



Portland VA Patient Safety Center of Inquiry - Portland Informatics Center

Multi-modal Evaluation of Medication Recon Technology

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Presentation Outline

- Goals for the Portland PSCI
- Overview of Med-Rec technology
- Development of measures
- Findings to date
- Next steps



Portland VA Medical Center



Acknowledgements

- Victoria Church, RN, CNS - Portland Informatics Center
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- Patricia Holahan, PhD - Stevens Institute of Technology
- Scott Wood, PhD - VHA National Center for Patient Safety
- Erin Narus, PharmD - VHA National Center for Patient Safety
- Deb Ondeck, RN - Lebanon VAMC
- Kenneth Boockvar, MD, MS - Geriatric Research Education Clinical Center



Poll of Participants

What is the composition of audience?

- Physicians with primary clinical appointments
- Non-physicians with primary clinical appointments
- Clinicians with primary research appointments
- Healthcare quality, safety, and/or systems specialists
- other

Portland Patient Safety Center of Inquiry - Medication Reconciliation



- Sponsored by National Center for Patient Safety
- Dedicated to developing, testing, and implementing tools and processes for medication reconciliation
- Strategic plan focuses upon interfaces in care



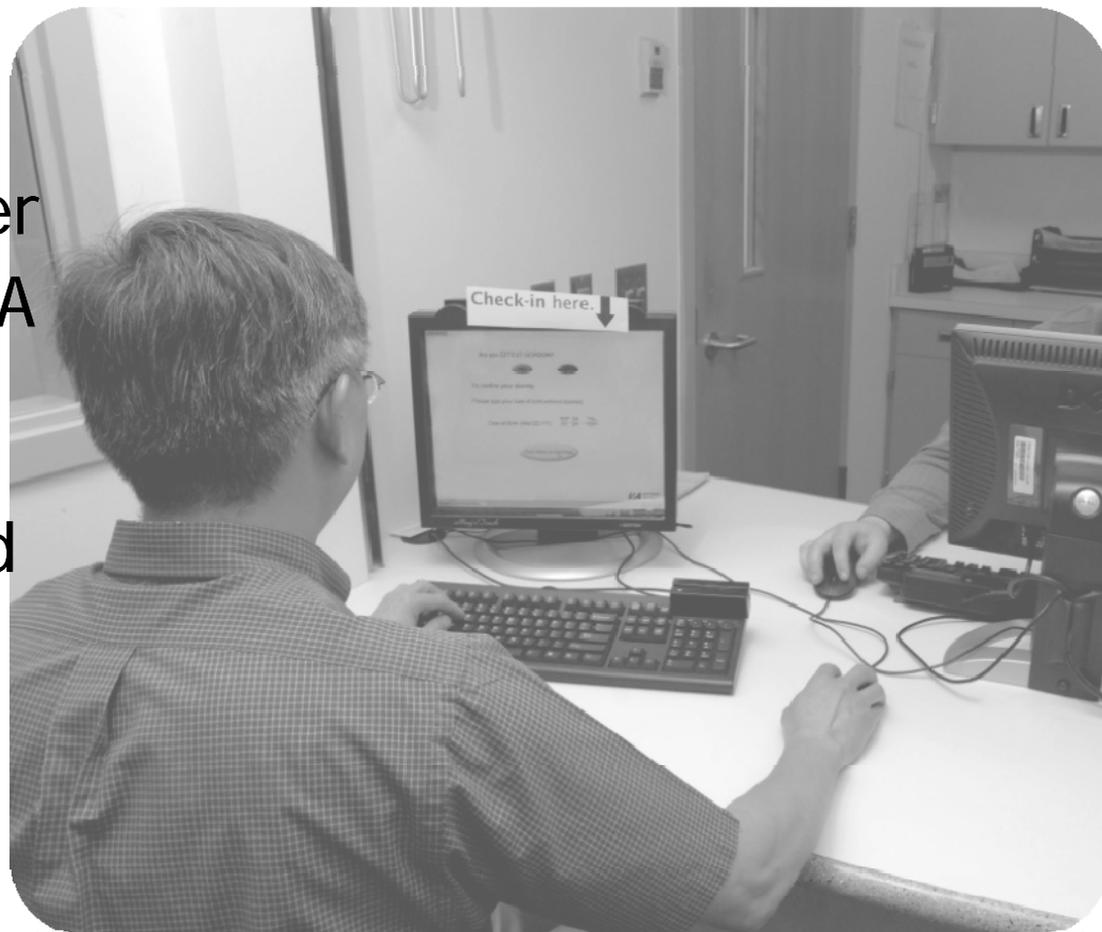
Portland PSCI - Med Rec



Kiosk Prototype to Collect a Med History



- Automated Patient History Intake Device (APHID)
- Point of service consumer software with CPRS/Vista interface
- Developed by PVAMC and the National Center for Patient Safety (NCPS)
- Used in production at PVAMC since June 2007

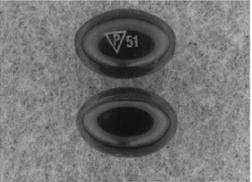


History Collection Details



- Supports medication adherence history and allergy history capture
- Displays all active, remote, non-VA, discontinued, and expired medications (configurable)
- Images are matched with dispense data and National Drug Code numbers
- Data available in CPRS notes as free text data objects

Medication # 2(of 14) ACTIVE Med:
DOCUSATE NA 100MG CAP
TAKE ONE CAPSULE BY MOUTH TWICE A DAY FOR DRY,
PAINFUL STOOLS



Comments about this drug:

Taking this medication as directed?

Please list or verify your allergies:

Allergies on record in our system:

Drug Allergies: PENICILLIN <PCN> PEANUT OIL CODEINE	Food Allergies: LATEX
--------------------------------------------------------------	--------------------------

Please note inaccuracies in our Allergy list, or add NEW allergies:

Sample Med Recon Screenshots

CPRS Chart Note Output



```
PATIENT ENTERED MEDICATION REVIEW: Oct 24, 2008
'Y' indicates patient IS taking medication as written;
'N' indicates patient NOT taking medication;
'?' indicates that the patient is UNSURE about the medication OR
taking medication OTHER than as written.
'X' indicates NO RESPONSE (incomplete review).

*** ACTIVE MEDICATIONS      * * *      ACTIVE MEDICATIONS      ***
Y  Carboxymethylcellulose Na 1% Oph Soln
    Instill 1 Drop Ou Qid Prn For Dry Eyes.          Refills Left: 11
    PROVIDER: Eighteen Physician                      Filled: 5/30/08

Y  Docusate Na 100Mg Cap
    Take One Capsule Po Bid                          Refills Left: 3
    PROVIDER: Eighteen Physician                      Filled: 5/20/08

Y  Fluoxetine Hcl 20Mg Cap
    Take One Capsule Po Qam                          Refills Left: 1
    PROVIDER: Eighteen Physician                      Filled: 5/20/08
```

