Effects of New Funding Models for Patient-Centered Medical Homes on Primary Care Practice Finances and Services: Results of a Microsimulation Model

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ABSTRACT

PURPOSE We assess the financial implications for primary care practices of participating in patient-centered medical home (PCMH) funding initiatives.

METHODS We estimated practices' changes in net revenue under 3 PCMH funding initiatives: increased fee-for-service (FFS) payments, traditional FFS with additional per-member-per-month (PMPM) payments, or traditional FFS with PMPM and pay-for-performance (P4P) payments. Net revenue estimates were based on a validated microsimulation model utilizing national practice surveys. Simulated practices reflecting the national range of practice size, location, and patient population were examined under several potential changes in clinical services: investments in patient tracking, communications, and quality improvement; increased support staff; altered visit templates to accommodate longer visits, telephone visits or electronic visits; and extended service delivery hours.

RESULTS Under the status quo of traditional FFS payments, clinics operate near their maximum estimated possible net revenue levels, suggesting they respond strongly to existing financial incentives. Practices gained substantial additional net annual revenue per full-time physician under PMPM or PMPM plus P4P payments ($113,300 per year, 95% CI, $28,500 to $198,200) but not under increased FFS payments (−$53,500, 95% CI, −$69,700 to −$37,200), after accounting for costs of meeting PCMH funding requirements. Expanding services beyond minimum required levels decreased net revenue, because traditional FFS revenues decreased.

CONCLUSIONS PCMH funding through PMPM payments could substantially improve practice finances but will not offer sufficient financial incentives to expand services beyond minimum requirements for PCMH funding.

INTRODUCTION

As of 2014 at least 114 distinct initiatives from state, federal, and private payers funded primary care clinics to offer services as patient-centered medical homes (PCMHs)—practices delivering comprehensive care for most health problems; coordinating care among multiple clinicians; and achieving heightened standards for accessibility, quality, and safety.[1-4] These initiatives, which now involve at least 21 million patients in the United States,[4] intend to improve access and quality while delivering population-based care at lower cost.[1-3] To do so amidst workforce constraints, practices face challenges, including adopting process improvement techniques and electronic registries for care management, expanding care teams, offering patients longer in-person visits and access to electronic or telephone visits, and extending night and/or weekend business hours to enhance care access.[1,5-8] According to recent national surveys, 3 major payment strategies have dominated PCMH initiatives: increased fee-for-service (FFS) payments, traditional FFS payments with additional per-member-per-month (PMPM) payments, and

traditional FFS payments with PMPM and pay-for-performance (P4P) payments.[4,7]

To date, studies of PCMH performance have tracked patient outcomes and total medical spending, with generally positive quality but mixed cost results.[9-19] An unaddressed question, however, is how current PCMH funding models affect the financial sustainability of primary care practices and particularly whether current PCMH payment initiatives provide sufficient incentives for meaningful practice transformation. One emerging concern is that practices may minimally reform delivery in response to PCMH payment requirements while still pursuing a practice model that maximizes traditional FFS revenue.[20,21] Here, we estimate the revenue and cost implications to primary care practices of delivering services funded by PCMH payment initiatives.

METHODS

We used a previously validated microsimulation model of primary care practices[22,23] to estimate practice-level changes in net annual revenue after PCMH transformation under each of 3 dominant payment approaches supporting PCMH transformation. (increased FFS, PMPM, or PMPM plus P4P).
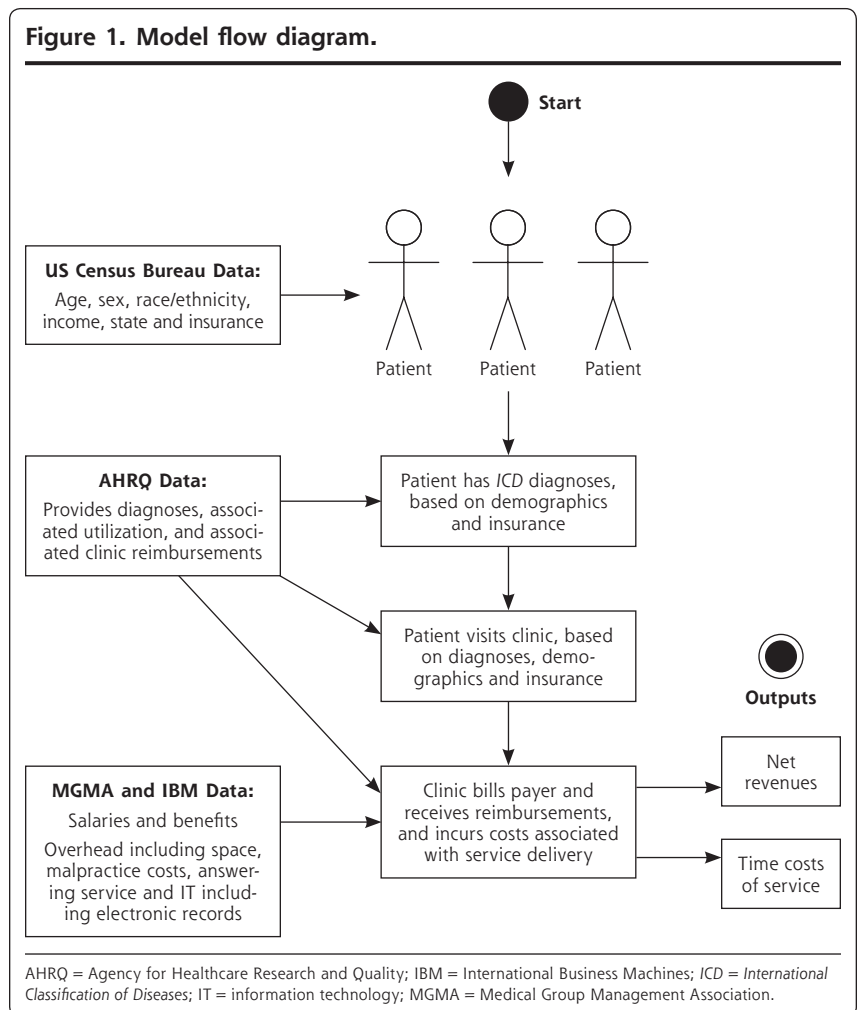
Microsimulation Model

