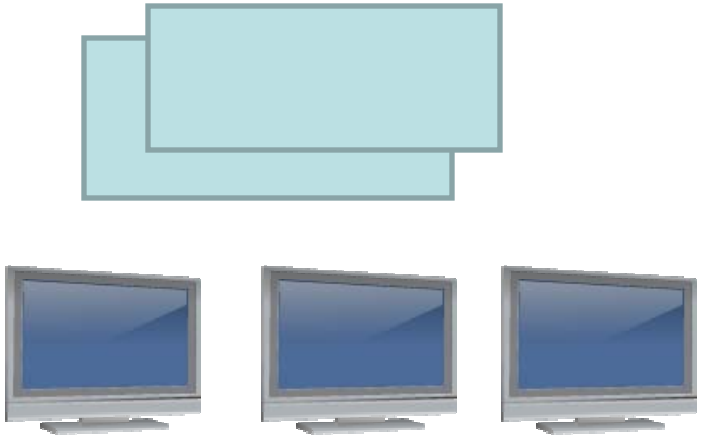
Requesting Help

1. Hide n' go seek
2. More monitors?
3. Link to….

   other documents



Abbreviated or not

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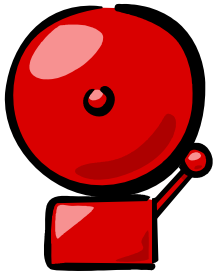
Alerts: For Rx and/or for Dosages

1. Regular:



OR

2. Tiered:

- Flash on screen
- Must Acknowledge
- Must justify override

Pt. X . Tried Rx previously. Pt allergic

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Alerts Just for You

- Service-specific

- Provider-specific

Alerts:
Other (unintended) Function

Bumpers

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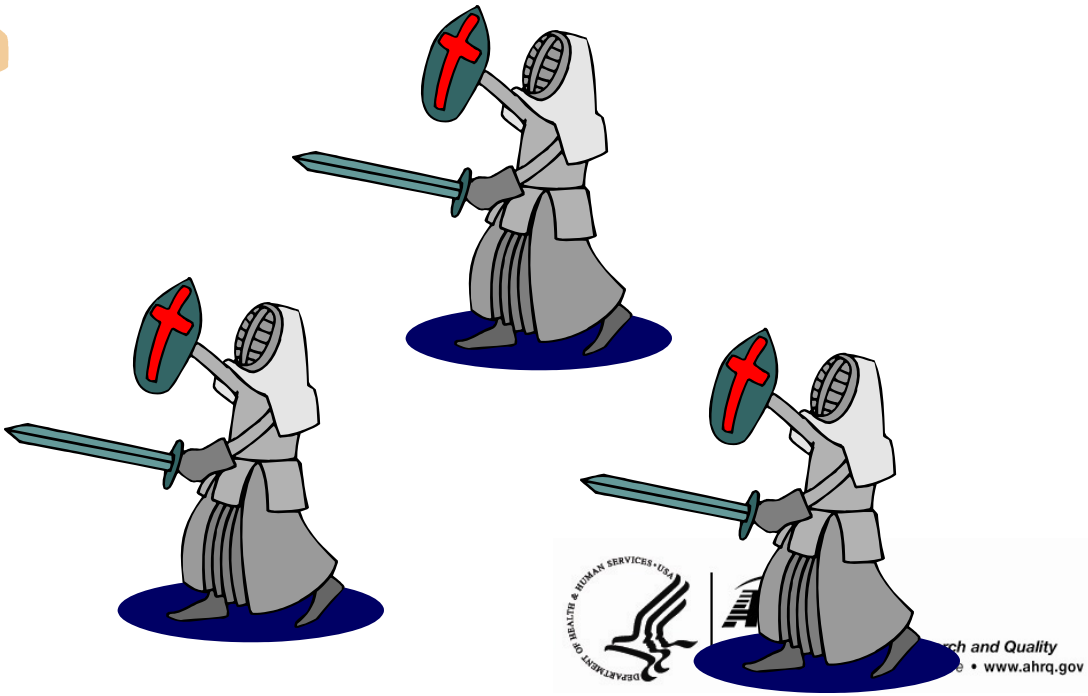
Order Sets

- Acknowledge order sets as not-so-hidden CDS

- Order set wars



Competing Order Sets

- Danger of differing order sets when residents or others circulate across institutions and/or services.

Trajectories of installation:

1. Off the shelf (or off someone's shelf)
2. Withdrawn
   - (Real story of Cedar-Sinai)
3. Re-introduced stepwise
4. Role of departments and power
5. CDS and order-set wars
6. Time and input and utility

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Evaluations: What the data show

1. Implementation rates
2. Success rates
3. Factors influencing achievement
4. The bases of decision support:

   building on CPOE and EMRs

5. Concerns of experienced providers

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The Future of CDS

- Learning from our mistakes
- Improved technology
- Concern about future clinicians who never practiced without them

- Don’t leave home without them?

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Thank you!

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Use of Clinical Decision Support in Clinical Practice

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  - The Pfizer Health Literacy Foundation
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- Dr. David Lobach and Dr. Kensaku Kawamoto have a pending patent application for the intellectual property related to SEBASTIAN, which represents one approach for instantiating the HL7 Decision Support Service described in this presentation. Drs. Lobach and Kawamoto and Duke University may benefit financially if products using SEBASTIAN are commercially successful.

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Presentation Overview

- Success Factors for CDS
- CDS Engine - SEBASTIAN
- CDS Examples in Practice
  - Chronic Disease Management
  - Diagnosis and Management
  - Population Health Management
  - Medication Management
  - Care Transitions for Complex Patients
- Lessons Learned

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Success Factors for CDS

- Systematic review to identify features of CDS systems important for improving clinical practice[1]
- >10,000 manuscripts screened, 70 RCTs included
- 68% → significant improvement in clinical practice
- Most common system types and content:
  - 34%: Computer systems providing patient-specific advice on printed encounter forms or printouts attached to charts
  - 26%: Non-electronic systems that attached patient-specific advice on appropriate charts
  - 16%: CPOE systems with CDS capabilities
  - 81% chronic conditions, 23% acute conditions
  - 53% pharmacotherapy, 46% lab test ordering

[1] Kawamoto K, Houlahan C, Balas A, Lobach DF. Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success. *BMJ*. 2005;330:765-72.

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Principle Findings-1

Multi-variate regression analysis identified 4 features as independent predictors of success:

CDS Intervention Feature	Adjusted OR	p-value
Automatic provision of decision support as part of clinician workflow	112.1	< 0.00001
Provision of decision support at time and location of decision making	15.4	0.0263
Provision of a recommendation rather than just an assessment	7.1	0.0187
Computer generation of decision support	6.3	0.0294

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Principle Findings-2

- % of CDS interventions leading to significant improvements in clinical practice
  - CDS interventions lacking *any* of the 4 features → 46%
  - CDS interventions with all 4 features → 94% (n = 32)

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Sebastian

System for Evidence-Based Advice through Simultaneous Transaction with an Intelligent Agent across a Network

