

**PMCOE
in a
Box**



PMCOE in a Box
Table of Contents

Overview 3

Structure and Governance 5

Value Framework 7

Scientific Framework 10

Data Collection and Analysis 12

Precision Medicine Product Review Cycle Attached

Questionnaire 1: Vision for Clinical Care Improvement Attached

Questionnaire 2: Delivery Application Attached

Questionnaire 3: Scientific Framework Attached

PMCOE in a Box

Overview

PMCOE in a Box provides a framework to establish multidisciplinary Centers of Excellence which mesh clinical care and discovery, using the transformative measurement and analytical tools to facilitate recognition of biologically relevant subgroups, and ensure that each patient is provided with optimal clinical care based upon current scientific understanding. This patient and disease focused framework will catalyze the assembly of a system that enables the continuous learning from each patient's monitored experience, and optimizes both their care and the care of patients who follow.

PMCOEs will:

1. provide outstanding, multidisciplinary clinical care to patients with specific diseases/diagnoses
2. identify more homogeneous subsets of patients – based on phenotype and trajectory - for whom diagnosis, prediction and therapy can be optimized
3. construct and continuously refine a scientific framework of the pathobiology that guides optimal clinical care and pathway discovery in specific diseases
4. identify novel measures and analyses that improve subgroup definition and application
5. utilize a series of universal systems that enable prospective data and sample collection from patient cohorts
6. continuously learn from the accumulated evidence about how to better manage the current patient and future patients, identifying and realizing opportunities to increase the value of their clinical care

Components of the box

Structure and Governance

This section will provide the guidance and framework that describes and establishes the parameters for the overall vision and operations of the center. This includes responsibility for coordinating the patient centered experience, operational issues including overseeing budget and personnel, stewardship of philanthropic funds, and organization of research.

Value Framework

This section will help PMCOEs capture the value of precision medicine. It is critical all paths to capture precision medicine value are pursued in order to continue providing state of the art care in the changing medical financial landscape. The guidance and framework described in this section will help to deliver greater value within and outside the Johns Hopkins system with several examples.

Scientific Framework

This section will provide the framework to guide the PMCOEs in the description, construction and refinement of iterative pathobiologic models to help define patient subsets, define disease trajectory, and analyze data to enable discovery.

Data Collection and Analysis

This section will provide the framework to guide the PMCOEs in adopting processes to allow systematic longitudinal collection of data and the creation of precision medicine applications. The tools, guidelines, and procedures covers the following topics: collaborative environment guideline, universal consent, Cohort in a Box, databases, biorepository storage and retrieval, and data analysis.

PMCOE in a Box

Structure and Governance

Formation

A PMCOE must be approved by all Department or Institute Director stakeholders. These Directors will choose a representative to the PMCOE Board of Directors. It is expected that the Directors (or a representative of the PMCOE) will meet monthly to coordinate efforts among PMCOEs and to create opportunities for collaboration.

PMCOE Roles and Operations

The PMCOE team will consist of internal PMCOE resources as well as inHealth shared resources assigned to assist the PMCOEs during the Start-Up Phase. inHealth Resources will be assigned to multiple PMCOEs and a percentage of their time will be dedicated to your PMCOE, as indicated in the roles below. It is expected that between 6 and 18 months from initial formation, the PMCOE will transfer into an Established phase. Once in the Established Phase, the inHealth resources roles will be reduced as they focus on other PMCOEs in the Start-Up phase. The skills and tasks associated with the inHealth resources will need to be transferred to internal PMCOE team members to ensure a smooth transition into an established and successful PMCOE.

Director

Reports to the Vice Dean of Research and is responsible for:

- the overall vision and operations of the center
- meeting metrics and goals
- coordinates the patient centered experience
- oversees budget and personnel of the center
- identifying and initiating collaboration opportunities with other PMCOEs and Johns Hopkins entities to include but not limited to: Johns Hopkins HealthCare, Johns Hopkins University, and Johns Hopkins Applied Physics Laboratory

Faculty/Scientific Lead

Responsible for:

- scientific direction of center with respect to identifying new clinically significant subgroups of patients
- coordinating multidisciplinary translational research.
- biospecimen and database infrastructure

Data Manager

Responsible for:

- data collection and storage for the center
- identifying data process improvement priorities
- identifying data projection needs
- identifying data quality issues and solutions

Data Science – *inHealth Resource*

Startup Phase: 10 - 25%

Established Phase: 0 - 5%

Responsible for:

- working with the Faculty/Scientific lead to develop impactful data insights to improve patient health outcomes
- creation of precision medicine analysis and prototype tools using the PMAP platform

