Impact of nutritional counseling by family physicians in primary healthcare on chronic disease prevention: A systematic review of randomized controlled studies

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ABSTRACT

Background: Chronic diseases, heavily influenced by diet, present a global health burden. Family physicians, as primary care providers, are uniquely positioned to deliver nutritional counseling for prevention, yet its effectiveness and implementation challenges warrant systematic evaluation. This systematic review assesses the impact of family physician-delivered nutritional counseling in primary care on chronic disease prevention, examining effects on clinical outcomes, dietary behaviors, self-management, and implementation barriers.

Methods: Nine randomized controlled trials (published between 2014 and 2025) were included after searching multiple databases. Studies involved adults at risk for chronic diseases (e.g., hypertension, diabetes, obesity) receiving structured family physician counseling versus usual care. Outcomes included dietary behaviors, clinical/biochemical risk factors (weight, BMI, blood pressure, lipids, HbA1c), self-management, and barriers.

Results: Nutritional counseling by family physicians yielded modest but statistically significant improvements in key clinical outcomes: weight/BMI reductions (mean: −2.5 to −2.9 kg), HbA1c (−0.15% to −0.29%), LDL-cholesterol (−0.46 mmol/L), and blood pressure in high-risk populations (−4.6 to −5.6 mmHg diastolic). Effects on systolic BP and triglycerides were inconsistent. More robust, sustained improvements were seen in dietary behaviors (increased fruit/vegetable intake) and self-management skills (health-directed behavior, self-monitoring). Web-based counseling matched traditional effectiveness at a lower cost. Key barriers included limited consultation time, insufficient FP nutrition training, lack of tools, and patient-level challenges (food access, cost). Variability in effectiveness was linked to intervention design, intensity, and context.

Conclusion: Family physician-delivered nutritional counseling contributes to chronic disease prevention through modest clinical improvements and stronger gains in patient self-management and dietary behaviors. However, barriers, such as time, training, resource constraints, limit real-world implementation and impact. Scalable solutions include integrating technology (web platforms), team-based care, enhanced FP nutrition education, and addressing social determinants of health.

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1. INTRODUCTION

The rising burden of chronic diseases worldwide poses significant challenges to healthcare systems, emphasizing the pressing need for effective preventive strategies.[1,2] Chronic conditions such as cardiovascular diseases, diabetes, obesity, and related metabolic disorders are largely influenced by modifiable lifestyle factors, among which dietary habits play a critical role.[3,4] Poor nutrition is recognized as a leading contributor to these diseases, and consequently, nutritional counseling has emerged as a vital component of chronic disease prevention and management.[4] Family physicians, often the first point of contact in primary healthcare, are uniquely positioned to deliver this counseling, given their ongoing relationships with patients and their central role in holistic care.[5,6]

Family physicians play a pivotal role in delivering preventive care, including dietary guidance.[5] Unlike specialized dietitians, family physicians frequently interact with patients during routine check-ups, making them well-positioned to provide brief but impactful nutritional advice.[7] However, the extent to which nutritional counseling by family physicians influences long-term dietary behaviors and chronic disease prevention remains an area of ongoing research. Some studies suggest that physician-delivered dietary interventions can lead to improvements in patient outcomes, such as weight loss and better metabolic control.[8,9] Despite the proven effectiveness of such interventions, managing conditions such as diabetes, achieving weight loss, and mitigating risk factors, nutritional counseling remains underutilized in primary care settings.[10] Barriers faced by physicians include limited consultation time, insufficient nutrition training, and lack of structured tools, while patients may struggle with access to healthy foods, financial constraints, and limited nutritional knowledge,[11,12] as limitations to effective nutritional counseling in primary care.[13]

This systematic review of randomized controlled studies aims to evaluate the effectiveness of nutritional counseling provided by family physicians in primary healthcare settings for chronic disease prevention. Specifically, it examines: (1) the impact of physician-led dietary interventions on patient dietary behaviors, (2) measurable health outcomes (e.g., weight, blood pressure, glycemic control), and (3) barriers and facilitators to successful implementation. By synthesizing existing evidence, this review seeks to inform clinical practice and healthcare policies on optimizing nutritional counseling in primary care to mitigate chronic disease risk. Including only randomized controlled studies enhances the reliability of findings with minimal bias and confounding factors due to randomization, and would synthesizes the highest level of evidence for effectiveness of nutritional counseling on outcomes.

2. METHODOLOGY

Study Design

This was a systematic review guided by the following search question: In adult patients attending primary healthcare (P), does structured nutritional counseling provided directly by family physicians/general practitioners (I), compared to usual care or no specific dietary intervention (C), lead to improved dietary behaviors, favorable changes in chronic disease risk factors (e.g., BMI, blood pressure, HbA1c, cholesterol), and reduced incidence or progression of chronic diseases (O)?

Search Strategy

A systematic literature search was conducted to identify relevant randomized controlled trials (RCTs) evaluating the impact of nutritional counseling delivered by family physicians (or general practitioners) in primary healthcare settings on chronic disease prevention.

The search strategy was guided by the predefined PICO framework: **Population** (adult primary care patients); **Intervention** (structured nutritional counseling provided directly by family physicians); **Comparator** (usual care or no specific dietary intervention); and **Outcomes** (dietary behaviors, chronic disease risk factors [e.g., BMI, blood pressure, HbA1c, cholesterol], and chronic disease incidence/progression).

Multiple electronic databases (e.g., MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials) were searched, using a combination of controlled vocabulary (MeSH terms) and keywords related to *nutritional counseling*, *family physicians*, *primary care*, and *chronic diseases* (e.g., cardiovascular disease, diabetes, obesity). Additional studies were identified through manual searches of reference lists of included articles and relevant reviews.

Study Selection Criteria

Studies were included if they met the following criteria:

Design: Randomized controlled trials (RCTs), including pragmatic or cluster RCTs.