Our model combines (1) a patient-level simulation of patients attending primary care clinics with (2) a practice-level simulation of revenues and costs of service delivery to each clinic (Figure 1). The model was populated by sampling from detailed clinic utilization, revenue, and cost data from national surveys of primary care clinics, including clinics before and after PCMH transformation (Table 1). By structuring the model as a microsimulation, we account for the covariance between practice characteristics and patient characteristics, including billing practice variations. Comprehensive details are provided in the Supplemental Appendix (http://www.annfammed.org/content/14/5/404/suppl/DC1).

At the patient level, the model simulates representative populations of each state and Washington, DC,[24] and insurance coverage estimates among each population subsequent to the Patient Protection and Affordable Care Act[33] (Supplemental Appendix Table 1, http://www.annfammed.org/content/14/5/404/suppl/DC1). Based on age, sex, race/ethnicity, income, and insurance status, the model assigns diagnoses to each individual (by *International Classification of Disease-Ninth Revision*) to reflect the distribution of diagnoses (including comorbidities) across demographic groups,[25] then estimates the number of outpatient visits and payments to clinics associated with these visits.[25] Payment estimates account for geographic variations in billing and reimbursement by clinician and payer.

At the practice level, the model estimates visits and payments to primary care practices per year using national survey data.[26] The model calculates practice costs for both personnel (staffing ratios and staff salaries per full-time physician)[28] and overhead expendi-

Figure 1. Model flow diagram.

AHRQ = Agency for Healthcare Research and Quality; IBM = International Business Machines; *ICD* = *International Classification of Diseases*; IT = information technology; MGMA = Medical Group Management Association.

tures (staff benefits, building/occupancy, information technology, medical supply equipment, administrative supplies, liability insurance and fees, laboratory and imaging fees, and other ancillary service costs)[34] (Supplemental Appendix Table 2, http://www.annfammed. org/content/14/5/404/suppl/DC1). All revenues and costs are expressed in 2015 US dollars using the Consumer Price Index to adjust for inflation.[35]

For validation, we ensured our model's estimates of utilization, cost, and revenue were within 5% error of independent survey data[36] and revenue and cost data among both pretransformation[37] and posttransforma-

