

COMMENTARY

Charting the Course to Success in the Era of Personalized Nutrition

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Abstract

Background: The personalized nutrition industry is quickly gaining scale, momentum, and consumer visibility. Health care practitioners must ready themselves to evaluate and utilize new products, services, and technologies, that will be required in order to responsibly enable their patients to benefit from this new era of precision medicine. This paper seeks to accomplish two objectives: (1) establish a perspective on the application of personalized nutrition in clinical practice in light of the current state of the industry ecosystem and the underlying science; and (2) propose a specific course of action for practitioners seeking to develop and deliver personalized nutrition services to patients.

Problem: Consumer and industry enthusiasm have created climate in which the promotion of personalized nutrition often overreaches the current state of the science. While the transition to the personalization of nutrition prescriptions is underway and inevitable, a

great deal of time and discovery still stand in the way of true, “n of 1” personalization. Consumers, and even practitioners, need to protect themselves from the exuberance of nutrition entrepreneurs and learn to capitalize on the *present* state of the science and technology.

Conclusions: With the sights of the market locked on a destination of true personalization, many practitioners are failing to recognize the significance of the level of precision they can achieve today. Using readily available testing and assessment methods, practitioners can group patients with a common diagnosis or risk factor into clusters defined by common underlying causes. Utilizing affordable and accessible digital health tracking technologies in combination with this root-cause focused disease taxonomy, practitioners are capable of creating significant value today through the personalization and continuous refinement of nutrition and other lifestyle medicine prescriptions.

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Introduction

As the health care system makes the long-awaited shift from disease management to disease reversal and health creation, food is becoming the new pharma. The great majority of health care costs are driven by chronic disease, and the inescapable fact of the matter is that chronic diseases are largely lifestyle-borne illnesses. Most experts would agree that as diet produces the most pronounced life-long environmental impact on health, nutrition is the most powerful lifestyle lever for causing, as well as solving, the chronic disease pandemic.

Beneath this simple conclusion lies a web of enormous complexity—and a tremendous opportunity for innovators that organize and situate themselves to capitalize on the new era of personalized nutrition.

We have invested decades applying a seemingly logical approach to the problem. If lifestyle, and most notably nutrition, is the primary driver of chronic disease, our first priority is to discover the optimal diet and lifestyle. From there, we need only to resolve the vexing matter of tapping the discipline to adhere to this health sustaining way of living. Unfortunately, this approach has failed.

Science has indisputably revealed that health and disease arise from the complex interactions between our lifestyle, bioindividuality (genetics, microbiome, etc), and environment. Consequently, despite decades of effort, diet fads, and hundreds of books from intelligent and well-credentialed authors telling us what, when and how to eat, no universal silver bullet has emerged.

What has emerged, however, is the field of personalized nutrition and the significant market opportunity it represents.

Personalized nutrition is an unusual evolution in medicine and technology for 2 reasons. First, the consumer marketplace has been preconditioned to embrace the concept and the hope that it represents for the future of health and health care. This acceptance can be traced to 2 main sources:

1. Widespread consumer frustration over confusing and often conflicting nutrition advice from expert sources.
2. The resounding public celebration of the sequencing of the human genome as the breakthrough that will reveal the hidden code of life.

The second unusual characteristic is the fact that consumer optimism and confidence related to the power of personalized nutrition exceeds the current state of the science. This exuberance can even be found within certain segments of the health care practitioner community.

The result is a bolus of pent-up consumer demand for individualized nutrition prescriptions that has created fertile ground for nutrition entrepreneurs. However, this demand is characterized by varying degrees of consumer naiveté and vulnerability that must be handled responsibly by the nutrition industry and early-adopting practitioners.

So, how can innovators responsibly capitalize on the emerging market for personalized nutrition today and situate themselves as enduring market leaders as the field advances?

To explore this topic, it is helpful to deconstruct the concept of personalized nutrition into 3 component parts:

1. Assessment and prescription.
2. Engagement, tracking and recalibration.
3. Production and fulfillment (a topic to be addressed in a future article).

Assessment and Prescription

Nutrition influences the expression of the human genome. But the reality is that identifying nutritionally addressable risk factors and health promoting opportunities at the individual level is a daunting task. The process must account for the genetic diversity of human populations; the complexity of foods, lifestyles and cultures; and the variety of metabolic processes that must all be considered in concert with one another to truly personalize a nutrition prescription.

