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Precision Lifestyle Medicine:

A New Frontier in the Science of Behavior Change and Population Health

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Despite marked strides in population health and increased life expectancy in the U.S. over the past two decades, chronic disease and disability dominate the U.S. health burden,¹ leading to poor quality of life, high healthcare use and costs, functional impairment, psychological distress, and premature death. An estimated one in seven U.S. adults has at least two of five major chronic conditions: cardiovascular disease, cancer, chronic obstructive pulmonary disease, diabetes, and arthritis.² These chronic conditions are highly related to unhealthy lifestyle factors, particularly smoking, physical inactivity, poor diet quality, and worsening or stagnant rates of obesity. The continuing erosion of these lifestyle factors³ foretells increasing incidence, prevalence, and co-occurrence of lifestyle-related chronic conditions. Together with a rapidly aging and diversifying population, chronic conditions place a heavy burden upon individuals, families, society, and healthcare systems.

The landscape of health care is changing with new delivery and payment models emerging at a pace never seen before, opening opportunities to promote precision lifestyle medicine, defined as tailored, preventive, and personalized behavior change. The Affordable Care Act has promoted new models of care and reimbursement (e.g., Chronic Care Management, Patient-Centered Medical Homes, and Accountable Care Organizations). These fundamental shifts aim to achieve the Institute for Healthcare Improvement Triple Aim of improving population health, improving the patient experience of care, and reducing per capita cost.⁴ The drive to minimize the gap between lifespan and health span by focusing on well-being and prevention is integral to the new accountable care paradigm and critical to achieving the Triple Aim. Precision lifestyle medicine is fundamental to the success of these efforts to prevent and control costly chronic conditions, improve the health of populations, and eliminate health disparities.

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The precision medicine movement, propelled by a recent presidential initiative and an NIH-sponsored national research cohort, heralds targeted and proactive treatments for precisely characterized disease phenotypes and endotypes to achieve optimal health for individual patients, made possible, in part, by advances in translational clinical research and biomedical technologies. Khoury and Evans⁵ proposed the term “precision prevention,” which highlights opportunities to reap the benefits of precision medicine—increased effectiveness and efficiency—before the onset of disease and for secondary and tertiary prevention. Because lifestyle behaviors are responsible for the greatest proportion of death and disability in the U.S. and worldwide,⁶ it is imperative to transform traditional lifestyle intervention approaches.

Challenges to contemporary lifestyle interventions are related to a lack of precision in three domains: (1) successfully developing and implementing lifestyle interventions in diverse settings; (2) efficiently identifying individuals who will maximally benefit from intervention within those settings; and (3) effectively engaging and retaining the diversity of patient experience. Availability of resources, existing expertise, and policies that support lifestyle interventions are a few of the factors that vary in communities, healthcare systems, and other settings. Additionally, one size does not fit all for individuals when it comes to lifestyle interventions. Diversity according to biology, behavior, and environment all influence how individuals engage in lifestyle interventions. These challenges have been exemplified through research and practice aimed at translating the landmark Diabetes Prevention Program trial lifestyle intervention for use in diverse settings, patient populations, and patient subgroups.

Precision lifestyle medicine offers a blueprint for the next generation of lifestyle interventions that will be adaptive to variations in individual biology, lifecourse, behavior, and environment at baseline and over time. In the example provided by Khoury and Evans,⁵ a precision medicine approach results in a referral to a diabetes prevention program for a woman aged 50 years based on her specific genetic and clinical risk factors. Extending this example, a precision lifestyle medicine approach would offer this woman a diabetes prevention program specifically tailored to her baseline characteristics (e.g., socioecologic and psycho-behavioral) as well as adaptations based on her progress toward intervention targets over time (e.g., weight and physical activity trajectories). Tailoring to baseline characteristics will require aggregation and analysis of large amounts of individual data, the big data approach,⁷ to produce generalizable knowledge about effectiveness of various lifestyle interventions in diverse populations and settings to predict individual response. Adaptations based on progress over time will require extensive monitoring data of an individual, the small data approach, to predict an individual’s progress and inform shared decision making about intervention choices by clinician and patient. New technologies have made it a reality to collect real-life individual data, including digital traces of purchases and entertainment; passive tracking data on physical activity and location; and active tracking data on mood, anxiety, affect, and behaviors, so-called quantified self. Additionally, next-generation sequencing technology has drastically accelerated the discovery of genetic variations associated with specific diseases. This genetic information can help identify patients who are highly susceptible to disease development and help select those who are more likely to respond to the interventions. New analytics have also emerged that can

translate these data into actionable information in order to design and implement patient-centered, context-relevant, and in-the-moment lifestyle intervention strategies. Additionally, increasing permeability between clinical research and practice within a “learning healthcare system”⁸ will afford tremendous opportunities to enhance systematic data collection on the comparative effectiveness of lifestyle interventions delivered in real-life settings to improve the relevance and generalizability of lifestyle research findings. Analysis and integration of these precision health variables raise critical issues regarding privacy and confidentiality that will be important to consider.

Additionally, challenges will include ensuring that precision lifestyle approaches are based on representative samples of individuals as opposed to selected patient populations.

To realize maximum population health benefit, precision lifestyle medicine must be scalable and sustainable. Rapid advances and adoption of technologies such as electronic health records, mobile health applications, and wearable devices and sensors can facilitate strategies to identify and reach patients, individualize strategies, monitor progress, and titrate dose. These technologies will significantly facilitate widespread scalability and sustainability. Additionally, improved understanding of the science of behavior change, especially research supported by the NIH Common Fund initiative focused on this area, will significantly contribute to the potential for scalability and sustainability. Because effective lifestyle interventions are commonly multicomponent, with some addressing multiple behaviors in a single program, and efficacy and effectiveness trials are rarely powered to assess effect modifiers or mediators, there is a dearth of evidence to understand which component is effective for which patient subgroup or through what mechanism. This is to be changed under the NIH Science of Behavior Change Program, whose goal is “to implement a mechanisms-focused, experimental medicine approach to behavior change research and to develop the tools required to implement such an approach.” The experimental medicine approach to behavior change research will fuel the promise of precision lifestyle medicine to provide targeted, predictive, and personalized care for health maintenance and disease prevention, and to do so in ways that are scalable and sustainable on a population level.

In sum, precision lifestyle medicine represents a departure from traditional lifestyle intervention models and calls for innovative tools and transformative mechanism-driven strategies to support this new paradigm. Traditional public health prevention efforts that entail population-wide policy and environmental interventions should continue to form an important part of a comprehensive approach. Complementing these approaches, precision lifestyle medicine supports the diversity of individuals in the adoption and maintenance of healthy lifestyles. The precision medicine movement is poised to radically leverage medicine’s inherently personalized approach to promoting optimal health for individual patients. Likewise, precision lifestyle medicine holds enormous potential to contribute to existing public health prevention efforts to successfully and efficiently promote population health, control healthcare costs, and eliminate health disparities. As a specialty in precision medicine, precision lifestyle medicine has the potential to disrupt traditional healthcare paradigms to address the current burden of chronic disease and transform population health for the 21st century.

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