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مجلس الضمان الصحي
Council of Health Insurance

POPULATION HEALTH MANAGEMENT GUIDEBOOK

Guidance and reference material for implementing and adopting PHM

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INTRODUCTION

PREFACE

It is our pleasure to present this population health management (PHM) guidebook for the private sector. We recognize our duty of care as a regulator to support payers and providers, and thus, we have taken steps to produce this guidebook to assist you in your endeavors of PHM adoption and implementation.

This guidebook marks an exciting step on the journey that some of you have already embarked upon. However, we at CHI believe that we have an opportunity to accelerate and enhance the implementation of PHM in the private sector.

By providing you with insights, strategies, and best practices, we aim to empower you to take full advantage of the benefits that PHM can bring to your organizations and the communities you serve. By focusing on PHM, we can shift our healthcare system towards a more proactive and preventive approach, ultimately ensuring the efficient use of resources and improving the health outcomes of our population.

We view our PHM Program as a crucial foundation for supporting our wider Value-based health care (VBHC) strategy, aligning with the Kingdom's health care transformation agenda.

We hope that this guidebook serves as a valuable resource for you, enabling you to navigate the complexities of implementing PHM in the private sector. Together, let us embrace this opportunity to transform healthcare delivery and create a healthier future for our population.

ABOUT THE COUNCIL OF HEALTH INSURANCE

Vision

To be an international leader in prevention and improving value in health care services for the health insurance beneficiaries.

Mission

Improve the health of beneficiaries through a regulatory environment focused on prevention and enables stakeholders to promote equity, transparency and Value-based health care.

Values

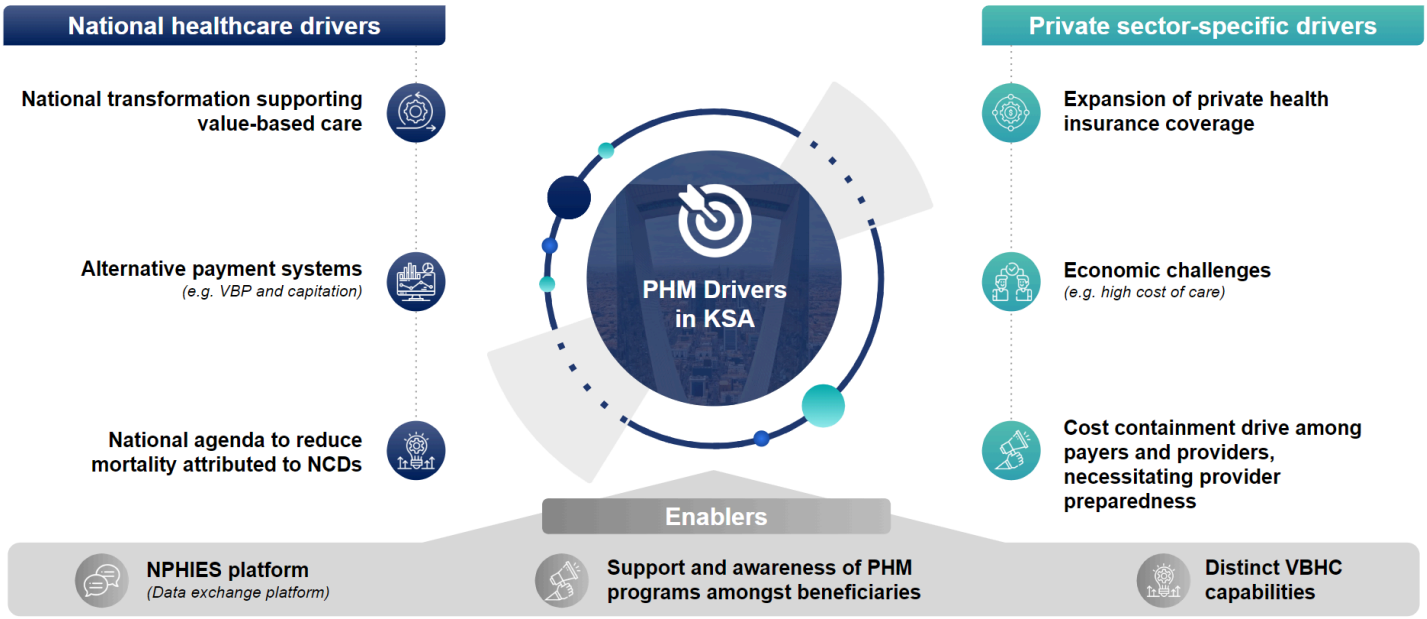
- Competence
- Professionalism
- Creativity and Innovation
- Collaboration

ABOUT CHI's PROMOTION OF VALUE-BASED HEALTH CARE

Aligned with Vision 2030 and the Health Sector Transformation Program (HSTP), CHI's adoption of Value-based health care encompasses three main programs[1]:

- Promotion of population health adoption
- Value-based payments
- Payer and Provider benchmarking

Various drivers across KSA's wider health sector transformation landscape and the private sector have influenced the need for CHI to advance PHM.



Embedding PHM across KSA's private sector, will bolster the advancement of CHI's existing programs towards realizing the Value-based health care agenda - supporting the adoption of a healthcare model that rewards providers based on health outcomes[2]. **CHI will promote and drive PHM programs across the Kingdom to enhance well-being and improve population health outcomes**.

1 Reka, H., et al. Value-based health care in Saudi Health Insurance Market. 2022.

2 NEJM Catalyst. What is Value-based health care? 2017.

ABOUT THE PHM GUIDEBOOK

The guide is designed to be a helpful tool for supporting payers and providers in adopting and implementing PHM. The central content of this guide is organized into sequenced steps and activities of our PHM cycle, which has been adapted from best practices globally.

We encourage payers and providers to work together with their assigned teams including PHM Champions, project or program managers, clinicians, data analysts and quality improvement specialists. Together, you will be able to progress through the steps and adapt the content of this guide to your own setting and context, with the goal of improving population health.

Benefits of the Guidebook

The guidebook is intended to support the following aims:

Creating a unified, approach to adopting PHM

Clarifying roles and responsibilities across stakeholders

Standardization of tools and methodologies used across the ecosystem

Equipping stakeholders with the necessary guidance and resources to advance PHM objectives

Enabling stakeholders to benchmark themselves against standard practice

POPULATION HEALTH MANAGEMENT OVERVIEW

01

POPULATION HEALTH MANAGEMENT

1.1

PHM Definitions and Principles

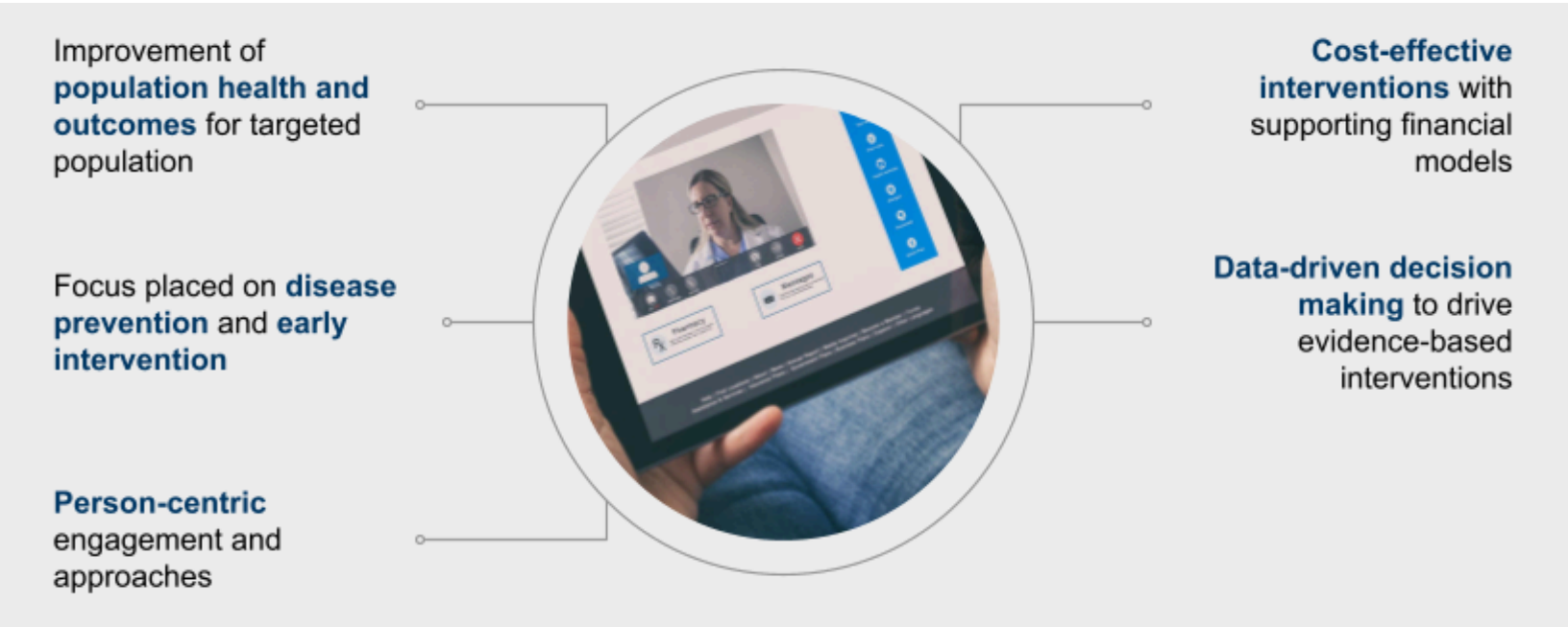
Definitions

The Guidebook uses the following definitions for Population Health and PHM:

POPULATION HEALTH is the **health outcomes of a group of individuals**, including the **distribution of such outcomes** within the group[3].

POPULATION HEALTH MANAGEMENT is a care model that **addresses the population and individuals' health needs** at all points along the **continuum of care** through the development of **data driven, cost-effective** and **evidence-based interventions**[4].

Common Principles[5, 6, 7]



3 Kindig, D. Purchasing Population Health: Paying for Results. *Ann Arbor.* 1997.

4 National Committee for Quality Assurance. Population Health Management: Roadmap for Integrated Delivery Networks. 2016.

5 Blandi, L., et. al. Population health management: Principles, models and areas of application in public health. Acta Biomed. 2023

6 Imperial College Health Partners, NHS England. Population Health Management Flatpack. 2018

7 Kindig, D., & Stoddart, G. What Is Population Health? *Am J Public Health.* 2003.

POPULATION HEALTH MANAGEMENT CYCLE

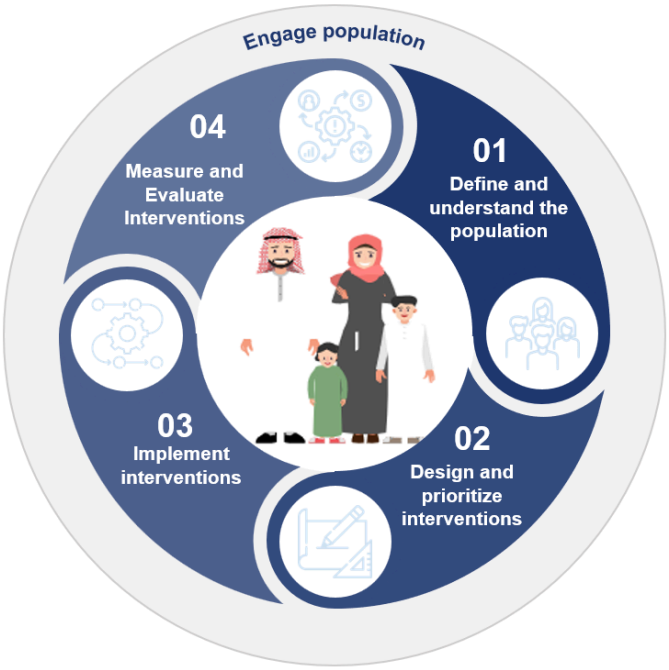
1.2

Detailed steps of the PHM cycle

The five steps of the PHM cycle, adapted from several sources,[8,9] serve as a **comprehensive guide** for the adoption and implementation of PHM, drawing on best practices.

These steps will serve as the **outline for the subsequent sections** of this guidebook.

Detailed descriptions, analyses, along with best practices for each step will be presented to provide structured guidance in the adoption and implementation of PHM.



The Population Health Management Cycle

01 Define and understand the population

- 01 Identify targeted population and define population need
- 02 Collect relevant population data
- 03 Segment the population
- 04 Perform risk stratification

02 Design and prioritize interventions

- 05 Identify list of viable interventions
- 06 Prioritize interventions

03 Implement interventions

- 07 Establish governance for interventions implementation
- 08 Align resource and capacity to delivery requirements
- 09 Facilitate care integration

04 Measure and evaluate interventions

- 10 Plan the evaluation process
- 11 Develop PHM indicators
- 12 Measure and evaluate interventions
- 13 Apply continuous improvement

Engage population

Health promotion and disease prevention

05 ***(ongoing through the PHM Cycle)***

Population engagement

8 National Committee for Quality Assurance. NCQA Population Health Management Guide. 2018.

9 California Department of Health Care Services. CalAIM: Population Health Management (PHM) Policy Guide. 2023; Imperial College Health Partners, NHS England. Population Health Management Flatpack. 2018.

Step 1 - Define and understand the population

Understanding the **population to be targeted** by the PHM program, through collecting **relevant health** and **non-health beneficiaries data**, segmenting the population based on the needs of individuals and stratifying the population according to risk.

Step 2 - Design and prioritize interventions

Identifying the most appropriate interventions for the segmented or stratified population aimed at improving health outcomes. Interventions are then prioritized to enable the most effective interventions to be implemented.

Step 3 - Implement interventions

Implementing interventions, through embedding the **enablers**, **skills** and **systems** that organizations need to **effectively launch** the identified and prioritized interventions.

Step 4 - Measure and evaluate interventions

Measuring outcomes and **evaluating progress against targets** and **key performance indicators (KPIs)** throughout the duration of an intervention, in order to identify areas for **continuous improvement** and gauge their success in improving population health.

Step 5 *(ongoing through the PHM Cycle)* - Engage Population

Directly engaging the population, to enhance individuals to actively **manage their own health**, **enable personalized care**, and employ strategies to **promote health-improving behaviors** and **prevent disease** within entire communities.

CHI's 2024-25 PRIORITY HEALTH CONDITIONS

1.3

Responding to concerning health outcomes and cost patterns, CHI initiated the Population Health 5x5 Program[10] in 2021, in-line with the national Vision 2030 and HSTP priorities. This initiative seeks to enhance the health of privately insured beneficiaries by embracing VBHC principles and addressing five prevalent, high-cost health conditions over five years (ending in 2025). The aim is to optimize the impact of health promotion and disease prevention initiatives, ultimately improving the population's overall health outcomes.

CHI will continuously review the prioritized health conditions which will result in the prioritization of other health conditions in response to emerging insights and collected data. Payers and providers are encouraged to focus at the beginning on the five priority conditions, then consider scaling programs up to include other conditions.

Five priority conditions

The guidance provided in this PHM Guidebook goes beyond these five conditions, as the steps are agnostic of priority areas.

