

A Primer in Population Health Management

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Population health management (PHM) and value-based care (VBC) aim to enhance care quality and reduce costs, and may include additional goals. The definition and implementation of PHM vary among organizations. Although definitions vary, central to PHM is improving the health of a *specific* population. It is distinct from other disciplines, particularly public health, which it often is confused with. Although PHM program designs vary from one organization to another, they share common characteristics, including multidisciplinary teams, data analytics, information sharing, and a broad range of interventions. Data analysis and reporting are key elements of PHM programs, supporting informed decision making and guiding evidence-based activities. Risk stratification is an important feature of analytics that identifies population segments where interventions are likely to have the most impact. PHM teams require expertise from different disciplines, and clinicians should be involved in the design of programs and stratification models, the development and monitoring of interventions, the communication of goals and opportunities, and the evaluation of a program's success. Physician leaders play an important role not only in these activities but also in trust building. PHM operations entail clear roles and expectations; participatory input, and regular information sharing are essential. Many challenges that may impact the evaluation of PHM programs include annual variations, outcome realization times, and limited ability to attribute outcomes to specific interventions. Investment in PHM, alignment with VBC, proactive efficient interventions, adaptable operations, dependable analytics, and strong collaboration drive success.

KEY WORDS: Population; health; management; data; analysis; stratification; team; design.

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Scenario: A provider organization has a value-based care agreement with a payer calling for improving the quality of care and patient satisfaction scores, and reducing cost among their shared population of patients/enrollees. While the contract lists performance indicators, both organizations have different perspectives regarding their responsibilities and implementation, and have data to measure performance against value-based care and population health goals. Each of them has better access to certain data and a different relationship with the population. How would they achieve their shared goals?

Several textbooks on population health (PH) exist, but there are few short practical guides on population health management (PHM) among the plethora of PH/PHM articles. This article presents an experience-informed, literature-supported outline for PHM programs. It describes

the concept and its evolution and implementation, while highlighting contextual factors. Additional content, including healthcare trends, resource allocation, and impact evaluation can be found elsewhere.¹

PHM and value-based care (VBC) share common goals of, at minimum, improving quality and reducing the cost of care. Adoption of VBC has varying results, depending on the complexity, experience, and other factors, usually with positive clinical and cost outcomes.² PHM is the strategy through which PH and VBC goals are achieved. It brings together other, closely related, concepts, including quality improvement, case management, disease prevention, and health promotion to improve population health outcomes (Table 1). Although small practices may not have PHM teams, the concepts discussed here would inform their involvement in government- and private-payer VBC models. PHM activities

Table 1. Comparison of Population Health Management With Other Key Functions^a

PHM	Public Health	CM	QI
Focuses on defined population and individuals within it Population is attributed to the organization Utilizes functions and tools such as QI and CM Goals include the Triple Aim Emphasis on leading indicators	Pertains to an entire community without drilling down to individual needs or subpopulations with exceptions (e.g., tuberculosis clinics and asthma management in schools) Does not address cost reduction Emphasis on lagging indicators (e.g., hospitalizations, mortality)	Addresses short-term patient needs in the context of acute events Includes cost reduction and patient satisfaction Utilized to manage individuals in a subpopulation Emphasis on lagging indicators	Aims to improve clinical processes and outcomes May include patient experience, depending on context Does not address cost reduction Utilized to optimize programs and processes

CM, case management; PHM, population health management; QI, quality improvement.

^aOrganizations may structure PHM, case management, and quality improvement separately or jointly.

may serve as quality improvement projects, which would fulfill regulatory, accreditation, and recertification requirements for organizations and clinicians.

DEFINITION OF POPULATION HEALTH MANAGEMENT

PHM focuses on improving the health of an attributable population, but definitions and perceptions have varied. A recent review of PH frameworks underscored this variability, in addition to a lack of metrics in about half of them, particularly older ones.³ The theme of a discrete population is common among most definitions of PH/PHM, with differences discerned between them when they are examined through the Triple Aim lens (Table 2).⁴ Some definitions emphasize medical aspects of the health of the population, whereas others include the physical and psychosocial well-being of its members. Data management, stratification, evaluation, and feedback cycles often are missing or only implied. One potential drawback of a focus on both a distinct population and specific measures is that the health of other individuals may be neglected; therefore, PHM programs and organizations should be mindful of other needs as well.

