

Using Integrated Health Plan EMR Data to Evaluate Outcomes Associated with Clinical Services for the Treatment of Non-Malignant Chronic Pain

Lynn L DeBar, PhD MPH

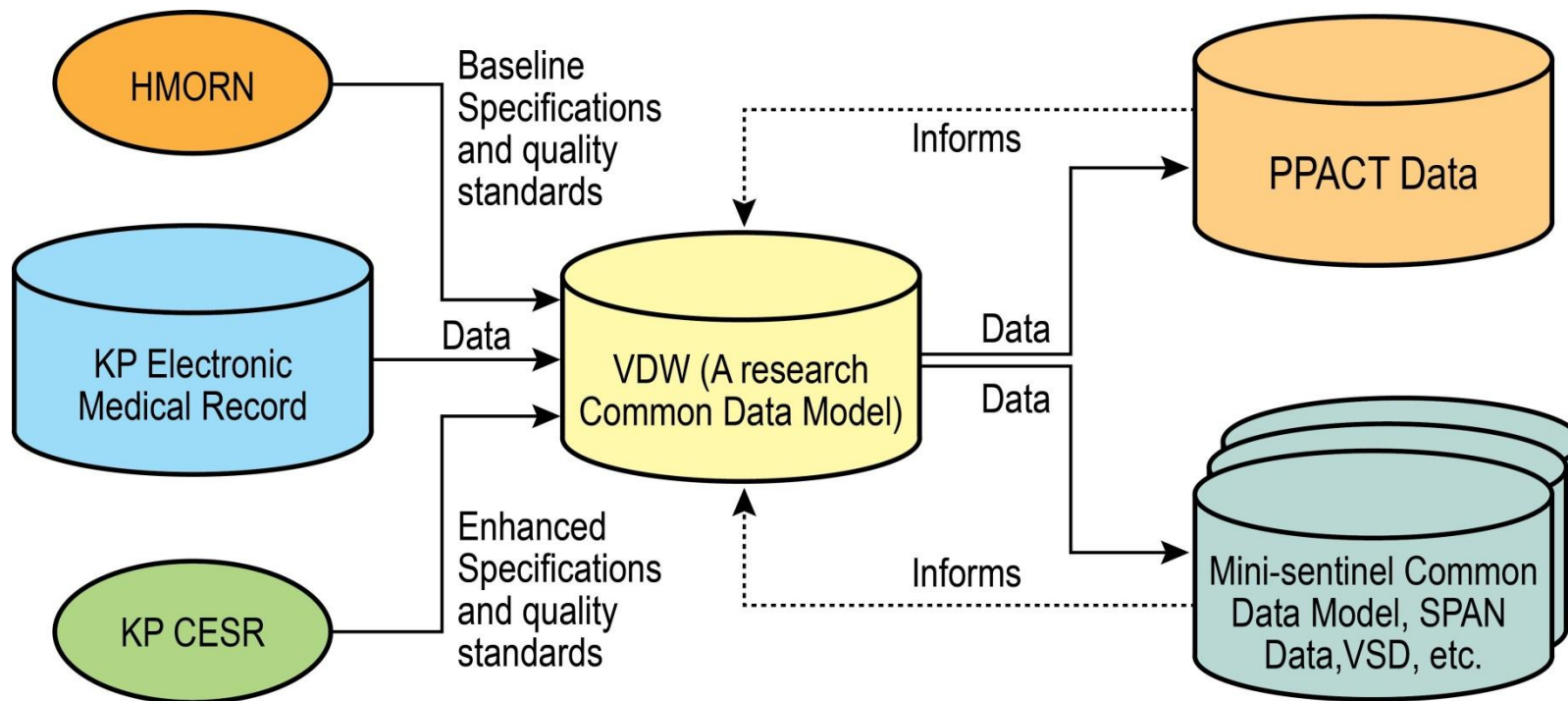
Kaiser Permanente Center for Health Research

Agenda

- Utilizing EMR Data for Clinical Research
 - Types of data / variables available
 - Ascertaining data quality and comparability across health care systems: the role of the HMORN Virtual Data Warehouse
- The Opioid Use Improvement Project at KP-Northwest: an approach to enhance responsible prescribing and clinical care
 - Instituting the Regional Opioid Treatment Plan
 - Centrality of the Panel Support Tool
- PPACT – using health plan tools to conduct a pragmatic trial
 - Study design and use of EMR and related clinical tools
 - The special case of Patient Reported Outcomes
- Summary of Additional EMR-based Opioid Studies Underway

EMR Data from Integrated Health Plans: Advantages for Clinical Research

- Practice based (not just claims data but details of care)
- Defined populations (known denominator)
- Integrated health care systems: Most medical care is obtained within our systems
- Automated case identification (facilitates recruitment)
- Diverse provider base (enables studies of relationships between provider behaviors and outcomes)
- Same EMR system across all Kaiser sites yet system differences (facilitates natural experiments and internal replication)



