

## ORIGINAL ARTICLE

# Health-related Culinary Education: A Summary of Representative Emerging Programs for Health Professionals and Patients

健康相关的膳食教育：适用于卫生保健专业人员和患者的代表性新兴项目概述

Educación culinaria relacionada con la salud: resumen de los programas emergentes representativos para profesionales sanitarios y pacientes

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## ABSTRACT

**Background:** Beneficial correlations are suggested between food preparation and home food preparation of healthy choices. Therefore, there is an emergence of culinary medicine (CM) programs directed at both patients and medical professionals which deliver education emphasizing skills such as shopping, food storage, and meal preparation.

**Objective:** The goal of this article is to provide a description of emerging CM programs and to imagine how this field can mature.

**Methods:** During April 2015, 10 CM programs were identified by surveying CM and lifestyle medicine leaders. Program directors completed a narrative describing their program's structure, curricula, educational design, modes of delivery, funding, and cost. Interviews were conducted in an effort to optimize data collection.

**Results:** All 10 culinary programs deliver medical education curricula educating 2654 health professionals per year. Educational goals vary within the domains of (1) provider's self-behavior, (2) nutritional knowledge and (3) prescribing nutrition. Six programs deliver patients' curricula, educating 4225 individuals per year. These programs' content varies and focuses on either specific diets or various culinary behaviors. All the programs' directors are health professionals who are also either credentialed chefs or have a strong culinary background. Nine of these programs offer culinary training in either a hands-on or visual demonstration within a teaching

kitchen setting, while one delivers remote culinary tele-education. Seven programs track outcomes using various questionnaires and biometric data.

**Conclusions:** There is currently no consensus about learning objectives, curricular domains, staffing, and facility requirements associated with CM, and there has been little research to explore its impact. A shared strategy is needed to collectively overcome these challenges.

## 摘要

**背景：**食品制备与健康消费之间存在有益的相关性。因此，有越来越多的烹饪医学（Culinary Medicine, CM）项目向患者提供医学教育课程，重点介绍购物、食品存储和膳食准备等方面的技能。

**目的：**本文的目的是介绍新兴的CM项目，并设想本领域如何才能走向成熟。

**方法：**2015年4月，通过CM和生活方式医学领导者调查确定了10个CM项目。项目主管进行了叙述，介绍了各自项目的结构、课程、教育设计、提供方式、资金来源和成本。进行了访谈，以优化数据采集。

**结果：**所有10个项目提供的医疗教育课程每年共计培训2654名卫生保健专业人员。教育目标不尽相同，大致领域为（1）提供者的自我行为；

（2）营养知识；（3）营养处方。向患者提供课程的6个项目每年培训4225人。这些项目的内容不尽相同，强调具体的膳食或各种烹饪行为。所有项目主管都是卫生保健专业人员，要么是持证厨师，要么具有很强的烹饪背景。其中9个项目在教学厨房中提供动手或可视化演示烹饪

培训，另有1项提供烹饪远程教育。7个项目用各种问卷和生物统计数据跟踪结果。

**结论：**关于CM相关的学习目标、课程领域、员工配备和设施要求，目前并未达成共识，而且探索其影响的研究很少。需要共同的策略来共同应对这些挑战。

## SINOPSIS

**Antecedentes:** Se sugieren correlaciones beneficiosas entre la preparación de la comida y el consumo de opciones saludables. Por consiguiente, están creciendo los programas de medicina culinaria que proporcionan conocimientos sobre los pacientes y la educación médica enfatizando habilidades como la compra, la conservación de los alimentos y la preparación de comidas.

**Objetivo:** El propósito de este artículo es proporcionar una descripción de los programas emergentes de medicina culinaria e imaginar cómo puede madurar este campo.

**Métodos:** Durante abril de 2015 se identificaron 10 programas de medicina culinaria investigando a los líderes en medicina culinaria y de estilo de vida. Los directores del programa concluyeron un informe que describía la estructura, conocimientos, diseño educacional, modos de impartición, financiación y costes de sus programas. En un esfuerzo por optimizar la recogida de datos, se llevaron a cabo entrevistas.

