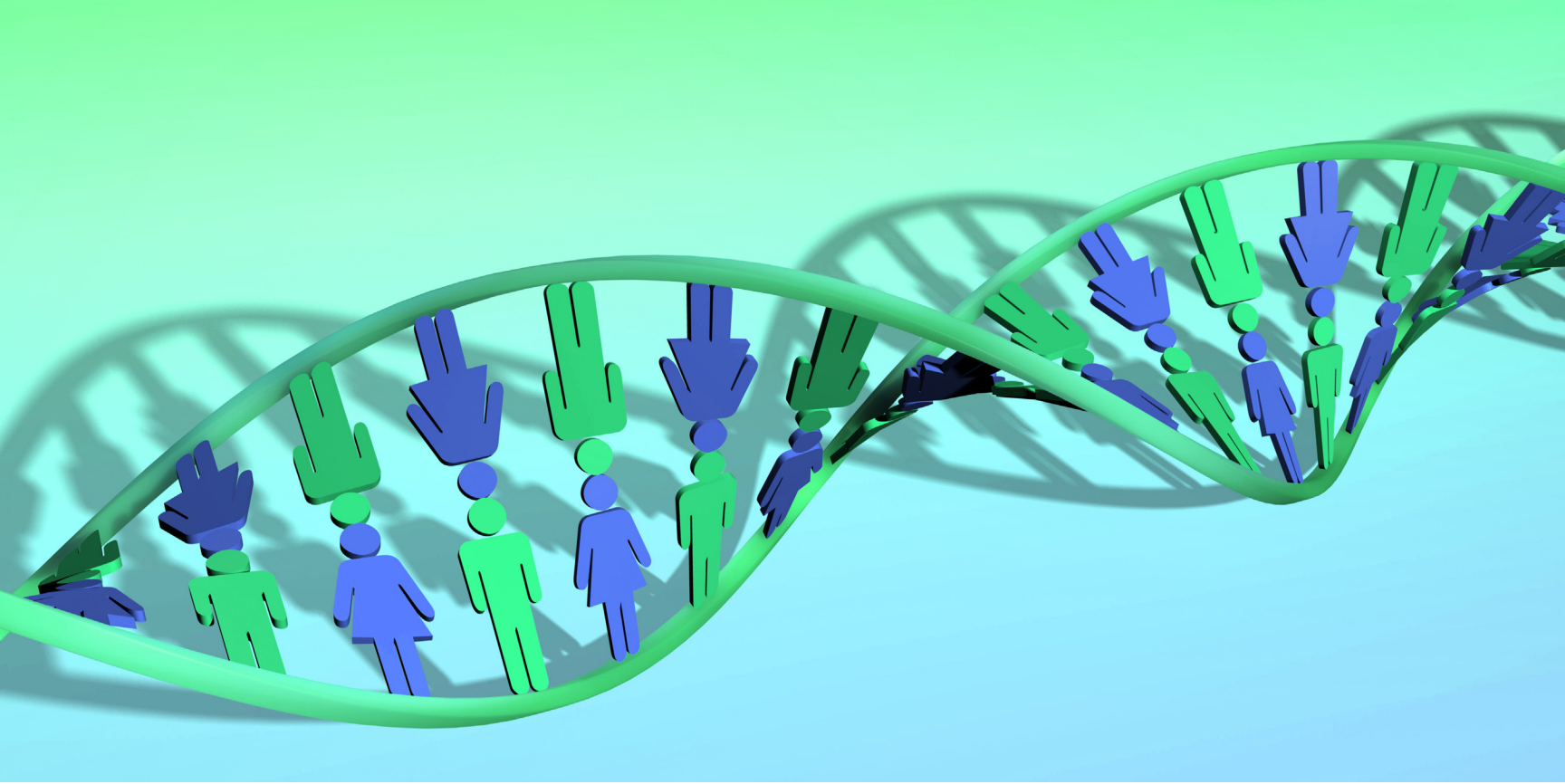


Precision health and wellness

The next step for population health management

IBM Institute for Business Value
survey conducted by
Oxford Economics

How IBM can help

IBM Healthcare is creating solutions to enable a smarter, more connected healthcare system that can assist clinicians in delivering better care and empower people to make better choices. In addition to the company's investment in health technology research and innovation, IBM's healthcare solutions and consulting enable organizations to achieve greater efficiency within their operations; collaborate to help improve outcomes; and integrate with new partners for a more sustainable, personalized and patient-centric system focused on value. For more information about IBM Healthcare solutions, visit **ibm.com**/healthcare.