Sample CPRS output

CPRS Chart Note Output



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'Y' indicates patient taking medication as written;
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Y Fluoxetine Hcl 20Mg Cap
  Take One Capsule Po Qam
  PROVIDER: Eighteen Physician
```

Patient report

Fill history

Alphabetized sig and prescriber

Refills Left: 11
Filled: 5/30/08

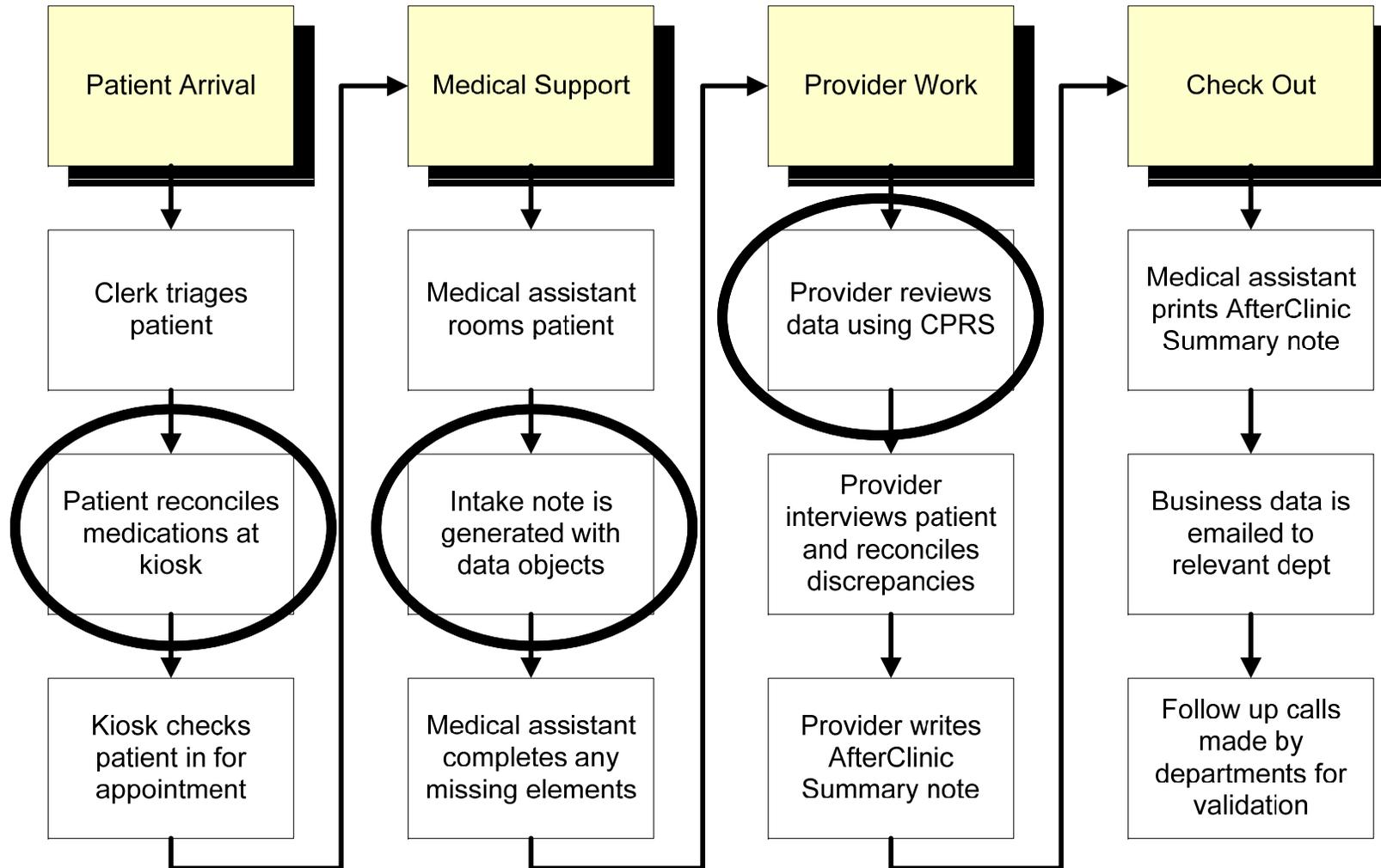
Refills Left: 3
Filled: 5/20/08

Refills Left: 1
Filled: 5/20/08

Sample CPRS output



Normative Workflow Model

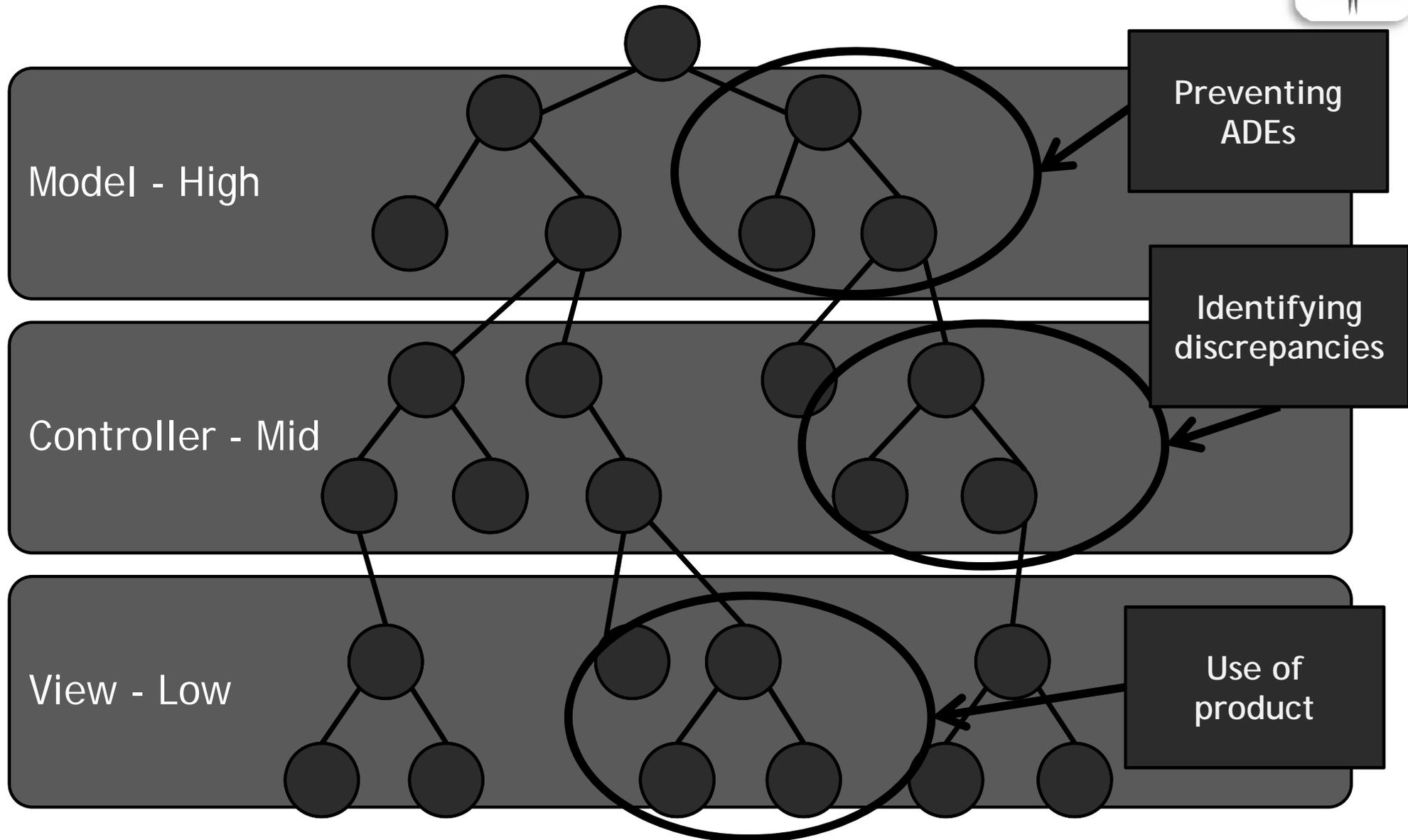




Designing Measures

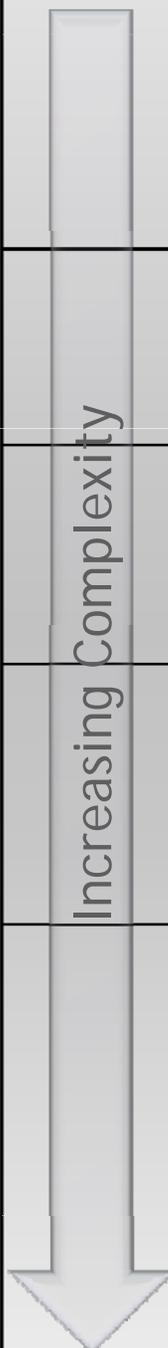
- Should verify the implementation of a tool, concept, or process
- Should include system signals to predict key quality characteristic
- Should include measures of accuracy and efficacy to validate the strategy
- Should resonate with all stakeholders
- Must be able to operationalize for other non-research dedicated facilities

Model View Controller Framework



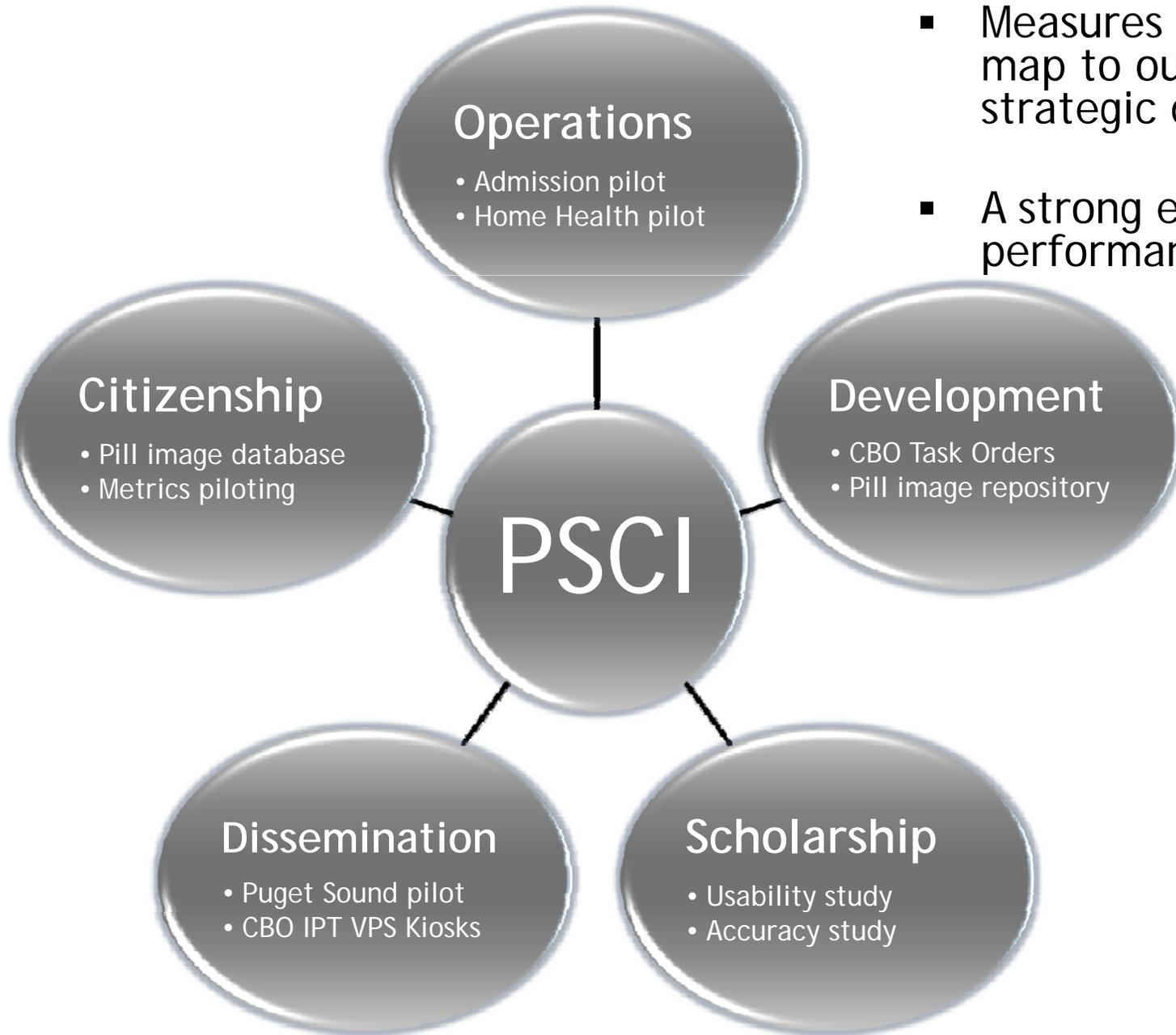
Domain	Outcome	Metric	Status
Feasibility	Technology is available and can business throughput expectations		
Accuracy	Technology produces accurate output		
Efficacy	Technology influences staff behavior Technology impacts health outcomes		

Increasing Complexity



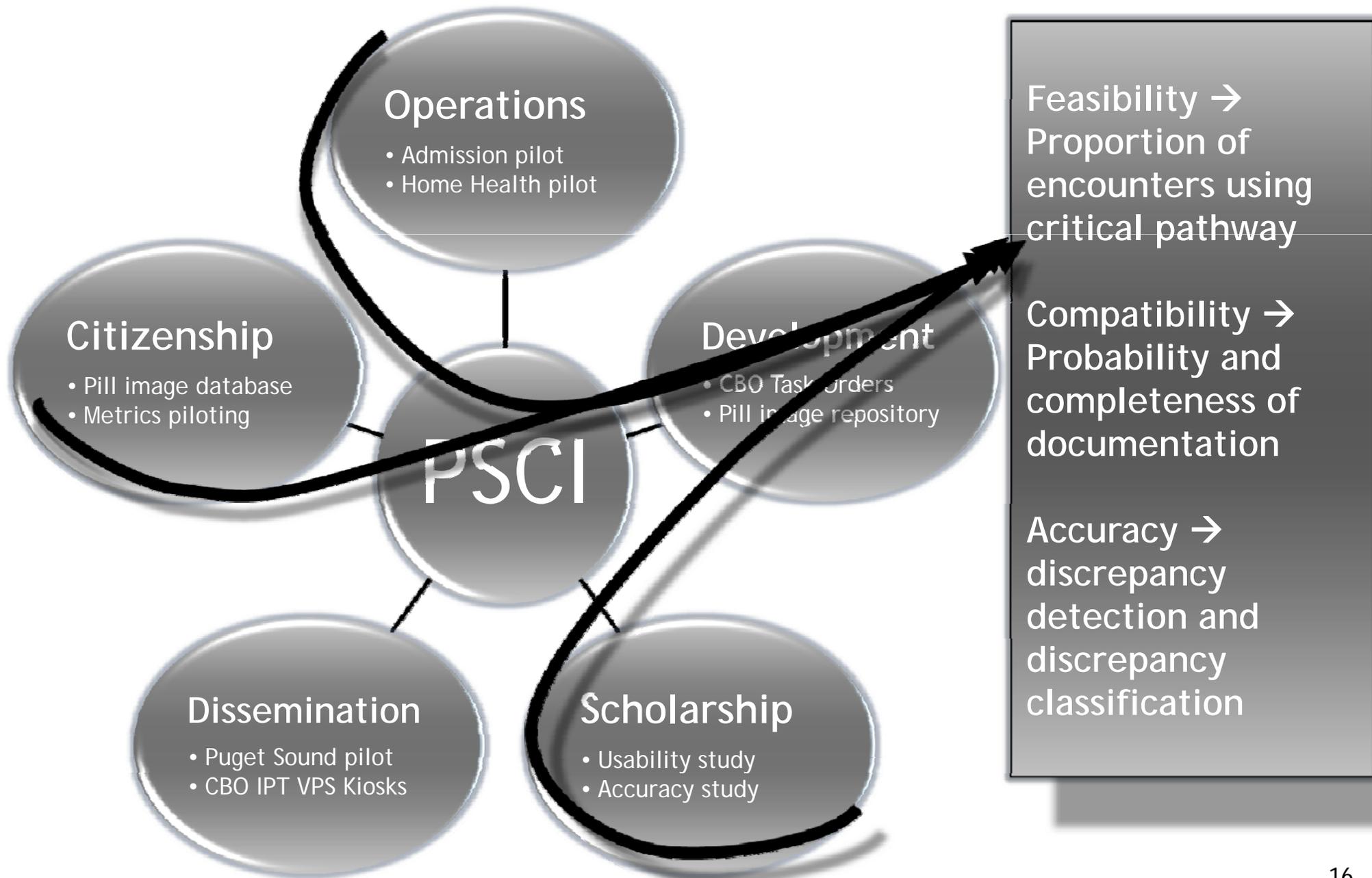
Suggests a tiered approach to the development of measures - we use a 'customer grid' to organize our work

Integrating with National Goals

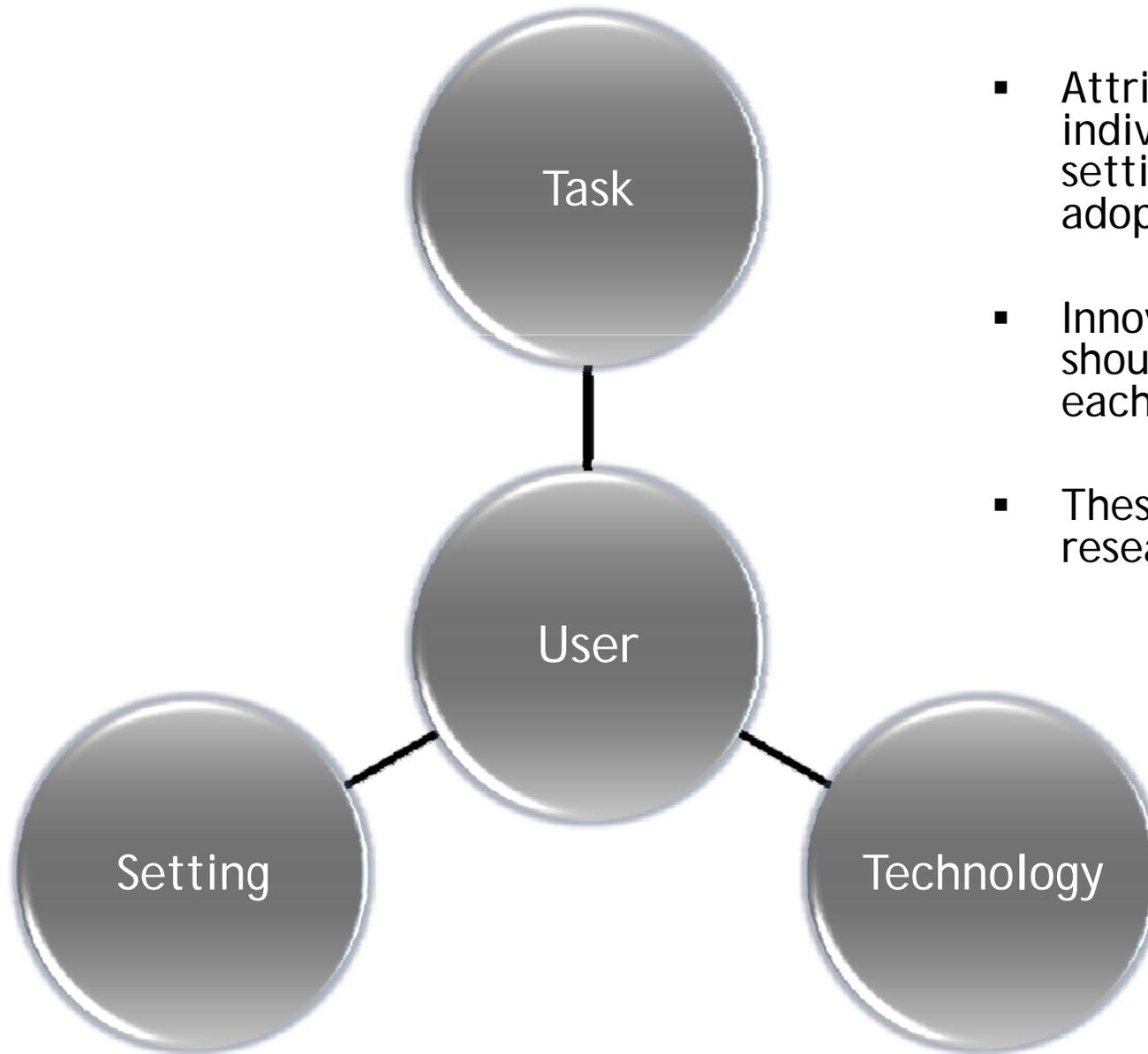


- Measures must practically map to our organizational and strategic domains
- A strong emphasis on performance monitoring

Integrating with National Goals

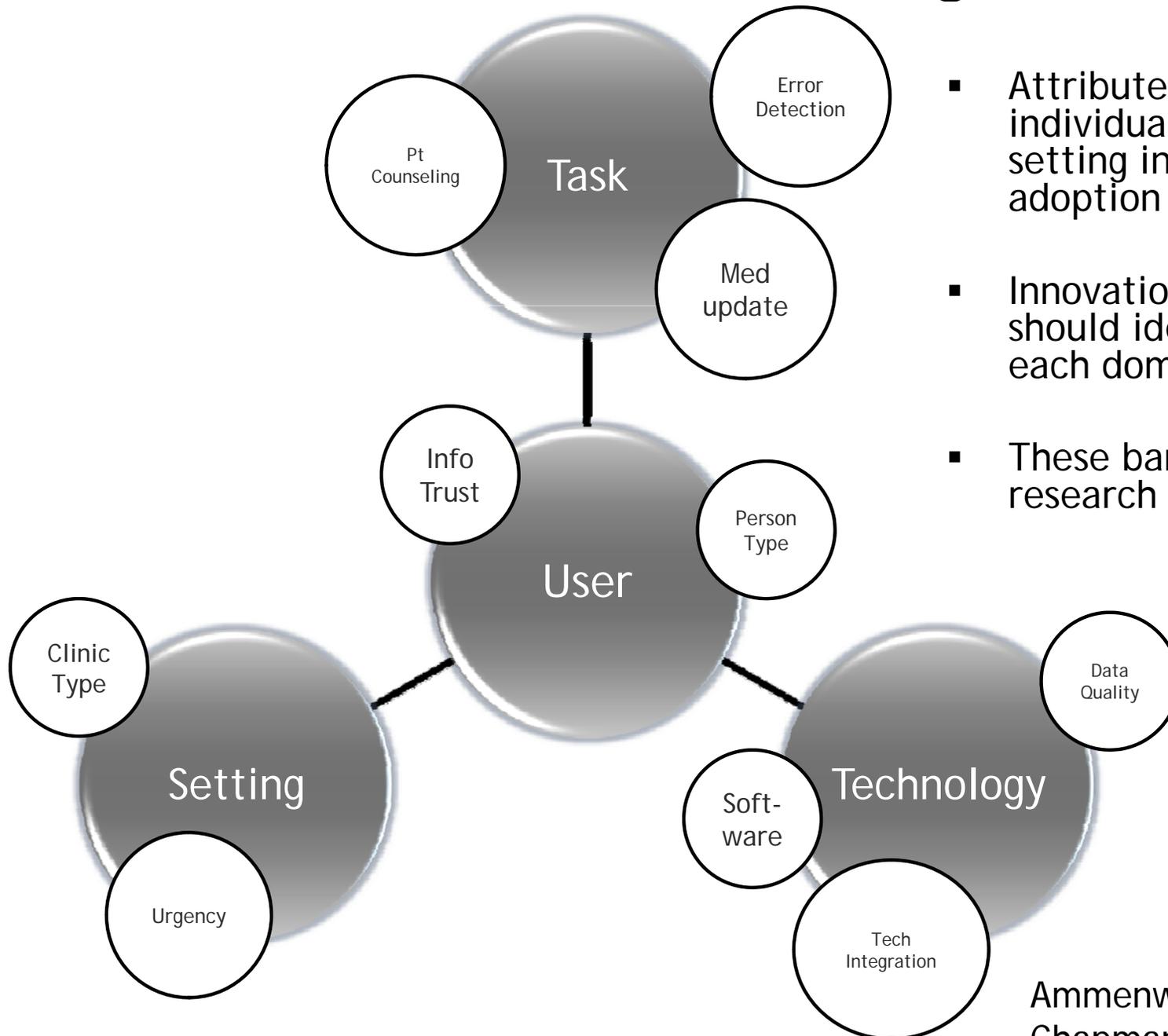