Population health management teams should monitor and evaluate program effectiveness and then make changes to optimize their impact.

Public health, the last definition in Table 2, may be confused with PH/PHM. Conflating PHM and public health may confuse stakeholders about the role of providers, payers, and government agencies, and may misguide policymakers and funders, potentially resulting in budget and resource allocation concerns.⁵

Interest in PH, which is focused on improving the health of a population, grew in the 1990s, and it became a key element

of the Triple Aim in 2008⁶ (Figure 1). PHM is the strategy by which the Triple Aim concept is implemented to optimize the population's health status, its experience of care (in terms of quality and satisfaction), and the cost of care (particularly avoidable ED and hospitalization costs). Both PHM and the Triple Aim call for specifying a population of concern, and both have evolved over time to encompass health equity and reducing healthcare disparities.⁷ PHM definitions may not explicitly incorporate provider experience, which the Quadruple Aim has done so.⁸ It is worth noting that VBC may increase the provider's work burden and dissatisfaction.²

The definition of PH/PHM definition evolved as follows:⁵⁻⁸

- **Early conceptualization (pre-2008):** Definitions were less comprehensive and were not explicitly linked to quality improvement and cost reduction.
- **The Triple Aim Era (2008 to the present):** Because it was included in this framework, PH gained wider recognition; however, some definitions continued to lack one or more of the three aims.
- **Emergence of risk adjustment:** Meaningful comparison of similar but separate populations, such as Medicare beneficiaries at various accountable care organizations and Medicare Advantage (MA) payers, relies on standardized measurement of disease burden (risk adjustment) in each group. PHM programs are increasingly managing initiatives to capture disease burden within their populations.
- **Focus on social determinants of health (SDOH):** Definitions have increasingly encompassed SDoH with emphasis on integrating community and social services into PHM strategy. The COVID-19 pandemic highlighted significant health disparities among disadvantaged and minority groups, and strengthened the case for addressing SDoH and health inequity.
- **Emphasis on data and technology:** Data management and analytics are integral to PHM to optimize decision making and allocation of scarce resources. The size and complexity of patient information have grown, and PHM utilizes increasingly sophisticated analytical techniques including machine learning.

Table 2. Definitions of Population Health Management^a

Country	Context	Summary of Definition	Aims ^b
United States	Conceptual model	A proactive, organized, and cost-effective approach to prevention that uses newer technologies to reduce <i>morbidity</i> , and to improve <i>health status</i> , <i>health service use</i> , and <i>productivity</i> of individuals in <i>defined</i> populations.	PH, Q, C
United States	Research framework	Strategies designed to improve consumer health and increase quality of care <i>while managing medical costs</i> of <i>defined</i> populations	PH, Q, C
United Kingdom	Implementation strategy	An approach to care management is built on <i>segmentation</i> of health risks, interventions to provide tertiary and secondary <i>prevention</i> for the acutely ill and <i>at-risk</i> populations, and strategies to encourage healthier <i>lifestyles</i> .	PH
United States	Implementation strategy	An approach to <i>select</i> patients for further intervention based on specific care parameters. It <i>circumvents the time constraints</i> that may limit management <i>during clinic visits</i> and allows evaluation of a <i>panel of patients</i> who do not have follow-up appointments.	PH, Q
United States	Technology	A systematic approach to ensuring that <i>all patients</i> receive appropriate preventive, chronic, and transitional care to enhance the <i>cost-effectiveness</i> of care delivery by ensuring the wellness of <i>entire patient populations</i> .	PH, Q, C
United States	Technology	An <i>assessment</i> of the coordination of care across patient populations to improve clinical and financial outcomes through disease management, case management, and demand management.	C
United States	Contemplative article	PHM industry consists of a diverse and evolving <i>group of stakeholders</i> offering many tools, programs, and services that <i>coordinate</i> to deliver <i>interoperable care</i> for patients with a variety of <i>health risks</i> and in <i>every healthcare setting</i> .	Q
United States	Contemplative article	PHM is not disease management. It is a <i>community-based, patient-centered, provider-led</i> approach that can be measured, and can not only improve <i>health status</i> , but also <i>reduce cost</i> .	PH, C
United States	Contemplative article	Accountability and management of the health of an <i>entire community, regardless</i> of system membership or insurance status. ^c	---

PH, population health; PHM, population health management; Q, quality; C, cost.

^aSummarized for brevity from reference 4 (emphasis in italics by this author).