10 Hasbrouck, L., et al. Improving Health in Saudi Arabia. 2021.

ROLES & RESPONSIBILITIES ACROSS THE PHM CYCLE

1.4

	CHI	Payers	Providers
Define and understand the population	Defines target population needs; compiles extensive dataset; conducts population segmentation and initial risk stratification, issues findings	Registers beneficiary; collects beneficiary info & claims data across the sector; applies further risk stratification as needed	Registers service users; collects user information; supports payers to apply further risk stratification as needed
Design and prioritize interventions	Provides guidance via setting principles for design and prioritization	Supports providers in designing and prioritizing PHM interventions	Designs and prioritizes PHM interventions, in-line with population needs
Implement interventions	Provides guidance on key considerations for implementing interventions	Supports providers in implementing and scaling interventions	Plans roll out and implements interventions for target population
Monitor and evaluate	Sets standards and priority indicators to be monitored through PHM interventions	Supports providers in measuring intervention outcomes & implementing continuous improvement	Measures outcomes via monitoring indicators; adjusts interventions in-line with outcomes
Engage population	Provides guidance on best practice for population engagement across the private sector	Works with providers and employers (where relevant) to activate outreach to beneficiaries	Actively engages service users, with the aim of improving self-management of individuals' healthcare

Further detail on roles and responsibilities for each step in the PHM Cycle are available at the end of each section in the step-by-step guidance. Roles have been developed through consultation with the private sector.

STEP-BY-STEP GUIDANCE

02

DEFINE & UNDERSTAND THE POPULATION

2.1

What does this step entail?

1. **Identify** targeted **population** and define population **need**
2. **Collect** relevant **population data**
3. **Segment** the population
4. Perform **risk stratification**

Why is it important?

- ➔ Construct a comprehensive **profile** for high risk individuals
- ➔ Identify **population cohorts** for targeted interventions
- ➔ Facilitate **proactive management** of individuals, particularly those at high-risk

What is the intended outcome?

Establish a thorough and **well-defined understanding** of the targeted population, setting the foundation for population level and targeted **interventions**.

1. Identify targeted population and define population need

The purpose of this sub-step is to identify the targeted population and learn about their health needs, prioritizing the most prevalent and significant health risks that should be the primary focus of the PHM program.

CHI will take an active role in identifying population health needs for the private sector. Outlined below is a high-level process of how population need is identified and key health risks facing the population are prioritized and communicated:

STEP 1

Gather data relevant to population health needs

Data is collected from diverse sources which encompass various aspects of health, such as prevalence of chronic diseases, demographic characteristics, socio-economic status, and access to healthcare services.

STEP 2

Consolidate data in a format offering comprehensive overview of needs

Data is synthesized into a format that provides a comprehensive understanding of the population's health needs. Specific examples of formats that can provide context and insights into the data are narrative summaries, analytic reports and dashboards but overviews should not be limited only to these formats.

STEP 3

Summarize and communicate insights to key stakeholders

Insights from the population needs data are shared with relevant stakeholders (e.g., providers, payers, regulatory bodies) for review and consideration. Stakeholders should use the information to inform decision-making and actions to adopt PHM.

Beyond the broad private sector-wide population need that CHI will define, payers and providers should **conduct these steps to identify additional and specific population needs** that are relevant to organizations' local context.

2. Collect relevant population data

An effective PHM program relies on comprehensive population data that might be drawn from multiple sources, including Electronic Health Records (EHR), claims data, public health records, that could generate a comprehensive view of the beneficiaries' health status, diagnosis, treatment, etc. It is expected that the collection process and data quality will be improved continuously over time, allowing richer and more valuable insights

In CHI data is being collected and consolidated from various sources including the **Customer Relationship Management (CRM) dataset** (insights into provider performance), **HIDP dataset** (beneficiary enrollment details), and **Oracle-National Platform for Health and Insurance Exchange Services (NPHIES) dataset** (healthcare claim information). The collected data encompasses individual details, including:

Diagnosis:
E.g. primary diagnosis, date of diagnosis, laboratory/test results

Utilization:
E.g. hospitalizations, emergency visits, specialist consultation

Payer details:
E.g. name, insurance network, insurance plan

Medical history:
E.g. medications, surgeries, therapies

Treatment plan:
E.g. severity/stage of disease, care plan details

Cost:
E.g. total cost, no. claims, average claim cost

Provider details:
E.g. name, type (e.g. primary, specialist etc.), specialty, network, location

Non-exhaustive

Providers will have to improve their clinical documentation, clinical coding practices and completeness of minimum dataset for claims to feed sources with the right information. Providers may supplement their claims data with clinical data from electronic health records to further understand their population health needs. Payers are receiving claims data from providers and may have other beneficiary information that would enrich their population health database.

Under data sharing agreements and policies, **CHI is striving to share and grant access to payers and providers to its integrated database and tools** where each organization could directly access their population health data via CHI portals.

In addition to this, more data can be gathered (e.g., social determinants of health) that could enrich the PHM insights and would make the tailored interventions more effective.

Collection of this data occurs at the individual level, with aggregation of these datasets creating a comprehensive data asset. Through this, the aggregated data from across KSA's private health sector will enable the organization to perform an in-depth analysis of the current healthcare landscape, empowering informed decision-making for targeted interventions. Additionally, collected data should be used to conduct monitoring and evaluation of interventions and inform continuous improvement (more detail is covered in section *2.4 MEASURE & EVALUATE INTERVENTIONS*).

3. Segment the population

Population segmentation involves separating the population in distinct groups based on shared characteristics or needs, allowing for a better understanding of the needs within different segments, and for better tailoring of PHM interventions. Segmentation is typically performed based on patients' health profiles, specifically health conditions.

This step is crucial to:

- Provide valuable population **insights** for prevalence and distribution of health conditions;
- Enable improved **healthcare resource** and **care planning**.

CHI will conduct population segmentation, on behalf of KSA's private health ecosystem. Population segmentation is sometimes used interchangeably with risk stratification, contributing to potential overlap. For the purposes of KSA's private sector, population segmentation should be regarded as a distinct process to risk stratification, which is outlined in the following sub-section *4. Perform risk stratification*:

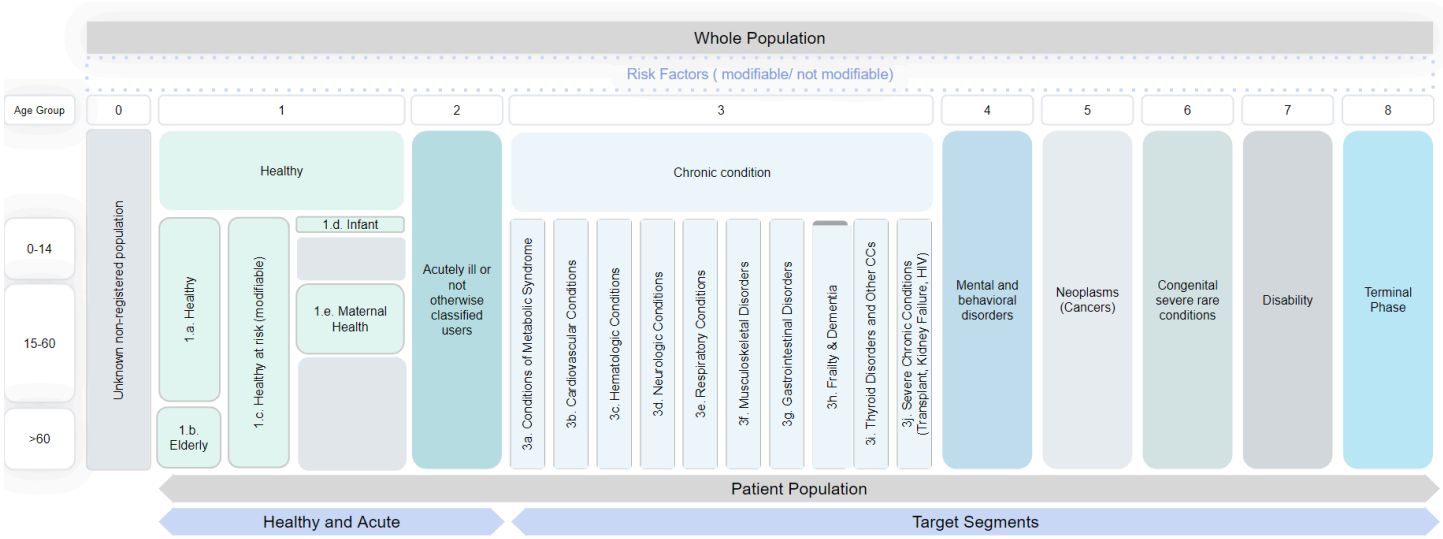
Differences between Population Segmentation and Risk Stratification

Indicator types	Population Segmentation	Risk Stratification
Key features	Population divided into distinct groups based on shared characteristics or needs.	Population divided into groups based on levels of risk, which may include risk of adverse health outcomes, conditions or healthcare service utilization/cost etc.
Purpose	• Supports better understanding and addressing the specific health requirements of population segments • Allows healthcare providers to tailor interventions and design services effectively to meet the needs of specific population groups	• Supports identifying individuals within a population who are at higher risk of certain health events or conditions. • Allows healthcare providers to prioritize resources, care management and interventions towards those at greatest risk, aiming to prevent adverse health outcomes
Responsible entity in the private sector	Conducted by CHI, covering the whole privately insured population with outputs shared with payers and providers.	Initial stratification conducted by CHI, focusing on cost. Payers and providers are encouraged to analyze outputs further and conduct their own stratification as needed.

There are a variety of methodologies which can be used for population segmentation[11]. CHI has selected and will use a methodology adapted from the Bridges to Health[12, 13] framework. Through this method, all private health insurance beneficiaries that have had an interaction with the healthcare system (through a submitted claim) will be segmented into nine core groups (as detailed in the figure below). Segments are devised in line with the following rules:

- All individuals will fit into **one of the population segments**;
- The individuals within each segment will have **sufficiently similar healthcare needs**;
- Each segment is **distinct enough** from other segments to warrant separate consideration.

The Bridges to Health framework



As an example, the five priority health conditions considered in CHI's PHM program align with specific segments/ subsegments of the tailored Bridges to Health framework as follows:

11 R.M. Wooda, B.J. Murch, R.C. Betteridge. A comparison of population segmentation methods. *ORHC*. 2019,

12 Lynn, J., et al. Using population segmentation to provide better health care for all: the "Bridges to Health" model. 2007.

13 Outcomes Based Healthcare. Part 2: Whole population segmentation models. No Date.

CHI's priority health condition	Tailored Bridges to Health segment	Segment classification
Coronary heart disease	Cardiovascular conditions	Segment 3b
Diabetes/ pre-diabetes	Metabolic syndrome conditions	Segment 3a
High blood pressure	Metabolic syndrome conditions	Segment 3a
Obesity	Metabolic syndrome conditions	Segment 3a
Tobacco use	Healthy at risk	Segment 1c

The findings will be visualized through PHM dashboards and shared through segmentation reports as required, which will facilitate data-driven decision-making and sharing of insights across the private sector.

As individuals may fit the criteria for more than one segment, an additional step is undertaken to assign individuals to the segment associated with the highest cost.

Further details about the population segmentation methodology used are available in the appendix.

4. Perform risk stratification

Risk stratification is the process of categorizing patients who face a greater risk of adverse health outcomes into groups with similar risk profiles. This method could help providers build a more granular understanding of the population targeted for PHM interventions[14] as well as tailor interventions directly to these risk groups.

For KSA's private health sector context, risk stratification is recommended for use in providing deeper layers of insight. In addition to the population segmentation, CHI will conduct initial risk stratification of the private health insurance population, stratifying by **healthcare cost**.

Payers are encouraged to independently conduct deeper analysis, including further risk stratification, as needed, with support and agreement from providers. It is recommended that payers and providers agree on a **shared stratification method** to implement when collaborating to launch PHM programs and interventions.

There are a multitude of risk stratification models; existing models can be used, or organizations can develop bespoke approaches tailored to their populations. Common risk stratification methodologies include:

- Charlson's Comorbidity Index
- American Academy of Family Physicians (AAFP) Two-Step Process
- Johns Hopkins ACG® system risk stratification
- 3M™ Clinical Risk Grouping Software (CRG)
- Edmonton Frailty Scale

An overview of some risk stratification methods can be found in the appendix, with a recommendation on when their adoption may be most appropriate.

14 National Association of Community Health Centers. Value transformation framework action guide. No Date; Imperial College Health Partners, NHS England. Population Health Management Flatpack. 2018; National Committee for Quality Assurance. NCQA Population Health Management Guide. 2018.

Case study: Kaiser Permanente, risk stratification-targeted interventions

KNFC* developed their Transitions Program using a predictive risk stratification model, which calculated risk of readmission. Patients at lower risk received usual care, while increased risk patients were assigned to the program which included post-discharge follow-ups assessments and telephone calls from case managers.

9% reduction in the chance of readmission for patients on the program

Key learnings for KSA

Appropriate risk stratification can be effective in **identifying high risk** population cohorts who may benefit from enhanced care, while indicating **lower risk patients** who can be safely **treated with typical care** without impacting health outcomes.

**Kaiser Permanente Northern California*

The detailed case study can be found in the Appendix

Caveats to risk stratification

Conducting risk stratification will help better understand the population to support PHM efforts. However, there are several considerations and limitations associated with this approach to be mindful of when implementing risk stratification and applying the outputs[15].

The outputs should be supplemented with additional judgment, because:

- Risk stratification tools may yield 'false positives' and 'false negatives,' inaccurately identifying individuals as high risk or low risk, respectively.
- These tools may not directly pinpoint the most significant improvement opportunities. Additional steps may be needed to identify individuals amenable to interventions beyond risk prediction.
- Not all individuals identified in a risk group may benefit from interventions targeted at the cohort.

There can be challenges in targeting the ‘highest risk’ cohorts:

- Individuals in high-risk categories may transition out of 'high risk' due to optimized care, high mortality rates, or recovery from acute episodes.
- The high risk group may have diverse and complex needs, making them less suitable targets for general population-focused PHM interventions.
- Focusing on high-risk cohorts might divert attention from the ‘rising risk’ population, where general PHM interventions could be more effective in preventing individuals from becoming high risk.

15 Mora et. al. Key aspects related to implementation of risk stratification in health care systems-the ASSEHS study. *BMC Health Serv Res*. 2017.

Imperial College Health Partners, NHS England. Population Health Management Flatpack. 2018

Key activities assigned to each stakeholder throughout every step

Steps	Stakeholder activities		
	CHI	Payer	Provider
Identify targeted population and define population need	Sets KSA private health sector priority conditions to target with interventions	Identifies additional needs specific to local context/ beneficiary pool	Identifies additional needs specific to local context/ service users
Collect relevant population data	Compiles data from across the private health insurance ecosystem	Collects claims data and individual level data from registered beneficiaries	Collects individual level data from registered service users
Segment population	Conducts population segmentation to the PHM dataset; shares outcome with stakeholders	Accesses segmentation dashboards and reports; integrates results into PHM intervention design	Accesses segmentation dashboards and reports; integrates results into PHM intervention design
Perform risk stratification	Provides guidance on risk stratification methodologies	Determines the need for, and agrees a suitable methodology for further analysis with providers	Determines the need for, and agrees a suitable methodology for further analysis with payers

DESIGN & PRIORITIZE INTERVENTIONS

2.2

What does this step entail?

5. Identify **list of viable interventions**
6. **Prioritize interventions**

Why is it important?

- ➔ Guide the **identification** of tailored **interventions**
- ➔ Ensure interventions **align** with the diverse **needs** of distinct **population segments**
- ➔ Maximize organizations' impact on PHM through **strategic resource deployment**

What is the intended outcome?

Identify a **well-defined** and **prioritized** set of **interventions** that address the specific needs of the identified target population segments.