Health Economics – *inHealth Resource*

Startup Phase: 10 - 25%

Established Phase: 0 - 5%

Responsible for:

- identifying potential targets for capturing value outside the institution
- measure and report on PMCOE interventions/tools/opportunities' value outside the institution

Health System Business Analysis – *inHealth Resource*

Startup Phase: 10 - 25%

Established Phase: 0 - 5%

Responsible for:

- financial and value metric measurement
- budget development and reporting
- identifying potential targets for capturing value throughout Johns Hopkins Health System
- measure and report on PMCOE interventions/tools/opportunities' value within the institution

Project Management – *inHealth Resource*

Startup Phase: 10 - 25%

Established Phase: 0 - 5%

Responsible for:

- tracking PMCOE tasks and major milestone completion
- coordinating PMCOE meetings and distributing agendas, minutes, and slides
- creating project timelines and holding PMCOE members accountable to deadlines

The PMCOE members should meet regularly (at least monthly) to ensure tangible progress of the PMCOE. During the first 6 months of the PMCOE, more frequent meetings may be necessary to ensure a smooth and timely initiation of the center and in order to engage appropriate expert assistance outside of the PMCOE. To help ensure initialization meetings are productive and respectful to everyone's time, questionnaires related to PMCOE goals and data needs will need to be completed prior to the launch of the PMCOE. The precision medicine portal provides contact information to aid PMCOEs as they encounter challenges during initialization.

PMCOE in a Box *Value Framework*

Formation

Johns Hopkins is in a unique position to capture the value of precision medicine in a variety of ways. This Value Framework will help guide PMCOEs to look at other avenues for capturing value, some of which may not have been strived for in the past. All of these opportunities are important, even though some may not return direct financial value to the PMCOE. It is critical all paths to capture precision medicine value are pursued in order to continue providing state of the art care in the changing medical financial landscape.

Opportunities for Capturing Precision Medicine Value

Reputation

Precision Medicine is the new frontier for science and medical research. By rapidly pursuing opportunities to spread the science beyond the walls of Johns Hopkins, we are able to ensure Johns Hopkins remains the leader in science and discovery. Opportunities for PMCOEs to capture reputational value include: increasing publications and journals, speaking opportunities, and shaping local, state, and federal policies.

Grants/Philanthropy

Johns Hopkins PMCOEs are disease focused, creating targetable opportunities for disease centered philanthropic organizations and research grants. Philanthropic opportunities should be enthusiastically pursued and coordinated with inHealth leadership. These external funding sources help support the Johns Hopkins mission, and precision medicine has been a prime candidate for contributions due to its focused approach to improving outcomes.

Research Costs and Barriers

By improving the process of collecting patient information and linking it through the PMAP platform, opportunities for technology driven insights can present themselves. This digital, connected-data approach can improve the efficiency of research teams, requiring less manual manipulation of data and enabling research teams to build on each other's code bases, which accelerates the pace of data delivery and scientific discovery.

Efficiency of Care/Reimbursement

Precision medicine relies on improving the process of subgrouping patients and tailoring treatment options around these subgroups. This precision medicine approach can help PMCOEs improve patient outcomes while eliminating ineffective treatments. Maryland's Care Redesign Program, as well as other programs nationally, create opportunities for the health system to capture additional value for treatments that improve outcomes at lower costs. These opportunities help to improve the standard of care beyond the Johns Hopkins clinic setting and positively impact more patients.

Health System and Payers

From the payer perspective, precision medicine offers a more efficient approach to healthcare. Avoiding an ineffective treatment in poor responders would save the cost of treatment and the costs of treatment related adverse effects. Also, it could help poor responders to move more quickly to better alternative treatments and spend less time in a treatment facility. Johns Hopkins, through Johns Hopkins HealthCare (JHHC), stands to benefit from precision medicine as a payer. Opportunities to partner with JHHC to implement precision medicine medical policies and interventions can amplify the value of precision medicine for Johns Hopkins.

Value to Industry

Precision medicine tools developed by PMCOEs could be of interest to pharmaceutical companies, contract research organizations (CROs), and the technology industry. For example, if certain patient characteristics can be measured and predict patient response to a specific drug, the precision medicine algorithm can be marketed as a partner diagnostic test for that drug. Opportunities to market precision medicine tools to the private industry for licensing should be researched and pursued with inHealth leadership collaboration.