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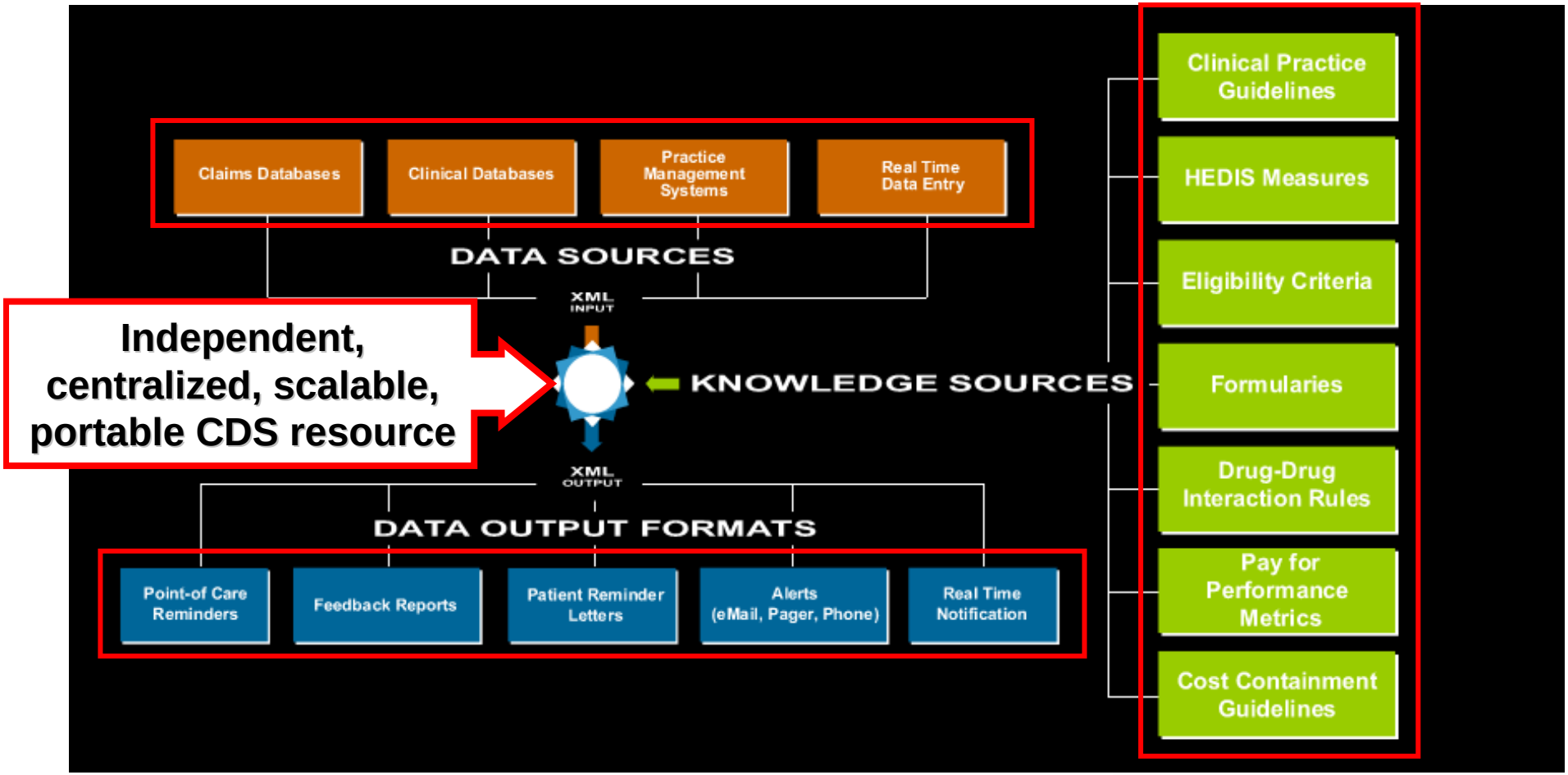
SEBASTIAN Overview



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CDS for Chronic Disease Mgt

- Setting: Duke University Health System
- Goal: To provide guideline-based care recommendations for chronic diseases at the point of care

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Duke University Health System

- Academic medical center and hospital with 2 associated community hospitals
- >100 academic and community-based clinics
- 10,765 full-time employees
  - 1,653 clinical faculty
  - 850 house staff physicians in training
- Inpatient admissions: 61,197 (FY07)
- Outpatient visits: 1.4 M (FY07)

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Duke eBrowser -- Electronic Record Viewer

https://clinapp6.duhs.duke.edu:8081 - LOBAC002 eBrowser - Microsoft Internet Explorer

Patient Activity Rounding Orders OR Summary ESIG Help | All Results | -Choose Patient List- | - Choose Patient -

Duke | type MRN | Go | Summary: DM Unknown Drug Allergies | Patient: [redacted] | MRN: [redacted]

All Results | Dictated Reports | Procs/Ops | Radiology | General Labs | Microbiology | Pathology | Resp. Care | New Results | Print List

Next 1-50

Report Type	Date/Time	Status	Fac
Comprehensive Clinic Note	07/06/2007 00:00		DUMI
GLYCATED HEMOGLOBIN (HBA1C)	03/22/2007 15:01		DUMI
CHOLESTEROL, TOTAL	03/22/2007 15:01		DUMI
LDL-CHOLESTEROL (DIRECT)	03/22/2007 15:00		DUMI
FAM Endocrinology Follow Up	03/22/2007 00:00		DUMI
MICROALBUMIN/CREATININE RATIO	07/13/2006 16:54		DUMI
GLYCATED HEMOGLOBIN (HBA1C)	07/13/2006 16:49		DUMI
LIPID PANEL (CALCULATED LDL)	07/13/2006 16:49		DUMI
OP4 (TBILI,AST,ALKPHOS,ALT)	07/13/2006 16:49		DUMI
OP7 (CO2,CL,K,NA,BUN,GLU,CR)	07/13/2006 16:49		DUMI
Endocrinology Consultation	07/13/2006 00:00		DUMI
MAMMOGRAPHY-SCREENING EXAM	05/25/2005 11:55		DUMI
Clinic Note	05/25/2005 00:00	Preliminary	DUMI
MAMMOGRAPHY-SCREENING EXAM	05/19/2004 09:00		DUMI
Clinic Notes	05/19/2004 00:00	Preliminary	DUMI
GLUCOSE WHOLE BLD BY GMD(POCT)	12/18/2003 14:15		DUMI
Family Med Clinic Note	12/18/2003 00:00	Preliminary	DUMI
Endocrine Bone Density Results	12/18/2003 00:00	Modified	DUMI
MICROALBUMIN/CREATININE RATIO	11/12/2003 11:40		DUMI
CREATINE KINASE	11/12/2003 11:33		DUMI
GLYCATED HEMOGLOBIN (HBA1C)	11/12/2003 11:33		DUMI
LIPID PANEL (CALCULATED LDL)	11/12/2003 11:33		DUMI
OP7 (CO2,CL,K,NA,BUN,GLU,CR)	11/12/2003 11:33		DUMI
OP4 (TBILI,AST,ALKPHOS,ALT)	11/12/2003 11:33		DUMI
ECG (ELECTROCARDIOGRAM STANDARD)	11/12/2003 10:48		DUMI
GLUCOSE WHOLE BLD BY GMD(POCT)	11/12/2003 09:33		DUMI
Family Med Clinic Note	11/12/2003 00:00	Preliminary	DUMI
CT PELVIS W/WO ENHANCE	10/01/2003 09:52		DUMI
CT DUAL ABDOMEN W-WO ENHANCMNT	10/01/2003 09:52		DUMI
Urology - Clinic Note	10/01/2003 00:00		DUMI
URINALYSIS COMPLETE	09/23/2003 13:37		DUMI
OP7 (CO2,CL,K,NA,BUN,GLU,CR)	09/23/2003 09:59		DUMI

Patient: [redacted]