5. Identify list of viable interventions

Once the population is segmented and stratified, providers and payers must work together to identify the most suitable interventions. Viewing potential interventions through the continuum of care[16] is recommended, which focuses on three pivotal stages:

- **Health promotion:** population-based strategies that target major disease risk factors, mostly through efforts to change health-related behavior;
- **Preventive care:** population-directed services in areas such as vaccination, screening, and prenatal care;
- **Diagnosis/ treatment:** subsets of diagnostic and therapeutic activities considered as being the first line of organized personal medical care.

As a general guide, individuals in various risk categories often benefit differently from interventions across the continuum of care.

	Continuum of care		
	Health promotion	Preventive care	Diagnosis/ treatment
Risk category focus	'Lower' risk	'Medium', 'Rising' risk, 'Higher' risk	'Medium' or 'Higher' risk
Interventions benefits	Keep people healthy, helping them prevent developing chronic conditions	• **'Medium' and 'rising' risk groups**: help limit condition progression • **'Higher' risk group**: help limit developing additional comorbidities	Benefit where reduction in the severity of the condition(s) is integral to improving outcomes
Breadth of intervention	• Broad interventions • Low cost per individual	• Targeted interventions • Moderate cost per individual	• Highly targeted interventions • Higher cost per individual

The risk categories outlined here are generalized from risk groups described in a range of separate risk stratification methodologies.

16 Marshall M., et al. Selecting Indicators for the Quality of Health Promotion, Prevention and Primary Care at the Health Systems Level in OECD Countries. 2004.

Case study: Bexley - Integrated GP led diabetes care

To design interventions to improve early/preventive treatment of diabetes, Bexley focused on high-impact areas. This meant prioritising patient self-management and targeting at-risk demographic groups. Leading clinicians and patient groups were central in the design process, while Bexley planned the initiative in a way that maximized the use of their existing IT foundations.

Bexley have achieved the highest diabetes control in London.
One intervention alone, an education program, led to a 16.2% reduction in HbA1c

Key learnings for KSA

Focus on **high-impact areas**, place **key stakeholders**, patients and **expertise** at the centre of the design process, and **leverage existing capabilities** to maximize the effectiveness of intervention design.

The detailed case study can be found in the Appendix

Interventions are developed based on evidenced case studies that have been implemented previously and tailored to the local context. The presence of a robust evidence base indicates that the intervention is likely to have positive outcomes for the target population; this base establishes the effectiveness of the intervention through defined KPIs.

Below is a sample list of potential evidence-based interventions for each of the five priority conditions, aligned to the continuum of care. More than one intervention, and a selection of interventions targeting multiple components of the continuum of care can be adopted. Interventions may be provided in different settings and through different modes of delivery, such as phone consultation, home care, online etc. as appropriate to aid delivery.

5 priority conditions	Continuum of Care		
	Health Promotion	Preventive Care	Diagnosis/ Treatment
Diabetes/ pre-diabetes	• Lifestyle advice programs • Diabetes and risk factor awareness campaigns	• Risk-based/ targeted diabetes screening	• Personalized lifestyle intervention plans • HbA1c/eye assessment monitoring • Patient self-management programs
Coronary heart disease	• Advice and support for targeted groups • Community awareness initiatives • Early symptoms and emergency awareness	• Patient online portal • Community blood pressure screening	• Patient self-management programs • Early diagnosis programs • *Standardized physician order sets* • *Readmission risk predictor*
High blood pressure	• Community blood pressure screening	• Interactive text messaging system	• *Community-based care teams* • *Reinforcing prevention focused primary care practice* • Telehealth intervention
Obesity	• Advertised exercise campaigns • Telehealth healthy lifestyle applications	• *Provision of tools and education for clinicians* • Reinforcing prevention focused primary care practice	• Targeted in-person lifestyle classes • Online lifestyle programs for obese individuals
Tobacco use	• Adolescent awareness programs • Gamified smoking cessation mobile applications	• Targeted tobacco use screening and cessation support	• *Clinical decision support tool* • Smoking cessation healthcare coverage • Opt-out smoking cessation referrals

The sample list of interventions is non-exhaustive and includes capability building interventions (italicized) support. Further detail on these interventions, including evidenced impacts, can be found in the Appendix.

6. Prioritize interventions

Prioritizing interventions involves assessing possible interventions against a set of defined criteria, to determine which interventions should be implemented, and in which order.

CHI has assessed various methodologies derived from best practices and suggests adopting the following methodology (expected impact vs. ease of implementation), which payers/providers should tailor to their specific context[17]. Below is a non-exhaustive set of key criteria to consider when utilizing this methodology:

Expected Impact		Ease of Implementation	
Criteria	**Description**	**Criteria**	**Description**
Relative size of population impacted	Evaluate the scale of the affected population to enable prioritization of interventions with a wider impact	Resources and effort required	Assess the workforce, budget, and effort needed to gauge the feasibility of implementation
Relative expected benefit for individuals	Focus on evidence-based outcomes to ensure that interventions with proven effectiveness are prioritized	Obstacles or resistance	Identify potential challenges to ensure proactive planning for successful implementation
Facilitating success of other initiatives	Evaluate potential synergies between interventions that contribute to a cohesive and interconnected approach	Lack of dependencies	Prioritize interventions with fewer dependencies to streamline the implementation process
Cost-Benefit analysis*	Understand the economic implications to identify interventions with a favorable balance of costs and benefits	Foundations in place	Evaluate existing infrastructure to aid in selecting interventions ready for implementation
Targeting disadvantaged groups	Prioritize interventions that address health disparities contributes to inclusive healthcare	Applicability to the KSA and private sector context	Consider the local context to ensure that interventions align with KSA's unique healthcare landscape

*Existing Cost-Benefit analyses should be considered where possible rather than conducting new ones.

More detail on this prioritization methodology example can be found in the Appendix.

17 Atwal. et. al. Prioritisation processes for programme implementation and evaluation in public health: A scoping review. *Front Public Health*. 2023

Key activities assigned to each stakeholder throughout every step

Steps	Stakeholder activities		
	CHI	Payer	Provider
Identify list of viable interventions	Shares examples of best practice and evidence based interventions from international and KSA contexts	Supports providers in designing interventions	Researches and identifies evidence-based interventions targeted to priority conditions; designs interventions for local context
Prioritize interventions	Provides guidance on prioritization considerations and example methodologies	Supports providers in prioritizing interventions	Determines prioritization criteria relevant to the organization's goals; conducts prioritization of interventions for implementation

IMPLEMENT INTERVENTIONS

2.3

What does this step entail?

7. Establish **governance** for interventions implementation
8. Align **resource and capacity** to delivery requirements
9. Facilitate **care integration**

Why is it important?

- ➔ Translate **intervention designs** into actionable **healthcare practices**
- ➔ Ensure the correct resources and an **aligned and trained workforce** for effective implementation of interventions
- ➔ Enhance **communication** and **collaboration** across relevant stakeholders

What is the intended outcome?

Strategically align the **workforce** to **support** intervention **implementation**, and ensure **efficient collaboration** and **skill utilization** between all relevant **stakeholders**.

7. Establish governance for interventions implementation

Setting the right governance and responsibility for interventions is essential to ensure effective implementation, proper management of risks and issues, and maintain a consistently positive impact. It provides a framework for decision-making, accountability, and oversight, allowing efficient allocation of resources.

Outlined below are some best practices for embedding effective governance[18, 19]. This best practice applies to both organization-wide PHM Programs and individual PHM interventions/workstreams:

- Governance needs to include a range of capability and representation to ensure oversight over all aspects of delivery; including organization leadership, clinical governance, program/project management, administrative and data expertise.
- The governance model needs to be well-defined with shared accountability. This needs to include formalized delegation of authority from organizational leadership to PHM workstreams, confirmed in a jointly-created high-level accountability framework.
- Decision-making mechanisms should be evidence-based and collaborative.
- Data and information governance needs to be agreed across all relevant partners, with partners committed to meeting data sharing standards. This should be supported by formalized data sharing agreements.

Case study: Baptist Health South Florida (BHSF) PowerPlans

To implement 'PowerPlans', standardised physician order sets, into clinics, BHSF set up dedicated governance with: (1) a Multidisciplinary Cardiovascular Collaboration Committee (MCCC), responsible for driving adoption of the PowerPlans, (2) active participation from nursing leadership in program, and (3) monthly meetings with external performance improvement consultants

Staff compliance to PowerPlans increased from 26% to a high of 63%

Key learnings for KSA

Establishing a **clear, dedicated governance structure**, for the intervention, with **clinical leadership** and structured multi-disciplinary involvement is key to successful adoption and sustained positive impact of interventions.

The detailed case study can be found in the Appendix

18 Corbett-Nolan, A., Mattoo, D., Tantum, L. How population health management will deliver a sustainable NHS. 2018.
Imperial College Health Partners, NHS England. Population Health Management Flatpack. 2018

19 Macfarlane, A. J. R. What is clinical governance?. *BJA Educ.* 2019.

Additionally, to support PHM programs launched by payers and providers, it is important for organizations to effectively allocate responsibility for driving and delivering the program. It is recommended for organizations to establish the following roles:

PHM 'Champion':

- Each payer and provider should identify an individual (or team) to be responsible for driving and standardizing the adoption of PHM across the organization. This does not need to be a full time role, and may be shared between multiple individuals.
- The Champion should coordinate with CHI to support PHM piloting and rollout and will share knowledge and train others in the organization on PHM best practices.

Population Health Care Manager:

As per CHI's accreditation for payers and providers, the Care Managers' role in the medical division requires 5 year's experience as a healthcare professional.

The role of the Population Health Care Manager includes:

- Program development and management
- Utilizing data analytics to inform program targets and evaluate program success
- Design interventions and solutions
- Coordinate with internal and external stakeholders

PHM support team:

To assist the PHM program, organizations require the right supporting skillsets. Dedicated/supporting roles recommended for each organization include:

- Data analysts to support with reporting and monitoring
- Project management to help with organizing and driving the program
- Quality improvement specialists to support the improvement of care services

8. Align resource and capacity to delivery requirements

While identifying the appropriate interventions is crucial, an organization must also ensure the right resources are in place to deliver them.

Some of the key resources that are required before launching an intervention include:

- **Funding** - accessing and planning for financial resources will be highly dependent on the organizational funding model
- **Data and data infrastructure** - covered in *2. Collect relevant population data*
- **Care resources and partnerships** - covered in *9. Facilitate care integration*.
- **Workforce** - guidance outlining best practice in planning human resources is detailed below.

Each organization should review its human resources, to determine what resource profile is needed for the rollout and implementation of the new interventions.

Ensuring appropriate staff levels involves three core elements:

1. Identify and plan the necessary roles

- Identify roles necessary for the intervention (i.e., clinical, administrative, support)
- Assess current workforce to identify gaps or needs for additional critical roles
- Consider implications of using current staff, including how time allocation between intervention delivery and existing roles may be effectively balanced
- Determine if any specialized roles are required for the intervention

2. Build the right skills and experience

- Define essential skill set needed for the successful delivery of the intervention
- Design and provide targeted training and skill development programs to ensure workforce readiness to successfully implement interventions
- Engage with healthcare systems that have implemented similar or exemplar interventions, to understand how lessons learned can be applied

3. Evaluate and refine roles

- Adjust roles and training programs based on the intervention feedback, measured outcomes and evaluation of the intervention's impact on the target population

Organizations should leverage their population health data for both implementing PHM interventions and broader healthcare workforce planning, which would help define the workforce model that best fits the needs of beneficiaries.

9. Facilitate care integration

Key foundational principles should be considered when coordinating interventions among different stakeholders to ensure a cohesive approach to delivering interventions[20]:

1. Align with key payers and providers

The collaboration in shaping policies, allocating resources, and aligning goals early in the process is crucial for an effective and successful implementation of interventions.

2. Engage clinical staff

Involve clinical staff and managers from planning through delivery, as their direct contact with patients is crucial for the practical and effective implementation of interventions.

3. Assess care resources needed to deliver

Work with multidisciplinary and resource planning teams to understand the care resources required and the impact the intervention may have on existing supply. Care resources which may require additional consideration and planning include technology (e.g. wearables), disposables, pharmaceuticals etc.

4. Ensure collaboration in the ecosystem

Encourage open discussion and joint efforts among a breadth of stakeholders to address complexities of implementation. This should include not only relevant payers and providers, but wider healthcare-adjacent organizations (e.g. charities, social care organizations) for support where relevant.

A robust collaboration system supports effective communication, shared responsibilities, and coordinated efforts across stakeholders.

20 Farmanova, E., Baker, GR., Cohen, D. Combining Integration of Care and a Population Health Approach: A Scoping Review of Redesign Strategies and Interventions, and their Impact. *Int J Integr Care*. 2019.

Imperial College Health Partners, NHS England. Population Health Management Flatpack. 2018

Key activities assigned to each stakeholder throughout every step

Steps	Stakeholder activities		
	CHI	Payer	Provider
Establish governance for interventions implementation	Provides guidance on intervention governance	Supports providers in setting up a governance structure for interventions	Establishes effective programme and clinical governance structures to implement interventions successfully
Align resource and capacity to delivery requirements	Provides guidance on workforce planning	Supports providers in workforce planning	Conducts workforce planning determining the resources, skills, and roles required to implement interventions
Facilitate care integration	Provides guidance on care integration	Supports providers in coordination across the ecosystem	Coordinates across the healthcare ecosystem to support care integration for each intervention implemented

MEASURE & EVALUATE INTERVENTIONS

2.4

What does this step entail?

10. **Plan** the **evaluation process**
11. Develop **PHM indicators**
12. **Monitor** and **evaluate interventions**
13. **Apply continuous improvement**

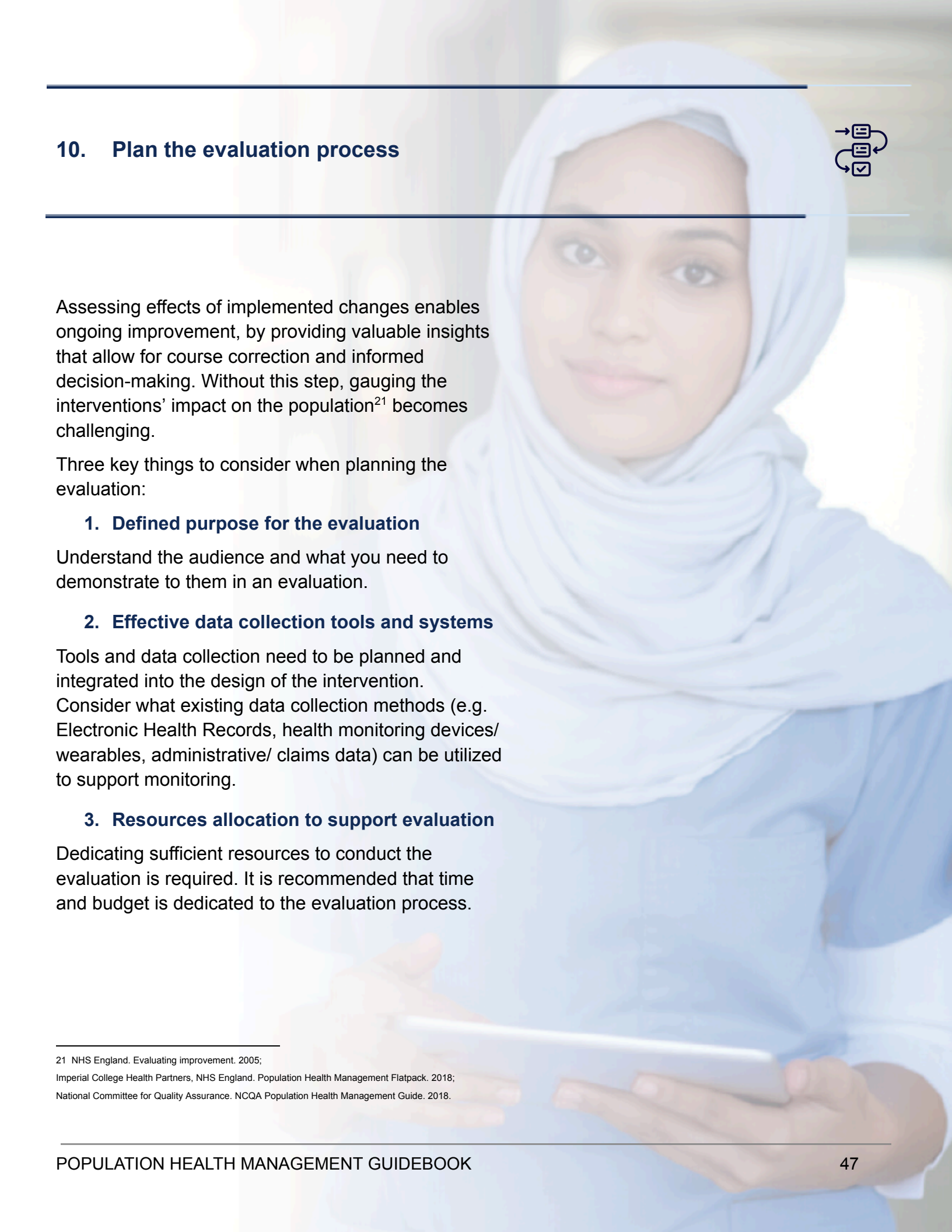
Why is it important?

