Nutrition care by primary-care physicians: Advancing our understanding using the COM-B framework

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Abstract

Objective: To investigate the nutrition education provided by primary care physicians (PCPs).

Design: An integrative review was used to examine literature on nutrition care provided by PCPs from 2012 to 2018. A literature search was conducted in MEDLINE, PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and Scopus using key search terms.

Setting: United States, The Netherlands, Germany, Denmark, United Kingdom, Lebanon, Australia and New Zealand.

Subjects: Primary Care Physicians

Results: Sixteen qualitative and quantitative studies were analysed thematically using meta-synthesis informed by the COM-B model of behaviour (capability, motivation and opportunity), to understand the influences on PCPs’ behaviours to provide nutrition care. PCPs’ perceive that they lack nutrition capability. While PCPs motivation to provide nutrition care differs based on patient characteristics and those of their own, opportunity is influenced by medical educators, mentors and policy generated by professional and governmental organizations.

Conclusions: The development of PCPs’ capability, motivation and opportunity to provide nutrition care should begin in undergraduate medical training, and continue into PCP training to create synergy between these behaviours for PCPs to become confident providing nutrition care as an integral component of disease prevention and management in contemporary medical practice.

Keywords: medical nutrition education, primary care physician, nutrition care, primary care
Introduction

The importance of nutrition in health and wellbeing is strongly recognised across the world (1). People in almost every region of the world could benefit from rebalancing their diets to eat optimal amounts of various foods and nutrients, according to the Global Burden of Disease study where trends in consumption of 15 dietary factors were tracked from 1990 to 2017 in 195 countries (2-4). People in almost every region of the world could benefit from rebalancing their diets to eat optimal amounts of various foods and nutrients, according to the Global Burden of Disease study where trends in consumption of 15 dietary factors were tracked from 1990 to 2017 in 195 countries (2-4). Globally, one in five deaths are associated with poor diet, which contributes to a number of chronic diseases (2). Poor diet is responsible for more deaths than any other risk factor (4). Leading dietary risk factors are high sodium intake and low intake of healthy foods, such as whole grains, fruits, nuts and seeds, and vegetables (4). It is now recognised that dietary modification can be more effective than medication for the management of many chronic diseases (5) and has the potential to significantly improve biomarkers associated with chronic disease (6). Small changes in weight and biomarkers at a population level can have a large impact on the burden of disease of populations (7). It is therefore not surprising that a healthy diet is a highly recommended feature of chronic disease prevention and management (8, 9).

An important strategy to support healthy eating in populations is to advocate for healthy eating through health care services (10). Primary care has been identified as an ideal setting to help patients have a healthy diet (11, 12). Primary care physicians (PCPs) are ideally placed to provide nutrition care to patients as they represent the initial point of contact within the healthcare system (13) and their nutrition care is held in high regard by patients (14). Within consultations, nutrition care is defined as any practice that aims to improve the dietary
intake of a patient to improve health outcomes and can include nutrition assessment, nutrition advice or nutrition counselling (15, 16). As a generalist doctor, PCPs have a gatekeeper role for nutrition that requires confidence in nutrition care, including appropriate nutrition knowledge, skills and attitudes to counsel patients about their diet and recognise when there is a need to refer onto other health professionals, such as dietitians, for more specialised nutrition care (17).

There have been enduring claims since the 1980s that PCPs provide inadequate nutrition care to patients (18-22), with minimal clear gains over recent times. It is currently estimated that nutrition care occurs in less than 7% of consultations (23) and less than 37% of people with a poor diet remember ever discussing nutrition in a consultation with a PCP (12). Several barriers that prevent PCPs from providing nutrition care are well recognised, including lack of nutrition education (18, 19, 24), subsequent perceived lack of nutrition knowledge low confidence and self efficacy in nutrition (15, 18, 19, 24, 25) and a perceived lack of time in consultations (15, 19, 24, 26). A new way of examining this problem is needed to overcome these barriers and better inform strategies for supporting PCPs to provide nutrition care and address the research gap in this area.

