

# Making Sense of EMR Adoption as Complex Interventions in Primary Health Care

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# Agenda

- Setting the Stage
- Scoping Review of Complex Interventions
- Synthesizing Lessons Learned with Complex Interventions in a Research Network (PPRNet)
- A Multivariate EMR Integration Model
- Discussion

# Setting the Stage

- Why? What and How?
- Review: Impact of EMR on physician practice; Lau 2012
  - Questions: Impact? Influencing factors? Lessons?
  - Methods: Medline-CINAHL, 2000/09, evaluation studies, clinical adoption framework
  - Findings: 27 controlled + 16 descriptive studies, 6 domains, 51% studies and 46% measures positive,
  - Findings: 48 factors at micro, meso and macro levels
- Complex interventions – review, example and model

# SCOPING REVIEW OF COMPLEX INTERVENTIONS

# Scoping Review Overview

|                          |  |
|--------------------------|--|
| <b>Research Question</b> | What is the current state of knowledge on complex healthcare interventions (and complex eHealth interventions)?  |
| <b>Methods*</b>          | <ul style="list-style-type: none"><li>• MEDLINE search for 'complex intervention(s)' in title; supplemented by broader hand search</li><li>• Data extraction/charting for key attributes and elements</li><li>• Qualitative collation, summarization and reporting of results</li></ul>  |
| <b>Findings</b>          | <ul style="list-style-type: none"><li>• Description of studies:<ul style="list-style-type: none"><li>• 40 primary studies, pilots, protocols and development papers on complex healthcare interventions</li><li>• 16 reviews</li><li>• 20 papers on methodology and frameworks</li><li>• 40 discussion and opinion papers</li></ul></li><li>• Summary of findings re: conceptualization, implementation and evaluation on following slides</li></ul> |

\* - Alignment to Scoping Review guidelines by Arskey & O'Malley

# Conceptualization

- Common frameworks and theories found
  - E.g. Developing and evaluating complex interventions: the new Medical Research Council guidance (2008)
- Differences in foci, viewpoints and approaches

|                              | Design/Development | Implementation | Evaluation | Ongoing Operations/Use |
|------------------------------|--------------------|----------------|------------|------------------------|
| Medical Research Council     | ✓                  | ✓              | ✓          | ✓                      |
| Normalization Process        |                    | ✓              |            |                        |
| Implementation Fidelity      |                    | ✓              |            |                        |
| Complexity Theory            | ✓                  | ✓              | ✓          |                        |
| HI Trial Methodologic Issues |                    | ✓              | ✓          |                        |

# Conceptualization (cont'd)

- Defining “Complex Interventions”
  - Most often not defined (only 9/40 or 22.5% of studies)
  - Focus on intervention itself
- Underlying theory and foundations
  - Not always mentioned (or in enough detail) (30/42 or 71.4% mentioned rationale/foundation for intervention; 13/40 or 32.5% mentioned specific theories)
  - Examples: Human Error Theory, User-Centered Design, Social Cognitive Theory, Social Ecology Theory

# Implementation

- Components of Interventions
  - Variability with respect to detail provided about interventions and their components
  - Common types: education/learning, wellness and promotion
  - Common applications: mental illness, chronic disease (cancer, diabetes, vascular disease)
- Settings
  - 23/45 settings (51.5%) were general practice/primary care; 9/45 (20%) were hospital
- Tailoring
  - 13/40 (32.5%) have some aspect of tailoring interventions