GENLAB Chemistry: Final 03/22/2007 15:01 Acc# [redacted] Acct# [redacted]

```
GLYCATED HEMOGLOBIN (HBA1C)
                                                        Reference
  GLYCATED HEMOGLOBIN (HBA1C)        *8.3        %      [4.3-6.0]
  AVERAGE BLOOD GLUCOSE (CALC)        197        mg/dL
            INTERPRETIVE DATA
            *****************
            AVERAGE BLOOD GLUCOSE ASSOCIATED WITH THIS PERCENT GLYCATED
            HEMOGLOBIN (BASED ON DCCT)
            *****************

  ATTENDING MD:
   LOBACH,DAVID F

  ORDERING MD:
   LOBACH,DAVID F

  PERFORMED BY:
   DUHS FRANKLIN LAB 4425 BEN FRANKLIN BLVD DURHAM, NC 27704
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Duke eBrowser – Disease Management Module

https://clinapp6.duhs.duke.edu:8081 - Patient Summary for [redacted] MRN: [redacted] - Microsoft Internet Exp...

Allergies/ADE | Problems | Medications | Vitals | Cautions | Disease Mgmt. | Print | Send Feedback | Close

Health Maintanence | Diabetes * | Hypertension *

Evaluate Patient for Diabetes

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Duke Health Disease Management System – Diabetes

https://clinapp6.duhs.duke.edu:8081 - Patient Summary for [redacted] MRN: [redacted] - Microsoft Internet Exp...

Allergies/ADE | Problems | Medications | Vitals | Cautions | Disease Mgmt. | Print | Send Feedback | Close

Health Maintanence | Diabetes * | Hypertension *

Patient is diagnosed with Diabetes. *Last evaluated at 7:18 PM on 08/15/2007.*

Re-evaluate patient for Diabetes | Remove Patient From Disease List | Input Observations

Focus	Status	Relevant Data		Guidelines
B.P.	DUE NOW	Last Done:	03/22/07 (4m 24d ago)	q visit, goal < 130/80
		Last Value:	132/82 mmHg	
Weight	DUE NOW	Last Done:	03/22/07 (4m 24d ago)	q visit, goal BMI < 25
		Last Value:	75.7 kg	
		BMI:	30.5	
Visual Foot Exam	DUE NOW	Last Done:	07/13/06 (1y 1m 2d ago)	q visit
		Last Value:		
Foot Monofilament	DUE NOW	Last Done:	07/13/06 (1y 1m 2d ago)	annual
		Last Value:		
Hgb_{A1C}	DUE NOW	Last Done:	03/22/07 (4m 24d ago)	q6mo if < 7%, q3mo if >= 7%
		Last Value:	8.3%	
Urine Micro alb/cr Ratio	DUE NOW	Last Done:	07/13/06 (1y 1m 2d ago)	annual
		Last Value:	2.4 mg/g	
Total Chol.	✓ Not due	Last Done:	03/22/07 (4m 24d ago)	annual, goal < 200
		Last Value:	187 mg/dL	
LDL Chol.	✓ Not due	Last Done:	03/22/07 (4m 24d ago)	annual, goal < 100
		Last Value:	110 mg/dL	
Eye Exam	✓ Not due - already scheduled	Last Done:	08/09/07 (6d ago)	annual
		Appt scheduled:	09/13/07	
Flu Vacc.	✓ Not flu season	Last Done:	> 2 years ago	annual, unless egg allergic
Pneum. Vacc.	✓ Not due	Last Done:	01/03/07 (7m 12d ago)	once; revacc. if >= 65, last 5+ yrs ago when < 65
ASA (81 mg)	CONSIDER Rx	Not known to be allergic to aspirin		age >= 40, no contraindications
		Aspirin not listed as prescribed		
Education	DUE NOW	Last Done:	Not on record	once; repeat annualy if hgbA1c >= 7%

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Duke Health Disease Management System – Diabetes Knowledge

https://clinapp6.duhs.duke.edu:8081 - Care Metric - Microsoft Internet Explorer

Care Metric	Care Guideline	Help Information on Care Metric
Diabetes – Hgb_{A1C} test	Conduct every 6 months if meeting goal, every 3 months if not meeting goal. Goal: < 7.0%	**Guideline:** - Monitor Hgb_{A1C} level every 6 months if meeting goal (Hgb_{A1C} level < 7.0%), every 3 months if not meeting goal. (E_{ADA}) - Manage patient as appropriate to achieve Hgb_{A1C} level < 7.0%. (B_{ADA}) **Rationale:** - The hemoglobin A1C test measures a patient's average glycemia over the preceding 2–3 months. - Prospective randomized clinical trials have shown that improved glycemic control is associated with sustained decreased rates of retinopathy, nephropathy, and neuropathy. - In these trials, treatment regimens that reduced average A1C to ~7% (~1% above the upper limits of normal) were associated with fewer long-term microvascular complications. **What this rule does:** - This rule prompts for a Hgb_{A1C} test if it has been ≥ 5 months since the last test, if that test showed a Hgb_{A1C} level under 7.0%. Otherwise, this rule prompts for a Hgb_{A1C} test if it has been ≥ 2 months since the last test. **Data entry notes:** - Rule inactivation: this rule can be turned off for a specific patient and later turned back on if appropriate. - Documentation of reason for not delivering intervention: a clinician may document a reason for not delivering the recommended intervention. This reason will be displayed on future reminder screens until the intervention is completed. **References:** (1) American Diabetes Association. Standards of Medical Care in Diabetes – 2006. *Diabetes Care*. 2006;29 (Supplement 1): S4-S42. Link to guideline as PDF. [note: Hgb_{A1C} monitoring guidelines are on pp. S10-S11] Link to evidence scale Link to responsible entity Link to maintenance information

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Duke Health Disease Management System – Diabetes