**Resultados:** Los 10 programas culinarios proporcionan conocimientos sobre educación médica educando a

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2654 profesionales sanitarios por año. Las metas educacionales varían dentro de los dominios de (1) comportamiento del propio profesional sanitario, (2) formación nutricional y (3) nutrición a prescribir. Seis programas proporcionan conocimientos sobre los pacientes, educando a 4225 individuos por año. Estos contenidos de los programas varían y se centran bien en dietas específicas o bien en diferentes comportamientos culinari-

os. Todos los directores de los programas son profesionales sanitarios que también son o bien chefs con credenciales o bien tienen unos excelentes conocimientos culinarios básicos. Nueve de estos programas ofrecen formación culinaria bien práctica o bien mediante demostración visual en el entorno de una cocina para la formación, mientras que uno proporciona educación culinaria a distancia. Siete programas

hacen un seguimiento de los resultados usando varios cuestionarios y datos biométricos.

**Conclusiones:** Actualmente no existe un consenso acerca de los objetivos de enseñanza, dominios curriculares, personal y requisitos de instalaciones asociados a la medicina culinaria y se ha realizado poca investigación sobre su impacto. Es necesario llevar a cabo una estrategia compartida para superar estos retos de forma colectiva.

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### INTRODUCTION

Healthy nutrition is recommended for all.<sup>1</sup> Beneficial correlations are suggested between healthy food preparation skills and consumption of healthy choices.<sup>2,3</sup> However, a survey from 2007 to 2008 evaluating trends in US home food preparation found a decrease in cooking activities.<sup>4</sup> Thus, experts are suggesting that nutritional education should augment a primary focus on nutrients with food-oriented education,<sup>5</sup> emphasizing skills such as shopping, food storage, and meal planning and preparation.<sup>2,6</sup>

In response, patients' educational interventions that aim to improve culinary behaviors have recently emerged.<sup>7</sup> These interventions were found to improve short-term attitudes regarding healthy cooking,<sup>8</sup> confidence in cooking,<sup>9</sup> healthy food consumption,<sup>9</sup> and health outcomes.<sup>10</sup>

Culinary education is emerging in medical education as well. The majority of the nutritional content currently taught in medical education is related to biochemistry, not practical, food-related knowledge and skills that may positively impact eating behaviors.<sup>11</sup> This gap manifests in the attitudes of residents, fellows, and other practicing clinicians who lack the confidence and knowledge to effectively prescribe nutrition.<sup>12,13</sup> To bridge this gap, culinary education programs are emerging to address food-based knowl-

edge and skills. Preliminary results from 2 such programs have documented improvement in both the providers' personal and professional nutrition-related behaviors,<sup>14</sup> including the providers' perceived ability to advise patients with metabolic risk factors.<sup>15</sup>

Proponents of health-related culinary education are suggesting different labels for this area such as "culinary nutrition" or "culinary medicine" (CM). A recent manuscript suggested a definition of CM as "a new evidence-based field in medicine that blends the art of food and cooking with the science of medicine."<sup>16</sup> However, there is still no consensus with regard to terminology, and useful definitions still need to be established by the larger medical and culinary communities.

The goal of this article is to provide a preliminary description of 10 emerging CM programs and to envision how the field of CM might mature in such a way that it impacts health behaviors and outcomes of both medical professionals and the patients and communities in which they serve.

### METHODS

During April 2015, a series of CM programs that deliver either medical or patient education were identified by surveying both worldwide CM leaders (eg, a complete list of physicians who are also chefs as identified by the authors) and lifestyle medicine leaders (eg, representatives from worldwide lifestyle medicine societies). This was intended to be a representative but not necessarily exhaustive list of relevant thought leaders in this area. The program's entry criteria consisted of the following: (1) delivery of health-related culinary courses that are scheduled on a regular basis (2) operation through a health-related organization (eg, hospital, clinic, medical school, school of public health), and (3) with or without a teaching kitchen. Programs that merely license another program's curricula were excluded.

Each of the identified program directors was invited to complete a narrative (Appendix, available at [www.gahmj.com](http://www.gahmj.com)) describing his or her program's (1) structure (culinary facilities, organizational structure); (2) curriculum (structure, learning objectives, content, outcomes); (3) educational design (trainees, modes of delivery, culinary providers, other providers) (4) cost; and (5) funding. Directors were also invited to add themes or

topics relevant to this descriptive summary.

The first and last authors (RP, DME) summarized the data and identified agreements and disagreements to discuss. The first author (RP) conducted interviews with each of the 10 directors in an effort to optimize data collection. This summary does not involve human subjects and thus was not sent for Institutional Review Board approval.

## RESULTS

Eleven CM programs were identified, and their respective directors were invited to participate in the compilation of information for this article. Ten programs' directors (91%) completed the survey, and the CM programs that they direct are presented in Table 1. Nine of them were founded in the United States, and one was founded in Israel. Nine of the CM programs were founded in host institutions including teaching hospitals, clinics, medical schools, and a school of public health, and one (Chef Clinic-ChefMD) was founded as a private clinic.