Without question, health and nutrition research, and their translation into products, will become increasingly personalized. This process will unfold gradually as science advances toward distinguishing the unique and addressable differences among us. As that ever-expanding body of knowledge converges with the industrial means to deliver individualized nutrition solutions, we will witness the evolution of the nutrition industry and the manifestation of food as medicine.

While the science continues to mature around nutritional genomics and its 3 supporting “omic” disciplines (transcriptomics, proteomics, and metabolomics), present-day innovators must explore the responsible boundaries of nutrition assessment and prescription along the following technology and innovation continuum:

Static and Slow Moving Survey Measures

1. Individual tastes, preferences, and cultural norms (the original basis for personalized nutrition).
2. Lifestyle, life stage, and geography (recognizing that weight lifters, marathon runners, babies, senior citizens, and people living in Seattle each have unique nutritional needs).
3. Known health conditions.
4. Inferred genetic risk factors (as indicated by family health history).

Dynamic (With the Exception of Genetics) Quantitative Measures

5. Biomarkers (lipids, hemoglobin A_{1c}, etc).
6. Nutritional deficiencies (as measured by laboratory testing and/or physical signs and symptoms).
7. Genetics (and in the foreseeable future, epigenetics).
8. Microbiome (species variation and microbial metabolism).

The more basic assessment approaches (1 through 4 mentioned in the previous list) can be accomplished through consumer/patient surveys with little need for repetition as these measures are either fixed or change very slowly.

Assessments that capitalize on modern testing technologies (5 through 8 mentioned in the previous list) are more dynamic, offering the benefit of quantification and the potential to create powerful feedback loops. However, with the sexiness of testing comes added expense and the heightened potential for misdirection when they are used in isolation.

Biomarkers and measured nutrient deficiencies (5 and 6 mentioned in the previous list) have compelling intuitive appeal but are in fact, generally insufficient as the sole input to produce an effective nutrition prescription. Common sense would suggest, for example, that the remedy for an observed nutrient deficiency is to increase the consumption of that nutrient. This may, or may not be true as the actual causes of these deficiencies often arise from dysfunction in the digestive system impacting nutrient absorption, genetic factors, or other system imbalances.

Ultimately the most promising combination, genetic and microbiome testing are still in their early stages of maturity, and, like the other laboratory measures, should

be used today in conjunction with other forms of assessment.

Cluster-level Personalization

The critical, and commonly overlooked reality that practitioners and industry stakeholders must acknowledge is that the transition from the era of reactive, diagnosis-based health interventions calibrated to population averages to the coming era of true, “n of 1,” precision health will not happen in a single bound. Rather, the transition has been underway for years and has placed us today, at the interim destination of cluster-level personalization—a profound step forward.

Consider the difference. Until recently, 3 patients with recurring and debilitating headaches are each diagnosed as suffering from migraines. The diagnosis is defined from a constellation of symptoms. And the resolution of the diagnosis is achieved through the ongoing suppression of those symptoms that comprise the migraine diagnosis. Each is prescribed, and left indefinitely dependent on one of a family of medications intended to mitigate their headaches.

Today, with modern assistance, these patients can look past their diagnosis to investigate its potential underlying causes. One discovers that he is part of a cluster of people whose migraines primarily arise from glucose toxicity. One learns that she is part of a cluster of people whose migraines primarily arise from reproductive hormone imbalance. And the third patient finds she is part of a cluster effected primarily by sinus issues.

Cluster-level personalization—grouping people on the basis of underlying causes of conditions, common genetic vulnerabilities, and/or similar metabolic phenotypes—enables the design of health interventions that resolve symptoms and risks by way of their causes rather than the never-ending, costly battle to suppress their effects.

This potential exists today, years ahead of truly personalized medicine, and the economic implications are staggering. Contrary to the popular refrain, the number one cost driver in health care is not chronic disease—it is symptom suppression medicine.

Engagement, Tracking, and Recalibration

The method of nutritional assessment and prescription should inform the approach to outcomes tracking and recalibration of the nutrition prescription. While imperfect when used in isolation, testing adds the critical element of measurable progress. More than a technical necessity, done properly, this process establishes the foundation for consumer engagement by establishing a dynamic, quantitative feedback loop to demonstrate progress.

The transition from the manufacturing and sale of nutrition products into the new realm of personalized nutrition will entail far more than upgraded technology, production, packaging, and fulfillment. The most

potentially challenging transition will arise from the reality that personalized nutrition requires an intimate and active relationship with each customer.