https://clinapp6.duhs.duke.edu:8081 - Patient Summary for [redacted] MRN: [redacted] - Microsoft Internet Exp...

Allergies/ADE | Problems | Medications | Vitals | Cautions | Disease Mgmt. | Print | Send Feedback | Close

Health Maintanence | Diabetes * | Hypertension *

Patient is diagnosed with Diabetes. *Last evaluated at 7:18 PM on 08/15/2007.*

Re-evaluate patient for Diabetes | Remove Patient From Disease List | Input Observations

Focus	Status	Relevant Data		Guidelines
B.P.	DUE NOW	Last Done:	03/22/07 (4m 24d ago)	q visit, goal < 130/80
		Last Value:	132/82 mmHg	
Weight	DUE NOW	Last Done:	03/22/07 (4m 24d ago)	q visit, goal BMI < 25
		Last Value:	75.7 kg	
		BMI:	30.5	
Visual Foot Exam	DUE NOW	Last Done:	07/13/06 (1y 1m 2d ago)	q visit
		Last Value:		
Foot Monofilament	DUE NOW	Last Done:	07/13/06 (1y 1m 2d ago)	annual
		Last Value:		
Hgb_{A1C}	DUE NOW	Last Done:	03/22/07 (4m 24d ago)	q6mo if < 7%, q3mo if >= 7%
		Last Value:	8.3%	
Urine Micro alb/cr Ratio	DUE NOW	Last Done:	07/13/06 (1y 1m 2d ago)	annual
		Last Value:	2.4 mg/g	
Total Chol.	✓ Not due	Last Done:	03/22/07 (4m 24d ago)	annual, goal < 200
		Last Value:	187 mg/dL	
LDL Chol.	✓ Not due	Last Done:	03/22/07 (4m 24d ago)	annual, goal < 100
		Last Value:	110 mg/dL	
Eye Exam	✓ Not due - already scheduled	Last Done:	08/09/07 (6d ago)	annual
		Appt scheduled:	09/13/07	
Flu Vacc.	✓ Not flu season	Last Done:	> 2 years ago	annual, unless egg allergic
Pneum. Vacc.	✓ Not due	Last Done:	01/03/07 (7m 12d ago)	once; revacc. if >= 65, last 5+ yrs ago when < 65
ASA (81 mg)	CONSIDER Rx	Not known to be allergic to aspirin		age >= 40, no contraindications
		Aspirin not listed as prescribed		
Education	DUE NOW	Last Done:	Not on record	once; repeat annualy if hgbA1c >= 7%

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Duke eBrowser – Disease Management Data Entry Screen

https://clinapp6.duhs.duke.edu:8081 - Patient Summary for [redacted]

Allergies/ADE | Problems | Medications | Vitals | Cautions | Disease Mgmt. | Print | Send Feedback

Health Maintanence | Diabetes * | Hypertension *

Save Observations and Re-Evaluate | Cancel

+ B.P. Measurement

+ Weight Measurement

- Visual Foot Examination

Visual Foot Exam:	Date Done: 08/15/2007 Observation: Left 5th toe ulcer
Documentation:	Date: ☐ **Intervention considered but not delivered. Reason:** ◉ Patient refused ○ Medically inappropriate at this time ○ Scheduled for future visit ○ Other **Comment:** (required except if "Scheduled for future visit" selected as reason)
Rule status:	☐ **Inactivate rule for this patient. Reason:** ◉ Patient refuses ○ Medically inappropriate ○ Other

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CDS for Diagnosis and Mgt

- Setting: Private practice ophthalmology and optometrist offices
- Goal: To overcome challenges to collecting complex clinical data at the point of care in order to provide diagnostic decision support and improve care documentation, staging and quality

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FUTURE CARE

A study sponsored by the National Eye Institute and Duke University © 1-888-500-4032

Point-of-Care Data Collection and Decision Support for Eye Care Professionals

Principle Investigator: Paul Lee, MD, JD

Joint Project of

Division of Clinical Informatics, Dept. of Community and Family Medicine

and Department of Ophthalmology,

Duke University Medical Center, Durham, NC

National Eye Institute

NATIONAL INSTITUTES OF HEALTH

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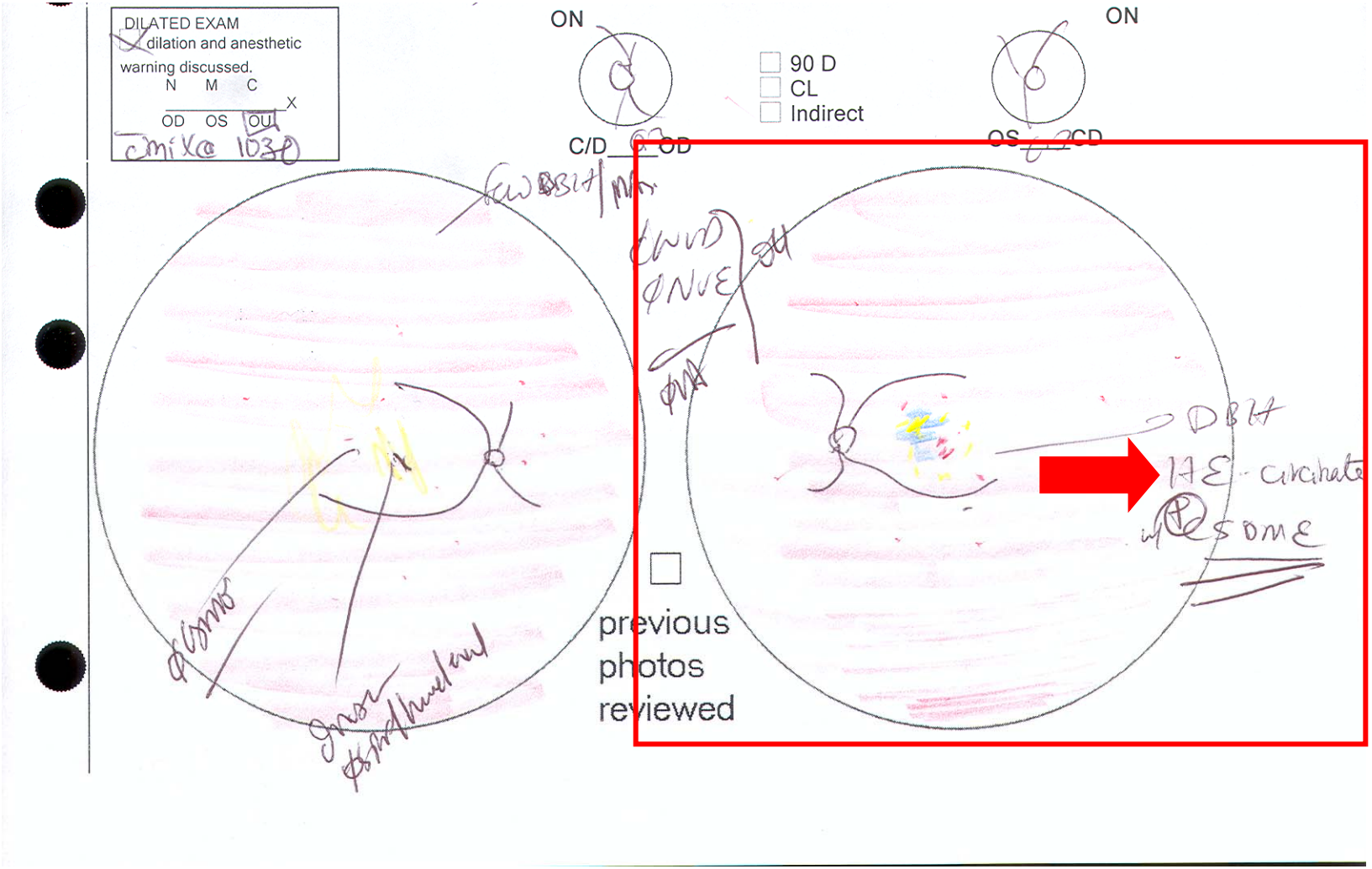
Sample Note – Color Diagrams



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Capturing Detailed Diagrams

Eye Center

03-17-2005 Current Patient: john smith 01:07:24

Visual Acuity/Refraction | Exam 1 | Slit Lamp | Optic Nerve & Retinal Exam 1 | Retinal Exam 2

Undo
Clear

OD

I II IV III

Undo
Clear

OS

I II III

DRS OD

- [ ] Normal
- [x] Microaneurysms
- [x] Dot-Blot Hemorrhages
- [ ] Cotton Wool Spots
- [ ] IRMA
- [ ] NVE
- [x] NVD
- [x] VH

CSDME

DRS OS

- [ ] Normal
- [x] Microaneurysms
- [x] Dot-Blot Hemorrhages
- [ ] Cotton Wool Spots
- [ ] IRMA
- [ ] NVE
- [ ] NVD
- [ ] VH

CSDME

Main | History | Exam | Additional Tests | Decision Making | Finish Chart

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Eye Care Decision Support

Eye Center

08-17-2006 Current Patient: John Smith 12:36:34

Diagnosis | Assessment | Counseling/Discussion

Diagnoses - OD | Diagnoses - OS

Stage
Proliferative - Neovascularization

Diagnosis
Proliferative

Modify Stage
- Normal
- Mild Non-Proliferative
- Moderate Non-Proliferative
- Severe NPDR - IRH
- Severe NPDR - VB
- Severe NPDR - IRMA
- Proliferative NV
- Proliferative VH
- Proliferative PRH
- Proliferative S/P PRP
- DME - Mild
- DME - Moderate
- DME - Severe

Sample Retinal Image

Proliferative - Neovascularization

Click the image to display a larger version.

Additional Diagnosis Notes - OD

Notes

