Outcomes of Implementing Patient Centered Medical Home Interventions:

A Review of the Evidence from Prospective Evaluation Studies in the United States

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Abundant research comparing nations, states and regions within the US, and specific systems of care has shown that health systems built on a solid foundation of primary care deliver more effective, efficient and equitable care than do systems that fail to invest adequately in primary care.[1,2] However, some policy analysts have questioned whether these largely cross-sectional, observational studies are adequate for making inferences about whether implementing major policy interventions to strengthen primary care as part of health reform would in the relatively short term "bend the cost curve" at the same time as improving quality of care and patient outcomes.

In October 2009, we issued a review of available research evidence from prospective, controlled studies of patient centered medical home interventions in the United States designed to enhance and improve primary care. This report updates our review of patient centered medical home evaluations. Since our 2009 report, findings from several additional evaluations of patient centered medical home interventions have been released. These include some patient centered medical home initiatives mentioned in our 2009 report which have released updated findings from ongoing assessments, as well as evaluations of new patient centered medical home initiatives not included in last year's report. In total, the patient centered medical home initiatives included in this report involve more than a million patients cared for in thousands of diverse practice settings, involving both private and public payers.

The findings from our updated review are entirely consistent with those of our 2009 report: Investing in primary care patient centered medical homes results in improved quality of care and patient experiences, and reductions in expensive hospital and emergency department utilization. There is now even stronger evidence that investments in primary care can bend the cost curve, with several major evaluations showing that patient centered medical home initiatives have produced a net savings in total health care expenditures for the patients served by these initiatives.

Section 1 of the report provides a summary of the key findings on cost related outcomes. Section 2 provides more background information about each patient centered medical home model and includes data on quality and access in addition to costs, as well as reference citations. The methods used in the review are described in the Appendix.

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Section 1:

Summary of Data on Cost Outcomes from Patient Centered Medical Home Interventions

A. Integrated Delivery System PCMH Models

Group Health Cooperative of Puget Sound

- $10 PMPM reduction in total costs; total PMPM cost $488 for PCMH patients vs. $498 for control patients (p=.076).

- 16% reduction in hospital admissions (p<.001); 5.1 admissions per 1,000 patients per month in PCMH patients vs. 5.4 in controls. $14 PMPM reduction in inpatient hospital costs relative to controls. 29% reduction in emergency department use (p<.001); 27 emergency department visits per 1,000 patients per month in PCMH patients vs. 39 in controls. $4 PMPM reduction in emergency department costs relative to controls.

Geisinger Health System ProvenHealth Navigator PCMH Model

- 18% reduction in hospital admissions relative to controls: 257 admissions per 1,000 members per year in PCMH patients vs. 313 admissions per 1,000 members per year in controls (p<.01). Within PCMH cohort, admission rates decreased from 288 per 1,000 members per year at baseline to 257 during PCMH intervention period.

- 7% reduction in total PMPM costs relative to controls (p=.21).

Veterans Health Administration and VA Midwest Healthcare Network, Veterans Integrated Service Network 23 (VISN 23)

- For Chronic Disease Management model PCMH for high-risk patients with COPD, composite outcome for all hospitalizations or ED visits 27% lower in the CDM group (123.8 mean events per 100 patient-years) compared to the UC group (170.5 mean events per 100 patient-years) (rate ratio 0.73; 0.56-0.90; p < 0.003). The cost of the CDM intervention was $650 per patient. The total mean ± SD per patient cost that included the cost of CDM in the CDM group was $4491 ± 4678 compared to $5084 ± 5060 representing a $593 per patient cost savings for the CDM program.

- Comparable reductions in ED and hospitalizations were found for Veterans Health Administration PCMH interventions targeting other patients with chronic conditions.

HealthPartners Medical Group BestCare PCMH Model

- 39% decrease in emergency department visits and 24% decrease in hospital admissions per enrollee between 2004 and 2009.

- Overall costs for enrollees in HealthPartners Medical Group decreased from being equal to the state average in 2004 to 92% of the state average in 2008, in a state with costs already well below the national average.

Intermountain Healthcare Medical Group Care Management Plus PCMH Model

- Reduced hospitalizations in PCMH group; by year 2 of follow-up, 31.8% of PCMH patients had been hospitalized at least once vs 34.7% of control patients (p=.23). Among patients with diabetes, 30.5% of the PCMH group were hospitalized vs 39.2% of controls (p=.01).

- Net reduction in total costs was $640 per patient per year ($1,650 savings per year among highest risk patients).

B. Private Payer Sponsored PCMH Initiatives

BlueCross BlueShield of South Carolina-Palmetto Primary Care Physicians

- 10.4% reduction in inpatient hospital days per 1,000 enrollees per year among PCMH patients, from 542.9 to 486.5. Inpatient days 36.3% lower among PCMH patients than among control patients. 12.4% reduction in emergency department visits per 1,000 enrollees per month among PCMH patients, from 21.4 to 18.8. Emergency department visits per 1,000 enrollees were 32.2% lower among PCMH patients than among control patients.

