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The Primary Care Reform Intervention Stakeholder Matrix: A Framework for Advancing Primary Care

March 2021

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Executive Summary

Primary care is associated with better health outcomes. However, there has been widespread underinvestment in primary care across the US, as well as declines in both primary care use and the primary care workforce. Recognition of these issues has led to growing efforts to reform how the US invests in, pays for, and implements primary care – an encouraging trend given that improvement will require collaboration among multiple stakeholders.

Because there are multiple potential interventions for supporting primary care reform, it is critical to use a holistic stakeholder-solution perspective – one that systematically frames interventions based on which stakeholders can implement and accept accountability for them. This approach is particularly critical when multi-stakeholder engagement is desired, as collaboration is most relevant when grounded in discourse about which groups can most effectively implement which interventions.

To address gaps and advance a stakeholder-solution approach for use by primary care stakeholders, we created PRISM: the **P**rimary care **R**eform **I**ntervention **S**takeholder **M**atrix. The matrix seeks to assist stakeholders in decision-making by (a) defining potential interventions using a stakeholder-solution perspective (i.e., describing the landscape of solutions from a stakeholder actionability perspective) and (b) using that landscape to highlight current evidence on potential interventions.

PRISM achieves this by jointly considering both interventions (payment, supply, technology, activity) and stakeholders (public policymakers, payers, and providers), producing 12 overarching categories of stakeholder-intervention strategies for addressing issues in primary care. The matrix provides a framework that groups can use when considering primary care interventions and pursuing multi-stakeholder engagement and collaboration.
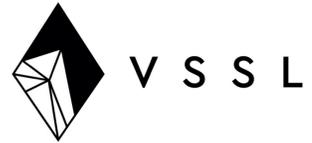
Primary care is associated with better health outcomes.[1] Recent studies demonstrate that an increase of 10 additional primary care physicians per 100,000 population was associated with a 51.5-day increase in life expectancy.[2] In Rhode Island, requirements to increase the amount of health care dollars spent on primary care was associated with lower overall health care spending.[3] The preponderance of evidence suggests that primary care delivery is associated with lower costs, higher patient satisfaction, fewer hospitalizations and emergency department visits, and lower mortality.

However, despite these potential benefits, there has been widespread underinvestment in primary care across the US. Over the past decade the US has seen a decline in primary care visits and in the number of primary care workforce.[2] Most of health care spending is orientated toward specialty care and hospital services, with as little as 2-5% of health care spending for older Medicare patients directed toward primary care.[4]

Recognition of these issues has led to growing efforts to reform how the US invests in, pays for, and implements primary care. Federal and state policymakers have implemented policies to drive change through payment reform.[3,5] Professional societies[6,7] and accreditation entities[8] have focused support for primary-care centered delivery initiatives, such as patient-centered medical homes, and new paradigms for financing primary care.[9]

Educators have lobbied to increase the supply of primary care clinicians by expanding the number of medical and health professions training positions.[10,11] Collectively, these trends are encouraging, as improvement will require collaboration among multiple stakeholders.

ONE GOAL, MANY PATHS & THE NEED FOR A HOLISTIC STAKEHOLDER-SOLUTION PERSPECTIVE
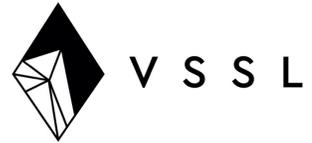
As these examples highlight, there are many potential interventions for supporting primary care reform. Some emphasize wholesale or targeted increases in financial payment for primary care services. Others involve workforce changes to address existing or projected personnel shortages. Yet other interventions seek to drive improvement in clinical functions, such as care coordination, continuity, or patient engagement. Health care stakeholders may be converging around a unified call to reform primary care,[9] but there are many paths to that goal.

Given this diversity of potential interventions, it is critical for stakeholders to drive reform using a holistic stakeholder-solution perspective, i.e., one that systematically frames and motivates interventions through the lens of stakeholder actionability. This approach is critical because while different interventions are not mutually exclusive, no group or entity has the scope or ability to implement all solutions.

Given inevitable resource constraints, stakeholders must also prioritize certain interventions over others even within their own purview. Moreover, solutions implemented by one stakeholder (e.g., payment reform) can be interdependent on actions of another (e.g., clinical care delivery changes by primary care practices).

Notably, the need for a stakeholder-solution approach is particularly critical when multi-stakeholder engagement is desired: collaboration is most relevant when grounded in discourse about which groups can most effectively implement which interventions. In turn, a comprehensive stakeholder-solution framework could help policymakers, payers and health systems work together to drive sustainable and scalable efforts to reform primary care.

Unfortunately, this remains a major gap in work supporting primary care reform, which often seeks to engage stakeholders but does not set agenda or actions items based on what is actionable for each one.
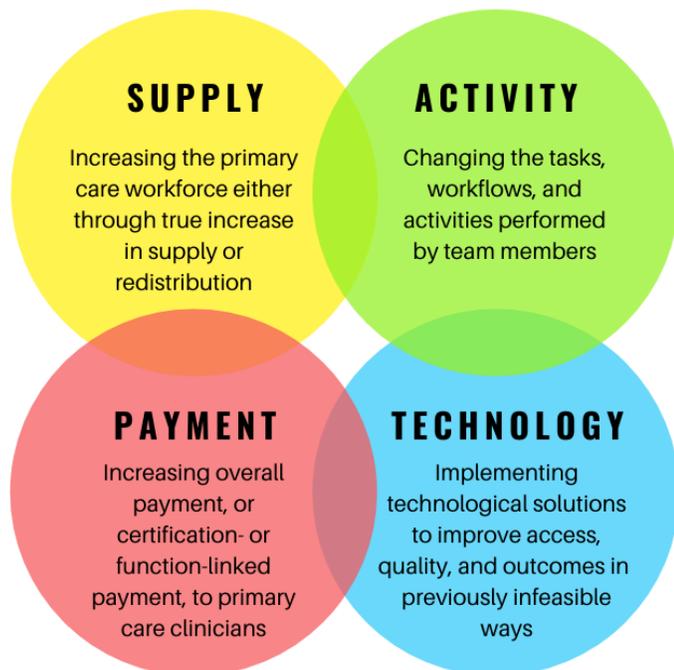
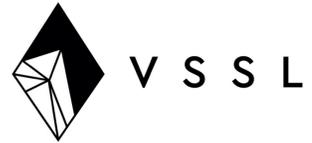## THE PRIMARY CARE REFORM INTERVENTION STAKEHOLDER MATRIX (PRISM)

To address existing gaps, we created PRISM: the **P**rimary care **R**eform **I**ntervention **S**takeholder **M**atrix. Rather than offer specific solutions about how to reform primary care, which will differ by local community and market context, the matrix seeks to assist stakeholders in decision-making by (a) defining potential interventions using a stakeholder-solution perspective (i.e., describing the landscape of solutions from a stakeholder actionability perspective) and (b) using that landscape to highlight current evidence on potential interventions. PRISM achieves this by incorporating three key components:

Interventions. PRISM articulates a holistic framework for interventions that can be used to implement primary care reform. The matrix consists of four intervention types: payment, supply, technology, and activity.

