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Education: Economics, Math, Psychology →
Medicine (Washington University in St. Louis)

Medical Informatics / Health Services
Administration (University of Utah)

My work focuses on redesigning health
systems, including health information
technology, to provide higher quality, safer,
more satisfying care.

Managing and Coordinating Health Care: Creating Collaborative, Proactive Systems

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www.caremanagementplus.org



About me and quick definitions



Me: Internist / Medical Informatics / Quantitative **Definitions**

- Primary care provider: whomever gives you ongoing, comprehensive care (your family doctor, internist, pediatrician, or gynecologist)
- Primary care team: at least a provider + medical assistant, and sometimes (if you need them) a care manager nurse, social worker, pharmacist, etc ...
- Care management: system to make treatment plans and processes consistent / reliable / appropriate to evidence and patient preference
- Care coordination: reconciling and prioritizing plans of care across settings and teams

Case study

Ms. Viera

a 75-year-old woman
with diabetes,
systolic hypertension,
mild congestive heart failure,
arthritis and
recently diagnosed dementia.



Ms. Viera and her caregiver come to clinic with several problems, including

1. hip and knee pain,
2. trouble taking all of her current 12 medicines,
3. dizziness when she gets up at night,
4. low blood sugars in the morning, and
5. a recent fall.

Ms. Viera's office visit

And Out in the hall:

- 6. The caregiver confidentially notes he is exhausted
- 7. money is running low for additional medications.

How can Dr. Smith and the primary care team handle these issues?

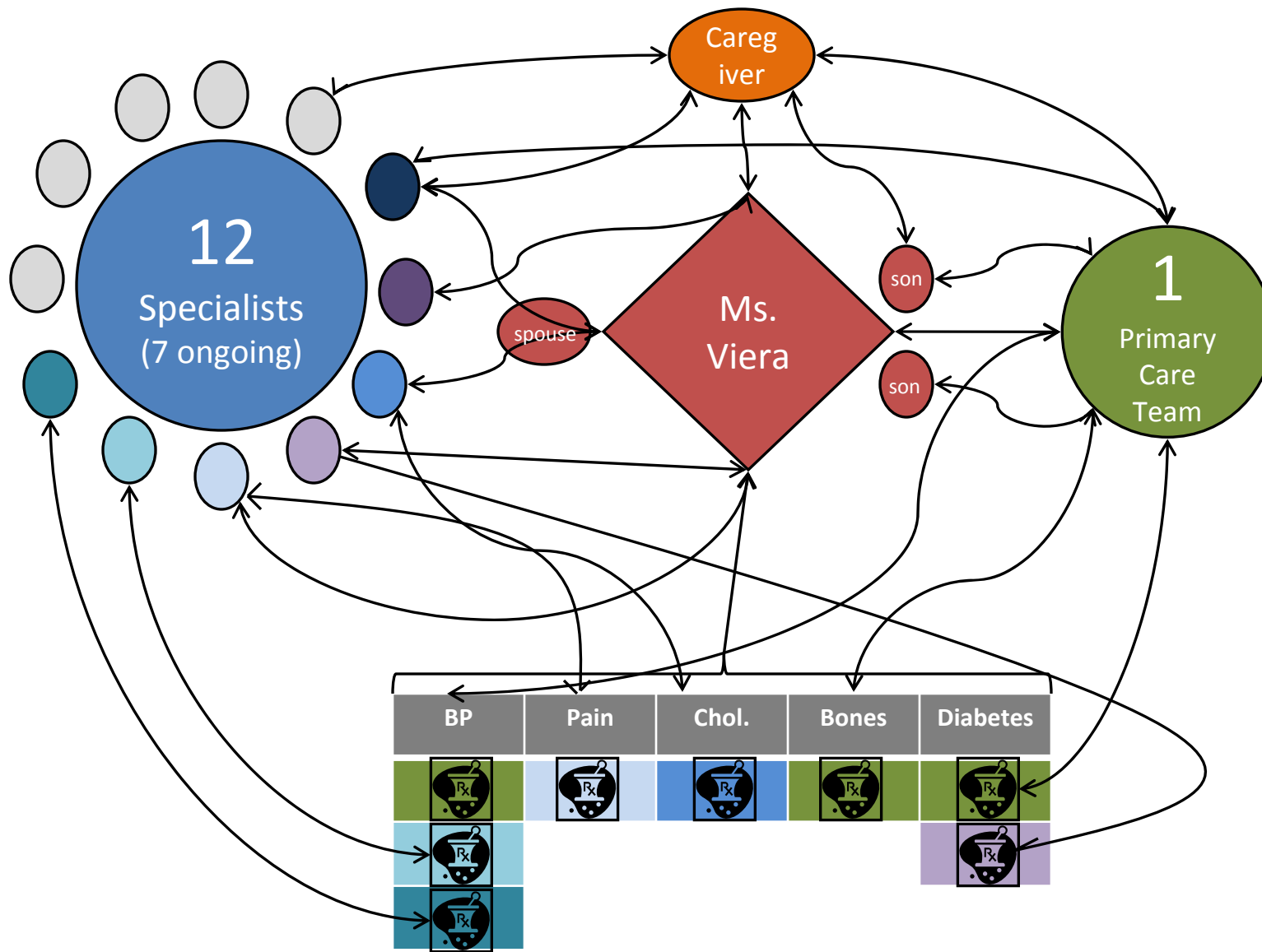
Simple heuristics won't work: they don't capture the complexity. However, there must be a way ...

Past: Heroism in the face of multiple illnesses

- Multiple diseases increase risk and coordination *logarithmically* (5+ : 90 x risk of hospitalization; 10x prescriptions; 13 providers vs. 2)
- To manage preventive and chronic illnesses in a primary care panel: 23 hours a day
- Patients with multiple illnesses *better* process quality scores but *worse* 'preventable' hospitalizations

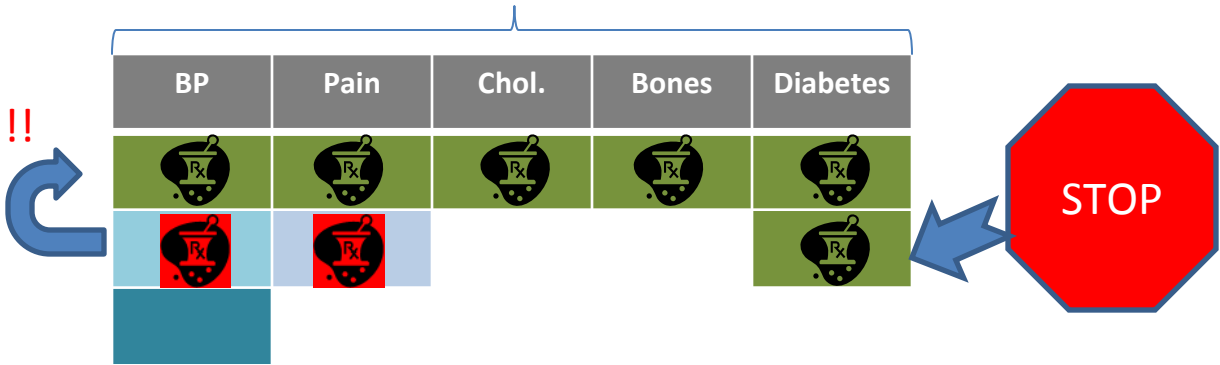
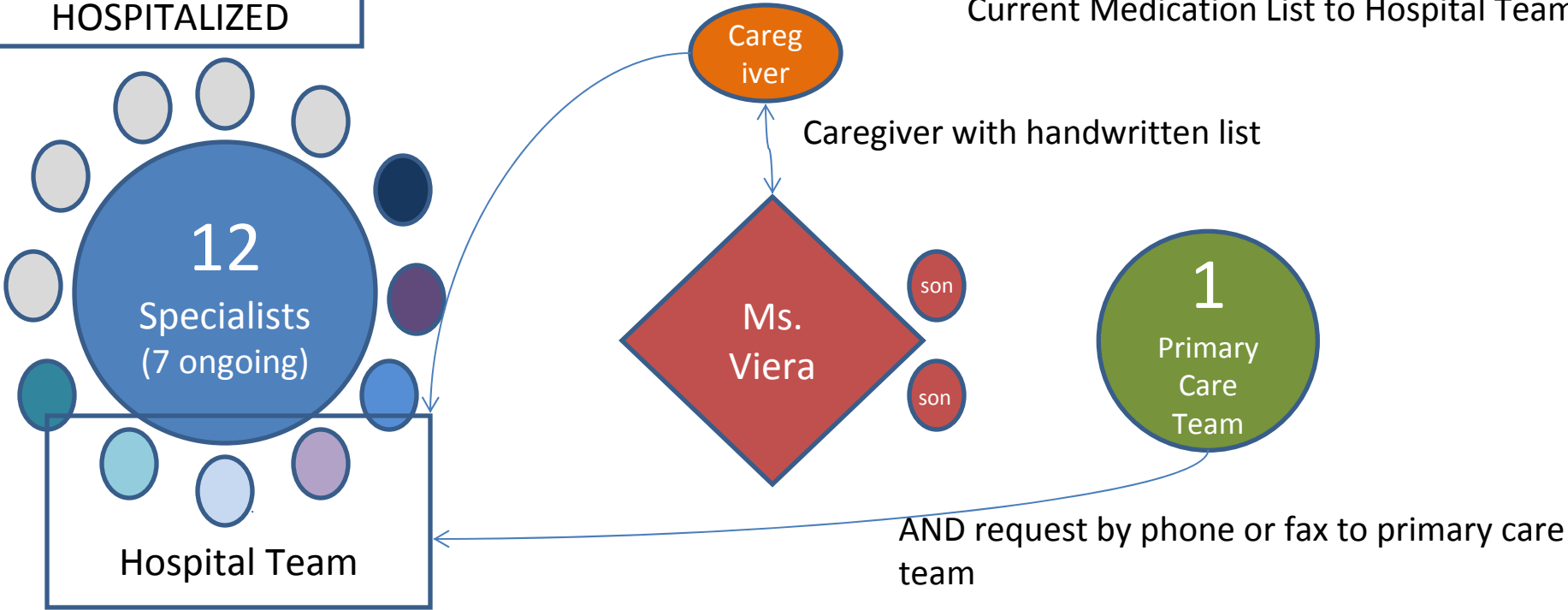
The system of usual care coordination: neither proactive nor collaborative.