# Evaluation

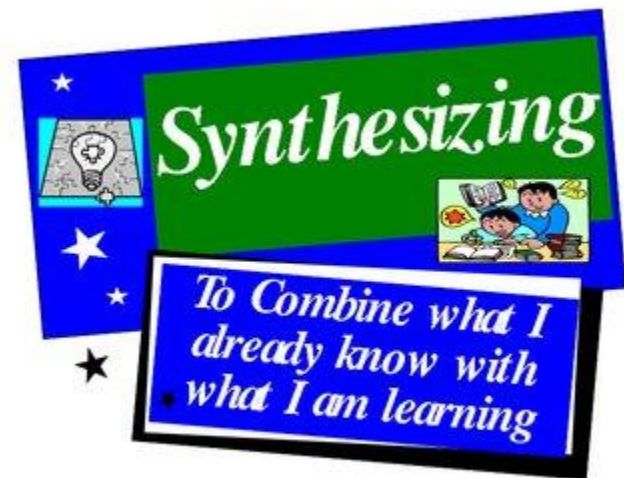
- Methods
  - Mostly RCT study designs (19/28 or 67.9% of studies)
  - 5/8 pilots aligned with MRC framework
- Analysis
  - Various approaches to analysis including regression, coding and thematic analysis
  - Process evaluation found in 7/40 or 17.5% of studies
  - Economic components in 12/40 or 30% of studies
- Metrics:
  - All studies used multiple outcome measures
  - Mostly process measures, and clinical outcome (physiological, behavior change) (21/28 or 75%)

# Summary

- Wide ranging definitions, approaches, and perspectives with respect to complex interventions
- Gaps remain with respect to guidelines and standards spanning conceptualization, implementation and evaluation (and reporting)
- An organizing scheme or taxonomy for describing complex interventions may be helpful
- Complex eHealth interventions should be further examined in relation to the identified attributes of complex interventions



# SYNTHESIZING LESSONS LEARNED WITH COMPLEX INTERVENTIONS IN A RESEARCH NETWORK (PPRNET)



# Objectives

- Discuss key concepts and learning that has been generated through a series of PPRNet-TRIP studies from 2001-present
- Create an understanding of how practices have transformed using the PPRNet-QI models to implement complex interventions in primary care settings

# PPRNet Is...

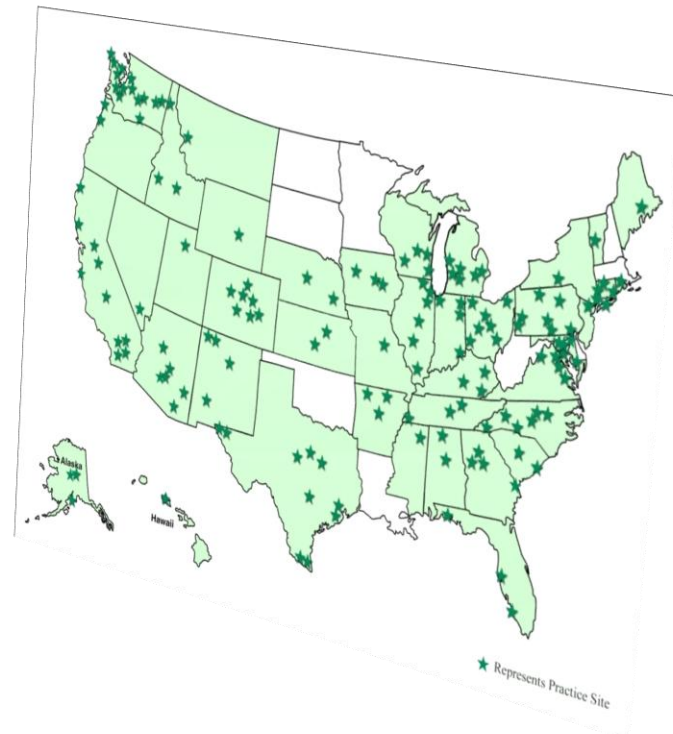
## A Practice Based Research Network (PBRN)

- Consists of practices devoted principally to the primary care of patients
- Aims to answer community based health care questions and engage in quality improvement activities
- Maintains an ongoing commitment to network activities that transcends individual research projects



# PPRNet's Network

- Small/medium-sized primary care practices in 44 states
- 224 current practices as members



# PPRNet Aims To...

- Turn clinical data into actionable information
- Empirically test theoretically sound interventions using EHR to improve health care quality
- Disseminate successful interventions

“Blurring the distinction between quality improvement and research”

# Background

- Diverse set of primary care PPRNet studies
- Focus and findings were project specific
- Research Questions:
  - What is the learning from the PPRNet-TRIP studies about how practices create change and make improvement while using health information technology (HIT)?
  - What is needed to develop high performing primary care teams?