The next step for population health management

Population Health Management (PHM) will become an almost universally accepted method for healthcare delivery and management in the United States by the end of this decade, according to a new IBM study. PHM is becoming increasingly important for both payers and providers, as new payment models are applied that put outcomes and value of care ahead of quantity. Even as PHM develops and matures, it is already beginning a transformation – one that shifts focus to earlier-at-risk populations to keep them healthier longer, while also exploring more efficient ways of managing the chronically ill. From an analysis of the projected state of healthcare by 2020, we believe that PHM will converge with Precision Medicine, which incorporates genomic data to personalize optimal treatments for individual patients, to create an entirely new paradigm in healthcare services. This first in a series of reports about the future of healthcare focuses on the current and projected state of PHM and foreshadows the evolution to a new model we call Precision Health and Wellness.

Executive summary

Population Health Management, which provides insights to clinicians, collaborative care givers and community-based support agencies to identify gaps in the care of specifically selected cohorts, has been rapidly deployed in the United States over the past few years, particularly among healthcare providers. However, even as PHM is being integrated into their practices, it is already beginning to transform into a more precise method for managing discrete healthcare populations. Analysis of data from a recent IBM Institute for Business Value study of healthcare payers and providers reveals that today's PHM models and programs are being influenced by three key factors:

- *Impact of payment reform and new care delivery models* – Evolving payment and reimbursement models to support more integrated, holistic, and personalized care that rewards outcomes and value over volume.
- *Data, analytics and cognitive* – The deeper, data-derived insights that advanced analytics and cognitive computing will bring to the PHM equation to improve holistic healthcare.
- *Optimization for successful PHM with Precision Medicine* –The potential for more exacting diagnoses and targeted treatment through a convergence of PHM with Precision Medicine, which uses clinically relevant genetic variation to stratify subgroups of patients to identify optimal treatment and provide better care.

99% of respondents agree Population Health Management is essential for healthcare transformation at a national level in the United States.

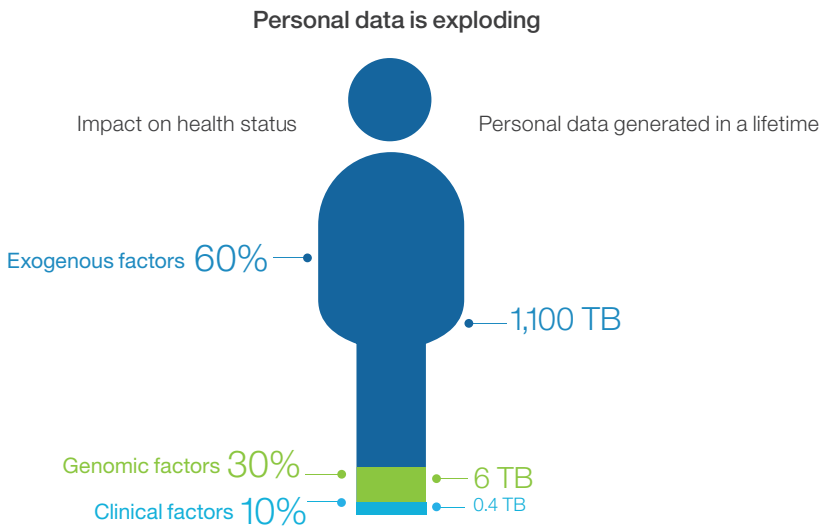
37% of providers and 35% percent of payers say a mounting shift in resource allocation will continue away from applying PHM to populations with active (chronic) disease toward increasing investment in at-risk populations to keep them healthier longer.

61% of respondents say genomic data tops their needs by 2020, indicating a convergence of PHM and Precision Medicine.