Delivery Application

Our most successful PMCOEs have a vision for packaging their intervention to be applied at other health systems or payers. One avenue for realizing this vision is by creating a delivery application software product that can be sold or licensed. One example of a delivery application developed through a PMCOE is the prostate cancer active surveillance tool. Patients can receive personalized prostate cancer risk assessments based on subsets of patients that match their profile. Patients are also able to choose their recommended treatment based on knowledge of their personalized risk and their risk of side effects from treatments. Delivery applications such as the prostate cancer active surveillance tool have the ability to amplify the positive effects of precision medicine by reaching patients that otherwise may not be able to be seen at a PMCOE. They also create a new opportunity to capture value for the health system and ensure we are able to transform the science of medicine in the future. As PMCOEs look to develop their own delivery application, Dwight Raum (contact information below) can help guide them to the appropriate resources throughout Johns Hopkins.

Value Delivery Resources

Dr. Scott Zeger – Bloomberg School of Public Health (SPH)

Email: sz@jhu.edu

The Bloomberg School of Public Health has health economics faculty conducting research on a wide variety of topics, including the impact of health care, health insurance, and preventative services on health lifestyles, as well as providing guidance on the most efficient, cost-effective, and equitable courses of action in a health care setting. Dr. Zeger can help PMCOEs engage the Bloomberg School of Public Health and establish partnerships with health economics collaborators.

Dr. Mary Cooke – Johns Hopkins HealthCare (JHHC) LLC

Email: mcooke@jhhc.com

Jointly owned by the Johns Hopkins Health System and the Johns Hopkins University School of Medicine, JHHC LLC develops and manages medical care contracts with organizations, government programs, and health care providers for more than 500,000 plan members. A dedicated advocate for our client-employers, patient-members and physician-providers, JHHC believes that collaboration between the three creates optimal results for patients and healthy financial outcomes for our providers and employers. Johns Hopkins HealthCare serves four lines of business: Johns Hopkins Employer Health Programs (EHP), Priority Partners, Johns Hopkins US Family Health Plan, and Johns Hopkins Advantage MD. PMCOE collaboration with JHHC will build on and enrich JHHC's population health expertise and create an envisioned learning ecosystem whereby the unique circumstances and treatment effects of individual population subgroups will inform and differentially impact their clinical care and health outcomes. Dr. Cooke can facilitate the implementation of science-based, precision medicine interventions aimed at improving the health of enrolled JHHC populations.

Dr. Jodi Segal – Center for Drug Safety and Effectiveness

The Center for Drug Safety and Effectiveness serves as a nexus for individuals at Johns Hopkins who are involved in research, education, clinical programs, and public service to improve prescription drug use and pharmaceutical policy in the United States and around the world. The knowledge base of the Center's core faculty reflects a diversity of fields, ranging from pharmacovigilance to regulatory policy. Dr. Segal brings additional value based healthcare insight to the inHealth team and is an excellent resource for PMCOE's as they work towards capturing the value of precision medicine.

Dwight Raum – Technology Innovation Center (TIC)

Email: draum@jhmi.edu

The Technology Innovation Center (TIC) is a professional design and software engineering team that builds and deploys innovative clinical information systems across Johns Hopkins Medicine. This multidisciplinary team is a hub for clinicians to create novel, technology-based solutions that span our medical specialties and practice settings. Mr. Raum leads development of clinical care applications built on the Precision Medicine Analytics Platform (PMAP) and can facilitate PMCOE collaboration with TIC. Mr. Raum should be consulted when a PMCOE is working to develop a delivery application.

PMCOE in a Box ***Scientific Framework***

Formation

The PMCOEs represent a new vehicle for scientific partnership and discovery for the Johns Hopkins Community. PMCOEs require a plan to create transdisciplinary partnerships to enable the description, construction, and refinement of iterative pathobiologic models to help define patient subsets, define disease trajectory, and analyze data to enable discovery.

Goals

The research aims should strive to:

- Construct and continuously refine a scientific framework of the pathobiology that guides optimal clinical care
- Identify more homogeneous subsets of patients for whom clinical care can be optimized
- Quantitatively model patient disease state, trajectory, and treatment benefits using the best available measurements
- Identify novel measures that improve our capacity to monitor/predict patients' health state, trajectory, and likely treatment benefits
- Design and implement JHHS-based validation studies
- Continuously learn from the accumulated evidence about how to better treat the current patient and future patients
- Align JHHS clinical delivery and financing system with accumulated evidence
- Disseminate evidence
- Achieve national/global recognition as the leader in science-based, individualized medical care and health optimization.

Science and Discovery Collaborators

Dr. Scott Zeger – Bloomberg School of Public Health (SPH)

Email: sz@jhu.edu

The Bloomberg School of Public Health has health economics, population-centric Health IT, and data science faculty working to advance the science and performance of health care facilities.

Dr. Zeger can help to partner PMCOEs with these SPH resources and provide insight into the PMCOE's data analysis plan.