- Total medical and pharmacy costs PMPM were 6.5% lower in the PCMH group than the control group.

BlueCross BlueShield of North Dakota-MeritCare Health System

- Hospital admissions decreased by 6% and emergency department visits decreased by 24% in the PCMH group from 2003 to 2005, while increasing by 45% and 3%, respectively, in the control group. In 2005, PCMH patients had 13.02 annual inpatient admissions per 100 patients, compared with 17.65 admissions per 100 patients in the control group. PCMH patients had 20.31 annual emergency department visits per 100 members, compared with 25.00 among control patients.

- In 2005, total costs per member per year were $530 lower than expected in the intervention group based on historical trends. Between 2003 and 2005, total annual expenditures per PCMH patient increased from $5,561 to $7,433, compared with a much larger increase among control patients from $5,868 in 2003 to $10,108 in 2005.

Metropolitan Health Networks-Humana (Florida)

- Hospital days per 1,000 enrollees dropped by 4.6% in the PCMH group compared to an increase of 36% in the control group. Hospital admissions per 1,000 customers dropped by 3%, with readmissions 6% below Medicare benchmarks.

- Emergency room expense rose by 4.5% for the PCMH group compared to an increase of 17.4% for the control group. Diagnostic imaging expense for the PCMH group decreased by 9.8% compared to an increase of 10.7% for the control group. Pharmacy expense increases were 6.5% for the PCMH group versus 14.5% for the control group.

- Overall medical expense for the PCMH group rose by 5.2% compared to a 26.3% increase for the control group.

C. Medicaid Sponsored PCMH Initiatives

Community Care of North Carolina

- Cumulative savings of $974.5 million over 6 years (2003-2008). 40% decrease in hospitalizations for asthma and 16% lower emergency department visit rate.

Colorado Medicaid and SCHIP

- Median annual costs $785 for PCMH children compared with $1,000 for controls. In an evaluation specifically examining children in Denver with chronic conditions, PCMH children had lower median annual costs ($2,275) than those not enrolled in a PCMH practice ($3,404).

D. Other PCMH Programs

Johns Hopkins Guided Care PCMH Model

- 24% reduction in total hospital inpatient days, 15% fewer ER visits, 37% decrease in skilled nursing facility days.
- Annual net Medicare savings of $75,000 per PCMH care coordinator nurse deployed in a practice.

Genesee Health Plan (Michigan)

- 50% decrease in emergency department visits and 15% fewer inpatient hospitalizations, with total hospital days per 1,000 enrollees 26.6% lower than competitors.

Erie County PCMH Model

- Decreased duplication of services and tests, lowered hospitalization rates, with an estimated savings of $1 million for every 1,000 enrollees.

Geriatric Resources for Assessment and Care of Elders

- Use of the emergency department significantly lower. The subgroup defined at the start of the study as having a high risk of hospitalization was found to have significantly lower hospitalization rates compared with high-risk usual care patients.

Section 2:

Full Summaries of Patient Centered Medical Home Interventions and Outcomes

A. Integrated Delivery Systems

Group Health Cooperative of Puget Sound

Group Health Cooperative of Puget Sound, a large, consumer-owned integrated delivery system in the Northwest, is rolling out a major transformation of its primary care practices. In 2007, Group Health Cooperative piloted a patient centered medical home redesign at one of its Seattle clinic sites. The redesign included substantial workforce investments to reduce primary care physician panels from an average of 2,327 patients to 1,800, expand in-person visits from 20 to 30 minutes and use more planned telephone and email virtual visits, and allocate daily "desktop medicine" time for staff to perform outreach, coordination, and other activities. The redesign emphasized team-based chronic and preventive care and 24/7 access using modalities including EHR patient portals.

A controlled evaluation of the pilot clinic redesign, published in peer-reviewed journals,[3,4] found the following:

- **Total lives covered in PCMH model**
  All 7,018 adults enrolled at the Group Health PCMH pilot clinic; patients not selected for risk status or particular health conditions.

- **Comparison group**
  200,970 adults enrolled at the 19 other Group Health clinic sites. Analyses adjusted for any baseline differences between intervention and control groups.

- **Evaluation design and time period**
  Pre-post controlled cohort study with 21 months of follow-up cost and utilization data.

- **Data sources**
  Claims data to measure utilization and costs
  Surveys and quality indicator databases to measure patient experiences and processes of care.

- **Cost and utilization outcomes**
  $10 PMPM reduction in total costs; total PMPM cost $488 for PCMH patients vs. $498 for control patients (p=.076).

  16% reduction in hospital admissions (p<.001); 5.1 admissions per 1,000 patients per month in PCMH patients vs. 5.4 in controls. $14 PMPM reduction in inpatient hospital costs relative to controls.

  29% reduction in emergency department use (p<.001); 27 emergency department visits per 1,000 patients per month in PCMH patients vs. 39 in controls. $4 PMPM reduction in emergency department costs relative to controls.

- **Total spending on PCMH enrollees**
  Total PMPM cost $488 for PCMH patients vs. $498 for control patients (p=.076).

