



For What Do you Pay Primary Care Providers? Primary Care Activity Level (PCAL)

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Key challenges facing US health care

- ❖ Too many people lack adequate insurance
- ❖ Costs are high and increasing fast
- ❖ Quality of care is worse than in many other countries
- ❖ Causes?
 - Not enough primary care is provided
 - Care is not coordinated well between providers
 - Patients not incented to make the best choices

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Goals of this paper

- ❖ How can we change the way we pay primary care providers so as to improve incentives?
 - Patient-centered medical home (PCMH)
 - Risk-based comprehensive payment
- ❖ How can we approximate the appropriate level of resources needed for high quality primary care for diverse patients?
 - Primary Care Activity Levels (PCAL)
- ❖ Will the new payment model be acceptable to physicians in relation to the status quo?
 - Simulate results at the primary care practitioner level

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Outline of paper

- ❖ The US primary care problem
- ❖ Introduction to Patient Centered Medical Home
- ❖ Data and Methods
- ❖ Results from PCAL modeling
- ❖ Assigning patients to primary care practitioners
- ❖ Results of PCP simulations

Who provides primary care in the US?

School nurses, public health officials, etc.

Primary care physicians

- Family Practice
- Internal Medicine
- Pediatrics
- Geriatrics

} Often called General Practitioners (GPs)

Here: **PCPs**

But a lot of primary care is also provided by

- Obstetricians/Gynecologists
- Cardiologists
- Endocrinologists
- Emergency rooms (?)
- Etc.

Primary Care is not done well in the US

- ❖ PC doctors mostly paid on a fee-for service (FFS) basis
- ❖ Paid less well than other doctors
 - => Few medical students training to become PC doctors
- ❖ PC practices do not have incentives to coordinate care
- ❖ Little incentive to provide preventive care or Information
- ❖ Overtreatment when Fee > MC
- ❖ Incentives to shun the truly needy

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Primary Care is in Crisis - **Even Worse!**

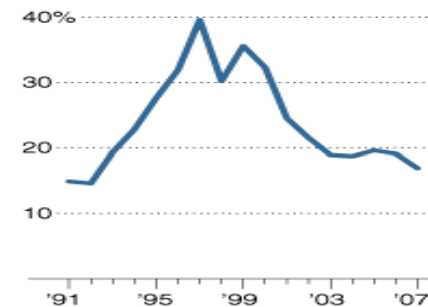
"Primary Care Shortage Could Worsen Under Reform" Kaiser Health Plan. September 15, 2009

"Shortage of Doctors an Obstacle to Obama Goals" New York Times, April 26, 2009

"Primary care doctor shortage continues in Mass." Boston Globe, September 14, 2009

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Percentage of medical school graduates who said they intended to go into primary health care

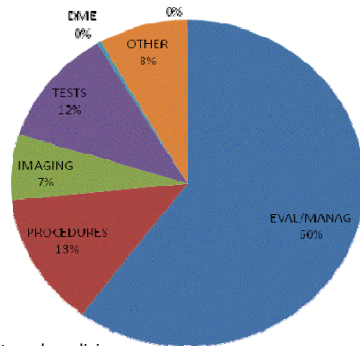


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PCPs spend a lot of time providing things other than primary care

MEDSTAT 2005 Commercially-insured MarketScan data

Spending on Primary Care Specialties



PCPs = family practice, internal medicine, pediatrician, and geriatrics

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How do we fix the primary care problem?

- ❖ Pay primary care doctors higher fees?
- ❖ Change consumer behavior
- ❖ Change organization of primary care
- ❖ Change incentives facing primary care practitioners

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What motivates primary care doctors?