Population: Adults (aged ≥18 years) attending primary healthcare settings, particularly those at elevated risk for chronic diseases (e.g., hypertension, prediabetes, metabolic syndrome, obesity, dyslipidemia).

Intervention: Structured nutritional counseling delivered directly by family physicians or general practitioners during routine care. Interventions involving other healthcare professionals (e.g., dietitians, nurses) were excluded unless the family physician was the primary counselor.

Comparator: Usual care (standard primary care without structured nutritional counseling) or no specific dietary intervention.

Outcomes: Measured changes in (a) dietary behaviors, (b) clinical/biochemical risk factors (e.g., weight, BMI, blood pressure, lipid profile, glycemic control), and/or (c) chronic disease incidence/progression. Studies reporting barriers/facilitators to implementation were also included.

Publication period and language: Studies published betweein 2014 and 2025 were the only ones considered to capture the most recent evidence and only English studies were included

Exclusion criteria encompassed non-RCT designs, interventions led exclusively by non-physician providers (e.g., dedicated dietitians), studies in non-primary care settings (e.g., hospitals), and those focusing solely on minor (<18 years of age) and pediatric populations.

Study Selection Process

Two reviewers independently screened titles and abstracts of identified records against the inclusion criteria. Full texts of potentially eligible studies were retrieved and assessed for eligibility. Disagreements were resolved through discussion or consultation with a third reviewer. The screening process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency.

The selection process involved two independent reviewers who first screened titles and abstracts for relevance. Full-text articles of potentially eligible studies were then assessed for final inclusion based on the inclusion criteria. Any discrepancies between reviewers were resolved through discussion or consultation with a third reviewer. Figure 1 shows further details of this process.
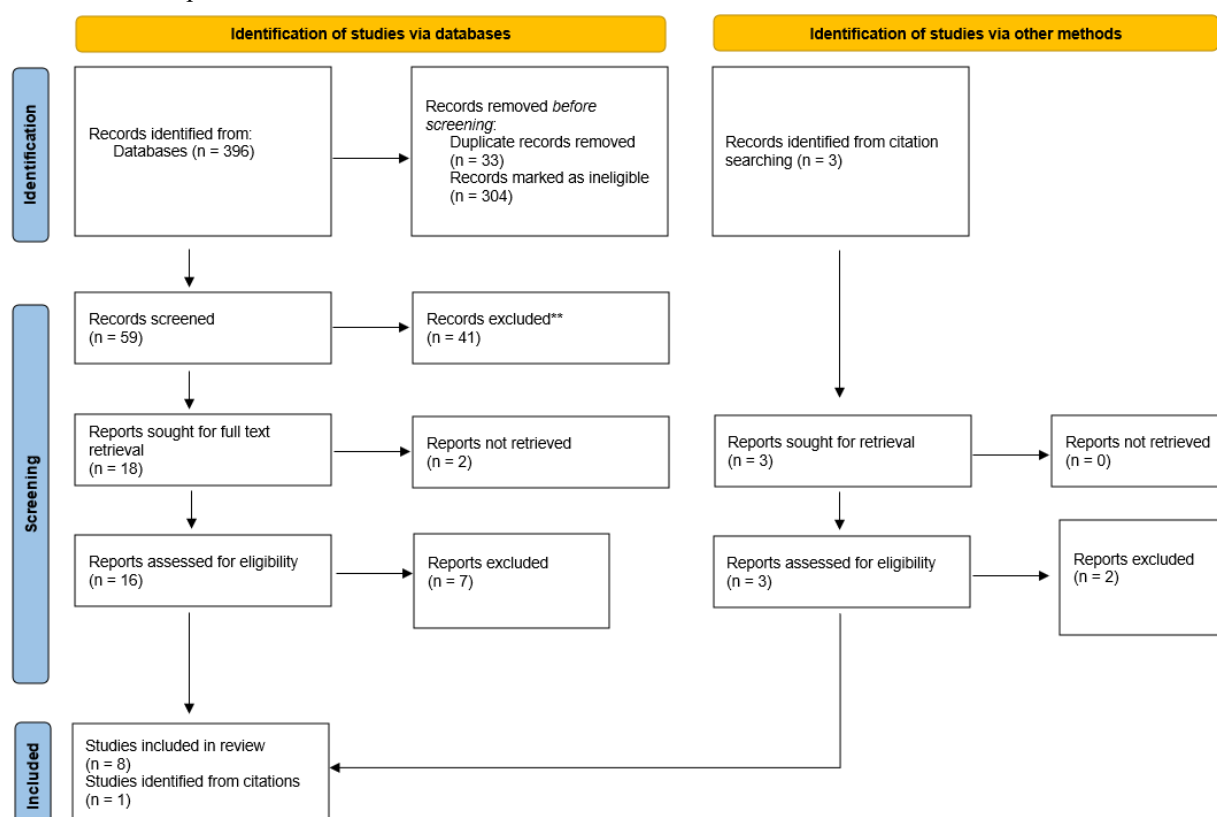

Figure 1. PRISMA Flow chart showing the study selection process

Data Extraction

Data from included studies were extracted using a standardized template, capturing study characteristics (authors, publication year, design, sample size), population details (age, sex, specific chronic disease risk factors, such hypertension, obesity, etc.), intervention (nutritional counseling details, including content, frequency, duration, tools used, nutritional training provided to family physicians), comparator (details of usual care or any other alternative care in the primary health settings), and outcomes (pimary and secondary outcomes, eg.: behavioral, clinical, biochemical, and measurement time points).

We also capture the results for each study, such as quantitative data (mean changes, effect sizes, statistical significance) for all outcomes, and we recorded reported barriers/facilitators to implementation.

Quality Assessment

Risk of bias for each included RCT was assessed independently by two reviewers using the Cochrane Risk of Bias Tool (RoB 2.0),[14] evaluating randomization, allocation concealment, blinding, incomplete outcome data, selective reporting, and other biases. Discrepancies were resolved by consensus.