- **Return on investment**
  PMPM primary care utilization costs $1.68 more for PCMH patients than for control patients (p=.001).

  When fully accounting for all additional investments in the PCMH model, return on PCMH investment was 1.5:1.

- **Quality outcomes**
  The pilot clinic had an absolute increase of 4% more of its patients achieving target levels on HEDIS quality measures at 12 months, significantly different from the control clinic trend; pilot clinic patients also reported significantly greater improvement on measures of patient experiences, such as care coordination and patient activation, relative to control patient trends.

  Better work environment: Less staff burnout, with only 10% of pilot clinic staff reporting high emotional exhaustion at 12 months compared to 30% of staff at control clinics, despite being similar at baseline; Group Health has seen a major improvement in recruitment and retention of primary care physicians.

As a result of the success of the pilot clinic redesign, Group Health is implementing the PCMH model at all 26 of its primary care clinics serving 380,000 patients.

Geisinger Health System ProvenHealth Navigator PCMH Model

The Geisinger Health System, a large integrated delivery system in Pennsylvania, implemented a patient centered medical home redesign in 11 of its primary care practices beginning in 2006, phased in over 17 months. Their ProvenHealth Navigator model focuses on Medicare beneficiaries, emphasizing primary care-based care coordination with team models featuring nurse care coordinators, EHR decision-support and performance incentives.[5]

- **Total lives covered in PCMH model**
  8,634 Medicare Advantage enrollees in PCMH practices; included all Medicare Advantage enrollees at these practices; not selected for risk status or health conditions.

- **Comparison group**
  6,676 Medicare Advantage enrollees at non-PCMH Geisenger network practices, matched using propensity scores to identify patients with similar case mix profile.

- **Evaluation design and time period**
  Pre-post controlled cohort study with 3 years of follow-up data.

- **Data sources**
  Claims data to measure utilization and costs, including patient out-of-pocket costs but excluding pharmacy costs.[6]

- **Cost and utilization outcomes**
  18% reduction in hospital admissions relative to controls: 257 admissions per 1,000 members per year in PCMH patients vs. 313 admissions per 1,000 members per year in controls ($p<.01$). Within PCMH cohort, admission rates decreased from 288 per 1,000 members per year at baseline to 257 during PCMH intervention period.

  7% reduction in total PMPM costs relative to controls ($p=.21$).

- **Total spending on PCMH enrollees**
  Published evaluation did not report actual spending amount PMPM "to protect the confidentiality of GHP payment information." National Medicare spending per beneficiary, excluding pharmacy benefits and patient cost-sharing, is more than $7,000 per beneficiary per year. By extrapolation, a 7% reduction in spending per Geisenger Medicare Advantage PCMH enrollee could conservatively be estimated to save $500 per enrollee per year.

- **Return on investment**
  Geisinger has estimated in unpublished reports an ROI of more than 2 to 1 for its investment in its PCMH model, and is spreading the ProvenHealth Navigator PCMH model throughout the Geisenger Health System.

- **Quality outcomes**
  Statistically significant improvements in quality of preventive (74.0% improvement), coronary artery disease (22.0%) and diabetes care (34.5%) for PCMH pilot practice sites.

Veterans Health Administration and VA Midwest Healthcare Network, Veterans Integrated Service Network 23 (VISN 23)

Veterans Health Administration is the largest integrated health care delivery system in the country, providing health care services to 7,817,694 enrollees and 5,447,889 unique veterans in 2009. VA Midwest Healthcare System (VISN 23) encompasses Minnesota, North and South Dakota, Iowa and Nebraska and provides health care to 392,993 enrollees and 298,109 unique veterans. VISN 23 invested substantial workforce and telehealth resources in 2006 to establish VISN-wide chronic disease management (CDM) based on the Wagner Chronic Disease Model. Veterans at highest risk for acute hospitalization related to chronic disease were targeted for intervention including assigned Chronic Disease RN care/case managers and telehealth home monitoring (CCHT). Building upon CDM efforts, in 2008 VISN 23 piloted a patient centered medical home (subsequently branded Patient Aligned Care Team—PACT—in the Veterans Health Administration) in a rural-based primary care outpatient clinic. This pilot project redesigned clinical delivery to be team-based, continuously improving, and performance oriented. The pilot project leveraged the electronic medical record and existing chronic disease care capabilities to enhance population-based care as well as improve community partnerships for co-managed care with the private sector.

- **Total lives covered in PCMH model**
  Managed in CDM: 10,847 October 2007–August 2009. Managed in PACT (PCMH) Pilot: 2,407 July 2008–August 2009.

- **Comparison group**
  For CDM, randomized groups with intervention and control arms. For PACT, controls were non-PACT patients at same facility and also VHA statewide comparison group.

- **Evaluation design and time period**
  CDM 2006-2010; PACT 2008–ongoing. For CDM, design was a randomized clinical trial. For PACT, design was a prospective cohort study. CDM evaluations have been published[7] and submitted for publication[8,9] in peer-reviewed journals.

