Nutrition Education in an Era of Global Obesity and Diabetes: Thinking Outside the Box

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Abstract

In an era when rates of obesity, diabetes, and other lifestyle-related diseases challenge medical educators and governments worldwide, it is necessary to consider novel educational strategies, both didactic and experiential, whereby current and future health professionals can be better prepared to proactively advise and teach patients enhanced self-care skills (e.g., diet, movement, stress management, and enhanced behavioral change).

In this Perspective, the authors summarize current circumstances involving rising rates of obesity and diabetes worldwide, the lack of nutrition- and lifestyle-related curricular requirements for professional medical certification, societal trends regarding modern food culture and food availability in health care settings, and the misalignment of financial incentives to promote health.

The authors assess what elements of self-care should or should not be required within future curricula and certification exams. They consider how best to educate trainees about diet and how to "translate" nutrition, exercise, and behavioral science knowledge into practical advice. They explore several ideas for reforming nutrition education, including "teaching kitchens" as required laboratory classes for nutrition and lifestyle instruction, wearable technologies for tracking behaviors and physiological data relating to lifestyle choices, and the prospect of hospitals and other medical venues serving as exemplars of healthy, delicious food options. Finally, the authors argue that "salutogenesis"—the study of the creation and maintenance of health and well-being—should assume its rightful position alongside the study of "pathogenesis"—disease diagnosis and treatment—in medical education and practice.

In 1960, Americans spent three times as much on food ($74 billion) as they did on health care ($27 billion). In 2012, Americans spent twice as much on health care ($2.9 trillion) as they did on food ($1.38 trillion). Over the past five decades, food costs have increased 18-fold; health care costs, 102-fold.[1,2]

Our Current Situation

Although genetics are an important consideration in health, during the past half-century our genes have not measurably altered, and yet we are significantly more overweight, obese, and prone to lifestyle-related diseases. Today, one-third of the U.S. population is obese. Two-thirds are overweight. The medical costs of obesity in the United States are estimated to be as high as 20.6% of total health care costs.[3] Additionally, three-quarters of health care dollars are spent on chronic lifestyle-related diseases.[4] Diabetes alone is estimated to cost the United States $245 billion per year.[5] In 1960, U.S. diabetes rates were 1% of the population, with the majority of cases diagnosed as type 1 diabetes.[6] Today 9.3% of U.S. citizens are diabetic, with the overwhelming majority suffering from type 2 diabetes.[7]

As the editors of the *Lancet* remarked: "The fact that Type 2 diabetes, a largely preventable disorder, has reached epidemic proportions is a public health humiliation. A strong, integrative, and imaginative response is required in which the limits of drug treatment and the opportunities of Civil Society are recognized."[8]

These societal trends are even more alarming among children. Childhood obesity has trebled since 1970.[9,10] One-third of children born after 2000 are expected to develop type 2 diabetes during their lifetime.[11] Writing in the *New England Journal of Medicine* about generational epidemiological trends, Olshansky et al[12] noted, "There is now evidence that America's children will be the first in the nation's history to live shorter lives than their parents."

These disease trends are spreading worldwide. Rates of obesity and diabetes across the developing world are accelerating at a more rapid pace than here in the United States. For example, in 1980, the incidence of childhood overweight and obesity in China was less than 2%. It is now more than 15% in boys and 9% in girls. In China's large cities with populations of at least 1 million, 25% of boys and 16% of girls are overweight or obese. This extraordinary demographic transformation has occurred in a single generation.[13]

In 2000, 15% of all diabetics in the world lived in China. Today, it is one-third.[14–16] Combining the prevalence of diabetes in China and India, half of all humans living with diabetes reside in these two "developing" nations.[17]

The *New York Times Magazine* exposé "The extraordinary science of addictive junk food" introduced the notion that food science engineers have systematically combined sugar, salt, fat, and "pleasing mouth feel" to design processed foods which increasingly appear to be biologically addictive.[18] Recent studies offer plausible neurophysiological

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Acad Med. XXXX;XX:00–00.
First published online
doi: 10.1097/ACM.0000000000000682

mechanisms whereby repeated exposure to highly processed foods that are high in sugar, salt, and unhealthy fats leads to addictive behaviors.[19,20] As such, medical educators must also now be aware of these biological imperatives complicating the task of advising patients about healthier diets and lifestyle.

