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Cost-Effectiveness of Community Pharmacist-Led Smoking Cessation Programs (2015–2025): A Meta-Analysis Review

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Abstract

To systematically review the types of economic evaluations used for community pharmacist-delivered smoking cessation programs and to conduct a meta-analysis of their clinical effectiveness. Methods A systematic search was conducted in PubMed, Scopus, Science Direct, EBSCO, and ProQuest for studies published between 2015 and 2025. The participant criteria are active smokers aged over 18 years, not limited by gender, and the program focuses on community settings. Full economic evaluations of pharmacist-led smoking cessation programs for adults were included. Study quality was assessed using the CHEERS 2022 checklist. Clinical effectiveness data were pooled using a random-effects meta-analysis. The protocol was registered with PROSPERO (CRD420251117242). Results out of 681 identified records, four studies met the inclusion criteria, encompassing more than 1,300 participants. Interventions were conducted in Spain, Canada, Malaysia, and the USA. The majority used cost-effectiveness analyses and reported significant improvements in smoking cessation rates. Meta-analysis showed that pharmacist-led programs significantly improved quit rates (pooled OR = 2.74; 95% CI: 1.83–4.11; p < 0.001) with low heterogeneity (I^2 = 8.8%). ICERs were consistently below accepted cost-effectiveness thresholds. Based on a threshold analysis using a WTP of CAD$20,000 per QALY, the intervention by Phillips et al. remains cost-effective. The intervention would remain below the threshold unless total costs increased by 23.6% or QALY gains reduced by more than 18%. Conclusion community pharmacist-delivered smoking cessation programs are a clinically effective and economically favorable public health strategy. Policymakers should consider establishing reimbursement models to facilitate their broader implementation.

Keywords: *Community pharmacy services, Cost benefit analysis, Health economics, Pharmacists, Smoking cessation*

INTRODUCTION

The global tobacco epidemic remains a leading cause of preventable morbidity and mortality, claiming over 8 million lives each year worldwide (World Health Organization, 2025). Beyond its devastating health impact, tobacco use imposes a vast economic burden, with total costs estimated at US$1.4 trillion annually, equivalent to 1.8% of global GDP, through both direct healthcare expenses and indirect productivity losses due to tobacco-related diseases such as cancer and chronic obstructive pulmonary disease (Goodchild et al., 2018; Martínez et al., 2024). Despite the enormous social and economic toll, global investment in tobacco control remains disproportionately low compared to tobacco tax revenues, which reached US$269 billion in 2013–2014, while only about US$1 billion was allocated to tobacco control initiatives (Ibrahim et al., 2016). This imbalance underscores the urgent need for interventions that are not only clinically

Vol. 4. No. 4 Desember 2025
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effective but also economically efficient to maximize the impact of limited public health resources.

Community pharmacists play a pivotal role in this effort as they are among the most accessible healthcare professionals, providing trusted health services across diverse and underserved communities (Cantor et al., 2015). Pharmacist-led smoking cessation programs, combining behavioral counseling with pharmacotherapy such as nicotine replacement therapy (NRT), have been shown to more than double the likelihood of successful quitting compared with usual care (Brown et al., 2016; Cantor et al., 2015). These findings demonstrate the potential of pharmacists to expand the reach of tobacco cessation services and contribute meaningfully to reducing smoking prevalence at the population level.

Despite their strategic accessibility, community pharmacies face considerable operational barriers in delivering smoking cessation interventions. Pharmacists often encounter high workloads, limited consultation time, and inadequate reimbursement models, which can constrain the consistent implementation of structured cessation services. Additionally, disparities in service availability, particularly in rural and underserved areas, pose challenges to equitable access. These systemic and logistical issues may hinder the scalability and sustainability of pharmacist-led interventions, highlighting the need to assess not only their clinical and economic value, but also their feasibility within routine community pharmacy operations.

Nevertheless, evidence of clinical effectiveness alone is often insufficient to support policy adoption and sustainable funding in resource-limited health systems (Hilts et al., 2024). Economic evaluation serves as a crucial framework for assessing an intervention's value for money by comparing costs and outcomes across alternatives (Drummond et al., 2015; Leung, 2016). While the clinical benefits of pharmacist-led smoking cessation are well established, economic evidence remains fragmented and rarely synthesized alongside quantitative assessments of clinical outcomes (Rabarison et al., 2015). However, no recent systematic review has synthesized economic outcomes alongside quantitative clinical effectiveness, particularly in community pharmacy settings. Therefore, this study aims to systematically review and integrate recent evidence on both the economic evaluations and clinical effectiveness of community pharmacist-delivered smoking cessation programs.

