Supplementary Online Content

Markovitz AR, Alexander JA, Lantz PM, Paustian ML. Patient-centered medical home implementation and use of preventive services: the role of practice socioeconomic context. *JAMA Intern Med*. Published online February 16, 2015. doi:10.1001/jamainternmed.2014.8263.

eTable 1. Capabilities Used to Calculate PCMH Implementation Scores, by PCMH Functional Domain

eTable 2. Multivariable Mixed Model Results for the Association Between Medical Home Implementation and Breast Cancer Screening in BCBSM PGIP Practices, July 2009 to June 2012

eTable 3. Multivariable Mixed Model Results for the Association Between Medical Home Implementation and Cervical Cancer Screening in BCBSM PGIP Practices, July 2009 to June 2012

eTable 4. Multivariable Mixed Model Results for the Association Between Medical Home Implementation and Colorectal Cancer Screening in BCBSM PGIP Practices, July 2009 to June 2012

eMethods. Primary Care Relationship Attribution

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eTable 1. Capabilities used to calculate PCMH implementation scores, by PCMH functional domain[1–4]

Domain 1: Patient-Provider Partnership
1.1: Practice unit has developed PCMH-related patient communication tools, has trained staff, and is prepared to implement patient-provider partnership with each established patient, which may consist of a signed agreement or other documented patient communication process to establish patient-provider partnership
1.2: Process of reaching out to established patients is underway, and practice unit is using a systematic approach to inform patients about PCMH, including patients who do not visit the practice regularly
1.3: Patient-provider agreement or other documented patient communication process is implemented and documented for at least 10% of current patients
1.4: Patient-provider agreement or other documented patient communication process is implemented and documented for at least 30% of current patients
1.5: Patient-provider agreement or other documented patient communication process is implemented and documented for at least 50% of current patients
1.6: Patient-provider agreement or other documented patient communication process is implemented and documented for at least 60% of current patients
1.7: Patient-provider agreement or other documented patient communication process is implemented and documented for at least 80% of current patients
1.8: Patient-provider agreement or other documented patient communication process is implemented and documented for at least 90% of current patients
Domain 2: Patient Registry
2.1: A paper or electronic all-payer registry is being used to manage all established patients in the practice unit with Diabetes
2.2: Registry incorporates patient clinical information, for all established patients in the registry, for a substantial majority of health care services received at other sites that are necessary to manage chronic care and preventive services for the population
2.3: Registry incorporates evidence-based care guidelines
2.4: Registry information is available and in use by the practice unit team at the point of care
2.5: Registry contains information on the individual attributed practitioner for every patient currently in the registry who has a medical home in the practice unit
2.6: Registry is being used to generate routine, systematic communication to patients regarding gaps in care
2.7: Registry is being used to flag gaps in care for every patient currently in the registry
2.9: Registry is fully electronic, comprehensive and integrated, with analytic capabilities
2.10: Registry is being used to manage all patients with persistent Asthma
2.11: Registry is being used to manage all patients with Coronary Artery Disease
2.12: Registry is being used to manage all patients with Congestive Heart Failure
2.13: Registry is being used to manage patients with at least 2 other chronic conditions for which there are evidence-based guidelines and the need for ongoing population and patient management, and which are sufficiently prevalent in the practice to warrant inclusion in the registry based on the judgment of the practice leaders
2.14: Registry incorporates preventive services guidelines and is being used to generate routine, systematic communication to all patients in the practice regarding needed preventive services