Sociotechnical Modeling



- Attributes of the task, individual, technology and setting influence the adoption of innovations
- Innovation champions should identify barriers in each domain
- These barriers can map to research measures

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Domain	Outcome	Metric	Status
 Feasibility	Technology is available and can business throughput expectations		
 Usability	Patients and providers can understand and use software		
 Compatibility	Facility incorporates technology into workflow		
 Accuracy	Technology produces accurate and valid output		
 Efficacy	Technology influences staff behavior Technology impacts health outcomes		

Add human factors measures to the tiered grid - note the inclusion of usability characteristics

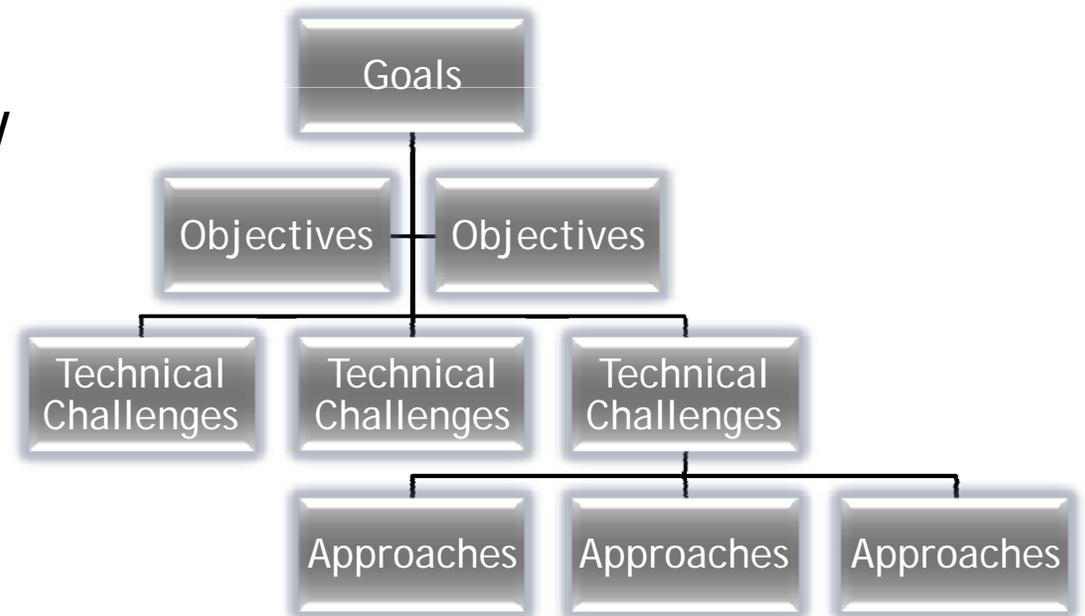
Increasing Complexity



Mapping Functional Components

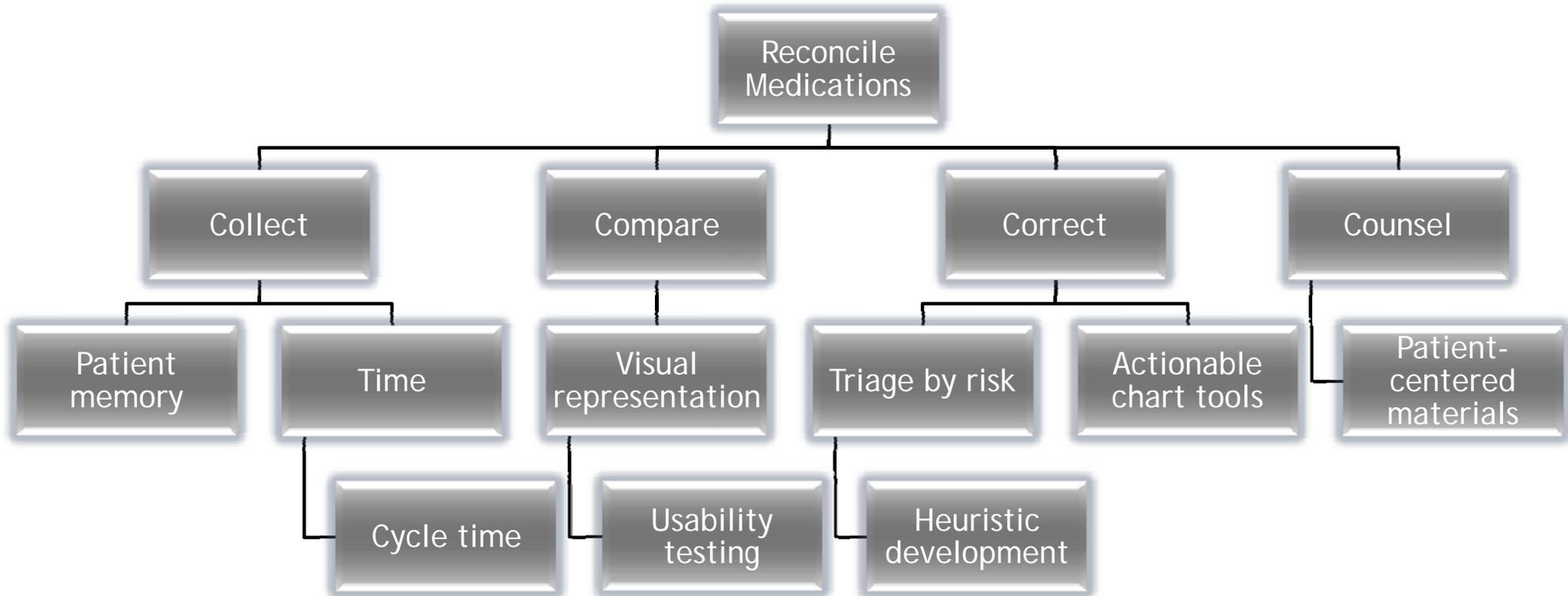
- Individual functional modules may have specific importance to project or stakeholders
- Functional modules likely map to important strategic facility goals
- Important to think about these components with greater granularity when considering metrics
- Certain measurement approaches will 'cover more ground'

GOTChA





Sample GOTChA for Med Recon



Domain	Outcome	Metric	Status
Feasibility	Technology is available and can business throughput expectations	Production installation with simulation statistics Mean time between downtime or software unavailability	
Usability	Patients and providers can understand and use software	Patient assessed learnability, memorability, efficiency Provider perceived clarity, efficiency, effectiveness	
Compatibility	Facility incorporates technology into workflow	Proportion of cases using kiosk critical pathway Compliance with pilot document performance measures	