Event	System1 : usual care
Ms. Viera is hospitalized.	Courtesy call made to PCP. ↓
Month 1: Ms. Viera goes home. An appointment is planned with her PCP for follow-up.	Ms. Viera receives sheet with the instructions to make an appointment; PCP receives a fax in 7 days with discharge info. ↓
Month 2: Ms. Viera resumes usual activities and becomes dizzy in the morning	She calls the PCP, an appointment is scheduled, but she goes to the ED due to worsening symptoms. ↓
Month 3: Adjustments to medications are made by 3 specialists.	2 of 3 send reports to the PCP office with plan; these reports are duly filed. When seen by the PCP, she can't remember these changes. ↓
Month 6: Ms. Viera has chest pain and calls her PCP for help.	PCP sees patient urgently; BP is out of control and Ms. Viera is hospitalized for observation. ↓
Month 12: Review of the year for Ms. Viera and family	After her second hospitalization, she is discharged to rehabilitation and a skilled nursing facility.



Ms. Viera is
HOSPITALIZED

Current Medication List to Hospital Team

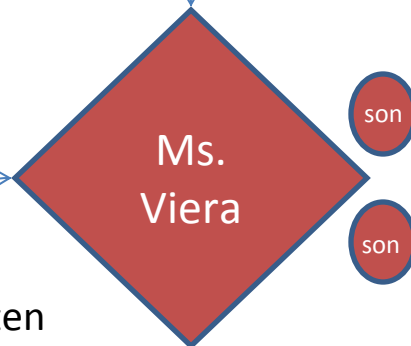


Ms. Viera is
DISCHARGED

Care plan back to patient and Primary Care



Caregiver with handwritten list !!

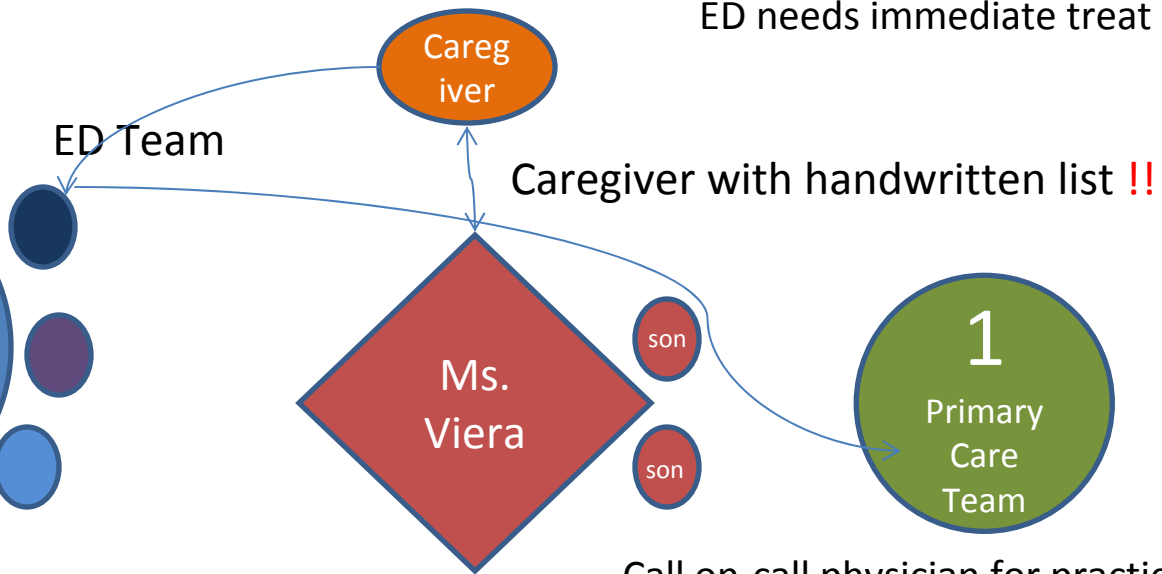
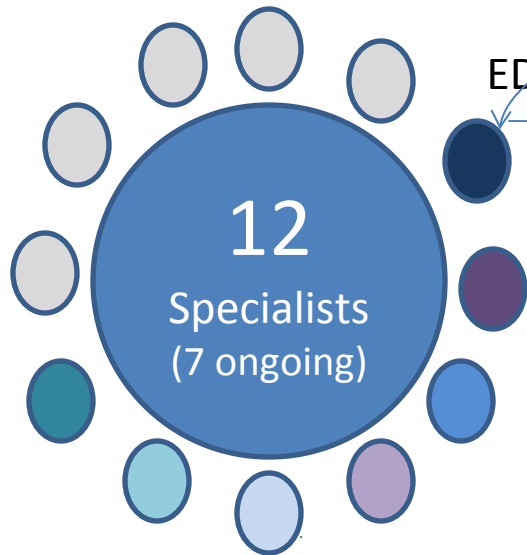


Handwritten
discharge form

Faxed discharge summary to Primary Care;
Call if Hospital Team exceptional
Discharge summary: +7 days; Appt time +3 days