Table 1. Data Inputs to the Model

Parameter	Details	Source
Population demographics within each state population		
Age, y	Cohorts of <5, 5-13, 14-17, 18-24, 25-44, 45-64, 65-84, and >84 y	US Census Bureau[24]
Sex	Cohorts of male or female	
Race/ethnicity	Cohorts of non-Hispanic white, non-Hispanic black, Hispanic, and other	
Income	Housing income relative to household size, expressed relative to federal poverty level	
Insurance status	Cohorts of private, Medicare, Medicaid/CHIP, or self-pay	
Patient features		
Diagnoses among each demographic group	*International Classification of Disease, Ninth Revision*	Agency for Healthcare Research and Quality[25]
Per-person utilization of primary care clinics	Visits per person per year, conditional on demographics, diagnoses, and state of residence	
Practice features		
Reimbursement for each primary care visit	Specific to diagnoses and payer	Agency for Healthcare Research and Quality[25]
Productivity of primary care physicians and midlevel clinicians	Encounters and empanelment per clinician per year, by clinician type (physician, NP, PA)	Medical Group Management Association[26]
Utilization changes associated with changes in staff	Changes in encounters and empanelment given levels of support staff[a]	
Staffing ratios of midlevel clinicians and support staff per full-time physician	Including NPs, PAs, RNs, LPNs, and MAs	
Overhead costs	Including staff benefits, building and occupancy, information technology, drug and medical supply, equipment and administrative supplies, liability insurance and fees, laboratory and imaging fees, and other ancillary service costs	
Compensation costs for clinician	Salary per full-time physician or midlevel clinician per year	Bureau of Labor Statistics[27]
Compensation costs for support staff	Salary per full-time worker per year, by worker type	IBM Kenexa Compensation Analysis[28]
New financing approaches		
Increased FFS payment rates	Median increase of 12% above current *CPT* codes (95% CI, 10%-14%)[b]	CareFirst BlueCross BlueShield[29]
PMPM payment rates	Median of $4.90 per empaneled patient per month (95% CI, $3.00-$8.00)	Survey of patient-centered medical home initiatives[4]
P4P payment rates	Median receipt rate of $2.63 per empaneled patient per annum (95% CI, $1.08-$4.17)[c]	National Academy for State Health Policy[1]
Empanelment rate among new patient encounters (to charge new PMPM fees during panel expansion)	Median of 53% of new encounters (95% CI, 42%-64%) who become additional panel members	Medical Group Management Association[26]
Reimbursement codes for electronic and telephone visits	99444 for electronic, 99441 for telephone, varied by state and payer	Center for Connected Health Policy[30]
Additional infrastructure costs for electronic visits	$240 per year (95% CI, $0-$360)	Telehealth Resource Center[31]
Encounter rate per extended business hour	Regression model of utilization per extended hour[d]	Agency for Healthcare Research and Quality[25]

CHIP = Children's Health Insurance Program; *CPT = Current Procedural Terminology*; FFS = fee for service; IBM =International Business Machines; LPN = licensed practical nurse; MA = medical assistant; NP = nurse practitioner; PA = physician assistant; P4P = pay for performance; PMPM = per-member-per-month; RN = registered nurse.

Note: See Supplemental Appendix Tables 1 and 2 and Supplemental Appendix Figure 1 for full parameter values, http://www.annfammed.org/content/14/5/404/suppl/DC1.

[a] See the Supplemental Appendix Figure 1, http://www.annfammed.org/content/14/5/404/suppl/DC1.

[b] Confidence intervals are estimates of the distribution of input data, not the results of a model of population data estimates, and are used to construct normal probability distributions from which to perform repeated sampling in our probabilistic uncertainty analyses.

[c] Receipt rate incorporates the observed rate of performance target achievement, which we varied in sensitivity analyses from a baseline estimate of 10% to a lower and upper bound of 0% to 100%.[32]

[d] See the Supplemental Appendix, http://www.annfammed.org/content/14/5/404/suppl/DC1.

tion[38] primary care clinics (Supplemental Appendix Figure 2, http://www.annfammed.org/content/14/5/404/suppl/DC1).

PCMH Simulation

We first calculated the changes in costs and revenues per full-time equivalent (FTE) physician if practices changed minimally to meet criteria for new PCMH funding (base case), then estimated what changes to service delivery would maximize net revenues under the new PCMH funding approaches. To provide optimistic financial sustainability estimates for PCMHs, we did not include highly variable up-front costs of transformation in our base-case simulation,[39] only the costs to maintain PCMH functions after transformation. Furthermore, we defined the minimum criteria to match the standards accepted for PCMH financing by payers responding to a previous national PCMH survey,[4] which included basic (level 1) PCMH standards for accreditation by the National Committee for Quality Assurance (NCQA) and accreditation by other major agencies, including the Utilization Review Accreditation Commission and the Joint Commission. The criteria were not limited to NCQA level 3 recognition because many PCMH payment initiatives have been funding practices as PCMHs despite not meeting level 3 criteria; with the more inclusive definition, our results favor PCMH maintenance (ie, does not inflate our cost estimates). Typical staff ratios among practices meeting PCMH criteria were obtained from a survey of 502 practices in 7 regions.[40]

Minimum costs of PCMH maintenance included physical infrastructure charges for patient tracking, quality improvement, communications, and related infrastructure, averaging in 2015 US dollars $2.51 per patient per month (95% CI, $0.95-$4.57) estimated from a national survey of 1,009 practices[38] (updated from $2.26 in 2009 dollars using the Consumer Price Index, not significantly different from the estimate of $2.08, 95% CI, $0.58-$4.83, from a more limited survey of 20 practices, excluding one-time transformation costs,[39] and estimates from smaller surveys in Utah [8 practices, $3.85] and Colorado [12 practices, $4.83]).[41] Salaries and overhead costs incurred for support staff were incorporated into all cost tabulations (Supplemental Appendix and Table 1), whereas the effects of support staff on clinic efficiency and productivity (eg, through extended team roles) were incorporated by Monte Carlo sampling from the probability distribution of encounters and revenue associated with different staffing ratios[26] (Supplemental Appendix Figure 1, http://www.annfammed.org/content/14/5/404/suppl/DC1). As an additional check of face validity, our estimates for PCMH monthly maintenance costs per 1 FTE physician were approximately $70,750 (95% CI,