- ❖ Money (profits)
- ❖ Providing clinically best care
- ❖ Making patients happy
- ❖ Doing well in relation to peers
- ❖ Conforming to norms/expectations
- ❖ Doing a good job

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Current approaches in US

- ❖ Organizational change
- ❖ Team-oriented practice
- ❖ Bundled payment for PC
- ❖ Pay-for-performance incentives
- ❖ All summed up in

Patient-Centered Medical Home

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Calculations needed for payment

- ❖ Risk-based comprehensive (“base”) payment
 - Provide stable, predictable funding to support population management
 - Avoid creating incentives for PCPs to shirk on attracting and treating high cost, chronically ill
 - Payments are population based = illness burden per month (quarter) not on episodes of treatment

- ❖ Risk-based rewards for high performance (bonuses)
 - Cost and utilization measures
 - Clinical health measures
 - Patient experience (satisfaction)

Different paper

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Building the Base Payment Model

- ❖ What data?
 - For now, insurance billing (or encounter) data – reasonably comprehensive and consistent
 - Later? “Enhanced billing data” (add some items from electronic health records)
- ❖ What to predict?
 - A proxy for “the level of activity this person’s primary care will require”
 - **Primary Care Activity Level (PCAL)**
 - Pay more for “the kinds of people” who take more effort (that is, expected PCAL)

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Three key questions for a PCAL model

What services will no longer be permissible for the PCPs to bill the health plan for separately?

Primary Care Core Services

(decided by physician panel)

What weighted sum of all services best reflects the expected burden imposed on PCPs for a given patient?

Primary Care Activity Level = PCAL

(decided by economists and physician panel)

What will you do when other providers provide primary care cores services?

(not yet decided, but needs to be part of bonus system)

Base Payment - Data

- ❖ Used Thomson Reuters MarketScan commercially insured enrollees 2006 and 2007 data
 - Ages 0 to 65
 - N = 1.4 million people
 - Enrollment information: unique individual ID, age, gender, plan ID, plan type, enrollee state and county, months of eligibility in 2006 and 2007
 - Used the small subset of all plans that include provider IDs, patient and provider county of residence, and provider specialty

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Predicting the PCAL Base Payment

❖ Predictors of PCAL

- Hierarchical condition categories (HCCs), created from diagnoses on medical claims
- Age/sex variables
- Disease interaction terms

❖ Goal is to provide “proper” payments for patients

- Not overpay for healthy ones
- Make clinicians “financially indifferent to” enrolling sick patients

❖ Use Weighted Least Squares

- Annualized spending weighted by fraction of year present



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DxCG Medical Model Basics

Demographic

- Member ID: 00001
- Name: John Doe
- Gender: Male
- Age: 50

Medical Profile

- Hypertension
- Type I Diabetes
- Congestive Heart Failure
- Alcohol Dependence

Predicted cost
\$26,314
Risk Score
6.35



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Hierarchical Conditions Categories (HCCs) linear regression model

$$\begin{aligned}
 Risk = & \beta_{0_{agecat}} + \beta_1 HCC_1 + \beta_2 HCC_2 + \beta_3 HCC_3 + \dots + \beta_n HCC_n \\
 & + (Age < 18) * (\beta_{k0} + \beta_{k1} HCC_1 + \dots + \beta_{kn} HCC_n) \\
 & + (Age > 65) * (\beta_{e0} + \beta_{e1} HCC_1 + \dots + \beta_{en} HCC_n) \\
 & + (\text{Selected interactions of HCC groups})
 \end{aligned}$$

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Risk-adjusted base payment

Based on

- Expected Primary Care Activity Level PCAL (age, sex, diagnoses) (NOT current PC services)
- Local factors (e.g., prevailing costs)
- Socioeconomic variables (eventually)
 - Education
 - Language
 - Income
 - Access measures



What is the right measure to use of Primary Care Activity Level (PCAL)?

Narrow bundles

- PC core services by assigned PCP
- PC core services by all PCPs
- All services by assigned PCP
- All services by all PCPs
- PCAL services, narrow definition
- PCAL services, broad definition
- Total outpatient spending
- ↓ Total spending on all services

Broad bundles



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Services and proportions used for calculating PCAL 5 (Definition 1)

- ❖ 100% of Simple lab tests, prevention procedures, physician home visits
- ❖ 75% of Physician office visits for evaluation and management (E&M)
- ❖ 50% of selected inpatient E&M visits, outpatient visits and simple procedures
- ❖ 50% of echography, EKGs, selected other lab tests

Used in Ash and Ellis 2008 and in one demonstration site

Services and proportions used for calculating PCAL 6 (Definition 2)