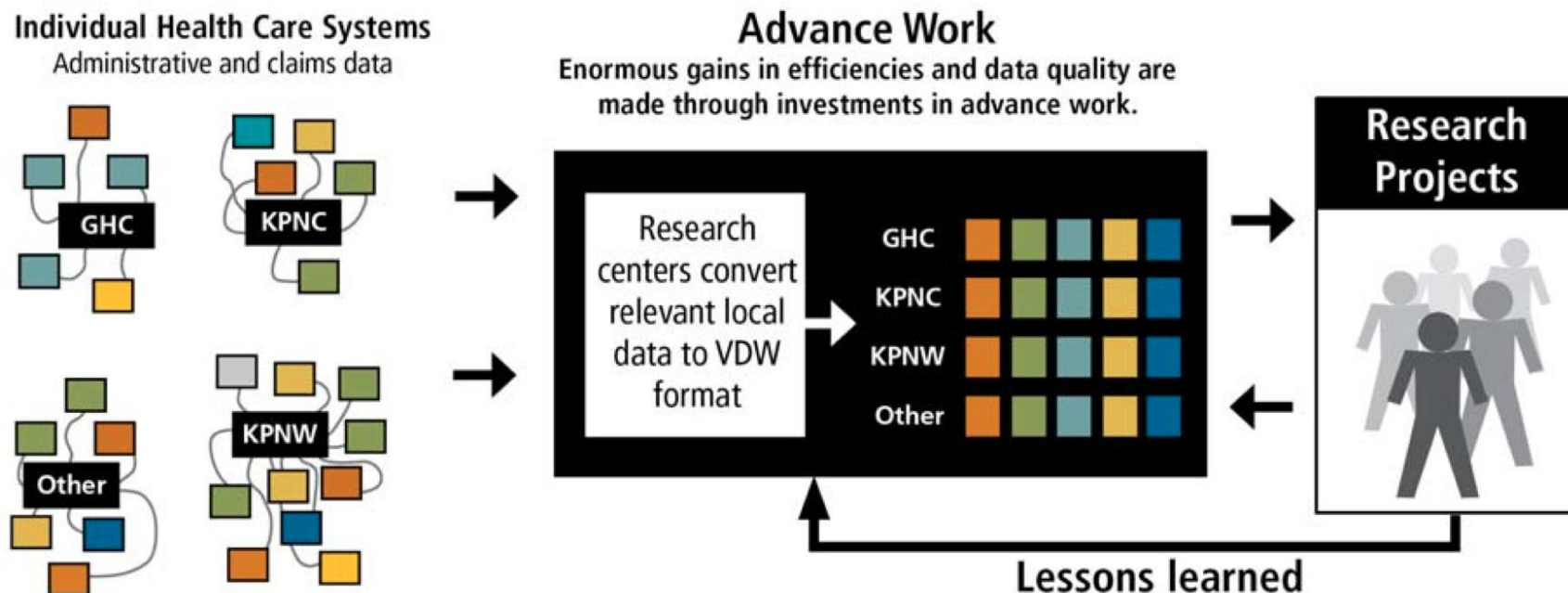
Data Resources: Virtual Data Warehouse (VDW)

- Set of Common Data Standards: Variable names, definitions, formats, data structures
- “Virtual” = data are maintained at each participating site*;
“Distributed” may be an equally appropriate description
- Source data (EMRs, other clinical and administrative databases) may differ from Site to Site
- SAS and Oracle databases

* Kaiser Permanente Research Centers in Northwest, Hawaii, Northern California, Southern California, Colorado, Georgia, and MidAtlantic), Group Health Cooperative, Health Partners, Harvard Pilgrim, Geisinger, Henry Ford, Maccabi Institute (Israel), Marshfield, Essentia Institute of Rural Health, Meyers Primary Care Institute, Scott and White Research, Palo Alto Medical Foundation Research Institute

The VDW: How It Works

The Virtual Data Warehouse:
A method for standardizing and pooling electronic health data for multi-site research



Demographics
Person ID
Birth date
Gender
Race
Ethnicity

Enrollment
Person ID
Start and end dates
Outside utilization flag
Insurance plan and type
Drug coverage
Primary care clinic
Primary care provider

Language
Person ID
Language
Primary language Y/N
Spoken/written

Social History
Encounter ID
Person ID
Date
Education
Drug history
Alcohol history
Sexual history
Tobacco history

Tumors
Person ID
Diagnosis date
Tumor type variables
Tumor stage variables
Treatment variables

Vital Signs
Person ID
Encounter ID
Encounter type
Measurement date
Blood pressure, pulse
Height, weight
Head circumference

Utilization			
Encounters	Diagnoses	Procedures	Providers
Person ID	Person ID	Person ID	Provider ID
Encounter ID	Encounter ID	Encounter ID	Specialty
Dates of service	Encounter type	Date of service	Birth year
Provider ID	Date	Procedure type	Gender
Encounter type	Diagnosis code	Procedure code	Race
Facility	Diagnosis type	Encounter type	Year graduated
Department	Primary diag. flag	Provider ID	
DRG	Principal diag. flag		
	Provider ID		

This set of four tables incorporates data for all medical encounters.