# Seven Studies

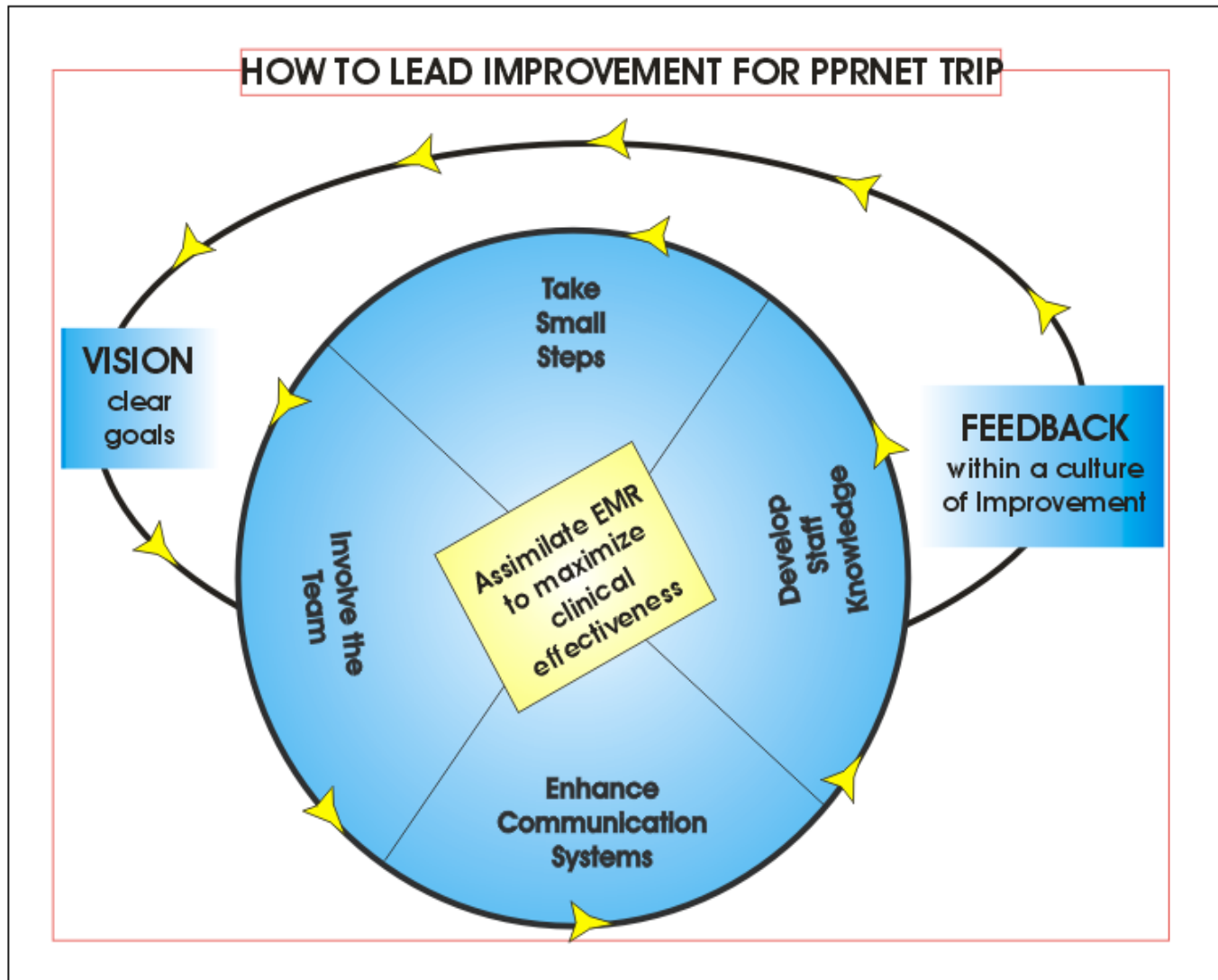
- TRIP-II (CVD and stroke) *AHRQ* 2001-2002
- A-TRIP (36 indicators) *AHRQ* 2002-2006
- AA-TRIP (alcohol screening, brief intervention) *NIAAA* 2005-2007
- C-TRIP (CRC screening) *NCI* 2006-2010
- MS-TRIP (med safety) *AHRQ* 2007-2010
- SO-TRIP (screening, immunizations and diabetes) *AHRQ* 2008-2010
- AM-TRIP (alcohol screening, brief intervention, medication) *NIAAA* 2008-2012