To thrive in the new era, nutrition product companies must independently, or more likely, through strategic collaboration, become technology enabled, relationship enterprises skilled at orchestrating the 4 dimensions of the customer relationship:

1. Assessment and serial testing.
2. Continuous, individualized tracking, outcomes measurement, and optimization.
3. Targeted consumer education, engagement, and habit formation.
4. Personalized nutrition product production and delivery.

One of the key determinants of success will be the ability to dramatically reduce the cost and friction associated with laboratory testing. This process will begin with home testing using dried blood spot, urine, saliva, and stool samples. In the foreseeable future, consumers will be equipped to measure certain key biomarkers with in-home technology.

Among the most promising of these next-generation technologies is an early stage company called Cor (see KnowYourCor.com) that has developed a device that nearly eliminates the cost and friction of measuring up to 50 biomarkers from a tiny drop of blood using light.

The newest class of continuous glucose monitors (ie, the Abbott Freestyle Libre) that allows consumers to painlessly monitor their glucose levels in near real-time has turned blood sugar into a biofeedback modality. Combined with sleep, activity, and nutrition tracking, this family of technologies enables consumers, in a period of a week, to make a host of personal discoveries including the following:

- The inverse relationship between their hours of sleep and average daily glucose.
- The effect of stress on their blood sugar.
- The approximate number of steps after a meal required to return their blood sugar to its normal level.
- Their unique, and often surprising individual glycemic response to the foods in their diets.
- The effectiveness of new, glucose controlling nutrition products.

The nutrition and sensor data tsunami now clearly visible on the horizon will prompt many companies to rightly conclude that the era of personalized nutrition demands strategic collaboration. The market leader in the new field of nutrition analytics is today, a company called Nutrino (see NutrinoHealth.com) that has established itself as a technology enabler, and accelerant of the transition to personalized nutrition for a diverse array of collaborating partners.

Beyond its AI driven nutrition analytics capabilities, Nutrino has integrated with a host of device manufacturers from Abbott and Medtronic to the new Oura ring (see OuraRing.com) that, with its newest wearable, will likely become the market leader in sleep tracking and stress monitoring through its continuous measurement of heart rate variability.

From the consumer perspective, personalized nutrition will not be isolated to meal times and morning/evening supplement swallowing. It will be a ubiquitous, continuous activity that produces, and relies upon, a personal data trail that must be shared with nutrition product companies, health care practitioners, and the other nodes of their personal health ecosystem.

The new era brings with it a potent, but highly participatory approach to managing health. Its impact on a person's health is a direct function of that person's level of engagement, understanding of key facets of their own health, and their proficiency to fashion and extract value and insight from their personal health ecosystem.

This reality has given rise to yet another new breed of company devoted to synthesizing technologies, nutrition products, testing, digital education, coaching, user communities, and expert designed protocols into potent health interventions delivered through elegant and efficient user experiences.

The ultimate hub of collaboration for personalized nutrition stakeholders ranging from physician thought leaders to labs and supplement companies, is an early stage company called DestinyWell (see DestinyWell.com). The company is a curator, integrator, and educator positioned to be the leading formulator and optimizer of this new class of digital therapeutics.

Conclusions

Do not be confused, deterred, or lulled into complacency by the fact that more years of work and discovery lie ahead of the rise of truly personalized nutrition. The shift is happening now, and firms seeking to establish themselves as market leaders in the new era are already allocating resources accordingly. Likewise, practitioners should begin to actively equip themselves in 3 key ways:

1. Closing knowledge gaps related to functional nutrition and nutritional genomics.
2. Formation of care teams that include nutrition and health coaching expertise.
3. Development of a practice-level technology suite that enables and streamlines the functions of assessment, tracking, and personalized patient education delivery.

The formation of a collaborative matrix of third party technologies and allied practitioners is crucial to succeed in the new era. Given the diversity of technologies and

capabilities that must be artfully harmonized to create the consumer experience of personalized nutrition, every player in the ecosystem needs to build its team of collaborators around its internal expertise.

Throughout the process, firms and practitioners must remain mindful of the fact that the first translation of the nutritional genomics-rooted notion of personalized nutrition into the development of new products and services will not target individuals. Rather, it will target clusters of people with similar metabolic phenotypes and genetic vulnerabilities. True personalization will follow later—possibly much later.

When it does, those practitioners and industry stakeholders that have successfully reinvented themselves to capitalize on cluster-level personalization will be well equipped with the requisite culture, infrastructure, collaborators, and brand to responsibly evolve at whatever pace is dictated by the science toward a destination of true personalization.