- ❖ 100% of PCP core services by assigned PCP
- ❖ 75% of PCP core services by other PCPs
- ❖ 25% of selected specialty and lab service spending
- ❖ 10% of emergency department visit spending
- ❖ 5% of prescription drug spending
- ❖ 2% of hospital spending

*Payments to be based on *expected* PCAL

Results of a quick survey of PCPs for desired time allocation under a PCMH

- ❖ 50% of time spent on PC core services
- ❖ 5% of time giving referrals to specialists interpreting results or follow up care
- ❖ 5% of time for follow up to emergency department visits or preventing them
- ❖ 5% of time for hospital referrals or follow up
- ❖ 10% for prescription drug advice and follow up
- ❖ 25 percent of time for patient information, emails, telephone calls, mailings

Services and proportions used for calculating PCAL 6B (Definition 3)

- ❖ 100% of proxy for PCP core services by anyone
- ❖ 5% of specialty and lab service spending
- ❖ 5% of emergency department visit spending
- ❖ 5% of hospital spending
- ❖ 10% of prescription drug spending

*Payments to be based on *expected* PCAL

Alternative measures of patient resource needs

Table 1A Individual patients

		1A Patient level analysis (N=1,497,620)		
		Mean	Std. Dev	% of total
1.	PC Core Services by assigned PCP	\$150	310	4%
2.	PC Core Services by all PCPs	\$214	398	5%
3.	All services by assigned PCP	\$212	969	5%
4.	All services by any PCP	\$294	1,055	7%
5.	PCAL services definition 1	\$506	947	12%
6.	PCAL services, definition 2	\$485	1,159	12%
7.	Total outpatient spending	\$2,305	8,169	56%
8.	Total spending on all services	\$4,144	17,301	100%

Table 2. Exploratory power of three models at the individual level

	Age -sex model (N=1,497,620)			Basic HCC model (N=1,497,620)		
	R ²	Std. err.	MAD*	R ²	Std. err.	MAD*
1. PC Core Services by assigned PCP	0.056	185	152	0.238	167	120
2. PC Core Services by all PCPs	0.070	166	187	0.356	138	131
3. All services by assigned PCP	0.015	444	220	0.066	433	183
4. All services by any PCP	0.025	346	268	0.112	331	204
5. PCAL services, definition 1	0.065	173	417	0.495	127	244
6. PCAL services, definition 2	0.040	218	379	0.487	159	211
7. Total outpatient spending	0.022	342	2521	0.429	261	1568
8. Total spending on all services	0.021	393	4534	0.473	288	2719

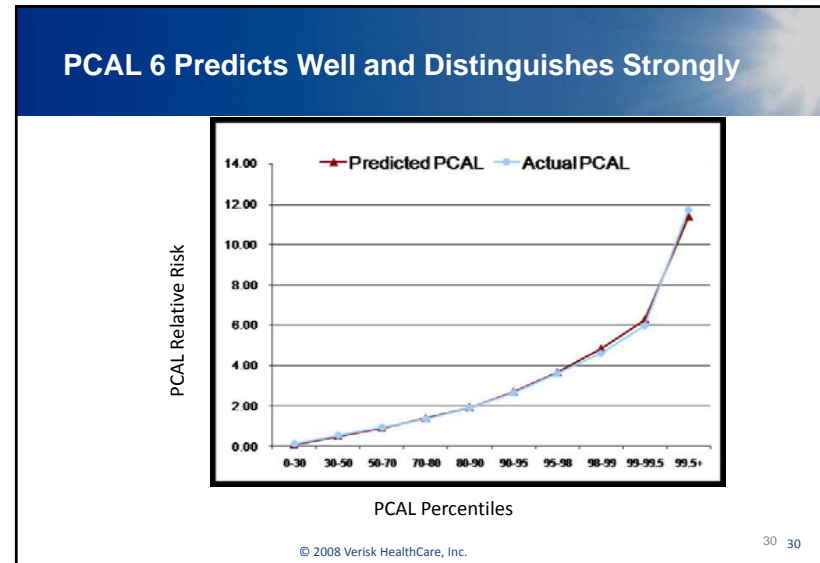
*MAD: Mean Absolute Deviation

Table 3a. Correlation matrix of actual expenditure measures Using individual level spending measures