One program (Chef Coaching) provides CM education without the use of a kitchen, 3 use in-house kitchens (Healthy Cooking and Lifestyle Center, Food Pantry

and Demonstration Kitchen, and The Goldring Center for Culinary Medicine), 3 collaborate with professional culinary institutes (FareWellness, Healthy Kitchen Healthy Lives, MedCHEFS), 2 use home kitchens (Chef Clinic-ChefMD, Culinary Medicine Specialists), and 1 (CHEF program) uses a culinary institute–designed teaching kitchen within the hospital's cafeteria. Four programs have additional facilities such as a pantry (Food Pantry and Demonstration Kitchen) or gardens (Chef Clinic-ChefMD, CHEF program, FareWellness). Although the infrastructure varies from program to program, all of the programs' directors are health professionals, mostly physicians, who also are either credentialed chefs or have a strong culinary background.

## EDUCATIONAL FEATURES

The educational features of the CM programs are described in Table 2. Each has a medical education curriculum, whereas 6 also offer education to patients (ChefMD, Chef Coaching, CHEF program, Healthy Cooking and Lifestyle Center, Food Pantry and Demonstration Kitchen, and The Goldring Center for Culinary Medicine). Most of the CM curricula feature group culinary education in a teaching kitchen (either a

**Table 1** Culinary Medicine Programs Contributing to This Article

Program; Institution, (cost/y)	Culinary Facility	Organizational Structure	Funding (Foundation; Sustainability)
Chef Clinic-ChefMD; private independent institution, (N/A)	Hands-on teaching kitchen (in the faculty's house); 6 seats	Program director (MD, chef); dietitian; nurse; chefs; foodbank staff	N/A; fee for service (which also support the medical education)
Chef Coaching; Institute of Lifestyle Medicine, Joslin Diabetes Center, (\$17k)	N/A	Program director (MD, chef, health coach); health psychologist; administrative assistant	Institution support, educational grants; fee for service, training tuition
CHEF Program; The Children's Hospital of San Antonio, (\$117k)	Hands-on teaching kitchen (embedded in hospital cafeteria)	Medical/research director (MD), program director (Chef), education and curricula specialist (RD)	Foundation grant; foundation grant + research grant
Culinary Medicine Specialists; Geisel School of Medicine at Dartmouth, (N/A)	Hands-on teaching kitchen (in the home of the student's dean; 12 seats)	Program director (MD, chef)	Discretionary medical school fund; N/A
FareWellness; North shore LIJ Health System and Lenox Hill Hospital, (\$5k)	Collaboration with the Natural Gourmet Institute; 16 seats	Program director (MD)	Private donation; Department of Medicine support, donations
Healthy Cooking and Lifestyle Center; Hadassah Hebrew University Medical Center, (\$100K)	Hands-on teaching kitchen (with portable components that can be used in the community); 20 seats	Program director (MD, Chef); Chef; RD; administrative assistant	Foundation grant; educational grants, foundation grants, research grants, fee for service
Healthy Kitchens Healthy Lives; Harvard School of Public Health (confidential)	Collaboration with the Culinary Institute of America, Napa, California; 400 seats.	Program director (MD), 42 faculty presenters (medical, public health, lifestyle medicine and culinary) and >50 chefs preparing food (300 dishes)	NA; tuition, external sponsors
MedCHEFS; West Virginia University School of Medicine, (\$5K)	Collaboration with the Blue Ridge Technical College	Program director (MD)	State fund
Food Pantry and Demonstration Kitchen; Boston Medical Center (\$300K, including pantry costs)	Visual demonstration teaching kitchen; 15 seats	Program director (RD, chef); 4 pantry full-time workers (dietitian technician)	Endowments; endowment, donations
The Goldring Center for Culinary Medicine; Tulane University School of Medicine, (confidential)	Hands-on teaching kitchen; 20 seats (dinners for up to 60)	Program director (MD, chef), chef, RD, research director	Foundation grant; foundation grant