- ➔ Offer **insights** into their **impact** on **population health**
- ➔ Ensure **accountability** and **transparency** in organizations' PHM **efforts**
- ➔ Foster an **adaptive approach** to healthcare delivery, which is responsive to improvement opportunities

What is the intended outcome?

Provide a comprehensive **understanding** of the **effectiveness**, **efficiency**, and **impact** of implemented **interventions**, which will enable the **continuous optimization** of the PHM interventions and strategy adopted.

10. Plan the evaluation process



Assessing effects of implemented changes enables ongoing improvement, by providing valuable insights that allow for course correction and informed decision-making. Without this step, gauging the interventions' impact on the population[21] becomes challenging.

Three key things to consider when planning the evaluation:

1. Defined purpose for the evaluation

Understand the audience and what you need to demonstrate to them in an evaluation.

2. Effective data collection tools and systems

Tools and data collection need to be planned and integrated into the design of the intervention. Consider what existing data collection methods (e.g. Electronic Health Records, health monitoring devices/ wearables, administrative/ claims data) can be utilized to support monitoring.

3. Resources allocation to support evaluation

Dedicating sufficient resources to conduct the evaluation is required. It is recommended that time and budget is dedicated to the evaluation process.

21 NHS England. Evaluating improvement. 2005;
Imperial College Health Partners, NHS England. Population Health Management Flatpack. 2018;
National Committee for Quality Assurance. NCQA Population Health Management Guide. 2018.

11. Develop PHM indicators

Indicators are essential tools for assessing the effectiveness and impact of PHM interventions. They provide measurable data points that allow for the evaluation of progress, outcomes, and overall performance. Monitoring these indicators enables organizations to track the success of their interventions, identify areas for improvement, and make informed decisions to optimize population health outcomes. Progress against providers' PHM program objectives and targets will also require indicators to assess.

Indicators are either single values (i.e. number #), or follow the N/D structure, comprising two main components[22]:

- **The numerator**: which represents the specific aspect being measured.
- **The denominator**: which provides context by defining the population or sample size under consideration.

An indicator typically comprises three measurable components:

- **Metric:** the specific measure being assessed, such as HbA1c levels, LDL cholesterol levels, BMI etc.
- **Baseline:** the initial value or status of the metric before the intervention is implemented, serving as a reference point for comparison.
- **Target:** the desired level or outcome of the metric after the intervention has been implemented, representing the goal to be achieved. Targets require a timeframe and incremental targets to achieve within defined durations. National and international benchmarks should be assessed and referenced when setting the targets to determine appropriate metrics can be achieved.

22 Agency for Healthcare Research and Quality. Guide to patient safety indicators. 2007.

As per the Donabedian framework, indicators can be categorized into three main types[23, 24, 25]:

- **Structure indicators:** These indicators comprise factors such as the quantity and suitability of healthcare facilities and equipment, the qualifications of medical personnel and their institutions, as well as the administrative framework and programs in place.

  Monitoring the maturity of structures can help to identify, mitigate and prevent structural obstructions to providers or patients' efforts to achieve quality care.

- **Process indicators:** Processes are all the activities undertaken by both providers and patients during the care process. Process Indicators gauge the execution of the intervention's activities and outputs.

  The delivery of care is simply a product of all the processes conducted. Therefore, by monitoring how well these processes are being executed via indicators, we gain insight into the quality of delivery of care for patients.

- **Outcome indicators:** Outcomes, in this context, refer to the status of patients' health. These indicators assess whether the intervention is delivering its expected impact on patients health in the short, intermediate, and long term. They may include specific risk factors, measurements used to assess health conditions (e.g. HBA1c, cholesterol) or even the extent of their knowledge on self-managing their condition.

  By tracking how these indicators change from the baseline, throughout an intervention, organizations can evaluate how successful an intervention has been and if course-correction is necessary.

23 Donabedian., A. Evaluating the Quality of Medical Care. Milbank Q. 2005.

24 Agency for Healthcare Research and Quality. Types of Health Care Quality Measures. 2015.

25 Centers for Disease Control and Prevention. Indicators. 2021.

Indicator types	Example Indicators		
	Indicator Name	Description	Calculation
Structure indicators	Availability of Diabetes Educators (DEs)	**The ratio** of DEs within the organization to patients 18 to 75 years of age with diabetes	N/D = X.Y N = Number of DEs (measured as full-time equivalents) within the organization D = Number of members 18 to 75 years of age with diabetes (types 1 and 2).
Process indicators	Annual HbA1c testing for diabetic patients	**The percentage of patients** 18 to 75 years of age with diabetes (types 1 and 2) who received at least one HbA1c test in the measurement year.	N/D*100 = % N = Number of members 18 to 75 years of age with diabetes (types 1 and 2) who received at least one HbA1c testing in the measurement year. D = Number of members 18 to 75 years of age with diabetes (types 1 and 2).
Outcome indicators	Hba1C Control For Diabetes Mellitus	**The percentage of patients** 18 to 75 years of age with diabetes whose HbA1c was successfully controlled during the measurement year.	N/D*100 = % N = Number of members 18 to 75 years of age with diabetes whose HbA1c was successfully controlled during the measurement year. D = Number of members 18 to 75 years of age with diabetes (types 1 and 2).

The maturity of PHM interventions can determine the most suitable indicator types to monitor:

- **Newly launched PHM interventions** benefit from focusing on process and structure indicators to ensure the activities, workflows, resources and infrastructure are effectively embedded to successfully establish the functionality of the intervention.
- **For more mature PHM interventions** monitoring should be concentrated on outcome indicators, as the interventions will have had sufficient time to demonstrate their effects on population's health.

CHI has a set of core measures for each population focus of the 5x5 program and some general measures, developed after careful benchmarking with other population health measures. Measures have been mainly adopted from the Health Effectiveness Data and Information Set (HEDIS) and other sources such as the Agency for Health Research and Quality (AHRQ), the Organization for Economic Cooperation and Development (OECD), and others.

In addition, payers and providers will need to select further indicators to measure the implementation of their interventions.

12. Monitor and evaluate interventions

For efficient monitoring of these indicators, adopting a systematic approach allows for data-driven decision-making. Here are the steps to achieve this:

	Step	Description
BEFORE INTERVENTION START	1. Select/ define indicators	Determine specific measurable indicators used to assess progress and impact of intervention *(covered in sub-section 12)*
	2. Set baseline	Gather relevant data before launching intervention, needed to establish baseline against which progress can be measured
	3. Set clear targets	Establish specific targets, for each KPI, based on industry benchmarks, historical data, or predictive analysis to ensure it is ambitious and attainable
	4. Determine monitoring frequency	Decide how often you need to monitor each KPI (i.e., daily, monthly) depending on its sensitivity and the speed at which it can be affected by change
	5. Determine monitoring mechanism	Select the tools and methods required to collect, aggregate and integrate data relevant to measure the indicators on an ongoing basis
THROUGHOUT INTERVENTION	6. Implement intervention	Launch PHM intervention, in line with the intervention design and implementation plan
	7. Monitor intervention	Collect data at the previously defined intervals
	8. Analyze data	Assess effectiveness of the intervention by comparing data collected against baseline to identify trends, successes, and challenges
	9. Review and adjust KPIs regularly	Periodically reassess KPIs and their targets to ensure they remain relevant and aligned with any changes in the program's goals or external dynamics
	10. Incorporate a feedback loop	Establish a process where insights from KPI monitoring inform adjustments to strategies, creating a continuous cycle of improvement

13. Apply continuous improvement

Crucial to the monitoring and evaluation process, is the use of evaluation outputs to drive continuous improvement of PHM interventions over time. Delving deeper into the key considerations for incorporating a feedback loop (step 10. in the monitoring and evaluation approach), the components of applying continuous improvement include:

Identify intervention strengths and weaknesses: Use quantitative and qualitative analysis to identify what is succeeding and what can be improved in the intervention

- Review the analyzed indicator data (step 8 in the monitoring and evaluation approach), comparing to the baseline data to identify any significant changes or trends. Look for areas where the intervention has shown progress and areas where it may have fallen short.
- Further quantitative analysis beyond the outcome indicators could include assessing impact on patients (satisfaction measurements/surveys, individual outcome measurement etc.) and cost (cost-benefit analysis)
- Qualitative analysis should be used to assess intervention performance from the perspective of key experts and staff, and may include focus groups, workshops and interviews to understand pain points, opportunities for improvement and successes
- Process improvement methodologies[26][27] (examples include *Model for Improvement*, *Lean* and *Six Sigma*) and tools for analyzing causes of service issues[28] (examples include *Fishbone Root Cause Analysis*, *Five Whys*, *Value Stream Mapping*) can be used where applicable to identify areas of improvement for intervention delivery

Examples of tools to understand the causes of service issues have been included in the appendix.

Develop an improvement plan: Create a detailed plan outlining the actions required to achieve the improvement goals and maximize successes. This plan should include a timeline to implement the changes in a manageable timeframe.

Implement changes: Execute the improvement plan by implementing the necessary changes to the intervention. This may include improvements such as; adjusting the intervention delivery and resources, refinements of the care model, increasing training for staff, and implementing supporting technology.

26 Agency for Healthcare Research and Quality. Ways To Approach the Quality Improvement Process. 2020.

27 Harel Z. et al. How to Diagnose Solutions to a Quality of Care Problem. Clin J Am Soc Nephrol. 2016.

28 World Health Organisation. Improving the quality of health services - tools and resources. 2018.

Adjust and iterate further: Having adjusted the intervention, ongoing monitoring and evaluation should determine whether the improvements to the intervention have made an impact and whether further amendments are required. If certain changes are not producing the desired results, consider alternative approaches and interventions.

Case study: Miramont Family Medicine, Primary Care Tobacco Screening

Miramont put evaluation and continuous improvement at the forefront of their smoking screening and cessation program. Use of patient data and a decision support tool provided areas where interventions were lacking. Insights were shared with primary care teams to encourage constant iteration. Medical staff received monthly performance reports and regular tobacco metric updates.

Tobacco screening rates increased from 80% to 90% and smoking cessation rates increased from 80% to 87%

Key learnings for KSA

Planning the evaluation up front, with **dedicated resource** is key. Monitoring of indicators should be **continuous**, and **regularly shared** with stakeholders. Insights should be used to **refine** the intervention as needed to improve performance.

The detailed case study can be found in the Appendix

Key activities assigned to each stakeholder throughout every step

Steps	Stakeholder activities		
	CHI	Payer	Provider
Plan the evaluation	-	Supports providers in planning the evaluation	Plans evaluation process prior to launch; ensures resources and tools for conducting evaluations are in place
Develop PHM indicators	Sets key indicators, aligned to the 5 priority conditions to monitor and measure improvement	Assists providers to determine and select relevant indicators to monitor throughout interventions	Determines relevant indicators to monitor throughout interventions. Collects data and continuously monitors indicators throughout implementation; shares data with stakeholders
Monitor and evaluate interventions	Sets sector baseline and benchmarks for all selected indicators	Assists providers in setting relevant indicators, baselines and targets	Sets indicators, baseline, and targets prior to launch; monitors and analyzes indicators throughout implementation; implements continuous improvement
Apply continuous improvement	-	Supports providers to improve intervention delivery	Refines intervention delivery according to performance measured through monitoring and evaluation

ENGAGE POPULATION

2.5

Health promotion and disease prevention

Approaches to promote health-improving behaviors to the population, and prevent disease, are vital aspects of PHM, and comprise strategies aimed at enhancing the health and well-being of entire communities. PHM efforts to reduce the burden of preventable illnesses and improve overall health outcomes by implementing population-wide interventions include:

Health promotion programs

Health education campaigns

Utilizing various media channels to disseminate information about health risks, preventive measures, and healthy behaviors.

Physical activities initiatives

Creating opportunities for physical exercise through infrastructure development.

Mental health awareness programs

Raise awareness about mental health issues, reduce stigma, and provide resources for stress management and seeking help.

Nutrition programs

Promote healthy eating habits and provide information on balanced diets, portion control, and the benefits of fruits and vegetables.

Disease prevention programs

Screening programs

Conducting screenings for early detection of diseases and chronic conditions.

Vaccination programs

Offering vaccines to protect against infectious diseases.

Immunization registries

Maintaining immunization records to ensure individuals receive recommended vaccines and track vaccination coverage rate.

Non-exhaustive

Through population promotion and prevention efforts, PHM seeks to create environments conducive to health, empower individuals to make healthier choices, and ultimately foster healthier communities.

Case study: Broome County Walks

Broome County Walks was a community-wide initiative focused on tackling obesity. It promoted 30-minutes of daily walking targeted at insufficiently-active 40-65 year old residents by organising community activities and programs, launching an 8-week multimedia marketing campaign, and collaborating with county officials to develop appropriate walking trails.

Over 4 years, 80,000 participants engaged with Broome County Walks. The proportion of residents who walked for 30-minutes or more, 5 days a week, increased from 53% to 61% in one year.

Key learnings for KSA

Appropriate infrastructure and **community networks,** alongside an **influential media campaign** to promote awareness, **c**an successfully **support and promote change** in individuals' lifestyles

The detailed case study can be found in the Appendix

Population engagement

Population engagement refers to the knowledge, skills, and confidence individuals possess to actively manage their own health[29].

Several strategies can be employed to engage population effectively[30, 31]:

- **Personalized health education:** share information tailored to each segment's health needs, making it more understandable at an individual level.
- **Enhanced patient-provider engagement:** foster open communication and trust between patient & provider enticing individuals to attend frequent checkups.
- **Community-based programs:** implement initiatives that involve local communities, creating support networks and fostering community engagement.
- **Technology integration:** utilize digital tools for remote monitoring, communication, and health information access, enhancing patient engagement.
- **Shared decision-making:** encourage shared decision-making by actively involving patients in discussions about their treatment options.