From the vantage point of fundamental lifestyle choices, evidence exists that chronic illnesses could be postponed or prevented. For example, data from the Nurses Study,[21] which includes 116,000 participants, suggest that individuals who do not smoke, are not overweight, exercise modestly, have a good but not necessarily exemplary diet, and drink a glass or less of wine or spirits daily reduce their risk of coronary artery disease by 82%. Importantly, fewer than 3% of the survey population met these seemingly manageable self-care criteria.[21] Similar findings exist for many other lifestyle illnesses in men and women. The challenge is, how do we, as medical educators, alter these regrettable statistics on a societal scale?

The field of medicine maintains unique influence in guiding patients and public policy to encourage healthful choices. However, only 27% of U.S. medical schools teach the recommended 25 hours of nutrition.[22,23] On average, U.S. medical schools offer 19.6 hours of nutrition-related education across four years of medical education.[22] This corresponds to less than 1% of estimated total lecture hours. Moreover, the majority of this educational content relates to biochemistry, not diets or practical, food-related decision making.

Among entering medical students, 71% think nutrition is clinically important. Upon graduation, however, fewer than half believe that nutrition is clinically relevant.[24] Once in practice, fewer than 14% of physicians believe they were adequately trained in nutritional counseling.[25]

Unfortunately, there are few external incentives to improve nutrition education in medical school. Current United States Medical Licensing Examination tests evaluate biochemical knowledge and information relating to nutritional deficiencies, but no standardized patient examinations test the knowledge or skills of medical trainees to advise a patient seeking guidance with regard to evidence-based diet and lifestyle modification and optimization.[26]

At the postgraduate level, with regard to board certification exam requirements for internal medicine certification, the word "nutrition" is not mentioned in the required proficiencies.[27] More surprisingly, to become a cardiologist in the United States, fellows must complete 10 cardio versions and 100 cardiac catheterizations, but requirements in nutrition counseling are not included.[28] Medical educators and licensing boards must significantly raise their requirements regarding nutrition science and lifestyle counseling if we expect the next generation of trainees to study and master this material.[29]

Additionally, financial incentives to enhance diet and lifestyle choices are nearly absent at best and totally misaligned at worst. Current payment systems for hospitals and the majority of "health" providers predominantly remain "fee for service." Coronary bypass surgeries may cost over $100,000 per operation, but many services that may reduce the risks of cardiovascular events are still not reimbursed.[30,31]

In addition to external incentives, a rethinking of the role of nutrition in medical education must include awareness of the external environment, including our health care food environments. Indeed, 63% of medical schools maintain at least one fast food franchise at their affiliated hospitals.[32] Many U.S. hospitals serve foods that are inherently unhealthy. A consequence of such food availability is that patients may erroneously perceive the status quo to be acceptable from a medical perspective.[33] It is not.

Thinking Outside the Box

Is there evidence, albeit circumstantial, that *cooking* may impact weight and health?

Among industrialized countries, the United States and the United Kingdom were the most obese nations in 2000.[34] At that time, both France and Italy, which have extensive and widely appreciated culinary traditions, observed far lower rates of obesity in their respective populations. Paradoxically, across a range of countries, those nations in which citizens spent more time preparing food had lower rates of obesity. For example, in 2000, French and Italian citizens spent an average of 19 minutes more per day cooking than did Americans. By contrast, British adults spent the same time cooking as their U.S. counterparts and exhibited comparable obesity rates.[34] Although this does not constitute a causal relationship, it raises a provocative idea—namely, that cooking may have a role to play in a population's health.

We add to this provocative idea the caveat that most overweight individuals do not wish to be overweight—that they are aware of "healthier choices" but feel "stuck" in their perceived inability to change. Most were never taught to cook. Health professionals have not been trained to guide or refer them toward resources that can improve their skills with regard to enhanced self-care behavior.