**Table 2** Educational Features of Representative Culinary Medicine Programs

Program	Trainees	Modes of Delivery	Culinary Providers	Other Providers
Chef Clinic/ ChefMD	Healthy individuals; patients with mixed chronic medical conditions; medical students; practicing clinicians, <sup>a</sup> chefs, coaches and health-conscious executive	Hands-on workshops; cooking demonstrations; lectures; video clips; printed material	MD-chef; chefs; culinary students	Nurse; community dietitian
Chef Coaching	Healthy individuals; patients with diabetes; medical students, residents and fellows; practicing physicians	Coaching; lectures; cooking demonstrations; video clips	MD-chef	Health psychologist
CHEF Program	Healthy individuals; patients with mixed chronic medical conditions; residents; practicing physicians	Hands-on workshops; cooking demonstrations; lectures; video clips; printed material	Chef; RD	MD
Culinary Medicine Specialists	Medical students	Hands-on workshops	MD-chef	N/A
FareWellness	Healthy individuals; patients with mixed chronic medical conditions; medical students, residents, and fellows; practicing physicians and chefs	Hands-on workshops; cooking demonstrations; lectures; planting and harvesting food	MD-chef; chef	Dietitians; urban gardener
Healthy Cooking and Lifestyle Center	Healthy individuals; patients with mixed chronic medical conditions; medical students, residents; practicing physicians, nurses, dietitians, chefs	Hands-on workshops; cooking demonstrations; lectures; printed material	MD-chef; chef; preschool and school assistants	Dietitian, institutional clinical faculty
Healthy Kitchens Healthy Lives	Residents and fellows; practicing clinician professionals <sup>a</sup> ; non-medical registrants (eg, food service providers; IT entrepreneurs, hotel and restaurant executives; health policy and health insurance representatives, etc)	Hands-on workshops; cooking demonstrations; didactic lectures; printed materials; recipe sampling	Chefs (Culinary Institute of America)	Dietitians; Academic Medical and Public Health faculty (nutrition, behavioral change, mindfulness, exercise, sustainability, IT experts and others)
MedCHEFS	Healthy individuals; patients with mixed chronic medical conditions; medical students and residents	Hands-on workshops; lectures; video clips; printed material	Chef (local Culinary Arts College); medical students	N/A
Food Pantry and Demonstration Kitchen	Healthy individuals; patients with mixed chronic medical conditions; medical students	Cooking demonstrations; printed material	RD-chef	N/A
The Goldring Center for Culinary Medicine	Healthy individuals; patients with mixed chronic medical conditions; medical students; residents and fellows; practicing physicians and chefs	Hands-on workshops; lectures; video clips; printed material; licensing the program to other organizations <sup>b</sup>	MD-chef; chef; medical students; culinary nutrition interns	Institutional clinical faculty

<sup>a</sup> Physicians (MDs) and other healthcare professionals (registered dietitians [RDs], registered nurses [RNs], physical therapists [PTs], doctors of chiropractic [DCs], exercise physiologists, psychologists, licensed master social workers, etc).

<sup>b</sup> Organizations licensed the Goldring Center for Culinary Medicine curriculum: University of Texas: Southwestern: Moncrief Cancer Institute; Texas College of Osteopathic Medicine; UCLA Clinical and Translational Science Institute; Arnot Health Graduate Medical Education; University of Illinois Chicago; Western University of Health Sciences; Rutgers University School of Medicine – Robert Wood Johnson Campus; University of Colorado at Denver; Michigan State University College of Health Sciences; UT Health Science Center San Antonio; University of Chicago: Pritzker School of Medicine; Mercer University School of Medicine; Penn State University School of Medicine; Children's Hospital – San Antonio.

visual demonstration or a hands-on teaching kitchen). However one, the Chef Coaching program, is focused on remote one-on-one culinary education using other modalities such as video-clips and telephone sessions.

The culinary providers are usually culinary experts who might be employees either of the program or at the collaborating institutions, such as the Culinary Institute of America. In one instance, a chef was reported to be on faculty at the program's host institution (Tulane School of Medicine). Three program directors report that they use laypersons (Healthy Cooking and Lifestyle Center), medical trainees (MedCHEFS, The Goldring Center for

Culinary Medicine), or culinary students (The Goldring Center for Culinary Medicine) as culinary providers to deliver community curricula. In addition to culinary providers, program directors report on other content providers: dietitians (Chef Clinic/ChefMD, FareWellness, Healthy Cooking and Lifestyle Center, Healthy Kitchens Healthy Lives); behavior change experts (Chef Coaching and Healthy Kitchens Healthy Lives); medical specialists (eg, endocrinologist, gastroenterologist) (Healthy Cooking and Lifestyle Center, The Goldring Center for Culinary Medicine); gardener (FareWellness); and public health faculty (Healthy Kitchens Healthy Lives).