- **Data sources**
  Multiple sources including randomized control trials, primary data collection, VHA Support Service Center and Decision Support System Cost and Clinical Measures, VISN 23 Clinical Outcomes (HEDIS-like) measures, VISN 23 Patient Satisfaction Survey, and VA Nebraska-Western Iowa Clinical Outcomes (HEDIS-like) measures.

- **Cost and utilization outcomes**
  Chronic Disease Management—COPD: VISN 23 Hi-Mod risk COPD patients assigned a chronic disease case manager and provided a home action plan (n=373) showed a 51% relative risk reduction compared to controls (n=370) in ED visits and 31% relative risk reduction for acute hospitalization.

  Chronic Disease Management—COPD: High-risk CDM (n=372) and high-risk Usual Care (n=371) composite outcome for all hospitalizations or ED visits were 27% lower in the CDM group (123.8 mean events per 100 patient-years) compared to the UC group (170.5 mean events per 100 patient-years) (rate ratio 0.73; 0.56-0.90; $p < 0.003$). The cost of the CDM intervention was $241,620 or $650 per patient. The total mean ± SD per patient cost that included the cost of CDM in the CDM group was $4491 ± 4678 compared to $5084 ± 5060 representing a $593 per patient cost savings for the CDM program.[9]

  Chronic Disease Management—CHF: VISN 23 Hi-Mod risk CHF patients that were case managed and/or on CCHT for at least 12 consecutive weeks during the past 6 months in FY 2010 reduced ED/UC visits by 35% compared to baseline. At baseline (FY09Q3), 445 ED/UC visits by 249 CDM-CCHT CHF patients (1.79 visits/pt;

178.71 VA ED or UC visits/100 CDM-CCHT CHF patients) in the preceding 6 months; at end (FY10Q3), 351 ED/UC visits by 303 CDM/CCHT CHF patients (1.16 visits/pt; 115.84 VA ED or UC visits/100 CDM-CCHT CHF patients) in the preceding 6 months.

Chronic Disease Management DM—CHF: Long-term impact of CDM on CHF admission and ED visit rates for 144 CHF case/care managed patients, paired sample, retrospective design with patients serving as their own control. (Non-published). On average, there were 0.15 fewer admissions/patient for heart failure 15 months after initial date of case management compared to 15 months before initial date of case management. On average, there were 1.02 fewer ED visits/patient for heart failure 15 months after initial date of case management compared to 15 months before initial date of case management.

- **Total spending on PCMH enrollees**
  Total costs calculated for evaluation of Chronic Disease Management—COPD program focused on high-risk patients. The total mean ± SD per patient cost that included the cost of CDM in the CDM group was $4491 ± 4678 compared to $5084 ± 5060 representing a $593 per patient cost savings for the CDM program.[9]

- **Return on investment**
  Investment cost for enhanced PCMH care was assessed for the PACT program. For a primary care face-to-face patient visit per individual primary care provider, the mean Direct Cost/Visit was higher for the PACT team providers ($175) compared to the same facility non-PACT team providers ($163) for July 2008– Jan. 2009. The overall change in total costs of care for patients in the PACT model has not yet been computed, but based on the overall cost savings of the VHA CDM model it is reasonable to expect that the marginal added cost of PACT primary care visits would be more than offset by the savings from reductions in emergency department and acute hospital services.

- **Quality outcomes**
  CDM-COPD: All cause mortality was 10.1/100 patient yr in the intervention group and 13.8 /100 patient yr in the usual care group (p = 0.09).[7] CDM–Diabetes: % of patients with 1 year of CDM vs. Usual Care achieving therapeutic goals of HgbA1C < 8.0% and LDL < 100 and BP < 130/80 was 22.3% with CDM and 10.4% with usual care (n=556).[8]