Particularly, Precision Medicine helps PHM program managers to better understand the causal relationships among numerous influencers on health and wellbeing, including genetic, environmental, behavioral, mental and social factors, all of which have been shown to have a significant impact on health status, wellbeing and longevity (see Figure 1).[1] This is particularly important because research shows that, although the largest proportion of investment in health goes into healthcare, only about 10 percent of health is influenced by medical care.[2]

Figure 1

Data generated for a single individual



Source: IBM Analysis 2016. Adapted from McGovern, Laura, George Miller, and Paul Hughes-Cromwick. "The Relative Contribution of Multiple Determinants to Health Outcomes." Project HOPE, 2014.

Respondents recognized that PHM provides a framework designed to avoid or postpone disease onset, proactively engage populations, offer additional resources for preventive screening and wellness of at-risk populations and just-as-effective – but less costly – treatment for chronic diseases. In conjunction with foundational clinical medicine, PHM has the potential to provide tremendous benefits to society.

To better understand the current state of PHM and its convergence with Precision Medicine, the IBM Institute for Business Value interviewed almost 300 healthcare providers and payers in the United States about their current PHM strategies and implementations and how they envision their level of maturity by 2020. These interviews were part of a larger study that included payers and providers in Canada, the United Kingdom, Denmark, Australia and New Zealand. Additional results will be detailed in future IBM Institute for Business Value executive reports beginning in early 2017.

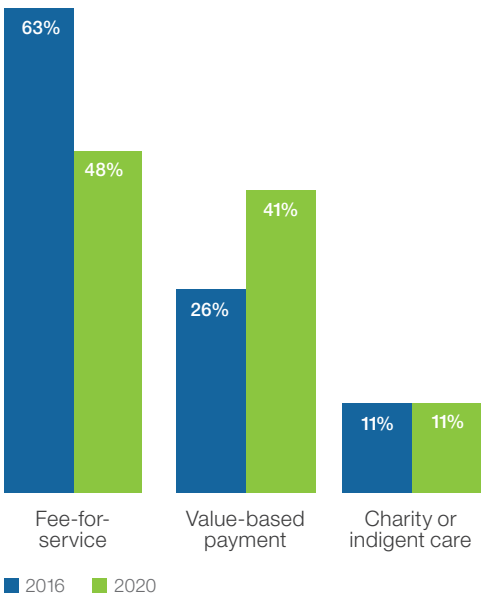
In this executive report, we will examine the change in payment and care delivery models and what these mean for medical practitioners. We will also look at the increasing impact of advanced analytics and cognitive computing and their potential contributions to more holistic healthcare. Finally, we will explore how PHM can converge with Precision Medicine and evolve into a new, effective and efficient construct for population health that has the potential to address at-risk populations and provide better support for existing chronic conditions.

Precision Medicine[3]

Precision Medicine can be defined as the interpretation and definition of clinically relevant genetic variation used to stratify subgroups of patients to identify optimal treatments that integrate research findings and clinical practice to build knowledge bases that can better guide individualized patient care to more precisely influenced outcomes.

Figure 2

Where is your organization today and where will it be by 2020, moving from FFS to value-based payment?



Source: Where would you say your organization is today on the journey from fee-for-service ("episodes of care") to value-based payment, as defined by the percent of total revenue associated with FFS contracts versus value-based payment contracts? Where do you think you will be by 2020? U.S. Providers, n=200

Impact of payment reform and new care delivery models

The shift from fee-for-service to value-based payments

What is driving PHM to become ubiquitous today in the United States? Not surprisingly, the majority of our respondents cited payment reform as a primary influencer of change across the entire healthcare landscape, including PHM. The greatest shift is moving from PHM programs now driven by the healthcare organization itself to those that will be supported by payment reform from the U.S. Centers for Medicare & Medicaid Services (CMS). This payment reform parallels a shift to value-based care/outcomes. .

Of all revenue generated by providers in 2016, our study showed that 63 percent came from fee-for-service (FFS) and 27 percent from value-based payments (VBP). By 2020, that is expected to shift to 48 percent FFS and 41 percent VBP (see Figure 2).

The reasons for the slow adoption of VBP models are complex, partially because they involve a huge cultural shift in how clinicians have been trained to provide care. The practice of engaging and treating similar cohorts of patients, while providing more precise, personalized care is not yet very widely practiced and remains a daunting challenge for most healthcare providers today.