Case study: Frailty Virtual Ward, Leeds

Leeds' Frailty Virtual Ward is focused on continually engaging high risk patients, removing the need for in-hospital treatment. Staff contact patients, GPs and care homes via telephone, and monitor patients via remote monitoring devices. If any face-to-face assistance is required, health workers to visit patients directly at home.

Leeds have saved 21,500 bed days since launching their pilot virtual ward in November 2019 (as of March 2023).

Key learnings for KSA

Technology integration can be utilised to strengthen **patient-provider relationships,** by making engagement easier for both medical professionals and patients.

The detailed case study can be found in the Appendix

29 Patient Engagement Hit. Patient engagement strategies for improving patient activation. 2024.

30 Krist, A. H., et al. Engaging patients in decision-making and behavior change to promote prevention. Stud Health Technol Inform. 2017.

31 The Strategy Unit and Ipsos Mori. Patient-centered intelligence: A guide to patient activation. 2021.

APPENDICES

03

APPENDIX I - GLOSSARY OF TERMS

Term	Definition
Population Health	The health outcomes of a group of individuals, including the distribution of such outcomes within the group.
Population Health Management (PHM)	Enhances overall population health by using data to plan and deliver proactive care for maximum impact. This includes identifying groups at risk, designing targeted interventions, and preventing health risks, thereby improving care for those with existing conditions and reducing unwarranted variations in outcomes.
Value Based Healthcare (VBHC)	A healthcare delivery model in which providers, including hospitals and physicians, are paid based on patient health outcomes.
PHM Cycle	The sequential steps taken to target, design, implement and monitor PHM interventions. The cycle is continuous, whereby outcomes and learnings from an intervention are used for continuous improvement.
Health promotion	Population-based strategies that target major disease risk factors, mostly through efforts to change health-related behavior.
Disease prevention	Strategies and interventions aimed at reducing the occurrence and impact of diseases within a specific population.
Key performance indicators (KPIs)	Measurable values that organizations use to evaluate their progress towards achieving specific goals and objectives.
Population need	The health needs and requirements of a specific population or community. It involves understanding the health status, demographics, and social determinants of health that influence the well-being of a population.
Electronic health records (EHR)	Digital systems that store and manage comprehensive health information for individuals within a specific population, including diagnoses, medications, allergies, laboratory results, and other relevant health information.
Population segmentation	Grouping the population in distinct groups based on various factors, allowing for a better understanding of the needs within different segments.
Risk stratification	The process of categorizing patients who face a greater risk of adverse health outcomes into groups with similar risk profiles
Continuum of care	A coordinated system of healthcare services that guides patients through different levels and settings of care
Evaluation	The systematic assessment and analysis of the effectiveness, efficiency, and impact of PHM initiatives and interventions.

APPENDIX II - BRIDGES TO HEALTH POPULATION SEGMENTATION DETAILED METHODOLOGY

CHI intends to execute a two-step strategy for population segmentation, adapted from a customized Bridges to Health framework designed specifically for the KSA context. The overarching implementation plan is outlined as follows:

Data integration:

- Examining healthcare claims data to detect utilization patterns, prevalent health conditions, care providers, and gaps.
- Leveraging beneficiary demographic information to grasp population health needs more comprehensively and customize interventions accordingly.

Population segmentation:

- CHI will conduct segmentation, to divide the beneficiary pool into core groups based on health conditions, resulting in nine core groups and 15 sub-segments that cover the entire population.
- The eight segments and 15 sub-segments are subsequently categorized based on age groups, which include children (0-14 years), youths and younger adults (15-60 years), and older adults (> 60 years old). These groups are then assessed for risk factors to facilitate further risk stratification.
- Each segment is categorical, with individuals being assigned to only one segment based on prevailing conditions. Patient claims data, including primary and secondary diagnoses, is utilized to map the population into acute and chronic care conditions.
- If patients are eligible for more than one category, they are assigned to the category associated with the highest cost.
- Relative associated costs and resource utilization is determined using an adaptation of the Lombardy ranking methodology[32], with additional diseases and updated costs to align to the KSA health sector context.
- In the Lombardy ranking methodology, detailed pathologies and conditions are listed alongside their respective ranks and average annual costs as determined in the Lombardy region (Italy). This methodology is used because the study provides a large, non-biased, sample size and was conducted as a longitudinal study with data collected over an extended period, multiple time points to limit variation.

The data will be analyzed and presented through PHM dashboards, featuring reports that can be downloaded and shared with other stakeholders.

32 Regione Lombardia, La Giunta. Indirizzi per la presa in carico della cronicità e della fragilità in Regione Lombardia. 2015.

APPENDIX III - OVERVIEW OF RISK STRATIFICATION METHODOLOGIES

Outlined in this section is a non-exhaustive list of common risk stratification methodologies. Examples that are not outlined that can also be considered include:

- National Association of Community Health Centers (NACHC) risk stratification - *when a simpler methodology focused on patient complexity and comorbidity*
- Edmonton Frailty Scale - *when the organization is focusing on risk associated with age and age-related complexity*
- Condition specific stratifications (e.g. Canadian Syncope Risk Score) - *when the organization is focusing on risk associated with a specific condition*

Charlson's Comorbidity Index

Recommended for use: *when identifying highly complex service users, particularly for acute healthcare settings.*

The Charlson Comorbidity Index[33] score helps stratify individuals within a population based on the presence and severity of comorbid conditions, providing insights into mortality risk. This score is determined based on 19 medical conditions, outlined in the table below.

CCI comorbidity scoring table

Comorbidity	Score
Prior myocardial infarction	1
Congestive heart failure	1
Peripheral vascular disease	1
Cerebrovascular disease	1
Dementia	1
Chronic pulmonary disease	1
Rheumatologic disease	1
Peptic ulcer disease	1
Mild liver disease	1
Diabetes	1
Cerebrovascular (hemiplegia) event	2
Moderate-to-severe renal disease	2
Diabetes with chronic complications	2
Cancer without metastases	2
Leukemia	2
Lymphoma	2
Moderate or severe liver disease	3
Metastatic solid tumor	6
Acquired immunodeficiency syndrome (AIDS)	6

33 Glasheen, W. P., et al. Charlson Comorbidity index: icd-9 update and icd-10 translation. *Am Health Drug Benefits*. 2019.

Each medical condition category is assigned a score or weight of 1, 2, 3, or 6. An additional score for age is incorporated to consider mortality risk in the absence of clinical diagnoses. The final score is obtained by summing the scores for active condition categories along with the age adjustment, where higher scores indicate a more severe condition and, consequently, a worse prognosis.

The approach does not require specific licensing and is frequently used internationally. It is important to consider that the index is more focused on predicting acute risk and mortality, and is less suited to identifying individuals who may benefit from health promotion efforts.

Some of the benefits of Charlson's approach are:

- It facilitates triage, prioritization, and proactive patient engagement.
- It enables prioritization of care-management resources based on patient risk, through the correlation of mortality risk with expected healthcare resource consumption.

However, challenges in validating the Charlson Comorbidity Index within the context of KSA may arise, necessitating localized studies to ensure the accuracy and relevance of the index for predicting health outcomes in the Saudi population. Additionally, data standardization challenges across KSA may pose obstacles to the calculation, potentially impacting the validity of the index.

American Academy of Family Physicians (AAFP) Two-Step Process for Risk Stratification Method

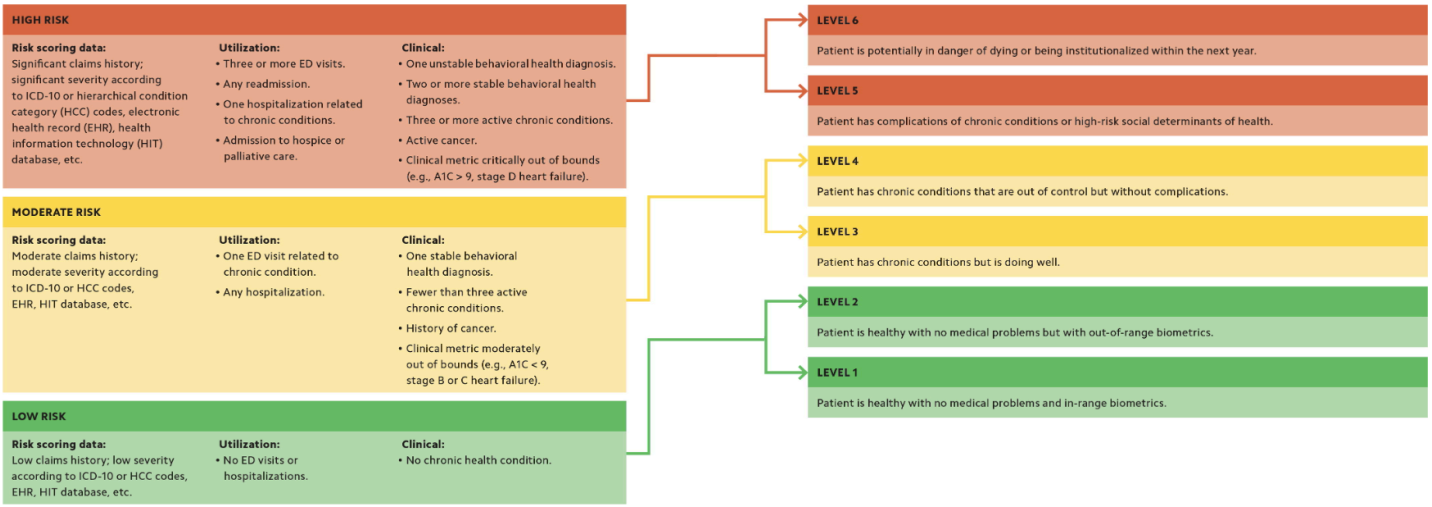
Recommended for use: *when identifying the highest risk patients to target with limited resources, primarily for primary healthcare settings.*

The AAFP Two-Step Risk Stratification Method is used to assess a patient's risk level based on objective data and subjective input. The method involves two steps[34]:

- Step one categorizes patients into high, medium, or low risk groups based on objective data such as chronic conditions, age, comorbidities, physical limitations, and other factors obtained from claims or electronic health records (EHRs).
- Step two assigns patients to one of six risk levels based on subjective considerations, including the presence of chronic conditions, control of those conditions, complications, social determinants of health, and the potential for death or institutionalization within the next year.

34 Dera, J. Risk Stratification: A Two-Step Process for Identifying Your Sickest Patients. *Fam Pract Manag*. 2019

AAFD Two-Step Process



Some of the benefits of the AAFP approach are:

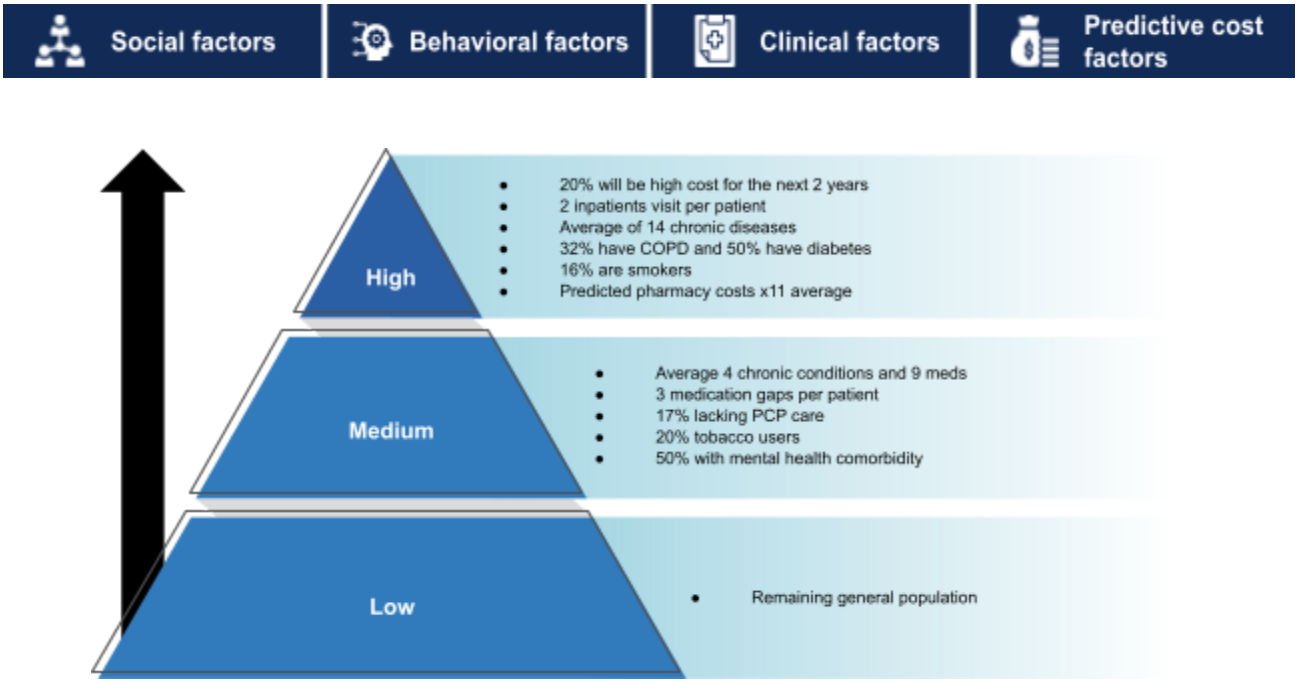
- The approach is suitable when resources are limited, as it provides a simplified approach to risk stratification, using readily available data (e.g. age, gender, and diagnoses).
- Incorporating subjective data allows physician/staff input and patient preferences and well-being to be included in the assessment of risk

Johns Hopkins ACG® system risk stratification tool

Recommended for use: *when aiming to determine the impacts that risk categories have across a broad range of healthcare settings (e.g. inpatient, primary care, pharmacy etc.)*
The Johns Hopkins risk stratification[35] tool classifies patients into low, medium, or high-risk groups for healthcare utilization.

This categorization is determined by various factors:

Johns Hopkins ACG® Risk stratification approach



Upon completion of risk stratification on the Johns Hopkins ACG® system, organizations can access the data retrieved from the system for their own use.

Some of the benefits of the Johns Hopkins approach are:

- Incorporates both further segmentation (i.e. by social, behavioral, clinical, cost factors) and risk stratification, aiding users in estimating future demand for services required by patients, enabling targeted intervention, and predicting potential health challenges for patients.
- Allows users to focus their resources towards the population that needs it the most.
- Equips health care leaders, providers, and analysts with valuable insights on how to mitigate medical costs and enhance the health status of their population.

35 Johns Hopkins. Risk stratification 101: What is it and how is it used? 2022

However, challenges may arise in ensuring the availability and quality of pertinent healthcare data in KSA, posing a risk to the accuracy of risk assessments due to incomplete or inaccurate information. Additionally, the method requires specific licensing for each user, which may be an impairment for adoption and may impede creating a unified approach across the private sector.

3M™ Clinical Risk Grouping Software

Recommended for use: When needing to account for a broad range of health and non-health aspects of risk for the population.

Using the 3M™ CRG Software,[36, 37] individuals are assigned a classification code based on their health status: the first digit refers to health status, second to fourth represents the base clinical risk group, the fifth identifies severity of illness.