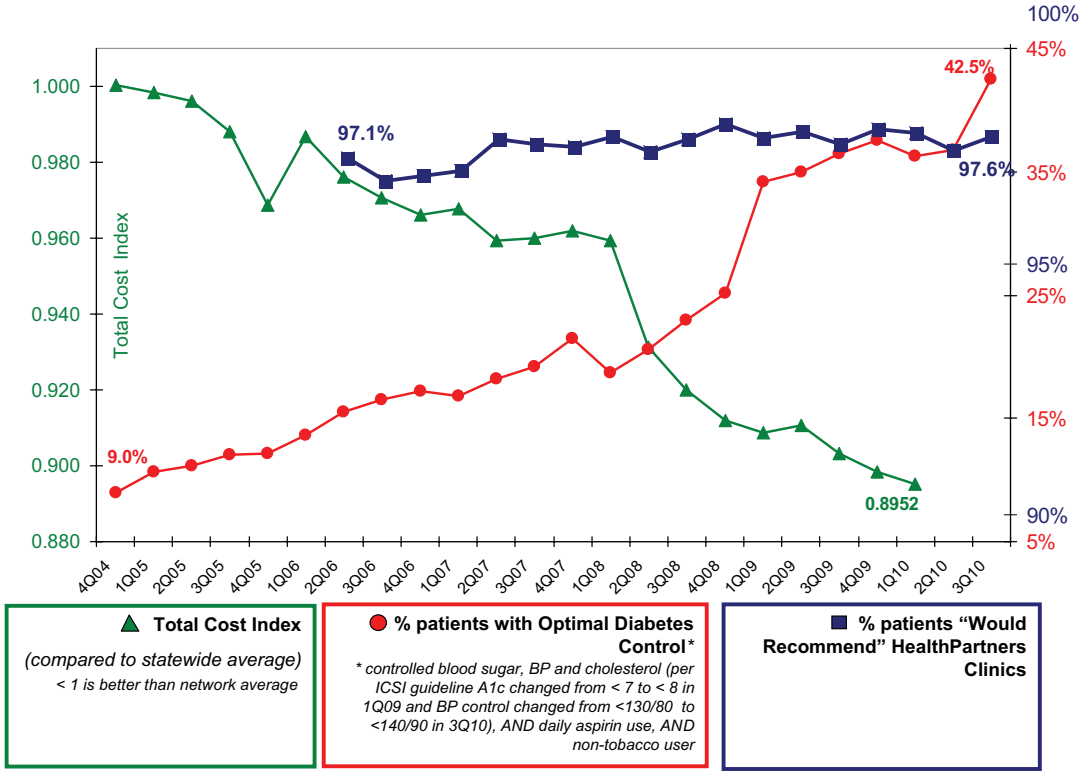
  PACT—Diabetes: Diabetic patients in PACT improved HgbA1C < 9.0% from 91% of diabetic patients to 96%, compared to same facility non-PACT (90% to 92%) and VA statewide (89% to 90%) in 12 months. HTN control in diabetic patients: PACT improved blood pressure control (<130/80) from 47% to 62% of diabetic patients with hypertension, compared to same facility non-PACT (40% to 49%) and VA statewide (42% to 45%) in 12 months. Lipid control in diabetic patients: PACT improved lipid control (LDL < 100) from 78% of diabetic hyperlipidemic patients to 86%, compared to same facility non-PACT (77% to 80%) and VA statewide (72% to 80%) in 12 months.

  PACT—HTN: PACT improved blood pressure control (<140/90 mmHg) from 82% of patients with hypertension to 86%, compared to same facility non-PACT (80% to 80%) and VA statewide (74% to 76%) in 12 months.

  PACT—Access: PACT team improved face-to-face clinic visit access from mean 26.5 days (Third Next Available Appointment) to 14 days (high 26.5 days, low 6.8 days) in 15 months, compared to same facility non-PACT mean of 31.5 days to 17.8 days (high 31.6 days, low 5.4 days).

  PACT—Patient Satisfaction: From July 2008 to April of 2009, overall patient satisfaction (Good

TRIPLE AIM: Health-Experience-Affordability HealthPartners Clinics



Source: HealthPartners

or Excellent, 5 point Likert scale) in PACT team went from 89% of respondents to 84%, compared to same facility non-PACT team with overall patient satisfaction scores of 76% to 80%.

VHA is currently implementing the PACT model PCMH model across the entire VHA system. Chronic disease management is embedded in the PACT model as part of the responsibilities of the PACT teamlets.

HealthPartners Medical Group

HealthPartners Medical Group, a 700-physician group that is part of a consumer-governed health organization in Minnesota, implemented a patient centered medical home model in 2004 as part of its "BestCare" model of delivery system redesign. The BestCare model invested in better care coordination centered in the primary care medical home, including proactive chronic disease management through phone, computer and face-to-face coaching. The program also emphasized more convenient access to primary care through online scheduling, test results, email consults and post-visit coaching, and has become the standard model in HealthPartners Medical Group primary care sites. [10,11]

- **Total lives covered in PCMH model**
  More than 350,000 HealthPartners plan enrollees cared for by HealthPartners Medical Group.

- **Comparison group**
  For costs, expenditures for HealthPartners members compared with average Minnesota per person health expenditures. No control group for quality evaluation.

- **Evaluation design and time period**
  5-year longitudinal tracking of cost and quality data for enrollees between 2004 and 2009.

- **Data sources**
  Claims data and quality databases.

- **Cost and utilization outcomes**
  39% decrease in emergency department visits and 24% decrease in hospital admissions per enrollee between 2004 and 2009.

- **Total spending on PCMH enrollees**
  Overall costs for enrollees in HealthPartners

Medical Group decreased from being equal to the state average in 2004 to 92% of the state average in 2008, in a state with costs already well below the national average.

- **Return on investment**
  Not reported.

- **Quality outcomes**
  129% increase in PCMH patients receiving optimal diabetes care, 48% increase in PCMH patients receiving optimal heart disease care. 350% reduction in appointment waiting time at PCMH clinics.

Intermountain Healthcare Medical Group Care Management Plus PCMH Model

Intermountain Healthcare Medical Group, part of an integrated delivery system in Utah, began implementing a PCMH redesign model in 2001. The Care Management Plus PCMH model focuses on primary care-based care coordination of high-risk elders, embedding RN care managers in primary care practices and enhancing EHR functionality in support of chronic care and care coordination.[12]

- **Total lives covered in PCMH model**
  1,144 patients aged 65 or over with at least one chronic condition and a need for targeted care management, at 7 primary care practices.