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Domain 3: Performance Reporting
3.1: Performance reports that allow tracking and comparison of results at a specific point in time across the population of patients are generated for Diabetes
3.2: Performance reports are generated at the population level, practice unit, and individual provider level
3.3: Performance reports include patients with at least 2 other chronic conditions for which there are evidence-based guidelines and the need for ongoing population and patient management, and which are sufficiently prevalent in the practice to warrant inclusion in the registry based on the judgment of the practice leaders
3.4: Data contained in performance reports has been fully validated and reconciled to ensure accuracy
3.5: Trend reports are generated, enabling physicians and their POs/sub-POs to track, compare and manage performance results for their population of patients over time
3.7: Performance reports include all current patients in the practice, including well patients, and include data on preventive services
3.8: Performance reports include patient clinical information for a substantial majority of health care services received at other sites that are necessary to manage chronic care and preventive services for the population
3.9: Performance reports include information on services provided by specialists
3.10: Performance reports are generated for the population of patients with persistent asthma
3.11: Performance reports are generated for the population of patients with Coronary Artery Disease
3.12: Performance reports are generated for the population of patients with Congestive Heart Failure
Domain 4: Individual Care Management
4.1: Practice unit leaders and staff have been trained/educated and have comprehensive knowledge of the Patient Centered-Medical Home model, the Chronic Care model, and practice transformation concepts
4.2: Practice unit has developed an integrated team of multi-disciplinary providers and a systematic approach is in place to deliver coordinated care management services that address patients' full range of health care needs for at least one chronic condition
4.3: Systematic approach is in place to ensure that evidence-based care guidelines are established and in use at the point of care by all team members of the practice unit
4.5: Development of written action plan and goal-setting is systematically offered to all patients with the chronic condition selected for initial focus, with substantive patient-specific and patient-friendly documentation provided to the patient
4.6: A systematic approach is in place for appointment tracking and generation of reminders for all patients with the chronic condition selected for initial focus
4.7: A systematic approach is in place to ensure that follow-up for needed services is provided for all patients with the chronic condition selected for initial focus
4.8: Planned visits are offered to all patients with the chronic condition selected for initial focus
4.9: Group visit option is available for all patients in the practice unit with the chronic condition selected for initial focus (as appropriate for the patient)
4.10: Medication review and management is provided at every visit for all patients with chronic conditions
4.11: Action plan development and goal-setting is systematically offered to all patients with chronic conditions or other complex health care needs prevalent in practice’s patient population
4.12: A systematic approach is in place for appointment tracking and generation of reminders for all patients

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4.13: A systematic approach is in place to ensure follow-up for needed services for all patients
4.14: Planned visits are offered to all patients with chronic conditions prevalent in practice population
4.15: Group visit option is available to all patients with chronic conditions prevalent in practice population
Domain 5: Extended Access
5.1: Patients have 24-hour access to a clinical decision-maker by phone, and clinical decision-maker has a feedback loop within 24 hours or next business day to the patient's PCMH
5.2: Clinical decision-maker accesses and updates patient's EMR or registry info during the phone call
5.3: Provider has made arrangements for patients to have access to non-ED after-hours provider for urgent care needs during at least 8 after-hours per week and, if different from the PCMH office, after-hours provider has a feedback loop within 24 hours or next business day to the patient's PCMH
5.4: A systematic approach is in place to ensure that all patients are fully informed about after-hours care availability and location, at the PCMH site as well as other after-hours care sites, including urgent care facilities, if applicable
5.5: Practice unit has made arrangements for patients to have access to non-ED after-hours provider for urgent care needs (as defined under 5.3) during at least 12 after-hours per week
5.6: Non-ED after-hours provider for urgent care accesses and updates the patient’s EMR or patient’s registry record during the visit
5.7: Advanced access scheduling is in place, reserving at least 30% of appointments for same-day appointments for acute and routine care (i.e., any elective non-acute/urgent need, including physical exams and planned chronic care services, for established patients)
5.8: Advanced access scheduling is in place reserving at least 50% of appointments for same-day appointment for acute and routine care (i.e., any elective non-acute/urgent need, including physical exams and planned chronic care services, for established patients)
5.9: Practice unit has telephonic or other access to interpreter(s) for all languages common to practice’s established patients
Domain 6: Test Tracking and Follow-up
6.1: Practice has test tracking process/procedure documented, which requires tracking and follow-up for all tests and test results, with identified timeframes for notifying patients of results
6.2: Systematic approach and identified timeframes are in place for ensuring patients receive needed tests and practice obtains results
6.3: Process is in place for ensuring patient contact details are kept up to date
6.4: Mechanism is in place for patients to obtain information about normal tests
6.5: Systematic approach is used to inform patients about abnormal test results
6.6: Systematic approach is used to ensure that patients with abnormal results receive the recommended follow-up care within defined timeframes
6.7: Systematic approach is used to document all test tracking steps in the patient’s medical record
6.8: All clinicians and appropriate office staff are trained to ensure adherence to the test-tracking procedure; all training is documented either in personnel file or in training logs or records
6.9: Practice has Computerized Order Entry integrated with automated test tracking system
Domain 8: E-prescribing
8.1: E-prescribing system is in place and is used by physician champions in the practice unit
8.2: E-prescribing system is in place and is used by all physicians in the practice unit