Healthy Kitchens, Healthy Lives

So, why not consider an atypical alliance? What if medical schools partnered with culinary schools and schools of public health to form "a united front?" Why not encourage medical, public health, and culinary experts to share notes, skills, questions, and novel ideas as to how these three communities can partner to diminish rates of obesity and diabetes?

This was the rationale for the launch of the educational continuing medical education program "Healthy Kitchens, Healthy Lives—Caring for Our Patients and Ourselves" (HKHL) in 2006.[35] This annual conference, jointly sponsored by the Harvard School of Public Health, the Culinary Institute of America, and the Samueli Institute, has attracted more than 3,500 health professionals. The conference blends didactic and experiential learning through academic lectures, cooking demonstrations, and hands-on cooking attended by all 400 conference registrants across a variety of instructional kitchens.

The conference was partly inspired by the work of Erica Frank,[36] who has demonstrated that for physicians, practicing a healthful behavior oneself was the most consistent and powerful predictor of physicians counseling patients about these same behaviors. As examples, exercise, smoking, seat belt use, and sunscreen use by physicians predict their counseling patients about these identical

practices. Perhaps, we theorized, how a physician eats (and cooks) can influence the ways in which he or she advises patients about food, diet, and self-care.

At HKHL, over four days, attendees receive updates on relevant nutrition science; how to cook healthy, delicious, easy-to-make, affordable recipes and family meals; the importance of movement and exercise prescription as counterparts to a healthful diet; and the relevance of mindfulness to help individuals optimize behavior and change habits for the better, often facilitated by trained professionals (e.g., health coaches or registered dietitians trained in motivational interviewing). This information is then "translated" through the tasting of 325 healthy, delicious dishes over four days, along with practical examples of mindfulness, exercise, and health coaching techniques. Additionally, attendees enter instructional kitchens in groups of 8 to 10 and, with culinary instructors guiding them, learn to prepare, from scratch, a broad range of healthy, delicious, affordable, and easy-to-make vegetables, whole grains, salads, proteins, etc., from every culinary tradition. This experiential aspect of this educational design, we believe, is critical to enhanced learning on the part of trainees.

In 2013, we published the results of a survey of previous HKHL attendees (387 total participants; 192 MDs), testing the idea that the inclusion of culinary education in the form of cooking demonstrations and hands-on cooking, as adjuncts to traditional didactic nutrition-related presentations, would result in measurable positive changes in personal and professional nutrition-related behaviors.[37] Our preliminary results suggested that this occurred. (See Figure 1.)

"Teaching kitchens" as classrooms for nutrition

The principles of HKHL may be incorporated into medical schools and residency programs. One example of this is at the Geisel School of Medicine at Dartmouth, where HKHL alumni are creating curricula for medical students and internal medicine residents. Nutrition didactics will be taught in lecture format, and cooking classes will be offered through partnerships with area culinary class venues near the college. Tulane University School of Medicine has launched a culinary medicine initiative, including a teaching kitchen. This program includes curricular modules for medical students and the option of an elective clinical "rotation" at a professional cooking school. These and future medical curricula will inform the process whereby medical trainees learn to "translate" nutrition and behavioral science into practical advice for themselves and their patients.

From another vantage point, it has been reasonably investigated that regardless of the initial benefits of specific diets, almost all diets have high recidivism rates at 12 to 18 months.[38] It is also true that many interventions that recommend a diet do so without properly teaching the skills necessary to follow such diets (i.e., there are nutritional recommendations, but few or no cooking instructions). Here we, propose the concept of a "teaching kitchen and self-care curriculum." As envisioned, the teaching kitchen is conceptually a place where individuals can learn nutrition facts and shopping and cooking skills, and receive information and personalized guidance about exercise, mindfulness, and behavioral optimization, informed by reflection about one's motivations for change. Its instructors would ideally include medical professionals, chef instructors, registered dieticians, exercise trainers, mindfulness teachers, and health coaches.

It is further proposed that this model be formally tested, in observational and controlled settings, to explore the possibility that a multidisciplinary approach, involving diet, cooking, movement, mindfulness, and behavioral change practices will prove to be superior to existing "diet" strategies and may lead to more sustained, constructive changes in behavior, physiology, quality of life, and, potentially, costs. Importantly, the teaching kitchen concept described is not a "diet" or "weight loss" program but, rather, a reference guide to necessary self-care "skills for life."