Data Synthesis

A narrative synthesis was undertaken to comprehensively summarize the findings. First, the impact on dietary behaviors and self-management was assessed, including outcomes such as diet scores, fruit and vegetable intake, physical activity levels, and self-efficacy. Second, the effects on clinical outcomes were examined, focusing on measures such as weight, body mass index (BMI), blood pressure, lipid profiles, glycated hemoglobin (HbA1c), waist circumference, and composite risk scores. Third, the synthesis explored barriers and facilitators to implementation, highlighting factors such as physician time constraints, training gaps, and patient access to necessary resources. Finally, delivery methods and cost-effectiveness were compared, including traditional versus web-based formats, to identify practical and sustainable approaches for intervention delivery.

3. RESULTS

Characteristics of included studies

The nine studies included in our review were published from 2014 to 2025, with the majority (six) published between 2014 and 2018, and only one by Elfakki et al.[15] in 2025. All studies employed randomized controlled designs, primarily pragmatic or cluster randomized controlled trials (RCTs), with multi-site recruitment noted in three studies.[16–18] The populations consistently targeted adult primary care patients (aged 18-79) at elevated risk for chronic diseases, including those with specific conditions (e.g., Grade 1 hypertension, metabolic syndrome, prediabetes), multiple cardiovascular risk factors (e.g., dyslipidemia, hypertension), or obesity/overweight. Sample sizes varied substantially, with most studies enrolling between 197 and 601 participants. Intervention group sizes reflected this variation, from 50 to 349 participants. Geographically, the studies represented diverse primary care settings across North America, Europe, Australia, Asia, and the Middle East

Table 1. Characteristics of included studies

Study, year*	Title	Study design	Population characteristics	Sample
Fortin et al.[20] 2016	Integration of chronic disease prevention and management services into primary care: a pragmatic randomized controlled trial (PR1MaC)	Pragmatic randomized controlled trial	Adult men and women aged 18-75 Have at least one chronic condition or risk factor (diabetes, cardiovascular disease, COPD, asthma, tobacco smoking, obesity, hyperlipidemia, prediabetes, sedentary lifestyle Multimorbidity status: majority have multiple conditions	Total: 332 Intervention: 166 Control: 166
Keyserling et al.[16] 2014	A Comparison of Live Counseling With a Web-Based Lifestyle and Medication Intervention to Reduce Coronary Heart Disease Risk: A Randomized Clinical Trial	Randomized Comparative effectiveness trial Multi-site (conducted in 5 diverse family medicine practices in North Carolina)	Adult men and women aged 35-79 with mean age: 62 years 32% employed full time 88% had health insurance 86% with high blood pressure, 85% with high blood cholesterol, 61% with diabetes	Total: 385 Counselor: 192 Web: 193
Pogosova et al.[19] 2018	Preventive Counselling With the Use of Remote Technologies Provides Effective Control of Metabolic Risk	Randomized controlled study	Adult men and women aged 40-65 - majority female (82%), Cardiovascular diseasse risk	Total: 100 Intervention: 50 Control: 50

	Factors in Patients With High and Very High Cardiovascular Risk		(81% high, 19% very high) and have any two criteria for metabolic syndrome	
Gomez-Huelgas et al.[21] 2015	Effects of a long-term lifestyle intervention program with Mediterranean diet and exercise for the management of patients with metabolic syndrome in a primary care setting	Randomized controlled trial (RCT)	Adults diagnosed with metabolic syndrome from a community health centre in Malaga, Spain	Total: 601 LSI: 298 Usual care: 303
Elfakki et al.[15] 2025	Evaluation of the impact of a family physician-led lifestyle clinic on overweight and obesity: A clustered randomized trial in Hail, Saudi Arabia	parallel, open-label, clustered, randomized trial	Overweight and obese adults Healthy adult volunteers	Total: 198 Intervention: 99 Control: 99
Duijzer et al.[17] 2017	Effect and maintenance of the SLIMMER diabetes prevention lifestyle intervention in Dutch primary healthcare: a randomised controlled trial	Randomized, controlled, multi-site, stratified	Adults aged 40-70 years Increased risk of type 2 diabetes Impaired fasting glucose or high risk score Overweight or obese: 48% overweight, 42% obese History of cardiovascular disease: 15%	Total: 316 Intervention: 158 Control: 158
Wong et al.[22] 2014	Dietary counselling has no effect on cardiovascular risk factors among Chinese Grade 1 hypertensive patients: a randomized controlled trial	Randomized controlled trial, parallel design	Patients aged 40-70 years old Newly diagnosed with Grade 1 hypertension From primary care settings in Hong Kong	Total: 556 Usual care (control): 275 DASH-based dietary counselling (intervention): 281
Baldeón et al.[23] 2018	Impact of training primary care physicians in behavioral counseling to reduce cardiovascular disease risk factors in Ecuador	Randomized clinical trial, controlled, parallel design	Adult patients at high risk of developing type 2 diabetes	Total: 197 Intervention Care Group (ICG): 113

				Usual Care Group (UCG): 84
Harris et al.[18] 2017	An Australian general practice-based strategy to improve chronic disease prevention, and its impact on patient-reported outcomes: evaluation of the preventive evidence into practice cluster randomised controlled trial	Cluster randomized controlled trial, multi-site, longitudinal design	Adult men and women aged 40-69, without chronic diseases (diabetes, cardiovascular disease, renal impairment) Majority female (514 women vs. 225 men) Generally skilled with professional/technical or higher university qualifications (62%) Employed (65%) At increased risk for diet, physical inactivity, or weight issues	Total: 739 Intervention: 349 Control: 390

*Year of publication, **COPD** – Chronic Obstructive Pulmonary Disease, **DASH** – Dietary Approaches to Stop Hypertension, **ICG** – Intervention Care Group, **LSI** – Lifestyle Intervention, **PR1MaC** – Prevention of Chronic Disease through Primary Care, **RCT** – Randomized Controlled Trial, **SLIMMER** – SLIM iMplementation Experience Regionally, **UCG** – Usual Care Group

As shown in Table 2, the findings reveal a complex picture, demonstrating potential benefits of nutritional counseling by family physicians in primary healthcare on chronic disease prevention for specific clinical parameters and self-management skills.