# PPRNet-TRIP Quality Improvement Model

- Prioritize Performance
- Involve All Staff
- Redesign Delivery System
- Activate the Patient
- Use EMR Tools



# PPRNet Practice Development Model



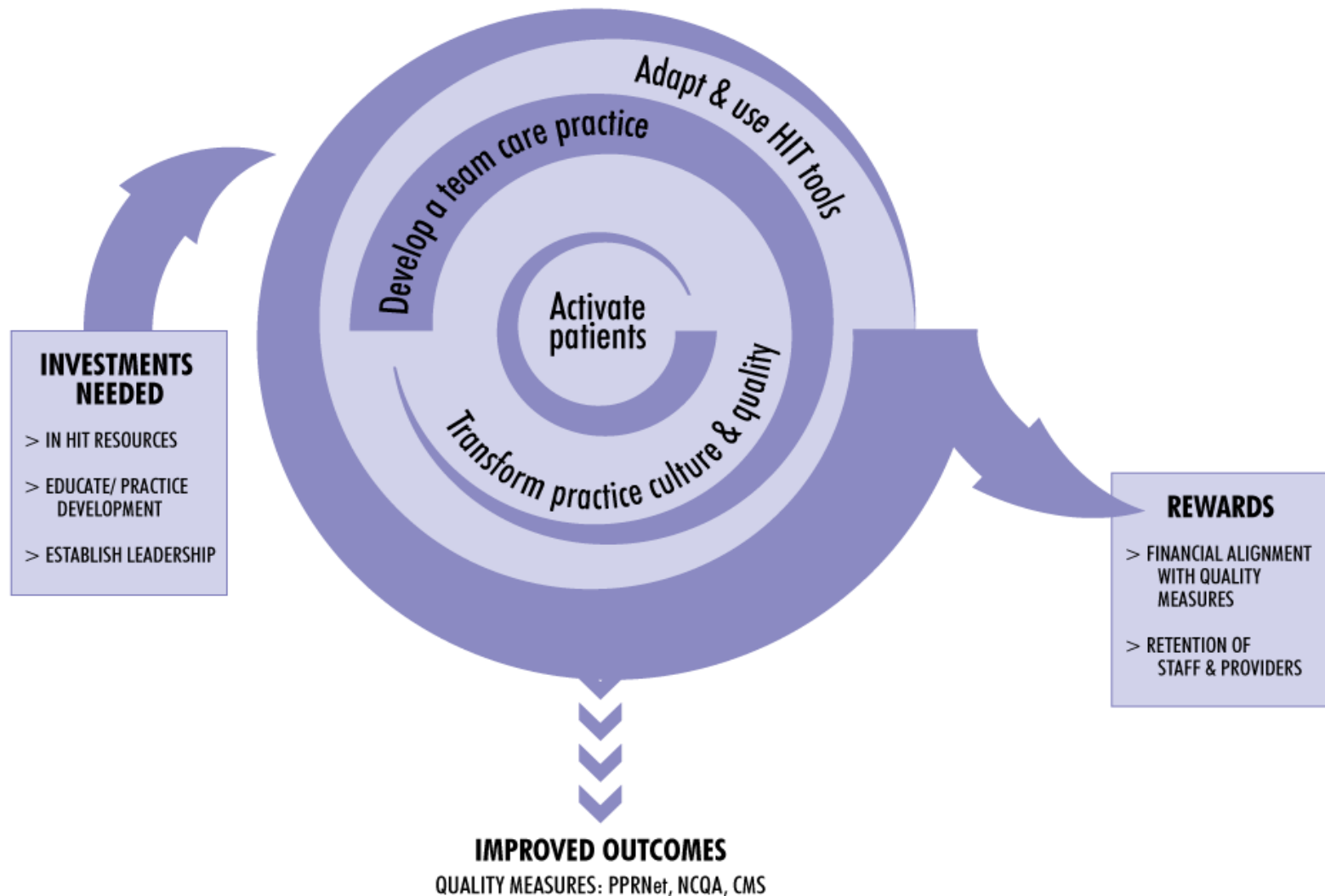
- Secondary analysis of mixed methods data from 7 studies
  - Field notes and observations at practice site visits, network meetings, memos, correspondence, interviews
  - Merged within NVivo 9.0 database
  - Immersion and crystallization
  - Cross-case comparative analysis/matrix
  - Member checking by practice members