## MEDICAL EDUCATION CURRICULA

The structure, content, and outcome measures of the CM medical education curricula are described in Table 3. These include 7 undergraduate medical education (UME), 5 graduate medical education (GME), and 5 continuing medical education (CME) curricula that educate a total of 2654 health professions per year. Two of the GME curricula include elective (FareWellness, The Goldring Center for Culinary Medicine), and 3 include required courses (Chef Coaching, CHEF program, Healthy Cooking and Lifestyle Center); one of the UME curricula includes a required course (MedCHEFS), 2 include combination of required and elective courses (Healthy Cooking and Lifestyle Center, The Goldring Center for Culinary Medicine), 3 include elective courses (Chef Clinic, Culinary Medicine Specialists, FareWellness), and 1 is an interest group (Food Pantry and Demonstration Kitchen). Furthermore, Tulane Medical School's CM curriculum has been licensed by an additional 12 US medical schools that incorporated CM curriculum by collaborating with culinary institutions in their communities.

Two programs reported on interprofessional CME curricula (Chef Coaching, Healthy Kitchens Healthy Lives), and one (Healthy Cooking and Lifestyle Center) reported on both dietitians' and nurses' curricula. Two programs offered professional CM training programs: Certified Culinary Medicine Specialist for health providers and chefs (The Goldring Center for Culinary Medicine), and Certificate of Completion in Chef Coaching for health coaches and chefs (Chef Coaching).

All the learning objectives of the medical education curricula that have been reported include improving providers' nutrition related self-behavior. Other curricula's learning objectives are inconsistent and can be grouped to nutritional knowledge and prescribing nutrition domains. Learning objectives in the nutritional knowledge domain include (1) the ability to discuss culinary skills such as shopping, food storage, and meal preparation (usually when the curricula include other nutrition programs) or (2) the ability to discuss culinary skills but also traditional nutritional knowledge. Learning objectives in the domain of prescribing nutrition vary as well and include (1) the ability to counsel patients about nutrition and various culinary skills, (2) changing providers language from nutrient-based to food-based language, (3) improving providers' attitudes about the importance of patients' culinary behaviors, and (4) providing tools for increasing patients' culinary behaviors such as recipes, video clips, and ideas for referral.

CM medical education curricula's content varies as well. Sessions are divided by either specific diets (eg, vegetarian and vegan diet, Paleo diet, Atkins diet); health conditions (eg, healthy individuals, diabetes, cancers); or culinary behaviors (eg, cooking legumes or vegetables, preparing breakfast). Two curricula address additional behaviors such as physical activity and mindfulness (Healthy Kitchens Healthy Lives, and Healthy Cooking and Lifestyle Center).

Six programs which educate a total of 2311 health professions per year evaluate their curriculum impact. These include Chef Coaching, FareWellness, Healthy Cooking and Lifestyle Center, Healthy Kitchens Healthy Lives, Food Pantry and Demonstration Kitchen, and The Goldring Center for Culinary Medicine. Outcome measures include (1) provider's perceived personal habits such as culinary skills and confidence<sup>14</sup> and healthy food consumption<sup>14,15,17</sup>; (2) professional outcomes such as perceived attitude<sup>14,15,17</sup> and knowledge<sup>15</sup> regarding nutrition and cooking as well as confidence to<sup>14,15</sup> and extent of nutritional and culinary counseling<sup>14</sup>; and (3) patients' perceived nutritional habits.<sup>17</sup>

## PATIENT EDUCATION CURRICULA

Six CM programs provide patients' curricula and educate a total of 4225 individuals per year. The structure, content, and outcome measures of these curricula are described in Table 4. One program (Chef Coaching) delivers a remote hands-off course while others offer either hands-on cooking or cooking demonstrations. While all the programs that provide experiential education (eg, hands-on cooking or visual demonstrations) deliver community courses using basic kitchen tools such as a cutting board, knife, or a food processor, 3 also deliver courses in their teaching kitchens (CHEF program, Healthy Cooking and Lifestyle Center, Food Pantry and Demonstration Kitchen).

All patients' curricula include courses for both healthy individuals and patients with variety of chronic diseases, primary obesity and diabetes. One program (Chef Coaching) addresses only culinary behavior and is aimed to augment any nutritional program the patients follow, while others provide culinary knowledge together with nutrition guidance. The educational content areas of these courses vary and focus on either specific diets (eg, the Mediterranean diet) or culinary behaviors (eg, cooking lentils, preparing breakfast).