Guidelines for interventions that aim to modify how health professionals provide care include utilising theories that attempt to explain their behaviours (27). One such theory is the COM-B model (28) which proposes that the target behaviour (to provide nutrition care) is influenced by one’s capability to perform the task (knowledge and skills), motivation to perform the task and opportunity to perform the task, including factors that lie outside the control of the individual (See Figure 1) (28). This is an important model for population health as it can be applied at the level of health professionals and therefore influence their actions with patients
and subsequent health outcomes. Better understanding of the problem using the lens of this theory has the potential to inform novel strategies to support PCPs to provide nutrition care. Higher rates of nutrition care have the potential to make significant positive impacts at a population health level (29). This integrative review critically synthesises literature that has investigated nutrition care provided by PCPs. It uses the COM-B framework as a lens for interpreting the current status of the problem and provides new insights into how PCPs can be supported to provide nutrition care that meets the needs of their patients and the broader population.
Methods

Overview

An integrative review synthesises a diverse range of qualitative and quantitative literature to provide a comprehensive understanding of a phenomenon of interest (30). While the diversity and inclusivity of integrative reviews allow for a rich understanding of the topic, data analysis is made more complex (30, 31). Therefore, to ensure a rigorous review process in this integrative review, the five steps outlined by review guidelines were utilised (30): problem identification, literature search, data evaluation, data analysis and presentation.

Problem and inclusion criteria

This integrative review examined the enduring problem of inadequate nutrition care provided by PCPs. From this problem, the review questions were developed using the SPIDER tool (Sample, Phenomenon of interest, Design, Evaluation and Research type) (32). Studies and papers were included if: (i) the study involved PCPs or gathered data on PCPs, including their international equivalents such as General Practitioners, Family Doctors and Family Physicians; (ii) the study examined any aspect of PCP’s nutrition knowledge, skills and/or confidence in providing nutrition care; (iii) the study was empirical, full text, in English and published between 2012 and 2018. This time period was chosen as the most recent synthesis of literature came from the 2012 International Heelsum workshop (33). The International Heelsum Collaboration on Nutrition in Primary Care was a group of medical, behavioural, communication, epidemiological and nutrition experts who met six times in conference workshop format between the mid-1990s to 2012. The overarching aim of the Heelsum workshops was to advocate for research and advancements that assist GPs to appropriately incorporate nutrition concepts during consultations with patients (34). Studies that focused
solely on medical students and their nutrition education were excluded in this review and will be published elsewhere.

**Literature search**

A systematic literature search was conducted between May and July 2018. The literature search included computerised searches, ancestry searching and journal hand searching to ensure all eligible studies were included (30). A health librarian assisted with the computer-based search of MEDLINE, PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and Scopus. Medical subject headings were used in the execution of PubMed and MEDLINE database searches. Search terms related to PCPs included “primary care physician”, or “family doctor”, “general practitioner” or “family physician”. Search terms for the topic of interest included: “nutrition”, “knowledge”, “competence”, “skills”, “confidence”, “nutrition care”, “nutrition advice” or “nutrition education”. Google Scholar was used to obtain additional articles identified by journal hand searching. All databases search results were imported into EndNote prior to screening.

**Data extraction and evaluation**

One investigator (JC) screened the title and abstracts of all 805 studies initially identified through the search using the inclusion and exclusion criteria. Studies that appeared to meet the inclusion criteria based on their titles and abstracts were retrieved for further review. A total of 35 studies were included from the initial screen. Two investigators (JC and LB) independently assessed the full texts using the inclusion and exclusion criteria to establish a final number of included studies. Any discrepancies were discussed prior to excluding studies and a third reviewer (GJH) was used if consensus was not reached following a short discussion. Studies excluded were coded based on the exclusion criteria. Data were extracted
by JC using a table developed by the research team. Data extracted included: author, year, country, aim, research design, sample, participants, and key or relevant findings. To ensure accuracy, one investigator (LB) cross-checked the extracted data using the full-text of each included study.

Critical appraisal of the data was conducted by two independent investigators (JC and LB) using the Mixed Methods Appraisal tool (MMAT), version 2011 (35). The MMAT allows for simultaneous evaluation of all empirical literature: qualitative, quantitative and mixed methods studies (36) making it appropriate for an integrative review. The tool involves 4 questions which are answered as Yes, No or Unclear, resulting in an overall score ranging from 0 to 4. This tool has been shown to be efficient (15 minutes per study), user friendly and has high intra-class correlation (35). Agreement was reached on nearly all (>90%) of the appraisal items. Where scores differed, discrepancies were resolved through discussion.