- **Comparison group**
  2,288 patients at 6 control primary care clinics, matched to intervention patients by age, gender and clinical risk profile.

- **Evaluation design and time period**
  Prospective, controlled matched trial, conducted between 2002 and 2005.

- **Data sources**
  Intermountain Healthcare utilization and clinical databases.

- **Cost and utilization outcomes**
  Reduced hospitalizations in PCMH group; by year 2 of follow-up, 31.8% of PCMH patients had been hospitalized at least once vs. 34.7% of control patients (p=.23). Among patients with diabetes, 30.5% of the PCMH group were hospitalized vs 39.2% of controls (p=.01).

- **Total spending on PCMH enrollees**
  Net reduction in total costs was $640 per patient per year ($1,650 savings per year among highest risk patients).

- **Quality outcomes**
  Absolute reduction of 3.4% in 2-year mortality (13.1% died in PCMH group, 16.6% in controls, p=.07).

Based on these evaluation results, the Care Management Plus PCMH model is now being implemented at more than 75 practices in more than 6 states.

B. Private Payer Sponsored PCMH Initiatives

BlueCross BlueShield of South Carolina-Palmetto Primary Care Physicians

In 2009, BlueCross BlueShield of South Carolina and BlueChoice Health Plan partnered with a medical group, Palmetto Primary Care Physicians, in a PCMH program targeting diabetics. The PCMH model includes care teams to coordinate patient outreach and support activities, and a blended payment model to primary care physicians consisting of fee-for-service payments, monthly care coordination payments and performance-based incentive payments. Palmetto Primary Care Physicians has approximately 55 primary care providers at 22 sites. Participating sites were NCQA-recognized level 3 medical homes.[13]

- **Total lives covered in PCMH model**
  809 BCBS enrollees with diabetes who were continuously enrolled in the PCMH model for 1 year.

- **Comparison group**
  6,558 continuously enrolled BCBS diabetic patients treated by all other primary care providers in the Charleston area. Age and gender profile was similar for PCMH and control groups.

- **Evaluation design and time period**
  Pre-post controlled cohort study with 1 year of follow-up data.

- **Data sources**
  Claims data to measure utilization and costs.

- **Cost and utilization outcomes**
  10.4% reduction from baseline to 1-year follow up in inpatient hospital days per 1,000 enrollees per year among PCMH patients, from 542.9 to 486.5. Inpatient days were 36.3% lower among PCMH patients than among control patients at 1 year; at baseline, the PCMH group had 10.3% more inpatient days per year than the control group.

  12.4% reduction from baseline to 1-year follow up in emergency department visits per 1,000 enrollees per month among PCMH patients, from 21.4 to 18.8. Emergency department visits per 1,000 enrollees were 32.2% lower among PCMH than among control patients at 1 year; at baseline, the PCMH group had 13.7% fewer emergency department visits per 1,000 enrollees than the control group.

- **Total spending on PCMH enrollees**
  At 1 year, total medical and pharmacy costs PMPM were 6.5% lower in the PCMH group than the control group. At baseline, total costs per enrollee were almost identical in the 2 groups.

- **Return on investment**
  Not reported.

- **Quality outcomes**
  PCMH patients demonstrated improvements on 6 of the 10 quality metrics assessed: LDL levels less than 100, mAB testing, annual eye exam, reduced BMI, regular HbA1C testing and HbA1c less than 8.

As a result of the success of the initial PCMH initiative, South Carolina BCBS launched a second PCMH initiative in October 2009 for nearly 300 Federal Employee Program members—the second medical home pilot approved by FEP in the nation—and has also started PCMH initiatives with 2 other medical groups with NCQA-recognized level 3 medical homes.

BlueCross BlueShield of North Dakota-MeritCare Health System

Not-for-profit MeritCare Health System is an integrated delivery system in North Dakota with 430 employed physicians and 180 non-physician clinicians at 46 clinic sites in North Dakota and Minnesota. Blue Cross Blue Shield initiated a PCMH model for diabetic patients in 2005 at one of the MeritCare primary care clinics, replacing an external disease management program with a primary care-oriented care management program that embedded a nurse at the primary care medical home and included tracking of clinical indicators and shared-savings for reduced costs for the patients in the model.[14]

- **Total lives covered in PCMH model**
  192 BCBS enrollees with diabetes participating in the PCMH model.

- **Comparison group**
  Unspecified number of BCBS patients with diabetes cared for at a control MeritCare clinic.

- **Evaluation design and time period**
  Pre-post controlled cohort study comparing 2003 and 2005 data.

- **Data sources**
  Claims data to measure utilization and costs, adjusted for case mix.

- **Cost and utilization outcomes**
  Hospital admissions decreased by 6% and emergency department visits decreased by 24% in the PCMH group from 2003 to 2005, while increasing by 45% and 3%, respectively, in the control group. In 2005, PCMH patients had 13.02 annual inpatient admissions per 100 patients, compared with 17.65 admissions per 100 patients in the control group. PCMH patients had 20.31 annual emergency department visits per 100 members, compared with 25.00 among control patients.