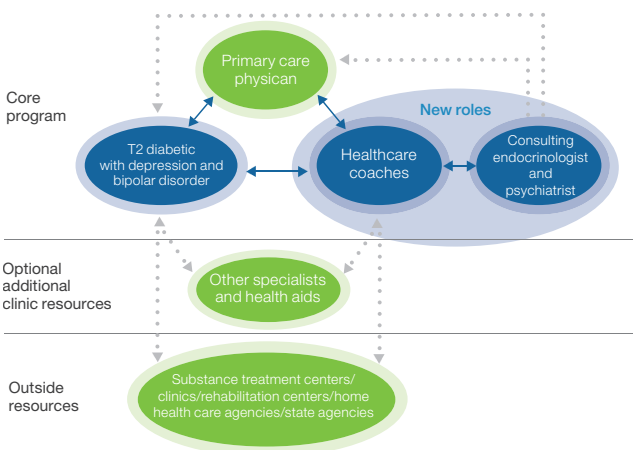
The transformation of care delivery models

PHM provides insights to clinicians, collaborative caregivers and community-based support agencies to help identify and close gaps in the care of specifically selected cohorts and individuals. These insights can lead to improvements in providing more effective and efficient interventions to reach successful health and wellness outcomes. This will be achieved through new coordinated care constructs, such as the Patient-Centered Medical Home (PCMH). PCMH is an enhanced primary-care model that provides comprehensive, coordinated and timely care with appropriate reimbursement. While reimbursement is still primarily fee-for-service, new programs and incentives are rewarding even closer collaboration and an emphasis on outcomes and shared savings. This underscores the central role of teamwork and engagement by those receiving care and anticipates value-based payments.[4]

The remarkable growth in the adoption of the PCMH seems to parallel PHM as a primary care delivery model, with 66 percent of our respondents stating they have a PCMH model in place today, and 100 percent claiming they will have it in place by 2020. It is likely that the makeup of the PCMH will mature from a clinically focused disease management and intervention "site" into PCMH 2.0 – a system that collaboratively manages multiple co-morbidities, mental disorders and lifestyle changes (see Figure 3). PCHM 2.0 could be viewed as a primary care "version" of PHM and, eventually, Precision Health and Wellness programs that incorporate early screening, remote monitoring and patient-reported data.[5]

Figure 3

PCMH: 2.0 Simultaneous management of mental health disorders and chronic diseases in primary care settings mirror PHM programs for co-morbid conditions



Source: Coleman, Charles. "The Rewards of Integrating Behavioral Health & Mental Health into Primary Care and the PCMH 2.0." IBM Watson Health. May 2016. Adapted from J. Unützer. Accessed October 2016.

No outcome. No income.[6]

"Convincing current practitioners – across all fields in health care – that they need to practice population-based care is a gigantic cultural challenge. But since we're trained – speaking for physicians now – since we're trained one patient, one problem, one at a time, and since we're paid one patient, one problem, one at a time – now we're asking for a complete paradigm shift to go towards a population of patients with diabetes, a population of patients with heart failure. Where's your registry? Are you measuring outcomes? How do you stack up locally, regionally, nationally? – wow! This is asking a lot of people. Now is the time to embrace the population health agenda. Certainly health reform is all about being paid based – at least in part – on the outcome of your care for a population. So if you would: no outcome, no income."

David Nash, M.D.
Dean, Jefferson College of Population Health

"Our medical policy team has already been looking at testing for genomic variances, if you will, and have been looking to see does it make sense, does it change treatment outcomes and when it does change treatment outcomes for the better, then certainly we have been incorporating it already into our policies."

Phil Majewski, M.D.
Senior Medical Director, Highmark

Data, analytics and cognitive: Insights to support PHM

Data

When asked what data and insights organizations are gathering today, as opposed to what they expect to need by 2020, the majority of respondents indicated that the most significant changes expected are resoundingly "–omic" in nature, specifically those most commonly associated with Precision Medicine (genomic data) and public health data (syndromic surveillance).

Across the board – in all categories of importance to successful PHM – access to and the integration of data ranked as the two most essential requirements for successful PHM by providers surveyed. The top types and sources of data used today are projected to be the same in 2020, namely Electronic Medical (or Health) Records (EMR/EHR), clinical records and medical and pharmacy claims.