Data analysis
This integrative review included both qualitative and quantitative studies, which were analysed thematically using meta-synthesis, an integrative interpretation of results to offer a novel finding (31). (28).

Results
Descriptive findings
The study selection processed is described in Figure 2. Out of 805 possible studies; 16 met the inclusion criteria and were included in the review (Table 1). The studies were mostly descriptive surveys (n=12) (37-48), as well as two descriptive designs that used video
observations (49, 50), one qualitative focus group study (51) and one intervention study (52). Participant numbers for all studies ranged from 3 to 4074; most were between 47 and 1136 with the exception of one larger study (44). All studies were published between the years 2012 and 2018. Studies were mostly conducted in US (n=6), Europe (n=4), United Kingdom (UK) (n=1), Middle East (n=1), Australia (n=2) and New Zealand (n=2). Of the four European studies, one was conducted in The Netherlands, one in Germany, one in Denmark and one in Croatia. The study from the Middle East was from Lebanon.

The methodological quality of the studies ranged from 0 (lowest quality) to 4 (highest quality) out of 4, with many studies scoring 2 (36). Three studies scored zero for methodological quality (39, 42, 50). The most common limitations of the studies were that the measurement tool did not have established validity and the response rates were low, increasing the likely presence of response bias.

Meta synthesis

Three themes were developed in line with the COM-B framework: (i) PCPs’ capability to provide nutrition care, (ii) PCPs’ motivation to provide nutrition care; and (iii) PCPs’ opportunity to provide nutrition care.
PCPs’ capability to provide nutrition care

All of the studies were based on the premise that it is essential for PCPs to be capable of providing nutrition care in order to meet the needs of patients and the population. PCPs’ capability to provide nutrition care was specifically referred to in some studies as a pre-requisite for competent nutrition care (43, 51), and strongly connected with motivation and opportunity to provide nutrition care (44, 48). PCPs in two studies stated that nutrition capability should encompass the biological, social, economic, cultural and spiritual aspects of food and nutrition due to its relevance and importance to patients (48, 51).

No consensus method exists for assessing PCPs’ capability (including knowledge or skills). It is therefore not surprising that no study objectively assessed PCPs’ knowledge. Rather, studies chose to investigate PCPs’ perceptions of their own nutrition capability (usually framed as ‘knowledge’ or ‘skills’). The PCPs in most of these studies reported their capability as inadequate (39, 41, 48, 50). For example, one study reported a mean counselling knowledge score on a 0-100 scale of 50.8 (±15.6) (50). However, one study reported good-to-very-good nutrition knowledge (39). The consistent explanation given for PCPs’ perceived lack of nutrition capability was inadequate nutrition education received during medical training (37, 39-41). Low levels of nutrition capability meant that doctors felt they were unable to advise patients on the essential role of nutrition in the cause, prevention and treatment of disease in an evidence-based manner (39, 42).

PCPs with greater self-efficacy in nutrition were more likely to report providing nutrition care (47). Furthermore, PCPs’ perceptions of their nutrition capability were higher in more experienced PCPs (48, 50) but did not seem to be affected by age or gender (39). Having a personal interest in nutrition (38, 39, 44) and having healthy personal eating habits (46) also
appeared to influence PCPs’ perception of their nutrition capability. Nutrition topics currently in the media reportedly provided a ready means of increasing nutrition knowledge (39) as was association with other health care professionals, such as dietitians (51). Several studies demonstrated that PCPs requested further training in nutrition to incorporate and reinforce current nutrition recommendations into practice (40, 43, 46, 48). Many PCPs stated they wished they had received more nutrition education while at medical school (48), during PCP training (48) and in continuing education sessions (40) to address their self-perceived low nutrition capability (40, 43, 46, 48). One study rejected the suggestion of further training in nutrition care which appeared to be influenced by a low motivation for this aspect of care (51).