Payment interventions refer to ways to change reimbursement for primary care services.

Supply interventions consist of ways to increase the primary care workforce either through true increase in supply (i.e., adding new workforce members) or redistribution (i.e., redeploying workforce to different tasks).

SUPPLY

Increasing the primary care workforce either through true increase in supply or redistribution

ACTIVITY

Changing the tasks, workflows, and activities performed by team members

PAYMENT

Increasing overall payment, or certification- or function-linked payment, to primary care clinicians

TECHNOLOGY

Implementing technological solutions to improve access, quality, and outcomes in previously infeasible ways

Technology interventions involve approaches to using health information technology and digital solutions to change the primary care experience. Activity interventions encompass ways to change the tasks, workflows, and activities to improve care.

Supply. Increasing the supply of primary care workforce can be done in several different ways. For example, the primary care workforce may be increased by increasing the number of physicians in primary care. This solution itself has several flavors: increasing the overall number of physicians trained (e.g., by opening new medical schools, increasing graduate medical education funding) or the number and proportion of physicians who will enter primary care (e.g., through loan repayment incentives to medical students if they choose primary care professions).

The primary care workforce can also be increased through training more non-physician practitioners, i.e., nurse practitioners, doctors of nursing practice, and physician assistants. Additionally, non-practitioner workforce can be increased through the proliferation of traditional roles (e.g., nurses, social workers, and medical assistants) and/or through the incorporation of non-traditional roles (e.g., health coaches and community health workers). Finally, infrastructure can be increased (e.g., building primary care clinics).

Activity. Independent of workforce supply, primary care outcomes can also depend on the activities and tasks that team members perform. For instance, the patient centered medical home (PCMH) model seeks to encourage clinical team members to provide more comprehensive, coordinated primary care using a set of activities that includes developing chronic disease registries, using patient portals, and implementing care management processes.
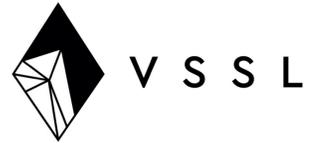
Payment. There are also multiple avenues to increase payment for primary care services. Payment can be increased as a stand-alone solution. For example, Rhode Island as part of the state's 2010 affordability standards required commercial payers to spend more on primary care and care coordination services without being prescriptive about specific functions.[3] Payment can also come with stipulations. One way this can be done is via certification. The National Committee for Quality Assurance, for instance, offers PCMH certification[8] for which some payers will pay primary care practices who have achieved different levels of PCMH certification.

Another related mechanism is to increase primary care reimbursement by paying for functions that produce care delivery changes (i.e., changes in how care is delivered, not just attainment of certification). This approach can be focused on reimbursement for a specific function, for example Medicare's introduction of care coordination codes – which have been adopted by multiple additional payers – including Transitional Care Management (TCM),[12] Chronic Care Management (CCM)[13] and BHI[14] – which reimburse ambulatory physicians for coordinating care after care transitions, providing care management for chronic conditions, and integrating behavioral health into primary care, respectively.

Some may view these strategies as *activity* rather than *payment* focused (e.g., BHI is defined by a set of activities that primary care and behavioral health team members perform in coordination with each other in order to support the delivery of effective mental health services in primary care settings). However, we conceive of them as payment strategies because the primary intervention is payment-related (creating payment codes and reimbursing clinicians for them) rather than activity-related.
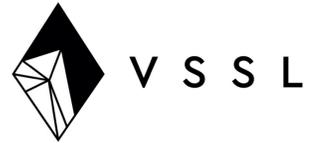
Paying for function can also include multiple primary care functions, for example, the Center for Medicare and Medicaid Innovation (CMMI) Comprehensive Primary Care Plus (CPC+) program,[15] which provides a per member per month incentive for specific primary care functions, e.g., care management, access, and care coordination.

Technology. For many health care stakeholders, technology represents a popular, often-cited solution for reforming and improving primary care. This approach is based on the overarching rationale that technology can improve access, quality, and outcomes in ways that were previously infeasible. One mechanism for achieving these benefits is through stronger patient-clinician communication. Technology interventions such as electronic health records (EHRs),[16-17] telemedicine solutions,[18] home monitoring,[19] and digital apps[20] can increase patients' access to clinicians and health outcomes.

Similarly, a second mechanism for improving primary care through technology is through stronger clinician-clinician communication between primary care and subspecialty clinicians. Better between-clinician communication can support better care coordination and reduce care fragmentation.[21-22] Technology also enables organizations to track and improve clinician performance – a third potential mechanism through which technology interventions could improve primary care.

For instance, group practices can use dashboards embedded within EHRs or business insight software to feed back performance information to clinicians, thereby encouraging them to improve quality (e.g., by identifying which patients have gaps in high quality services, such as cancer screening) and address cost (e.g., by providing information about patients' health care utilization).

These categories are not mutually exclusive. Payment interventions may directly or indirectly prompt new technology interventions (e.g., payment models may prompt new technology investments). Supply and activity interventions may be tightly coupled in some cases (e.g., hiring new team members to perform new activities). Activity interventions often result from or connect to payment interventions. Nonetheless, the ability to implement each intervention type varies across stakeholders.

In defining interventions types, PRISM also acknowledges but excludes concepts identified in prior work: "cultural recognition about the need to invest in primary care," and "orientation towards primary care"[1], which are more requisite preconditions and motivations for reform rather than reform interventions themselves.

Stakeholders. PRISM recognizes three major stakeholders in primary care delivery reform: public policymakers, payers, and providers. The intervention framework is applied across these three stakeholder groups to identify which ones can assume accountability and act upon specific strategies.
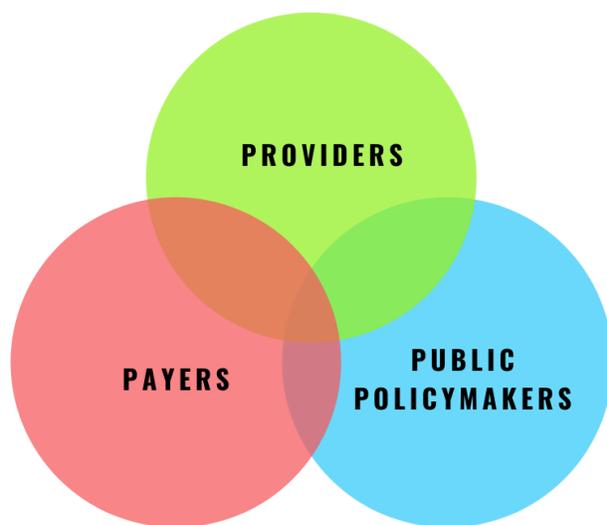
We believe that patients are central and ultimate stakeholders in health care. However, while we recognize the importance of, and trend toward, patient-informed and patient-driven interventions, these were beyond the scope of this work, which focused on aspects of payment and delivery reforms that are driven by policymakers, payers, and providers.
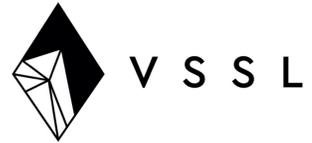
## Putting It Together: A Stakeholder-Intervention Framework

Public policymakers, payers and providers differ in their ability to drive reform by enacting supply, payment, technology investment, and staffing changes. Therefore, PRISM frames solutions through the lens of each stakeholder group and the "levers they can pull". By incorporating four general intervention types across three stakeholder groups, the matrix demonstrates a framework that is comprised of 12 distinct strategies.