BP	Pain	Chol.	Bones	Diabetes

Ms. Viera DEVELOPS SYMPTOMS



ED needs immediate treat decision

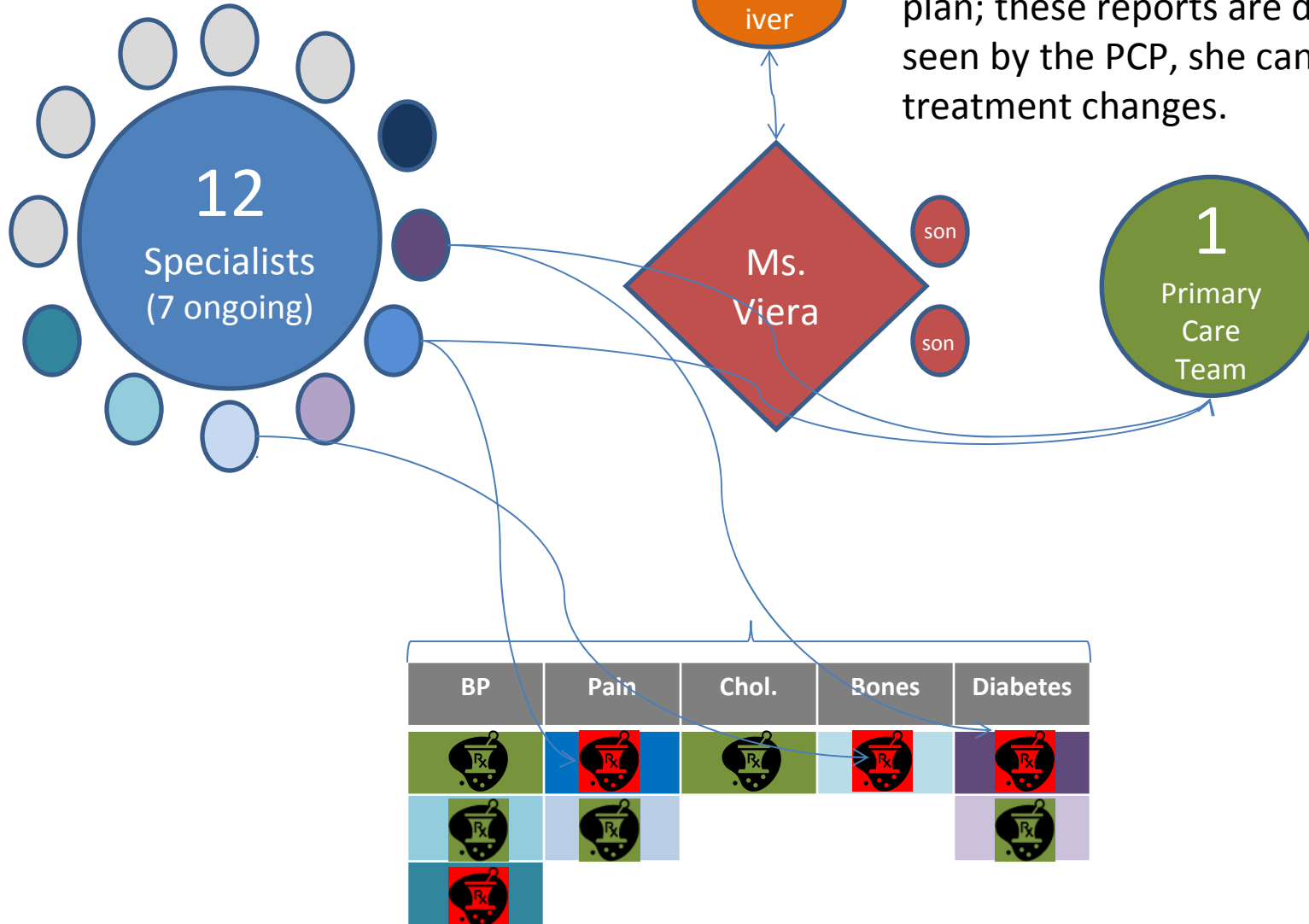
Call on-call physician for practice –
Is Electronic Health Record list up to date?

BP	Pain	Chol.	Bones	Diabetes

OUTCOME: (RE)Hospitalization due to system failure

Ms. Viera SEES 3
SPECIALISTS

2 of 3 send reports to the PCP office with
plan; these reports are duly filed. When
seen by the PCP, she can't remember
treatment changes.



Problems identified with the old system

- Lack of collaboration between patient/family and health care team
- Lack of reliable, completed communication
 - 50% of the time ...
 - Patients don't understand the plan
 - Can't identify what was communicated
 - Don't feel included in the plan
- Failure to prioritize needs

On to the future



Complex Adaptive System (CAS)

A dynamic network of agents who constantly act and react to one another. Control is distributed among agents who, through their decisions based on competition and cooperation, produce emergent behavior of a system.

-John Holland (paraphrased)

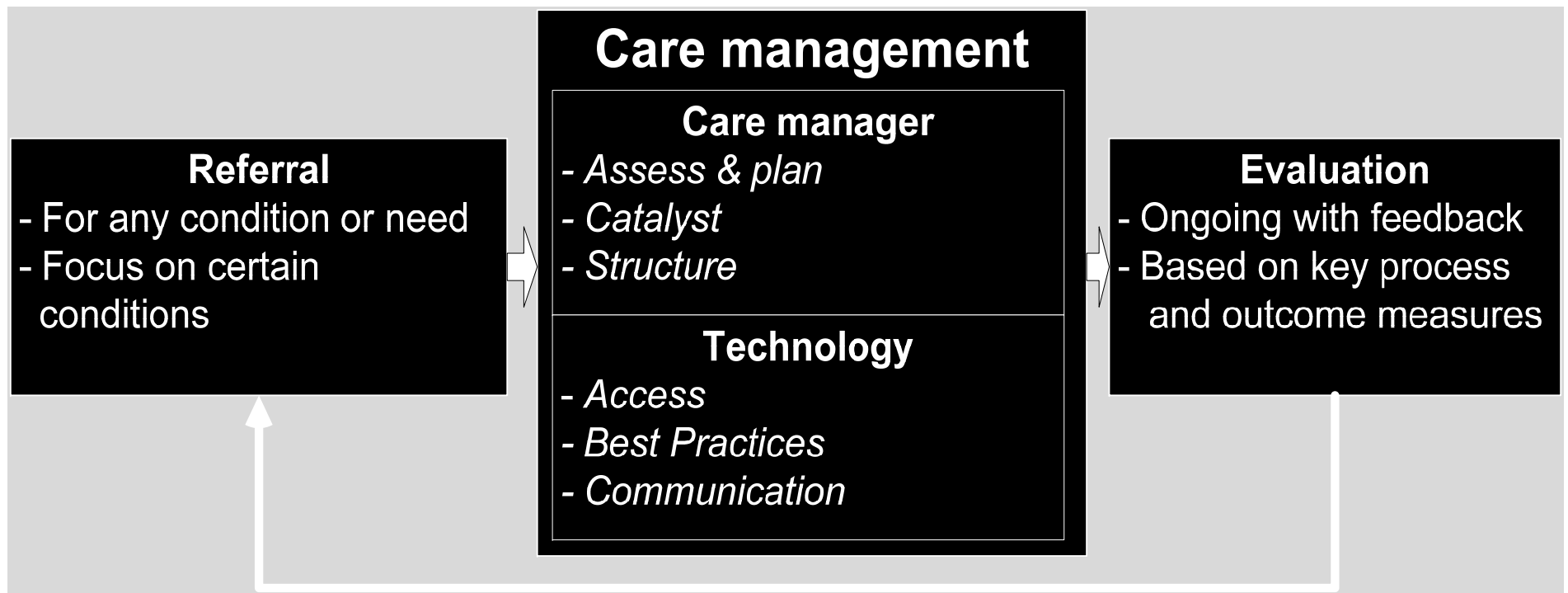
- 1) order is emergent as opposed to predetermined
- 2) the system's history is irreversible, and
- 3) the system's future is often unpredictable.