Dr. Victor Velculescu – Genomics and Molecular Measurement

Email: velculescu@jhmi.edu

There are several genomics and molecular measurement projects being executed at Johns Hopkins. The AACR Project Genie aims to catalyze precision medicine oncology through genomic and clinical data sharing across multiple U.S. and international cancer centers. The Johns Hopkins Molecular Pathology Lab is working to improve the breadth of testing available and accelerating the process to utilize services. As part of the All of Us Program, Johns Hopkins will be genotyping samples which could help bring down the cost for PMCOE genotyping needs. Dr. Velculescu can help to link PMCOEs with available Genomics and Molecular Measurement resources.

Dr. Peter Searson – Whiting School of Engineering

Email: searson@jhu.edu

As the leader of the Hopkins inHealth Measurement Corps, Dr. Searson works to discover, test, and implement new ways to measure human health to improve patient care. Precise measurement opens up the opportunity for precision medicine interventions. PMCOEs should work with his team and the Whiting School of Engineering to implement novel measurement techniques, which enables new pathways to discovery and clinical delivery.

Dr. Gregory Kirk – Johns Hopkins Department of Medicine

Email: gdk@jhu.edu

Clinical Cohorts are defined as well-phenotyped patients followed over time with informative clinical, patient-reported, and laboratory data linked to appropriate biospecimens. Dr. Kirk has done extensive work to document the pathway for PMCOEs to establish successful clinical cohorts. An up to date version of the Cohort-in-a-Box guide can be found on the PMAP Portal.

Diana Gumas – Institute for Clinical and Translational Research (ICTR)

Dr. Christopher Chute – ICTR

Email: dgumas1@jhmi.edu

Email: chute@jhu.edu

The ICTR addresses obstacles in translating basic science discoveries into research in humans, translating clinical discoveries into the community, and communicating experience from clinical practice back to researchers. Diana Gumas can help guide PMCOEs through the data collection/PMAP integration steps and help to navigate the Data Trust/IRB process. Dr. Chute can provide PMCOEs with feedback regarding the data normalization process.

PMCOE in a Box

Data Collection and Analysis

Formation

Key to the success of the PMCOE vision and mission is the systematic longitudinal collection of data. Several tools, guidelines, and procedures were developed to aid PMCOE's data collection and analysis. While all these tools may not be necessary for the PMCOE to be effective, adoption of these tools, guidelines, and procedures can help to streamline your formation of a PMCOE and help to accelerate precision medicine applications.

Tools, Guidelines, and Procedures

Collaborative Environment Guideline

As part of the institutional vision and commitment to precision medicine, that PMCOEs will make their samples visible to collaborators and be willing to encourage and enter into collaborations.

Universal Consent

It is the goal of the PMCOEs to partner with patients for life throughout the trajectory of their disease. It is anticipated that patients will contribute biospecimens and disease related data at multiple time points. This requires a universal consent that allows collection across repeated times. Example IRB approved protocols and consents can be found on the PMAP Portal.

Cohort in a Box

PMCOEs are dependent on clinical cohorts (well-phenotyped patients followed over time with informative clinical, patient-reported, laboratory and imaging data linked to appropriate biospecimens). Up-front attention and guidance to the rationale, design, and practical aspects of cohort development will improve efficiency, quality, and scientific rigor while adhering to HIPAA requirements and establishing best practices in data collection and management. Cohort in a Box provides detailed guidelines for forming clinical cohorts and can be found on the PMAP Portal.

Databases

Linked databases for data curation are required for developing PMAP backed applications. Data elements should be defined prospectively prior to the PMCOE starting. Common databases and sources used for research data collection include: Redcap, surveys, legacy databases (MS Access, etc.). Common databases and sources used for clinical data collection include: Epic (smart forms, smart phrases), patient reported outcomes (surveys, MyChart, etc.).

Biorepository Storage and Retrieval

JHU currently operates two biorepositories for sample storage and retrieval. One is the GRCF Biorepository and Cell Center (on-site), operated as part of JHGenomics. The second is JHBR (operated by the JHBSPH, located off-site). Each Biorepository has slightly different capabilities and charges. These capabilities and a summary of charges are provided on the PMAP Portal. PMCOEs may utilize already established biorepositories (e.g., a Departmental Collection), provided they meet quality standards.

Data Analysis

The Precision Medicine Analytics Platform (PMAP) is a Johns Hopkins initiative to accelerate biomedical research by combining EMR, medical imaging, physiological monitoring, and genomics onto a cloud-based big data platform. By combining all of these data sources into a connected system, meaningful data insights can be discovered, leading to improved clinical care and precision medicine applications. Additional information regarding the PMAP platform, including in depth descriptions of PMAP tools and other data analysis resources available to PMCOEs, can be found on the PMAP Portal.