The framework does so while acknowledging that there may not always be clear distinctions between stakeholders. For instance, policymakers may serve the role of payers in the context of federal or state insurance programs. Providers and payers can purchase each other and become "payviders." There may be instances in which public policymakers may have control over providers (e.g., county hospitals). PRISM also acknowledges the potential spillovers that can occur between stakeholders (e.g., policies established by public policymakers can influence decisions among private payers).

To provide insight to decision-makers, PRISM highlights evidence or examples underlying each -stakeholder-intervention strategy type. Importantly, in discussing examples, the matrix does not seek to comprehensively summarize (e.g., systematically review) or grade (e.g., create guidelines) the evidence for several reasons.

> *There are major gaps in existing evidence.* To date, no definitive, large-scale randomized controlled trials – the strongest type of evidence – have tested the effect of primary care on quality, costs, and patient experience.

> *Much of the evidence that does exist possesses limitations*. Many studies evaluating the impact of primary care on outcomes are retrospective observational analyses. Some studies are done at an 'ecological' or population-level and lack individual patient level data. Finally, the
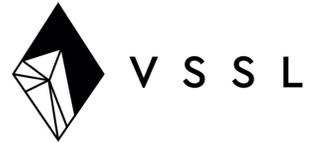
definition and scope of "primary care" can also vary across medical evidence. While different studies may all study "primary care", they can differ in what that encompasses (e.g., a function versus more clinicians in a given specialty).

Other studies lack granularity about primary care interventions themselves. For instance, some studies evaluating *patient-centered medical homes (PCMH)* as an intervention have defined it based on certification (did a practice achieve external certification for a patient-centered medical home designation based on potential to perform certain activities?) rather than changes in care delivery (did a patient-centered medical home perspective lead a practice to consistently use activities to change how it delivers care?).

Given these issues, PRISM focuses on highlighting examples and studies that demonstrate the potential of different solutions. Given rapid changes in care delivery over time, we sought to prioritize examples and work from the past 5 years.

Stakeholder-Intervention Strategies

1. *Supply – Public Policymakers*

Public policymakers play an outsized role in regulating supply of primary care clinicians. For example, the Health Resources and Services Administration (HRSA) recently allocated increased funding toward scholarship and loan repayment opportunities for clinicians entering the primary care workforce[11], with some evidence to suggest that loan forgiveness programs can influence trainees to choose primary care careers.[23]

Public policymakers can also influence the number of clinicians trained in primary care-focused residencies. One solution is to expand the total number of residency training positions, thereby increasing both primary

care and non-primary care trainees. For instance, the Patient Protection and Affordable Care Act of 2010 helped establish the Teaching Health Center Graduate Medical Education program, which allocated funding for community-based health centers to create or expand residency programs to train primary care clinicians without altering specialty residency positions.[24]

A variant of this approach would be to maintain the total number of training positions, but redistribute positions away from non-primary care specialties toward primary care specialties. A 2000 report from the U.S. General Accounting Office detailed such policy changes in the Veterans Health Administration, which substantially increased primary care residency positions while reducing specialty care residency positions.[25]

Importantly, public policymakers can target primary care supply solutions to specific areas. To address rural shortages nationally, HHS in 2019 issued $20 million in Rural Residency Planning and Development Program grants, aimed at increasing rural residency programs in Family Medicine, Psychiatry, and Internal Medicine in rural areas throughout the US.[26]

Additionally, the state of Washington commissioned a 2016 RAND Corporation report that analyzed public policy options for increasing the primary care workforce in rural areas in the state.[27] The report concluded that to adequately address primary care shortages, a combination of interventions would be needed, including the creation of a (planned) new medical school, increases in rural primary care residency positions, increases in Medicaid reimbursement to primary care, and use of team-based models that included nurse practitioners and physicians assistants.

For public policymakers, the influence on clinician supply is not limited only to physicians. In the United Kingdom, policymakers have evaluated the prospects of integrating community health workers into the primary care workforce.[28] In the US, HRSA funds the Nurse Corps Scholarship and

Loan Repayment programs, which can serve to fill primary care nursing positions in under-resourced settings.[11]

2. Supply – Payers

For payers, the main lever for increasing the supply of primary care workforce is through increasing or reforming primary care payment – an indirect solution that could incentivize the retention of existing clinicians, grow the pipeline of primary care trainees, and/or draw in non-physician team members by spurring the development of new team-based care models (e.g., integrated behavioral health and health coaches).

However, another strategy for payers is to directly hire clinicians to supplement care. Examples of this approach include physicians and advance practice practitioners who do in-home annual wellness visits for Medicare beneficiaries and nurses who provide additional care management to support patients with high utilization in chronic disease management and care navigation needs.[29-30]

3. Supply – Providers

Providers can increase primary care workforce supply in three main ways: (1) by hiring more primary care physicians, (2) by reconfiguring how primary care clinicians work with teams to deliver care (e.g., creating interdisciplinary teams), and (3) by supporting training programs to increase focus on and opportunities to pursue careers in primary care.

The most obvious way for providers to increase the primary care workforce supply is by hiring more primary care clinicians. While other stakeholders (e.g., public policymakers) are better positioned to enact changes to increase primary care trainees, they must be hired by providers into positions in order for the primary care workforce to truly increase.