METHOD

This systematic review and meta-analysis was designed and conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021). To ensure transparency and minimize bias, the review protocol was registered prospectively with the International Prospective Register of

Vol. 4. No. 4 Desember 2025
e-ISSN: 2830-5558 p-ISSN: 2830-5744

Systematic Reviews (PROSPERO), under the registration number CRD420251117242 (Sideri et al., 2018).

Studies were deemed eligible for inclusion based on the Population, Intervention, Comparison, and Outcome (PICO) framework (Page et al., 2021):

1. Population (P): Adult smokers aged 18 years or older.
2. Intervention (I): Smoking cessation programs, including counseling and/or pharmacotherapy, delivered by pharmacists in a community pharmacy setting.
3. Comparison (C): Usual care, no intervention, or other interventions not involving pharmacists as the primary provider.
4. Outcome (O): A full economic evaluation, such as a cost-effectiveness analysis (CEA), cost-utility analysis (CUA), cost-benefit analysis (CBA), or cost-analysis (CA), presented alongside measures of clinical effectiveness (e.g., quit rates, quality-adjusted life years).

Inclusion criteria were restricted to peer-reviewed, full-text articles published in the English language between January 2015 and August 2025. Reviews, editorials, commentaries, conference abstracts, and studies that did not include a full economic evaluation were excluded.

A comprehensive and systematic literature search was conducted across five electronic databases: PubMed, Scopus, Science Direct, EBSCO, and ProQuest. The search was finalized on to identify all relevant studies published within the specified timeframe (Page et al., 2021). The search strategy combined keywords and Medical Subject Headings (MeSH) terms across three core concepts: (1) the intervention provider (e.g., "pharmacist," "community pharmacy"); (2) the health condition (e.g., "smoking cessation," "tobacco use"); and (3) the type of analysis (e.g., "economic evaluation," "cost-effectiveness analysis"). An example of the full search strategy for PubMed was: ((pharmacist* OR "community pharmacy" OR "pharmacy-based") AND ("smoking cessation" OR "smoking cessation" OR "tobacco use") AND ("economics" OR "economic evaluation" OR "cost-effectiveness" OR "cost utility")) with filters for publication dates (2015-2025) and English language. Full search strategy will be shown in Supplementary File 1.

Following the removal of duplicate records, two reviewers independently screened the titles and abstracts of all identified articles against the predefined eligibility criteria. The full texts of potentially relevant articles were then retrieved and assessed for final inclusion. Any differences or disagreements between the reviewers at both stages are resolved through discussion and consensus until a good joint decision is reached. The screening and selection process uses the help of Rayyan software.

A standardized data extraction form was developed and used by two reviewers independently to collect relevant information from the included studies. The extracted data included: first author and

Vol. 4. No. 4 Desember 2025
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publication year, country of study, population characteristics, details of the intervention and comparator, type of economic evaluation, analytical perspective, time horizon, study design, cost components, clinical effectiveness outcomes (e.g., quit rates, QALYs), and the primary economic outcomes and conclusions (e.g., Incremental Cost-Effectiveness Ratio). The collection of complete information related to the selected full text is collected in the Mendeley Reference Manager.

The methodological quality and transparency of reporting for the economic evaluation component of each included study were critically appraised using the 28-item Consolidated Health Economic Evaluation Reporting Standards (CHEERS) 2022 checklist (Husereau et al., 2022). This tool is the gold standard for assessing the quality of economic evaluations. Two reviewers conducted the quality assessment independently, with disagreements resolved by consensus.

To synthesize clinical effectiveness and economic outcomes across included studies, several effect measures were employed: For smoking cessation outcomes, the primary measure used was the Odds Ratio (OR), comparing the likelihood of quitting smoking between intervention and control groups.

In terms of economic evaluation, Incremental Cost-Effectiveness Ratios (ICERs) were the main measure for assessing cost-effectiveness, expressed as the additional cost per successful quitter and per Quality-Adjusted Life Year (QALY) gained. Studies reporting QALY differences between groups presented these using mean differences (ΔQALY).