3M™ Clinical Risk Grouping Software: Population groupings

3M CRG core health status groups (1-9)	Base 3M CRGs (Total = 330)	Description/Example of base 3M CRG	Severity levels	Number of 3M CRGs (Total = 1,408)
9 - Catastrophic condition status	10	History of major organ transplant	4	40
8 - Dominant and metastatic malignancies	30	Colon malignancy - under active treatment	4	120
7 - Dominant chronic disease in 3 or more organ systems (triplets)	28	Diabetes mellitus, congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD)	6	168
6 - Significant chronic disease in multiple organ systems (pairs)	78	Diabetes mellitus and CHF	6	468
5 - Single dominant or moderate chronic disease	125	Diabetes mellitus	4	500
4 - Minor chronic disease in multiple organ systems	1	Migraine and benign prostatic hyperplasia (BPH)	4	4
3 - Single minor chronic disease	50	Migraine	2	100
2 - History of significant acute disease	6	Chest pains	None	6
1 - Healthy/Non-Users	2	Healthy (no chronic health problems)	None	2

Some of the benefits of the 3M™ CRG Software approach are:

- Enables precise longitudinal care coordination, addressing cost-of-care management, quality outcomes, and provider profiling.
- Adjusts for individual burden of illness, helping measure and manage population health, track outcomes, analyze treatment efficacy, and monitor quality of care.

Similar to the Johns Hopkins risk stratification approach, 3M™ CRG Software requires specific licensing for each user, which may create challenges for creating a unified approach across the private sector.

36 3M™. 3M™ Clinical Risk Grouping Software. 2018.

37 3M™. 3M™ Clinical Risk Groups: Measuring risk, managing care, 2018,

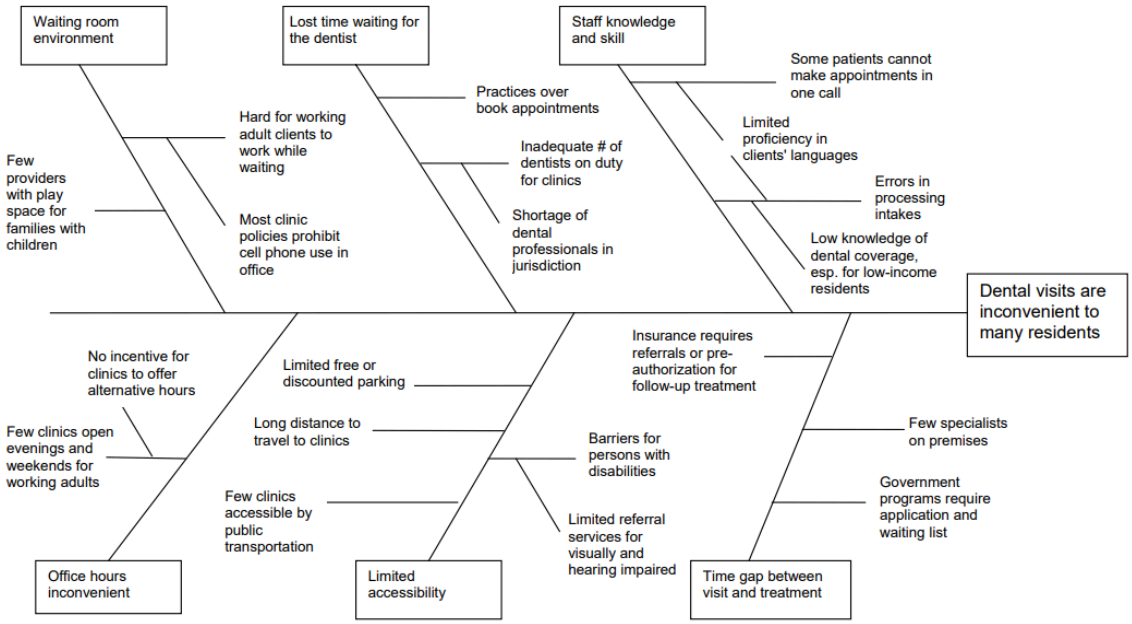
APPENDIX IV - OVERVIEW OF ROOT CAUSE ANALYSIS APPROACHES

Fishbone root cause analysis

Recommended for use: *to analyze significant challenges, in order to better understand the categories of potential cause and effect, and subsequently brainstorm targeted interventions.*

A cause and effect diagram, often referred to as a "fishbone" diagram, aids in brainstorming to pinpoint potential causes of a problem and organizing ideas into relevant categories[38]. This visual tool offers a structured approach compared to other brainstorming methods. The problem or effect is depicted at the head of the fish, while potential contributing causes are listed on smaller "bones" under different cause categories. By directing the team to examine these categories, a fishbone diagram can uncover potential causes that may not have been otherwise considered.

Example of a fishbone diagram[39]



38 CMS Medicare. How to Use the Fishbone Tool for Root Cause Analysis. No Date.

39 Public Health Foundation. Fishbone (Ishikawa) Diagram (Example). No Date.

Below are general guidelines to build a fishbone diagram:

STEP 1 Define the problem statement (referred to as the effect) clearly and specifically, placing it at the head of the "fish." Avoid framing the problem in terms of a solution.

STEP 2 Determine the major categories of causes contributing to the problem, branching out from the main arrow. Common categories include equipment or supply factors, environmental factors, rules/policy/procedure factors, and people/staff factors.

STEP 3 Brainstorm all potential causes of the problem by asking "Why does this happen?". Each causal factor is recorded as a branch stemming from the appropriate category on the fishbone diagram. Causes may be listed in multiple places if they pertain to multiple categories.

STEP 4 Repeat the process by asking "Why does this happen?" about each identified cause, branching out sub-causes from the cause branches.

STEP 5 Continue asking "Why?" to uncover deeper levels of causes, organizing them under related causes or categories. This facilitates the identification and addressing of root causes to prevent future occurrences of the problem.

The foundational problems that allowed the contributing factors to lead to a harmful event are the root causes of that event. Multiple root causes can exist for a single event. After pinpointing these root causes and contributing factors, each one must be addressed accordingly.

Five Whys

Recommended for use: *when analysis needs to dig deeper into the root cause of a specific problem. It is particularly useful when initial causes have been identified through other means (e.g. fishbone), and there is a need to explore multiple layers of causation.*

The Five Whys is a straightforward method for solving problems by uncovering their root causes efficiently. It involves asking "Why?" repeatedly to delve deeper into the issue and avoid oversimplified answers. Each answer should lead to another "Why?" question, helping to identify the underlying cause. This technique is simple to learn and apply, making it an effective tool for quickly pinpointing the root cause of a problem[40, 41].

40 Institute for Healthcare Improvement. 5 Whys: Finding the Root Cause. 2019.

41 CMS Medicare. Five Whys Tool for Root Cause Analysis. No Date.

Example of a template that can be used while conducting the Five Whys methodology

Problem statement	One sentence description of event or problem
Why? ➡	
Why? ➡	
Why? ➡	
Why? ➡	
Why? ➡	
Root Cause(s)	1. 2. 3. To validate root causes, ask the following: If you removed this root cause, would this event or problem have been prevented?

Below are general guidelines to conduct the Five Whys approach:

STEP 1 Develop a clear and specific problem statement.

STEP 2 The question “Why did the problem occur?” is asked and the team's response is recorded. To determine if that response is the root cause, the team should ask itself if correcting the most recent response would likely prevent the problem from recurring. If the answer is yes, the response is likely a contributing factor rather than the root cause.

STEP 3 If the response is identified as a contributing factor, the team continues asking "Why?" until they agree that the root cause has been identified.

STEP 4 It often requires three to five "whys," but sometimes more. The team continues until it reaches consensus on the root cause.

Value Stream Mapping

Recommended for use: *when there is a need to identify challenges with, and improving the flow of processes and individuals within healthcare settings. In particular, it is effective in identifying bottlenecks, waste, inefficiencies and challenges in care coordination that have an adverse effect on care quality.*

Lean management[42] is an organizational philosophy and toolkit aimed at enhancing value from the patient's perspective within healthcare settings.

One pivotal tool in lean methodology is Value Stream Mapping (VSM), designed to delineate steps that would bring the team closer to the objective. Essentially, a VSM provides a visual depiction of the movement of people, materials, and information within a complex system, fostering a shared understanding among stakeholders. The primary aim is to facilitate process enhancement by eliminating non-value-added steps[43].

Several critical aspects characterize VSMs:

- First, a multidisciplinary team (including front-line workers) should be brought together to develop the VSM. Empowering front-line workers to spearhead improvement efforts, a fundamental principle of lean, helps in embed a culture which embraces and promotes improvement. Additionally, frontline workers possess an intimate understanding of specific processes, unmatched by senior management, which is essential to bring insights and knowledge to the VSM development.
- Second, the VSM needs to be thorough enough to identify every step that doesn't add value, no matter how small. It's these small improvements that add up and make lean methods so effective.
- Third, every step on the VSM should be evaluated to see if it adds value for the patient, and if there's a safer, faster, or better way to do it. If the answer is "yes" to any of these questions, it means there's room for improvement.
- Fourth, building a VSM is an iterative process; the VSM will need to be constantly compared to an "ideal" state. This illustrates how lean is constantly evolving and improving.

42 Gellad, Z. F., & Day, T. E. What Is Value Stream Mapping, and How Can It Help My Practice? Am J Gastroenterol. 2016.

43 NHS Improving Quality. Bringing lean to life. No Date.

APPENDIX V - CASE STUDIES DEEP DIVES

Intervention: Predictive risk-model of 30-day hospital readmissions

Context

Kaiser Permanente Northern California (KPNC) is an integrated healthcare consortium in the US. To reduce the rate of hospital readmission, or death, within 30-days of hospital discharge, a predictive risk-model was developed. It highlighted patients who would be at high-risk of readmission and thus, would require additional, targeted care post-discharge to prevent this.

The predictive risk-model, and KPNC's use of the tool to mitigate readmissions, highlights key best-practice elements for how providers should conduct risk-stratification, and apply the findings to improve health outcomes.

Approach

KPNC's approach followed three key principles:

1. **Robust patient database**

   KPNC was able to calculate accurate predictions of patients' risk of readmission primarily because it had developed a detailed database on patient records. As a result, KPNC were able to identify patients, in the past, who had been readmitted, and generated a comprehensive list of influential risk-characteristics correlated with readmission. These characteristics included: (1) severity of patient's illness, (2) comorbidity score, (3) length of stay, (4) code status, and (5) pattern of previous hospital admissions.

   The model could then utilize the patient database to provide predictions on future patients by identifying how they measured up on these risk-factors

2. **Tailored interventions**

   Depending on a patient's predicted risk value, they would be put in a particular category group: High-, Medium- or Low-risk. Interventions were tailored to each group to provide appropriate care. The frequency of check-ups from dedicated case managers, for example, was significantly higher for high-risk patients than low-risk. This approach allowed efficient allocation of resources by avoiding unnecessarily intensive treatment for low-risk patients.

3. **Mitigating false negatives**

   KPNC also recognised limitations within its predictive model and the database that it was built from. In particular, one risk-factor that the model negated was social determinants of health e.g. homelessness, as this was not easily captured via patient records. As a result, clinicians would make their own additional evaluations on low-risk patients to ensure that they were receiving the adequate level of care.

Key outcomes

The predictive-risk model ensured that KPNC was able to appropriately map treatment and check-up plans to the risk level of all discharged patients. High risk patients were provided effective treatment, while avoiding highly resource intensive plans for low risk patients. As a result, there was a 9% reduction in likelihood of 30-day readmission for patients.

Intervention: An integrated GP-led diabetes care

Context

Bexley CCG recognised the increasing prevalence of Diabetes within their population, and the financial pressure this was putting on its healthcare system. They identified that efforts and resources would be best placed in early/preventive treatment of diabetes, to most effectively and cost-efficiently mitigate against the increasing prevalence of diabetes within their population.

Bexley CCG began the process of designing interventions to address this. With demonstrated success, the strategies Bexley implemented represent best-practice elements for how healthcare organizations should design and prioritize interventions.

Approach

Bexley CCG's approach followed three key principles:

1. **Strategic allocation of resources**

   Using an evidence-based approach, Bexley identified the parts of the patient journey for which interventions would be most effective. Recognising that prevention and early treatment of diabetes would yield greater impact, Bexley identified the key stages in the pre-diabetes patient journey to allocate resources to. Among the diabetic cohort, Bexley identified that patients spend 8,757 hours self-managing their diabetes compared to just 3 hours with a medical professional. Thus, they designed a suite of interventions around optimizing multiple aspects of those self management hours. Demographic and geographic analysis also identified the marginalized groups associated with poor access to care and worsened outcomes, and thus designed bespoke interventions to target these groups specifically.

2. **Insights from key stakeholders and experts**

   To ensure their interventions provided appropriate treatment to fit the population's need, through the design process, they consulted with the patients who would be receiving the treatment through meetings and reports. Patients were represented on the Diabetes Practice Development team, which coordinates support for primary care providers, and in the delivery of X-Pert, a self-management education program for patients.

3. **Leveraging existing capabilities**

   Bexley determined how they could leverage their existing capabilities within interventions to ensure maximal impact and ease of delivery. The Bexley Diabetes Stakeholder Network, was an existing group which Bexley drew on to garner patient insights. Instead of implementing a high cost, new IT system across all providers which would require significant infrastructural upheaval, Bexley decided to harness and refine its existing system; a more cost-efficient and lower risk solution.

Key outcomes

As a result of Bexley's strategic approach, the interventions designed were able to provide appropriate treatment for patients. For example, one intervention alone, X-pert, was able to produce a 16.2% reduction in patients' HbA1c levels. Overall, through the suite of interventions, Bexley CCG was able to provide the most effective diabetes control in London.

Intervention: Implementation of PowerPlans to prevent heart failure readmissions

Context

Baptist Health South Florida (BHSF), a clinical care network with 11 hospitals, sought to improve the 30-day heart failure readmission rate in one hospital - Homestead Hospital (HH). To achieve this, 'PowerPlans', standardized physician order sets, were implemented with the aim of decreasing variation in patient treatment and promoting evidence-based care.

Dedicated governance was set up to promote successful adoption of these PowerPlans, ensuring the program was clinically-led and shaped by performance improvement expertise. The program highlights some key best-practice elements for how health providers can establish effective programmatic and clinical governance for their interventions.

Approach

Homestead Hospital's approach followed three key principle

1. **Well-defined roles and accountabilities**

   BHSF-wide teams were allocated responsibilities to develop the PowerPlans. More narrowly, the Multidisciplinary Cardiovascular Collaboration Committee (MCCC), a Homestead-Hospital (HH) team, was dedicated toward the adoption of the intervention within the hospital only.

   Alongside all this, a Critical Care Services Director role was put in place. The responsibilities of the role included: (a) representing HH at BHSF-wide meetings, and (b) serving as a liaison and facilitator for the rollout of PowerPlans in HH.

2. **Engagement from key stakeholders**

   Engagement from key stakeholders was enabled via two main avenues:

   a) MCCC Participation

   This committee was composed of a range of key stakeholders, from hospital staff to representatives from the performance improvement, pharmacy, laboratory and dietary departments.

   b) Proactive Nursing Leadership

   Nurses had a key role to play in the adoption of PowerPlans, as they would often be utilizing them in day-to-day life. As a result, nursing leadership contributed significantly to the research and development, education and implementation of this intervention.

3. **Formalized quality assurance process**

   The MCCC had scheduled monthly meetings to evaluate the performance of the intervention against pre-defined KPIs (compliance and readmission rates). Alongside this, they also consulted an external performance improvement specialist regularly to optimize the hospital's adoption of PowerPlans.

Key outcomes

As a result of the intervention, 30-day heart failure readmission rates fell from ~30% to 11.1%.