Our survey showed that organizations are already making good use of a wide range of datasets, but expect to increase both the extent and types of data in coming years. This data will be accessed from multiple sources using remote monitoring capabilities and captured within Electronic Medical Records.

Remote monitoring and screening

The number of providers expecting to access data from remote monitoring and self-reported data included in PHM programs almost doubles by 2020, and the number of payers increases by a fifth. Current predictive algorithms can be updated with genomic data to achieve improved predictive power. Screening programs, too, will be improved, not only for single gene disorders, but also for conditions where gene variants are further influenced by environment and lifestyle.[7] Often, no screens are used today to assess an individual's mental health status, even though evidence shows that mental health disorders and illness—whether diagnosed or not—are highly prevalent and have a direct effect on physical well-being and the associated costs of treating physical or biological diseases. We expect this to change as PHM practices continue to mature.[8]

Electronic Medical Records

Access to clinical data and the use of Electronic Medical Records (EMRs), which are designed to capture clinical data related to individual patients, are highly prevalent today, with some two-thirds of providers in our study using EMR systems for PHM purposes. However, a minority of respondents said their success with this approach was limited. One issue is that EMRs do not include much in the way of social, environmental, mental or behavioral influencers of health.[9] The requirement for incorporating such data into PHM applications and programs is a key factor in the need for additional technologies that can leverage that data: seventy percent of study respondents said they are evaluating population health applications, risk stratification, care coordination, analytics and collaborative applications.

Our research reveals that the most essential requirements for PHM are access to data from multiple sources and the integration of that data into PHM applications and programs, and real-time access to the EMR (or data) warehouse. Many providers are still trying to leverage EMR data and applications to feed into their care coordination and PHM programs and platforms.

"The first big challenge is actually dealing with the research environment, which means access to data, which means finding all the great datasets that are potentially usable, and getting them in a place where people really can use them. So, it's not enough to just say – oh, here's a portal. Getting those things in a form that users can actually manage those data in a realistic way in their lifetime."

Mark Cullen, M.D.
Senior Associate Dean for Research of the School of Medicine,
Director of Stanford Center for Population Health Sciences
Stanford University

Cognitive computing[10]

Cognitive computing refers to systems that learn at scale, reason with purpose and interact with humans naturally. Rather than being explicitly programmed, they learn and reason from their interactions with us and from their experiences with their environment. Cognitive computing refers to systems that:

- Create deeper human engagement
- Scale and elevate expertise
- Infuse products and services with cognition
- Enable cognitive processes and operations
- Enhance exploration and discovery.

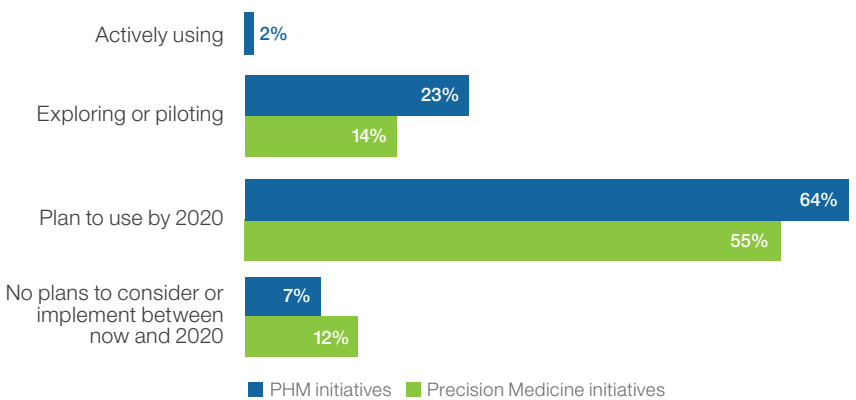
Cognitive systems generate not just answers to numerical problems, but hypotheses, reasoned arguments and recommendations about more complex – and meaningful – bodies of data.

Analytics and cognitive

Analytics technologies are already extensively deployed by U.S. payers and providers, but recent advances in cognitive computing are likely to help develop deeper, more personalized insights. Two-thirds of respondents use analytics today to determine how well their PHM programs are working in their internal processes (see Figure 4). Forty-six percent cited their uses of analytics predominantly to stratify their populations, while 26 percent use analytics for decision support. Only 18 percent said they have analytics running from the beginning to the end of the care continuum to include outcomes evaluation, risk and reporting. We can only anticipate that analytics will become a major contributor in achieving value-based care.