Main | History | Exam | Additional Tests | Decision Making | Finish Chart

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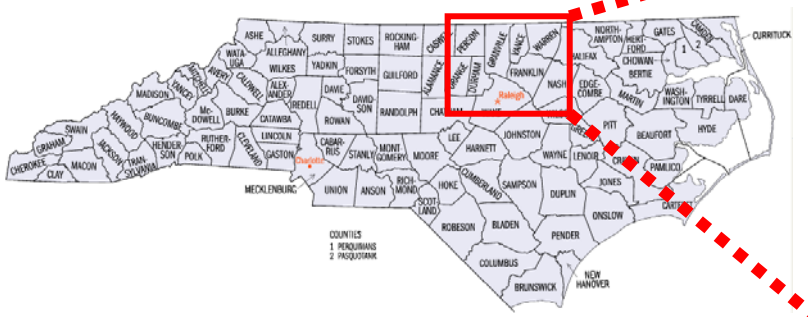
CDS for Population Management

- Setting: Urban and rural safety net providers for Medicaid beneficiaries in a 6-county region of north central NC
- Goal: To improve appropriate utilization and quality of care



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COACH HIE Context

- Receives and displays external billing/claims/clinical data from 5 hospitals, 8 clinics and NC State Medicaid
- Supports care management activities (documentation, communication, referrals, care plans, etc.) for 2 care management teams
- 5 Hospitals, 34 Primary Care Clinics, 3 Urgent Care Facilities, & 8 Government Agencies
- >40,000 Medicaid Beneficiaries

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COACH Sample Screen

File Edit View Favorites T Address https://top.mc.c

COACH

Quick Search Go Drafts New Patient Register LATCH Advanced Search Feedback Admin Help Logout

COACH PROD David F Lobach

[redacted] Annette View Patient Add to Patient List Printer Friendly Refresh Home

DOB	Age	Race	Gender	M/S	Programs
04/25/[redacted]		B	F		D[redacted], MED - [redacted]r, CA - [redacted] (A)

Add a Program

DEMOGRAPHICS | PROBLEMS & PROCEDURES | MEDS & ALLERGIES | CARE PLANS & PSYCHOSOCIAL | LABS & OBSERVATIONS | ENCOUNTERS | PROVIDERS | REFERRALS | DATA FORMS

Add an Address

Addresses	City, State Zipcode	County	Map Link
118[redacted]nit 2	Durham, 27[redacted]	Durham	(Map)
Po [redacted]	Durham, N[redacted]	Durham	(Map)
118[redacted]	Durham, 27[redacted]	Durham	(Map)
118[redacted]	Durham, N[redacted]		(Map)
132[redacted]	Durham, N[redacted]		(Map)
Po [redacted]	Durham, 27[redacted]	Durham	(Map)
Po [redacted]	Durham, N[redacted]	Durham	(Map)

Add a Phone Number

Phone Numbers	Type
919[redacted]	Home
919[redacted]	Home

Add a Provider

Active Providers	Role	Location	Status Date
Andrea Leach, RD	Nutritionist	DCHN	09/13/2004
Sharita Lee, HEd	H Ed	DCHN	07/16/2004
-Not Assigned-		Duke Medical Outpatient Cli	-

Add a Comment

Date	Author	Comments & Other Information
07/16/2004	Sharita L Lee/Dept_CFM/mc/Duke	Diabetes Disparities Collaborative

Add a Parent/Guardian

Guardian Name	Relationship

Add a School

School	School Phone

Add a Case Code

DCHN Case Code	Case Manager

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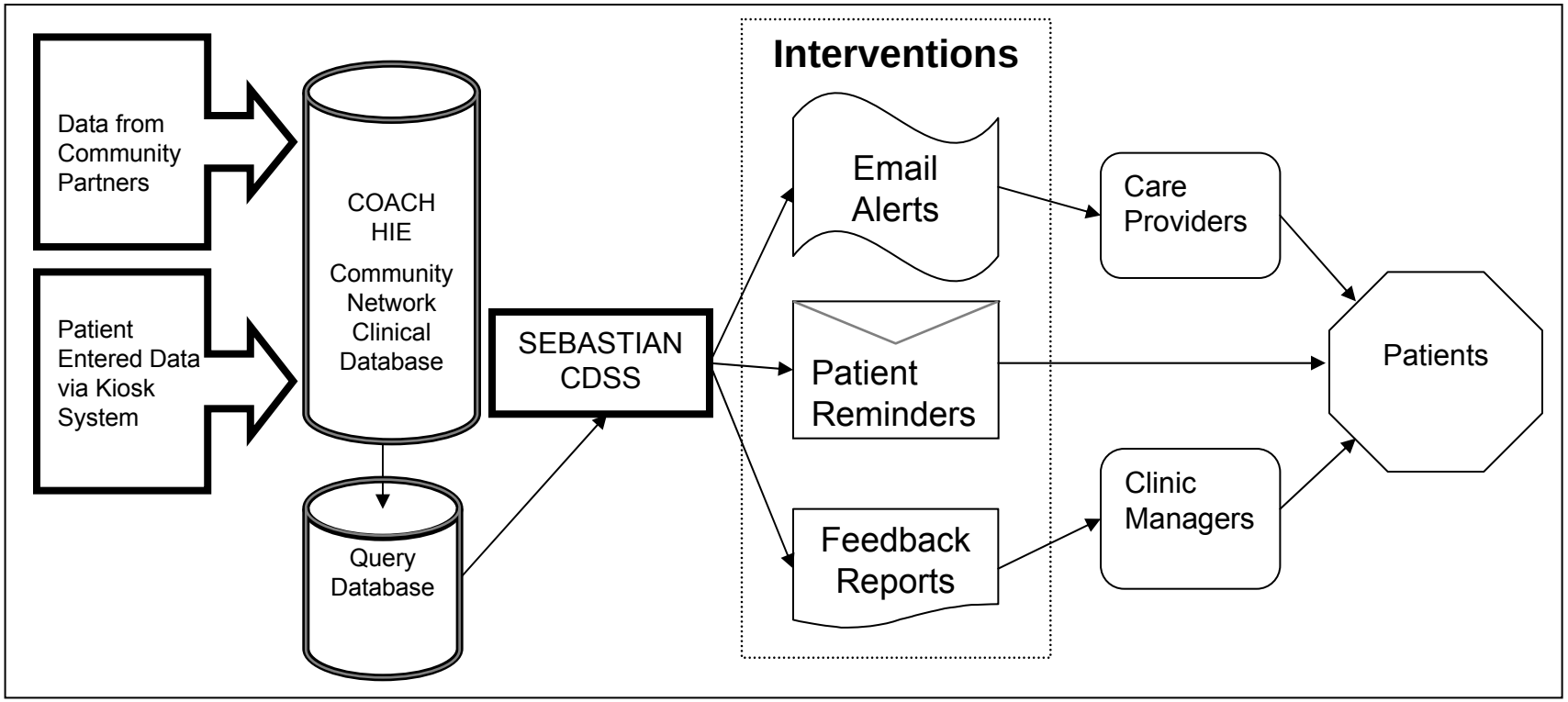
Population Mgt Intervention



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Sample Provider Alert

COACH Alerts for Ms. Jenny Rawlings
Document ID: 24
08/08/05 (Mon)

If you have any questions or concerns, please contact Ken Kawamoto, M.D.-Ph.D. candidate, Duke University (kawam001@mc.duke.edu; 919-684-2340).

Patients requiring attention (highest priority patients listed first):

1. Norris, [redacted] (COACH link). 23 yr. old Caucasian female, DOB [redacted]/82.
Medicaid #: [redacted] Duke MRN: [redacted] Priority: 23.0
[redacted] Durham, NC 27[redacted] Home #: 919-[redacted]

ED visits that may require follow-up:

☐ **3+ ED visits in 90 days, most recent in past month:** The patient was seen at Duke Hospital ED (listed as 'Emergency Room-duke' in COACH) on 07/09/05. This visit was at least the 3rd ED visit in 90 days. Including this visit, the patient has had 13 such repetitive (3+ in 90 days) ED visit(s) in the past 6 months.

General preventive care needs:

☐ **DUE NOW - Chlamydia test:** Women between the ages of 16 and 26 should be tested for Chlamydia once every year. We have no record of the patient having received a Chlamydia test in the past 2 years.

☐ **DUE NOW - Pap smear:** Women between the ages of 21 and 64 should have a Pap smear at least once every 3 years to screen for cervical cancer. We have no record of the patient having received a Pap smear in the past 3 years.

2. Weaver, [redacted] (COACH link). 8 mo. old Caucasian male, DOB [redacted]/04.

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Sample Feedback Report

Feedback Report - Duke Family Medicine **April 25, 2005**
Active CAII Patients: 2,339

Sorted by: Highest priority patients

Williams, Jacob	Medicaid # 000000000	
15 year old African-American male	DOB 5/17/89	Priority: 100
1001 Main Street, Durham, NC 27000-1001	919-123-4567	MRN: ABC1231

Events requiring follow-up:

- **ED visit for diabetes:** 1/20/05, Duke Hospital; Encounter diagnosis - diabetes
- **Multiple missed appointments by patient w/ diabetes:** 2/18/05, Missed appointment at Duke CFM; (4th missed appointment in 60 days)

Health maintenance needs:

- **DUE NOW -- Well-child visit:** Patients aged 12-16 should have a well-child visit once every year. (CPT billing procedure code 99210). Last known well-child visit: 8/12/03 at Duke CFM.

Diabetes care needs:

- **DUE NOW -- Hemoglobin A1c test:** Recommended once every 6 months. Last known HgbA1c: 6/1/04 at Duke Pediatrics.
- **DUE NOW -- LDL cholesterol test:** Recommended once every 6 months. Last known LDL test: 6/1/04 at Duke Pediatrics.