These effect measures allowed for a standardized comparison of both clinical outcomes and economic value across diverse study designs and settings. Where sufficient data were available, a meta-analysis using a random-effects model was conducted to pool ORs for smoking cessation outcomes.

METHODS

A mixed-methods synthesis was applied, combining narrative and quantitative approaches. The narrative synthesis summarized study characteristics and economic evaluation parameters, including perspective, time horizon, and cost components. For quantitative analysis, a meta-analysis using a random-effects model (DerSimonian and Laird method) was conducted to pool Odds Ratios (ORs) for biochemically verified or self-reported smoking cessation at the longest follow-up (Kontopantelis et al., 2013). Statistical heterogeneity was assessed using the Chi-squared test ($p<0.10$) and quantified by the I^2 statistic, interpreted as low (25%), moderate (50%), or high (75%) heterogeneity (Corbett et al., 2016). All analyses were performed with Review Manager (RevMan) version 5.4.

RESULTS AND DISCUSSION

Study Selection

The initial search across the five databases yielded 681 records. After 54

Vol. 4. No. 4 Desember 2025
e-ISSN: 2830-5558 p-ISSN: 2830-5744

duplicates were removed, 627 unique records remained for screening. Based on title and abstract review, 622 records were excluded as they did not meet the inclusion criteria. This left five articles for full-text assessment. Of these, one study was excluded because it was a clinical effectiveness trial that did not contain a full economic evaluation. Ultimately, four studies met all eligibility criteria and were included in the systematic review. Three of these four studies provided sufficient data for inclusion in the meta-analysis of clinical effectiveness. The detailed study selection process is illustrated in the PRISMA 2020 flow diagram (Figure 1).

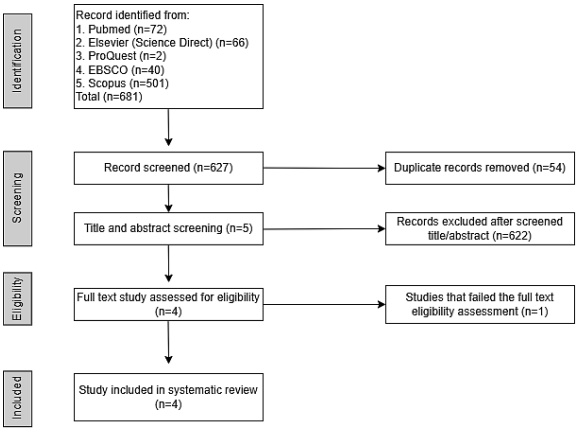

Figure 1. PRISMA 2020 flow diagram systematic reviews which included searches of databases and registers only

Study Characteristics

The four included studies were published between 2015 and 2025 and were conducted in diverse geographical and healthcare settings: Spain, Canada, Malaysia, and the United States (Cantor et al., 2015; Ibrahim et al., 2016; Martínez et al., 2024; Phillips et al., 2022). All studies were full economic evaluations conducted alongside clinical trials or observational studies. Three were cost-effectiveness analyses (CEA), while one study from Spain conducted both a CEA and a cost-utility analysis (CUA). The analytical perspective varied, including the healthcare system perspective (Canada, USA), a specific payer perspective (a university in Malaysia), and a limited societal perspective (Spain). The time horizon for the analyses ranged from 6 to 12 months. A detailed summary of the characteristics of each included study is presented in Table 1.

Risk of Bias in Studies

The quality of reporting, as assessed by the CHEERS 2022 checklist, was variable across the four studies, with total scores ranging from 16 to 27 out of a possible 28 (Table 2). The study by Cantor et al. (Cantor et al., 2015) demonstrated the highest reporting quality. Common strengths across studies included a clear statement of the research question, target population, and intervention. However, several methodological weaknesses were identified, particularly in the lower-scoring studies. These included a failure to explicitly state and justify the time horizon and discount rate, insufficient detail on the methods for estimating costs and outcomes, and a lack of robust sensitivity analyses to explore uncertainty in the results.