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Domain 9: Preventive Services
9.1: Primary prevention program is in place that focuses on identifying and educating patients about personal health behaviors to reduce their risk of disease and injury
9.2: A systematic approach is in place to providing preventive services
9.3: Strategies are in place to promote and conduct outreach regarding ongoing well care visits and screenings for all populations, consistent with guidelines for such age and gender-appropriate services promulgated by credible national organizations
9.4: Practice has process in place to inquire about a patient's outside health encounters and has capability to incorporate information in patient tracking system or medical record
9.5: Practice has a systematic approach in place to ensure the provision/documentation of tobacco use assessment tools and advice regarding smoking cessation
9.6: Written standing order protocols are in place allowing practice unit care team members to authorize and deliver preventive services according to physician-approved protocol without examination by a clinician
9.7: Secondary prevention program is in place to identify and treat asymptomatic persons who have already developed risk factors or pre-clinical disease, but in whom the disease itself has not become clinically apparent
9.8: Staff receives regular training and/or communications in health promotion and disease prevention and incorporates preventive-focused practices into ongoing administrative operations
Domain 10: Linkage to Community Services
10.1: PO has conducted a comprehensive review of community resources for the geographic population that they serve, in conjunction with practice units
10.2: PO maintains a community resource database based on input from practice units that serves as a central repository of information for all practice units
10.3: PO in conjunction with practice units has established collaborative relationships with appropriate community-based agencies and organizations
10.4: All members of practice unit care team involved in establishing care treatment plans have received training on community resources so that they can identify and refer patients appropriately
10.5: Systematic approach is in place for educating all patients about community resources and assessing/discussing need for referral
10.6: Systematic approach is in place for referring patients to community resources
10.7: Systematic approach is in place for tracking referrals of high-risk patients to community resources made by the care team, and making every effort to ensure that patients complete the referral activity
10.8: Systematic approach is in place for conducting follow-up with high-risk patients regarding any indicated next steps as an outcome of their referral to a community-based program or agency
Domain 11: Self-Management Support
11.1: Member of clinical care team or PO is educated about and familiar with self-management support concepts and techniques and works with appropriate staff members at the practice unit at regular intervals to ensure they are educated in and able to actively use self-management support concepts and techniques
11.2: Self-management support is offered to all patients with the chronic condition selected for initial focus (based on need, suitability, and patient interest)
11.3: Systematic follow-up occurs for all patients with the chronic condition selected for initial focus who are engaged in self-management support to discuss action plans and goals, and provide supportive reminders

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11.4: Regular patient experience/satisfaction surveys are conducted for patients engaged in self-management support, to identify areas for improvement in the self-management support efforts
11.5: Self-management support is offered to patients with all chronic conditions prevalent in the practice's patient population (based on need, suitability and patient interest)
11.6: Systematic follow-up occurs for patients with all chronic conditions prevalent in the practice's patient population who are engaged in self-management support to discuss action plans and goals, and provide supportive reminders
11.7: Support and guidance in establishing and working towards a self-management goal is offered to every patient, including well patients
Domain 12: Patient Web Portal
12.1: Available vendor options for purchasing and implementing a patient web portal system have been evaluated
12.2: PO or practice unit has assessed liability and safety issues involved in maintaining a patient web portal at any level and developed policies that allow for a safe and efficient exchange of information
12.3: Ability for patients to request and schedule appointments electronically is activated and available to all patients
12.4: Ability for patients to log and/or graphs results of self-administered tests (e.g., daily blood glucose levels) is activated and available to all patients
12.5: Providers are automatically alerted by system regarding self-reported patient data that indicates a potential health issue
12.6: Ability for patients to participate in E-visits is activated and available to all patients
12.7: Providers are using patient portal to send automated care reminders, health education materials, links to community resources, educational websites and self-management materials to patients electronically
12.8: Patient portal system includes capability for patient to create personal health record, and is activated and available to all patients
12.9: Ability for patients to review test results electronically is activated and available to all patients
12.10: Ability for patients to request prescription renewals electronically is activated and available to all patients
Domain 13: Coordination of Care
13.1: For every patient with chronic condition selected for initial focus, mechanism is established for being notified of each patient admit and discharge or other type of encounter, at facilities with which the PCMH physician has admitting privileges or other ongoing relationships
13.2: Process is in place for exchanging necessary medical records and discussing continued care arrangements with other providers, including facilities, for all patients with chronic condition selected for initial focus
13.3: Approach is in place to systematically track care coordination activities for each patient with chronic condition selected for initial focus
13.4: Process is in place to systematically flag for immediate attention any patient issue that indicates a potentially time-sensitive health issue for all patients with chronic condition selected for initial focus
13.5: Process is in place to ensure that written transition plans are developed, in collaboration with patient and caregivers, where appropriate, for patients with chronic condition selected for initial focus who are leaving the practice (i.e., because they are moving, going into a long-term care facility, or choosing to leave the practice)
13.6: Process is in place to coordinate care with payer case manager for patients with complex or catastrophic conditions