**PCPs’ motivation to providing nutrition care**

In two studies, PCPs expressed a genuine interest in nutrition and appeared motivated to provide nutrition care (38, 40, 41). However, some participants in other studies demonstrated low motivation to provide nutrition care (37, 51). Poor motivation to provide nutrition care seemed to be more pronounced in participants who had graduated from medical school several years ago compared with new graduates (41, 48) and participants who felt they had previously been unsuccessful in supporting patients to improve their diet (44, 48). PCPs clearly showed low motivation to provide nutrition care when they felt they lacked nutrition capability (44, 48). However, additional training in topics such as motivational interviewing seemed to increase motivation to provide nutrition care (50). In two studies, the authors interpreted PCPs’ low motivation for nutrition care as a key factor contributing to the evidence-practice gap (39, 40).
Factors that influenced PCPs’ motivation for nutrition care were explored in several studies. PCPs with a personal interest in nutrition and its effects on health reported drawing on this motivation when including nutrition care in consultations (38). Similarly, PCPs with healthy lifestyle habits reported providing nutrition care regularly in practice (47, 52). For some PCPs, their motivation was influenced by medical educators who acted as role models for them when they were students (37). One study examined the motivation for nutrition care amongst family medicine residents as well as internal medicine residents and obstetrics and gynaecology residents (43). Family medicine residents demonstrated greater motivation and perceived norms to provide nutrition care compared with internal medicine and obstetrics and gynecology residents (43).

The priority that PCPs placed on nutrition care was investigated in some studies as a proxy for motivation. One study used video observations of PCPs providing nutrition care to overweight patients and found that PCPs spent more time discussing nutrition with female patients and heavier patients (50). This study contrasted with another that examined consultations with adults and found that PCPs prioritised nutrition care for male patients over female patients (45). In this same study, younger female PCPs (≤ 48 years) and older male PCPs (≤ 57 years) reported it was more important to recommend lipid lowering medication to male rather than female overweight patients (p=0.01) (45). In contrast, younger male PCPs (≤ 56 years) reported it was more important to recommend weight loss for overweight males compared with females (71.4% v 54.8%, p=0.004) (45). Collectively, these studies highlight that PCPs’ motivation for nutrition care can differ based on characteristics of patients as well as their own characteristics.

PCPs’ opportunity to provide nutrition care
PCPs’ opportunity to provide nutrition care encompassed all factors identified in the studies that were seen to be beyond the control of PCPs. Several studies identified that the health care system in the country of study did not provide payment to PCPs for nutrition care (39, 44, 52). Understandably, the lack of financial recognition for nutrition care often meant that PCPs felt there was insufficient time to include this practice in consultations (44, 53). One study acknowledged that PCPs were more likely to provide nutrition care to patients with private medical insurance, which may be related to the ability to be remunerated for this practice (44). Two studies identified practice-based changes that could facilitate opportunity to provide nutrition care, including having access to scales that accommodate obese patients and having prompts in the electronic patient management system to record weight and give recommendations for nutrition and physical activity (48, 52).

Studies often reported that PCPs could have greater opportunity to provide nutrition care if there were changes at governmental and professional organizational levels. Suggested changes at government level involved creating health policies that required additional primary prevention and health promotion initiatives (38). Similarly, suggested changes at a professional level included having mandatory nutrition training for PCPs (38, 48). An example provided of a professional level change was the introduction of a nutrition syllabus into the Royal New Zealand College of General Practitioners (RNZCGP) training program in 2012 (13). Additionally, one study suggested that greater access to professional development opportunities were required in order for PCPs to develop their capability in nutrition care (40).
Discussion

We have used the COM-B framework as a lens for interpreting the problem of PCPs’ inadequate provision of nutrition care to patients. The analysis has added insights to our understanding of a fundamental problem that is preventing health care services from supporting healthy eating in populations. The COM-B model (28) proposes that PCPs’ behaviour in providing nutrition care is predominantly influenced by three interrelated factors: capability; motivation and opportunity (See Figure 1). Ideally, strategies to address the problem need to impact all three areas of the COM-B model simultaneously. Therefore, we will discuss three issues: 1) Increasing PCP’s capability to provide nutrition care; 2) Increasing PCP’s motivation to provide nutrition care; 3) Increasing PCP’s opportunity to provide nutrition care.