Other issues requiring follow-up:

- **NEED PHYSICIAN FOLLOW-UP – Risk factors for TB exposure:** Patient reported information at health information kiosk visit on 1/25/05.

Other relevant information:

- **CAII status:** Active
- **CAII home clinic:** Duke CFM
- **High Medicaid cost:** Medicaid costs over last 6 months: $5200. $1000 (20%) on outpatient encounters, $1530 (30%) on ED visits, $2550 (50%) on inpatient encounters
- **Meets DCHN priority contact criteria:** Patient has diabetes and < 80% of diabetes care standards are met.

Doe, Jane	Medicaid # 000000000	
58 year old Caucasian female	DOB 3/28/46	Priority: 82
200 Cedar Lane, Durham NC 27000-0200	919-345-6789	MRN: WXY4567

Events requiring follow-up:

- **ED visit for asthma:** 2/14/05, ED visit at Duke; Encounter diagnosis - diabetes
- **Multiple missed appointments by patient w/ asthma:** 2/25/05, Missed appointment at LCHC; (2nd missed appointment in 60 days)

Asthma care needs:

- **Asthma Action Plan:** Patients with asthma should have a written asthma action plan. None documented. Patient reported information at health information kiosk visit on 2/10/05.

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Sample Patient Letter

Durham Community Health Network

REGIONAL PEDIATRIC Associates, P.A.

Lincoln Community Health Center – Duke University Medical Center – Durham County Department of Social Services
Durham County Health Department – Durham Pediatrics – Regional Pediatric Associates – Central Family Practice

Same rules for diabetes used across 4 applications

August 9, 2005

To the parents of [redacted],

We are sending you this letter to address your child's health care needs. Based on our records, it appears your child may be due for the following services:

Diabetes services that may be due:

- ☐ **Hemoglobin A1c test:** This test is recommended every 6 months for patients with diabetes.
- ☐ **Cholesterol test:** This test is recommended every 12 months for patients with diabetes.
- ☐ **Urine protein test:** This test is recommended every 12 months for patients with diabetes.

Please call our office at (919) 477-2202 to schedule an appointment, so that the doctor can check to see if your child is in need of these services. Also, please bring this letter with you to the appointment and show it to the doctor. We look forward to seeing you soon!

Sincerely,

Your Care Team

Your Care Team
Regional Pediatric Associates
A Member of the Durham Community Health Network

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CDS for Medication Management

- Setting: 14 primary care practices and their affiliated care managers serving Medicaid beneficiaries
- Goal: To improve adherence to evidence-based pharmacotherapy for IOM priority conditions

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Med. Mgt. Project Overview

- Point-of-care information about filled prescriptions
- Evidence based pharmacotherapy recommendations about 7 priority conditions (IHD, CHF, Htn, Stroke, Asthma, COPD, Diabetes)
- 14 clinic sites and notifications to care managers
- Report delivery beginning March 2009

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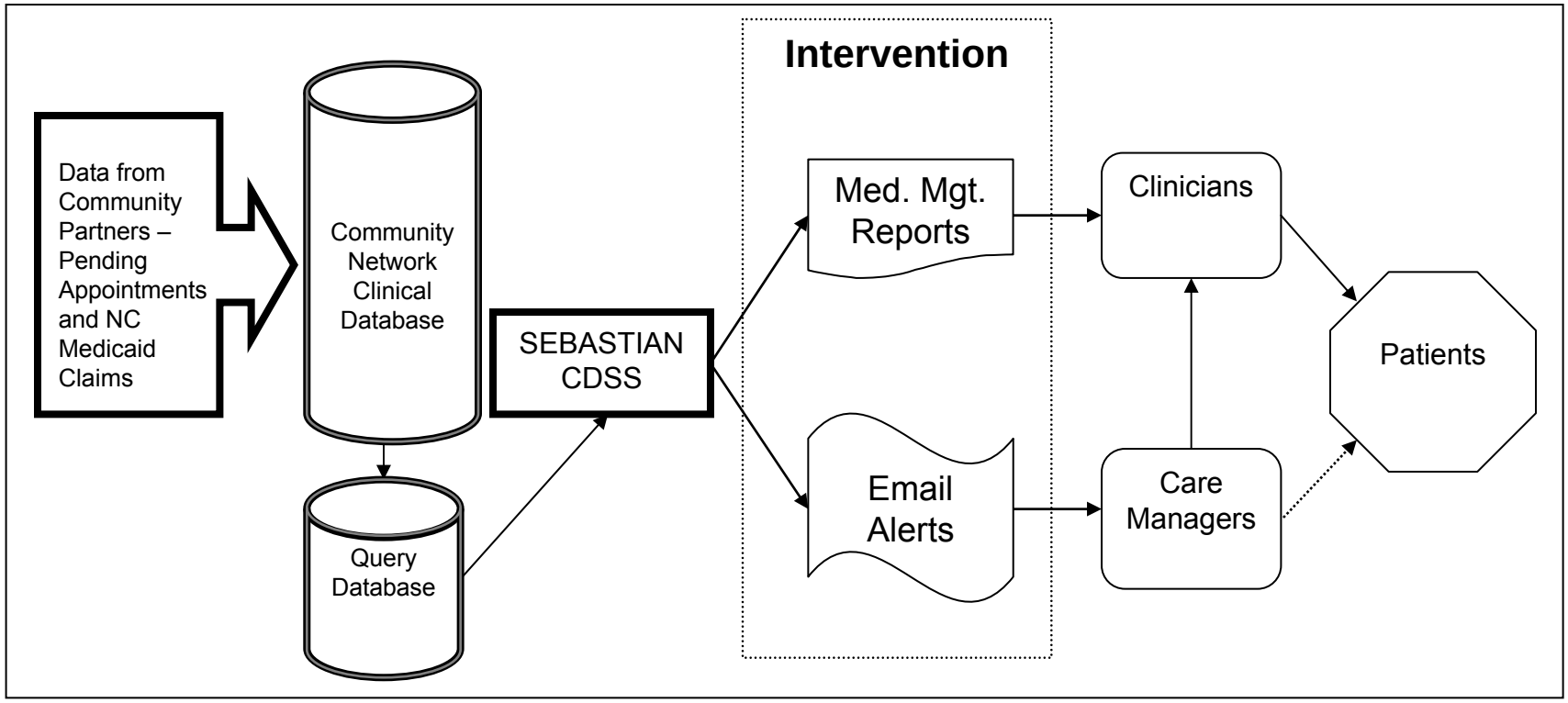
Intervention Overview



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Sample Medication Mgt. Report

Doe, Jane (Duke MRN 12345) **MD: Smith, John** **Appointment Date: 7/17/07**
Medication Summary **Appointment Time: 10:15am**

PLEASE NOTE: The information below was generated from claims data and may be inaccurate or incomplete. Please verify the information, as the provider is acknowledged as the final authority for all care decisions.

IOM PRIORITY CONDITIONS DETECTED FROM BILLING DATA FOR THIS PATIENT:

1. Diabetes mellitus
2. Hypertension
3. Ischemic heart disease (post-MI)

PRESCRIPTIONS FILLED IN THE 12 MONTHS PRIOR TO 6/28/07 (EXCLUDING ANTIBIOTICS):[A,B,C]

	% days covered	2006 Jul	Aug	Sep	Oct	Nov	Dec	2007 Jan	Feb	Mar	Apr	May	Jun
Cardiovascular Drugs													
Beta Blockers	**87%**												
Carvedilol 25 mg tab (30d Rx) (MD: Smith, John)	39%												
Metoprolol 100 mg tab (30d Rx) (MD: Smith, John)	52%												
ACE Inhibitors	**!! 0%**												
Statins	**!! 47%**												
Simvastatin 25 mg tab (30d Rx) (MD: Smith, John)	47%												
Diuretics	**83%**												
Torsemide 10 mg tab (30d Rx) (MD: Smith, John)	38%												
Torsemide 20 mg tab (30d Rx) (MD: Smith, John)	45%												
Diabetes Drugs													
Insulin	**98%**												
Humulin N 100 units/mL vial (30d Rx) (MD: Lee, David)	88%												
Humulin R 100 units/mL vial (30d Rx) (MD: Lee, David)	91%												
Oral Agents	**85%**												
Metformin 500 mg tab (30d Rx) (MD: Lee, David)	85%												
Other Drugs													
Colchicine 0.6 mg tab (30d Rx) (MD: Benson, Carol)	77%												
Loratadine 10 mg tab (30d Rx) (MD: Smith, John)	42%												