Labs	
Lab Results	Lab Notes
Person ID	Row ID
Order date	Result note
Collection date	Note type
Result date	Line
Test immediacy	
Test location	
LOINC code	
Test result and unit	
Normal result range	
Ordering provider	
Department	
Facility	
Row ID	

Pharmacy	
Pharmacy (Rx fills)	EverNDC
Person ID	NDC
Dispensing date	Generic names
Dispensing MD	Brand names
NDC	AHFS code
Days supply	GPI code
Amount dispensed	

Death	
Cause of Death	Deaths
Person ID	Person ID
Cause of death	Date of death
Type of cause	Source
Source	Confidence
Confidence	

Census	
Census Location	Census Demographics
Person ID	Person ID
Geocode	Geocode
Location start date	Census year
Location end date	Census source
	Race
	Ethnicity
	Education
	Household income

Medication Orders		
Medication Orders	Medication Orders Diagnoses	Medication Lookup
Person ID	Order ID	Medication ID
Encounter ID	Order diagnosis	Medication name
Order ID	Order Dx code type	Medication route
Prescription ID		Generic name
Medication ID		Therapeutic class
Order date		Pharmaceutical class
SIG		Controlled substance Y/N
Simple generic name		

Personal Health Records (PHR)		
PHR Registration	PHR Activity	PHR Test
Person ID	Person ID	Person ID
Create date	Access date	Access date
Last login	Type of activity	Test name
Acct active		

PHR Messages	PHR Proxy
Person ID	Person ID
Message ID	Proxy person ID
Thread ID	Proxy relationship
Message date	Proxy start date
Sending provider	Proxy end date

Clinical Context: KPNW Operational Response to Opioid Use

- Motivating factors for systematic clinical response (safety & efficacy concerns)
 - High dose opioid prescribing
 - Primary care in need of assistance
- Opioid Use Improvement Project (OUI)

Objectives:

- Improve patient safety
- Improve provider and team support
- Improve outcomes with chronic pain management

Identification of high risk patients

- High daily MEQ
- Suicide Attempts
- Pharmacy Concerns (multiple and/or early refills)
- Substance Abuse
- Dose Escalations

Care Management Tools

- Opioid Therapy Plans (OTP)
- Care flags added to Patient Support Tool (PST)
- Brief Pain Inventory (BPI)
 - Back office staff trained to enter data
 - Clinicians trained to track functional improvements
- Best Practices Alerts (BPA)

Opioid Therapy Plan (OTP) Operational Criteria

PATIENT CRITERIA	BASIC GREEN	COMPLEX YELLOW	COMPLEX RED
Follows plan reliably	X		
No history of opioid abuse	X		
No history of other substance abuse within past 2 years	X		
No current behaviors indicating drug misuse	X		
Current behaviors raise questions about the ability to follow the OTP		X	
History of opioid abuse		X	
History of other substance abuse within past 2 years		X	
Calculated overall opioid dosing level at 180mg morphine equivalent or higher		X	
Have demonstrated repeated problems following the OTP (e.g. unexpected UDS)			X
Active substance abuse			X
Have current behaviors which raise concerns about possibility of diversion			X

PCP REQUIREMENTS	BASIC GREEN	COMPLEX YELLOW	COMPLEX RED
Office visit frequency (minimum)	Semi-annually (1 may be TAV)	Quarterly (2 may be TAVs)	Quarterly (no TAVs)
Office visit required for any dosing changes	No	Yes	Yes
Brief Pain Inventory (BPI) completed (minimum) <i>[Recommended to be administered at every office visit]</i>	Semi-annually	Quarterly	Quarterly
Refresh pain diagnosis on problem list	Yearly	Yearly	Yearly
Verify current dosing level is reflected on OTP on the problem list	Yes	Yes	Yes
Discuss with the patient their use of opioid, non-opioid and non-pharmacological modalities to control pain	Each visit	Each visit	Each visit
UDS ordered and resulted (minimum)	Yearly	Quarterly	Quarterly
Confirm random pill counts completed	PRN	2x/Year & PRN	2x/Year & PRN
Create AVS or send letter with patient's dosing and instructions after dosing change	Yes	Yes – AVS only	Yes – AVS only
Create separate monthly opioid prescriptions, no refills and no mail order	No	Yes*	Yes
Early refills for travel	Yes	Yes	Up to 2/year
May refill prescriptions early for lost or stolen reasons (Police report needed before receiving refill of stolen medications)	Yes	Limited supply only	No
New OTP required when prescriber changes or OTP color changes	Yes	Yes	Yes

PST - PATIENT

Print Preview

DM	CVD	CHF	HTN
Y			
CKD	Asth		Gap
	Y		8

Consider Dx refresh: Address condition during an office encounter and enter dx code in HealthConnect during 2011. If Dx is no longer active, click X? to exclude it.
X? 205.01 ACUTE MYELOID LEUKEMIA IN REMISSION Source: KPHC Date: 12/11/09

Utilization Profile

Last Discharge: 10/27/08
 MYALGIA AND MYOSITIS NOS

Last ER Visit:

Preventive Care

Last Flu Date:
 Last H1N1 Date:
 Last Pneumo: 7/22/08
 Last Td:
 Last Tdap: 7/22/08
 Last Mamm: 12/20/10
 Last Pap: 5/19/10
 Last Flex Sig: 5/6/08

Opiate Therapy Plan

OTP on PL: 2/22/10
 Last APAP dispense:
 Last OTP order:
 Last Brief Pain Inventory: 8/29/11
 Last PCP visit w PAIN Dx:
 Last urine drug test: 1/13/11

Panel Support Tool Caregaps:

Therapeutic Care Gaps:

Statin - START at min.Simva 40. Last LDL 224 24-NOV-10 Possible interaction:

Chronic Condition Monitoring Care Gaps:

OTP order REQUIRED by current PCP
 Qtrly pain Dx DUE with PCP ofc visit, Last Visit On:
 OTP yellow/red: QTRLY Urine Drug Screening DUE
 DM eye screen OVERDUE, previous 24 months findings unknown
 HBA1C DUE SOON Last: 7.1 05-APR-11.