Results of Individual Studies

A total of four studies met the inclusion criteria, differing in design, setting, and intervention type, yet all evaluated the cost-effectiveness of pharmacist-delivered smoking cessation programs. Martínez et al. (2024) conducted

Vol. 4. No. 4 Desember 2025
e-ISSN: 2830-5558 p-ISSN: 2830-5744

a cluster-controlled trial in Spanish community pharmacies using the CESAR© intervention, which achieved a 12-month quit rate of 54.3% versus 37.1% in controls (OR 2.08; 95% CI: 1.47–2.93) and was dominant—more effective and less costly—from both provider and limited societal perspectives (Martínez et al., 2024). Phillips et al. (2022) in Canada compared intensive and brief pharmacist-led programs, reporting quit rates of 36% and 22% (vs. 7% control) and ICERs of CAD $1,701 per quitter and CAD $16,172 per QALY, confirming cost-effectiveness (Phillips et al., 2022). Ibrahim et al. (2016) assessed a university-based cessation clinic in Malaysia, where pharmacist counseling with or without NRT achieved a 29.1% quit rate; counseling alone was most cost-effective (MYR 360 per 1% success) though no control group was included (Ibrahim et al., 2016). Cantor et al. (2015) in the U.S. evaluated a hybrid physician-pharmacist model, showing quit rates of 20% versus 13% (OR 1.67; 95% CI: 1.01–2.76) at US $1,132 per quitter (Cantor et al., 2015). Collectively, these studies demonstrate consistent evidence that pharmacist-delivered cessation services yield higher quit rates and are cost-effective or dominant across diverse health system contexts.

Economic Evaluation Findings

A narrative synthesis of the economic findings reveals a consistent conclusion across all four studies: pharmacist-led smoking cessation interventions are an economically favorable strategy. The study by Martínez et al. (Martínez et al., 2024), found their intervention to be dominant, meaning it was both more effective (higher quit rates and QALYs) and less costly than usual care from both a health provider and limited societal perspective. The remaining three studies concluded that their respective interventions were cost-effective. For instance, Phillips et al. (Phillips et al., 2022), reported an ICER of CAD 16,172 per QALY gained, while Cantor et al. (Cantor et al., 2015), reported an ICER of US$3,781 per QALY gained. Both values fall well below commonly cited willingness-to-pay thresholds (e.g., $50,000 per QALY), indicating a high degree of value for money. The cost components analyzed were primarily direct medical costs, such as pharmacist time, training, intervention materials, and medications. Only the Spanish study incorporated indirect costs related to productivity losses from work absenteeism (Martínez et al., 2024).

Table 1. Characteristics of Included Economic Evaluation Studies

Study Characteristics (Author, Year, Country, Setting)	Type of Economic Evaluation	Perspective of Analysis	Population and Sample	Cost Components	Clinical Effectiveness Data	Conclusions on Cost-Effectiveness
Martínez et al., 2024, Spain, Community Pharmacies	Cost-effectiveness and cost-utility	Limited societal and health provider	Adult smokers visiting community pharmacies in	Direct health costs (visits, tests, medications),	Smoking cessation at 12 months: 54.3% (intervention) vs.	The intervention (CESAR© training + service) was dominant (more effective and

			Spain; n=102	Indirect costs (work loss), Intervention costs (pharmacist time)	37.1% (control), adjusted difference 17.6% (CI: 0.05; 0.25); QALY gain 0.03 (CI: -0.01; 0.07)	less costly) compared to usual care, under both perspectives. Cost-effectiveness and cost-utility analyses support the efficiency of the intervention at 12-months follow-up.
Phillips et al., 2022, Canada, Community pharmacies	Cost-effectiveness analysis	Health system perspective	Adult smokers recruited from community pharmacies; n=148	Pharmacist time, training, travel costs, materials, clinic costs, carbon monoxide testing, medication costs	Quit rate at 6 months: 29.3% in intervention vs. 11.6% in control (adjusted OR 3.23, 95% CI: 1.33–7.85); QALYs: intervention 0.439 vs. control 0.425; ICER: CAN$1,701 per additional quitter, CAN$16,172 per QALY gained	The intervention is cost-effective compared with usual care, with ICERs below commonly accepted thresholds; sensitivity analyses confirmed robustness of results.
Ibrahim et al., 2016, Malaysia, Universiti Sains Malaysia	Cost-effectiveness analysis	Payer's perspective (USM)	Open population: USM staff & students; Sample: 129 clients	Direct medical and non-medical costs: health personnel, NRT (gum, patch), disposables, educational materials, space, assets	30 quitters out of 129 participants (23.26%); Success by module: Counselling alone 45.8%, Gum & Patch 30%, Gum 24.1%, Patch 0%; CE ratio: lowest in counselling alone (MYR 360 per 1% success)	Counselling alone was the most cost-effective module; patch alone was not effective during study period
Cantor et al., 2015, USA, Primary care clinics (8 sites)	Cost-effectiveness analysis	Health care system perspective	Adult smokers from 8 primary care clinics; n=925 (474 intervention, 451 control)	Staff training, materials, counseling time, telephone follow-up, quitline referral costs	Quit rate at 6 months: 17.4% intervention vs. 13.4% usual care; Incremental cost per quitter: $1,132; per life-year gained: $2,601; per QALY: $3,781	The intervention is highly cost-effective compared with commonly accepted thresholds for smoking cessation interventions.