Table 2. Key Findings and Overall Conclusions of Included Studies

Study	Effects	Overall impact and study conclusion
Baldeón et al.[23] 2018	Counseling steps: ICG: 8.9±1.6, UCG: 6.6±2.3 (P = 0.001) - HbA1c: ICG showed greater decreases compared to UCG Total cholesterol: ICG showed greater decreases compared to UCG Weight: Significant improvement in ICG BMI: Significant improvement in ICG LDL-cholesterol: Significant improvement in ICG	Counseling steps were significantly higher in the intervention group compared to the usual care group. The intervention group showed greater decreases in HbA1c and total cholesterol compared to the usual care group. Significant improvements were observed in weight, BMI, HbA1C, total cholesterol, and LDL-cholesterol within the intervention group.
Harris et al.[18] 2017	Proportion of patients reporting BP, cholesterol, glucose, or weight check: No significant change in either group.	No significant changes were found in the proportion of patients reporting health checks or receiving lifestyle advice.

	Lifestyle advice or referral: Less than one in six at-risk patients reported receiving advice or referral at baseline, with little change at follow up. Attempts to improve diet and reduce weight: More intervention patients reported attempts. Diet score: Improved in the intervention group (p = 0.04). Self-reported BMI and PA risk: No significant change in either group. Proportion at-risk for diet, PA, or weight: No significant change in either group. Readiness to change: Increase in intervention group for eating more fruits and vegetables (from 76.7 to 82.8%), eating less fat (from 71.3 to 80.4%), and losing weight (from 69.7 to 79.5%). Patient-reported preventive care: No significant difference between groups. Advice/referral for lifestyle risk factors: No significant difference between groups.	There was a slight improvement in diet scores among intervention patients, but no significant changes in BMI or physical activity risk. The study highlights challenges in implementing effective preventive interventions in general practice due to scalability and diverse practice needs.
Fortin et al.[20] 2016	Health-directed behaviour: RR 1.71 (95% CI 1.13 to 2.59) Emotional well-being: RR 1.73 (95% CI 1.07 to 2.79) Self-monitoring and insight: RR 2.40 (95% CI 1.19 to 4.86) Constructive attitudes and approaches: RR 2.40 (95% CI 1.37 to 4.21) Skill and technique acquisition: RR 1.70 (95% CI 1.14 to 2.53) - Health service navigation: RR 1.93 (95% CI 1.08 to 3.47) Fruit and vegetable consumption: OR 2.36 (95% CI 1.41 to 3.95) - Physical activity: OR 3.81 (95% CI 1.65 to 8.76) Psychological distress: No significant change Self-efficacy for managing chronic disease: No significant difference	The intervention group showed significant improvements in 6 out of 8 self-management domains, as well as in physical health-related quality of life and lifestyle factors like fruit and vegetable consumption and physical activity. These improvements were sustained over a one-year period for several outcomes. The study demonstrated the feasibility and positive outcomes of integrating chronic disease prevention and management services into primary care settings.
Keyserling et al.[16] 2014	Framingham Risk Score (FRS): Counselor-delivered: -2.3% at 4 months, -1.9% at 12 months Web-based: -1.5% at 4 months, -1.7% at 12 months Diet and physical activity: Improvements in both groups Medication adherence: Increases in both groups Weight loss: Slight weight loss at 12 months A1c levels: Reduction in counselor group	Both counselor-delivered and web-based interventions reduced CHD risk over 12 months. The web-based format was less expensive and equally effective as the counselor-delivered format at 12 months. The interventions were highly acceptable to participants, with the web format being cost-effective.

	Quality of life: Sustained improvement in physical component measure Cost-effectiveness: Web-based intervention was less expensive ($110 vs $207 per participant)	
Pogosova et al.[19] 2018	Diastolic blood pressure: Intervention group decreased by 5.62±7.7 mm Hg (significant) Total cholesterol: Intervention group decreased by 0.5±0.83 mmol/l (significant) Low-density lipoprotein cholesterol: Intervention group decreased by 0.46±0.62 mmol/l (significant) Systolic blood pressure: Intervention group decreased by -17.76±16.2 mm Hg (significant), Control group decreased by -13.44±15.6 mm Hg (significant)	The study assessed the impact of preventive counseling with a focus on diet modification on lipid and metabolic parameters in patients with high or very high cardiovascular risk. The intervention group showed significant improvements in diastolic blood pressure and cholesterol levels compared to the control group. Both groups experienced significant decreases in systolic blood pressure.
Gomez-Huelgas et al.[21] 2015	Abdominal circumference: LSI: -0.4 ± 6 cm (p < 0.001 vs. usual care), Usual care: +2.1 ± 6.7 cm Systolic blood pressure: LSI: -5.5 ± 15 mmHg (p = 0.004 vs. usual care), Usual care: -0.6 ± 19 mmHg Diastolic blood pressure: LSI: -4.6 ± 10 mmHg (p < 0.001 vs. usual care), Usual care: -0.2 ± 13 mmHg HDL-cholesterol: LSI: +4 ± 12 mg/dL (p = 0.05 vs. usual care) and Usual care: +2 ± 12 mg/dL Fasting plasma glucose: LSI: -4 ± 35 mg/dl (p = 0.43 vs. usual care) and Usual care: -1 ± 32 mg/dl Triglyceride concentration: LSI: -0.4 ± 83 mg/dl (p = 0.28 vs. usual care) and Usual care: +6 ± 113 mg/dl	Intensive lifestyle intervention (LSI) with Mediterranean diet and exercise in primary healthcare resulted in significant improvements in abdominal circumference, blood pressure, and HDL-cholesterol levels compared to usual care. There were limited effects on glucose and triglyceride levels, with no significant differences between LSI and usual care.
Elfakki et al.[15] 2025	Reduction in BMI in Intervention group: mean BMI before = 36.74, mean BMI after = 33.82, mean difference = 2.91 (P < 0.001) Improvements in WC measurements in Intervention: notable improvements, but not statistically significant Weight loss: 5% weight loss	The lifestyle clinic led by a family physician significantly reduced BMI in overweight and obese adults. The intervention group showed notable improvements in waist circumference measurements, although these were not statistically significant.