	1	2	3	4	5	6	7	8
1. PC Core Services by assigned PCP	1.00							
2. PC Core Services by all PCPs	0.85	1.00						
3. All services by assigned PCP	0.44	0.39	1.00					
4. All services by any PCP	0.44	0.52	0.95	1.00				
5. PCAL services definition 1	0.43	0.53	0.26	0.34	1.00			
6. PCAL services, definition 2	0.50	0.62	0.41	0.49	0.84	1.00		
7. Total outpatient spending	0.16	0.22	0.25	0.28	0.46	0.38	1.00	
8. Total spending on all services	0.26	0.38	0.21	0.28	0.63	0.77	0.65	1.00

Table 3b. Correlation matrix of basic HCC predicted expenditure measures
Using individual level spending measures

	1	2	3	4	5	6	7	8
1. PC Core Services by assigned PCP	1.00							
2. PC Core Services by all PCPs	0.99	1.00						
3. All services by assigned PCP	0.86	0.86	1.00					
4. All services by any PCP	0.9	0.91	0.99	1.00				
5. PCAL services, definition 1	0.83	0.85	0.82	0.86	1.00			
6. PCAL services, definition 2	0.81	0.85	0.78	0.83	0.94	1.00		
7. Total outpatient spending	0.47	0.51	0.68	0.68	0.72	0.65	1.00	
8. Total spending on all services	0.59	0.66	0.68	0.72	0.84	0.89	0.83	1.00



- ### Base Payment Model Findings
- ❖ Predicted PCAL and predicted total cost are related, but rank patients somewhat differently
 - ❖ Predicted PCAL is highly discriminating ($R^2 \sim 50\%$)
 - ❖ Will it be good enough at the practice level?
 - ❖ How can results be presented to physicians and policymakers?
 - Requires the ability to assign patients to doctors (PCPs)
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Assignment of patients to PCPs

Individual patient statistics	Number of individuals	Percent of all PCP sample	Percent of full sample
Total sample in eligible plans ^a	1,497,620	70.7% ^b	100.0%
Saw exactly one PCP during 2007	635,002	60.0%	42.4%
Saw multiple PCPs in 2007	188,407	17.8%	12.6%
Saw at least one PCP in 2006 but none in 2007	235,497	22.2%	15.7%
Did not see any PCP with Provider ID and county given	438,714	0.0%	29.3%

PCP Assignment Algorithm

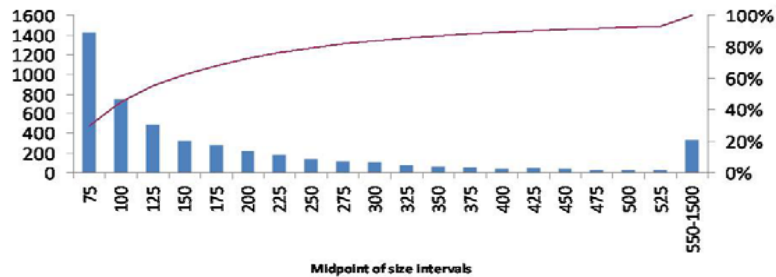
- ❖ PCP assignment
 - Patients assigned to PCP seen the most (most \$)
 - If patient did not see PCP in 2007, use 2006 PCPs
- ❖ New-PCP assignment
 - Includes people who never saw a PCP, based on county matching
- ❖ Pseudo-PCP assignment
 - Panels of at least 800 patients that are clusters of NEWPCPs

Table 6 PCP panels created

Using NEWPCP and PseudoPCP panels

	Number of PCP doctors	Average numbers of patients assigned	Total patients assigned	Mean spending per patient (Model 8)
Actual PCPs, their actual patients	51,508	20.6	1,058,906	4,893
NEWPCPs: PCPs with all patients assigned, including those with no PCP visits	51,508	29.1	1,497,620	4,144
Mid-sized NEWPCPs: with all patients assigned, but seeing more than 50 patients and less than 1500 =mid-sized NEWPCP	4,894	234	1,145,196	4,139
Pseudo PCPs: after assigning patients and merging PCPs	1,380	1086	1,497,620	4,144