Table 2. Bias Evaluation using CHEERS 2022

No	CHEERS 2022 Checklist Item	Martínez et al., 2024	Phillips et al., 2022	Ibrahim et al., 2016	Cantor et al., 2015
1	Identify the study as an economic evaluation and specify the interventions being compared	✓	✓	✓	✓
2	Provide a structured summary that highlights context, key methods, results and alternative analyses	✓	✓	□	✓
3	Give the context for the study, the study question and its practical relevance for decision making in policy or practice	✓	✓	✓	✓
4	Indicate whether a health economic analysis plan	✓	✓	✓	✓

	was developed and where available				
5	Describe characteristics of the study population (such as age range, demographics, socioeconomic, or clinical characteristics)	✓	✓	✓	✓
6	Provide relevant contextual information that may influence findings	✓	✓	✓	✓
7	Describe the interventions or strategies being compared and why chosen	✓	□	✓	✓
8	Comparator clearly explained	✓	✓	✓	✓
9	Evaluation time horizon declared and justified	✓	□	✓	✓
10	Discounts on fees and outcomes mentioned	X	X	X	✓
11	Health outcomes are clearly stated	✓	✓	✓	✓
12	Outcomes are measured according to the right methodology	✓	✓	✓	✓
13	Data sources for effectiveness described	✓	✓	✓	✓
14	Estimation methods and models are described	✓	✓	□	✓
15	Cost data sources explained	✓	✓	✓	✓
16	Unit cost valuation explained	✓	□	✓	✓
17	Currency, year, exchange rate mentioned	✓	✓	✓	✓
18	Clear resource allocation approach	✓	✓	□	✓
19	Sensitivity analysis is performed	✓	✓	□	✓
20	Key outcomes (ICER, cost/QALY) reported	✓	✓	✓	✓
21	Distribution/uncertainty results reported	✓	□	X	✓
22	Ethics/implementation implications explained	□	□	X	✓
23	Conflicts of interest reported	✓	✓	✓	✓
24	Funding source stated	✓	✓	✓	✓
25	The role of sponsors explained	✓	□	□	✓
26	Study registration code if available	X	✓	X	✓
27	Access to data or materials mentioned	X	X	X	□
28	Compliance with reporting guidelines mentioned	□	✓	X	✓
	Final Evaluation Score	(Score 20/28)	(Score 21/28)	(Score16/28)	(Score 27/28)

Vol. 4. No. 4 Desember 2025
e-ISSN: 2830-5558 p-ISSN: 2830-5744

Table 3. Meta analysis result

No	Study (Author, Year)	Study Design	Intervention	Sample (Int / Ctrl)	Quit Rate Int (%)	Quit Rate Ctrl (%)	Risk Difference (RD)	OR (95% CI)	Note
1	Martínez et al., 2024 (Spain)	Cluster-controlled (non-RCT)	CESAR© (pharmacist + training)	800 / 278	54.3	37.1	+17.2%	2.08 (1.47–2.93) (calculated)	12-month follow-up
2	Phillips et al., 2022 (Canada)	RCT, 3 arm	Pharmacist-led SCP (intensif)	50 / (ref: 7%)	36.0	7.0* (literature)	+29.0%	7.56 (2.70–21.1) (counted)	6 bulan abstinence
			Pharmacist-led SCP (short)	50 / (ref: 7%)	22.0	7.0*	+15.0%	3.74 (1.30–10.8) (calculated)	-
3	Ibrahim et al., 2016 (Malaysia)	Observasional	University Quit Clinic (USM)	129 / not mentioned	29.1	-	-	-	No control group
4	Cantor et al., 2015 (USA)	Decision model + trial	Doctor & Pharmacist Training	~246 / ~240	~20.0	~13.0	+7.0%	1.67 (1.01–2.76) (calculated)	Data from the model