$10,670-$51,320), not significantly different from the independent estimate of $64,768 per year (95% CI, 18,585-$83,856) from a recent survey of 12 practices.[39]

FFS revenues were assigned for each visit according to Table 1. Median PMPM rates, obtained from a national survey of PCMH funding initiative participants (Table 1),[4] were multiplied by the number of empaneled patients, estimated as the number of encounters multiplied by the ratio of empaneled patients to encounters (median of 53% of visits are empaneled, 95% CI, 42% to 64%, per national practice surveys [Table 1], and increased in sensitivity analyses).[26] P4P bonuses (Table 1) were distributed at the mean achievement rate of approximately 10% (also increased in sensitivity analyses).[32]

We next estimated changes in revenues and costs if practices offered PCMH functionality beyond minimum levels required for funding by increasing the staffing ratios above the minimum levels observed in a survey of 502 transforming practices across the nation[40] and by altering visit templates and service hours as anticipated under the PCMH model. Visit template alterations included (1) extending visit length by 5 minutes, lowering overall visit volume per day but using higher billing codes that reflected more time spent per patient; or (2) converting 10% of routine follow-up visits to electronic or telephone visits (reimbursed per payer-specific rates for *CPT* [*Current Procedural Terminology*] code 99444 for 10-minute electronic visits, or 99441 for 10-minute telephone visits), and adding 5 minutes documentation time and infrastructure costs (Table 1).[30,31,42] Shifting established patients to electronic or telephone visits enabled practices to open appointment slots for new and established patients. We distributed the open slots among new vs established patients in the same ratio as existing visit ratios at each clinic. Extended service hours included evening and weekend business hours during which the typical number of visits per hour was estimated from the Medical Expenditure Panel Survey (Table 1)[25]; costs of extending service hours included staff compensation for a physician or nurse practitioner, plus hourly overhead costs including support staff for the clinician, building space, and utility costs (Supplemental Appendix Table 2).[26]

Optimization

We performed an optimization analysis to identify what changes to support staff, visit templates, and service delivery hours would maximize net revenue before and after PCMH transformation. A generalized pattern search algorithm was used to repeatedly run the model across all possible combinations of staff, visit, and delivery hour changes to maximize net revenue per FTE physician under each payment approach.[43]

Break-Even Analysis

We estimated the probability that a PCMH would maintain positive net revenue after several possible service delivery changes: if adding 1 FTE for each type of support staff (care coordinator, registered nurse [RN], licensed practical nurse [LPN], or medical assistant [MA]) if adding 5 minutes to each visit (with coding also increased 1 level for these longer visits), if converting 10% of in-person visits to telephone or electronic visits, or if adding 1 business day equivalent (8 hours of evening/weekend service) per week in a practice of 5 FTE physicians (the median practice size). The probability was calculated by running the model 10,000 times, drawing repeatedly from the range of each input parameter (Supplemental Appendix Table 2 and Supplemental Appendix Figure 1) to estimate the frequency with which the clinic achieved positive net revenues after each service delivery change.[44]

Sensitivity Analyses

In sensitivity analyses, we varied the P4P bonus achievement rate (to 100%). We also varied PCMH payment rates, service delivery costs, and patient utilization rates from 80% to 120% of their base-case values (Table 1). We further investigated whether PCMH transformation produced such clinical efficiency that costs of PCMH maintenance became negative (a net cost savings) at up to $5 saved per patient per month. We explored the impact of risk-adjusting PMPM rates using the algorithm utilized by the Centers for Medicare and Medicaid Services.[45] Finally we performed subgroup analysis by state to identify geographic variations in net revenue (Supplemental Appendix).

All analyses were performed in *R* (v. 3.1.2, The R Foundation for Statistical Computing).

RESULTS

In the primary data sources used to populate the model, median gross annual revenues among primary care practices were $487,390 per year from standard FFS payments (95% CI, $205,231-$955,765) from a total of $871,069 in charges (95% CI, $365,54-$1,749,134) per FTE physician.[26] Based on these gross revenues, costs of clinic operations per FTE physician, including physician and support staff salaries and benefits, material costs, and overhead expenditures, totaled $443,569 (95% CI, $182,882-$876,449) per year.[26]

Financial Outcomes Before Medical Home Transformation

Before PCMH transformation, practice revenue optimization did not require major modifications to baseline support staffing ratios, visit templates, or service

delivery hours to maximize net annual revenues from traditional FFS payments. The staffing ratios that maximized net revenues included 0 FTEs for a care coordinator, 0.45 FTEs for RNs, 0.78 FTEs for LPNs, and 1.25 FTEs for MAs per 1 FTE physician (Supplemental Appendix). Visit duration did not increase, nor were electronic or telephone visits included (because of lost FFS revenue from routine office visit volume; Table 2). Evening and weekend business hours increased slightly (to 2.7 evening or weekend hours per week), beyond which overhead and staffing costs exceeded expected revenues from extended business hours.