Preventive Care Gaps:

Active Tobacco Use: Advise quitting today

Ob/Gyn: REED, SANDRA

Ob/Gyn Care Gaps:

COTEST OVERDUE. Last result: PAP N / EC- 19-MAY-10. (no endocervical cells)

** LDL	224	11/24/10
HDL	56.0	11/24/10
TRI	212	5/6/08
CHOL	297	11/24/10
** A1C	7.1	4/5/11
* FBG	71	4/23/10
* ALT	28	4/23/10
** CRE	0.8	4/5/11
BUN	19	4/5/11
** GFR	98.0	4/5/11
** ALB/CRE	24	10/8/10
** PRO/CRE		
HGB	13.6	9/29/10
HCT	41.5	9/29/10
NA	139.0	4/5/11
K	4.1	4/5/11
TSH	2.94	8/29/11
** PSA		



**Hover over the result to see trended results if available

PPACT: Building Upon Regional Actions & Data Capabilities

PAIN PROGRAM FOR ACTIVE COPING & TRAINING

- Principle Investigator: Lynn DeBar, PhD MPH Kaiser Permanente NW Center for Health Research
- Sites: KP Northwest, KP Southeast, KP Hawaii
- Pragmatic Clinical Trial Sponsored by:
 - National Institutes of Health Common Fund
 - National Institute of Neurological Diseases and Stroke
 - National Institute of Drug Abuse
 - Administrated by the National Center for Complementary and Alternative Medicine



FED UP WITH PAIN?
LET'S MAKE
A PACT

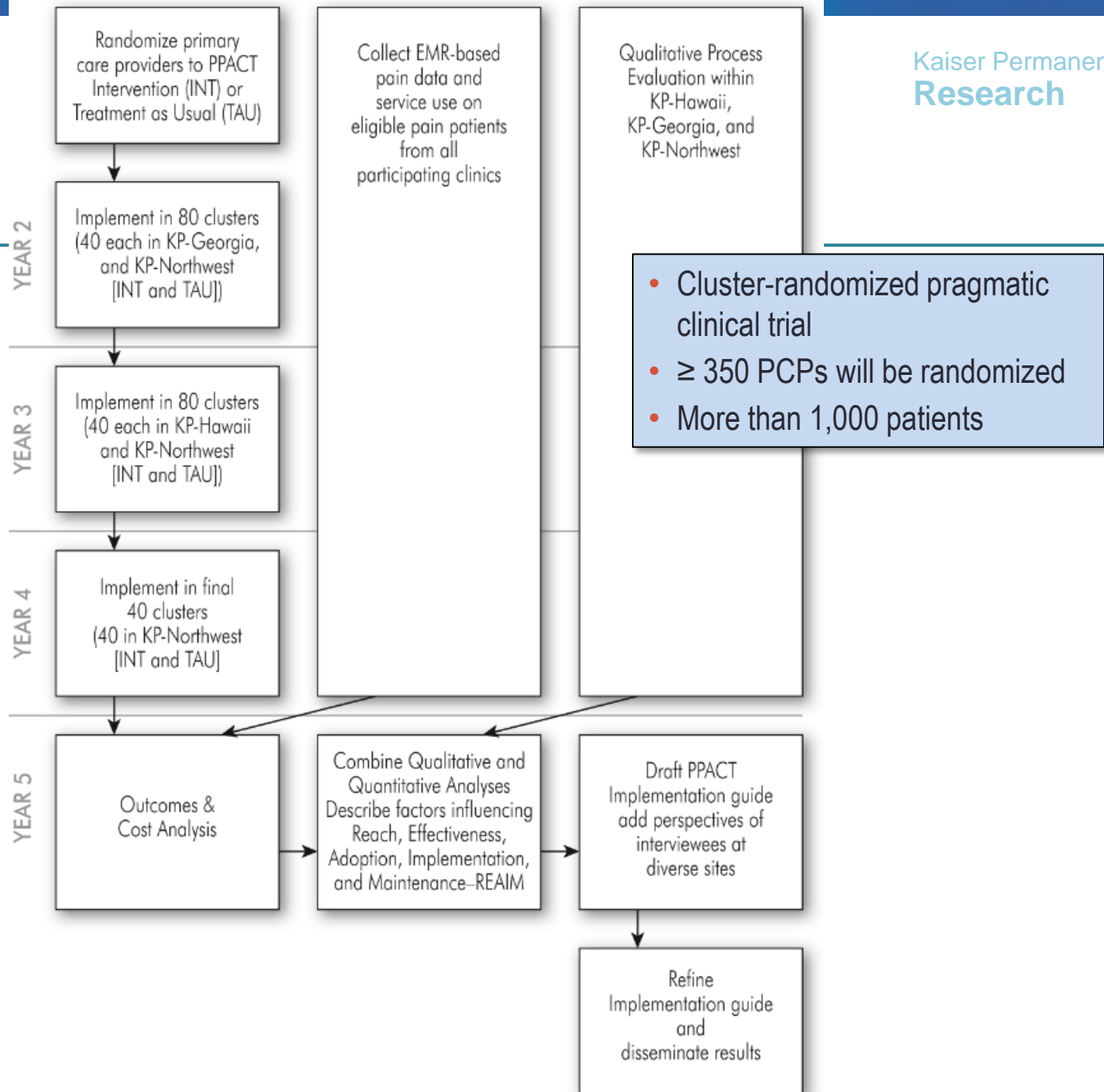
PPACT: Building Upon Regional Actions & Data Capabilities