- **Total spending on PCMH enrollees**
  In 2005, total costs per member per year were $530 lower than expected in the intervention group based on historical trends, saving an estimated $102,000 for the 192 patients in the PCMH model. Between 2003 and 2005, total annual expenditures per PCMH patient increased from $5,561 to $7,433, compared with a much larger increase among control patients from $5,868 in 2003 to $10,108 in 2005.

- **Return on investment**
  Not reported.

- **Quality outcomes**
  18% increase in the proportion of patients at the PCMH site who received a "complete care" bundle of five recommended services—a physician office visit, hemoglobin A1c test, eye exam, lipid test and microalbumin test—from 48.5% in 2003 to 57.4% in 2005, compared to a nonsignificant decline in this bundle of measures at the control site, from 57.3% in 2003 to 53.7% in 2005.

Because of these successful outcomes, the MeritCare control clinic adopted the same PCMH model in 2006, and total costs among patients at that clinic fell to match those of the initial PCMH site by 2007. BCBS of North Dakota is now spreading the PCMH model statewide.

Metropolitan Health Networks-Humana

Metropolitan Health Networks, Inc., operates several primary care practices in Florida, and partnered with Humana on a PCMH initiative for patients in a Humana Medicare Advantage plan. The PCMH model was piloted at several practices between November 2008 and October 2009. The practices were paid under a capitated contract and participated in a comprehensive practice evaluation, focusing on process, workflow, forms and policies and procedures and implementation of team-care models, HIT innovations and other approaches to achieve a more patient-centered model of care.[15]

- **Total lives covered in PCMH model**
  Not specified.

- **Comparison group**
  Control group of Medicare Advantage patients cared for at non-PCMH sites under capitated contracts.

- **Evaluation design and time period**
  Pre-post cohort study comparing baseline data from Nov. 2007–Oct. 2008 with intervention period data from Nov. 2008–Oct. 2009.

- **Data sources**
  Claims data.

- **Cost and utilization outcomes**
  Hospital days per 1,000 enrollees dropped by 4.6% in the PCMH group compared to an increase of 36% in the control group. Hospital admissions per 1,000 customers dropped by 3%, with readmissions 6% below Medicare benchmarks.

  Emergency room expense rose by 4.5% for the PCMH group compared to an increase of 17.4% for the control group. Diagnostic imaging expense for the PCMH group decreased by 9.8%

compared to an increase of 10.7% for the control group. Pharmacy expense increases were 6.5% for the PCMH group versus 14.5% for the control group.

- **Total spending on PCMH enrollees**
  Overall medical expense for the PCMH group rose by 5.2% compared to a 26.3% increase for the control group.

- **Return on investment**
  Not stated.

- **Quality outcomes**
  Breast and colorectal cancer screening rates were 13.3% and 6.3% higher respectively, compared to the control group. Seasonal influenza vaccination rates increased to 64%, compared to the national average of 43%. 94% of diabetic patients in PCMH group had an A1C level of less than 9%. Customer satisfaction results improved or stayed the same in 45 of 61 categories.

Based on the success of this PCMH pilot, Metropolitan Health Networks is spreading the PCMH model throughout its network of primary care practices in Florida and applying for NCQA medical home recognition.

C. Medicaid Sponsored PCMH Initiatives

Community Care of North Carolina

Community Care of North Carolina has more than a decade of experience with innovations in the delivery of primary care to Medicaid and SCHIP beneficiaries. Community Care linked these beneficiaries to a primary care medical home, provided technical assistance to practices to improve chronic care services, directly hired a cadre of nurses to collaborate with practices in case management of high-risk patients, and added a $2.50 (now $3.00) per member per month care coordination fee for each patient registered with the practice, contingent on practices reporting clinical tracking data. The Community Care PCMH program now involves more than 1,300 community-based practice sites with approximately 4,500 primary care clinicians throughout North Carolina.[16, 17, 18]

- **Total lives covered in PCMH model**
  970,000 Medicaid and SCHIP enrollees annually in North Carolina.

- **Comparison group**
  Medicaid and SCHIP enrollees in North Carolina in fee-for-service, non-PCMH model care.

- **Evaluation design and time period**
  External evaluation conducted by Mercer comparing costs in 2003-2007 for Medicaid and SCHIP enrollees in Community Care of North Carolina with those for non-PCMH Medicaid and SCHIP enrollees in the state, adjusted for case mix using the Johns Hopkins Adjusted Clinical Groups method.

- **Data sources**
  Medicaid and SCHIP claims data.

- **Cost and utilization outcomes**
  Cumulative savings of $974.5 million over 6 years (2003-2008). 40% decrease in hospitalizations for asthma and 16% lower emergency department visit rate.

- **Return on investment**
  Not reported.

- **Quality outcomes**
  93% of asthmatics received appropriate maintenance medications; diabetes quality measures improved by 15%.