Teaching kitchens can and should be available to populations, regardless of socioeconomic status. A demonstration of a preliminary teaching kitchen in underserved populations is the Share Our Strength's Cooking Matters program. This six-week course, which combines hands-on cooking classes with nutrition information and supermarket tours, operates in 45 U.S. states and Washington, DC, and reached 23,236 participants in 2012 alone. Cooking Matters's internal evaluations demonstrate their participants' improved nutrition choices, home cooking, and label reading.[39]

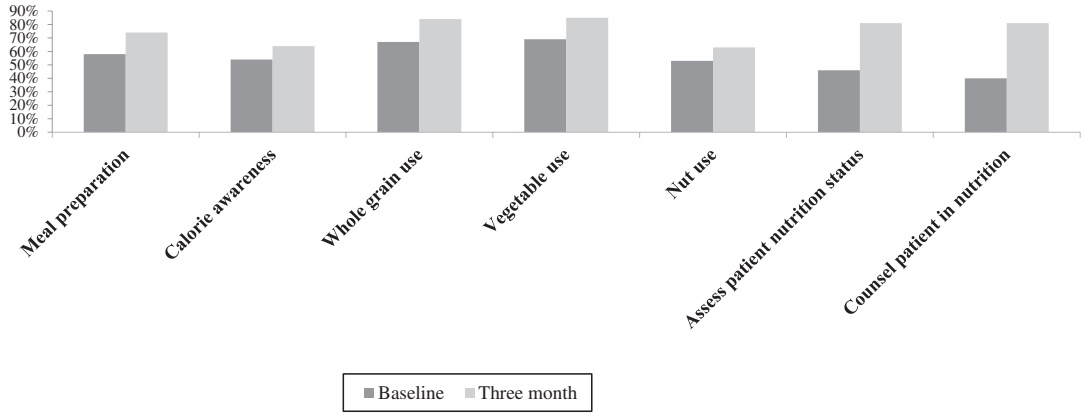

Figure 1 Personal and professional nutrition-related behaviors of 192 MD participants in the Healthy Kitchens, Healthy Lives conference. The data presented here were originally reported in Eisenberg DM, Myrdal Miller A, McManus K, Burgess J, Bernstein AM. Enhancing medical education to address obesity: "See one. Taste one. Cook one. Teach one." JAMA Intern Med. 2013;173:470–472. All comparisons $P \leq .05$.

Setting a healthy example

It is also worth considering the option of having hospitals and health centers build and take pride in exemplary cafeterias, restaurants, and food service programs, many of which could include the same healthful, delicious, accessible recipes being taught in the aforementioned teaching kitchens. A pioneering institution in this regard is the West Bloomfield Hospital in Michigan, which boasts healthy, organic, affordable cafeteria offerings and inpatient, on-demand dining prepared by trained chefs. Interestingly, family members who visit patients at this hospital frequently order from an identical menu as the patients, thereby helping to subsidize this novel program. The hospital also includes a hydroponic, organically certified greenhouse which provides about 15% of the vegetable produce for the hospital year-round. Moreover, the high-tech greenhouse serves as an educational magnet for school children across the entire region.[40]

The point is that hospitals and other health care venues have the ability become premier examples of healthful yet delicious, affordable, sustainable foods in any community.

Ingredients for education reform

Returning to the topic of education reform, shouldn't the latest science about nutrition, exercise, mindfulness practices, and behavioral change (and addictions rehab) be required knowledge for future medical graduates? Might required (or encouraged) experiential learning also be viewed as useful, if not essential? Is it unreasonable to view teaching kitchens as potentially necessary "learning laboratories" for nutritional instruction for health care professionals? We have biology, chemistry, and anatomy laboratory classes to supplement biology, chemistry, and anatomy didactic requirements—why not teaching kitchens as futuristic nutrition laboratory classes to establish required competencies for medical professionals? One's ability to translate nutrition information is essentially limited or enhanced by one's ability to cook or, at the very least, better understand how foods are typically prepared. Having medical professionals with basic proficiency in nutrition science and culinary arts may be an important ingredient in educational reform.