^bPHM aims versus the Triple Aim as assessed in reference 4.

^cThis definition aligns with public health.

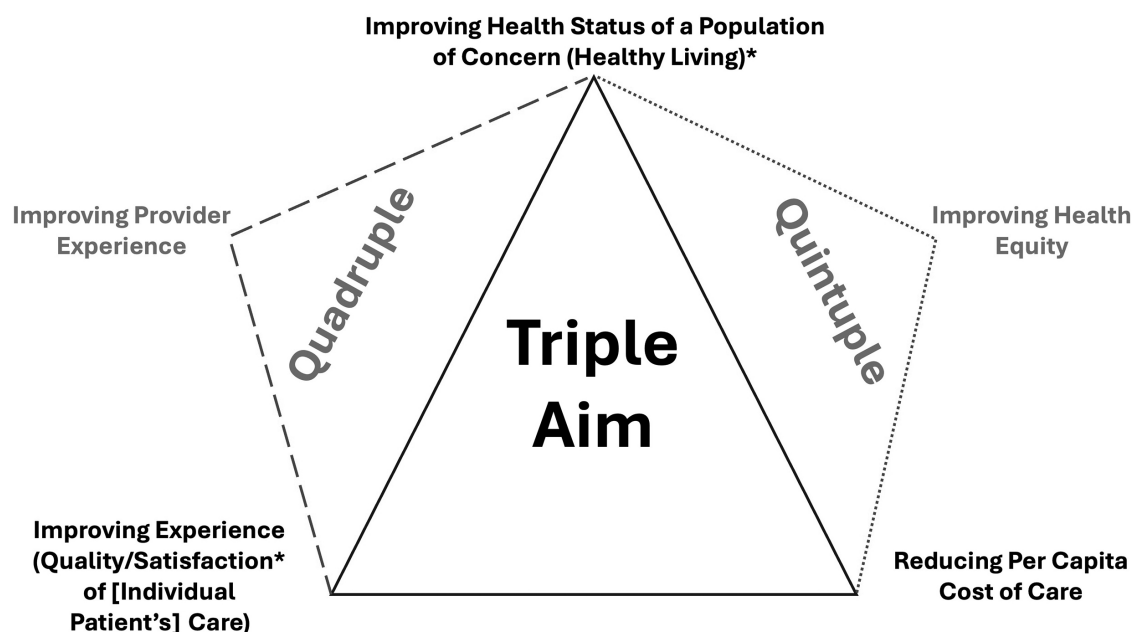


Figure 1. The evolution of the Triple Aim. Adapted from references 6-8. *Scope per original description of aims in reference 6.

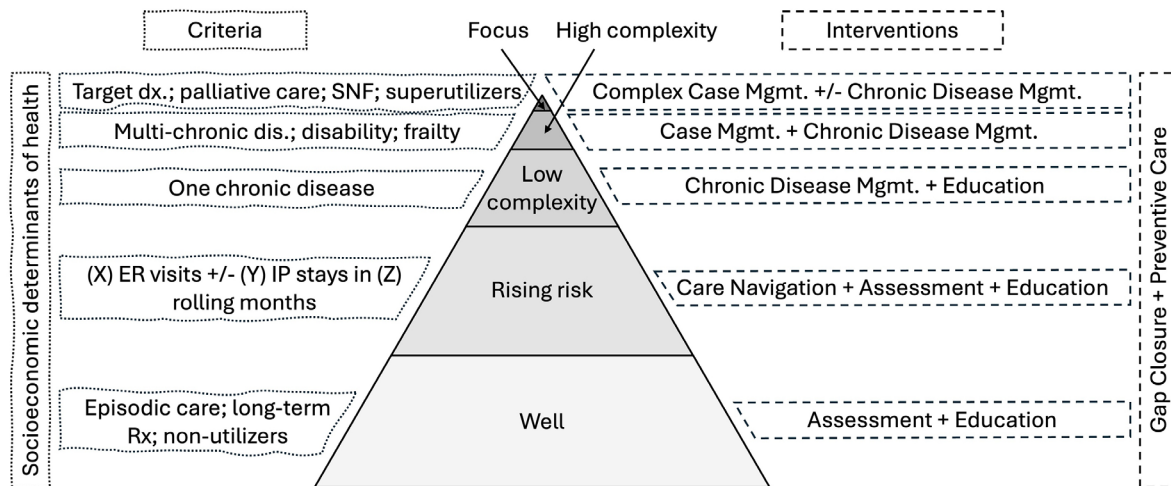


Figure 2. Example of population stratification. Dx, diagnosis; SNF, skilled nursing facility; Mgmt, management; ER, emergency room; IP, inpatient; Rx, prescription(s).