Increasing PCPs capability to provide nutrition care

Most studies reported that PCPs have inadequate capability to provide nutrition care to patients (39, 41, 48, 50) because they have not had enough nutrition education during medical training (37, 39-41) and have only experienced limited opportunities for continuing professional development (48, 50). These findings concur with earlier studies that describe a lack of nutrition education during medical training (18, 19, 24) and postgraduate training (54, 55) and poor recognition of the role of PCPs in improving the health of populations (56). The need to include education in public health and the environmental determinants of well-being, such as diet and lifestyle, as core elements in medical practice for graduates to deal with these fundamental elements of clinical practise and public health in medical training has previously been recognised (57) and has been reiterated in subsequent versions (58). Attempts to improve this situation have included: a physician nutrition specialist provided effective nutrition education within a residency program (59); brief counselling, tailored messages and...
strategies (60) the use of the 5 A’s model for stage-based counselling, cooking classes, demonstration kitchens, supermarket tours, computer-based automated telephone counselling and follow-up (61) nutrition modules for general practice vocational training (62) and a minimal intervention strategy to address overweight and obesity in adult primary care patients (63). The Heelsum workshops addressed topics such as nutritional attitudes and practices of primary care physicians (56), effective nutrition interactions between family doctors and patients (64, 65), nutritional guidance of family doctors (66, 67), empowering family doctors and patients in nutrition communication (68, 69), creating supportive environments for nutrition guidance (70, 71) and weight management (71, 72). Further public health initiatives may still be required to overcome the ‘problem’ of low levels of nutrition care by PCPs, such as international goals for the integration of nutrition into health services and for population receipt of nutrition care.

Some of the reviewed studies suggested that having mandatory nutrition training for PCPs would drive PCPs to provide nutrition care (40, 50). Other literature supports this suggestion (61, 73, 74). In one US study that assessed the state of nutrition education through the eyes of students, residents and physicians it was reported that nutrition education was poorly integrated into the curriculum and that nutrition counselling was rarely witnessed by students during shadowing experiences; what was observed was often outdated or incorrect (75). The residents perceived that they were ill-prepared to offer nutrition counseling and desired further training in behavioural counseling to increase their confidence in educating patients and physicians did not remember having any extensive training in nutrition (75). Despite the inclusion of nutrition education in the PCP curriculum, GP trainees in the Netherlands have requested more teaching in nutrition education and the majority of GP trainees (75%) and PCPs (80%) with less than three years’ experience want to learn when and to whom they
should refer patients to and sources of reliable, evidence-based nutrition information (76). Others note the need for program educators to be enthusiastic about their subject and incorporate experiential learning into programs (77). Clearly, there is need for guaranteed nutrition education in PCP training to ensure that PCPs develop skills and confidence to provide nutrition care for personal and population health.

**Increasing PCP’s motivation to provide nutrition care**

The studies in this review highlight that many factors influence PCPs’ motivation to provide nutrition care. These factors include: PCPs’ characteristics and those of their patients related to gender and medical conditions (45, 50), personal interest in nutrition (38, 40, 41), years since completion of medical school (41, 48), previous unsuccessful attempts in supporting patients improve their eating habits (44, 48) medical educators acting as role models for PCPs as a student (37) and training in motivational interviewing (50). Evidence exists that PCPs’ nutrition guidance practices are not only determined by barriers (19, 21, 61, 62, 73, 74, 78-86) but also by driving forces, self-efficacy factors and nutritional attitudes and beliefs, (21, 23, 34, 61, 62, 66, 68, 70, 72, 73, 81-83, 85-89). In the studies reviewed, having a personal interest in nutrition (38, 39, 44), having healthy personal eating habits (46) and being a more experienced PCP (48, 50) appeared to increase PCPs’ perception of their nutrition capability and motivation to provide nutrition care (38, 40, 41). Early literature established that physicians with better personal health habits have more positive attitudes toward counseling (90). More recent literature has endorsed PCPs’ personal interest in nutrition and its effects on health impact positively on nutrition guidance practices (62, 79-81, 85, 86, 91). This suggests that training in personal health behaviours could be key to integrating nutrition into undergraduate and PCP training to increase PCPs’ interest and confidence to provide
nutrition care. Initially, this confidence may only include patient health, and can then be extended to community, regional and global levels to address public health nutrition (92, 93).