Coordinate and integrate services for helping patients adopt self-management skills for managing chronic pain, limit use of opioid medications, and identify exacerbating factors amenable to treatment that is feasible and sustainable within the primary care setting

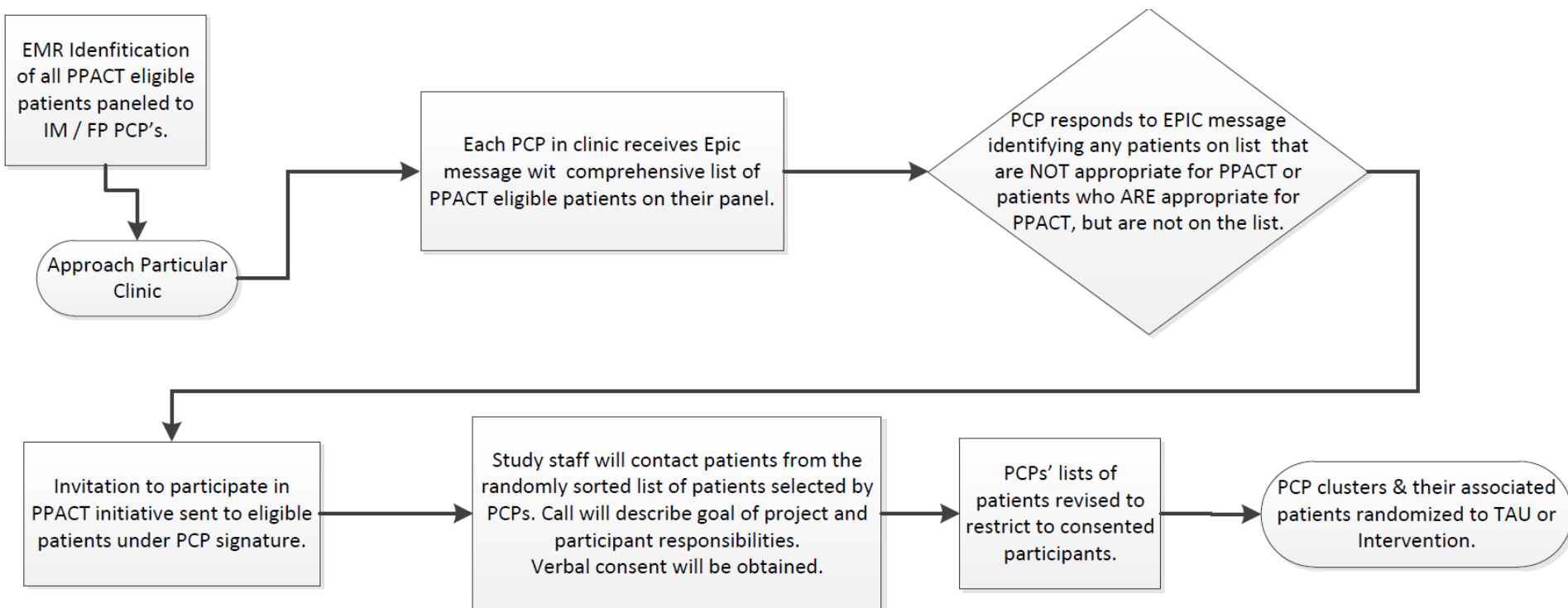
- Implemented across KPNW, KP-Georgia, and KP-Hawaii regions
- Involves 1,200–2,000 patients with chronic pain on opioids (600–1,000 receiving study-supported active care)
- Prioritized recruitment based on operationally identified need:
 - MEQ \geq 120mg
 - Concurrent opioid and benzodiazepine use
 - High utilization of primary care services



Trial Design



PPACT Recruitment & Randomization



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Variable	Analytic Purpose
Brief Pain Inventory (BPI) (Severity & Interference)	Primary Outcome
Opioids Dispensed (in morphine equivalents)	Secondary Outcome
Pain related treatment or diagnostic procedures	Secondary Outcome
Use of emergency / urgent care services	Secondary Outcome
Use of primary care services	Secondary Outcome
Use of specialty care services	Secondary Outcome
Total health service use & cost	Secondary Outcome
Comorbidities (Depression, anxiety, disability, chronic disease burden, sleep difficulties)	Covariates
Patient satisfaction	Secondary Outcome
Exercise as Vital Sign (EVS)	Secondary Outcome

Outcome Variables

- All data collected in routine clinical care
- Data pulled from electronic medical record (EMR) and administrative data systems
- KP Virtual Data Warehouse provides common EMR to ensure standardization across 3 regions
- BPI completion for patients using opioids:
 - Recommended at every visit, required quarterly to semi-annually

Ensuring Adequacy of Primary Outcome Data

	KP Northwest	KP Georgia	KP Hawaii
Routine BPI collection	Established	Developing	Champion Driven
Currently established collection methods	<ul style="list-style-type: none"> • Panel Support Tool Care Gap • Nursing workflow • E-mail (kp.org) 	<ul style="list-style-type: none"> • PCP training 	<ul style="list-style-type: none"> • Panel Support Tool Care Gap (not maximally utilized)
Active work with region to establish additional methods	<ul style="list-style-type: none"> • Ongoing PCP training 	<ul style="list-style-type: none"> • Panel Support Tool Care Gap • Pre-visit documentation • Nursing workflow • E-mail (kp.org) 	<ul style="list-style-type: none"> • Pharmacy collection at point of refill • Nursing workflow • E-mail (kp.org)