Financial Outcomes After Medical Home Transformation

Under current types of PCMH funding initiatives, practices experienced increases in gross annual revenue of $55,700 to $222,500 when only minimally reforming their staffing ratio and infrastructure to meet funding requirements (Table 2). At piloted rates of reimbursement, increased FFS financing generated the least revenue compared with PMPM or PMPM plus P4P. Net revenue under increased FFS financing was lower after PCMH transformation than under traditional FFS payments before PCMH transformation ($53,464 lost per FTE physician per year, 95% CI, $37,203-$69,725 lost). PMPM and PMPM plus P4P, by contrast, always resulted in net revenue gains compared with traditional FFS (Table 2 and Figure 2).

Altered Staffing Ratios

As shown in Table 2, increasing staff beyond the minimum required for PCMH funding reduced net revenue under all scenarios. The costs of salary, benefits, and overhead for staff exceeded the revenue benefits from increased efficiency and support from a greater number of staff members. Probabilistic sensitivity and uncertainty analyses across the range of observed minimum staffing levels (Table 1) did not alter this outcome.

Altered Visit Templates

Extending visit length or offering electronic or telephone visits reduced net revenue because of the staffing costs of implementation (Table 2). In the most revenue-generating scenario, where clinics adopted the PMPM plus P4P payment model, no new revenues were produced, but new annual costs of $168,700 were incurred from extending visit length by 5 minutes (as a result of lost FFS revenue from forfeited visits).

Extended Business Hours

By contrast, extended business hours increased net revenues for practices. Under the increased FFS approach, net revenue was maximized by extending evening or

weekend hours to 3.0 hours per week (95% CI, 2.7-3.2 hours), whereas under both the PMPM and PMPM plus P4P approaches, net revenue was maximized by increasing hours to 3.8 hours per week. At these levels, net revenues increased marginally by between $500 and $1,000 per year per FTE physician (Table 2). Beyond these extended hours levels, salary and overhead costs of each additional hour exceeded anticipated revenues.

Break Even Analysis

Figure 3 illustrates the probability that a clinic, after meeting minimum practice transformation requirements, would maintain positive net revenues after increasing support staff, altering visit templates, or

extending service hours under the new PCMH financing approaches. The probability that the new PCMH funding could support the addition of 1 FTE care coordinator for a median practice size of 5 FTE physicians ranged from 0% under increased FFS to 89% (95% CI, 55%-100%) under PMPM plus P4P bonuses. The probability was low for supporting routine electronic or telephone visits (less than 5%), and high for supporting extended business hours (100% in all simulation scenarios).

Sensitivity Analyses

Sensitivity analyses did not produce significant changes to the staffing ratios, visit templates, or busi-

Table 2. Model-Based Estimates of Changes in Net Revenue per Full-Time Physician for Primary Care Clinics Delivering PCMH Services Compared With the Net Revenue in the Traditional FFS Clinic Before PCMH Transformation

Change in Net Revenue ($/FTE physician/year)	Traditional FFS $ (95% CI)	Increased FFS $ (95% CI)	PMPM $ (95% CI)	PMPM plus P4P Bonuses $ (95% CI)	Maximizing Net Revenues Under PCMH Payment Initiatives
Minimum required changes for PCMH funding[a]	N/A	−53,464 (−69,725 to −37,203)	103,835 (24,462 to 183,208)	113,343 (28,511 to 198,176)	N/A
Service delivery enhancements					
Optimize staff ratio[b]	46,722 (25,737 to 155,577)	−53,464 (−69,725 to −37,203)	103,835 (24,462 to 183,208)	113,343 (28,511 to 198,176)	FTEs: 0.23 CC, 0.31 RN, 0.53 LPN, 1.11 MA
Extend visit length by 5 min[c]	−119,092 (−170,874 to −83,002)	−184,925 (−255,049 to −149,057)	−62,771 (−156,974 to −57,134)	−55,390 (−152,320 to −52,719)	Not in optimal result
Replace 10% of visits with electronic visits[d]	−16,175 (−17,134 to −15,165)	−71,497 (−83,935 to −59,960)	80,427 (11,394 to 145,836)	89,610 (15,611 to 159,704)	Not in optimal result
Replace 10% of visits with telephone visits[d]	−16,151 (−17,107 to −15,144)	−71,473 (−83,915 to −59,931)	80,451 (11,413 to 145,868)	89,634 (15,629 to 159,736)	Not in optimal result
Extend evening/weekend hours[e]	380 (373 to 386)	−52,959 (−69,227 to −36,692)	104,781 (25,402 to 184,160)	114,321 (29,482 to 199,159)	3.0-3.8 h/wk
Net revenue-maximizing combination[f]	47,101 (26,110 to 155,963)	−52,959 (−69,227 to −36,692)	104,781 (25,402 to 184,160)	11,4321 (29,482 to 199,159)	FTEs: 0.23 CC, 0.31 RN, 0.53 LPN, 1.11 MA + 3.0-3.8 h/wk evening/weekend service