PATIENT-SPECIFIC, EVIDENCE-BASED MEDICATION SUGGESTIONS FOR IOM PRIORITY CONDITIONS:

1. Consider prescribing ACE inhibitor or angiotensin II receptor blocker (ARB), unless contraindicated.
Indications that apply specifically for this patient: (1) diabetes in context of hypertension (ADA Diabetes guidelines, 2007)[D]; and (2) ischemic heart disease in context of diabetes and hypertension (ACC/AHA ACS guidelines, 2002)[D]. Some contraindications include pregnancy, renal artery stenosis, and allergy.

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CDS for Care Transitions

- Setting: A 6-county regional health information exchange network serving Medicaid beneficiaries
- Goal: To increase awareness about care transitions and to augment information availability across these transitions

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Project Description

- Identification of Care Transitions
  - Hospitalizations
  - ED visits
  - Specialty care consults
- Notification about Transitions
  - Medical homes
  - Patients
  - Care managers
- Request of Information
  - Discharge summaries
  - ED encounter notes
  - Specialty care consult notes

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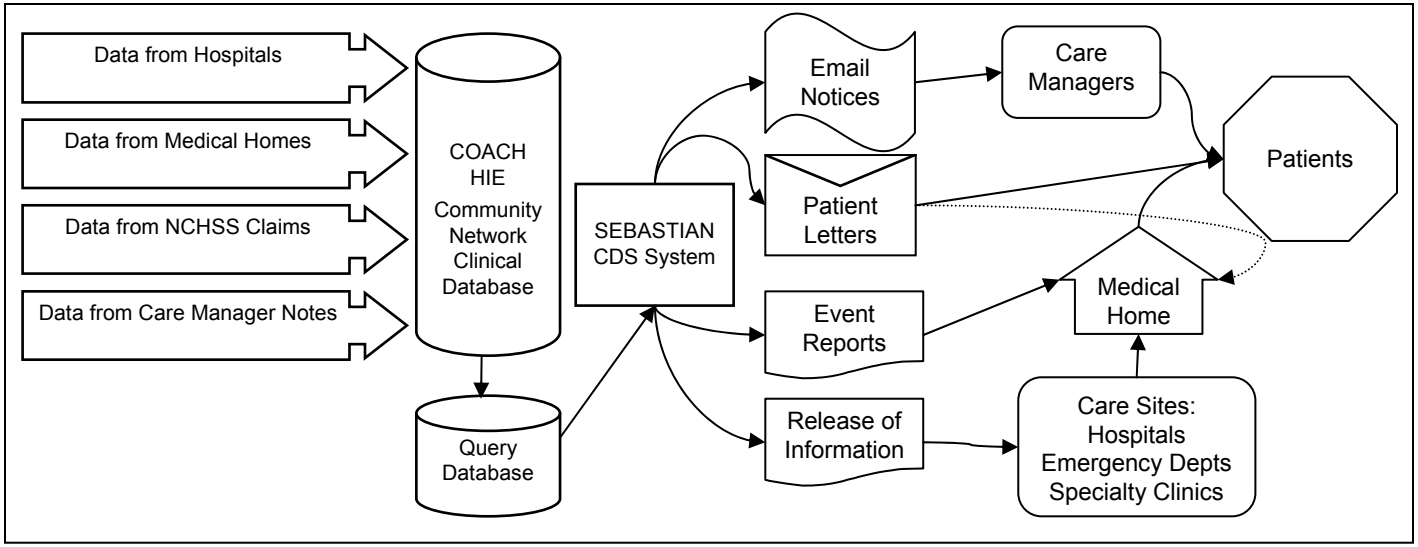
Intervention Overview



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Sample Event Report

Notice of Hospitalization for Lincoln Community Health Center

Patient Information:
Name: **Smith, Sample P.** DOB: 8/17/1943 Age: 64 Gender: F
Phone #s on file: 919-111-1111 (h); 919-222-2222 (w)
Address on file: 1234 Maple Street, Roxboro, NC 27573
MRNs on file: Lincoln (B15304), Durham Regional Hospital (1849302), Medicaid (574829491S)

Hospitalization Information:
Date: **2/1/08 – 2/6/08**
Location: **Durham Regional Hospital**
Primary diagnosis: **congestive heart failure**
Secondary diagnoses: diabetes mellitus, type II; essential hypertension; obstructive chronic bronchitis
Procedures performed: right heart catheterization, echocardiogram, chest radiograph, electrocardiogram
Billing providers: Joshua Maynard, MD
Request for discharge summary: sent on 2/11/08

Pending Appointments:
2/25/08 Duke Cardiology Clinic
No pending appointment found for Lincoln Community Health Center

Recent Encounter History (past 12 months or 12 encounters):

Date:	Type:	Location:	Provider:	Primary Diagnosis:
02/01/08	In	Durham Regional Hospital	Joshua Maynard, MD	congestive heart failure
12/07/07	Sp	Duke Cardiology Clinic	Elizabeth Smith, MD	congestive heart failure
11/24/07	ED	Durham Regional ED	Angela Daniels, MD	congestive heart failure
10/15/07	PCP	Lincoln Com.Health Ctr.	William Donavan, MD	diabetes mellitus, type II
08/18/07	Sp	Duke Cardiology Clinic	Elizabeth Smith, MD	congestive heart failure
07/28/07	Sp	Duke Pulmonary Clinic	Terry Sanders, MD	chronic bronchitis

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Sample Event Report (con't)

Recent Encounter History (past 12 months or 12 encounters):

Date:	Type:	Location:	Provider:	Primary Diagnosis:
02/01/08	In	Durham Regional Hospital	Joshua Maynard, MD	congestive heart failure
12/07/07	Sp	Duke Cardiology Clinic	Elizabeth Smith, MD	congestive heart failure
11/24/07	ED	Durham Regional ED	Angela Daniels, MD	congestive heart failure
10/15/07	PCP	Lincoln Com.Health Ctr.	William Donavan, MD	diabetes mellitus, type II
08/18/07	Sp	Duke Cardiology Clinic	Elizabeth Smith, MD	congestive heart failure
07/28/07	Sp	Duke Pulmonary Clinic	Terry Sanders, MD	chronic bronchitis
06/02/07	Sp	Triangle Ophthalmology	Dana Copeland, MD	diabetes mellitus, type II
05/02/07	PCP	Lincoln Com.Health Ctr.	William Donavan, MD	diabetes mellitus, type II
03/10/07	Sp	Duke Cardiology Clinic	Elizabeth Smith, MD	congestive heart failure
02/19/07	In	Duke Hospital	Donna Sullivan, MD	congestive heart failure
01/22/07	PCP	Lincoln Com. Health Ctr.	William Donavan, MD	diabetes mellitus, type II

Medical Home Information:

Most recent medical home provider: **William Donavan, MD** (last saw patient on 10/15/07, 5/2/07, and 1/22/07)

Patient also seen in last 24 months by Mary Langley, MD (on 4/22/06)

If you have any questions regarding this notice, please contact: Jan Willis, MS, MBA, project coordinator, Duke University Division of Clinical Informatics, at (919)684-2340.

PLEASE NOTE: The above information was generated from claims data and may be inaccurate or incomplete. Please verify the information, as the provider is acknowledged as the final authority for all care. decisions.

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Sample Care Manager Notice

COACH Alerts for Ms. Madeline Maturo
02/11/08 (Mon)

If you have any questions, please contact Jan Willis, MS, MBA, Duke University (jan.willis@duke.edu; 919-684-2340).

Patients requiring attention (highest priority patients listed first):

1. Smith, Sample P. (COACH link). 64 yr. old female, DOB 08/17/1943. Medical Home: Lincoln Comm. Health Ctr.
Medicaid #: 574829491S Lincoln MRN: B15304 Priority: 5.0