**Histogram: Panel Sizes
(Mid-sized New PCP, n=4817)**



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NEWPCP results on eight measures

Table 1B NEW PCPs, including those not seeing a PCP

		1B Assigned PCP analysis (N= 51,508)			Mean Number of patients
		Mean	Std. Dev	Max.	
1.	PC Core Services by assigned PCP	\$4,360	26,963	\$2,179,933	29.07
2.	PC Core Services by all PCPs	\$6,209	36,620	\$2,907,430	29.07
3.	All services by assigned PCP	\$6,171	38,128	\$2,665,267	29.07
4.	All services by any PCP	\$8,540	50,129	\$3,399,729	29.07
5.	PCAL services definition 1	\$14,714	84,824	\$6,225,181	29.07
6.	PCAL services, definition 2	\$14,113	81,248	\$6,114,394	29.07
7.	Total outpatient spending	\$67,029	392,492	\$26,805,828	29.07
8.	Total spending on all services	\$120,481	702,973	\$52,565,025	29.07

PseudoPCP results on 8 measures

Table 1C Pseudo PCPs with >= 800 patients

	Pseudo PCP analysis (N= 1,379)			Mean Number of patients
	Mean	Std. Dev	Max.	
1. PC Core Services by assigned PCP	\$162,870	133,391	\$2,259,826	1086.02
2. PC Core Services by all PCPs	\$231,925	177,375	\$3,034,946	1086.02
3. All services by assigned PCP	\$230,507	191,645	\$2,790,214	1086.02
4. All services by any PCP	\$318,992	245,523	\$3,586,058	1086.02
5. PCAL services definition 1	\$549,605	409,087	\$6,573,649	1086.02
6. PCAL services, definition 2	\$527,152	392,834	\$6,454,772	1086.02
7. Total outpatient spending	\$2,503,641	1,922,736	\$28,231,874	1086.02
8. Total spending on all services	\$4,500,175	3,484,114	\$52,752,125	1086.02

Alternative PCAL measures are very highly correlated at the NEWPCP level

Correlation at the NEWPCP Level (actual values)

	1.	2.	3.	4.	5.	6.	7.	8.
1. PC Core Services by assigned PCP	1							
2. PC Core Services by all PCPs	0.96	1						
3. All services by assigned PCP	0.84	0.86	1					
4. All services by any PCP	0.81	0.88	0.97	1				
5. PCAL services definition 1	0.75	0.82	0.89	0.93	1			
6. PCAL services, definition 2	0.80	0.87	0.92	0.96	0.98	1		
7. Total outpatient spending	0.68	0.75	0.85	0.90	0.97	0.96	1	
8. Total spending on all services	0.66	0.74	0.83	0.88	0.96	0.96	0.99	1

Correlation at the NEWPCP level (Predicted values using HCC Model)

	1.	2.	3.	4.	5.	6.	7.	8.
1. PC Core Services by assigned PCP	1							
2. PC Core Services by all PCPs	1.00	1						
3. All services by assigned PCP	0.97	0.97	1					
4. All services by any PCP	0.97	0.97	1.00	1				
5. PCAL services definition 1	0.93	0.94	0.99	0.99	1			
6. PCAL services, definition 2	0.94	0.95	0.99	0.99	1.00	1		
7. Total outpatient spending	0.87	0.88	0.96	0.96	0.99	0.98	1	
8. Total spending on all services	0.85	0.86	0.95	0.95	0.98	0.98	1.00	1

Alternative PCAL measures are highly correlated at the PSEUDOPCP level

Correlation at the PSEUDOPCP level (actual values)

	1	2	3	4	5	6	7	8
1. PC Core Services by assigned PCP	1							
2. PC Core Services by all PCPs	0.95	1						
3. All services by assigned PCP	0.79	0.80	1					
4. All services by any PCP	0.73	0.83	0.95	1				
5. PCAL services definition 1	0.65	0.73	0.82	0.89	1			
6. PCAL services, definition 2	0.72	0.80	0.87	0.93	0.97	1		
7. Total outpatient spending	0.54	0.62	0.78	0.84	0.96	0.94	1	
8. Total spending on all services	0.52	0.61	0.75	0.82	0.94	0.94	0.98	1