CC = care coordinator; FFS = fee for service; FTE = full-time equivalent; LPN = licensed practical nurse; MA = medical assistant; P4P = pay for performance; PCMH = patient-centered medical home; PMPM = per member per month; RN = registered nurse.

Note: Revenues include 4 funding scenarios: traditional FFS, increased FFS, PMPM, and PMPM plus P4P bonus. Confidence intervals in parentheses are from probabilistic sensitivity analyses in which the model was rerun 10,000 times while sampling from the probability distributions of all input parameters to generate confidence intervals around model results.

[a] Meets basic criteria of PCMH funding initiatives, cataloged previously,[4] incorporating changes in communication, care management, external coordination, patient tracking, test/referral tracking, and quality improvement at an inflation-adjusted cost of $2.51 per patient per month (95% CI, $0.95-$4.57).[35] Staffing ratios include a minimum of 0.23 FTE for a CC (0.21-0.25), 0.31 FTE for an RN (0.28-0.34), 0.53 FTE for an LPN (0.50-0.56), and 1.11 FTE for an MA per FTE physician (1.09-1.13).[40] Probabilistic sensitivity and uncertainty analyses performed across the listed CIs through repeated sampling from corresponding normal distributions of minimum staffing levels to assess robustness of results. All costs expressed in 2015 US dollars.

[b] Adjusted support staff (CC, RN, LPN, and MA) levels per full-time physician, determined by repeated sampling from observed joint probability distributions linking staffing levels across clinicians and support staff to encounters and empanelment (Supplemental Appendix Figure 1, http://www.annfammed.org/content/14/5/404/suppl/DC1), then detecting which combinations of staffing levels maximized net revenue while still meeting the minimum PCMH funding requirements. Note that maximum net revenue was achieved by minimum staffing in all PCMH funding scenarios.

[c] Increasing visits by 5 minutes each from the baseline length at each simulated clinic.

[d] Simulated as replacing 10% of regular in-person encounters.

[e] Optimization involved finding the number of evening or weekend hours per week that would maximize net revenues for the clinic, calculating medical revenue from each additional business hour of providing service availability during nights and weekends via a midlevel practitioner, and subtracting the costs of compensation and overhead expenditure for those hours.

[f] Includes optimized clinic activities in all above-mentioned domains.

ness hours that maximized net revenues for clinics. Increasing the P4P bonus success rate from 10% to 100% (Supplemental Appendix Table 3, http://www.annfammed.org/content/14/5/404/suppl/DC1) increased net revenues by $88,900 per FTE physician per year under the PMPM funding approach plus P4P bonuses. Varying payment rates in each PCMH financing approach minimally changed the optimal number of extended business hours (Supplemental Appendix Tables 4-5, http://www.annfammed.org/content/14/5/404/suppl/DC1). Under higher payment rates, altering visit templates to extend visit length or adding telephone or electronic visits generated greater losses to clinics than in the base case, because lost in-person visit revenue was greater. Varying service delivery costs and patient utilization rates produced minimal changes to revenue-maximizing number of extended business hours without otherwise altering the optimization results (Supplemental Appendix Tables 6-9, http://www.annfammed.org/content/14/5/404/suppl/DC1). The optimization result also did not change whether PCMH maintenance produced net savings instead of costs, or whether PMPM rates were risk-adjusted (Supplemental Appendix Tables 10 and 11, http://www.annfammed.org/content/14/5/404/suppl/DC1). Variations in patient population, billing behavior, and reimbursement rates by state did not change practice optimization, but they did produce as much as a $76,400/year per FTE physician difference in net revenue after PCMH transformation in different states (Supplemental Appendix Table 12, http://www.annfammed.org/content/14/5/404/suppl/DC1).

DISCUSSION

Although investments in the PCMH should be informed by benefits to patient care, the decision at a practice level remains influenced by financial outcomes, particularly given the tenuous financial sustainability of many primary care practices. The goal of primary care practice is to improve patient care. PCMH transformation has the additional goal of increasing general investment in primary care. Achieving these goals requires financial sustainability over the near-term, but the costs of these goals have been prohibitive, and providing high-value care has in turn been limited.