Accuracy	Technology produces accurate and valid output		
Efficacy	Technology influences staff behavior Technology impacts health outcomes		

We begin to insert measures into our grid based on GOTChA analysis

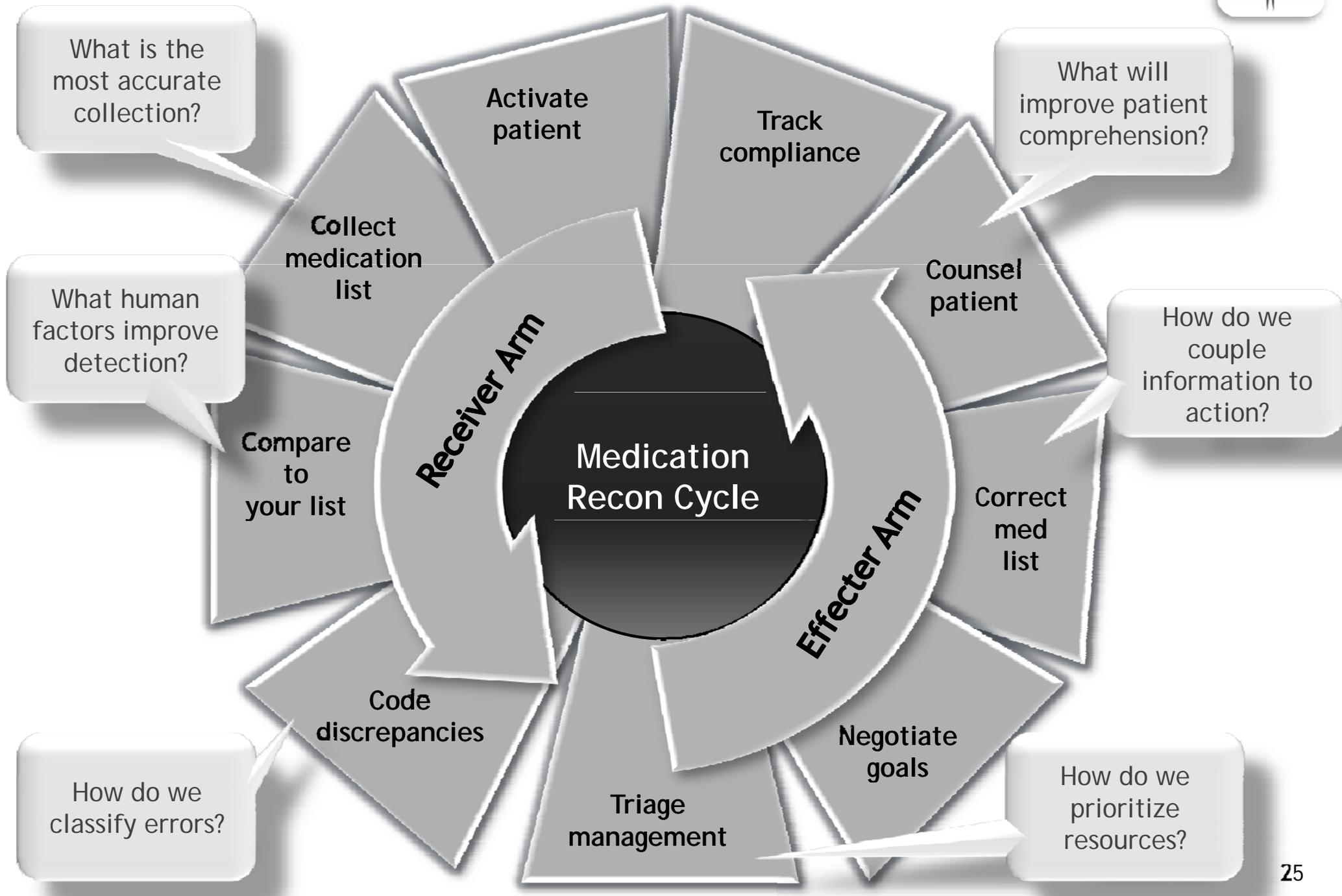
Popular Definition of Med Recon



A Unified Theorem for Med Rec



A Unified Theorem for Med Rec





Embedding in the Literature

- Discrepancy detection is a reasonable signal
- Code discrepancies based upon type, root cause, or severity
- Establish a predictive relationship to clinical behavior or risk of event



Embedding in the Literature - Seminal Papers

- Number of discrepancies/number of medications⁴
- Number of significant discrepancies/number of meds³
- Number of system-based discrepancies/number of meds²
- Number of ISMP med discrepancies/number of meds
- Positive Predictive Value of med discrepancies for an ADE¹
- Probability of clinician action for a given discrepancy

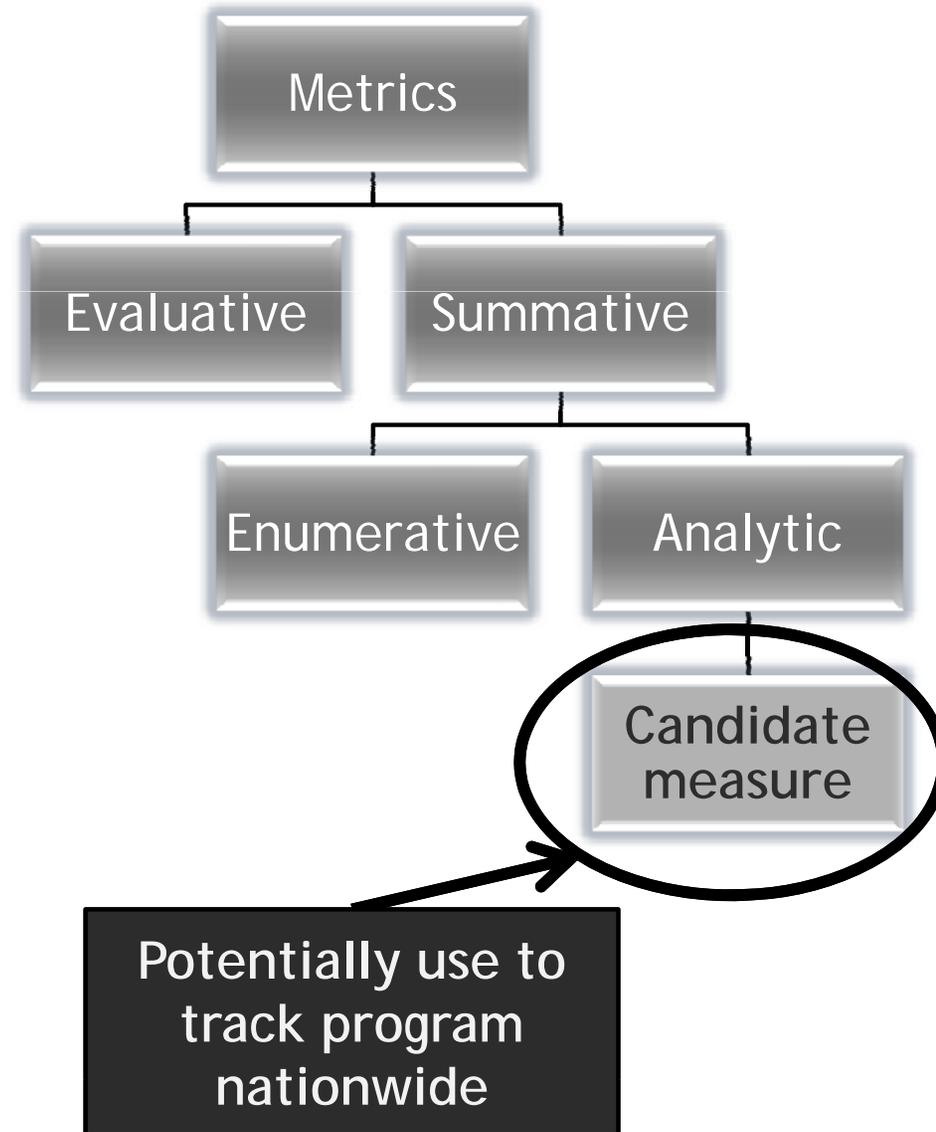
Boockvar, 2009¹
Orrico, 2008²
Pippins, 2008³
Bedel, 2000⁴

Domain	Outcome	Metric	Status
Feasibility	Technology is available and can business throughput expectations	Production installation with simulation statistics Mean time between downtime or software unavailability	
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Compatibility	Facility incorporates technology into workflow	Proportion of cases using kiosk critical pathway Compliance with pilot document performance measures	
Accuracy	Technology produces accurate and valid output	Identifies medication discrepancies when compared to usual care and standard of care Diagnostic performance of medication history output	