		The joint lifestyle clinic was effective in reducing BMI and improving waist circumference measurements.
Duijzer et al.[17] 2017	Weight reduction: -Intervention: -2.7 kg (95% CI: −3.7; −1.7) at 12 months, -2.5 kilograms (95% CI: −3.6; −1.4) at 18 months Fasting insulin:-Intervention: -12.1 pmol/l −1 (95% CI: −19.6; −4.6) at 12 months, -8.0 pmol/l −1 (95% CI: −14.7; −0.53) at 18 months Fasting glucose:-Intervention: -0.2 mmol l/1 -Control: -0.01 mmol/ 1 2-h glucose: -Intervention: -0.5 mmol l/1 -Control: 0.2 mmol/ 1 HbA1c: -Intervention: -0.15% -Control: -0.07% HOMA-IR: -Intervention: -0.29 -Control: 0.02 Physical activity: -Intervention: Increased time on vigorous activities by 65.7 min per week at 12 months - Control: Decreased time on vigorous activities by -80.2 min per week at 12 months Physical fitness: - Intervention: Improved by 25.1 m at 12 months - Control: Improved by 2.3 m at 12 months Quality of life: Health transition: Improved in intervention group (P < 0.05) Physical functioning: Improved in intervention group (P < 0.05) General mental health: Improved in intervention group (P < 0.05) Mental component score: Improved in intervention group (2.4 vs -0.1)	The SLIMMER lifestyle intervention significantly improved anthropometry and glucose metabolism, with sustained weight loss and reductions in fasting insulin levels at 12 and 18 months. The intervention led to improvements in dietary intake, physical activity, and quality of life, which were maintained over time. The study demonstrated sustained benefits in weight reduction and other lifestyle factors, indicating long-term effectiveness in diabetes prevention.
Wong et al.[22] 2014	Blood pressure: - Systolic BP at 6 months: -0.7 mmHg (95%CI -3.0-1.5) - Systolic BP at 12 months: -0.1 mmHg (95%CI -2.4-2.2) Diastolic BP at 6 months: -1.0 mmHg (95%CI -2.7-0.7) - Diastolic BP at 12 months: -1.1 mmHg (95%CI -2.9-0.6) Lipid profile: No significant differences between intervention and control groups. Body mass index (BMI): No significant differences between intervention and control groups.	Dietary counseling using the DASH diet had no significant effect on reducing cardiovascular risk factors in Chinese Grade 1 hypertensive patients. The intervention group did not show a significantly greater reduction in blood pressure compared to the control group. Improvements in lipid profile and BMI were observed, but no significant differences were detected between intervention and control groups.

*Year of publication, **A1c** – Glycated Hemoglobin, **BMI** – Body Mass Index, **BP** – Blood Pressure, **CHD** – Coronary Heart Disease, **CI** – Confidence Interval, **DASH** – Dietary Approaches to Stop Hypertension, **HbA1c** – Hemoglobin A1c, **HDL** – High-Density Lipoprotein, **HOMA-IR** – Homeostasis Model Assessment of Insulin Resistance, **ICG** – Intervention Care Group, **LDL** – Low-Density Lipoprotein, **LSI** – Lifestyle Intervention, **OR** – Odds Ratio, **PA** – Physical Activity, **RR** – Relative Risk, **SLIMMER** – SLIM iMplementation Experience Regionally, **UCG** – Usual Care Group, **WC** – Waist Circumference

Impact on clinical outcomes

The evidence suggests that family physician-delivered nutritional counseling can lead to statistically significant, though often modest, improvements in key clinical risk factors for chronic diseases across several studies.

As reported by RCT studies, significant weight and BMI reductions were observed in the intervention groups.[15,17,23] Duijzer et al.[17] demonstrated sustained weight loss (-2.7 kg at 12 months, -2.5 kg at 18 months) alongside improvements in insulin sensitivity (reduced fasting insulin, HOMA-IR) and glucose metabolism (reduced 2-h glucose, HbA1c) in high-risk diabetes patients.

Pogosova et al.[19] found significantly greater reductions in diastolic blood pressure (-5.62 mm Hg) and total/LDL cholesterol in high cardiovascular risk patients receiving counseling compared to controls. Gomez-Huelgas et al.[21] also reported significant systolic (-5.5 mmHg) and diastolic (-4.6 mmHg) blood pressure reductions with intensive lifestyle intervention (LSI) compared to usual care in metabolic syndrome patients. However, Wong et al.[22] found no significant difference in blood pressure reduction between DASH-based counseling and usual care in Grade 1 hypertensive patients.

Significant improvements in total cholesterol and LDL-cholesterol were reported by Baldeón et al.[23] and Pogosova et al.[19] Gomez-Huelgas et al.[21] also noted a significant increase in HDL-cholesterol with LSI. Baldeón et al.[23] and Duijzer[17] et al. demonstrated greater reductions in HbA1c in their intervention groups.

Keyserling et al.[16] achieved significant reductions in Framingham Risk Score (FRS) for coronary heart disease (CHD) at 4 months using both counselor-delivered and web-based formats, with sustained reductions at 12 months, while Gomez-Huelgas et al.[21] showed a significant decrease in abdominal circumference with LSI compared to an increase in the usual care group, unlike Elfakki et al.[15] who reported statistically insignificant improvements in waist circumference alongside significant BMI reduction.