Our model-based analyses suggest that if PCMH funding initiatives were expanded through current PMPM-based funding approaches (but not increased FFS at currently-piloted rates), primary care practices could expect to gain net revenue by participating in the initiatives. Although clinics under the traditional FFS payment system are operating near their revenue-maximizing levels of staffing and service delivery—suggesting that clinics are highly responsive to financial incentives—they would not gain additional revenues by investing incremental PCMH payments in increasing staff or altering visit templates beyond the minimally required levels to meet PCMH funding requirements. The costs of hiring additional clinic staff were not offset by increased clinic efficiency or workflow. Extending in-person visits or offering minimally or unreimbursed telephone or electronic visits resulted in lost revenue generated by traditional FFS office-based visits.

These findings contribute important new insights to the literature on PCMHs, explaining why some previous evaluations of PCMH demonstrations have shown mixed impact. Studies have not clearly established what factors determine whether PCMH

Figure 2. **Net revenue changes per full-time physician per year from clinics meeting minimum requirements to receive PCMH funding, as compared with the clinic operating under traditional fee-for-service payments.**
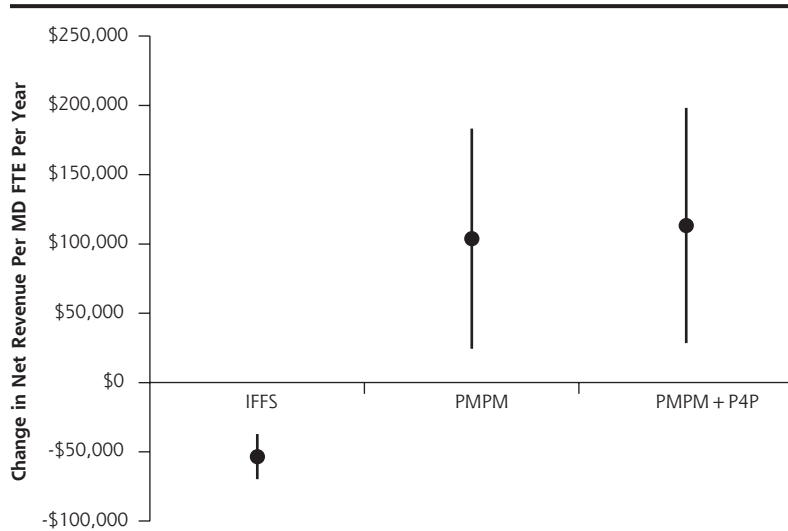
IFFS = increased fee for service; P4P = pay for performance; PCMH = patient-centered medical home; PMPM = per-member-per-month.

Note: The PCMH funding approaches include IFFS rates, PMPM funding, and PMPM plus P4P bonuses (Table 1). The uncertainty ranges portrayed incorporate 3 sets of uncertainty through repeated sampling from the probability distributions of the input parameters: uncertainty in levels of utilization and associated revenue, cost to the practice including staff compensation and other practice costs, and payments through the new PCMH financing approaches (eg, level of payment increase from IFFS).