PROGRAM DESIGN

Given the varied definitions of PHM, individual PHM programs should include a definition in their charters to ensure that stakeholders are aligned regarding the scope and purpose of the program. The context of PH varies widely among organizations and influences how they support and utilize PHM.^{5,9}

Effective PHM programs require careful design and implementation, particularly for organizations with significant revenues from VBC. They identify the target population and assess its current health status, experience of care, and utilization and cost of care to determine opportunities for improvement. Both program leadership and staff must communicate findings and recommendations with a diverse audience in mind. PHM teams should monitor and evaluate program effectiveness and then make changes to optimize their impact.

Data

Data play a vital role in PHM by furnishing insights that guide decision making, justify resource allocation, and evaluate impact. The requirements for PHM data are as follows:

- **Measure selection:** Meaningful metrics measurement tools in the categories noted earlier are chosen according to the program's goals and VBC terms.^{6,10,11}
- **Sources:** Measurement data are captured from patient and provider lists, claims, patient surveys, EMRs, various documents, health information exchanges, and public sources. It is essential to assess the quality of data in terms of veracity (accuracy), value, volume, velocity (frequency), variability and structure.
- **Integration and storage:** Collating such diverse data is complex but provides a more comprehensive picture about the population, which would guide action planning. Data lakes support more complex forms of analysis and

are more amenable to scaling, characteristics which large organizations may find attractive.

- **Analysis:** The aim is to identify individuals who are at the highest risk of unfavorable cost or quality outcomes, and those with gaps in care. Although sophisticated analytical techniques, including machine learning,¹²⁻¹⁴ are increasingly used to analyze PHM data, spreadsheet programs remain the workhorse of many PHM and finance teams.
- **Socialization:** Summary findings and drilldown details are shared in different fashions depending on the audience (e.g., leaders versus support teams versus individual providers). The format, whether summary slides, dashboards, EMR alerts, etc., should be user friendly, and patient-level data such as care gaps should be easily accessible and addressable within EMRs rather than spreadsheet files.

Stratification

A key output of data analysis is risk stratification of the population, which segments it into meaningful subpopulations based on shared characteristics so that each subgroup would receive specified interventions, an approach that has yielded positive results (Figure 2).¹⁴⁻¹⁶ Homegrown or commercial stratification scoring models are used identify the group(s) of higher-cost patients where interventions are likely to yield the most savings. Population segmentation yields risk scores, which may be derived from either simple scoring algorithms or complex predictive modeling.^{12-14,17} The criteria and number of output strata vary among PHM programs, and the intensity of intervention increases for subpopulations with a higher likelihood of healthcare utilization, which often is associated with lower quality scores. Stratification design may combine subpopulations represented in Figure 2 such as merging "focus" and "high complexity," or may split them

Table 3. Structure of Population Health Management Team

Discipline	Activities
Project managers and analysts	Facilitate and organize PHM operations; support PHM team members Liaise with health information technology, finance, and other teams Develop, assess and distribute reports within PHM and other teams Participate in program design, monitoring, and evaluation
Community health workers	Link between patients and the healthcare organization Assist patients to access care (e.g., appointments, transportation) Connect patients with CBO* resources for SDoH (e.g., food, housing, employment) Engage and activate patients toward self-management Build trust and rapport with patients
Social workers	Assess and address patients' psychosocial needs Help patients access government benefits and CBO services May oversee community health workers
Care coordinators or similar roles	Liaise with the clinical teams; may push or pull reports to them Facilitate communication and collaboration within the PHM team May liaise with health plans
Nurses	Provide input in PHM design, operations, monitoring, and evaluation; ideally participate in VBC activities Manage specific PHM programs Assist other members of PHM team Educate patients (individual or classroom) and clinical teams May provide case management for a defined cohort of patients
Physician leaders	Lead or provide significant input in PHM design, operations, monitoring, and evaluation; ideally participate in VBC activities Engage internal and external stakeholders Educate patients (classroom) and clinical teams
Pharmacists	Drive medication management, adherence, and reconciliation Provide input in PHM design, operations, monitoring, and evaluation Support management of targeted conditions Educate patients (individual or classroom) and clinical teams May be members of PHM or pharmacy team
Other	Behavioral health services; usually through a collaborative effort Health plan liaison(s); may be member of a separate team; facilitates collaboration and information sharing Distinct roles may benefit certain organizations or populations May provide input to relevant PHM and VBC initiatives

* CBO, community-based organizations; PHM, population health management; SDoH, social determinants of health.