The program succeeded in decreasing variation in care. In the initial period when PowerPlans were first implemented, compliance rates from medical staff was only ~26%. However, just over a year later, compliance rates reached a high of 63%.

Intervention: Improving Tobacco Use Screening and Smoking Cessation in Primary Care

Context

Miramont Family Medicine is a multi-provider primary care practice. Following the implementation of an Electronic Health Record (EHR) - Miramont made tobacco screening a key priority to address.

They set two targets around this:

1) Assess and document tobacco use status in 90% of all patients
2) Provide tobacco cessation support to 90% of all identified smokers/tobacco users

To achieve these targets, Miramont focused on improving monitoring and evaluation processes around their existing interventions to reduce tobacco usage. In doing so, this would allow Miramont to identify key weaknesses in service provision, and opportunities for improvement.

The processes that Miramont implemented highlight some of the key elements of best-practice for how health providers should measure and evaluate the impacts of their interventions.

Approach

Miramont's approach followed three key principles:

1. **Comprehensive database**

   Miramont centralized their EHRs across all practices into one database, allowing greater insights into their patient population. Medical assistants (MAs) asked patients a predefined set of questions (readiness-to-quit assessments) about their smoking status and registered this information. Formalizing these processes enabled Miramont to accurately monitor the effectiveness of their existing interventions by having a comprehensive database to garner insights from.

2. **Evidence-based feedback**

   Utilizing their database, the team were able to form useful insights through the use of a clinical decision support tool (Clinical Integration Networks of America (CINA) sheet). The CINA sheet provided a summary of relevant patient information, including gaps in tobacco use documentation and interventions. These reports gave insights into key success metrics, including screening and cessation rates, from which the team could identify areas where interventions were lacking.

3. **Frequent and regular evaluations**

   Given the insights that the team were able to leverage from the data, they made sure to communicate this frequently with relevant stakeholders to encourage constant iteration. For example, they provided medical staff with reports every month to highlight performance gaps. This included posting graphs in the nurse's station area as a daily reminder of tobacco metrics.

Key outcomes

Tobacco screening rates for the practices increased from 80% to 90% and smoking cessation rates increased from 80% to 87%. Overall, 13 of the practice's 17 providers were able to meet the target of assessing 90% of patients for tobacco use and providing 90% of relevant patients cessation services.

Intervention: Providing rapid, continuous care to patients in their own home through a frailty virtual ward

Context

Leeds Community Healthcare NHS Trust first piloted the ‘frailty virtual ward’ in November 2019. The intervention set out to provide rapid, continuous and appropriate care to patients aged over 65 with moderate to severe frailty in their own homes. However, the trust wanted to ensure that this treatment was provided without the need for patients to be in the hospital. This would help to alleviate pressure on hospital resources and improve the convenience of accessing medical care for patients.

The virtual ward, in providing this care, has demonstrated some key best-practice elements for how health providers should identify and proactively and continuously engage with their high risk populations.

Approach

Leeds Frailty Virtual Ward demonstrated 2 model strategies for successful patient engagement.

1. **Adopting technology to facilitate outreach**

   Technology integration has helped to enhance the patient-provider relationship. The use of video/phone calls, for example, has enabled medical staff to conduct daily check-ups with patients without the patient needing to leave their home. Moreover, the use of apps and wearable devices ensures that staff can still provide appropriate treatment by monitoring relevant and important physical measures such as heart rate, blood pressure or oxygen levels.

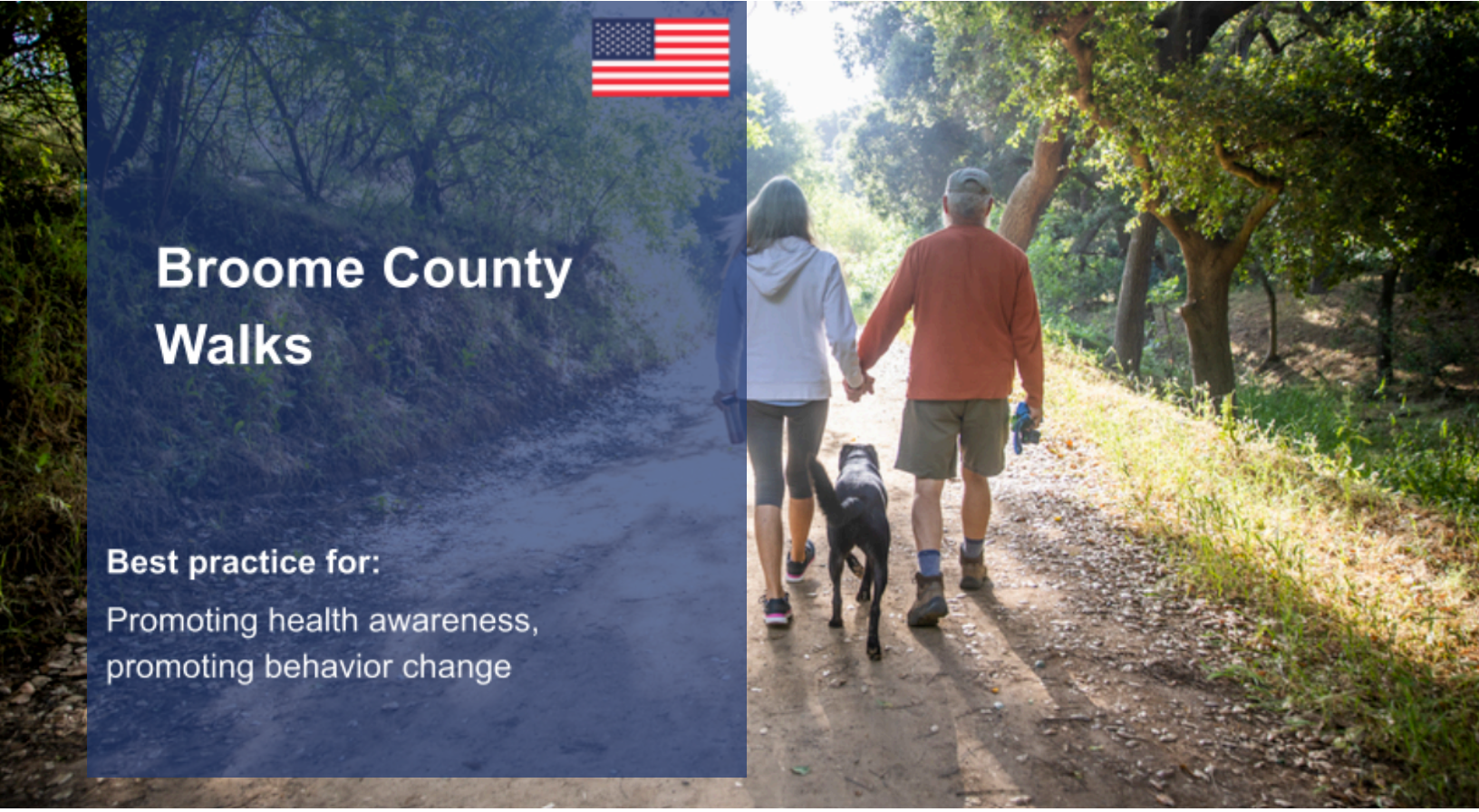
   This, in turn, has made patient health management much easier for both the patient and the provider.

2. **Multidisciplinary support**

   The virtual ward also provides multidisciplinary support for patients, from primary, secondary and community health workers. For example, community matrons contribute by visiting patients in their own homes, and pharmacists can prescribe appropriate medicines to patients. This has ensured that patients are getting the appropriate care to get back on their feet.

Key outcomes

The virtual ward has improved the treatment experience for patients, who are able to be easily reached and served in preferred care settings outside of hospital. It has achieved this by making regular and continuous patient-engagement more convenient for all parties. Further, multidisciplinary insights ensure that patients are receiving personalized and appropriate care. As a result of this, in March 2023, Leeds reported that over 21,500 bed days have been saved since they first piloted the virtual ward in November 2019.



Intervention: A community-wide campaign to promote 30-minutes of daily walking within insufficiently active 40-65 year old residents.

Additional source(s): Broome County Steps Program (CDC) ; BC Walks: Replication of a Communitywide Physical Activity Campaign.

Context

Obesity was a pressing health concern in Broome County (BC), New York. In one year, a survey of the county found that more than 3 in 5 respondents reported being either overweight or obese. As part of a range of initiatives to mitigate this, BC launched a community-wide campaign, BC Walks, to encourage insufficiently active 40-65 year olds to engage in 30-minutes of walking a day. The campaign, in harnessing a multi-faceted approach, demonstrates some best-practice elements for how organizations can promote health awareness and behavior change in the population.

Approach

Broome County's Approach followed 3 key strategies:

1. **Utilization of various media channels to promote awareness**

   Broome County developed an intensive 8-week media campaign to advertise BC Walks having identified media channels that had high usage amongst their population. They paid for 953 thirty-second advertisements during prime-time network television, 1645 sixty-second radio advertisements and 10 quarter-page advertisements in the local newspaper.

   This promoted awareness of the initiative to residents and ultimately, helped to enable participants to engage with the campaign message. For example, the media campaign led to 11,360 hits on the BC Walks website and following this, 961 individuals logged their minutes-walked into the website.

2. **Multidisciplinary collaboration to promote awareness**

   Alongside the media campaign, Broome County also encouraged local doctors and nurses to promote awareness of BC Walks and the importance of physical activity to their patients. In particular, the doctors and nurses were given prescription pads with the BC Walks logo to prescribe daily physical activity to relevant patients.

   Doctors and nurses were an influential channel to raise awareness through, as they would often be in direct contact with the audience that Broome County was targeting i.e. inactive 40-65 year olds.

3. **Infrastructural and Community development to support behavior change**

   As part of Broome County's strategy, they recognised the importance of designing infrastructure that made it as easy as possible for participants to engage in more walking. In particular, the campaign staff collaborated with transportation and land-use officials to develop walking trails and improve side-walks.

   Moreover, the coordination of community activities and the establishment of a team dedicated to promoting community engagement further helped to instill feelings of support, encouragement and group accountability that naturally arise from a sense of community. This encouraged and increased participation in BC Walks programs.

Key outcomes

Overall, Broome County successfully utilized a triple-pronged approach to engage their population with the campaign, BC Walks, using media channels relevant to their population. Over 4 years, 80,000 participants enrolled in the program. Furthermore, in a year alone, the proportion of residents who walked 30-minutes or more, 5 days a week, increased from 53% to 61%.

APPENDIX VI - DETAILED SAMPLE LIST OF INTERVENTIONS

The sample list of interventions is non-exhaustive and includes capability building interventions (italicized) support.

Diabetes/pre-diabetes			
Continuum Of Care	**Intervention**	**Key Characteristics**	**Exemplar Case Studies**
Health Promotion	**Lifestyle advice programs**	1. Program delivered online, in-person or hybrid 2. Providing personalized support on diet, weight management and physical activity 3. Led by a certified facilitator	***NHS:*** *"Healthier You"* **;** ***CDC:*** *Lifestyle Change Programs* **Impact(s):** 1. **20%** lower likelihood of having T2 Diabetes (vs control) 2. **7%** reduction in T2 Diabetes cases between 2018 and 2019 3. **21%** more likely to achieve weight loss of 5% of bodyweight
	Diabetes and risk factor awareness campaigns	1. Generate awareness via media campaigns, free Diabetes risk tests and providing access to lifestyle support programs	***CDC:*** *'Do I have PreDiabetes'* **Impact:** 1. **185,887** total views (as of 12/03/24) 2. **3.7 million** people who have taken Diabetes Risk test (as of Nov. 2021)
Preventive Care	**Risk-based/ targeted diabetes screening**	1. Invite specific patients to come to clinics, based off previous medical records, patients' demographics or risk-assessments 2. Measure current Diabetes risk via a health check-up, including HbA1c test 3. Depending on current risk, provide some intensity of counseling, lifestyle advice and treatment	**NHS:** *Bradford Beating Diabetes* **;** ***DEHKO:*** *'High-risk population strategy'* **Impact(s):** 1. **1000** new diagnosis of T2 Diabetes 2. **39%** of men and women reported improvements in dietary change 2. SCORE and FRS fell for men and women respectively
Diagnosis/ Treatment	**Personalized lifestyle intervention plans**	1. Weight-loss program targeted at T2 Diabetics 2. Intensive period of regimented diet planning and physical activity 3. Longer period after where patients left to their own device, but are still monitored and can access support	***NHS:*** *Path to Remission program* **Impact:** 1. **46%** of participants were in remission 2. **24%** had achieved 15kg weight loss 3. **1-year after,** effects were largely sustained

	HbA1c/eye assessment monitoring	1. A review team is set up to highlight gaps in diabetic patients' records, including when they've had their last HbA1c or eye test. 2. Gaps are highlighted to clinicians who can engage with patient appropriately	***HP2: a Clinically Integrated Network (CIN)*** **Impact:** 1. **3.33** percentage point decrease in patients with HbA1c levels > 9%
	Patient self-management programs	1. Accessible programs to educate population on self-management of diabetes 2. Elected leaders to raise awareness in marginalized communities	***NHS:*** *Bexley Integrated Care Network* **Impact:** 1. **Highest** rate of diabetes control in London 2. **16.2%** reduction in HbA1c levels (from educational program alone)

Coronary Heart Disease			
Continuum Of Care	**Intervention**	**Key Characteristics**	**Exemplar Case Studies**
Health Promotion	**Advice and support for targeted groups**	1. Campaigns targeting high-risk, under-addressed groups 2. Advice specific to group e.g. for women, how to mitigate risks risk of CHD during pregnancy	***Go Red for Women***
	Community awareness initiatives	1. Harness local community spaces such as pharmacies, shopping malls etc. 2. Offer free BP readings, risk-screening and advice	***CHAP:*** *Cardiovascular Health Awareness Program (Additional source)* **Impact:** 1. **66%** of people invited had BP readings taken 2. **43%** of people attended 2 or more sessions 3. Improvement in BP from 142/78 mmHg to **123/69 mmHg**
	Early symptoms and emergency awareness	1. Campaign to highlight early symptoms of heart attacks and how to get emergency help 2. Medium of communication includes websites, TV adverts etc.	***Help Us Help You***
Preventive Care	**Patient online portal**	1. Dashboard for patients to access own medical records, including current risk factors, any unaddressed issues and historical data 2. Option to submit new measurements 3. Access to laboratory forms for in-hospital blood tests	***Vascular Risk Management Program*** *(Additional Source)* **Impact:** 1. -14% decrease in Framingham Risk Score 2. 152 of 155 patients accessed website, with median of 56 visits 3. 65% probability that program is

			cost-effective (assuming 1 QALY = €20,000)
	Community blood pressure screening	1. Offer free BP checks and refer High-BP individuals to GP 2. GP can refer at-risk patients to community pharmacy for quick screenings 3. Pharmacies can contribute to updating patient medical records	***Rohpharm:*** *Community pharmacy blood pressure check service* **Impact:** 1. **More than 200** BP checks made over 7-month period 2. **22** referrals made to GPs
Diagnosis/ Treatment	**Patient self-management programs**	1. 1-to-1 coaching sessions between medical professionals and patients 2. Patients learn about their risk factors, when and how to reach out to their doctor and an action plan to mitigate their condition	***COACH:*** *Coaching patients On Achieving Cardiovascular Health* *(Additional source)* **Impact:** 1. **Significantly lower** cholesterol levels 2. **Significantly fewer** deaths in the COACH group 3. **15% reduction** cardiac bed-days
	Early diagnosis programs	Early diagnosis is based on 3 stages: 1. A patient questionnaire to determine risk status, including demographic characteristics, and any existing symptoms of CHD 2. If high-risk, patient will undergo physical examination and relevant treatment to determine if CHD is present 3. Refer to cardiologist if CHD is present	***Early Diagnosis Strategy:*** *Trial* **Impact:** 1. **More than 100%** increase in new diagnoses of CHD
	Standardized physician order sets	1. Ensure consistency in care and promote evidence-based treatment 2. Provide physicians with standardized order sets to highlight procedure for treating patients with cardiovascular issues	***Baptist Health South Florida:*** *Readmission Prevention* **Impact:** 1. **11.1%** heart failure 30-day readmission rate (vs 33.3% pre-intervention) 2. **63%** compliance rate to order sets
	Readmission risk predictor	1. Evaluate risk of being readmitted based of patient characteristics including comorbidity index, age, most recent inpatient visit 2. Evaluate risk factors associated with transition from surgery setting to care setting e.g. home 3. Predictor embedded within existing EHR to access patient health details	***Northern Life Health -*** *30-day Readmission Risk Predictor* **Impact:** 1. **9.1%** hospital-wide 30-day readmission rates (vs 9.8% pre-intervention) 2. **14.5%** heart failure 30-day readmission rates (vs 17% pre-intervention