BPI: Brief Pain Inventory

Current EHR Primary Outcome Data: Analytic Challenges & Interpretative Concerns

- Administration of BPI linked to Opioid Prescription
 - Frequency of PRO administration linked to opioid dose (morphine equivalent level)
 - Potential loss of follow-up data for those tapering off opioids
- Timing and Amount of Data Variable
 - Heterogeneity across health care providers
 - Potential for more frequent collection of PRO among patients with higher rates of health care utilization (potential bias by medical complexity or pain severity)

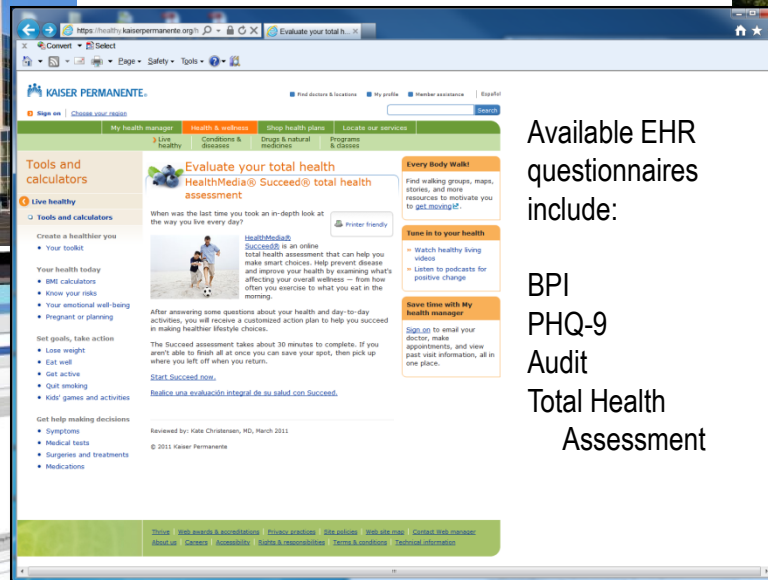
KP workflow process of PRO email collection

Kaiser Permanente

Patient Home



www.KP.org



Available EHR
questionnaires
include:

BPI
PHQ-9
Audit
Total Health
Assessment

?
Ask
doctor a
question



EPIC
Terminal

Personal
Digital
Devices



Increased patient health record adoption provides additional opportunities to collect PROs

	Change between 2008 and 2011
Total visits to kp.org	220% increase (Over 100 million visits in 2011)
Members registered for secure features	140% increase
Total online prescription refill orders	290% increase
Total online appointment requests	200% increase
Total e-mails sent to doctors & other care team members	200% increase
Total lab-test results view online	180% increase
Total healthy lifestyle program questionnaires submitted	200% increase

Why is the Clinical Use of PROs Limited?

- Adoption largely driven by “stick” (regulation or safety concerns) rather than “carrot” (clinical utility)
- PRO instruments need to fully meet both clinical and evaluation needs
- Administration not hardwired into work flow so that change over time can be tracked (more frequent use as screening measure or single point in time evaluation)
- Available technology often only partially implemented due to health plan or patient resource constraints and compliance/privacy concerns
- Placement in Clinical Record not convenient/ accessible

PRO data entered in
separate charting area



[This Visit](#) [Images](#) [Questionnaires](#) [Recent Visits](#) [Benefits Inquiry](#) [Open Orders](#) [Care Teams](#) [Print AVS](#) [Preview AVS](#) [PreVisit Summary](#) [KPPAS](#) [Admin](#)

BestPractice Advisories

[Refresh](#) Last refreshed on 4/18/2013 at 6:31 PM

Relevant Results

CBC, IRON (Last 3 results in 3 years)

WBC	HGB	HCT	PLT
(10/06/12)* 7.5	(10/06/12)* 14.2	(10/06/12)* 43.3	(10/06/12)* 321
(11/15/11) 18.4 ▲	(11/15/11) 11.7 ▼	(11/15/11) 38.2	(11/15/11) 268
(10/27/11) 5.7	(10/27/11) 12.6 ▼	(10/27/11) 36.4 ▼	(10/27/11) 373

Chemistries (Last 3 results in 3 years)

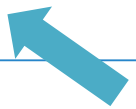
Na	K	Cr	ALT
(09/27/12)* 165 ▲	(12/16/11) 3.7	(12/16/11) 1.00	(12/16/11) 59 ▲
(12/16/11) 142	(06/30/11) 3.8	(06/30/11) 2.30 ▲	
(06/30/11) 138	(12/30/10) 5.0	(12/30/10) 0.91	

Lipid Panel (Last 3 results in 3 years)

Endocrine Results (Last 3 results in 3 years)

Urine Test Results (Last 3 results in 3 years)

Lab data embedded directly into chart note



- Less than ideal interface and data entry

Questionnaires

Current Questionnaires

BRIEF PAIN INVENTORY BPI (PAINMGT - NATL)

Add Remove Restore

Adv	Question	Answer	Comment
	Pain at its worst in past week	8	
	Pain at its least in past week	3	
	Average pain in past week	6	
	Pain right now	7	
	In the last week, how much relief have pain treatment or medications provided?	30%	
	Pain interference with general activities in past week	<input type="text"/>	
	Pain interference with mood in past week		
	Pain interference with walking ability in past week		
	Pain interference with normal work (job or house) in past week		
	Pain interference with relations with other people		
	Pain interference with sleep in past week		

Completion Match (Shift+F5) | Match to custom list; Scale of 0-10, where 0=no interference and 10=complete interference