— for example, subdividing “well” into “hidden risk” and “no risk”.

Clinicians' participation in designing and updating stratification models is important. Stratification criteria may include diagnoses, comorbidities and functional status, and demographic factors such as age, sex, and socioeconomic status. Specific diagnoses or events (e.g., end-stage renal disease) or a level of resource utilization such as superutilizers may define special subpopulations (indicated by “Focus” in Figure 2) and hierarchical condition categories (HCCs) may be used instead of or in addition to diagnoses. The resources available for the appropriate intervention for each subpopulation and their expected impact will be critical considerations in resource allocation and return-on-investment (ROI) analysis of existing and new initiatives.

Model outputs should be examined by clinicians for validity and utility, and stakeholders should ensure absence of bias in the model, to promote equity. PHM programs should coordinate with other teams that utilize purpose-specific

identification tools — for example, the LACE Index for Readmission, which evaluates length of stay, acuity of admission, the presence of comorbid conditions, and recent emergency department use — to ensure alignment of efforts and to minimize provider and patient abrasion. New stratification models should be pre-evaluated because those developed for one population or setting may not apply to others. Existing models should be reviewed at least annually to update coding and clinical logic, align with regulatory or accreditation requirements, modify the associated interventions, and (re) allocate resources as needed.

Team Structure

PHM teams are multidisciplinary because their planning and implementation require expertise from clinical and nonclinical disciplines to address the complex health needs of the population. Nontraditional staff increasingly are included in multidisciplinary PHM team and operations.^{14, 16} The team structure outlined in Table 3 varies considerably among

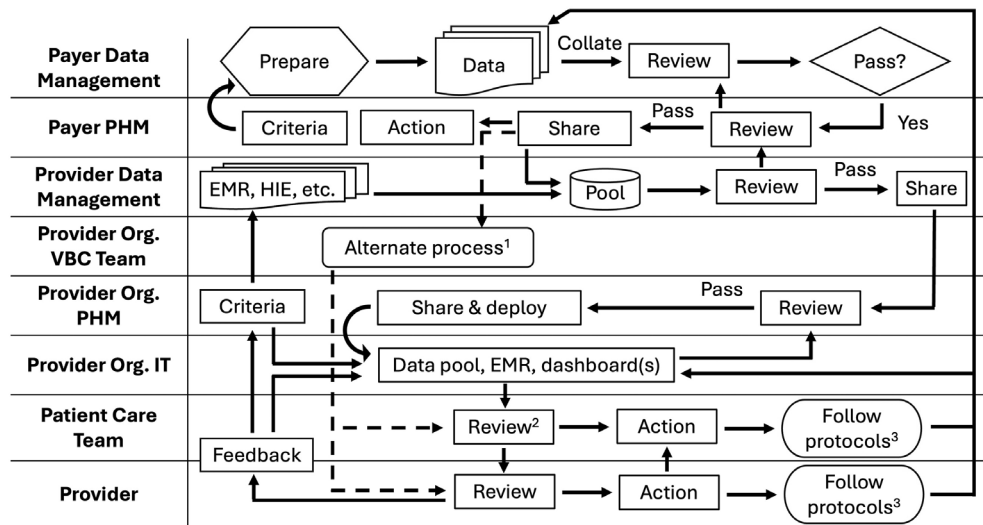


Figure 3. Sample simplified “swim lane” workflow. Detailed workflows are designed and shared in a multidisciplinary fashion. Process and project managers facilitate the development of workflows. Org, organization. 1, Alternate processes may be intentional in some organizations; they may lead to confusion and inefficiency in others. 2, Protocols should include nursing review and decision making. 3, Workflows for patient recall, prescription refill, referral, and so on. PHM, population health management; VBC, value-based care.

organizations; some roles may reside in other departments, and some roles may change over time within the same department. Physician leaders play a crucial role in the successful design and implementation of PHM and VBC, and their contributions can serve organizations best through formal management of PHM teams rather than acting in a consultative capacity. They provide informed guidance and support for team members in addition to trusted accountability within and outside the organization. Their expertise and leadership are essential for achieving desired goals thanks to their ability to drive improvement in the face of a constantly changing environment and rising rates of clinician burnout.