Correlation at the PSEUDOPCP level (Predicted values using HCC Model)

	1	2	3	4	5	6	7	8
1. PC Core Services by assigned PCP	1							
2. PC Core Services by all PCPs	1.00	1						
3. All services by assigned PCP	0.94	0.95	1					
4. All services by any PCP	0.94	0.95	1.00	1				
5. PCAL services definition 1	0.88	0.89	0.99	0.99	1			
6. PCAL services, definition 2	0.90	0.91	0.99	0.99	0.99	1		
7. Total outpatient spending	0.79	0.81	0.94	0.94	0.98	0.97	1	
8. Total spending on all services	0.77	0.79	0.92	0.92	0.96	0.97	0.99	1

Five hypothetical females age 53 – which will have the highest Primary Care Activity Level (PCAL 6)?

1 Healthy person. One HCC for minor infections (cold).

HCC 285 Other Non-Chronic Ear, Nose, Throat, and Mouth Disorders

2. Type 2 diabetic with minor signs of any organ failure

HCC 42 Diabetes with Neurologic or Peripheral Circulatory Manifestation

HCC 234 Hypertension

HCC 270 Diabetic and Other Vascular Retinopathies

3. Type 1 serious diabetic with serious problems.

HCC 41 Diabetes with Renal Manifestation

HCC 45 Type 1 Diabetes Mellitus

HCC 170 Depression

HCC 217 Unstable Angina and Other Acute Ischemic Heart Disease

HCC 303 Acute Nephritis

HCC 305 Acute and Other Urinary Tract Infection

4. Long term HIV patient, on drugs, no AIDS yet.

HCC 3 HIV/AIDS

HCC 44 Diabetes with No or Unspecified Complications

HCC 57 Other Endocrine/Metabolic/Nutritional Disorders

HCC 218 Angina Pectoris/Old Myocardial Infarction