Impact on dietary behaviors and self-management

While clinical biomarkers showed clearer positive trends in some studies, impacts on dietary behaviors and self-management skills were remain variable. Fortin et al.[20] demonstrated the most robust improvements in patient self-management capabilities, and these improvements were sustained over one year. Harris et al.[18] found a significant improvement in diet score within the intervention group (p=0.04) and increased readiness to change behaviors like eating

more fruits/vegetables and reducing fat intake. Similarly, Fortin et al.[20] also reported significantly increased fruit/vegetable consumption (OR 2.36) and physical activity (OR 3.81) in their intervention group. However, Harris et al.[18] noted that less than 16% of at-risk patients actually reported receiving lifestyle advice or referral at follow-up, indicating a gap in intervention delivery. Fortin et al. [20] and Duijzer et al.[17] reported significant increases in physical activity levels, physical functioning, general mental health, and mental component scores of quality of life (QoL).

Delivery methods and cost-effectiveness

Keyserling et al.[16] provided new insights by comparing counselor-delivered and web-based formats. While counselor-delivered showed a slightly larger FRS reduction at 4 months, both formats were equally effective at reducing CHD risk at 12 months. However, the web-based intervention was substantially less expensive ($110 vs. $207 per participant) and highly acceptable to patients.

Implementation challenges and variable effectiveness

A critical finding across multiple studies is the gap between potential effectiveness and real-world implementation. Harris et al.[18] highlighted the challenges of scaling preventive interventions in general practice, resulting in low rates of advice/referral, minimal changes in reported health checks or risk factors. Reported barriers included limited consultation time, insufficient training, and a lack of structured tools, as well as patient barriers like access to healthy food and knowledge gaps.

There was also a variability in reported effectiveness by some studies, contrasting the overall findings of most included studies. Harris et al.[18] found no significant changes in BMI, physical activity risk, or the proportion of patients at risk for diet/PA/weight issues. Wong et al.[22] found no significant differences in blood pressure, lipids, or BMI between their DASH intervention and usual care groups. Gomez-Huelgas et al.[21] found no significant differences in fasting glucose or triglycerides between LSI and usual care. This variability suggests effectiveness is highly dependent on intervention design, intensity, patient population, context, and potentially, family physicians' skill and time commitment.

Key identified themes and sub-themes

The findings can be categorized into 4 key themes: Clinical outcomes; dietary behaviors and self-management; implementation and effectiveness; and delivery methods (Table 3).

		Low rates of patients reporting receiving advice noted as a barrier.	
	Physical Activity (PA) & QoL	Significant increases in PA levels and physical fitness reported. Significant improvements in quality of life domains: physical functioning, general mental health, mental component scores, physical health-related QoL.	Fortin et al.,[20] Duijzer et al.[17]
Implementation barriers & Variable Effectiveness	Physician Barriers	Limited consultation time, insufficient nutrition training, lack of structured tools identified as major barriers to delivery. Low rates of advice/referral documented.	Harris et al.[18]
	Patient Barriers	Patient struggles include access to healthy foods, financial constraints, and limited nutritional knowledge.	Harris et al.[18]
	Variable Effectiveness	Significant heterogeneity in outcomes: Some studies showed clear benefits across multiple parameters, others found minimal or no significant differences vs. control/usual care (e.g., BP, lipids, BMI, glucose/triglycerides in specific populations). Effectiveness highly context-dependent.	Wong et al.,[22] Harris et al.,[18] Gomez-Huelgas et al.,[21] Baldeón et al.,[23] Fortin et al.,[20] Duijzer et al.[17]
Delivery Methods	Format (Counselor vs. Tech)	Counselor-delivered and web-based formats both significantly reduced CHD risk (FRS) at 12 months. Counselor had slightly larger effect at 4 months only.	Keyserling et al.[16]
	Cost-Effectiveness	Web-based intervention was substantially less expensive than counselor-delivered ($110 vs. $207 per participant) and equally effective at 12 months. Highly acceptable to patients.	Keyserling et al.[16]

Key Theme	Sub-Theme	Findings Summary	Studies
Clinical Outcomes	Weight/BMI Reduction	Significant reductions observed in intervention groups. Effects were often modest but clinically meaningful and sustained over time (e.g., 12-18 months).	Baldeón et al,[23] Elfakki et al.,[15] Duijzer et al.[17]
	Blood Pressure	Mixed results: Significant improvements in diastolic BP & systolic BP reported in some studies, particularly for high-risk patients. Other studies found no significant difference vs. usual care.	Pogosova et al.,[19] Gomez-Huelgas et al.,[21] Wong et al. [22]
	Lipid Profile	Significant improvements in Total Cholesterol and LDL-Cholesterol reported. One study found a significant increase in HDL-Cholesterol.	Baldeón et al.,[23] Pogosova et al.,[19] Gomez-Huelgas et al.[21]
	Glycemic Control	Significant reductions in HbA1c and improvements in insulin sensitivity/fasting insulin in high-risk or diabetic populations. Sustained effects observed.	Baldeón et al.,[23] Duijzer et al.[17]
	Metabolic Syndrome/WC	Significant reduction in abdominal circumference/waist circumference reported in metabolic syndrome patients. Notable improvements (though not always statistically significant) also observed.	Gomez-Huelgas et al.,[21] Elfakki et al.[15]
	Composite Risk Scores	Significant reduction in Framingham Risk Score (CHD risk) at 4 & 12 months using both counselor and web-based formats.	Keyserling et al.[16]
Behavioral & Self-Management Outcomes	Self-Management Skills	Robust, significant, and sustained (1 year) improvements across multiple domains: health-directed behavior, emotional well-being, self-monitoring, constructive attitudes, skill acquisition, health service navigation.	Fortin et al.[20]
	Dietary Behaviors	Significant improvements in overall diet scores and increased readiness to change (e.g., eat more F&V, reduce fat). Significantly increased fruit & vegetable consumption reported.	Harris et al.,[18] Fortin et al.[20]