Data gathering and lessons

- Crew Resource Management: redesigning interaction for better decision-making and information flow
- Distributed cognition: representations of information and process by which they are coordinated
- So we asked, iterated, asked again, and developed two basic ideas:
 - A new **agent** was needed : care manager
 - **Information technology** needed to be focused at better representation and prioritized distribution

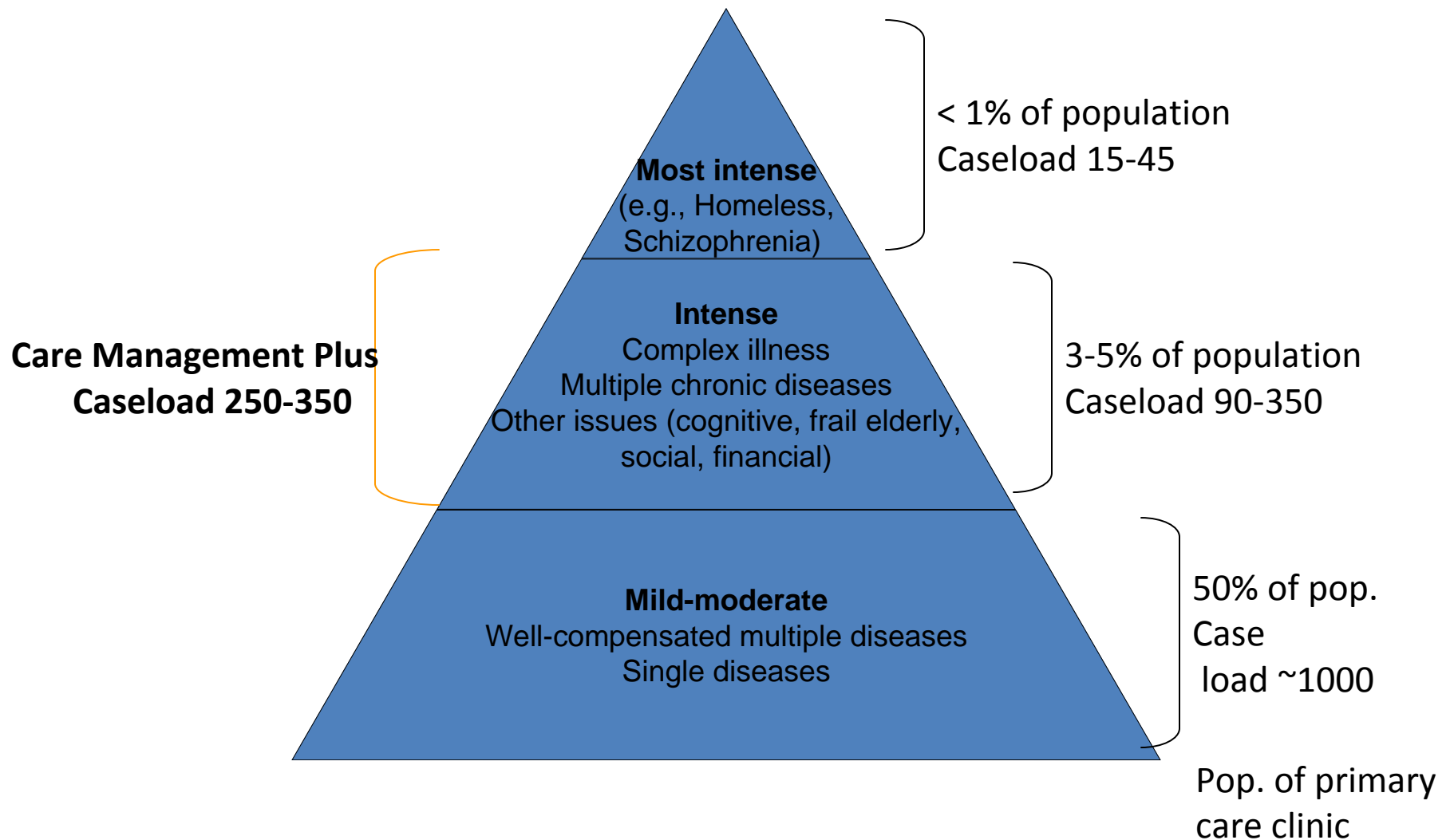
Ambulatory Care Management / Care Coordination: CM+

In >75 primary care clinics



Leads to improvements in patient satisfaction, disease control and...

Team-based Care management varies by intensity and function for different populations and needs.



TEAM PREPARATION

The right people on the team with the right training is a core principle.

Patients are taught to self-manage and have a **guide** through the system.

Care managers receive special training in

- Education, motivation/coaching
- Disease specific protocols
- Care for seniors / Caregiver support
- Connection to community resources

Providers / Other staff:

- Need to participate in protocol development/ implementation / adaptation
- Need to learn about care management (usually from the care managers)

HIT must be redesigned

← Back Schedule In Basket Chart Tel Enc Refill Enc Meds List Patient Lists Patient Station House Census for MD's MyChart Results Release

Epic Home Ozone, Oetest Patient

Ozone, Oetest Patien* Age Decd Sex F DOB 7/10/1930 MRN 06211008 PCP SHAH, AMIT R Alert INS BLUE CROSS OF OR* MyChart No POLST Yes AdvDir No

Snapshot OHSU Snapshot
Chart Review OHSU Snapshot Cardiology Snapshot
Results Review
Flowsheets

Demographics AdvDir/POLST/Power of Attorney

BestPractice Alerts

OHSU records indicate this patient has not had a screening mammogram within the past two years. The U.S. Preventive Services Task Force recommends a screening mammography at least every 2 years for women aged ages 40 and older. Please consider ordering a screening mammogram for this patient (check order set and 'Accept'). If not indicated/refused, please choose a button below.

Last MAMMOGRAM: Not on file
(No related orders found in patient record)

Acknowledge Reason:

☒ Open SmartSet: WHERMS MAM 2
(Last done by DAVID A DORR MD at 1420 on 1/28/09)

[Jump to to see the guideline](#)
[Jump to to change future scheduling of mammograms](#)

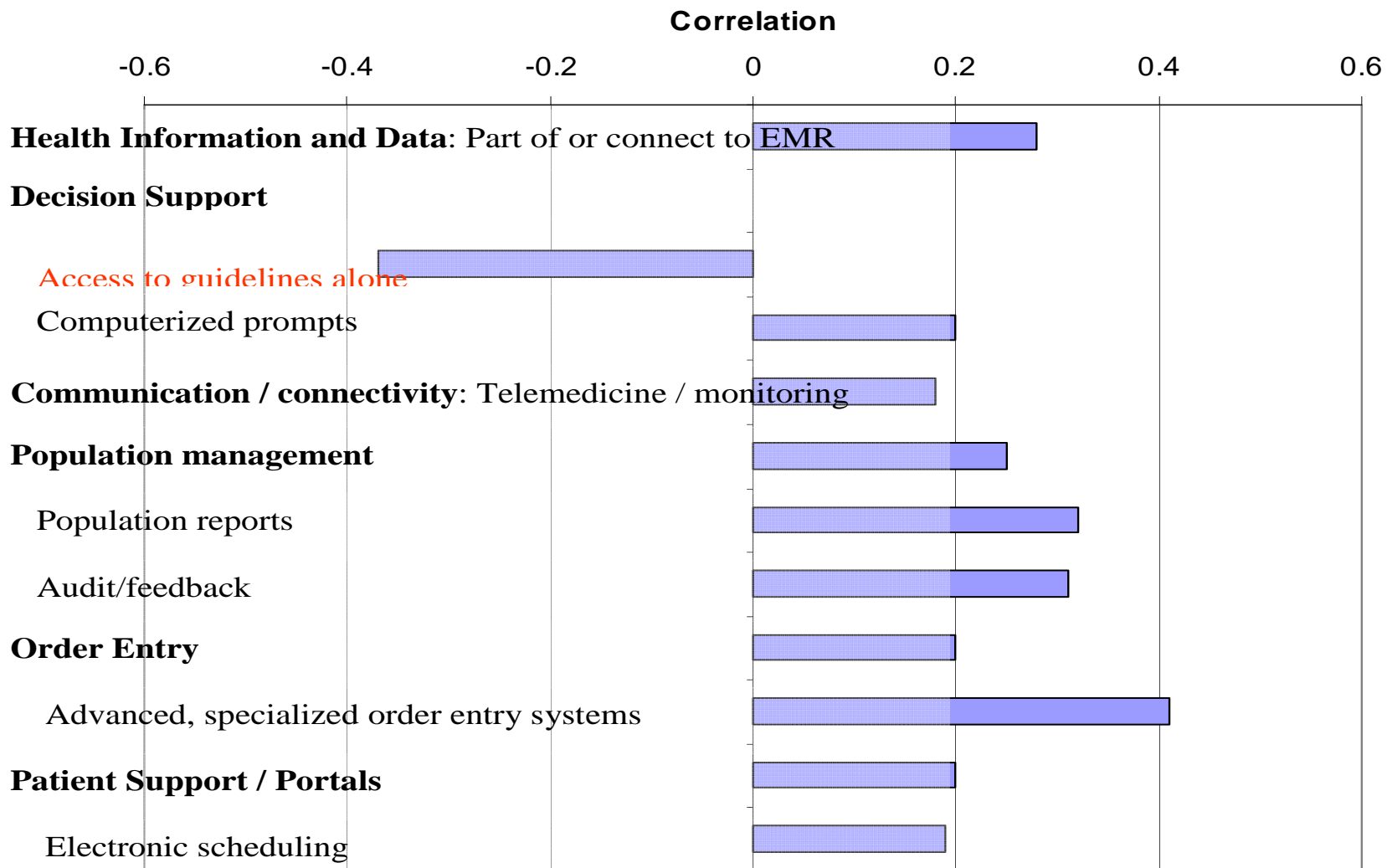
F9 F7 F8

Other Specified Pre-Operative Examination
Essential Hypertension, Benign
Kidney Transplant
Personal History of Malignant Neoplasm
chart in error
Regional Colitis
Advanced Maternal Age-Unsp
Bronchiolitis