5. CHF patient with no AMI.

HCC 222 Congestive Heart Failure

HCC 230 Specified Heart Arrhythmias

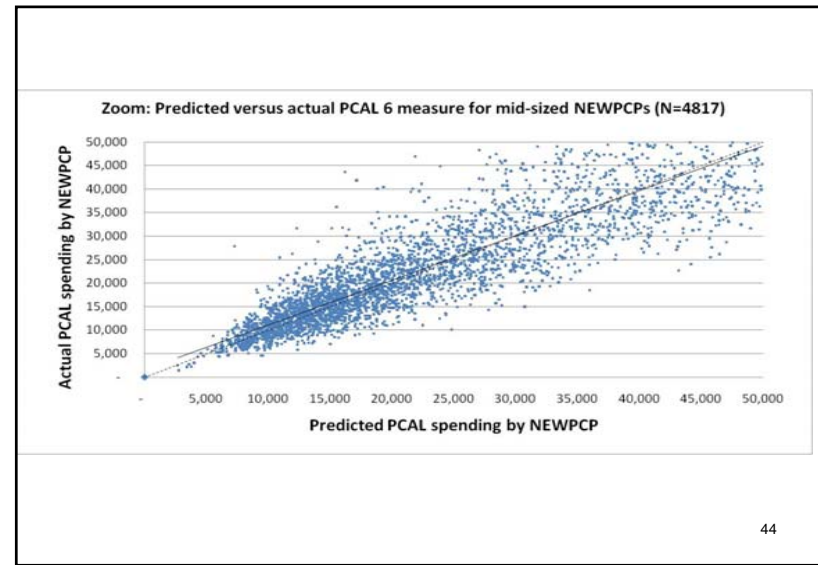
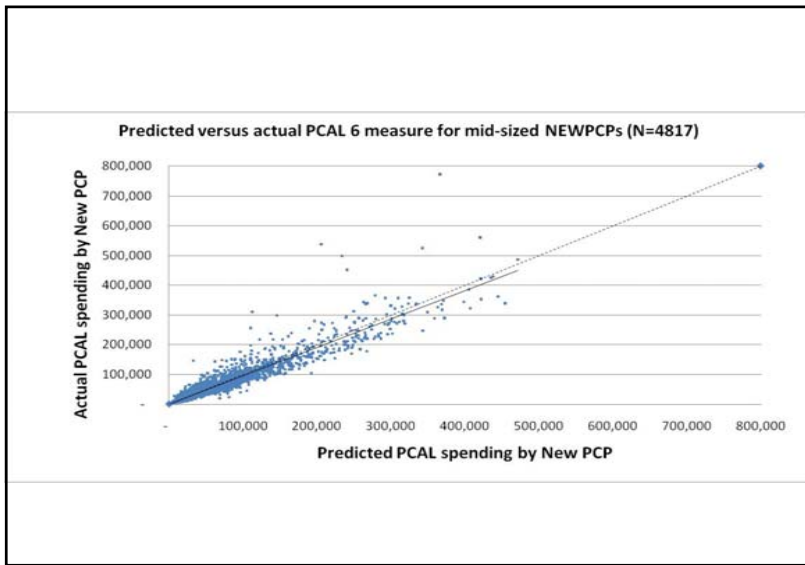
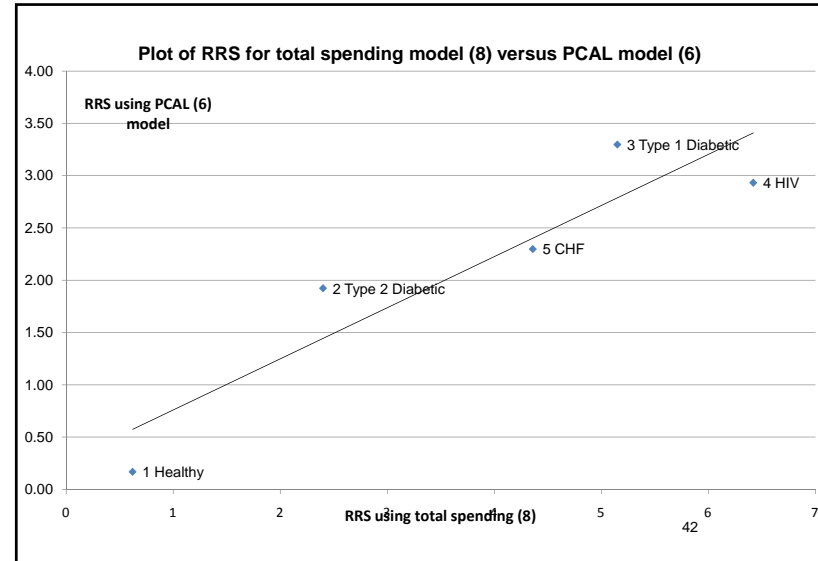
HCC 244 Cerebral Atherosclerosis and Aneurysm

HCC 250 Arteriosclerosis / Aneurysm / Other Vascular Disease

Five hypothetical women – whose PCAL is highest?

	DxCG Full Spending RRS	PCAL RRS
Person 1: Healthy	0.62	0.17
Person 2: Type 2 diabetic	2.40	1.92
Person 3: Type 1 diabetic w serious problems	5.15	3.30
Person 4: Long-term HIV pt	6.42	2.93
Person 5: CHF patient w no AMI	4.36	2.30

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Base Payment Model Findings

- ❖ Predicted PCAL and predicted total cost are related, but rank patients somewhat differently
- ❖ Predicted PCAL is highly discriminating ($R^2 \sim 40-50\%$)
- ❖ Alternative PCAL measures are very highly correlated ($\rho > .90$)
- ❖ Predictions are reasonably stable over time

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Conclusion

- ❖ PCMH is an attractive organizational model that will only work well with good risk adjustment:
 - To make fair payments
 - To judge value
 - To inform consumers
- ❖ Risk based payment models using HCCs can be highly predictive at physician level.
- ❖ Many details still need to be addressed
- ❖ We have made a “good start”
 - On the framework
 - On the empirical modeling

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