BP – Blood Pressure, **BMI** – Body Mass Index, **CHD** – Coronary Heart Disease, **F&V** – Fruits and Vegetables, **FRS** – Framingham Risk Score, **HbA1c** – Hemoglobin A1c, **HDL** – High-Density Lipoprotein, **LDL** – Low-Density Lipoprotein, **PA** – Physical Activity, **QoL** – Quality of Life, **WC** – Waist Circumference

Overall, nutritional counseling by family physicians can lead to statistically significant improvements in weight, BMI, BP (in some contexts), lipids, glycemic control, and metabolic syndrome markers, though effects are often modest. Improvements in patient self-management skills, dietary behaviors (readiness, F&V intake), physical activity, and quality of life were often more pronounced and sustained than clinical biomarkers in successful interventions. However, the reported barriers (physician time/training, patient access/knowledge) explain the frequent underutilization of counseling and the highly variable effectiveness seen across studies. Real-world impact is often less than potential. Web-based or blended models demonstrated equivalent effectiveness to traditional counseling at lower cost and high patient acceptability, suggesting a viable path to overcome scalability barriers. Then, effectiveness is highly dependent on the specific intervention design (intensity, structure, components), patient population, practice setting, and the ability to address implementation barriers.

4. DISCUSSION

This systematic review synthesizes evidence from nine diverse studies investigating the impact of nutritional counseling delivered by family physicians in primary care on chronic disease prevention outcomes. The findings reveal a complex picture, demonstrating potential benefits for specific clinical parameters and self-management skills, but also highlighting significant variability in effectiveness and persistent implementation challenges.

The modest but significant improvements in clinical parameters like weight, HbA1c, and lipids observed in several included studies align broadly with findings from previous systematic reviews and meta-analyses.[24–26] Our findings also alin with the 2020 US Preventive Services Task Force (USPSTF) evidence review that concluded that behavioral counseling interventions in adults with CVD risk factors are associated with small but statistically significant reductions in blood pressure, LDL-cholesterol, fasting glucose, and adiposity, alongside a lower pooled relative risk for cardiovascular events (0.80, 95% CI 0.73-0.87).[27] This suggests that the effects observed from family physician-delivered counseling, while often modest individually, contribute to a broader evidence base supporting the potential of primary care behavioral interventions for risk reduction. However, the magnitude of effect seen in this review often appears smaller than that achieved by interventions delivered by dedicated nutrition professionals or highly structured programs. Sialvera et al.,[28] in a direct comparison RCT, found that structured nutritional counseling by dietitians led to significantly greater improvements in LDL-cholesterol, total cholesterol, and triglycerides at 12 weeks compared to "standard advice" from physicians. Similarly,

Naz et al.,[29] in a broader review of structured nutritional interventions, reported more weight loss (4-10 kg) and BMI reductions (1.5-3.5 units) alongside sharper improvements in HbA1c and blood pressure, particularly when interventions included behavioral support or mobile health components. In contrast, a RCT by Van Damme et al. [30] found dietary counseling by a dietitian in CVD patients slightly improved diet quality but did not translate into significant improvements in cardiovascular risk profile, blood pressure, LDL-C, or body weight, underscoring the difficulty in achieving clinically significant biomarker changes even with specialist input. This comparative perspective suggests that while family physicians' nutritional counseling can lead to positive change, the intensity, structure, and perhaps specific expertise of the counselor significantly influence the magnitude of clinical benefit achievable within the constraints of primary care.

Another finding of this review is the relatively stronger and more consistent impact on patient self-management capabilities and certain behavioral outcomes compared to clinical biomarkers. These include sustained (1-year) improvements across multiple domains of self-management (health-directed behavior, emotional well-being, self-monitoring, constructive attitudes, skill acquisition, health service navigation) alongside increased fruit/vegetable consumption and physical activity.[20] Moreover, there were significant improvements in physical activity, physical functioning, and mental health components of quality of life.[17] This aligns with the USPSTF review's observation that behavioral counseling interventions tend to have a clearer impact on dietary changes than on physical activity.[27] It suggests that family physician-delivered counseling (which is often brief and focused on actionable advice within the consultation) may be particularly effective at empowering patients, building skills, and motivating initial behavioral shifts like increasing fruit/vegetable intake, which precede or lead to later biomarker improvements.[31,32] Campbell et al.[33] observed a similar pattern in chronic kidney disease patients, where a self-management intervention led to small, initial improvements in sodium intake, blood pressure, proteinuria, weight, and self-efficacy, but these benefits diminished over time after the intervention ceased, emphasizing the need for ongoing support to maintain behavioral gains. The findings highlight the critical role of family physicians in fostering patient agency and self-efficacy. Patient agency and self-efficacy are core components of chronic disease self-management, encompassing a patient's confidence and ability to actively participate in their healthcare, often undervalued in purely biomedical outcome measures.[34,35]

This review showed the impact of implementation barriers on the real-world effectiveness and utilization of nutritional counseling by family physicians. The gap between potential efficacy (demonstrated in some trials) and actual effectiveness in routine practice is pronounced. This underutilization directly reflects the barriers consistently identified, such as lack of time, inadequate training, absence of tools, and patient-level obstacles (access, cost, knowledge). This is not unique to nutrition counseling but is a well-documented challenge in implementing preventive services in primary care globally.[36–38] The root cause of the training deficit is highlighted by Devries et al.,[39] who reported severe deficiency of nutrition education in medical training despite strong evidence linking diet to health outcomes. This deficiency leaves family physicians ill-equipped and less confident in providing dietary advice, contributing to the underutilization observed. Furthermore, the time constraints inherent in modern primary care practice make it challenging to address complex lifestyle issues adequately within standard consultation rooms.[40] These systemic barriers explain why the promising results seen in some structured, often research-intensive interventions, like those by Baldeón et al.[23] or Fortin et al.,[20] may not readily translate to the everyday reality of busy primary care clinics.