It is worth noting that registrants of the 2014 HKHL conference were asked if their medical organizations had already built a demonstration or teaching kitchen facility, or had plans to build one within 24 months. Of the 430 registrants, 129 responded that teaching kitchens were already in existence or were being planned at their respective organizations. This observation has been replicated (and exceeded) among 2015 HKHL registrants. As such, this "outside the box" notion is garnering attention at a rapid pace.

Simply incorporating nutrition and lifestyle instruction into medical education will not be enough, however. Lifestyle and health-related behaviors occur almost entirely outside the doctor's offices, and so methods to scale and extend healthy behavior education into the "life-space" are also needed.

Innovations enabling healthy choices

Another related trend which must be monitored and harnessed by medical professionals involves wearable devices and Internet-based applications capable of providing static or real-time information relating to diet, exercise, and relevant physiological tracking. Food and health-related "apps" are among the most popular worldwide. Novel wearable devices capable of tracking activity and a range of biometrics are gaining societal acceptance.[41,42] Although a systematic review of this literature is beyond the scope of this manuscript, we, as educators, must embrace these trends in an effort to meet patients where they are—and likely will be—in the years ahead. Moreover, current and future health care trainees as well as patients who are "digital natives" will surely welcome the marriage of wearable device technology and routine medical care.

We now know that many people eat "mindlessly." That is to say that they are not sufficiently "present" or "mindful" to taste their food optimally, nor are they routinely mindful of the nutritional value (or lack thereof) and calories consumed. Recently, medical researchers have demonstrated that mindless eating predictably leads to increased caloric consumption,[43] whereas a modest amount of "mindfulness training" can lead to weight reduction or a decrease in unhealthful food cravings.[44] The benefits of mindfulness training for medical students and proactive clinicians have been reported elsewhere.[45–47] Significant efforts are under way at a variety of U.S. medical schools, including Georgetown University, the University of Cincinnati, Oregon Health Sciences University, and Stanford University, to incorporate mindfulness training into undergraduate and graduate medical education.

In addition, the field of "health coaching" has matured over the past decade. Health coaches, who tend to be medical and allied health professionals who have received postgraduate training in a range of psychological techniques (e.g., motivational interviewing), are equipped in ways many conventionally trained clinicians are not, to enable patients to change those lifestyle behaviors which have seemed immutable. Trained health coaches can do this through regular "coaching" sessions which rely far less on the predominant "expert model" (i.e., this is your problem and this is what you should do) as compared with the coaching model, which relies far more on an elicitation, from the patient, as to what the patient wishes to work on changing; motives for changing; ambivalences about making the necessary commitments; and resolve and confidence—or lack thereof—to change. A recent study by Appel et al[48] showcased the power of having primary care providers join with trained health coaches to enable a large percentage of obese, inner-city, middle-aged patients to lose weight and to maintain weight loss over 24 months. In the future, we can imagine armies of certified health coaches working with primary care physicians and specialists to enable patients to alter their behaviors for the purpose of primary or secondary prevention of common lifestyle-related diseases such as obesity, diabetes, cardiovascular disease, and cancer.

And yet, with few exceptions, neither "mindfulness training," nor "health coaching" are common components of existing medical education or training. Perhaps these should be considered for inclusion in future required curricula on a broad basis.

Putting "Salutogenesis" on Par With "Pathogenesis"

To achieve the necessary broader directional shift, "salutogenesis," the "mirror image" of "pathogenesis," must be elevated to its rightful place in medical education.[49,50]

Here is a question for future medical practitioners, researchers, and educators: To what extent can specific lifestyle choices reduce the risk of developing serious disease among those patients carrying the relevant genes as risk factors? This conundrum is at the core of "epigenetics," which is an accepted scientific frontier and includes an exploration of gene–diet interactions in determining weight loss and maintanence.[51,52] So, let us consider that "personalized medicine" in the 21st century will involve a *combination* of timeless wisdom regarding diet, mental reflection, and physical activity, in addition to new knowledge generated through biomedical discovery and advances in genetics, diagnosis, disease treatment, and technology. A nearly exclusive focus on high-tech strategies, however, will not meet societal needs.