- Variable collection of PROs

Flowsheet Report				
Select Flowsheets to View				
BRIEF PAIN INVENTORY NATL [167]				
BPI	1/18/2012	3/15/2012	1/30/2013	4/18/2013
Worst Pain	5	7	4	8
Least Pain	5	3		3
Average Pain	5	4		6
Current Pain		5		7
Percentage of Pain Relief				30%
Activity Interference				7
Mood Interference				4
Walking Interference				6
Work Interference				7
Relationship Interference				4
Sleep Interference				6
Enjoyment Interference				4

- Less than ideal display when viewing multiple PROs

Flowsheet Report									
Chart Review	Select Flowsheets to View								
SnapShot	BRIEF PAIN INVENTORY NATL [167]								
Results Review	DEPRESSION PHQ9 NATL [164]								
Launch RRS									
PST - PATIENT	BPI	1/18/2012	3/15/2012					1/30/2013	4/18/2013
Synopsis	Worst Pain	5	7					4	8
Graphs	Least Pain	5	3						3
Flowsheets	Average Pain	5	4						6
Launch EKG	Current Pain		5						7
Demographics	Percentage of Pain Relief								30%
Letters	Activity Interference								7
Allergies	Mood Interference								4
Activity Rx/Forms	Walking Interference								6
Problem List	Work Interference								7
Doc Flowsheets	Relationship Interference								4
Order Review	Sleep Interference								6
	Enjoyment Interference								4
	DEPRESSION PHQ9			3/16/2012	4/12/2012		4/12/2012		1/22/2013
	PHQ9 Score (Office Visit)			14	15		11		15
	Depression Severity (Office Visit)			A) 0 - 4 NONE	D) 15 -19 MODERATELY SEVERE		C) 10 -14 MODERATE		D) 15 -19 MODERATELY SEVERE

Online Document Center - View Document - Windows Internet Explorer

McAfee

Web Slice Gallery Suggested Sites

File Edit View Zoom Transform Streaming Annotations Help



Wait for the document to load...



1

2

3

Medication Generic (Brand)	Approximate dates you took this medication. How long did you take it?	Please indicate whether it helped NONE, SOME or A LOT	List any unacceptable side effects
Amisriptyline (Elevil)			
Desipramine (Norpramin)			
Doxepin (Sinequan)			
Nortriptyline (Pamelor)			
Trazodone (Desyrel)	last year	NONE	
Venlafaxine (Effexor)			
Duloxetine (Cymbalta)			
Fluoxetine (Prozac)			
Citalopram (Celexa)	ever to mo.	some	
Carbamazepine (Tegretol)			
Gabapentin (Neurontin)			
Prigabalin (Lyrica)	Several months	some	weight gain + sleep apnea
Topiramate (Topamax)			
Codaine (Tylenol #3)			
Fentanyl patch (Duragesic)	1 year	some	nausea + dizziness
Hydrocodone (Vicodin)			
Hydromorphone (Dilaudid)	over 1 year	some	nausea + dizziness
Levorphanol			
Meperidine (Demerol)			
Morphine - short acting			
Morphine - long acting (Oxamorph, MS Contin)	approx 2 months	some	drowsiness + constipation
Oxycodone (Percocet)			
Oxycodone - long acting (Oxycontin)			
Oxymorphone (Opana)			
Lidocaine patch (Lidoderm)			
Lorazepam (Ativan)			
Carisoprodol (Soma)			
Clonazepam (Klonopin)	2 years	some	
Cyclobenzaprine (Flexeril)	some months	NONE	nausea + dizziness
Methocarbamol (Robaxin)			
Diazepam (Valium)			
Temazepam (Restoril)			
Zolpidem (Ambien)			

List any over the counter medications you take; such as aspirin, acetaminophen, ibuprofen (Motrin), naproxen (Aleve)? And how often you take them: _____

List any vitamins or herbal products you take and how often you take them: Vitamin D-3 2000mg, Omega 3 Fish oil s +