Given these barriers, the findings regarding delivery models may highlight some solutions. Web-based nutritional counseling was equally effective as traditional counselor-delivered intervention in reducing coronary heart disease risk at 12 months, while being substantially less expensive ($110 vs. $207 per participant) and highly acceptable to patients, which points to a viable and scalable solution. A previous systematic review and meta-analysis showed that technology-assisted models (web-based, apps, telehealth) offer potential solutions to overcome time constraints as they help extend reach beyond the consultation, standardize content delivery, provide ongoing patient support, and potentially reduce costs.[41] However, the evidence on technology's effectiveness is mixed. Another systematic review by Vegting et al.[42] found that internet programs targeting multiple lifestyle interventions in primary/secondary care were not superior to usual care alone in improving cardiovascular risk profiles, with inconsistent results for weight loss and blood pressure. This suggests that simply delivering content digitally is insufficient. Thus, successful models likely need to be well-designed, interactive, potentially integrated with human support, and tailored to patient needs and contexts.[43] When well done, Keyserling et al.[16] showed that it is effective..

Team-based care emerges as another crucial strategy. While this review focused on family physician-delivered counseling, integrating other professionals is often essential. Jeejeebhoy et al.[44] demonstrated the feasibility and effectiveness of a family physician-led, team-based lifestyle intervention program for metabolic syndrome in primary care, resulting in reversal of MetS in 19% of patients and significant improvements in diet quality, VO2max, and cardiovascular risk scores. Similarly, an RCT by Casals et al.[45] showed that nutritional counseling by dietitians/nutritionists for malnourished hospital patients significantly improved nutritional state, quality of life, and reduced readmissions compared to controls. Sialvera et al.[28] directly demonstrated dietitian superiority for lipid management. This underlines that the optimal model may not be family physicians working in isolation, but rather acting as the central coordinators within a multidisciplinary team (including dietitians, nurses, health coaches), leveraging their unique relationship with the patient to initiate counseling, reinforce messages, and refer appropriately for more support when needed. This is also emfacized by by Jarl et al.[46] who

reported that nurse practitioners can also effectively lead DASH diet and lifestyle counseling within primary care teams, improving diet scores and achieving weight loss in hypertensive patients.

This systematic review confirms that nutritional counseling delivered by family physicians in primary care can contribute to chronic disease prevention, yielding modest improvements in key clinical risk factors and more substantial gains in patient self-management skills and certain health behaviors. However, the evidence is inconsistent, and the true potential is frequently unrealized due to pervasive systemic, practitioner, and patient-level barriers. The underutilization is also highlighted, aligning with the literature and is reflected in the variable outcomes and low rates of advice delivery documented in several studies.

Overcoming these barriers requires multi-faceted strategies. Integrating substantive, practical nutrition education into undergraduate and postgraduate medical training, and offering continuing professional development for practicing family physicians, is fundamental to building competence and confidence.[13,39,47] Healthcare systems must recognize the value of preventive counseling by allocating adequate time within consultations or creating specific preventive care slots. Reimbursement structures should incentivize effective lifestyle counseling. There should be structured tools and decision support to family physicians in practice as providing them with validated, brief assessment tools, decision aids, and patient resources (handouts, recipes, apps) can streamline counseling and improve consistency. Developing and implementing well-designed, evidence-based digital health tools (web platforms, apps) for patient education, self-monitoring, and tailored feedback, potentially in blended models with brief family physicians' support, as also shown effective by Keyserling et al.,[16] offers scalability and cost-effectiveness. Optimizing the primary care team structure to include dietitians, nurses, or health coaches helps family physicians deliver effective counseling and allows them to refer to other team members for more intensive nutritional therapy when indicated.[44] Finally, there is a need to address social determinants by recognizing and developing strategies, linking them with community resources and food availability, to mitigate patient barriers like food insecurity and financial constraints for effective interventions.

This systematic review, limited to randomized controlled studiews, ensures high-quality evidence and methodological rigor by focusing on the gold standard study design for evaluating interventions. It synthesizes both clinical outcomes (BMI, HbA1c, lipid profiles) and behavioral/self-management impacts (dietary changes, patient empowerment), offering a holistic perspective on nutritional counseling in primary care. The inclusion of nine geographically diverse studies enhances generalizability, while analysis of implementation barriers (physician time, training gaps) and facilitators (web-based delivery, team-based care) provides actionable insights. A very recent RCT, published in 2025, strengthens relevance, and the review's structured narrative synthesis with thematic tables organizes heterogeneous findings effectively. Cost-effectiveness comparisons, such as web-based versus traditional formats, add practical value for policymakers and healthcare systems.

However, heterogeneity in interventions, populations, outcomes, and follow-up periods (6–18 months) precluded meta-analysis. Excluding non-randomized and qualitative studies may miss real-world insights, while publication bias could overrepresent positive findings. Reliance on self-reported behaviors introduces social desirability bias, and short follow-ups limit understanding of long-term effects. The focus on physician-delivered counseling overlooks interdisciplinary contributions, and the concentration in high-income settings restricts applicability to resource-limited regions. Inconsistent reporting of physician training and fidelity to protocols further complicates interpretation of causal mechanisms.

5. CONCLUSION

Family physicians possess a unique and vital position to influence dietary behaviors and contribute to chronic disease prevention through nutritional counseling. While the clinical impact observed in this review is often modest compared to more intensive or specialist-led interventions, the potential to empower patients and improve self-management is significant. Realizing this potential consistently, however, necessitates moving beyond simply proving efficacy in research settings. It demands a concerted effort to dismantle implementation barriers through systemic changes, enhanced training, innovative delivery models like effective technology integration and team-based care, and a healthcare environment that truly values and supports preventive medicine. The success of family physician-delivered nutritional counseling hinges not just on the physician's advice, but on the ecosystem that enables its effective delivery and patient uptake.

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