# Findings

- 134 practices: collaborative learning community
- Practices use HIT/staff in new ways
- Complex interventions rely on four main concepts:
  - Develop a team care practice
  - Adapt and use HIT tools
  - Transform practice culture and quality
  - Activate patients

# Improving Primary Care Using HIT

PPRNet - TRIP - QI



# Concepts and Strategies: Complex Interventions

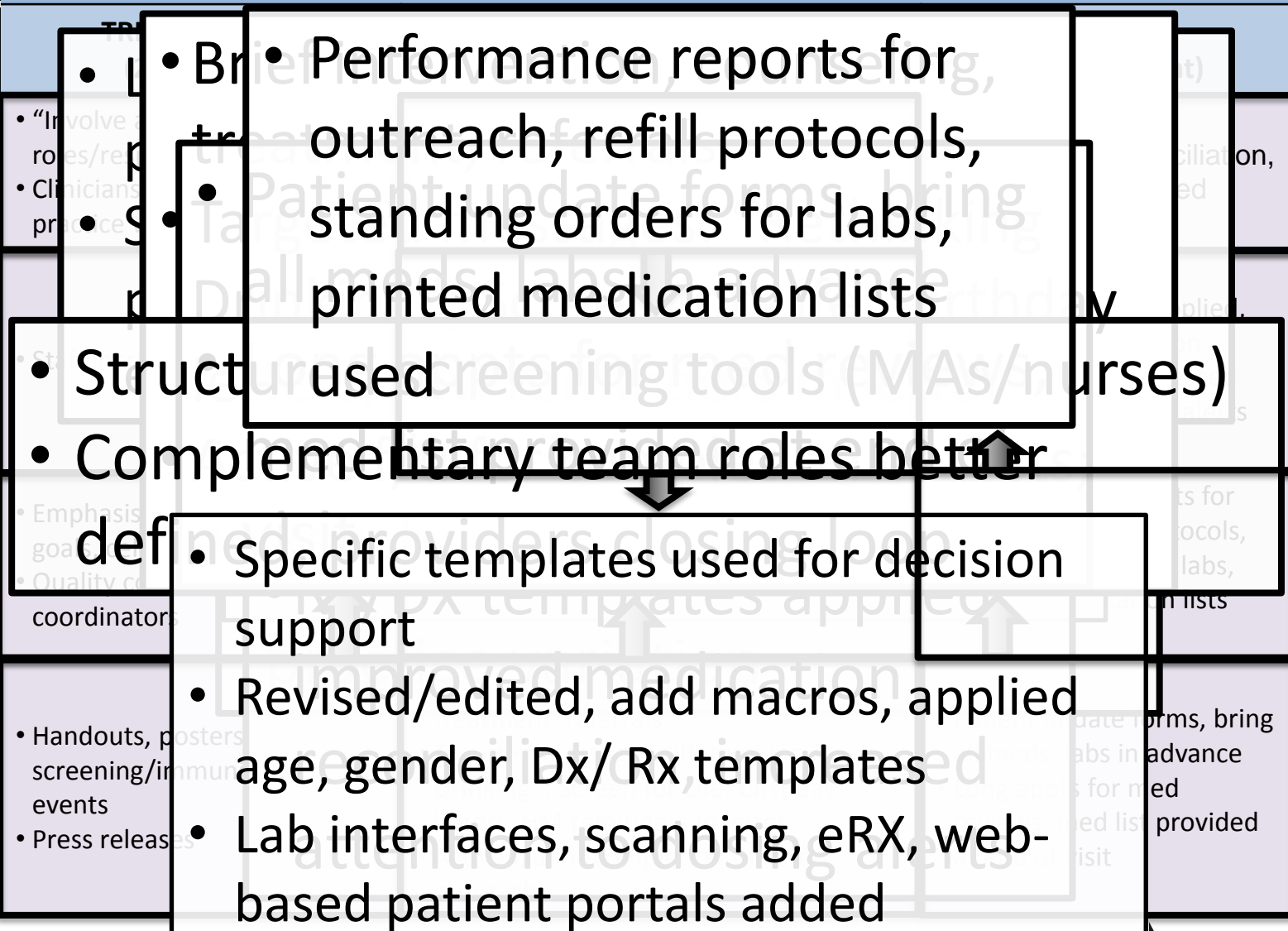
## Specific Approaches by Study

Develop a Team Care Practice

Adapt and Use HIT Tools

Transform Practice Culture and Quality

Activate Patients



# Discussion/Conclusions

- Practices expanded use of EHR, adding many enhanced features to support QI
- Practices recognized the value and asset of their staff in supporting QI goals
- External recognition and rewards have been motivators
- Patients are receptive to expanded roles of practice team