Salutogenesis is defined as "the process through which health and well-being are produced" (see Figure 2). Most of current medical curricula, worldwide, focus on pathogenesis and its manifestations as they relate to disease initiation, diagnosis, treatment, and management. What if future required curricula included didactic and experiential learning modules about nutrition and diet, exercise and movement, sleep and rest, mindfulness and its application to self-care, as well as the latest science regarding the optimization of behavioral change (i.e., health coaching techniques)?

Because most of our current curricula, training, and health care delivery models focus on pathogenesis, diagnostic procedures, and interventional strategies (i.e., disease care), what might a "redesign" of future delivery models (and medical education) look like if they were to simultaneously dive deeply into what is being learned about the promotion and maintenance of health—that is, "salutogenesis"? For the sake of discussion, let's consider future health care models, accessible to the majority of the population, which provide state-of-the-science, "high-tech" diagnostic and interventional strategies, which are collectively aimed at addressing disease (i.e., "pathogenesis"), as well as new core elements of conventional health care (not disease care), which promote wellness (i.e., "salutogenesis").

As depicted in Figure 3, we will increasingly be informed by discoveries relating genetics (and epigenetics) to disease risk; we will rightfully continue to invest heavily in basic, mechanistic, and clinical research; and we will continue to rely on hospital care. However, lengths of stay will likely continue to diminish over time, as will the overall ratio of inpatient to outpatient medical education. Much of medical and health care will be delivered by ambulatory and allied health professionals who must, in this futuristic model, become professionally "bilingual" in both disease diagnosis and treatment in addition to health creation and maintenance.

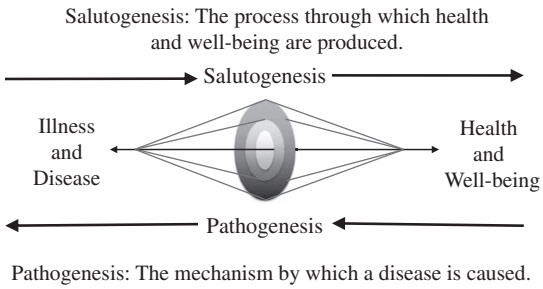

Figure 2 The relationship between pathogenesis, the mechanism by which a disease is caused, and salutogenesis, the process through which health and well-being are produced. Credit: Wayne B. Jonas, MD, and Samueli Institute (www.SamueliInstitute.org). Reproduced with permission.

As envisioned, primary care and allied health professionals will work closely with their hospital-based colleagues in selected instances, but will also increasingly work with colleagues responsible for movement and exercise training; nutrition and culinary (i.e., cooking) instruction; those with expertise in "stress management," ranging from psychopharmacology to psychotherapy to mindfulness instruction; and health coaches, who can provide guidance with regard to health-enhancing behavioral change strategies.

Today, if one sought such "comprehensive" care, he or she would have to be extraordinarily wealthy, educated, and well connected to receive all of the intended services. That said, if access to this theoretical model could demonstrate enhanced clinical outcomes, reduced medical care expenditures, improved quality of life, and enhanced societal productivity, why would we not want to pursue these imaginary future models of health care delivery for future generations? What's more, why should we not prepare the next generation of medical professionals to be conversant in each of these health-related areas and serve as the implementers of these designs? After all, the students we teach today will be practicing medicine well beyond 2050.