High Blood Pressure			
Continuum Of Care	**Intervention**	**Key Characteristics**	**Exemplar Case Studies**
Health Promotion/ Preventive Care	**Community blood pressure screening**	1. Free BP screening in community spaces, including pharmacies, mosques, parks, shopping malls, offices, leisure centers etc. 2. Screening done via a medical professional/volunteer or using self-screening devices. 3. Advertisement of these community screening events	***May Measurement Month**: Mass Screening and Awareness Campaign (UAE)* ; ***NHS (Blackpool):** Community Blood Pressure Events* ; ***Know your Numbers (Stockport):** Blood Pressure Self-Screening Kiosks* **Impact(s):** 1. **12.5% (3912)** of BP screenings were cases of hypertension (UAE) 3. **33% (533)** of BP screenings were cases of hypertension (Blackpool) 4. **28% (1622)** of BP screenings were cases of hypertension (Stockport)
Preventive Care	**Interactive text messaging system**	1. Patient can 'text' their BP readings 2. Patients receive next steps, depending on the patient's BP reading 3. Patients also receive reminders for taking medication and sending BP readings 4. Clinicians can monitor what patients' BP readings are and reach out if necessary	***Flo:** Advice and Interactive text Messaging (AIM) system* **Impact:** 1. **8%** reduction in total number of appointments 2. **15%** reduction in number of face-to-face appointments 3. **6.55mmHg** reduction in Systolic BP 4. **4.23mmHG** reduction in Diastolic BP
Diagnosis/ Treatment	***Community-based care teams***	1. Collaboration between medical providers with community health workers and pharmacists 2. Community health workers act as a source of education and support for local community 3. Pharmacists can advise on appropriate BP medication prescriptions	***Collaboration with community health workers*** ; ***Collaboration with pharmacists*** **Impact:** 1. **17.6 percentage point** increase in patients with target-level BP, following collaboration with community health workers 2. **54%** of participants achieved BP control 6-months after pharmacist-intervention

	Reinforcing prevention focused primary care practice	1. Medical education for GPs on how to treat patients, including what therapeutic and medicinal solutions to offer 2. Electronic BP measuring device provided to GPs to more accurately measure patient BP	***ESCAPE*** **Impact:** 1. **4.8mmHg** decrease in Systolic blood pressure 2. **1.9mmHg** decrease in diastolic blood pressure
	Telehealth Intervention	1. Mobile application can provide patients with medical reports, reminders for medicine and blood pressure readings, and contact details for relevant medical professionals 2. BP-monitoring wearable devices enable patients to self-screen blood pressure and upload readings via Bluetooth	***Mobile Application & Wearable Device*** **Impact:** 1. **8.52mmHg** decrease in Systolic blood pressure (vs 1.25mmHg in control)

Obesity			
Continuum Of Care	**Intervention**	**Key Characteristics**	**Exemplar Case Studies**
Health Promotion	**Advertised exercise campaigns**	1. Promote light-moderate exercise among at-risk population (e.g. 45-60 year olds) 2. Advertise campaign via local TV, newspapers 3. Encourage local doctors and nurses to spread word to their patients e.g. prescribe 30-minutes of walking daily	***Broome County Walks*** **Impact:** 1. **30** work-site walking programs established, with **1207** participants 2. **5** school-established programs, with **2000** students 3. **34%** more adults reporting increases in walking (vs control) 4. **78%** of Broome county residents reported hearing about the campaign
	Telehealth healthy lifestyle applications	1. Mobile applications to support individuals to make healthier lifestyle choices 2. This can include providing motivational messages, exercise routines, diet journals etc.	***CogniNu*** **Impact:** 1. **0.55kg** reduction in body weight 2. **0.6%** reduction in body fat
Preventive Care	***Provision of tools and education for clinicians***	1. Workshops educating health professionals on how to screen, counsel and guide patients 2. Screening and charting forms provided to health professionals to use to determine risk status of patients	***TIPS:*** *Teens Increasing Preventive Services* **Impact:** 1. **Significantly highe**r screening and counseling rates

	Reinforcing prevention focused primary care practice	1. Aim to improve the continuation of care between primary and secondary care 2. Involve GPs in secondary care practice to enable understanding of how specialists manage diabetes 3. Provide GPs with more experience in treating diabetic patients to enable understanding of when (and when not to) refer for secondary care	***GP Educational Program:*** *Improving coordination between Primary and Secondary Care* **Impact:** 1. **Improved** collaborate relationships between GPs and specialists 2. **Improved** confidence from GPs in knowing when to refer patients onwards
Diagnosis/ Treatment	**Targeted in-person lifestyle classes**	1. Program of in-person classes consisting of physical activity and dietary guidance 2. Physical activity should start light and progressively increase every session 3. Dietary advice includes developing skills for healthier eating e.g. food journals, meal prep, supermarket shopping etc. 4. Class program should be regular e.g. 2 days a week for 12 weeks	***Strong People Living Well*** **Impact:** 1. **1.8kg** fall in bodyweight 2. **0.6** fall in BMI 3. **2,027** increase in daily steps
	Online lifestyle programs for obese individuals	1. Online classes on diet and exercise 2. Online journal for participants to record progress 3. 1-to-1 feedback from class facilitator on journal 4. Optional, less-frequent classes and engagement with facilitator once program is over to provide ongoing support to patient	***Vtrim:*** *Online Partner for a Healthy Weight* **Impact:** 1. **65%** of participants achieved weight loss target after 12-month follow-up (vs 37.5% in control)

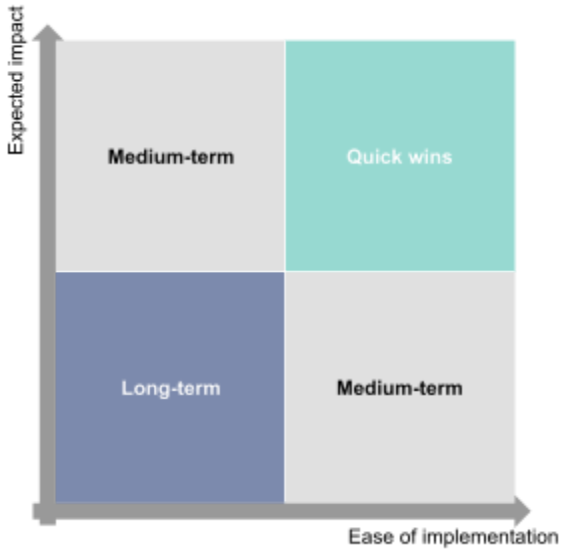
Tobacco Use			
Continuum Of Care	**Intervention**	**Key Characteristics**	**Exemplar Case Studies**
Health Promotion	**Adolescent awareness programs**	1. Adolescent and family-targeted intervention 2. Medium of communication can be classroom sessions in schools, booklets sent to families' homes, or direct contact with health educators 3. Topics include dangers of substance-abuse, how to resist temptation/peer pressure, and parental responsibilities	***LifeSkills Training*** ; ***Family Matters*** **Impact(s):** 1. **75%** reduction in initiation of cigarette smoking 2. **16.4%** fewer participants initiated smoking (vs control)
	Gamified smoking cessation mobile applications	1. Mobile application features include: gamifying the process of quitting smoking, highlighting individual's data (e.g. money saved not smoking), and option to share progress with friends	***NHS:*** *Stop Smoking*

Preventive Care	**Targeted tobacco use screening and cessation support**	1. Risk-assessment questionnaire to screen all patients at front-desk of clinic 2. At-risk patients are offered cessation services, including counseling, medicine, and lifestyle advice	***CEASE:*** *Clinical Effort Against Secondhand Smoke Exposure* **Impact:** 1. **42.5%** of patients received at least one form of tobacco control assistance during initial visit (vs 3.5% in control) 2. **Increase** in likelihood to quit smoking
Diagnosis/ Treatment	***Clinical decision support tool***	1. Tool integrated in EHR to access individual and aggregate patient information and treatment 2. Insights into gaps for patients 3. Monthly reports escalated to medical teams on their treatment for patients	***Miramont:*** *Improving Tobacco Screening and Cessation Usage rates* **Impact:** 1. **10 percentage point** increase in tobacco screening rates 2. **7 percentage point** increase in cessation support rates
	Smoking cessation healthcare coverage	1. Introduction of coverage in insurance plans for smoking cessation services 2. Services include counseling and provision of cessation medicines e.g. nicotine patches	***Medicaid:*** *Tobacco cessation benefit* **Impact:** 1. **37%** of smokers, who were enrolled in Medicaid program, used the service 2. **10 percentage point** decrease in smoking rate among Medicaid enrollees 3. **$2.12 ROI** for provision of services, due to aversion of acute cardiovascular events
	Opt-out smoking cessation referrals	1. For free smoking cessation support, patients have to opt-out from services	***Stop Smoking Services:*** *Opt-out referrals* **Impact:** 1. **64** more participants set a 'quit date' (vs before intervention) 2. **100% increase** in participants who reported abstinence (vs before intervention)

APPENDIX VII - EXAMPLE METHODOLOGY FOR PRIORITIZING INTERVENTIONS

There are a broad range of prioritization approaches which can be applied in healthcare settings for intervention selection[44]. Outlined here is the Expected Impact and Ease of Implementation method, which can be considered as important 'evaluation factors' when prioritizing interventions. Criteria under evaluation factor should be determined, in line with the organization's goals and objectives for the intervention. Each selected criteria should be given a score, determined through qualitative (e.g. workshops, expert input) and quantitative (e.g. data analysis and modeling) analysis. The scores can range from 1 (Low) to 5 (High), reflecting the perceived effectiveness and feasibility of each intervention. After individual scoring the criteria, the final score for each intervention will be obtained by summing the scores of each criteria within Expected Impact and Ease of Implementation.

The interventions can then be mapped onto a 2x2 matrix, with the x-axis representing Ease of Implementation and the y-axis representing Expected Impact, with the matrix being divided into four quadrants (as seen in the matrix below).



- **Quick wins** ***(top right quadrant)***:

These interventions offer substantial impact and are readily implementable.

- **Medium-term interventions** ***(top left and low right quadrants)***:

The top left quadrant involves impactful interventions that may require more planning, while the low right quadrant includes feasible interventions with moderate impact.

- **Long-term interventions** ***(low left quadrant)***:

These interventions require significant resources and face implementation challenges. Depending on the scope and ambition of the PHM program, these interventions may be deprioritized.

Following the scoring and mapping process, the identified interventions will be strategically placed on a roadmap aligned with the time-horizon of the organization's PHM program. The roadmap will prioritize interventions based on their placement within the matrix, ensuring a phased implementation approach: quick wins interventions will be prioritized for immediate implementation, while medium-term and long-term interventions will be implemented in later phases.

It's important to note that the emerging roadmap will be dynamic, and certain interventions, particularly medium-term and long-term ones, may be planned or initiated in parallel. This adaptive approach ensures that the organization can maximize impact, address varying timelines, and continually refine its PHM strategy based on evolving insights and experiences.

44 Change Factory. Strategic Prioritisation – Ease of Doing/Impact Matrix. No Date

APPENDIX VIII - PHM CHECKLIST

This section outlines the required actions for payers and providers to implement PHM, for each of the steps of the PHM Cycle. These actions are not accreditation standards, and do not replace existing accreditation issued by CHI, which are outlined in ***CHI Providers' Accreditation and Classification Program*** and ***CHI's Payer's Qualification and Classification Program.***

Additional resources include CHI's ***Essential Benefits Package (EBP),*** ***Insurance Drug Formulary (IDF)*** and ***Clinical Guidelines*****.**

PHM Cycle Stage	Organization	Required Actions
Define and Understand the Population	**Providers and Payers**	Identify local health needs and priorities amongst beneficiary populations - this can be done through consideration of the organization's priorities, as well as the segmentation outputs.
		Use the population segmentation outputs conducted by CHI to inform health care planning and inform design and implementation of PHM interventions.
	Payers	Apply risk stratification and further analysis to the population segmentation outputs as required. Payers are encouraged to collaborate with providers to select a shared risk stratification methodology of their choice to support PHM intervention design and intervention.

PHM Cycle Stage	Organization	Required Actions
Design & Prioritize Interventions	**Providers** *(supported by payers)*	Use further analysis to explore some of the causes of health risks associated with the outputs of the target population identified through the population segmentation (and risk stratification if applied).
		Based on the target population, map on the continuum of care where the interventions should be focused. This will inform the type of intervention that should be considered.
		Aligned to the target population, identify a list of viable interventions, ideally supported by a clear evidence-base outlining the impact of similar interventions.
		For the list of viable interventions, apply a prioritization method to select the intervention(s) that should be launched based on the expected benefits of implementation. Prioritization is recommended to consider expected impact and ease of implementation, but may incorporate other criteria that the organization deems important.

PHM Cycle Stage	Organization	Required Actions
Implement Interventions	**Providers and Payers**	Identify and assign key PHM responsibilities to individuals in the organization (e.g. PHM 'Champion', Population Health Care Manager, PHM support team).
		Establish well-defined governance (both program and clinical) structures to provide leadership and oversight to the organization's PHM program.
	Providers *(supported by payers)*	Set up dedicated governance (program and clinical) and leadership for PHM interventions/workstreams.
		Determine the resources required to launch and sustain the PHM intervention (including funding, data/infrastructure, care resources and workforce).
		Identify and plan to bring in the right experience, skills and roles required to deliver the intervention.
		Coordinate with other relevant partners and healthcare organizations to support the delivery of the intervention.
		Engage clinical staff and managers throughout the planning and delivery of the intervention.

PHM Cycle Stage	Organization	Required Actions
Measure and Evaluate Interventions	**Providers** *(supported by payers)*	Before launching the intervention, plan an evaluation process, including the time and resources required to conduct the evaluation.
		Define appropriate indicators to monitor throughout the intervention.
		Set the quantified baseline for the defined indicators, to establish a starting point to compare to through the monitoring and evaluation process.
		Set incremental targets to measure progress against for each of the defined indicators.
		Define the process to collect the required data to monitor indicators through the duration of interventions.
		After defined periods, assess collected data and measure progress against the incremental targets.
		Identify areas of success of the intervention and areas for improvement, in line with progress against targets and qualitative insights.
		Amend intervention delivery to address areas for improvement.

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- Tawuniya

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