Efficacy	Technology influences staff behavior Technology impacts health outcomes	Likelihood that clinicians would act on data Proportion of discrepancies coded "significant" Predicted number of avoided potential ADEs based on discrepancy detection	



Local or National Measures?

- Categorize according to stakeholder, domain, and complexity
- Select **key quality characteristics** – aspects important to the primary customer
- Select **key process variables** – the quality characteristics selected for focusing message
- Classify metrics as **evaluative or summative** – evaluative establish the validity whereas summative communicate quality
- Further classify the statistics as **enumerative or analytic** – enumerative statistics for static populations whereas analytic are done on dynamic process



Domain	Outcome	Metric	Status
Feasibility	Technology is available and can business throughput expectations	Production installation with simulation statistics	Done
		Mean time between downtime or software unavailability	Done
Usability	Patients and providers can understand and use software	Patient assessed learnability, memorability, efficiency	Done
		Provider perceived clarity, efficiency, effectiveness	In process
Compatibility	Facility incorporates technology into workflow	Proportion of cases using kiosk critical pathway	Done
		Compliance with pilot document performance measures	Done
Accuracy	Technology produces accurate and valid output	Identifies medication discrepancies when compared to usual care and standard of care	In process
		Diagnostic performance of medication history output	In process
Efficacy	Technology influences staff behavior	Likelihood that clinicians would act on data	In process