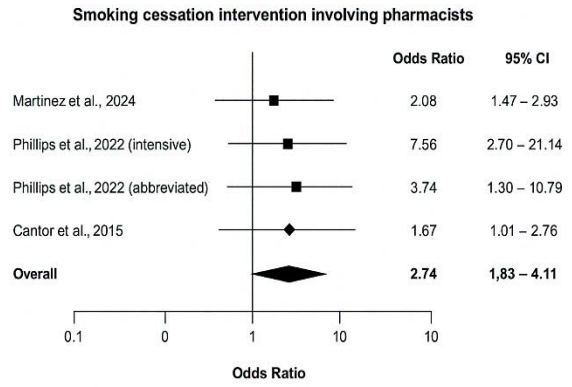

Figure 2. Pooled Effect of Pharmacist Involvement on Smoking Cessation Outc

Clinical Effectiveness Findings (Meta-Analysis)

The meta-analysis included three studies that compared the pharmacist-led intervention to a control group (Cantor et al., 2015; Martínez et al., 2024; Phillips et al., 2022). The analysis demonstrated a substantial and statistically significant benefit of the intervention. The pooled Odds Ratio (OR) was 2.74 (95% CI: 1.83–4.11, p<0.001), indicating that individuals receiving a pharmacist-led smoking cessation intervention were nearly three times more likely to quit smoking compared to those receiving usual care or a minimal intervention.

Statistical heterogeneity among the studies was very low, with an I^2 value of 8.8% (p=0.35), suggesting that the observed treatment effect was consistent across different study populations, intervention intensities, and healthcare systems. A forest plot visualizing the results for each study and the pooled estimate is conceptually represented below.

Reporting Biases

The risk of reporting bias was assessed narratively based on available information from each included study, in line with CHEERS 2022 criteria.

Overall, the studies included in this review showed a relatively low risk of selective reporting. All four studies clearly stated their objectives, economic evaluation methods, outcomes measured, and sources of data. However, some concerns were noted:

1. Martínez et al. (Martínez et al., 2024) and Phillips et al. (Phillips et al., 2022)

Vol. 4. No. 4 Desember 2025
e-ISSN: 2830-5558 p-ISSN: 2830-5744

reported comprehensive cost-effectiveness outcomes and QALY estimates, but neither explicitly stated whether they pre-registered their study protocols. Additionally, discounting of future costs and outcomes was not reported in both studies, potentially introducing time-horizon related bias.

2. Ibrahim et al. (Ibrahim et al., 2016) did not include a comparison/control group, limiting the ability to interpret intervention effects and raising the potential for overestimation bias. Furthermore, this study lacked sensitivity analysis and did not report uncertainty measures such as confidence intervals for effect size or cost estimates.
3. Cantor et al. (Cantor et al., 2015) reported detailed modeling assumptions, conducted sensitivity analyses, and declared conflict of interest and funding sources, reducing the risk of bias. However, due to reliance on modeled inputs and assumptions for comparator data, there remains a risk of indirectness or modeling bias.

While none of the studies were found to have serious concerns regarding intentional omission of outcome data, the absence of protocol registration and limited transparency in some methods may introduce moderate risk of reporting bias. No statistical methods (e.g., funnel plot) were applied to formally assess publication bias due to the limited number of included studies (n=4).

This systematic review and meta-analysis provide robust, dual-faceted evidence supporting the value of community pharmacist-delivered smoking cessation programs. The findings demonstrate that these interventions are not only clinically superior to usual care, significantly increasing the odds of quitting, but are also consistently found to be an economically advantageous public health strategy. The meta-analysis yields a precise and strong estimate of clinical effectiveness (OR 2.74), reinforcing the conclusions of prior research with the most up-to-date evidence.

