

The Advancement Toward Personalized and Evidence-Based Medicine

This article is the first in a four-part Health Capital Topics series focusing on the various public health problems associated with population health.¹ This series describes the vital role population health plays in the healthcare industry and will highlight four emerging trends in population health. Both population health and clinical medicine are necessary partners in preserving an efficient and effective healthcare system, by integrating preventative measures into disease control and management.

Population health is defined as “the health outcomes of a group of individuals, including the distribution of such outcomes within the group.”² Population health assesses the needs of a population rather than an individual.³ There are different health determinants and factors that can contribute to an individual’s health-related quality of life, including: access to healthcare; individual behavior; social environment; physical environment; and genetics.⁴ There are further sub-disparities within each health outcome such as race/ethnicity, socioeconomic status, geography, and gender. Over the past few decades, the definition of population health has been defined and refined by different researchers. Despite the various differences, each concept represents the importance of sustaining an epidemiological approach to managing the health of a population. *The Institute for Healthcare Improvement* created a “*Population Health Composite Model*,”⁵ which sets forth different components of health perspectives that characterizes an individual’s health status.

Generally, healthcare organizations, public health departments, social services entities, school systems, and employers each play a role in the improvement of the health of a population. Yet, the interaction between all these actors brings forth the differences between their ideas of population health. Population health may be viewed as a modern version of public health because it “is less directly tied to governmental health departments and explicitly includes the healthcare delivery system.”⁶ Population health has the ability to utilize emerging methods such as *personalized medicine* (PM).

According to the *United States National Library of Medicine*, PM is defined as “an emerging practice of medicine that uses an individual’s genetic profile to

*guide decisions made in regard to the prevention, diagnosis, and treatment of disease. Knowledge of a patient’s genetic profile can help doctors select the proper medication or therapy and administer it using the proper dose or regimen.”*⁷ PM, also referred to as *individualized medicine*, recognizes that individual patients may react differently to certain types of medications and treatments given for the same problem. This strategy seeks to adjust therapies based on the patient’s specific DNA profile and individual characteristics to effectively and efficiently target and treat diseases.⁸ Individual patient characteristics may include a patient’s family history, past history of medications, habitual activities in which the patient may partake. PM includes optimizing medicine and treatments through an individual’s genetic makeup rather than our current “*trial-and-error*” system.⁹ This new method could reduce healthcare costs in the long term.¹⁰

PM has been suggested as the “*future of health care*” and has been categorized as “*well-suited for the treatment of cancer.*”¹¹ It provides the opportunity for physicians to make more informed medical decisions, and there is also a higher probability of obtaining the desired outcome through more target-specific strategies.¹² The association between PM and population health is linked by the identification of high risk individuals. From a population health perspective, there is a way to accelerate the implementation of more evidence-based measures, specifically around genome applications, in order to identify more individuals who are at risk and could potentially benefit from the this preventative method.¹³

Evidence-based medicine (EBM) is the most common form of medical practice today. EBM is “*the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient.*”¹⁴ EBM incorporates clinical evidence from a variety of systematic research and integrates that with the provider’s expertise to define a treatment best suited for the individual.¹⁵ Researchers gather strong and test-proven evidence for consideration for EBM through a variety of methods, including meta-analysis of randomized controlled trials, controlled study without randomization, quasi-experimental study,

expert committee reports, professional opinions, and clinical experience.¹⁶

To better optimize healthcare delivery, certain physicians believe that doctors should utilize a combination of PM and EBM. According to Jeffrey Goldberger, MD, professor at Northwestern University's Feinberg School of Medicine, "*physicians should not value one theory over the other.*"¹⁷ When EBM fails, physicians should incorporate PM to treat those patients which were not helped using the precise evidence-based guidelines.¹⁸ If physicians were to combine both theories, the delivery of treatments might be more precise to specific patient populations.¹⁹ Healthcare would be optimized in every avenue; characteristics such as accelerated treatment, risk prediction, time reduction of bringing drugs to the market, and more specific-drug treatment will be possessed.²⁰ This capability could further advance healthcare delivery and could ultimately the public as a whole by avoiding adverse drug reactions.²¹

The physician's ability to seamlessly incorporate PM is limited. Our healthcare system is engulfed in a realm of "*standardized care*" which can stifle tailoring medicine to an individual. Currently, physicians are not utilizing individually tailored medicine because they are still investing in "*standard protocols.*"²² Ira Byock, MD, a palliative care physician and professor at the Geisel School of Medicine at Dartmouth University, stated that certain care protocols must have the capacity to be adjusted in order to reflect the preferences of the patient.²³ For example, within the realm of cancer the disease has become institutionalized among physicians as a "*personal disease.*"²⁴ In other words, the best care for one patient may not be the same for another. The ability to utilize evidence-based treatment algorithms for each specific type and stage of cancer has been an invaluable characteristic throughout the progression of cancer; however, there requires some quality of individualistic treatment and care plans to reflect the preferences and needs of the individual.²⁵

Currently, PM and EBM are viewed as conflicting ideas, due to limited economic resources, increased health expenses, and technological developments. However, proponents of utilizing PM to improve population health stress that both approaches should be balanced:

*"The more we believe that [personalized medicine] is needed for one drug, the more this means that drug response is not homogenous and that an unmodified [evidence based medicine] approach will not be helpful. If we decide that [evidence based medicine] is the way to go and drug response is homogenous and well represented by the mean, we are simply ignoring the patients who need personalized prescription."*²⁶

Physicians also hold certain perceptions regarding the elements of and barriers to PM. In a 2013 study, researchers examined physicians' perceptions of potential barriers to PM in correlation to their perception about access to PM across subpopulations.²⁷ The physicians stated that the most valuable elements of PM were the aggregation of a patient's full family history; having access to full drug interaction alerts within the medical records; and, utilizing a patient's biomarker measurements to guide therapy.²⁸ These same physicians reported that the most difficult barrier to overcome in implementing PM was the cost of gene based therapies.²⁹ Additionally, 88.2% of the physicians believed that PM was mostly available for White or European Americans, while only 67.6% of physicians believed that PM had some accessibility to Blacks or African Americans.³⁰ The study concluded that PM considered by providers to be beneficial; however, race and economic stability were still present barriers and limitations.

Researchers are cautiously advising their colleagues about the danger of making faulty assumptions about genetic testing in the realms of disparities. Some believe that there can be an end to disparities with the use of genetic testing, but there are still other complex factors that are considered (e.g., lifestyle habits, socioeconomic status, and race). As noted in a 2010 article in *Oncology Times*: "*Sometimes disparities get worse when new technology comes along, but if genomics is applied equally, things should get better.*"³¹

PM is an emerging practice and is continuously being experimented with and perfected. With the success of PM, healthcare delivery will take a new form and the population health will benefit; drug adversity will decrease; preventative measures will increase; and, "*doctors and genetic counselors will be able to craft a lifelong health maintenance strategy tailored to a person's unique genetic constitution.*"³² The forthcoming articles in this four-part population health series will discuss technology for patient outreach and will conclude with a two-part sub-series on mental health.

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