	Technology impacts health outcomes	Proportion of discrepancies coded "significant"	In process
		Predicted number of avoided potential ADEs based on discrepancy detection	In process



Simulation Modeling

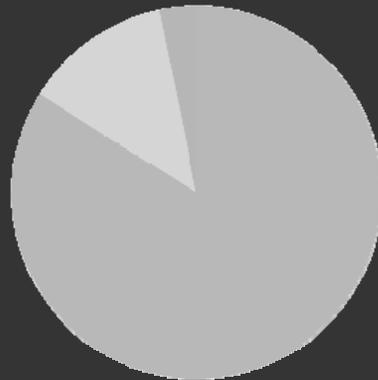
- Constructed normative model of business processes using computer software
- Gathered time and motion data to inform module behavior
- Ran simulation modules to estimate facility impact and forecast technology requirements

Value	N	Total time (min)	Avg time (min)	Mode (min)	Max time (min)
Kiosk waiting time	3	> 3			
	1	2-3			
	9	1-2			
	75	< 1			
Demographics	56		0.43	0.47	1.27
Allergy review	56		0.37	0.41	1.58
Medical history	56		0.34	0.53	3.48
Medication review	56		1.66	1.17	4.67
New medications	56		0.74	1.40	7.83



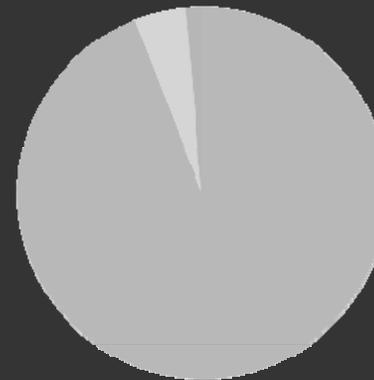
Patient Usability Assessment

Information Clear



- Agree
- Neutral
- Disagree

Medical Data Clear



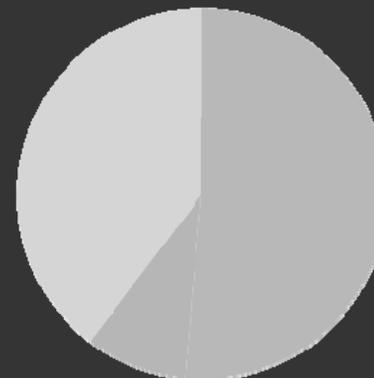
- Agree
- Neutral
- Disagree

Improved Recall



- Agree
- Neutral
- Disagree

Often Use Computers



- Agree
- Neutral
- Disagree

Provider Usability Assessment



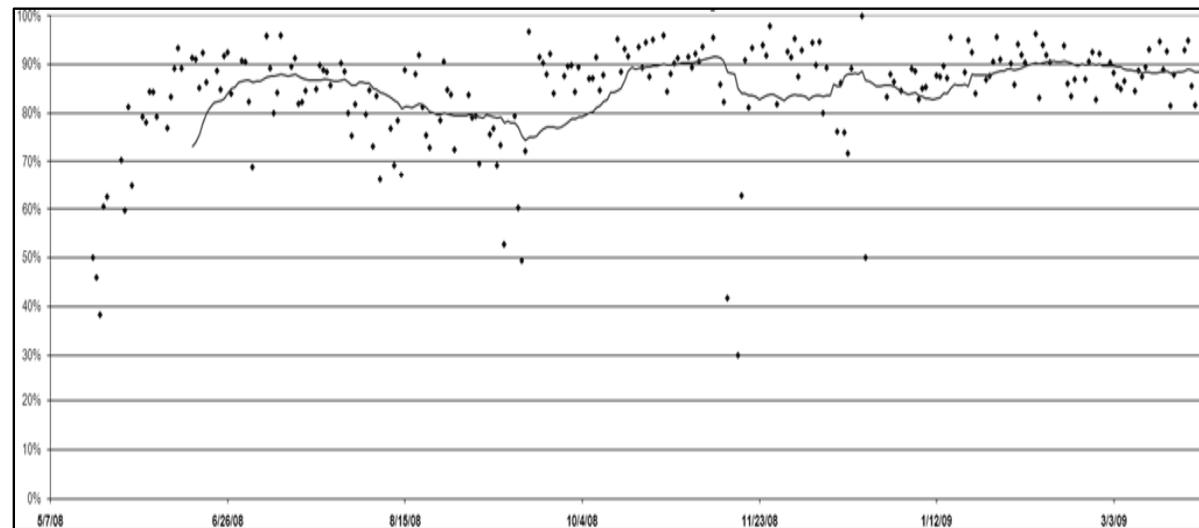
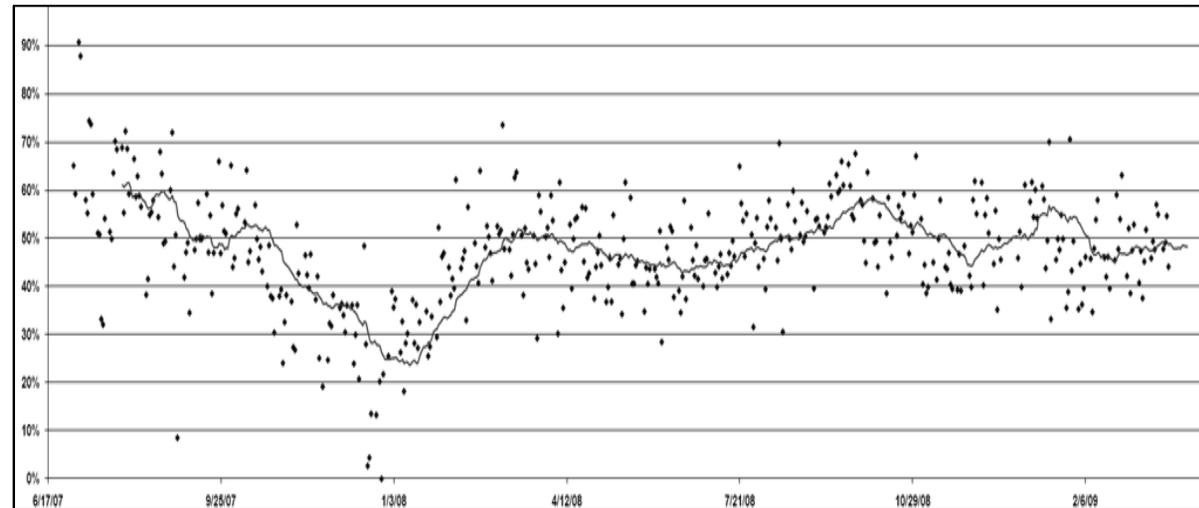
- Collaboration with the Stevens Institute of Technology - Howe School of Technology Management
- Applying user-centered design principles to provider assessment
- New survey instrument examines axes influencing innovation adoption



Compatibility with Workflow



- Over 200,000 encounters checked in using APHID since 2007
- Voluntary use in primary care averages 48%
- Facilitated use in specialty care averages 85%
- Architecture is highly reliable; system has been available 99% of time (mean time between downtime = 243d)