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13.7: Practice has written procedures and/or guidelines on care coordination processes, and appropriate members of care team are trained on care coordination processes and have clearly defined roles within that process
13.8: Care coordination capabilities as defined in 13.1-13.7 are extended to all patients with chronic conditions that need care coordination assistance
13.9: Coordination capabilities as defined in 13.1-13.7 are extended to all patients that need care coordination assistance
Domain 14: Specialist Referral Process
14.1: Documented procedures are in place to guide each phase of the specialist referral process – including desired timeframes for appointment and information exchange - for preferred or high volume providers
14.2: Documented procedures are in place to guide each phase of the specialist referral process – including desired timeframes for appointment and information exchange – for other key providers
14.4: PO or practice unit has developed specialist referral materials supportive of process and individual patient needs
14.5: Practice unit or designee routinely makes specialist appointments on behalf of patients
14.6: Each facet of the interaction between preferred/high volume specialists and the PCPs at the practice unit level is automated by using electronically-based tools and processes to avoid duplication of testing and prescribing across multiple care settings
14.7: For all specialist and sub-specialist visits deemed important to the patient's well-being, process is in place to determine whether or not patients completed the specialist referral in a timely manner, reasons they did not seek care if applicable, additional sub-specialist visits that occurred, specialist recommendations, and whether patients received recommended services
14.8: Appropriate practice unit staff is trained on all aspects of the specialist referral process

Note. PCMH, Patient Centered Medical Home; PO, Physician Organization; EMR, Electronic Medical Record; ED, Emergency Department; PCP, Primary Care Physician

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eTable 2. Multivariable mixed model results for the association between medical home implementation and breast cancer screening in BCBSM PGIP practices, July 2009 to June 2012

	Breast Cancer Screening			
Independent Variable	Beta Estimate	95% CI (Lower)	95% CI (Upper)	*P* Value
Interaction				
PCMH score at beginning of study year (for SES Cat 1)	2.6%	-0.1%	5.3%	.06
SES Index				
Category 1 (Highest)		*Reference*		
Category 2	-3.4%	-4.9%	-2.0%	<.001
Category 3	-5.0%	-6.7%	-3.3%	<.001
Category 4 (Lowest)	-6.0%	-8.7%	-3.3%	<.001
PCMH Score * SES Index				
Category 1 (Highest)		*Reference*		
Category 2	3.7%	1.1%	6.3%	.005
Category 3	3.9%	0.9%	6.8%	.01
Category 4 (Lowest)	2.8%	-1.5%	7.1%	.21
Effects over time				
Study Year				
July 2009 – June 2010		*Reference*		
July 2010 – June 2011	-2.3%	-2.9%	-1.6%	<.001
July 2011 – June 2012	-2.3%	-3.3%	-1.4%	<.001
Practice and patient characteristics				
Change in PCMH score during study year	3.0%	1.7%	4.3%	<.001
Mean prospective risk score for adults (per unit)	3.7%	2.7%	4.8%	<.001
Percent female (per 10%)	1.9%	1.6%	2.3%	<.001
Professional services per PCP in practice (per 1,000)	-0.2%	-0.5%	0.0%	.02
PCPs' average number of years in PGIP (per 1 year)	-0.2%	-0.6%	0.2%	.29
Turnover of physicians in practice (per 10%)	-0.1%	-0.2%	0.0%	.16
Practice Size				
Solo physician practice		*Reference*		
2-3 physicians	-0.5%	-1.2%	0.3%	.21
4-5 physicians	0.0%	-1.0%	1.1%	.94
6 or more physicians	0.6%	-0.6%	1.8%	.35
Practice Specialty (reference = primary care only)	-0.3%	-1.4%	0.7%	.55
Whether practice changed POs (reference = no)	0.2%	-0.6%	0.9%	.67