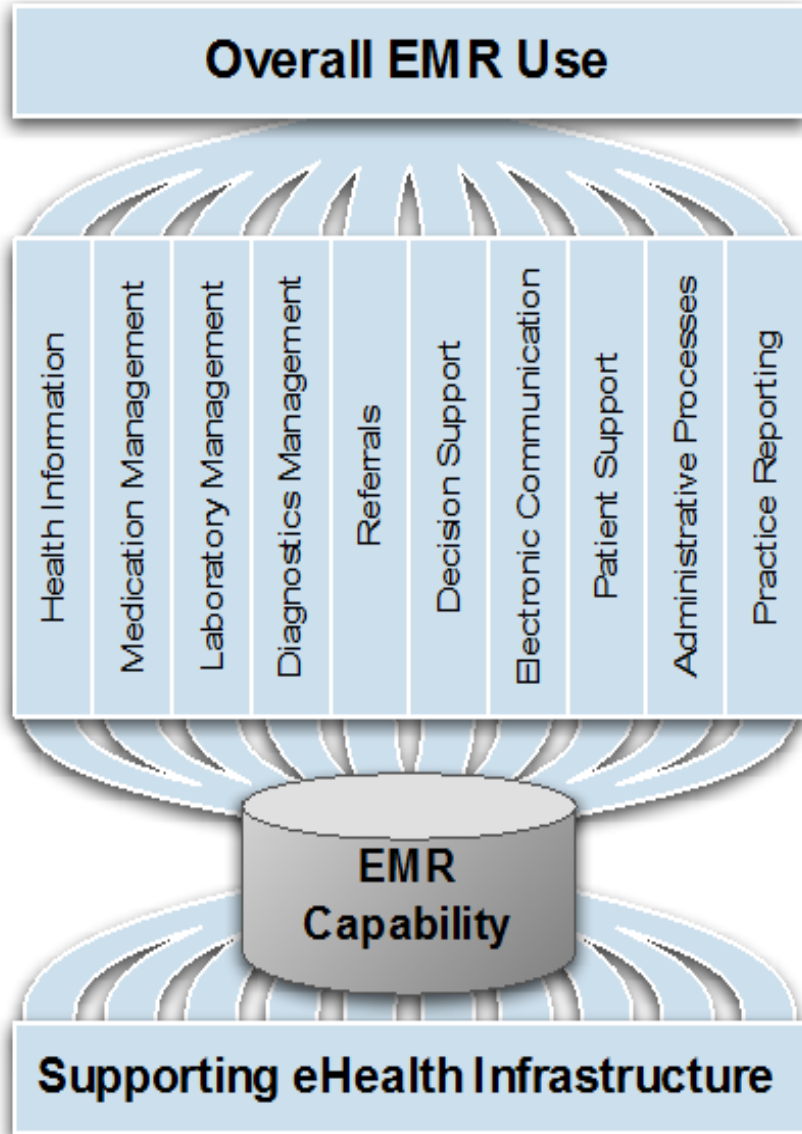
# A MULTIVARIATE EMR INTEGRATION MODEL

# A Multivariate EMR Integration Model

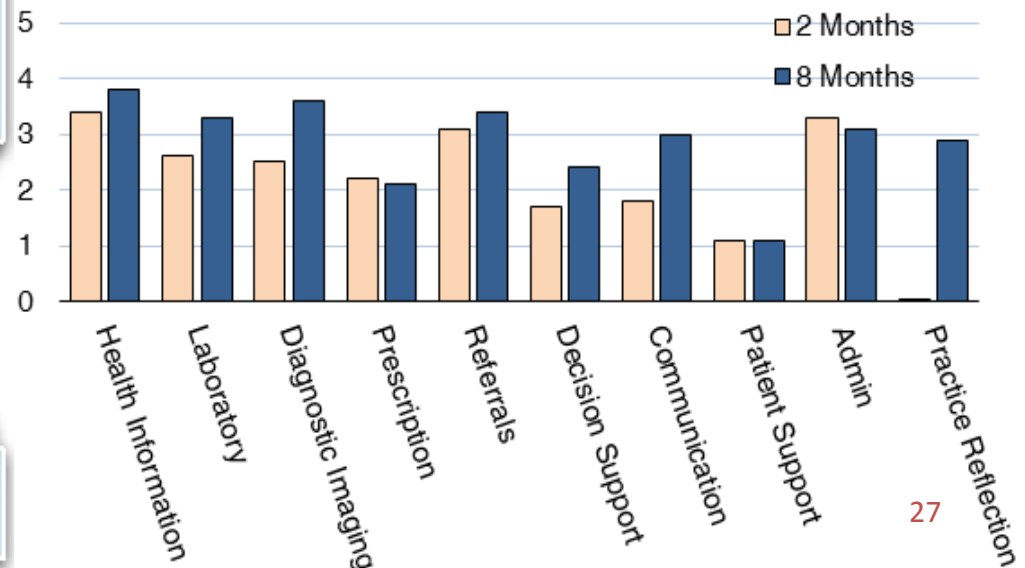
- Hypothesis
  - Integrated EMR associated with high quality PHC
- Assumptions
  - EMR adoption as complex intervention
  - Well adopted EMR associated with improvement in PHC
- Model definition
  - EMR adoption = adoption score 0 to 5
  - EMR integration = adoption score + contextual factors
  - PHC quality index = summary PHC quality indicator index 0 to 1
  - Model PHC quality index as a function of EMR integration

# EMR Adoption

Functional Categories



| Stage | EMR Adoption Level                     |
|-------|--|
| 5     | Fully integrated, linked with others   |
| 4     | Decision support, reports, messages    |
| 3     | Electronic paper record                |
| 2     | Some electronic patient info/reporting |
| 1     | Electronic references, paper charts    |
| 0     | Paper-based practice                   |