Proportion of encounters checked in using APHID over time in Primary Care (top panel) and Specialty Care (bottom panel)



External Peer Review Measures

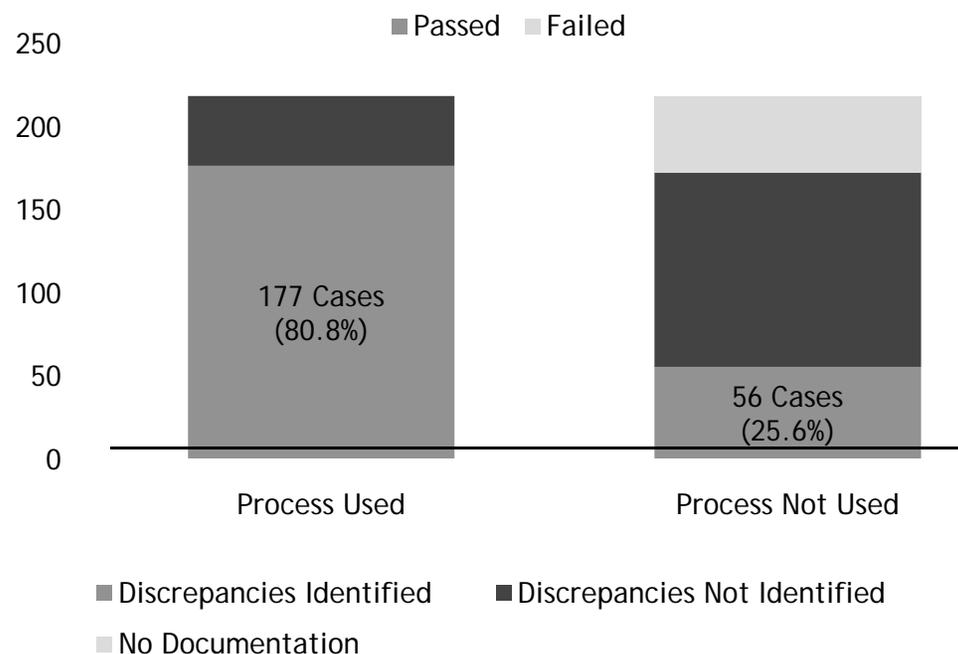
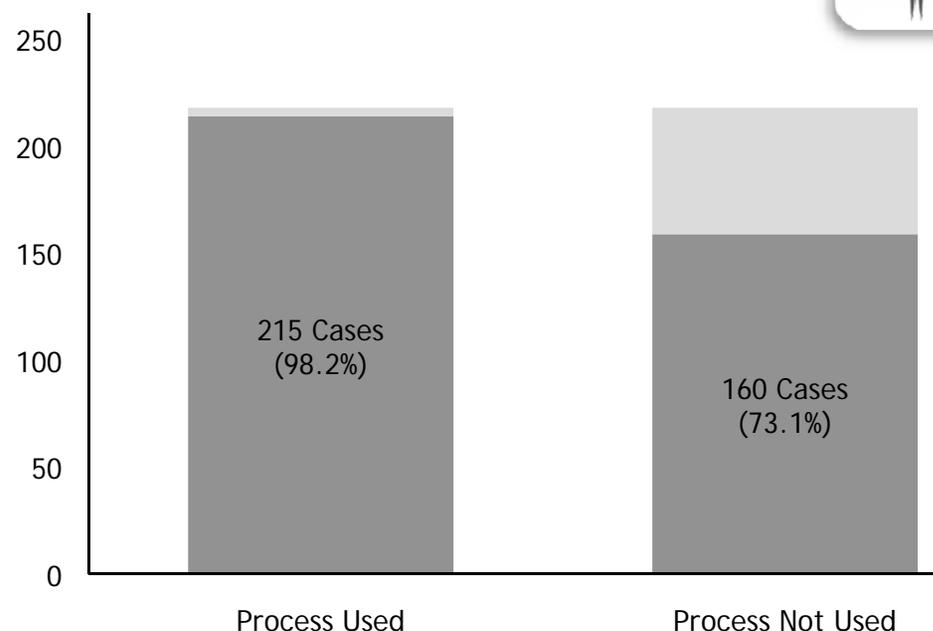
Proposed External Peer Review Performance (EPRP) measures for med recon

Task	Joint Commission	EPRP Proposed Metric	APHID Metric
1	Complete list of patient medications documented	Documentation of patient furnished list collected	Proportion of visits with PDO documented in chart
2	Medications on file for patient are compared to patient furnished list	Documentation of VA list with name, dose, route, frequency and that discrepancies were identified	Proportion of visits with PDO documented
3	Discrepancies are reconciled and documented	Evidence that list was reviewed with patient and medication changes made	Average number of discrepancies per case
4	Patient is furnished with a reconciled list	Evidence that changes were reviewed with patient and patient was given written list	Proportion of patient visits with Patient Education Packet or AfterVisit Summary distributed



Performance Measures

- Data collected from September 1, 2009 through February 1, 2010
- Staff generated text in 37% of all encounters and 76% of APHID check-in encounters
- Clinics using APHID were compliant 98 % of encounters; clinics using usual care were compliant 73% of encounters
- Average of 4.2 discrepancies per case in APHID; 2 discrepancies in usual care





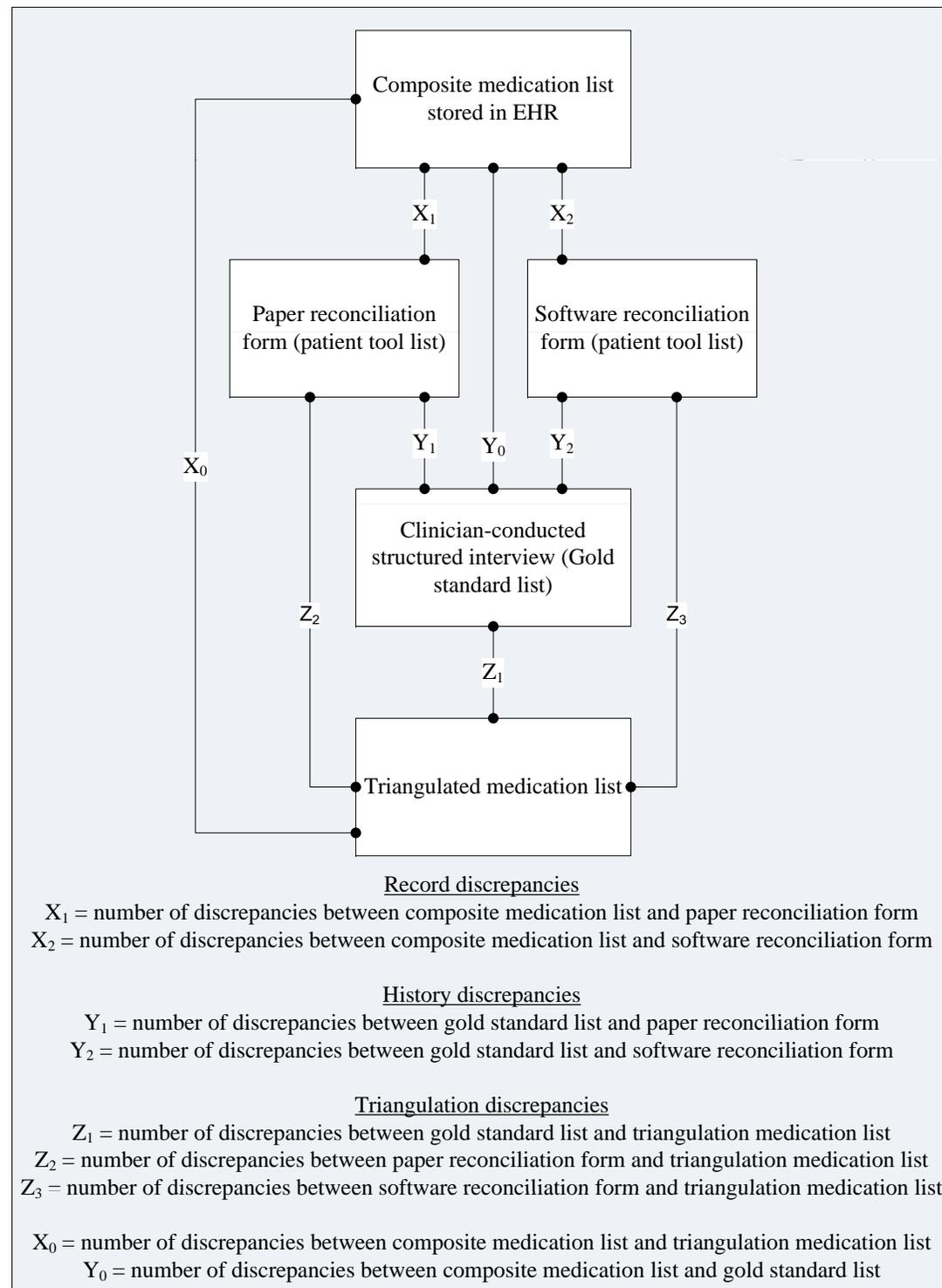
Sensitivity and Accuracy

Preliminary data collected from single clinic and validated by clinician interviews

	Number	Average number per visit	SD	Proportion of Visits (%)	Proportion of Meds (%)
Patients Checked-In	57				
Visits Checked-In	88				