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PO and practice environment characteristics				
Total practices in PO with a PCP (per 100)	-0.1%	-0.3%	0.1%	.16
Percent BCBSM market share (per 10%)	-0.3%	-1.0%	0.5%	.54
Percent non-white residents (per 10%)	-0.8%	-1.3%	-0.3%	.001
Percent rural (per 10%)	0.4%	0.2%	0.7%	<.001
Number of PCPs per 1,000 residents	6.0%	4.5%	7.5%	<.001

Note. BCBSM, Blue Cross Blue Shield of Michigan; PGIP, Physician Group Incentive Program; PCMH, patient centered medical home; SES, socioeconomic status; PCP, primary care physician; PO, physician organization

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eTable 3. Multivariable mixed model results for the association between medical home implementation and cervical cancer screening in BCBSM PGIP practices, July 2009 to June 2012

Independent Variable	Cervical Cancer Screening			
	Beta Estimate	95% CI (Lower)	95% CI (Upper)	*P* Value
Interaction				
PCMH score beginning of study year (for SES Cat 1)	-0.5%	-2.7%	1.7%	.64
SES Index				
Category 1 (Highest)		*Reference*		
Category 2	-2.2%	-3.3%	-1.0%	<.001
Category 3	-3.4%	-4.7%	-2.0%	<.001
Category 4 (Lowest)	-4.7%	-6.8%	-2.6%	<.001
PCMH Score * SES Index				
Category 1 (Highest)		*Reference*		
Category 2	2.8%	0.7%	4.9%	.01
Category 3	4.3%	1.9%	6.7%	<.001
Category 4 (Lowest)	4.7%	1.5%	7.9%	.004
Effects over time				
Study Year				
July 2009 – June 2010		*Reference*		
July 2010 – June 2011	-1.0%	-1.5%	-0.5%	<.001
July 2011 – June 2012	-2.9%	-3.6%	-2.2%	<.001
Practice and patient characteristics				
Change in PCMH score during study year	1.8%	0.8%	2.8%	<.001
Mean prospective risk score for adults (per unit)	-2.2%	-3.0%	-1.4%	<.001
Percent female (per 10%)	2.4%	2.1%	2.7%	<.001
Professional services per PCP in practice (per 1,000)	0.3%	0.2%	0.5%	<.001
PCPs' average number of years in PGIP (per 1 year)	0.1%	-0.2%	0.4%	.67
Turnover of physicians in practice (per 10%)	0.0%	-0.1%	0.1%	.54
Practice Size				
Solo physician practice		*Reference*		
2-3 physicians	1.0%	0.5%	1.6%	<.001
4-5 physicians	1.0%	0.1%	1.8%	.02
6 or more physicians	1.4%	0.4%	2.4%	.006
Practice Specialty (reference = primary care only)	0.4%	-0.5%	1.3%	.36
Whether practice changed POs (reference = no)	0.7%	0.1%	1.2%	.01

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PO and practice environment characteristics				
Total practices in PO with a PCP (per 100)	-0.2%	-0.4%	-0.1%	.003
Percent BCBSM market share (per 10%)	1.4%	0.7%	2.0%	<.001
Percent non-white residents (per 10%)	-0.7%	-1.1%	-0.3%	<.001
Percent rural (per 10%)	-0.4%	-0.6%	-0.2%	<.001
Number of PCPs per 1,000 residents	2.2%	1.0%	3.3%	<.001

Note. BCBSM, Blue Cross Blue Shield of Michigan; PGIP, Physician Group Incentive Program; PCMH, patient centered medical home; SES, socioeconomic status; PCP, primary care physician; PO, physician organization

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eTable 4. Multivariable mixed model results for the association between medical home implementation and colorectal cancer screening in BCBSM PGIP practices, July 2009 to June 2012