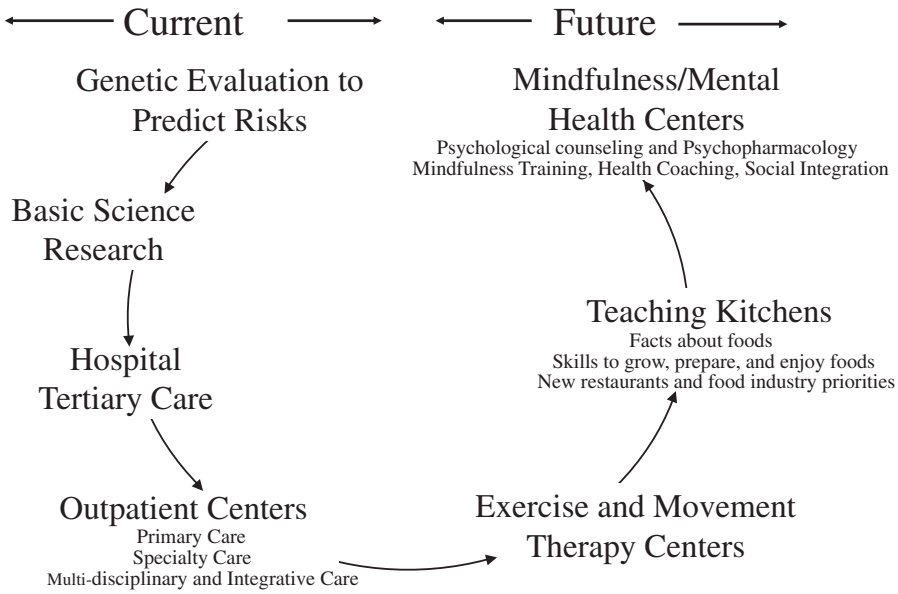

Figure 3 A model for health systems of the future.

Implications for Medical Educators

Here, we offer a number of recommendations for realizing the vision we have described. Although some of the recommendations below are already gaining momentum, medical educators may select to champion one or more of the following suggestions at their respective educational institutions:

1) Required courses in nutrition, exercise, stress management, and sleep hygiene.
2) Required competency examinations covering factual knowledge and advisory skill in all of the aforementioned areas, as prerequisites for professional certification.
3) The establishment of teaching kitchens for laboratory instruction in nutrition, paralleling the continued use of biology, chemistry, and anatomy labs for instruction in these required areas.
4) Increased emphasis on and further development of clinical assessment tools (e.g., OSCEs) to be used for training and evaluation relating to lifestyle counseling.
5) Hospitals and ambulatory care venues with exceptional cafeterias, restaurants, teaching kitchens, and inpatient menus showcasing foods that are healthy, delicious, affordable, and easy to make. These options would replace commonplace, highly processed alternatives.
6) The incorporation of data from wearable or implantable devices as routine elements of the medical record.
7) Instruction and training in self-regulatory methods, including mind–body and mindfulness techniques.
8) A disruptive realignment of financial incentives leaving behind "fee for service" domination in favor of "pay for performance" incentives and financial bonuses for keeping people *well*.
9) Having medical doctors, and all allied health care professionals, leading by example with regard to diet, as was the case when medical professionals quit smoking in the 1970s, due in part to overwhelming scientific evidence, thereby catalyzing the successful "movement" to lower smoking rates in the United States. Why not do the same with regard to a diminished intake of less healthy foods and "food-like substances?"

We offer these suggestions with the intention of elevating the prominence of nutrition science, self-care, lifestyle medicine, and behavioral optimization and placing them on par with existing educational requirements relating to disease mechanisms, diagnosis, treatment, and management. Such a combined approach, if embraced, could expand the culture and content of medical education to better address the great health challenges of our time, including the ways we eat, move, think, sleep, and relate to one another in our global village.

What are we, the educators, waiting for?

Acknowledgments: The authors wish to thank Wayne B. Jonas and Walter C. Willett for reviewing the manuscript and offering editorial suggestions.

Funding/Support: The Samueli Institute provided support for both D. Eisenberg and J. Burgess during the time this manuscript (and keynote presentation) were developed.

Other disclosures: D. Eisenberg is codirector of the Healthy Kitchens, Healthy Lives continuing medical education conference, copresented by the Harvard School of Public Health, the Samueli Institute, and the Culinary Institute of America. He is also a scientific consultant to LKK Health Products Group Ltd., China. He provides scientific advice with regard to the design of studies testing the mechanism and efficacy of traditional Chinese herbal products.

Ethical approval: Reported as not applicable.

Previous presentations: This article is adapted from a keynote presentation by D. Eisenberg, AMEE Conference, Prague, Czech Republic, August 27, 2013.

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