Beyond hiring, providers can also influence workforce supply through team configuration, i.e., how primary care clinicians and other team
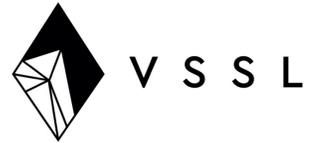
members work together to deliver care.[31-32] In particular, primary care capacity can be expanded without adding primary care physicians, who can be the most expensive members of clinical teams.[33] For instance, many primary care models have created expanded roles for medical assistants including the introduction of the "health coaches" and "community health workers" focused in self-management support and resource navigation.[34-35]

As another example, changes could involve integration of behavioral health in primary care via care delivered primarily by non-physician team members – an approach that can be associated with improved patient outcomes (e.g., in depression and anxiety) and increased capacity of primary care physicians and APPs.[36] Importantly, a focus on team reconfiguration can create virtuous cycles: successful team-based primary care models can attract primary care clinicians and reduce burnout that otherwise threatens staff retention and quality of care. [37,38]

To the extent that providers are affiliated or have other connections to training opportunities, another lever for influencing workforce supply is by supporting training programs that highlight primary care careers – a salient solution given that primary care training experiences can be a factor for improving the primary care pipeline.[21]

For instance, some providers are connected to medical schools, which have promoted primary care through (a) dedicated curricula and/or free tuition lowering barriers to entry to primary care, (b) primary care-focused tracks to cater experiences and opportunities to students interested in primary care, or (c) training experiences that seek to expose and draw more trainees to primary care-focused careers (particularly in underserved areas).[39-42] Providers in community health center settings can leverage the Teaching Health Center Graduate Medical Education program[24] and access funding to create primary care residency training programs.
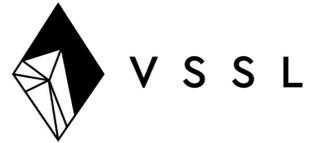
4. Activity-Public Policymakers

Public policymakers can regulate primary care activities by requiring or incentivizing specific tasks or services. Several states have created regulation incentivizing patient-centered medical home (PCMH) certification. For example, New York state developed specific pathways to PCMH certification in collaboration with NCQA.[43] The state covers the cost of certification for practices and provides per-member per-month and visit add-on incentives (for Medicaid population) for achieving certification.[44,45] Similarly, the state of Oregon has developed a state-specific PCMH through the Patient-Centered Primary Care Home (PCPCH) Program, and has incentivized participation in the program via practice support and incentives.[46,47]

Public policymakers can also create changes in primary care activity by testing regulations governing utilization of services – e.g., in the upcoming Direct Contracting program, CMS will implement a waiver that allows patients to be admittedly directly to skilled nursing facilities (SNF) admission without a requisite preceding hospital stay.[48] Additionally, policymakers can significantly influence how all health care providers, including primary care, communicate with patients. For instance, the 21st Century Cures Act required that patients have access to the entirety of their electronic health records without charge, including clinician notes.[49]

5. Activity-Payers

Payers may encourage activity interventions much in the same way as public policymakers. For instance, payers will often have their own quality performance incentive programs with their own set of quality measures. Many payers have incentivized NCQA PCMH certification or developed their own PCMH programs.

Similar to the state-led examples above, CareFirst Blue Cross Blue Shield implemented a de novo PCMH program in Maryland, northern Virginia, and the District of Columbia drawing majority participation of contracted primary care providers and incentivizing care coordination, access to

primary care, and care plan development activities.[50] Payers, like public policymakers, may also create policies that influence how primary care providers influence utilization of services. For instance, payers can implement measures such as waiving the SNF 3 Day Rule, which permits primary care clinicians to directly admit patients to SNFs without intervening hospitalization stays.

6. Activity-Providers

Much of the scope of the provider activity lever is choosing which voluntary programs to engage. For example, providers can voluntarily choose to participate in programs such as PCMH certification and implement systems to support the use of Transitional Care Management and Chronic Care Management services codes. Depending on practice size and contract type, providers may also be able to negotiate specific quality measures and performance thresholds.

Providers are also uniquely positioned to motivate specific activities, sometimes via internal performance incentives.[51] For example, Advocate Health system in Chicago has implemented a successful quality performance incentive program that combines individual and group performance on a number of quality measures.[52]

Importantly, provider activity interventions can be driven by professional and intrinsic motivations, not just external regulations or incentives from payers or policymakers. These internally driven interventions can either be aimed at creating efficiencies in practice environments or addressing a particular population health need.

For example, the learning health system is a model in which providers leverage health information technology, advanced analytics, and research methodology to implement and generate evidence-based practice with the goal of continuous improvement in health care delivery.[53] Several health
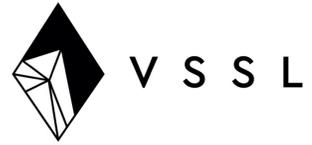
systems have used this model combining research and operational expertise toward improvement in internal outcomes and efficiencies.[54,55]

7. Payment-Public Policymakers

Public policymakers can use payment as a lever without being prescriptive regarding specific role or function for which payment is used. For example, Rhode Island increased proportion of spending in primary care as part of a state-wide initiative to control health care costs.[3]

In addition to the PCPCH Program described above, Oregon has enacted legislation that increases the proportion of primary care spending to at least 12% of total medical expenditures by 2023 within state Medicaid and public employee and educator benefit programs.[45] Paying for primary care via capitated payments in lieu of (or in addition to) fee-for-service is another example of public policymaker use of this lever. Medicare has implemented and proposed a number of primary care Alternative Payment Models in the last decade.

While all include some activity-based payment (e.g., quality measure performance or requiring 24/7 access to services), they also include per-member-per-month payments intended for (but not stipulated to) subsidizing team-based care models. Examples of these programs include Medicare's Comprehensive Primary Care[56] and Primary Care First programs.[57]

Public policymakers have also created incentives with a fee-for-service structure to promote specific functions of primary care, such as with the Medicare care coordination billing codes (e.g., TCM[58] and CCM[59]), behavioral health integration in primary care billing codes (e.g., Collaborative Care Model (CoCM),[60] and advance care planning billing codes.[61] Each of these sets of codes reimburse a specific activity and/or time spent on a specific activity in and/or outside of an office visit such as care

coordination for a patient with complex chronic conditions in the instance of CCM.

8. Payment -Payers

Similar to levers afforded to public policymakers, payers may increase primary care payment without specific activity stipulations. A prominent example of this strategy is the use of population-based global payments. In 2009, Blue Cross Blue Shield of Massachusetts implemented the Alternative Quality Contract which included global payments with two-sided risk (if expected costs were lower than predicted, the health system received shared savings, if higher, penalties) as well as quality incentives.

In an analysis of the first eight-years of the program, cost containment was greater among participants than controls (in part due to lower referral rates) and many measures of quality of care improved.[62] Following the success of the program for large health care systems, Blue Cross Blue Shield of Massachusetts implemented a similar program tailored to primary care allowing for small independent practices to engage in global payment models.[63]

Another lever for payers is through Medicare Advantage (MA) plans. MA plans have been paid by Medicare via a risk-adjusted global payment model since the creation of the program in the early 2000s. Traditionally, MA programs have in turn reimbursed providers using a fee-for-service payment model. However, several innovative primary care providers including ChenMed,[64] Iora Health,[65] and Oak Street Health[66] have partnered with MA payers to be paid more similarly to how Medicare pays them: via risk-adjusted, global payment, in some instances taking on 100% risk for total costs of care.

Payers may also opt to join Medicare-led alternative payment models (APMs) via the All-Payer Advanced APMs option.[67] Lastly, while payers do not create or introduce billing codes, they can choose to accept billing

codes created by public policymakers, such as providing reimbursement for TCM, CCM, and CoCM.