Figure 4

Use of cognitive computing, 2016 to 2020



Source: What sources and types of data are used in your PHM programs today and which do you expect to use by 2020? Select all that apply. U.S. Providers, n=200

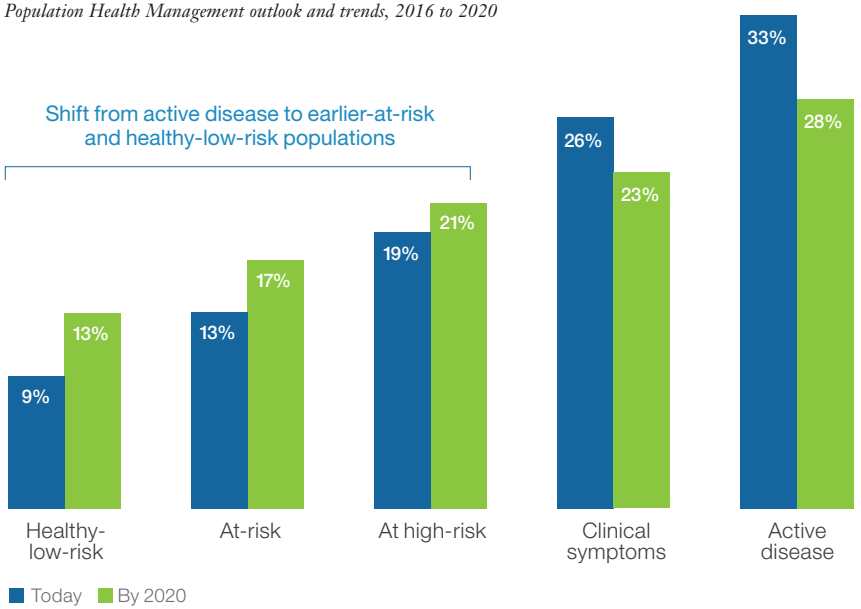
Approximately 75 percent of payers and providers in our study are already examining cognitive computing or will have cognitive systems in use by 2020. Nearly one-quarter are exploring or piloting the role of cognitive computing in their PHM applications today. More than half said they plan to use cognitive computing in their Precision Medicine applications by 2020, while 14 percent indicated they are exploring or now piloting cognitive computing in their Precision Medicine applications.

Study respondents said they expect to see marked growth in the use of natural language processing (NLP). Much highly relevant information is locked inside text files and provider notes today and is not commonly used for clinical or business insight. Executives in our survey recognize the potential benefits of extracting insights from this data for inclusion in their PHM programs, but need streamlined ways to move unstructured date into structured formats.

A significant finding is the emerging shift in focus and resource allocation within provider-based PHM programs to be more inclusive of healthy/low-risk, at-risk and at-high-risk patients, as well as their seriously ill populations with chronic co-morbidities normally associated with PHM programs. As one respondent noted: "It's our intention to keep a pre-diabetic 'pre-' for as long as we possibly can." (see Figure 5).

Figure 5

Population Health Management outlook and trends, 2016 to 2020



Source: Please indicate how much effort your organization devotes to the following populations today? In 2020? (U.S. Providers, n=200)

Improved predictive analytics will aid in a shift from maintenance to prevention – with an increased proliferation of targeted wellness and health education programs and payer-provider incentives. In the future, healthcare institutions will be looking earlier at how unhealthy characteristics are influenced by genetic and hereditary factors in concert with their biological characteristics and predispositions.

Currently, the industry does not universally avail itself of such information and overlay it with influential social, family, economic and environmental data. Nor do providers and payers build data sets and risk scores based on the unhealthy or risky behaviors of patients, such as alcohol/substance addiction, poor nutrition, or air and water quality issues. We expect PHM programs that address at-early-risk populations to increase as more data and insights about patient behavior are factored in with general health and wellness goals.