Medications Reviewed	1454				
Potentially Lethal discrepancies	3	0.03	0.18	3.4	0.2
Serious or significant discrepancies	139	1.58	1.76	70.5	9.6
Insignificant Discrepancies	262	2.98	2.60	83.0	18.0

Accuracy Trial

- Model developed to evaluate performance characteristics of a “diagnostic test”
- Software seeks to identify discrepancies and compared against a “gold standard” clinician history
- Have the additional value of “triangulation” to contend with
- Approach should permit descriptive statistics of performance and statistical tests against usual care





Sensitivity and Accuracy

- Randomized controlled trial currently enrolling primary care patients; studying accuracy of medication identification process
- 100% of subjects enrolled have 1 or more discrepancies when compared to composite VistA list; 483 discrepancies out of 1245 medications reviewed (38.7%)
- An estimated 50% of discrepancies have a system-based root cause

Numbers of medication discrepancies detected by APHID compared to clinician history

		Gold Standard compared to VistA		
		Discrepancy	No discrepancy	
APHID compared to VistA	Discrepancy	195	57	252
	No discrepancy	47	345	392
		242	402	644

Sensitivity: 81%
Specificity: 86%

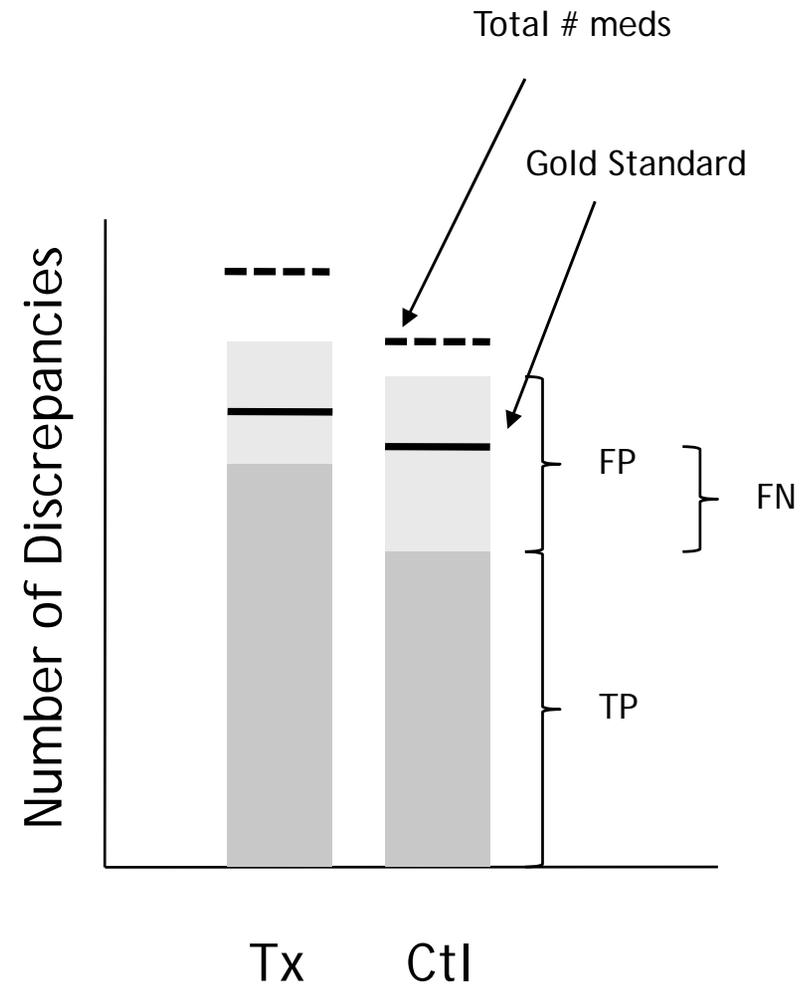
False Negative

False Positive



Goal for Accuracy Study

- Hope to assemble a better comparative estimate of med recon tool accuracy
- Will speak to clinician concerns about information validity
- Can construct a model of accuracy in an accessible way
- Better positioned to compare strategies when balancing safety with resource management

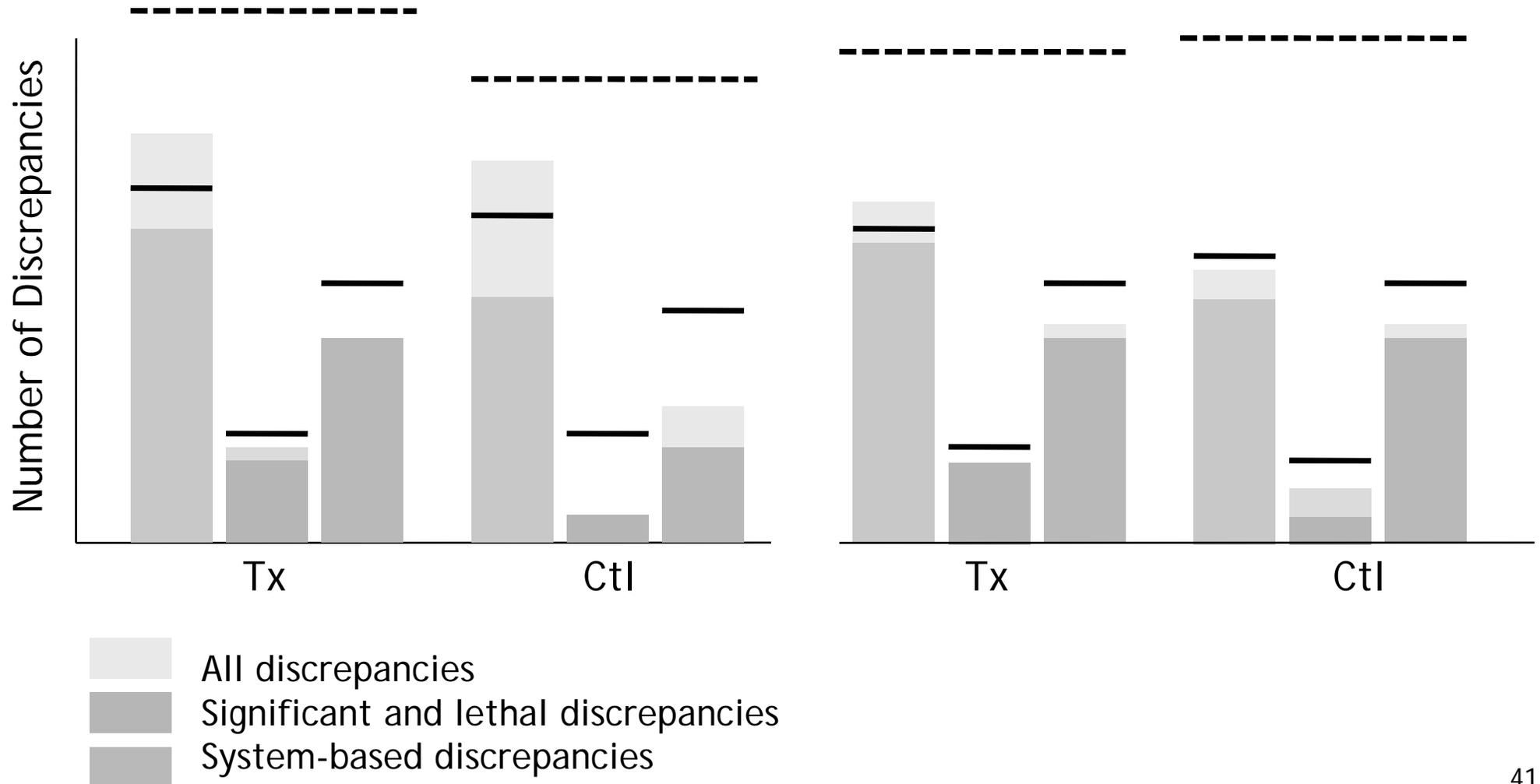




Visualizing Med Recon Accuracy

Compared to
Gold Standard

Compared to
Triangulation



Questions