9. Payment -Providers

Provider payment intervention levers rest heavily in contracting. Increasingly, payers are offering global payment arrangements designed for primary care, enabling participation of independent primary care practices without requiring that they join an ACO.[5,63] Providers can choose whether to engage in the various payment programs offered by public and private payers. If they opt to engage in capitated payment contracts, providers in many cases can decide whether to take downside risk and the amount of risk they will assume.

In addition to the choosing primary payment arrangements, providers can also affect payment through consolidation and potentially higher reimbursement rates. Primary care provider consolidation has become more prevalent; for instance, the proportion of primary care physicians practicing in groups owned by hospitals or health systems grew substantially from 2010 (28 percent) to 2016 (44 percent).[68] One study found that physicians in markets with the highest levels of market concentration (i.e., more concentration among providers) charged 14 to 30 percent higher rates than physicians in markets with the lowest levels.[69]

Beyond partnerships with payers, providers may contract directly with patients or employers as payers and provide enhanced services and access (e.g., longer appointment time, 24/7 access to physicians) through direct primary care or "concierge" models that are based on membership fees.[70] While one critique of this model is that access is generally limited to those who can afford additional monthly payment, there are also models that offer more affordable membership fees and cater to uninsured or underinsured patients.[71]

As noted above in the example of Advocate System, providers can also implement internal incentive programs that encourage the desired types of primary care activities and outcomes.[52]

10. Technology-Public Policymakers

Public policymakers may incentivize use of technology in primary care through several levers. The largest investment in technology in health care by the federal government, the 2009 HITECH Act,[72] included various measures meant to incentivize use and build health Information Technology (IT) infrastructure.[73] Most notably, the HITECH Act made available funds for incentive payments for adoption and use of certified electronic health record (EHR) technology spurring accelerated adoption of health IT in health care settings.[74]

It also included legislative authority to create national standards and certification for health IT technology while funding entities (Regional Extension Centers) tasked with supporting EHR adoption among small practices.[75] HITECH also drove infrastructure (e.g., to support interoperability via State Health Information Exchanges) and innovation (e.g., awards to "Beacon Communities" marked by accelerated adoption and innovative use of health IT).[75,76]

State public policymakers have also had substantial impact on uptake and use of technology. Telehealth services provide a prominent example: while federal public policymakers failed to drive substantial increases in video visits between patients and physicians despite the introduction of billing codes, some state governments introduced "parity laws" for Medicaid and/or commercial payers – laws that reimbursed telehealth visits at an equivalent rate to in-person visits – that drove increased volume of Medicare telehealth visits.[77,78]

The COVID-19 pandemic has underscored the ability of public policymakers to impact telehealth uptake. For instance, in the early phase

of the pandemic, the Washington state Health Care Authority implemented a number of changes built upon established telehealth policies by making direct patient- and provider-oriented investments in telehealth-related technology and focused on clinical implementation. Collectively, these policy changes, technology investments, and implementation support efforts drove significant adoption of telehealth in the early phase of the pandemic.[79]

11. Technology -Payers
Payer levers for the uptake and use of technology lie in reimbursement of technology-based services beyond state and federal regulations. They may choose, for instance, to reimburse telehealth services at office visit rates in states without parity laws. Payers may also lead in reimbursing novel services and may in turn influence public policymakers.

For example, many commercial plans preceded Medicare in reimbursing for e-consult services.[80] Payers may also have flexibility in how they choose to reimburse. Using the e-consult example, reimbursement may be modeled to pay per consult, for clinician time (specialist time only or specialist and primary care provider time), or integrated into value-based payment models (e.g., bundled or capitated payments).[81]

12. Technology -Providers
Providers ultimately choose which technology to implement, which can in turn affect primary care delivery and outcomes. For instance, the adoption of both synchronous and asynchronous telemedicine services in primary care may have substantial impact on access and cost of care delivery, and patient and population outcomes. Providers can invest in technology in ways that expand or reconfigure team member roles.

For example, introducing electronic check-in kiosks may allow for front desk staff to shift to different tasks, while electronic scribe services (e.g., a virtual scribe documenting visit) may allow for team members who would

otherwise serve as scribes to focus instead on patient navigation or self-management support services. Providers can also leverage technology in a way that focuses on clinician-patient communication. For example, secure messaging in patient portals can provide a mechanism for direct communication between visits.[82] Patient portals allow patients access to their medical record and the Open Notes initiative has expanded access for patients to view their visit notes.[83,84]

CONCLUSION

There are multiple potential interventions for reforming how the US invests in, pays for, and implements primary care. However, it is critical for stakeholders to drive reform using a holistic stakeholder-solution perspective that systematically frames and motivates interventions through the lens of stakeholder actionability. This approach is critical given different scopes or abilities of different stakeholders and interdependencies among them.

A stakeholder-solution perspective is also critical for multi-stakeholder engagement and collaboration. PRISM provides one way to achieve that goal by defining potential interventions using a stakeholder-solution perspective (i.e., describing the landscape of solutions from a stakeholder actionability perspective), and using that landscape to highlight current evidence on potential interventions.

The matrix demonstrates 12 non-mutually exclusive, but distinct categories of stakeholder-intervention strategies that groups can use when considering primary care reforms and interventions.


Cite as: Marcotte LM, Staloff JA, Reddy A, Liao JM. The Primary Care Reform Intervention Stakeholder Matrix: A Framework for Advancing Primary Care. Value & Systems Science Lab. 2021.

Primary Care Reform Intervention Stakeholder Matrix (PRISM)

| Interventions	Stakeholders		
	Public Policymakers	Payers	Providers
Supply	Funding for training primary care clinicians (new medical schools, expanded residency positions and funding); Loan repayment opportunities for clinicians who enter into primary care	Increasing primary care payment; Directly hiring clinicians to supplement care	Hiring PCPs; Creating interdisciplinary teams; Supporting training programs that increase focus on primary care careers
Activity	Regulation requiring certain activities (e.g., Oregon's state-wide PCMH regulations, open notes) or waiving requirements governing utilization of services (waiving SNF 3-Day rule)	Incentives to participate in existing certification programs (e.g., NCQA PCMH) or their own programs (e.g., CareFirst PCMH); Creating policies regarding utilization of services (e.g., waiving SNF 3-Day rule)	Engagement in certification or pay-for-function programs (e.g., NCQA PCMH) or implementation of systems for codes (TCM, CCM); Interventions to prompt provider activities, either externally (e.g., Advocate Health) or internally motivated
Payment	Increased primary care payment without stipulation (e.g., Rhode Island regulation); Introduction of capitated or other alternative payment models; Pay-for-function (e.g., care coordination codes)	Increased primary care payment without activity stipulation (e.g., BCBS-MA AQC global payment primary care models); Risk-adjusted global payment or capitation arrangements; Adoption of billing codes created by public policymakers (e.g., TCM)	Engagement with payers in models that increase payment to primary care; Internal provider incentive programs (e.g., Advocate Health); integration and consolidation; direct primary care or concierge medicine
Technology	Incentivize use and building of IT infrastructure (e.g., HITECH Act); Expanded allowance of and reimbursement for technology-based services (e.g., telehealth services; parity laws to increase reimbursement)	Reimbursement of technology-based services beyond state and federal regulations (e.g., reimbursement for PCP and specialist time for e-consult services)	Technology adoption that fundamentally changes primary care delivery (e.g., synchronous and asynchronous telehealth services, patient portals, open notes, electronic kiosks, electronic scribes)

References

1. Friedberg MW, Hussey PS, Schneider EC. Primary care: a critical review of the evidence on quality and costs of health care. Health Aff (Millwood). 2010;29(5):766-72.