Increasing PCPs’ opportunity to provide nutrition care

Several factors beyond the control of PCPs that impact the provision of nutrition care were identified in the reviewed studies. PCPs perceived greater opportunity to provide nutrition care if changes were made at governmental and professional organization levels such as mandatory nutrition training and creating health policies that required additional primary prevention and health promotion initiatives to improve public health outcomes (38, 40). The scope of policy changes in prevention and health promotion initiatives could make nutrition a central focus of health care (94, 95). Internationally, efforts have been made to strengthen accountability in nutrition for progress in reducing malnutrition (96). Additionally, many countries now have policies that focus on prevention and health promotion to support population health such as the recent Dutch National Prevention Agreement that addressed prevention (and stopping) of smoking, overweight and alcohol abuse for the entire Dutch population, and also aimed to strengthen and speed up the prevention programs (97).

Professional organisations for PCPs also provide policy. The Royal New Zealand College of General Practitioners (RNZCGP) policy for obesity, acknowledges that PCPs are ideally placed to identify and manage patients at risk of obesity, related to most New Zealanders visiting a GP annually and many GPs forming ongoing relationships with their patients (98). Previously, the Heelsum workshops discussed the problems, opportunities and future possibilities of nutrition guidance by family doctors in a changing world (66), and made recommendations: that both family doctors and patients need to be empowered in nutrition communication (68, 69), for the development of supportive environments for nutrition guidance to create synergy between primary care and public health (68, 70, 99), for
practice-based evidence for weight management, with an alliance between primary care and public health (71, 100), all in acknowledgment of the ongoing relationship and trust patients have in their PCP (101, 102). The embedding of family practice in a governments’ health policy is also very important (71).

An innovative approach to obesity care in Australia illustrates the interrelated nature of PCPs capability, motivation and opportunity to provide nutrition care (28). The “Change Program” was developed to increase PCPs’ confidence and self-efficacy to manage obesity that drew on the therapeutic relationship between patients and their PCP, was supported by evidence-based tools and provided holistic and person-centred care (103). This program uses PCP strengths as reliable and trusted messengers for health care, not only to increase uptake of interventions but also to coordinate, contextualise and deliver their own health and behaviour messages to help PCPs at the interface of patients’ and population health (104). The program has been successful in improving PCPs confidence in assisting and arranging care for patients (103, 105) and is feasible and acceptable for patients with obesity and a strong preference for PCP involvement (106).

There are both strengths and weaknesses in this integrative review. A strength is the wide variety of studies that utilised a range of methodological designs and objectives to provide a broad overview of PCPs provision of nutrition care. It can be complex to integrate qualitative and quantitative findings and can introduce bias (30), however, this potential was reduced by two independent researchers screening 35 full-text articles against inclusion and exclusion criteria, and a third reviewer being available for discussion with any discrepancies. Data extraction and quality assessment were also performed by two investigators to ensure consistency. As metasynthesis is a iterative process, emerging themes were constantly
reviewed and revised by the investigators. While the methodological quality did not influence inclusion or exclusion of studies, the results of the integrative review should be interpreted with caution related to the poor quality of some studies. Future studies would benefit from being grounded in theory that attempts to explain the behaviours of the target group. In the case of this review, the COM-B model supports developing multifaceted interventions that simultaneously target PCPs’ capability, motivation and opportunity to provide nutrition care. The findings of the reviewed studies assume there is a fundamental importance of targeting these factors through medical education, although future studies should also consider innovative professional development opportunities for current doctors to improve their practices.

Conclusion

This review suggests that PCPs’ behaviour related to nutrition care is influenced by three interrelated factors: capability, motivation and opportunity. To support PCPs to provide nutrition care, nutrition capability should begin in undergraduate medical training, and continue into PCP training to create synergy between acquisition of knowledge, motivation and opportunity to become confident in providing nutrition care. Concurrent with nutrition education is the need for motivation to provide nutrition care by educators and mentors reinforcing and modeling the role of nutrition in health. The final component, that of opportunity, should be supported in the practice setting and by governmental and professional organizations, since nutrition care is an integral component, not an optional component, of disease prevention and management in contemporary medical practice.