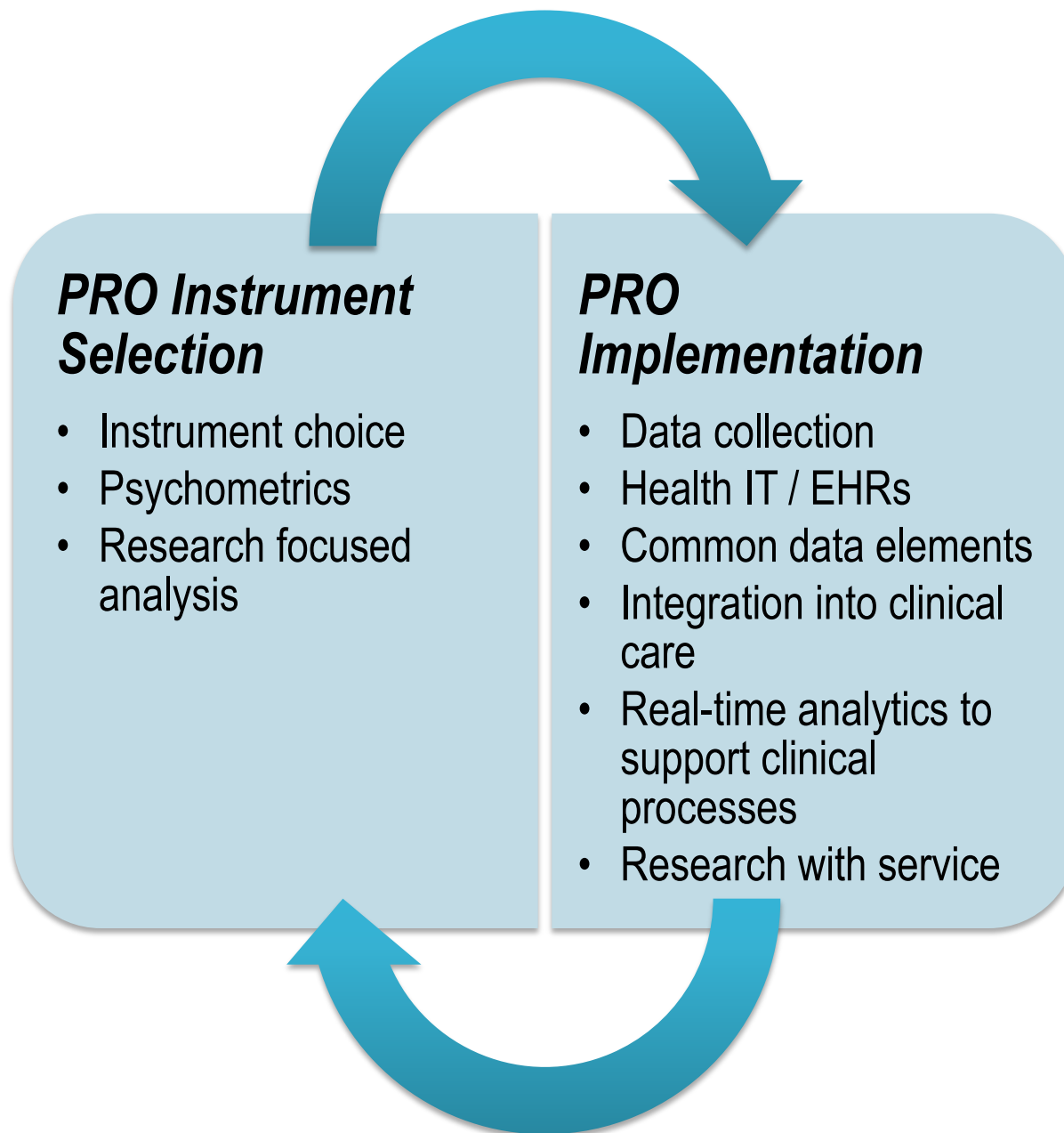
KPNW Pain Management Clinic
503-331-6131

Page 4 of 4

KAISER PERMANENTE.
All plans offered and underwritten by Kaiser Foundation Health Plan of the Northwest, 500 NE Multnomah St., Ste. 100, Portland, OR 97232.

Select each page individually...

Highly variable quality...



Additional EMR-based Opioid Studies Underway...

Opioid Treatment Impact Study

- Funded by the National Institute on Drug Abuse
- Principal Investigator: Benjamin Morasco, PhD; Portland VA Medical Center and Oregon Health & Science University
- Sites: Portland VA & Kaiser Permanente Northwest
- Objectives:
 - to identify clinician- and patient-level factors that predict which patients will receive an increase in opioid dose
 - to evaluate clinical outcomes associated with opioid dose escalation
 - to assess factors associated with changes in pain intensity and pain-related function over time



Opioid Treatment Impact Study

- Participants from 2 clinical sites
 - Kaiser Permanente Northwest (n=333)
 - Portland VA Medical Center (n=167)
- Eligibility
 - musculoskeletal pain
 - receiving a stable dose of chronic opioid therapy for 90 consecutive days
- EMR data
 - used to identify eligible participants
 - checked weekly to identify dose increases of > 25% in morphine equivalents among participants
- Structured interviews at baseline, 6, 12, 18, and 24 months, & after dose increases
 - assess pain intensity, functioning, QOL, depression, anxiety, alcohol and substance use, prescription opioid misuse, sleep, sexual function, common side effects of opioids, overdoses

Study of Opioid Overdose & Poisoning Events

Funded by Purdue Pharma, LLP

Principal Investigators:

Carla A. Green, PhD, MPH & Nancy A. Perrin, PhD

Center for Health Research, Kaiser Permanente Northwest

- Objectives

- To determine the best approaches for identifying opioid overdose and poisoning events (OOP events) using EMR data
- To assess the effects of Oxycontin® reformulated with abuse deterrent properties on OOP events
- To understand the circumstances surrounding OOP events, and any changes in circumstances following the introduction of the new formulation

Examines:

- The usefulness of different ICD-9 and ICD-10 codes, alone or in combination, for identifying OOP events
 - validated by chart audits
- Changes in rates of OOP events in the Kaiser Permanente Health System (KP Northwest & KP Northern California) using EMR-identified OOP events
 - Prior to and following the 2010 introduction of the tamper-resistant Oxycontin® formulation
 - Comparing different groups of opioids &
 - Evaluating morphine equivalents
- Changes in the circumstances surrounding OOP events
 - Using in-depth interviews with individuals and families of deceased individuals who experienced events
 - Using chart audits to identify route of opioid administration & how opioids were obtained

Summary

- EMR data improvement over claims data for clinical research but additional quality assurance necessary to ensure validity and usability
- Operational response to opioid-related efficacy and safety concerns can expand data available to study issues more broadly (e.g., pain-related PROs and PST elements)
- Clinical uptake of PRO's increasing but current data gaps
- Studies of opioid-related practice patterns must be augmented by ancillary data collection

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