2. Basu S, Berkowitz SA, Phillips RL, Bitton A, Landon BE, Phillips RS. Association of Primary Care Physician Supply With Population Mortality in the United States, 2005-2015. JAMA Intern Med. 2019;179(4):506-514.

3. Baum A, Song Z, Landon BE, Phillips RS, Bitton A, Basu S. Health Care Spending Slowed After Rhode Island Applied Affordability Standards To Commercial Insurers. Health Aff (Millwood). 2019;38(2):237-245.

4. Reid R, Damberg C, Friedberg MW. Primary Care Spending in the Fee-for-Service Medicare Population. JAMA Intern Med. 2019;179(7):977-980.

5. Delivering Value-based Transformation in Primary Care. CMS. Online. Available: https://innovation.cms.gov/files/x/primary-cares-initiative-onepager.pdf. Accessed: 02/18/2021.

6. Moore K. Advanced primary Care: A Foundational Alternative Payment Model (APC-APM) for Delivering Patient-Centered, Longitudinal, and Coordinated Care. American Academy of Family Physicians. April 14, 2017. Online. Available: https://aspe.hhs.gov/system/files/pdf/253406/AAFP.pdf. Accessed 02/18/2021.

7. Erickson SM, Outland B, Joy S, et al. Envisioning a Better U.S. Health Care System for All: Health Care Delivery and Payment System Reforms. Ann Intern Med. 2020;172(2 Suppl):S33-S49.
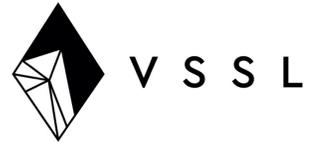
8. Patient-Centered Medical Home (PCMH). NCQA. Online. Available: https://www.ncqa.org/programs/health-care-providers-practices/patient-centered-medical-home-pcmh/. Accessed 02/18/2021.

9. Primary Care Speaks as One: Unified Voice, Unified, Vision, Changing Primary Care Finance. The Larry A. Green Center (Convener). 2020. Online. Available: https://www.newprimarycareparadigm.org/. Accessed: 02/01/2021.

10. New AAMC Report Confirms Growing Physician Shortage. AAMC. 06/26/2020. Online. Available: https://www.aamc.org/news-insights/press-releases/new-aamc-report-confirms-growing-physician-shortage. Accessed 02/18/2021.

11. HHS awards $293 million to expand primary health care workforce. HHS.gov. 10/18/2018. Online. Available: https://www.hhs.gov/about/news/2018/10/18/hhs-awards-293-million-expand-primary-health-care-workforce.html. Accessed 02/18/2021.

12. Bindman AB, Cox DF. Changes in Health Care Costs and Mortality Associated With Transitional Care Management Services After a Discharge Among Medicare Beneficiaries. JAMA Intern Med. 2018 Sep 1;178(9):1165-1171.

13. Chronic Care Management Services. Centers for Medicare and Medicaid Services. 07/2019. Online. Available: https://www.cms.gov/outreach-and-education/medicare-learning-network-mln/mlnproducts/downloads/chroniccaremanagement.pdf. Accessed 02/19/2021.

14. Carlo AD, Corage Baden A, McCarty RL, Ratzliff ADH. Early Health System Experiences with Collaborative Care (CoCM) Billing Codes: a Qualitative Study of Leadership and Support Staff. J Gen Intern Med. 2019;34(10):2150-2158.

15. Comprehensive Primary Care Plus. Centers for Medicare and Medicaid Services. Updated 01/19/21. Online. Available: https://innovation.cms.gov/innovation-models/comprehensive-primary-care-plus. Accessed 02/01/2021.

16. Nguyen L, Bellucci E, Nguyen LT. Electronic health records implementation: an evaluation of information system impact and contingency factors. Int J Med Inform. 2014 Nov;83(11):779-96.

17. Lau F, Kuziemsky C, Price M, Gardner J. A review on systematic reviews of health information system studies. J Am Med Inform Assoc. 2010 Nov-Dec;17(6):637-45.

18. Polinski JM, Barker T, Gagliano N, Sussman A, Brennan TA, Shrank WH. Patients' Satisfaction with and Preference for Telehealth Visits. J Gen Intern Med. 2016 Mar;31(3):269-75.

19. Petersen CL, Weeks WB, Norin O, Weinstein JN. Development and Implementation of a Person-Centered, Technology-Enhanced Care Model For Managing Chronic Conditions: Cohort Study. JMIR Mhealth Uhealth. 2019 Mar 20;7(3):e11082.

20. Bennett GG, Steinberg D, Askew S, Levine E, Foley P, Batch BC, Svetkey LP, Bosworth HB, Puleo EM, Brewer A, DeVries A, Miranda H. Effectiveness of an App and Provider Counseling for Obesity Treatment in Primary Care. Am J Prev Med. 2018 Dec;55(6):777-786.

21. Vimalananda VG, Gupte G, Seraj SM, Orlander J, Berlowitz D, Fincke BG, Simon SR. Electronic consultations (e-consults) to improve access to specialty care: a systematic review and narrative synthesis. J Telemed Telecare. 2015;21(6):323-30.

22. Bhavsar I, Wang J, Burke SM, Dowdell K, Hays RA, Intagliata NM. Electronic Consultations to Hepatologists Reduce Wait Time for Visits, Improve Communication, and Result in Cost Savings. Hepatol Commun. 2019;3(9):1177-1182.

23. Scheckel CJ, Richards J, Newman JR, et al. Role of Debt and Loan Forgiveness/Repayment Programs in Osteopathic Medical Graduates' Plans to Enter Primary Care. J Am Osteopath Assoc. 2019;119(4):227-235.

24. Chen C, Chen F, Mullan F. Teaching health centers: a new paradigm in graduate medical education. Acad Med. 2012;87(12):1752-1756.

25. U.S. Government Accountability Office. VA HEALTH CARE: Changes in Medical Residency Slots Reflect Shift to Primary Care. GAO/HEHS-00-62. Published April, 2000. https://www.gao.gov/assets/230/228957.pdf. Accessed 02/18/21.

26. HHS awards $20 million to 27 organizations to increase the rural workforce through the creation of new rural residency programs. HHS.gov. July 18, 2019. Online. Available: https://public3.pagefreezer.com/browse/HHS.gov/31-12-2020T08:51/https://www.hhs.gov/about/news/2019/07/18/hhs-awards-20-million-to-27-organizations-to-increase-rural-workforce.html. Accessed 02/02/2021.