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<tr>
<th>Author (year) Country</th>
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<th>Aim(s)</th>
<th>Relevant Findings</th>
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<tr>
<td>Khandelwal et al., (2018) USA</td>
<td>Survey of Programme Directors (n=40) IM Residents (n=133)</td>
<td>To explore outpatient nutrition practices and education in IM residency programs.</td>
<td>Most residents (61%) reported having very little or no training in nutrition. Participants who had received nutrition education during residency training were more likely to provide nutrition care to patients. Educators reported that a major barrier to nutrition education was lack of faculty expertise in nutrition.</td>
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<td>Dumic et al., (2017) Croatia</td>
<td>Survey of PCPs (n=444)</td>
<td>To examine Croatia’s PCPs nutrition counselling practices and determine factors that influence them</td>
<td>PCPs (77.0%) reported providing nutrition counselling to patients with specific health risks, 18.7% for all patients regardless of their individual risks, and 4.3% did not provide nutrition counselling. PCPs (55.6%) reported personal interest in nutrition and effects on health as reason for implementing nutrition counseling, significant for female PCPs (p &lt; 0.001) and PCPs without chronic diseases (p &lt; 0.001). PCPs reported lack of time (81.6%) as a significant barrier for nutrition counselling.</td>
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<td>Fitzpatrick et al., (2017) USA</td>
<td>c-RT of medical practices (n=14)</td>
<td>To examine the effect of a best practice alert on PCPs’ documentation of obesity-related care and referrals to weight management treatment.</td>
<td>The alert was associated with increased physician meaningful use compliance (17 to 33%), but was not an effective strategy for improving patient access to weight management services.</td>
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<td>Hseiki et al., (2017) Lebanon</td>
<td>Survey of PCPs (n=137)</td>
<td>To assess knowledge, attitude and practice of PCPs regarding nutrition counselling and the barriers to nutrition counselling.</td>
<td>PCPs reported their nutrition knowledge to be good-to-very good and have positive attitudes towards nutritional counselling. PCPs reported barriers to nutritional counselling included lack of time, gaps nutritional knowledge and lack of insurance fees for dietitians.</td>
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<td>Crowley et al., (2016) Australia&lt;sup&gt;36&lt;/sup&gt;</td>
<td>Survey of PCPs (n=322)</td>
<td>To describe PCPs perceived interest, confidence and barriers to support patient to have a healthy diet.</td>
<td>Most PCPs (n=295, 91.6%) reported interest in nutrition and supporting patients to eat well. Most PCPs (n=321, 71.7%) reported moderately high confidence in providing nutrition care. Many PCPs (n=170, 52.8%) cited lack of time as main barrier to provide nutrition care, and most PCPs (n=298, 89.8%) interested in receiving additional education and training.</td>
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<td>Crowley et al., (2016) New Zealand&lt;sup&gt;37&lt;/sup&gt;</td>
<td>Survey of GPR (n=47)</td>
<td>To investigate GPRs’ provision of nutrition advice using patient scenarios.</td>
<td>GPRs’ scored a mean of 7.9±0.2 out of 15 for recall of dietary strategies with scenarios. No association found between GPR scenario scores and confidence to provide nutrition care.</td>
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<td>Crowley et al., (2016) New Zealand&lt;sup&gt;47&lt;/sup&gt;</td>
<td>Focus groups of PCPs (n=48)</td>
<td>To investigate PCPs’ opinions regarding nutrition care provision to patients with chronic disease.</td>
<td>Many PCPs indicated routine provision of basic nutrition care to patients with chronic disease, but perceived limited consultation time and their nutrition competence constrained their capacity to provide nutrition care. Some questioned the benefits of increased nutrition competence.</td>
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<td>Laidlaw et al., (2015) UK&lt;sup&gt;45&lt;/sup&gt;</td>
<td>Video observation of PCPs (n=3)</td>
<td>To investigate weight-related communication between PCPs and patients.</td>
<td>PCPs raised weight in 25% of consultations with overweight and obese patients. PCPs initiated weight discussion more often than patients. Weight discussion attempts often blocked by patients.</td>
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<td>Nowson and O’Connell (2015) Australia&lt;sup&gt;38&lt;/sup&gt;</td>
<td>Survey of PCPs (n=93)</td>