# EMR Integration

- EMR integration as a function of
  - Adoption score + *[product + configuration + data quality + time since implementation + provider type + user prior knowledge + user satisfaction + practice organization + practice size + practice improvement + financial incentive]*
- Definition of variables (examples only)
  - Configuration: local, ASP single or ASP multiple instances
  - Data: sensitivity/specificity  $\geq 80\%$ ,  $\geq 60\%$ ,  $< 60\%$
  - Time:  $< 1$ , 1-2, 3-4,  $\geq 5$  years
  - Provider: solo physician, group physicians, interprofessional team
  - Organization: fee-for-service, alternate payment, capitation, blended
  - Size: 1-2, 3-4,  $\geq 5$  providers
  - Improvement: none, EMR, practice, both
  - Incentive: EMR support, practice support, both

# PHC Quality Indicators

- PHC quality index = subset CIHI PHC indicators, as proportion 0-1 (CIHI 2011, p89-90)
- PHC quality index as M/E, where E=count of indicators for eligible patient; M=count of targets that eligible patient has met

| Quality indicator  | Eligibility criteria              | Target                        | CIHI-PHC |
|--|-----------------------------------|-------------------------------|----------|
| <i>Process Measures</i>  |                                   |                               |          |
| Influenza immunization   | Age ≥ 65                          | Within last year              | 41       |
| Colon cancer screening (Hemoccult)   | Age ≥ 50                          | Within last two years         | 48       |
| Mammography and breast exam  | Ages 50 to 69                     | Within last two years         | 49       |
| PAP smear  | Ages 18 to 69                     | Within last three years       | 50       |
| Blood pressure measurement   | Age ≥ 18                          | Within last two years         | 54       |
| Fasting blood sugar<br>Lipid profile screening (full fasting)<br>Blood pressure measurement<br>Obesity/overweight screening  | Age ≥ 18, coronary artery disease | Within last year              | 55       |
| Hemoglobin A1c testing<br>Lipid profile screening (full fasting)<br>Blood pressure measurement<br>Obesity/overweight screening<br>Nephropathy screening<br>(e.g. albumin/creatinine ratio) | Age ≥ 18, diabetes mellitus       | Within last year              | 57       |
| Eye exam   | Ages 18 to 75, diabetes mellitus  | Within last two years         | 58       |
| ACE inhibitors or ARBs*  | Congestive heart failure          | Active ACE or ARB treatment   | 60       |
| Beta blocker   | Acute myocardial infarction       | Active beta blocker treatment | 62       |
| <i>Outcome Measures</i>  |                                   |                               |          |
| Blood pressure control   | Age ≥ 18, hypertension ≥1 year    | <140/90 mmHg                  | 40       |

# Multivariate EMR Integration Model

- Model
  - $\text{PHC quality index} = \text{Adoption score} + [\text{product} + \text{configuration} + \text{data quality} + \text{time since implementation} + \text{provider type} + \text{user prior knowledge} + \text{user satisfaction} + \text{practice organization} + \text{practice size} + \text{practice improvement} + \text{financial incentive}]$
- Data (Examples only)
  - EMR adoption score and user knowledge/satisfaction from interviews
  - Provider, time, organization, size, improvement, incentive from interviews
  - EMR data quality and PHC quality indicators from extracted data/queries
- Analysis
  - Univariable testing: relationship of PHC quality index with each variable
  - Multivariable testing: relationship PHC quality index and adoption score after controlling for other variables
  - Prediction?

# DISCUSSION

# Summary

- EMR adoption represents complex interventions that require an organized approach
- Gaps exist with respect to the conceptualization, implementation and evaluation of EMRs
- Multivariate models that combine quantitative measures with qualitative contextual assessment to better address complexities in EMR adoption



# Questions?

- Is there the potential to use secondary data from previous evaluations of EMR adoption/implementation to test the multivariate model retrospectively?
- Does the synthesized PPRNet framework for improving primary care using HIT have face validity for Canadian health services researchers?
- Are you currently doing work in the area of complex interventions, and if so, can you share with us what it is and the issues you have come across?

# Thank You!

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