OPERATIONS IN POPULATION HEALTH MANAGEMENT

Several operational considerations in population health management require attention:

- Clear roles and responsibilities that are consistent with the scope of practice for each team member;
- Thorough and rational workflows that outline process steps within and outside the organization, taking into account uncommon scenarios;
- Participatory input and a team-based approach that promotes a collaborative culture;
- Evidence-based recommendations, interventions, policies, and procedures; and
- Regular information sharing with clear protocols for communication within and outside the team, and receptiveness to feedback.

Detailed process descriptions such as “swim lane” workflows (Figure 3) delineate the responsibilities and accountability of each party. PHM operations entail regular meetings with various stakeholders to jointly share, discuss, update, plan, and facilitate activities. Periodic trend review by providers and payers is important, and may be held in one or more forums, such as joint (clinical) operational meetings and care management rounds.

Cost-optimization interventions may include complex case management for high-need/high-touch events and conditions; disease management for chronic conditions to curtail complications or exacerbations; care navigation to assist patients in accessing the right care at the right time in the right place; assessments of health, functional and/or disease status; and health education. Disease-specific interventions, community-based services,¹⁴ home-based primary care,^{19, 20} and hospital-at-home programs²¹ would benefit certain subgroups. Care and risk-adjustment gap closure activities (e.g., patient and provider reminders, reconciling gap lists with documentation in medical records, lab and specialist referrals) would apply to the entire population. Cyclical patterns, in which activities intensify during the year, may trigger different approaches, such as additional provider visits, at-home testing, or temporary staffing, among others. Recognizing those patterns and proactively planning for variable resource allocation optimize the impact of PHM.

Evaluation of the impact of PHM and the ROI from VBC agreements guides resource allocation, and value estimation of distinct interventions and the program relies on evidence-based knowledge and informed experience, both

areas in which clinicians can provide important insights. Challenges in determining the value of PHM include annual variations, the length of time some outcomes may take to materialize, and the difficulty in attributing outcomes to specific interventions because of the complex interplay of factors and concurrent initiatives. Additional information regarding program evaluation and resource allocation is available elsewhere.¹

FACTORS THAT LEAD TO SUCCESS

Organizations vested in VBC are more likely to develop and maintain strong PHM programs that are espoused as an enterprise-wide endeavor. Successful PHM programs share several characteristics related to their sponsorship, design, analytics, operations and interventions, as follows:

- Alignment of PHM operations with contractual obligations to ensure that outcomes serve not only the patients but also organizational goals;
- Close collaboration with the VBC team to align on the scope, selection, and number of measures for each contract, and the aggregate number of indicators across all payers;
- Reliable data management and analytics that employ insightful segmentation models and adapt quickly to reporting requirements;
- Robust, proactive rather than reactive, actions that take into account their target audience's behavior patterns, and utilize continuous process improvement;
- Effective and efficient interventions that address both preventable costs and the quality of care;
- Flexible PHM designs that adapt to changes in the population, provider network, and regulatory and accreditation requirements;
- Attention to communication, stakeholder buy-in, volume and format of data, clinician burnout, and staff roles throughout the organization;
- Productive collaborations within and outside the organization to promote engagement and garner support, particularly during changing times;
- Integration of various services including behavioral health, ideally co-located with primary care, and collaborations with community-based organizations; and
- Understanding payer coverage and benefits that may impact beneficiary behaviors and utilization patterns, and potentially PHM effectiveness.

SUMMARY

PHM programs aim to optimize, at minimum, the health status and quality and cost of care of attributable populations, which often are tied to VBC and are segmented to optimize the use and yield of resources. Successful PHM programs entail a wide range of activities, ideally addressing all aspects of the Quintuple Aim through effective communication, data

management and reporting, broad collaboration, utilizing tools from other disciplines, and innovative nontraditional solutions. Concepts and models of PH and PHM will continue to change because of shifting population needs, economic and regulatory influences, mergers and acquisitions, evolving workforce, new technology, and other factors. Organizations and their various teams will need to adapt to those changes to maintain the impact and value of PHM. ■■

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