Four programs are delivered for free, funded by grants (Healthy Cooking and Lifestyle Center, Food Pantry and Demonstration Kitchen) or insurers (Healthy Cooking and Lifestyle Center) or are taught by students as part their training (The Goldring Center for Culinary Medicine). Four programs that educate a total of 2580 participants per year measure the impact of their patient's curriculum. Outcome measures include (1) patient-perceived personal habits such as culinary skills and confidence and healthy food consumption,<sup>15</sup> (2) patient-perceived overall wellbeing such as self-care and quality of life,<sup>18</sup> and (3) biometric outcomes.<sup>15,18,19</sup>

## DISCUSSION

This article summarizes the organizational structure, educational design, curricular components, cost, and funding of 10 emerging programs that provide CM education to medical and patient audiences. CM leaders report a high acceptance of CM curricula by providers and patients. The skill set and knowledge base of chefs has widespread popular appeal, in contrast to traditional

**Table 3** Medical Education Curricular Components: Examples of Structure, Content, and Outcomes

Program (Foundation, n) <sup>a</sup>	Curriculum Structure	Curriculum Content	Outcomes Measures, Tool
Chef Clinic (2006, 55)	One to 4-h Continuing Medical Education modules; 2 wk clinical rotation (elective, Des Moines University School of Osteopathic Medicine ); wkend courses (culinary medicine certificate awarded)	Healthy shopping; portion control; knife skills; healthy culinary skills; food waste; from the garden to the plate; basic certified organic gardening and nutrition	Students' feedback
Chef Coaching (2015, 470)	One 3-h hands-on + three 60-min telecoaching sessions for preventive medicine residents (required, Yale School of Medicine); 1-h cooking demonstration for Physical Medicine and Rehabilitation resident (required, Harvard Medical School); 1-h interprofessional (Continuing Medical Education, credit by Harvard Medical School); 16-h Certificate of Completion in Chef Coaching	Mediterranean culinary skills; easy-to-make, affordable culinary techniques; setting and tracking accountable culinary goals; personal health	Culinary confidence and skills, Cooking With Chefs (CWC) questionnaire <sup>19</sup>
CHEF Program (2015, 260)	Two 2-h hands-on modules for physicians; three 2-h hands-on program for pediatric residents (required, Baylor College of Medicine )	Easy-to-make, affordable recipes; basic culinary techniques; nutrition education (for self-care and to share with patients)	N/A
Culinary Medicine Specialists (2014, 12)	Four 3-h hands-on program for medical students (elective, Geisel School of Medicine at Dartmouth)	Nutritional components and health benefits of various diets; healthy shopping; preparing nutritious meals; personal health	Students' feedback
FareWellness (2010, 26)	Three 2-h didactic + 4-h cooking demos for medical students and residents in varying training programs (elective, no credits); 4-h Continuing Medical Education (Hofstra School of Medicine)	Collaborating, Cooking and Caring; the Mediterranean diet; organic food; food policy in the US; integrative nutrition	Personal and professional nutrition-related behaviors, home-grown questionnaire
Healthy Cooking and Lifestyle Center, (2008, 600)	One 2-h didactic (required), 3-h hands-on (elective), 2-wk clinical rotation (elective) for medical students (Hadassah Hebrew university medical School); 12-h didactic + 6-h hands-on for Family Medicine residents (required, Hadassah Hebrew University Medical School); multiple 3-h hands-on modules for physicians; 3-h hands-on for dietitians; 4-h didactic + 6-h hands-on for nurses	Nutritional components and health benefits of various diets; behavioral changes strategies; easy-to-make, affordable culinary techniques; personal health	Personal and professional nutrition-related behaviors, home-grown questionnaire; patients outcomes, home-grown questionnaire and focus groups <sup>18</sup>
Healthy Kitchens Healthy Lives (2006, 450)	8 h of didactic + 8 h of workshop (interactive presentations and hands-on demonstration) + 4 h of hands-on cooking + sampling more than 300 recipes (Continuing Medical Education, credited by Harvard School of Public Health)	Review of optimal diets; fad diets; dietary guidelines; easy-to-make, affordable recipes and menus; physical activity; mindfulness; health coaching and behavioral change.	Personal and professional nutrition-related behaviors, home-grown questionnaire <sup>14</sup>
MedCHEFS (2013, 16)	Two full-day immersion for medical students followed by ten 2-h sessions (required, West Virginia University School of Medicine)	Nutrition and health; food groups; healthy culinary skills; weight management; Food in the 21st century; physical activity; mindfulness	Students' feedback
Food Pantry and Demonstration Kitchen (2001, 15)	Two-h module for medical students (Interest group, Boston University School of Medicine)	Easy-to-make, affordable, healthy food for students	Personal and professional nutrition-related behaviors, home-grown questionnaire
The Goldring Center for Culinary Medicine (2011, 450 + 300 in licensed curricula)	Eight 4-h hands-on (elective + required), 4-wk clinical rotation (elective) for medical students (Tulane University School of Medicine); seven 4-h hands-on for family medicine and pediatric residents (elective, Tulane University School of Medicine); Certified Culinary Medicine Specialist (credit by Tulane University School of Medicine)	Mediterranean cooking; nutrition and health; kitchen workflow; healthy shopping; weight management; metabolic risk factors	Personal and professional nutrition-related behaviors, home-grown questionnaire <sup>15</sup>