27. Friedberg MW, Martsolf GR, White C, Auerbach DI, Kandrack R, Reid RO, Butcher E, Yu H, Hollands S, and Nie X. Evaluation of
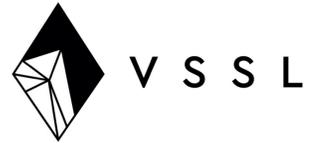
Policy Options for Increasing the Availability of Primary Care Services in Rural Washington State. Santa Monica, CA: RAND Corporation, 2016. Online. Available: https://www.rand.org/pubs/research_reports/RR1620.html. Accessed: 02/18/2021.

28. Hayhoe B, Cowling TE, Pillutla V, Garg P, Majeed A, Harris M. Integrating a nationally scaled workforce of community health workers in primary care: a modelling study. J R Soc Med. 2018;111(12):453-461.

29. Clinical Programs: Condition Management and Care Management. United Healthcare. Website. Online. Available: https://www.uhcmedicaresolutions.com/shop/medicare-advantage-plans/health-care-management.html. Accessed 02/02/2021.

30. Bellon JE, Bilderback A, Ahuja-Yende NS, Wilson C, Altieri Dunn SC, Brodine D, Boninger ML. University of Pittsburgh Medical Center Home Transitions Multidisciplinary Care Coordination Reduces Readmissions for Older Adults. J Am Geriatr Soc. 2019;67(1):156-163.

31. Meyers D, LeRoy L, Bailit M, Schaefer J, Wagner E, Zhan C. Workforce Configurations to Provide High-Quality, Comprehensive Primary Care: a Mixed-Method Exploration of Staffing for Four Types of Primary Care Practices. J Gen Intern Med. 2018;33(10):1774-1779.

32. Ladden MD, Bodenheimer T, Fishman NW, et al. The emerging primary care workforce: preliminary observations from the primary care team: learning from effective ambulatory practices project. Acad Med. 2013;88(12):1830-1834.

33. Chen PG, Mehrotra A, Auerbach DI. Do we really need more physicians? Responses to predicted primary care physician shortages. Med Care. 2014;52(2):95-96.

34. Chapman SA, Blash LK. New Roles for Medical Assistants in Innovative Primary Care Practices. Health Serv Res. 2017;52 Suppl 1(Suppl 1):383-406.

35. Hartzler AL, Tuzzio L, Hsu C, Wagner EH. Roles and Functions of Community Health Workers in Primary Care. Ann Fam Med. 2018;16(3):240-245.

36. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. Cochrane Database Syst Rev. 2012;10:CD006525.

37. Bodenheimer T, Sinsky C. From triple to quadruple aim: care of the patient requires care of the provider. Ann Fam Med. 2014;12(6):573-576.

38. Helfrich CD, Dolan ED, Simonetti J, et al. Elements of team-based care in a patient-centered medical home are associated with lower burnout among VA primary care employees. J Gen Intern Med. 2014;29 Suppl 2(Suppl 2):S659-S666.

39. Bresnick J. Kaiser's Population Health Medical School Will Start Off Free. Health IT Analytics: Population Health News. 02/21/2019. Online. Available: https://healthitanalytics.com/news/kaisers-population-health-medical-school-will-start-off-free. Accessed 02/18/2021.

40. George P, Tunkel AR, Dollase R, Gruppuso P, Dumenco L, Rapoza B, Borkan J. The Primary Care-Population Medicine Program at The
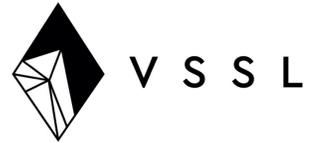
Warren Alpert Medical School of Brown University. Rhode Island Medical Journal. 2015;98(9):16-21.

41. Norris TE, Coombs JB, House P, Moore S, Wenrich MD, Ramsey PG. Regional solutions to the physician workforce shortage: the WWAMI experience. Acad Med. 2006;81(10):857-862.

42. Allen SM, Ballweg RA, Cosgrove EM, et al. Challenges and opportunities in building a sustainable rural primary care workforce in alignment with the Affordable Care Act: the WWAMI program as a case study. Acad Med. 2013;88(12):1862-1869.

43. New York State Patient Centered Medical Homes Quarterly report. New York State Department of Health. December 2018. Online. Available: https://www.health.ny.gov/technology/nys_pcmh/docs/pcmh_quarterly_report_dec_2018.pdf. Accessed 02/18/2021.

44. Frequently Asked Questions: Patient Centered Medical Homes. New York State Department of Health. Updated February 2018. Online. Available: health.ny.gov/technology/innovation_plan_initiative/pcmh/faqs.htm. Accessed 02/18/2021.

45. Improve Quality, Reduce Costs with New York State Patient-Centered Medical Home (NYS PCMH) Recognition Program. NCQA. 2018. Online. Available: https://pages.ncqa.org/nyspcmh/. Accessed 02/18/2021.

46. Oregon. PCC: Primary Care Collaborative. 2020. Online. Available: https://www.pcpcc.org/initiatives/Oregon. Accessed 02/18/2021.

47. Rissi JJ, Gelmon S, Saulino E, Merrithew N, Baker R, Hatcher P. Building the foundation for health system transformation: Oregon's Patient-Centered Primary Care Home program. J Public Health Manag Pract. 2015;21(1):34-41.

48. Direct Contracting Model: Global and Professional Options Request for Applications. Centers for Medicare and Medicaid Services. November 2019. Online. Available: https://innovation.cms.gov/Files/x/dc-rfa.pdf. Accessed 02/15/2021.

49. HHS Finalizes Historic Rules to Provide Patients More Control of Their Health Data. U.S. Department of Health and Human Services. March 2020. Online. Available: https://www.hhs.gov/about/news/2020/03/09/hhs-finalizes-historic-rules-to-provide-patients-more-control-of-their-health-data.html. Accessed 02/15/2021.

50. Cuellar A, Helmchen LA, Gimm G, et al. The CareFirst Patient-Centered Medical Home Program: Cost and Utilization Effects in Its First Three Years. J Gen Intern Med. 2016;31(11):1382-1388.

51. Emanuel EJ, Ubel PA, Kessler JB, et al. Using Behavioral Economics to Design Physician Incentives That Deliver High-Value Care. Ann Intern Med. 2016;164(2):114-119.

52. Marcotte L, Hodlofski A, Bond A, Patel P, Sacks L, Navathe AS. Into practice: How Advocate Health System uses behavioral economics to motivate physicians in its incentive program. Healthc (Amst). 2017;5(3):129-135.

53. Committee on the Learning Health Care System in America; Institute of Medicine. Best Care at Lower Cost: The Path to Continuously Learning Health Care in America. Smith M, Saunders R, Stuckhardt

L, McGinnis JM, editors. Washington (DC): National Academies Press (US); 2013 May 10.

54. Greene SM, Reid RJ, Larson EB. Implementing the learning health system: from concept to action. Ann Intern Med. 2012 Aug 7;157(3):207-10.