A key finding of this review is the contrast between the homogeneity of the clinical effect and the heterogeneity of the economic evaluation methods. The meta-analysis revealed very low statistical heterogeneity (I^2=8.8%), indicating a remarkably consistent clinical benefit across different countries, intervention designs, and patient populations. This consistency suggests that the core components of pharmacist-led support are robustly effective (Higgins & Green, 2009). In contrast, the economic methodologies varied substantially in terms of analytical perspective, time horizon, and the scope of costs included. This methodological diversity is not a flaw in the evidence base but rather an important finding in itself. It highlights that while the clinical gain from these interventions is a reliable and predictable outcome, its measured economic value is highly dependent on the specific context and the questions posed by the evaluator (Bagepally et al., 2022). This explains why a meta-analysis of economic

Vol. 4. No. 4 Desember 2025
e-ISSN: 2830-5558 p-ISSN: 2830-5744

outcomes like ICERs was not performed and would have been inappropriate, and it underscores the need for decision-makers to interpret economic evidence within their local healthcare and fiscal context.

The clinical effectiveness finding from our meta-analysis (OR = 2.74) aligns with and strengthens the conclusions of previous systematic reviews evaluating pharmacy-based smoking cessation interventions, which have reported significantly increased quit rate, for example community pharmacy interventions were associated with relative risks of approximately 2.21 (95 % CI 1.49–3.29) (Saba et al., 2014). The economic findings, while methodologically diverse, consistently indicate cost-effectiveness or even dominance across settings, reinforcing the financial viability of pharmacist-led programs despite varying assumptions (Phimarn et al., 2023). This unanimous conclusion delivers a powerful and clear message to policymakers and healthcare payers regarding the value proposition of these interventions.

Strengths and Limitations

This review's main strengths include adherence to rigorous methodological standards, such as PROSPERO registration, compliance with PRISMA 2020, comprehensive multi-database searching, and appraisal using the CHEERS 2022 checklist (Husereau et al., 2022; Page et al., 2021; Sideri et al., 2018). The inclusion of a meta-analysis adds quantitative evidence of clinical effectiveness often absent in prior economic reviews. However, limitations exist, primarily the small number of included studies (n=4), which precluded subgroup or meta-regression analyses to explore heterogeneity (Mohseni et al., 2022). Reporting quality was variable, with incomplete presentation of key parameters such as discounting—an important consideration for chronic conditions like smoking where costs and benefits accrue over time (Attema et al., 2018). Furthermore, most studies used short time horizons (6–12 months) and payer perspectives, potentially underestimating long-term and societal benefits. Since smoking-related costs and savings unfold over a lifetime, broader models incorporating societal perspectives would likely reveal even greater cost-effectiveness (Feirman et al., 2016; Reisinger et al., 2019). Thus, the current findings may represent conservative estimates of the true economic value of pharmacist-led smoking cessation interventions.

Implications for Practice, Policy, and Future Research

The evidence from this review underscores that community pharmacists should be formally recognized, trained, and supported to provide smoking cessation services as an integral part of primary care. Pharmacist-led interventions consistently improve quit rates and represent high-value healthcare services across settings (Brown et al., 2016; Carson-Chahhoud et al., 2019; Saba et al., 2014). The demonstrated cost-effectiveness provides strong justification for policymakers and payers to transition from pilot funding to sustainable reimbursement models, such as fee-for-

Vol. 4. No. 4 Desember 2025
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service or pay-for-performance to ensure equitable access (International Pharmaceutical Federation, 2024). Existing evaluations show that pharmacist-delivered programs can cost as little as £772 per quitter while yielding favorable cost-effectiveness ratios globally (Saba et al., 2014). Future research should strengthen the evidence base by adopting longer time horizons with decision-analytic modeling (Qin et al., 2022), incorporating broader societal perspectives that include productivity and patient costs, and adhering to CHEERS reporting standards to enhance transparency and comparability.

CONCLUSION

The evidence synthesized in this systematic review and meta-analysis is unequivocal. Community pharmacist-delivered smoking cessation programs are a powerful public health intervention that is both clinically effective and economically sound. By nearly tripling the odds of successful quitting, these programs offer significant health gains while representing an efficient and justifiable use of scarce healthcare resources. For health systems seeking high-value investments to combat the devastating health and economic toll of tobacco use, the widespread implementation and funding of pharmacist-led smoking cessation services should be a paramount priority. However, further long-term modeling is required to capture lifetime benefits.

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