Medications
Prescriptions
aspirin 325 mg Oral Tablet
pravastatin 40 mg Oral Tablet tablet

Immunizations/Injections
Allergen/immunotherapy
Single 12/15/2005, 12/15/201

Improved HIT for chronic illness




Creating HealtheVet Informatics Applications for Collaborative Care (CHIACC)

How can HIT help the redesign of care for Ms. Viera?

- Collaboration
 - Sharing information / interoperability
 - Explaining and aiding in decision making
- Communication
 - Close the loop BUT not overwhelm recipient
- Adapt
 - ‘Next step’ is usually only one to enforce
- Prioritization

Health Information summary sheet

Wilcox, Proc of
AMIA Symp,
2005

16 November 2006					 Patient Worksheet <small>Selected to Print for: All Patients, All Sections, Last Clinical Note</small>		v1.0.70 Comprehensive Version																															
PATIENT NAME TEST, BED			SEX F	DOB 01/01/1911	MMW 650730	MRN# 5992114																																
Problems																																						
Diabetes Mellitus, Type 2 Hypertension B <div>Chronic conditions</div>																																						
Active Medications																																						
1. - Glucophage (Metformin HCl), 500mg, Tablet, 1 TAB LET; Daily 2. - Simvastatin, 10mg, Tablet, Oral; 1 TAB LET; Daily 3. - Lisinopril, 10mg, Tablet, Oral; No dose for id 4. - Calcium Carbonate/Vitamin D (Calcium 500 mg-Vitamin D), 500-200, Tablet, 1 TAB LET; BID <div>Medications</div>																																						
Allergies																																						
(-) Penicillins - A Drug Allergy Group; Reaction(s): Rash <div>Allergies</div>																																						
Disease Management																																						
<table border="1"> <thead> <tr> <th>ADL</th> <th>Pain Score (0-10)</th> <th>WSE</th> </tr> </thead> <tbody> <tr> <td>11/16/2006 5</td> <td>11/16/2006 4</td> <td>11/16/2006 4</td> </tr> </tbody> </table> <div>Functional status</div>									ADL	Pain Score (0-10)	WSE	11/16/2006 5	11/16/2006 4	11/16/2006 4																								
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Clinical Laboratory Data																																						
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05/12/2003	50.00 N/A	-	-	-	-																																	
Reminders																																						
Lab <ul style="list-style-type: none"> [] Creatinine - Patient on Metformin product(s) and so Creatinine on record. [] HgbA1c - Urine Albumin Test- LDL - Serum Cr (should be done on all Patients with Diabetes). [] HCT - Serum K (should be done on all Patients with Heart Failure). Procedure <ul style="list-style-type: none"> [] Mammogram - Suggested yearly for women age 40 and above, every 1-2 years age 40 and above. [] Papanicolaou - Suggested for all Patients age 18 and above, every 1-3 years age 18 and above. [] Testis Examination - Suggested yearly for men age 50 and above, every 1-3 years age 50 and above. [] DEXA Screening - Suggested for women age 65 and over. Follow-up screening for those treated for osteoporosis recommended every 2-3 years. [] Colon Cancer screen - Suggested yearly fecal test or sigmoidoscopy Q 5 years, or colonoscopy Q 10 years. <div>Passive reminders</div>																																						

Organized by illness

Call

Care Manager Encounter Tickler List

Care Manager: Ann Larsen

Sched. Dt. and Time	Encounter Type	Enc. Reason	MMI	First Name	Last Name	Phone Number	Pri
2/17/04	Telephone Contact	DM F/U				(801)	Wo
2/17/04	Telephone Contact	DM F/U				(801)	Wo
2/17/04	Telephone Contact	DM F/U				(801)	Wo
2/17/04	Telephone Contact	DM F/U				(801)	Wo
2/17/04	Telephone Contact	Depression F/U				(801)	Obi
2/17/04	Telephone Contact	Dep F/U				(801)	Sm
2/17/04	Telephone Contact	DM F/U				(801)	Wo
2/17/04 8:30 AM	CM Office Visit					(801)	Wo
2/17/04 9:00 AM	Class					(801)	Sm
2/17/04 9:00 AM	Class					(801)	Met
2/17/04 9:00 AM	Class					(801)	Obi
2/17/04 9:00 AM	Class					(801)	Wo
2/17/04 10:40 AM	MD Office Visit	DM F/U				(801)	Wo
2/17/04 1:50 PM	MD Office Visit	DM F/U				(801)	Rur
2/17/04 3:00 PM	CM Office Visit					(801)	Wa
2/17/04 3:50 PM	MD Office Visit					(801)	Wo

Population Tickler

Remind about communication tasks

Facilitate the nuts and bolts of teamwork

Before 3/10

IHC
Also email

Will pay for
pm fees
\$10-30 us

5 people

Ice Appare Test

Who it passes

making - do infant +
clean - gen name
Home - head
Back - 2-3 who
Turn on 51

7-10 days
3 m.

If from cat officer

D. mobile

Specific elements address care coordination needs

External Record/Critical

Initial Request/Referral Date:

Record Type:

Source:

Notes:

Status:

Remind me to check status on this date:
☐ Records arrived

Add PHQ

Patient: Harry, Binnes

ID: 1324234

Date:

PHQ9

Fill out this section if you have previously completed a PHQ9 on paper. If you are completing the PHQ9 in the system (see form below), then severity score and Suicide Q9 will auto-fill. Click here for more [instructions](#).

Severity Score:

0

out of 27

PHQ Suicide Q9:

0

out of 3

Clinician Aware:

☐

Follow Up Required On:

Comments:

PHQ2

Fill out this section
Click here for more

Over the last 2 often have y

1. Down, depres

2. Little interest doing things

PHQ2 Score: [

Save

Back to PHQ9 List

Delete Record

PHQ9 Questionnaire

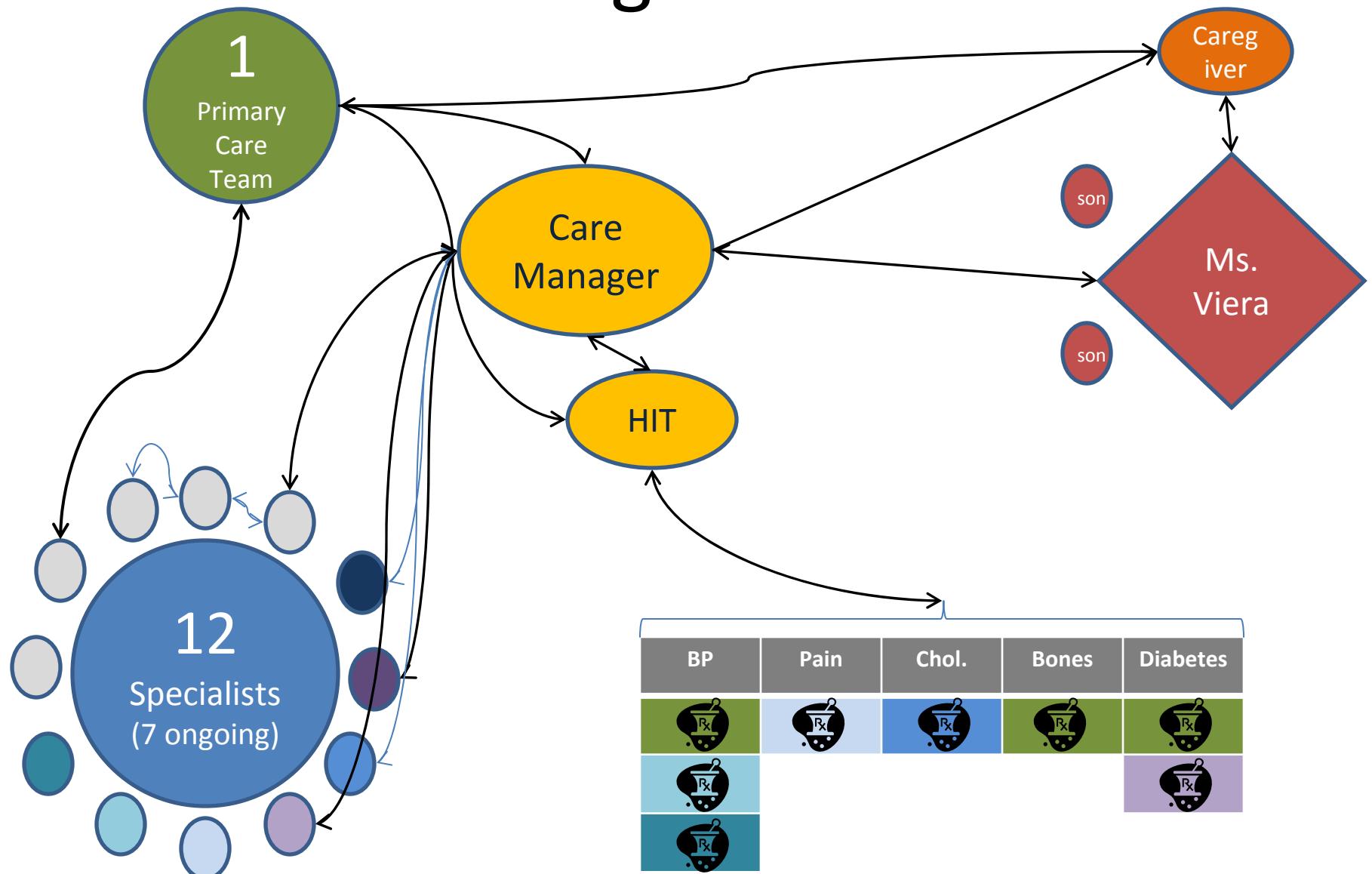
Fill out this section to complete a PHQ9 in ICCIS during or following an appointment. Once you complete the PHQ9 questionnaire, the Severity Score and Suicide Q9 (above) will auto-fill. Click here for more [instructions](#).

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at All	Several Days	More than Half the Days	Nearly Every Day
1. Little interest or pleasure in doing things?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Feeling down, depressed, or hopeless?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Trouble falling or staying asleep, or sleeping too much?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Feeling tired or having little energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Poor appetite or over eating?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Feeling bad about yourself--or that you are a failure or have let yourself or your family down?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Trouble concentrating on things, like reading the newspaper or watching television?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Moving or speaking so slowly that other people could have noticed. Or the opposite--being so fidgety or restless that you've been moving around a lot more than usual?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Thoughts that you'd be better off dead.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A more advanced system

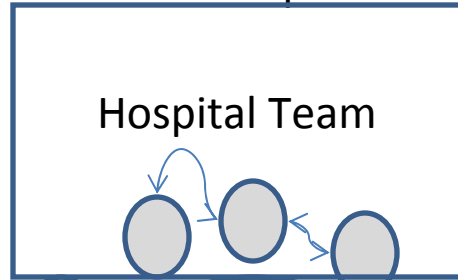
Event	System2a: High care coordination	System2b: High health information technology
Ms. Viera is hospitalized.	Care Manager (CM) called by family.	Admitting information sent to PCP, picked up by CM.
Month 1: Ms. Viera goes home. An appointment is planned with her PCP for follow-up.	CM assures appointment made and calls 2-4 days post-hospitalization. CM attends PCP visit.	Scheduled outreach for follow-up tracked per protocol and CM need; these remain until communication completed.
Month 2: Ms. Viera resumes usual activities and becomes dizzy in the morning	CM takes call, and has patient come in per provider advice; low blood sugars are to blame and medications adjusted.	Blood sugars are tracked over time in the system, with regular follow-up calls scheduled as medications adjusted.
Month 3: Adjustments to medications are made by 3 specialists.	On monthly review by CM, Ms. Viera brings in her medications and notes changes. The medication list is updated.	Specialist referrals deemed critical are tracked by system and missing report causes a reminder to be triggered.
Month 6: Ms. Viera has chest pain and calls her PCP for help.	Under a CM protocol, her BP was controlled and she is seen, stabilized, and returned home.	Protocols are enforced by system, with reminders about patient goals and follow-up.
Month 12: Review of the year for Ms. Viera and family	With Ms. Viera's permission, the daughter comes in for a conference, and helps arrange to keep Ms. Viera at home.	A summary generated by the system helps inform the conference and aids in care planning.

How might it work?

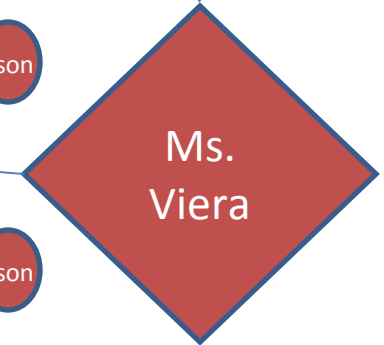




Care Manager (CM) called by family,
and contacts hospital team



Ms. Viera is
Hospitalized

A white rectangle with a blue border containing the text "Ms. Viera is Hospitalized".

Caregiver with EHR summary,
including medication list

Admitting information sent to PCP
electronically, picked up by CM.

BP	Pain	Chol.	Bones	Diabetes

A table with 5 columns: BP, Pain, Chol., Bones, Diabetes. The first two rows contain medication icons. A large blue curved arrow points from the table to the HIT icon.



CM assures appointment made and calls 2-4 days post-hospitalization. CM attends PCP visit.

Hospital Team

Written Discharge instructions



HIT

Ms. Viera is
DISCHARGED

Caregiver

son

son

Ms.
Viera

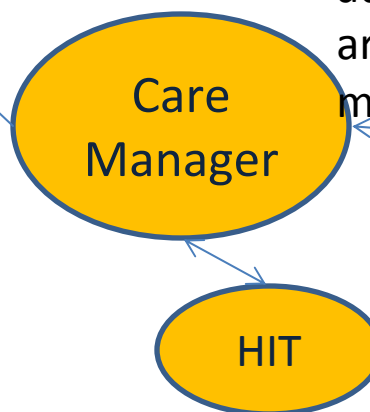
Scheduled outreach for follow-up tracked per protocol and CM need; these remain until communication completed.

12
Specialists
(7 ongoing)

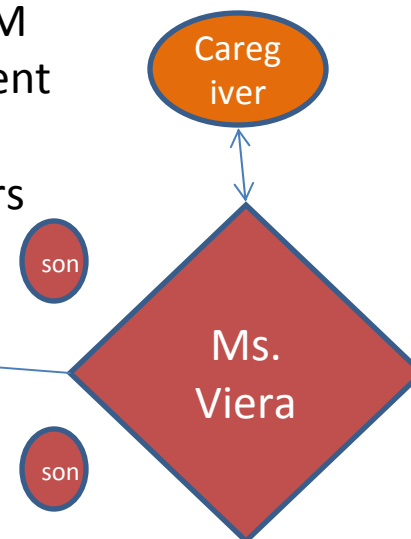
BP	Pain	Chol.	Bones	Diabetes

Medications reconciled at discharge and in visit

Ms. Viera HAS SYMPTOMS



& Calls primary care: CM
takes call, and has patient
come in per provider
advice; low blood sugars
are to blame and
medications adjusted.