Optimization for successful PHM and Precision Medicine

PHM is not a new concept, but, until recently, few provider organizations or institutions have been engaged in implementing, staffing and operationalizing PHM programs and processes. From our survey, three-quarters of providers and nearly two-thirds of payers stated their PHM initiatives were three years old or less. However, in that short time, they report considerable progress in implementation and management. Greater than 80 percent of respondents agreed or strongly agreed that:

- Their PHM programs are well integrated with traditional healthcare services
- They have a defined organization or department in place to deal with PHM
- They have a clear governance structure, budget and business model

These findings are somewhat surprising, since most PHM programs are still relatively new and the results of PHM integration with traditional health care services are still being evaluated for effectiveness and efficiency. Additionally, many of the analytics are not yet in place to validate qualitative and quantitative outcomes.

Ninety-two percent of providers stated that their physicians, nurses, care managers and most of their patient populations understood the value of PHM. This is also rather surprising, since PHM as a mode of managing populations is new to most providers and their patients.

Nevertheless, these data points show that both payers and providers clearly understand that staff buy-in and understanding are critical for moving forward. These factors suggest a fundamental paradigm shift in care delivery and management, moving away from the individual biomedical model toward a more holistic model of care, which is reflected in the respondents' commitment and confidence in their PHM programs and processes.

Collaboration and consolidation are critical to improved population health

Our study reveals that 83 percent of payers and 96 percent of providers agree that PHM and Precision Medicine will foster greater collaboration between peers by integrating many new sources of data and stakeholders. Twenty-four percent of survey respondents rated improved collaboration among all providers to be very successful, and we expect that number to grow substantially by the end of the decade. Improving population health requires the contribution of many entities, including state and local governments, hospitals, community organizations, health centers and private practices.

Health systems committed to population health are significantly more collaborative with external organizations than those that are not, reporting strong partnerships with community organizations (94 versus 80 percent) and priorities aligned with local public health (81 percent versus 61 percent). Notable partnerships include those with federally qualified health centers/community clinics (55 percent), other hospitals (52 percent), public health departments (52 percent), healthy community coalitions (48 percent) and community development organizations (30 percent).[11]

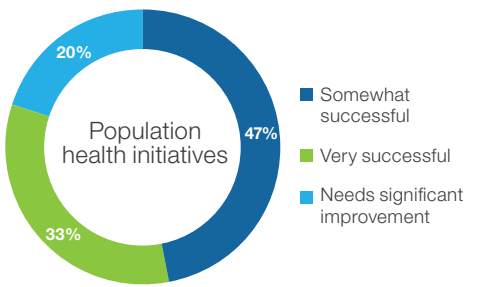
Part of collaboration is the understanding that housing, education and jobs policies can have as much impact on upstream prevention as anything a public health agency does. This means cooperation among hospitals, housing agencies, educational institutions, planning agencies and a wide array of partners. Closed loop referral capabilities represent a manifestation of collaboration, and while 74 percent of providers saw this as essential to high quality PHM, only 30 percent have it in place today. However, this grows to 73 percent by 2020.

"Academic institutions are recalibrating healthcare leaders in the area of population health in topics including quality, safety, technology, population health intelligence and to some extent, precision science."

David Nash, M.D.
Dean, Jefferson College of Population Health, September 2016

Figure 6

How successful are your population health initiatives in providing less costly interventions?



Source: Less costly interventions - How successful are your population health initiatives in the following areas? (U.S. Providers, n=200)

Today's challenges

Today, 66 percent of all respondents ranked "improving quality of care" as the biggest challenge they face. Security, at 43 percent, ranked second. Regulatory compliance and avoiding reimbursement penalties was third, at 39 percent, and keeping pace with medical innovations and changing business models to meet shifting financial incentives were at 31 percent, respectively.

When asked what the "biggest challenges facing your organization" would likely be by 2020, 54 percent of respondents ranked regulatory compliance and avoiding reimbursement penalties as the top challenge, followed by 51 percent who cited improving quality of care. Thirty-two percent selected security and 28 percent noted competition from new entrants. Approximately a quarter of respondents cited challenges in keeping pace with medical innovations and changing business models to meet shifting incentives.

Indications are that the long, hard march to continuously improve the quality of care delivered by healthcare organizations will remain a top priority, but there is a shift in emphasis to regulatory compliance to align with new reimbursement policies, incentives and payment procedures. Security remains a priority, but moves to third place as a challenge to the organization by 2020.