<sup>a</sup> Medical education curriculum foundation, average yearly participants.

nutritional education that may suggest compromising good-tasting food for better health.<sup>20</sup> However, several challenges have been identified.

First, there are currently no mutually agreed upon learning objectives for medical education, so a new pro-

gram might either adopt another program's curriculum or develop its own learning objectives. We suggest that these objectives should be discussed and agreed upon by thought leaders in CM. Long-term goals might include mapping of an agreed culinary curriculum to both pub-

**Table 4** Culinary Curricula Customized for Patients: Structure, Content, and Outcomes

Program (year, n) <sup>a</sup>	Curriculum Structure (Locations)	Curriculum Content	Outcomes Measures, Tool
Chef Clinic-ChefMD (2006, 425)	Three-min to 1.5-h video-clips; wkend culinary lectures and cooking and gardening demonstrations for healthy individuals/patients with mixed chronic health conditions (community)	Specific foods/recipes for mixed chronic health conditions; culinary and organic gardening techniques for general health and stress reduction	Feedback form
Chef Coaching (2015, 130)	Twelve 30-min tele-coaching sessions for healthy individuals/patients with diabetes; 1-h didactic and 1-h cooking demonstration for patients with diabetes (community, clinic)	Easy-to-make, affordable culinary techniques; setting and tracking accountable culinary goals	Culinary confidence and skills, Cooking With Chefs (CWC) questionnaire <sup>19</sup>
CHEF Program (2015, 500)	Ten 5–8-min education didactics and two 1-h hands-on for pregnant/healthy individuals; multiple 1-h hands-on for patients with mixed chronic health conditions (program's teaching kitchen; community)	Affordable, familiar, culturally relevant ingredients combined to maximize nutrient absorption; healthy shopping strategies; portion control; label reading	Nutrition related behaviors, home-grown questionnaire; biometric parameters, birthweight, BMI, HgA1c, lipid profile
Healthy Cooking and Lifestyle Center (2004, 1200)	Six (0.5-h didactic + 2.5-h hands-on) for patients with IBD/diabetes/celiac disease and for healthy individuals; 0.5-h didactic + 2.5-h hands-on for patients with obesity/cancer; three 2-h didactic + two 3-h hands-on for peer lay educators; 3-h hands-on for healthy kids (program's teaching kitchen; community)	Nutritional components and health benefits of various diets; easy-to-make, affordable culinary techniques and recipes	Quality of life, quality of life questionnaire <sup>21</sup> ; nutrition-related behaviors, home-grown questionnaires; biometric parameters, Crohn's Disease Activity Index <sup>21</sup>
Food Pantry and Demonstration Kitchen (2001, 1200)	Two-h cooking demonstrations for patients with diabetes/ cardiac disease/cancer/ obesity/failure to thrive/ allergies; 2-h cooking demonstrations for elders/ teens (program's teaching kitchen; community)	Easy-to-make, affordable culinary techniques and recipes	Feedback form
The Goldring Center for Culinary Medicine (2009, 750)	Six (0.5-h didactic + 1.5-h hands-on) beginner for healthy individuals/patients with diabetes; six (0.5-h didactic + 1.5-h hands-on) intermediate for healthy individuals/ patients with diabetes (program's teaching kitchen; community)	Translation of Mediterranean diet principles to the American kitchen	Nutrition related behaviors; home grown questionnaires; biometric parameters <sup>20</sup> , BMI, HgA1c, lipid profile

<sup>a</sup> Patients' curriculum foundation, average yearly participants.

lished nutritional curricula<sup>21</sup> and physicians' and other providers' training competencies.<sup>22</sup>

Second, educational content areas of patient curricula vary and focus on either specific diets (eg, the Mediterranean diet) or culinary behaviors (eg, cooking lentils, preparing vegetables, using whole grains). Lifestyle medicine was defined as “evidence-based practice of assisting individuals and their families to adopt and sustain behaviors that can improve health and quality of life.”<sup>23</sup> With this definition in mind, we recommend that culinary curricula should focus on healthy culinary behaviors which apply to various healthy diets and nutritional recommendations.