55. Horwitz LI, Kuznetsova M, Jones SA. Creating a Learning Health System through Rapid-Cycle, Randomized Testing. N Engl J Med. 2019 Sep 19;381(12):1175-1179.

56. Peikes D, Dale S, Ghosh A, Taylor EF, Swankoski K, O'Malley AS, Day TJ, Duda N, Singh P, Anglin G, Sessums LL, Brown RS. The Comprehensive Primary Care Initiative: Effects On Spending, Quality, Patients, And Physicians. Health Aff (Millwood). 2018;37(6):890-899.

57. Primary Care First: Foster Independence. Model Briefing. Center for Medicare and Medicaid Innovation, Centers for Medicare and Medicaid Services. Online. Available: https://innovation.cms.gov/Files/slides/pcf-info-webinar-series-slides.pdf. Accessed 02/18/2021.

58. Hudelson C, Marcotte LM. Transitional Care Management. VSSL Briefs. 2019; 1:1. https://patientsafety.uw.edu/sites/patientsafety.uw.edu/files/VSSLbrief_TCM_2019_1118_JL.pdf. Accessed 02/18/2021.

59. Hwang CS, Marcotte LM, Reddy A, Liao JM. Chronic Care Management VSSL Briefs; 2019 1:2. https://patientsafety.uw.edu/sites/patientsafety.uw.edu/files/VSSLbrief_CCM_2019_1218_JL.pdf. Accessed 02/18/2021.

60. Hwang CS, Liao JM, Reddy A, Carlo AD, Marcotte LM. The Psychiatric Collaborative Care Model in Primary Care. VSSL Briefs. 2020; 1:6. https://patientsafety.uw.edu/sites/patientsafety.uw.edu/files/VSSLbrief_CoCM_2020_0427_JL.pdf. Accessed 02/18/2021.

61. Advance Care Planning. Centers for Medicare and Medicaid Services. 08/2019. Online. Available: https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/AdvanceCarePlanning.pdf. Accessed 02/15/2021.

62. Song Z, Ji Y, Safran DG, Chernew ME. Health Care Spending, Utilization, and Quality 8 Years into Global Payment. N Engl J Med. 2019;381(3):252-263.

63. Dowling B. New innovation for independent primary care practices. Coverage: Health News Stories. July 11, 2020. Online. Available: https://coverage.bluecrossma.com/article/new-innovation-independent-primary-care-practices. Accessed 02/15/2021.

64. ChenMed. Website. Online. Available: https://www.chenmed.com/. Accessed 02/18/2021.

65. Iora Health. Website. Online. Available: https://www.iorahealth.com/. Accessed 02/18/2021.

66. Oak Street Health. Website. Online. Available: https://www.oakstreethealth.com/. Accessed 02/18/2021.

67. All-Payer Advanced Alternative Payment Models (APMs) Option. CMS Quality Payment Program. Online. Available:
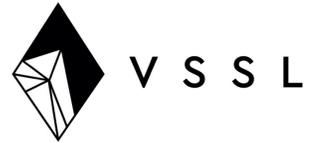
https://qpp.cms.gov/apms/all-payer-advanced-apms. Accessed 02/18/2021.

68. Fulton BD. Health Care Market Concentration Trends In The United States: Evidence And Policy Responses. Health Aff (Millwood). 2017 Sep 1;36(9):1530-1538.

69. Dunn A, Shapiro AH. Do Physicians Possess Market Power? Journal of Law and Economics. 2014; 57(1): 159-194.

70. Shrank WH. Primary Care Practice Transformation and the Rise of Consumerism. J Gen Intern Med. 2017;32(4):387-391.

71. Direct Enrollment Costs: Swedish Family Medicine – Ballard Self Pay Program. Swedish. Online. Available: https://www.swedish.org/locations/swedish-family-medicine-ballard/direct-enrollment-costs. Accessed 02/18/2021.

72. The American Recovery and Reinvestment Act: HR1 2009. Online. Available: https://www.congress.gov/111/plaws/publ5/PLAW-111publ5.pdf. Accessed 02/18/2021.

73. Buntin MB, Jain SH, Blumenthal D. Health information technology: laying the infrastructure for national health reform. Health Aff (Millwood). 2010;29(6):1214-1219.

74. Adler-Milstein J, Jha AK. HITECH Act Drove Large Gains In Hospital Electronic Health Record Adoption. Health Aff (Millwood). 2017;36(8):1416-1422.

75. Williams C, Mostashari F, Mertz K, Hogin E, Atwal P. From the Office of the National Coordinator: the strategy for advancing the exchange of health information [published correction appears in

Health Aff (Millwood). 2012 Mar;31(3):886]. Health Aff (Millwood). 2012;31(3):527-536.

76. McKethan A, Brammer C, Fatemi P, et al. An early status report on the Beacon Communities' plans for transformation via health information technology. Health Aff (Millwood). 2011;30(4):782-788.

77. Neufeld JD, Doarn CR, Aly R. State Policies Influence Medicare Telemedicine Utilization. Telemed J E Health. 2016;22(1):70-74.

78. Harvey JB, Valenta S, Simpson K, Lyles M, McElligott J. Utilization of Outpatient Telehealth Services in Parity and Nonparity States 2010-2015. Telemed J E Health. 2019;25(2):132-136.

79. Liao JM, Reddy A. Paying for and Delivering Telehealth in the Covid Era: Early Groundwork in WA Medicaid. UW Value and System Science Lab. 2020. Online. Available: https://patientsafety.uw.edu/sites/patientsafety.uw.edu/files/VSSL_outreach_TelehealthinCovidEra_2020_0817_AC.pdf. Accessed: 02/15/21.

80. Electronic Consult Reimbursement Roadmap. Blue Shield of California Foundation. March 2016. Online. Available: https://blueshieldcafoundation.org/sites/default/files/u19/eConsult%20GPS_032916.pdf. Accessed 02/18/2021.

81. Thielke A, King V. Electronic Consults (eConsults): Promising Evidence and Policy Considerations for Implementation. Milbank Memorial Fund. June 2020. Online. Available: milbank.org/wp-content/uploads/2020/06/eConsults_Milbank_Report_v4.pdf. Accessed: 02/15/21.

82. Sorondo B, Allen A, Fathima S, Bayleran J, Sabbagh I. Patient Portal as a Tool for Enhancing Patient Experience and Improving Quality of Care in Primary Care Practices. EGEMS (Wash DC). 2017 Jan 26;4(1):1262.

83. Hefner JL, MacEwan SR, Biltz A, Sieck CJ. Patient portal messaging for care coordination: a qualitative study of perspectives of experienced users with chronic conditions. BMC Fam Pract. 2019 May 3;20(1):57.

84. Esch T, Mejilla R, Anselmo M, Podtschaske B, Delbanco T, Walker J. Engaging patients through open notes: an evaluation using mixed methods. BMJ Open. 2016 Jan 29;6(1):e010034.