Colorado Medicaid and SCHIP

The Colorado Department of Health Care Policy and Financing has implemented a patient centered medical home program for low-income children enrolled in the

state's Medicaid and SCHIP programs. To qualify as medical homes, primary care practices must have 24/7 access, open access systems or similar convenient scheduling of appointments, and provide care coordination; these make practices eligible for extra pay-for-performance payments indexed to EPSDT metrics. As of March 2009, when the evaluation was performed, the PCMH initiative involved 310 physicians working at 97 different practices.

The Colorado Department of Health Care Policy and Financing has performed an internal evaluation of its PCMH program.[19]

- **Total lives covered in PCMH model**
  As of March 2009, 150,000 children in Colorado Medicaid and State Children's Health Insurance Programs were enrolled in PCMH practices.

- **Comparison group**
  Colorado Medicaid and SCHIP children not enrolled in PCMH designated practices.

- **Evaluation design and time period**
  Cross-sectional comparison of children in Medicaid and SCHIP receiving care in the PCMH model vs. usual care.

- **Data sources**
  State Medicaid and SCHIP data.

- **Cost and utilization outcomes**
  Median annual costs were $785 for PCMH children compared with $1,000 for controls, due to reductions in ER visits and hospitalizations.

- **Total spending on PCMH enrollees**
  Median annual costs $785 for PCMH children compared with $1,000 for controls. In an evaluation specifically examining children in Denver with chronic conditions, PCMH children had lower median annual costs ($2,275) than those not enrolled in a PCMH practice ($3,404).

- **Return on investment**
  Not specified

- **Quality outcomes**
  72% of children in the PCMH practices have had well-child visits, compared with 27% of controls.

D. Other PCMH Programs

Johns Hopkins Guided Care PCMH Model

The Guided Care PCMH model, organized by a group at Johns Hopkins School of Medicine features care coordination by teams of RNs and primary care physicians working in community-based practices. Guided Care model RNs are trained to teach patients and families self-management skills, including early identification of worsening symptoms that can be addressed before an emergency department or hospital admission becomes necessary. The RNs focus on Medicare beneficiaries in the top quartile of health risk.

A preliminary evaluation after 8 months of a cluster randomized trial of this model involving 904 patients has been published in a peer-reviewed journal.[20] The trends indicate:

- 24% reduction in total hospital inpatient days
- 15% fewer ER visits
- 37% decrease in skilled nursing facility days
- Annual net Medicare savings of $75,000 per Guided Care nurse deployed in a practice

Genesee Health Plan

The Genesee Health Plan, based in Flint, Michigan, developed a patient centered medical home model for its health plan serving 25,000 uninsured adults. The Genesee PCMH model, called Genesys HealthWorks, invested in a team approach to improve health and

reduce costs, including a Health Navigator to work with primary care clinicians to support patients to adopt healthy behaviors, improve chronic and preventive care and provide links to community resources.

A 4-year longitudinal evaluation of the patient centered medical home approach used in the Genesys HealthWorks model, as reported by the Institute for Healthcare Improvement,[21] found the following results:

- Improved access: 72% of the uninsured adults in Genesee County now identify a primary care practice as their medical home.
- Better quality: 137% increase in mammography screening rates; 36% reduction in smoking and improvements in other healthy behaviors.
- Reduction in ER and inpatient costs: 50% decrease in ER visits and 15% fewer inpatient hospitalizations, with total hospital days per 1,000 enrollees now cited as 26.6% lower than competitors.

Erie County PCMH Model

In the 1990s, Erie County, New York implemented a primary care medical home program for dual eligible Medicaid-Medicare patients with chronic disabilities, including substance abuse. A key part of the intervention was a per-member/per-month care coordination fee to primary care practices to support enhanced team-based chronic care management. An evaluation published in a peer-reviewed journal found that the intervention improved quality of care, decreased duplication of services and tests, lowered hospitalization rates and improved patient satisfaction while saving $1 million for every 1,000 enrollees.[22]

Geriatric Resources for Assessment and Care of Elders

The Geriatric Resources for Assessment and Care of Elders (GRACE) program, situated at an urban system of community clinics affiliated with the Indiana University School of Medicine, enrolled low-income seniors with multiple diagnoses, one-fourth of whom were at high-risk for hospitalization. The GRACE PCMH model included a nurse practitioner/social worker care coordination team, working closely with primary care physicians and a geriatrician. At 2 years, the use of the emergency department was significantly lower in the group receiving the GRACE intervention compared with controls. The subgroup defined at the start of the study as having a high risk of hospitalization was found to have a significantly lower hospitalization rate compared with high-risk usual care patients.[23]

Appendix: Review Methods

We reviewed peer-reviewed and non-peer-reviewed literature to identify evaluations of patient centered medical home interventions. To be eligible for inclusion in the review, evaluations needed to assess an intervention in the United States that consisted of a change in a primary care delivery model that involved at least some of the key redesign principles of the patient centered medical home. The evaluations also needed to report outcome data on service utilization and costs, and not only quality of care or patient experiences, and to include some type of control group to allow comparisons of outcomes between the PCMH intervention patients and patients who did not receive care under a PCMH model. When evaluations reported formal tests of significance, we cite the p values in our review.

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