Figure 3. Break even analysis, which identified the probability with which key medical home services could be supported by a clinic without achieving negative net revenue.
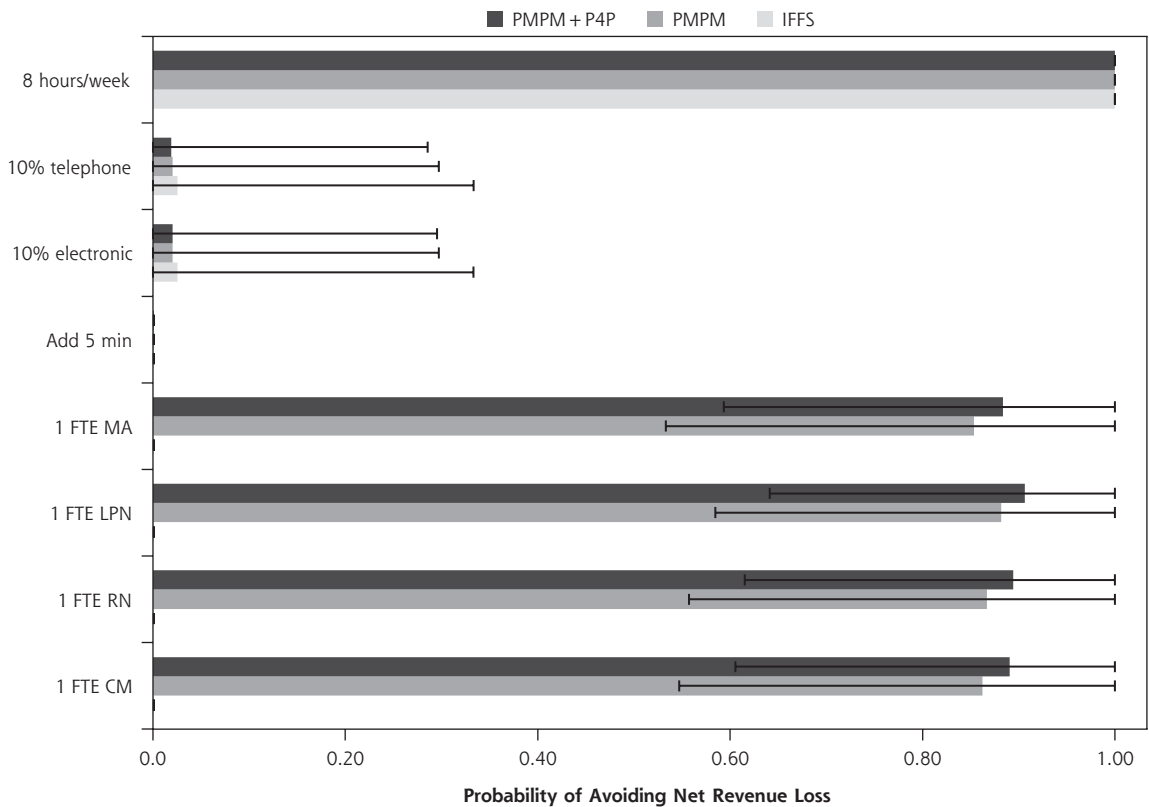
CC = care coordinator; FTE = full-time equivalent; IFFS = increased fee for service; LPN = licensed practical nurse; MA = medical assistant ; P4P = pay for performance; PMPM = per member per month; RN = registered nurse.

Note: We specifically calculated the probability that a clinic would not lose net revenue through the addition of 1 FTE for each type of support staff (CC, RN, LPN, and MA); when adding 5 minutes to each visit; when converting 10% of routine visits to electronic or telephone visits; or when adding 1 full business day (8 evening/weekend business hours) per week in a median practice size of 5 FTE physicians.

transformations are financially sustainable for practices. Our model suggests that although PCMH transformation initiatives have adopted a team-based delivery approach,[14,15,46] more radical payment reforms may be required to adequately fund these changes at the practice level. Phrased differently, practices must receive more robust non–visit-based payment mechanisms to provide an incentive to sustain transformation. The recently announced Comprehensive Primary Care Plus model aims to promote this type of payment reform in its Track 2, which incorporates higher PMPM amounts, larger performance bonuses, and perhaps most importantly, upfront per capita population-based payments that offset gradual reductions in FFS reimbursements.[47]

Our study fills an important gap in the literature because existing demonstration-project evaluation efforts have focused on system-level cost savings (eg, through fewer emergency department or specialty visits), which have been inconsistently observed.[10,14-16,18,48-62] For many practices, revenue gains must be observed at the practice level to justify practice-level workforce and time use changes. Another key advantage is that our modeling allows us to compare different reforms in the same practices, unlike demonstration projects for which it is unclear whether differences in outcomes are due to differences in the PCMH funding program itself or preexisting practice differences.

Our findings were robust to wide variations in levels of payment, cost, and clinic performance but have some important limitations. There are insufficient or no publicly available data on some new PCMH funding strategies, such as fully capitated payment, shared-savings programs, and the alternative payment model from Medicare. Our model will have to be extended as new payment strategies emerge with large-scale data. The number of staff required to meet PCMH requirements in the model was also based on a

pilot study involving a limited sample size of practices that elected into transformation[40]; nationwide, less ambitious or PCMH-ready clinics may require even more staff to assist in transformation, rendering our results conservative. Our results are also conservative because we examined the net revenue after transformation, not the costs of transformation itself, which remains highly variable.

Some clinics may choose to lose revenue in the interest of service enhancement, as long as they remain financially sustainable. Hence, we examined what levels of service would permit clinics to break even. Expanding business hours would be among the most revenue-generating strategies for delivering PCMH services, consistent with earlier findings,[63] and could be adopted sustainably under any of the PCMH funding initiatives. Notably, however, the current level of incentivized extended business hours were limited to about 3 hours per week, which may not be of important clinically.

Our model does not provide an answer to what practices should do, only what fiscal outcomes may occur after different decisions. We cannot predict health or experiential changes, which can be more directly assessed through traditional evaluation methods[3,6,64-72]; hence, we focused on the financial implications of practice-level management decisions, which are often assessed through modeling.

In a microsimulation model of primary care practices, current PMPM-based funding for patient-centered medical homes may enhance finances for practices but offers only minimal incentives to change staffing ratios and service delivery strategies. Achieving goals of the PCMH will likely require more radical payment reforms specifically to target funding toward the delivery of desired services.

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