1234 Maple Street, Roxborro, NC 27573 Home #: 919-111-1111

Hospitalizations that may require follow-up:

- ☐ **Hospitalization Discharge of Complex Patient.** Location: Durham Regional Hospital. Date: 02/01/08 to 02/06/08. Primary diagnosis: congestive heart failure. # hospitalizations in past 12 months: 2. Pending appointment at medical home: None scheduled.

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Sample Information Release

LINCOLN
COMMUNITY
HEALTH CENTER

Request for Release of Medical Information

To:	**From:**
Durham Regional Hospital Attn: Medical Information Release Unit P.O. Box 3016 Durham, NC 27710	Lincoln Community Health Center 1301 Fayetteville St. P.O. Box 52119 Durham, NC 27717-2119 (919) 956-4000
Information Requested For: Name: **Smith, Sample P.** DOB: 8/17/1943 Gender: F Durham Regional Hospital MRN: **1849302**	**Information Requested:** **Discharge summary from hospitalization starting on 2/1/08**

Please fax the above information to:

Lincoln Community Health Center
Attn: Claire Crenshaw, RN, clinic manager
Re: Sample P. Smith, Lincoln MRN B15304, DRH discharge summary, PCP William Donavan
Fax: (919)956-4001

We are attaching a return fax cover sheet for your convenience. Please use the attached cover sheet if possible, as it will help us with internal routing of the information.

If you have any questions or concerns, please contact: Claire Crenshaw, clinic manager, Lincoln Community Health Center, at (919)856-4000 extension 15.

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Project Challenges → Lessons

People	Working with diverse stakeholders
Politics	Working with systems, institutions and their policies
Pragmatism	What we wish we had known sooner

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Lessons: People

- Controlling expectations
- Avoiding “Scope Creep”
- Securing buy-in from end users
  - Decision rules
  - Letter content
- Creating familiar associations
  - Letterhead from clinic sites

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Lessons: Politics

- Obtaining data from partners
- Complying with HIPAA regulations
- Receiving IRB approval
- Working with community partners
- Working in the community setting
- Navigating the academic institution

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Lessons: Pragmatism #1

- Limiting the volume of notifications
- Providing adequate content in notices
  - Dates
  - Values
- Accommodating flexibility
- Assuring accuracy of CDS information

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Lessons: Pragmatism #2

- Enabling local configuration of CDS
  - End user control of notification distribution
  - Narrow scope of options
- Configuring CDS for individual patients
- Understanding the data
  - Accommodating data differences

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  - Pete Woods
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Project Publications

- Lobach DF, Kawamoto K, Anstrom KJ, Kooy KR, Eisenstein EL, Silvey GA, Willis JM, Johnson F, Simo J. Proactive population health management in the context of a regional health information exchange using standards-based decision support. *AMIA Annu Symp Proc.* 2007*;473-477*
- Lobach DF, Kawamoto K, Anstrom KJ, Russell ML, Woods P, Smith D. Development and Usability of a Point-of-Care Decision Support System for Chronic Disease Management Using the Recently-Approved HL7 Decision Support Service Standard. MedInfo. 2007; 861-865.
- Kawamoto K, Lobach DF. Design, implementation, use, and preliminary evaluation of SEBASTIAN, a standards-based web service for clinical decision support. *AMIA Annu Symp Proc.* 2005:380-384.
- Eisenstein EL, Anstrom KJ, Macri JM, Crosslin DR, Johnson FS, Kawamoto K, Lobach DF. Assessing the potential economic value of health information technology interventions. *AMIA Annu Symp Proc*. 2005:221-225.
- Lobach DF, Silvey GM, Macri JM, Hunt M, Kacmaz RO, Lee PP. Identifying and overcoming obstacles to point-of-care data collection for eye care professionals. *AMIA Annl Symp Proc*. 2005:465-469.

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Thank you!

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Questions & Answers

Our Panel:

Ben-Tzion Karsh, PHD, MSIE, University of Wisconsin Department of Industrial and Systems Engineering

Ross Koppel, PHD, MA, University of Pennsylvania Department of Sociology, and Center for Clinical Epidemiology and Biostatistics, School of Medicine

David F. Lobach, MD, PhD, Division of Clinical Informatics, Department of Community and Family Medicine, Duke University

Save the Date!

Our Next Event

A National Web Conference on How CDS Can Be Used to Monitor or Improve Population Health

Third teleconference in our four-part series on Clinical Decision Support

November 18, 2008,
from 3:30 – 5:00 PM Eastern Time

Watch your inbox for information on how to register

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