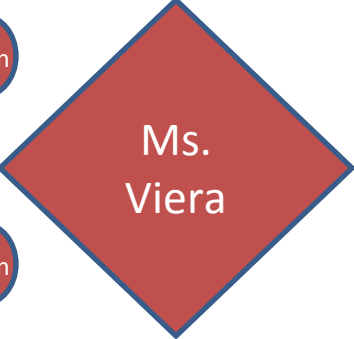


BP	Pain	Chol.	Bones	Diabetes

Ms. Viera SEES 3 SPECIALISTS



On monthly review by CM, Ms. Viera brings in her medications and notes changes. The medication list is updated.



Specialist referrals deemed **critical** are tracked by system and missing report causes a reminder to be triggered.



BP	Pain	Chol.	Bones	Diabetes

Fortunately, we have more than theory

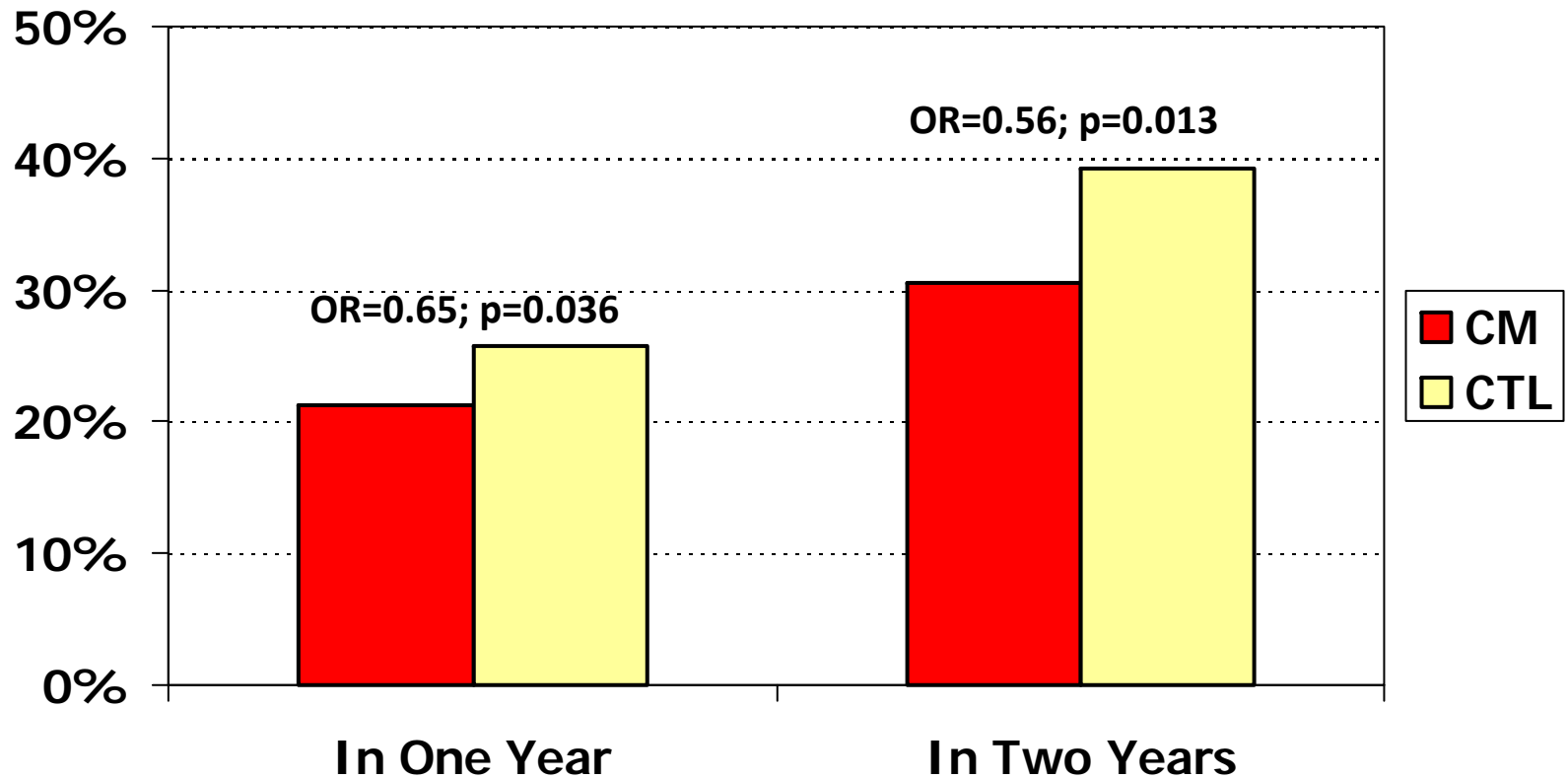
- Pilot study in 7 intervention clinics (install care manager, train, improve IT over 2 years) vs. 6 control (no care manager)
- Measure death, hospitalizations, efficiency over 3 years in thousands of patients

How does it work?

In CM+, Odds of dying were reduced significantly.

Variable	Time	CM+	Control	Difference
All Patients		(N=1,144)	(N=2,288)	
	at 1 year	6.5%	9.2%	-2.7%
Deaths	at 2 years	13.1%	16.6%	-3.5%
Multiple illnesses		(N=557)	(N=1114)	
	at 1 year	6.2%	10.6%	-4.4%
Deaths	at 2 years	12.9%	18.2%	-5.3%

Reduction in hospitalizations from CM+



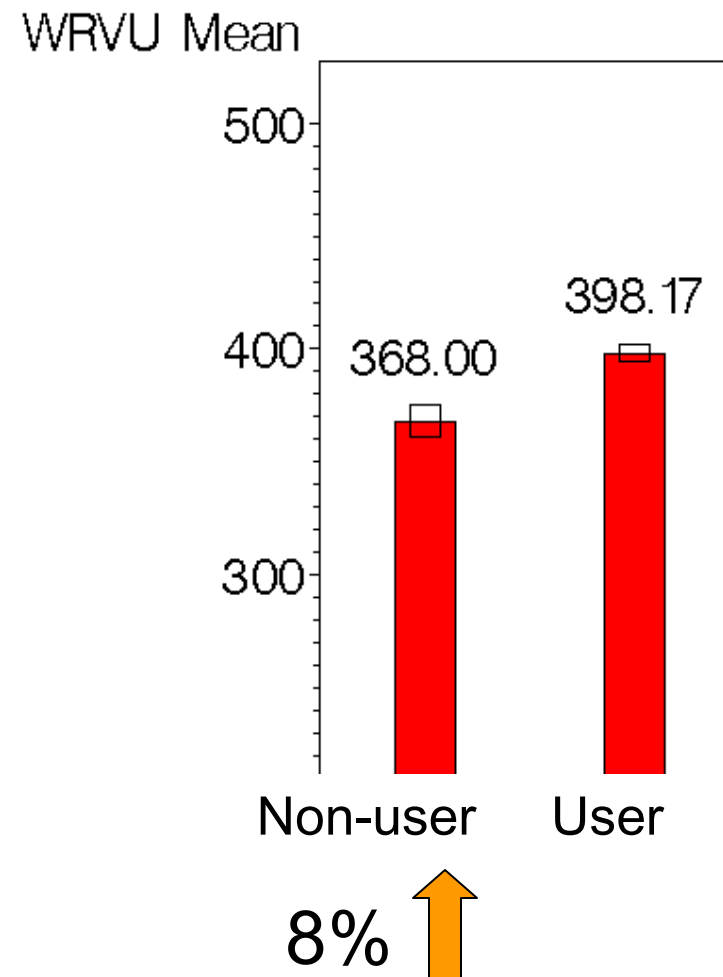
Physicians were more efficient through better documentation, a slight increase in visits, and a change in practice pattern.