Also, a trend emerges that the measures taken to improve the quality of care will be fully realized in the years to come. Major advances in the quality of care will be augmented not by more rigorous quality standards, but, rather, through the introduction of more precise diagnostic tools and practices. This includes more comprehensive PHM programs that integrate genomic, socio-economic, environmental, lifestyle, behavioral and mental health, and pharmacological data into the PHM equation.

Underscoring this trend is that most healthcare providers in our study revealed that the greatest need for improvement for successful PHM is in providing less costly interventions in the delivery mechanics of their programs (see Figure 6). In fact, only a third of respondents reported that population health initiatives were very successful when it came to providing less costly interventions, with 67 percent claiming that initiatives were somewhat successful or needed significant improvement. This calls into question the underlying operational efficiencies of PHM and the need for better resource allocation and alignment with caring for target populations, program implementation and outcomes. PHM applications that include decision support based on real-time analytics and evidence-based interventions will go a long way toward improving the efficiencies of interventions and their outcomes.

Precision Health and Wellness[12]

Precision Health and Wellness is defined as the incorporation, analysis, and use of clinical, genomic, pharmacological, behavioral and mental health, social and environmental, and diagnostic and screening data, synthesized through cognitive computing programs, to deliver more personalized, predictive and preventative population-based health and wellness programs.

Conclusions and next steps

To capitalize on the advantages anticipated by the integration of precision tools into PHM strategies, forward-looking leaders of healthcare organizations and systems should consider:

- Creating the ability to integrate an array of new, diverse data sets (physiological, socio-environmental, genomic and behavioral/mental health) to provide insights that can be readily shared among multiple care providers and community support networks. Important factors to consider include how to access and integrate this breadth of data into your PHM programs and processes and optimize its value.
- Providing the tools, technology, and training to evolve PHM applications beyond EMR into more effective and efficient methods for moving from reactive care to include more preventive strategies. These should be evidence-based with predictable outcomes that lend themselves to value-based care and shared-risk models. Consider tools that automate outreach, engagement with patients and that standardize the use of clinical guidelines and pathways.
- Embracing the added value and personalization that Precision Medicine brings to your PHM programs and applications. Many organizations are already building roadmaps to incorporate pharmacogenomics, real-time remote monitoring and diagnostics, as well as exogenous influencers of health, into what we call Precision Health and Wellness platforms. Consider engaging with Precision Medicine and bioinformatics professionals to develop plans that bring such data into your programs.

Are you ready for Precision Health and Wellness?

A few questions can help you assess where you are on your organization's transition to Precision Health and Wellness:

- Do you have a strategy in place to proactively identify and ingest diverse data sets?
- Have you identified which analytics and cognitive computing capabilities will allow you to derive the most value from incorporating these new data sets into your PHM processes and programs?
- How do you intend to leverage your healthcare ecosystem partners to accelerate prevention and wellness initiatives with your earlier-at-risk populations as a contributor to value-based care?

This executive report is the first in a series that examines the state of healthcare through the end of this decade. In the next report, to be published in early 2017, we will look at how PHM is being implemented in other countries around the world. Finally, we will use this consolidated data, as well as additional research, to provide an in-depth view of the future of healthcare, including the practices, processes and principles of the new concept of Precision Health and Wellness.

Precision Health and Wellness Services: Join the discussion

The domain of Population Health Management is complex enough. An evolution to Precision Health and Wellness Services will, we believe, be a positive move, but will also bring significant challenges. This executive report, in addition to the reporting of the state of PHM, also lays the initial foundation for Precision Health and Wellness Services. Our goal is to see constructive debate across the industry about this topic. We invite you to join the discussion by joining our blog **ibm.com**/blogs/insights-on-business/healthcare/

For more information

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The authors would like to thank the following for their significant support, expertise and contributions: Sean Hogan, Karen Handmaker, Anil Jain and Harry Reynolds.

Acknowledgements

In addition, the authors acknowledge the contribution of the following: Paul Grundy, Michael Weiner, Susan Noack, Jennifer Stone, Mavis Prall, Neha Aggarwal, Jim Phillips, Angela Finley, Oxford Economics and IBM Institute for Business Value Research Hub.

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