	Colorectal Cancer Screening			
Independent Variable	Beta Estimate	95% CI (Lower)	95% CI (Upper)	*P* Value
Interaction				
PCMH score beginning of study year (for SES Cat 1)	4.5%	1.8%	7.3%	<.001
SES Index				
Category 1 (Highest)	*Reference*			
Category 2	-2.3%	-3.8%	-0.8%	.002
Category 3	-4.4%	-6.2%	-2.7%	<.001
Category 4 (Lowest)	-4.6%	-7.2%	-1.9%	<.001
PCMH Score * SES Index				
Category 1 (Highest)	*Reference*			
Category 2	1.2%	-1.5%	3.9%	.38
Category 3	3.2%	0.2%	6.2%	.04
Category 4 (Lowest)	2.5%	-1.5%	6.5%	.23
Effects over time				
Study Year				
July 2009 – June 2010	*Reference*			
July 2010 – June 2011	-1.0%	-1.7%	-0.3%	.003
July 2011 – June 2012	-1.7%	-2.7%	-0.7%	<.001
Practice and patient characteristics				
Change in PCMH score during study year	3.8%	2.5%	5.1%	<.001
Mean prospective risk score for adults (per unit)	4.1%	3.2%	5.1%	<.001
Percent female (per 10%)	0.6%	0.2%	0.9%	.003
Professional services per PCP in practice (per 1,000)	0.8%	0.5%	1.0%	<.001
PCPs' average number of years in PGIP (per 1 year)	-0.1%	-0.5%	0.3%	.52
Turnover of physicians in practice (per 10%)	0.1%	-0.1%	0.2%	.25
Practice Size				
Solo physician practice	*Reference*			
2-3 physicians	0.1%	-0.7%	0.8%	.88
4-5 physicians	0.1%	-1.0%	1.2%	.86
6 or more physicians	0.3%	-1.0%	1.6%	.65
Practice Specialty (reference = primary care only)	0.6%	-0.5%	1.7%	.27
Whether practice changed POs (reference = no)	0.5%	-0.3%	1.2%	.21

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PO and practice environment characteristics				
Total practices in PO with a PCP (per 100)	-0.1%	-0.2%	0.1%	.56
Percent BCBSM market share (per 10%)	1.9%	1.1%	2.7%	<.001
Percent non-white residents (per 10%)	0.4%	-0.1%	0.9%	.16
Percent rural (per 10%)	-0.2%	-0.4%	0.1%	.22
Number of PCPs per 1,000 residents	3.1%	1.5%	4.7%	<.001

Note. BCBSM, Blue Cross Blue Shield of Michigan; PGIP, Physician Group Incentive Program; PCMH, patient centered medical home; SES, socioeconomic status; PCP, primary care physician; PO, physician organization

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eMethods. Primary care relationship attribution

The PCP Care Relationships algorithm is a retrospective assignment process jointly developed by The Clinical Epidemiology and Biostatistics Department at Blue Cross Blue Shield of Michigan and the Michigan Physician Group Incentive Program Analytic Consortium (MPAC). The primary care relationships used in this study represent the primary care physician considered most responsible for that member's primary care during the outcome time period based on relevant claims data.

Physician Eligibility
To be eligible for primary care relationships, a physician must either be credentialed in a primary care specialty (pediatrics, internal medicine, family medicine, general practice, geriatric medicine, adolescent medicine) or declare that they are functioning as a primary care provider if they are not credentialed in a primary care specialty. Physicians credentialed in a primary care specialty may declare that they are not functioning as a primary care provider and be ineligible to receive primary care assignments.

Member Eligibility
To be eligible for primary care relationships, a member must have had coverage with Blue Cross Blue Shield of Michigan at any time within the past 24 months.

Attribution Process
The process of assigning care relationships is an iterative process expanding either the time period or the contributing claims until the member is assigned to a primary care physician. The initial step is assignment based on the previous 12 months of evaluation and management claims for office and preventive visits in the outpatient setting. Ties between physicians are resolved based on the number of claims followed by the most recent visit. Overall, 75% of attributed members are assigned in this first step of the process. For members not assigned by the initial 12 months of claims, this process is repeated using 18 and 24 months of claims. These two additional steps account for 24% of attributed members assigned a primary care relationship. For members still not assigned, this process is repeated using preventive counseling and immunizations in addition to the evaluation and management services. If ties persist between physicians after all of these steps, the primary care relationship is assigned randomly among the tied physicians.

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