- Physicians who referred to care managers:

8% more productive

- Than peers in same clinic

Dorr, AJMC, 2007



Lessons and conclusion

- Assume nothing
- Complexity, for us, required manual prioritization and adaptation
- Communication tasks quickly become overwhelming without the HIT
 - Team – including the patient!
 - Care Planning with priorities
- The system requires distributed cognition over time to work

Next steps

- We are just discovering how to capture the prioritization and metrics : now we need better algorithms
- Solving HIT design and information flow through next generation systems
- Creating collaborative redesign through our clinic networks
- Understanding impact on health policy

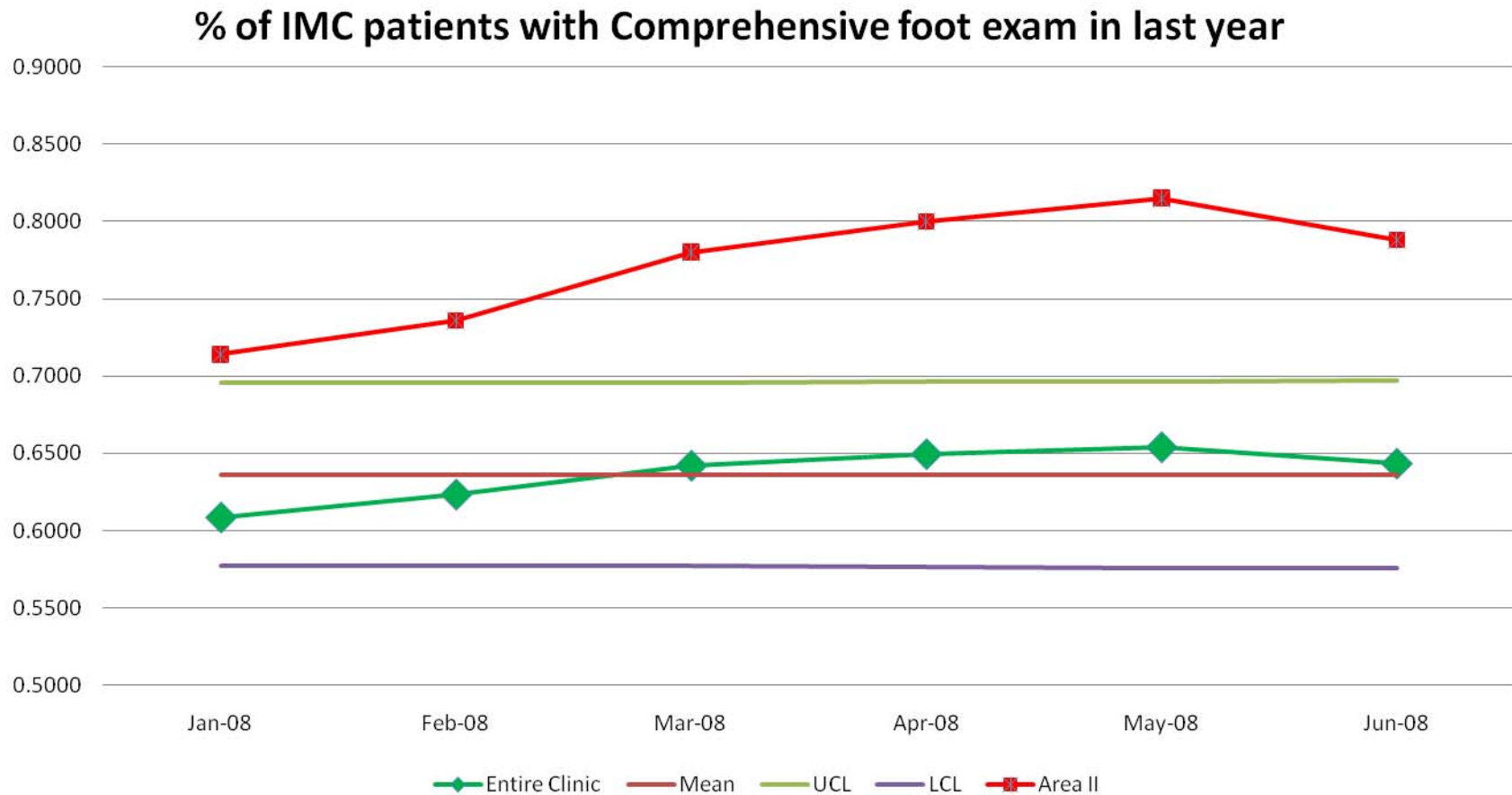
Thanks! The Care Management Plus Team

- OHSU
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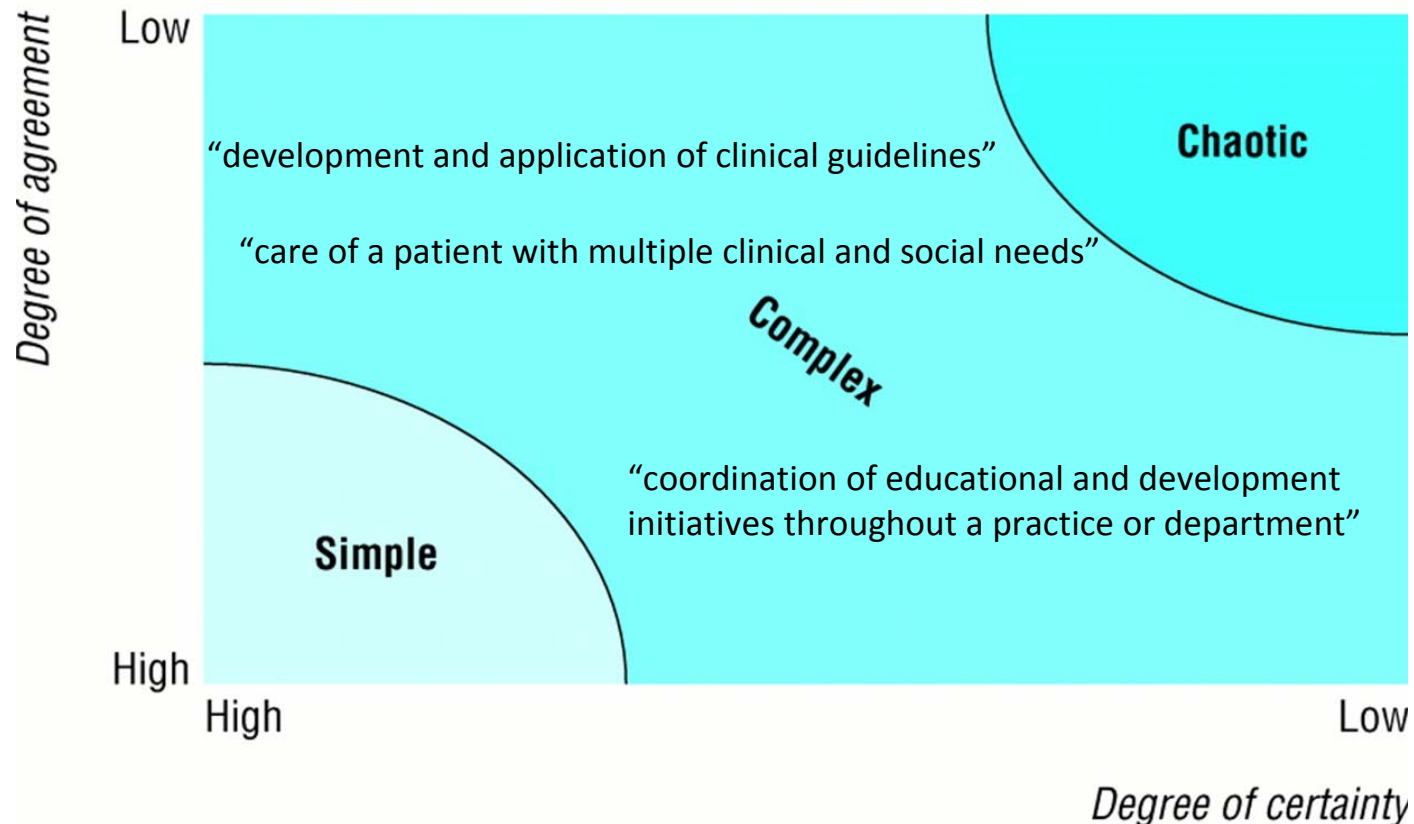
Additional slides

Run charts for complex care: comparative, actionable and educational



Pignone, AmJGast, 2009; Shojania, HealthAffairs, 2005

The 'Zone of Complexity' lies between the simple and the chaotic



Plsek, P., Greenhalgh, T. The Challenge of Complexity in Health Care, 2001.
<http://www.bmj.com/cgi/content/full/323/7313/625>