<td>To assess GPRs nutrition knowledge, perceived role in giving nutrition advice and confidence in ability to advise on prevention and treatment of CVD through use of evidence-based nutrition practices.</td>
<td>From the listed dietary strategies, PCPs selected weight loss (84%), reducing saturated fats (90%), a maximum of 2 alcoholic drinks/day (82%) increasing vegetables (83%) and salt reduction (51%) as “highly appropriate” strategies for advise on prevention and treatment of CVD. Only 51% of PCPs recommended salt reduction. 66% PCPs felt “moderately” (51%) or “very” confident (16%) providing nutrition advice.</td>
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<td>Smith et al., (2015) USA (39)</td>
<td>Survey of FM, IM and OB/GYN residents (n=219)</td>
<td>To assess FM, IM, and OB/GYN residents’ preparedness to provide nutrition care.</td>
<td>Residents’ mean self-reported counselling knowledge score was 50.8 (±15.5) on 0-100 scale. FM residents demonstrated greater motivation and perceived norms to provide nutrition care compared with IM and OB/GYN residents. Residents’ exposure to nutrition care had significantly higher self-efficacy and more positive attitudes and professional norms.</td>
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<td>Gorig et al., (2014) Germany (40)</td>
<td>Survey of PCPs (n=4074)</td>
<td>To explore PCPs’ routine provision of nutrition care and factors associated with use of the 5As tool in nutrition care.</td>
<td>Most PCPs (86%) reported high levels of competence in providing nutrition care, 49% felt successful in counselling their patients. PCPs reported routinely asking (68%) and advising (77%) patients to change their dietary habits. 5As were more likely to be used for female PCPs, PCPs with insured patients and patients at higher risk of CVD.</td>
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<tr>
<td>Pollak et al., (2014) USA (46)</td>
<td>Video observation of PCPs (n=49)</td>
<td>To examine the use of MI and length of time spent in weight-related discussions with adolescents</td>
<td>Consultations that used MI were usually shorter. PCPs were more likely to use MI in consultations with female patients (p=0.06) and heavier patients (p=0.02). Less time was spent discussing weight with older patients (p=0.04). More time was spent discussing weight with heavier patients (0.01).</td>
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<tr>
<td>Rohde et al., (2014) Denmark (41)</td>
<td>Survey of PCPs (n=219)</td>
<td>To examine PCPs’ attitudes and practices to prevention and treatment of overweight.</td>
<td>PCPs reported providing care for overweight males more frequently than females despite presenting with the same symptoms. PCPs reported to prescribe lipid lowering medication to overweight male patients more often than overweight female patients.</td>
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<tr>
<td>Hung et al., (2013) USA (42)</td>
<td>Survey of PCPs (n=1000)</td>
<td>To assess PCPs’ attitudes and behaviours about hypertension counselling and determine if their sociodemographic characteristics and personal habits influence adherence to practice guidelines.</td>
<td>Most PCPs advised hypertensive patients to eat a healthy diet (92.2%), reduce salt intake (96.1%), maintain a healthy weight (94.8%), limit alcohol (75.4%) and be physically active (94.4%). Non-smoking PCPs and PCPs who exercised &gt;1/7 were more likely to follow practice guidelines.</td>
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<tr>
<td>Study</td>
<td>Country</td>
<td>Study Design</td>
<td>Objectives</td>
<td>Findings</td>
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<tr>
<td>van Dillen et al., (2013)</td>
<td>Netherlands</td>
<td>Survey of PCPs (n=500)</td>
<td>To investigate determinants of nutrition and physical activity guidance provided by PCPs.</td>
<td>PCPs with greater self-efficacy in nutrition were more likely to report providing nutrition care.</td>
</tr>
<tr>
<td>Bleich et al., (2012)</td>
<td>USA</td>
<td>Survey of PCPs (n=500)</td>
<td>To evaluate PCPs perspectives on obesity care and causes of obesity, including self-perceived competence in treating obese patients.</td>
<td>PCPs reported wanting training (such as in nutrition counselling) and practice changes (such as having scales report BMI) to help improve obesity care. Newer graduates felt more successful helping obese patients lose weight.</td>
</tr>
</tbody>
</table>

c-RT= cluster randomised trial; CVD= cardiovascular disease; FM = family medicine; IM= internal medicine; OB/GYN=obstetrics and gynaecology; GME=graduate medical education; GPR= GP registrars; MI=motivational interviewing; ONPA=obesity, nutrition, and physical activity; USA=United States of America.

†Quality Score ranges from meeting none of four criteria (0) to meeting all criteria (****).