Third, 7 of the programs include chefs as culinary providers; however, none of them reported that their chef had any training in education or behavioral change. Some culinary schools' curricula include training in healthy cooking and basic nutrition; however, behavioral change and education skills are typically not taught to future chefs. Currently, the chefs who work in CM programs are a small self-selected group with a passion for education. Moving forward, training chefs whose education is focused on food production to be educators who are experts in behavioral change techniques such as coaching may be essential.<sup>24</sup> One can imagine that the coaching skills set, when combined with the credentialed chef's culinary skills, might be a useful 2-pronged

approach for promoting healthy eating.<sup>24</sup>

CM might provide compelling opportunities for medical education. First, one of the focus areas of culinary education is providers' personal behavior, which is a strong predictor of their advisory practices.<sup>25,26</sup> Second, because self-care is important in all professions, CM curricula might be used in variety of interprofessional educational programs (such as in Chef Coaching and Healthy Kitchens, Healthy Lives). Third, like other lifestyle medicine topics, CM presents a unique educational opportunity to address a challenge faced by providers and patients alike: improving health habits. Indeed, while most of the institutions' services address patient needs, all of the reported CM programs that provide patient education serve a dual purpose by educating providers as well. Furthermore, in The Goldring Center for Culinary Medicine, medical trainees (students and residents) practice as community culinary providers while learning a CM curriculum.

The reported programs may be categorized by programs that (1) utilize a teaching kitchen and employ culinary providers, (2) collaborate with culinary schools that have teaching kitchens and employ the culinary providers, and (3) offer distance based culinary curricula (eg, programs like Chef Coaching). Although there is a consensus among CM leaders about the advantage of hands-on culinary education, there is still

disagreement about the need to operate an independent teaching kitchen. While access to a teaching kitchen that serves as a laboratory and practice space may be ideal, the high cost of building and maintaining a facility is difficult to overcome.

Indeed, every program that offers hands-on education to both patients and medical professionals has a teaching kitchen. In contrast, the programs that offer hands-on medical education alone do not have a teaching kitchen. This may be due in part to the high volume of activities that are required to justify the cost of a teaching kitchen. Moreover, organizations that have a teaching kitchen reported on generating revenues through repurposing the facility for additional activities such as hospitality (The Goldring Center for Culinary Medicine) and healthy food production (Chef Clinic-ChefMD, Hadassah's Healthy Cooking and Lifestyle Center). Future opportunities might include the incorporation of modules that individuals can complete from their homes, such as the Chef Coaching program, which might increase teaching kitchens' capacity and decrease program costs. A long-term goal might include dedicated funding, such as from a health insurance companies. Experiments need to be done to explore whether and how these CM models can become financially self-sustaining.

Thus far, there has been very little research to explore whether, how, and to what extent any of these CM curricula affect behaviors and health outcomes of medical professionals or their patients/communities. Although all of the authors agreed on the importance of evaluating CM curricula, only 7 programs are collecting data about the impact of their curricula. Objective outcomes, such as HgA<sub>1c</sub> and lipid profile, are collected by 3 programs,<sup>18,19</sup> while other outcomes are collected by various self-perceived questionnaires, of which only one was officially validated.<sup>27</sup> A recent systemic review that summarizes the updated CM research has already identified the use of various unvalidated outcome measures.<sup>7</sup>

In order to enhance the impact of CM, additional research is needed regarding the most effective methods of delivering and evaluating these curricula. Using standard, valid data-collection instruments to evaluate these programs' impact on more than 6000 individuals annually might propel this movement forward in a significant and timely way. Evaluation from a healthcare cost perspective may be useful as well, as demonstrating a potential cost savings to insurers may lead them to financially support these programs, which could in turn help ensure their sustainability.

## CONCLUSION

CM holds promise as a new educational intervention to help individuals improve their eating behaviors. This summary of culinary programs might benefit institutions that are in the process of developing CM programs. The current lack of a consensus in educational goals, facility requirements, and sustainability models warrants further discussion among field

thought leaders. A true collaborative will be necessary to build a shared strategy and to address mutual challenges collectively, to ensure continued growth and development of this emerging field.

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