

Integration of non-dispensing pharmacists into primary healthcare services: an umbrella review and narrative synthesis of the effect on patient outcomes

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Abstract

Background: Primary health care services in Australia, comprised of a range of health care providers, are faced with the challenge of addressing increasingly complex and chronic disease. When integrated into primary practice, non-dispensing pharmacists provide a range of clinical services within a team-based model of care that can improve patient outcomes and quality use of medications.

Methods: This umbrella review searched Medline, PubMed, CINAHL, the Cochrane Database of Systematic Reviews and the JBI Database of Systematic Reviews from 1990-current for systematic reviews and meta-analyses that assessed the integration of non-dispensing pharmacists into primary health care settings on patient outcomes.

Results: A total of 591 publications were identified, of which five met the pre-determined inclusion criteria. Outcomes evaluated in the included studies were broadly classified into changes in biomedical markers, changes in prescribing practices and patient-reported outcomes.

Conclusions: Overall, the results of the included systematic reviews and meta-analyses suggest that the integration of a non-dispensing pharmacist had a positive effect on patient outcomes.

1. Introduction

Primary health care (PHC) services in Australia consist of a broad range of health care providers, including general practitioners (GPs), nurses, allied health professionals and pharmacists who provide a first contact for patients within the health care system.¹ These services are usually provided through general practices (or primary health care centres) that deliver 'comprehensive, continuous and person-centred care'.¹ While primary health care services are diverse and wide-ranging, the management of complex and chronic disease represents a key responsibility and challenge for primary health care providers. As the chronic disease burden places increasing pressure on the health care system, greater collaboration between GPs and other health care professionals is required to provide high quality care that is responsive to such demands.

Non-dispensing pharmacists (NDPs), also referred to as clinical pharmacists, practice pharmacists, or general practice-based pharmacists, are pharmacists who 'deliver professional services from or within a general practice medical centre with a coordinated, collaborative and integrated approach with an overall goal to improve the quality use of medications of the practice population'.² While pharmacists traditionally deliver care through independent services, there is increasing recognition of the value of integrating pharmacists into primary services as part of a team-based model to provide collaborative and effective care.³ Within this model, NDPs deliver a range of clinical services both directly to patients and to other health care professionals to optimise medical therapy, provide medical management services, promote medication safety initiatives, improve health literacy and educate and empower patients to employ effective medication self-management.^{3, 4} Statements released by the Australian Medical Association and the Royal Australian College of General Practitioners promote the integration of NDPs into primary care to improve the quality use of medications, reduce adverse drug events (ADEs), as well as to provide a financial benefit to the health care system.^{3, 5}

This team-based model of care is already in place in health care systems overseas, including in the US and the UK, and a body of evidence exists to support its benefit to patients and other health care providers. However, this model has not been readily adopted in the Australian context, and there is a lack of robust evidence examining its effectiveness in Australia. Several international systematic reviews^{6, 7, 8} and an umbrella review⁹ have explored the effectiveness of pharmacist involvement in the management of patients with chronic disease in a range of healthcare settings by investigating changes in biomedical markers, in prescribing quality, medication adherence and in patient-reported outcomes. These reviews explored a range of pharmacist interventions delivered in diverse healthcare settings, including in community pharmacies. In order to better understand the effect of integration of NDPs into primary health care settings, an umbrella review of existing systematic reviews and meta-analyses was conducted.

2. Methods

2.1 Umbrella review methods and objective

Umbrella reviews systematically review and summarise the evidence from multiple existing systematic reviews and meta-analyses to allow for rapid review of the evidence base for a particular issue to inform policymakers and clinical decision-makers.¹⁰

This umbrella review aimed to determine the effectiveness of the integration of NDPs into primary health care settings on patient outcomes such as biomedical markers, prescribing quality, and patient-reported outcomes. Integration was defined broadly as any intervention that involved co-location of pharmacists within PHC settings, and/or pharmacists who worked as part of multidisciplinary healthcare teams using a range of integrative processes. These processes include informational methods (shared electronic healthcare records), care coordination for shared assessments, and governance frameworks (such as formal partnerships)¹¹, in order to deliver a range of clinical services both directly to patients and to other health care professionals.

2.2 Literature search

A search of the literature was undertaken between August and December 2019 using Medline, PubMed, CINAHL, the Cochrane Database of Systematic Reviews, and the JBI Database of Systematic Reviews to identify all relevant systematic reviews and meta-analyses regarding the integration of non-dispensing pharmacists in primary health care. In addition, a manual review of the reference lists of systematic reviews was performed.

The search strategy, developed in conjunction with a trained librarian, was conducted using the following MeSH and natural language terms and was adapted for each database: (pharmacists OR pharmaceutical services OR non-dispensing pharmacist OR clinical pharmacist OR pharmaceutical care) AND (primary health care OR general practice OR family practice OR patient care team OR community health service OR community health centre OR primary care OR outpatient care OR family medicine OR multidisciplinary health care team OR team based care) AND (systematic review OR review). The search terms used were purposefully broad to allow identification of all possible relevant publications. After deliberation, it was decided not to include search terms relating to 'patient outcomes' as this narrowed the search and eliminated relevant publications. Rather, all publications were manually screened to determine whether patient outcomes were the outcomes of interest. Two independent reviewers (CS and SC) screened the titles and abstracts of all publications for eligibility (based on inclusion criteria outlined below) and examined the full text of those considered eligible. Searches were limited to English language articles, those with human subjects, and a set date range of 1990-current was used.

2.3 Inclusion criteria

Inclusion criteria used for this review were determined in accordance with the PICO scheme (population, intervention, comparison, outcome)¹⁰ as outlined in Table 1. Inclusion criteria consisted of (a) systematic reviews or meta-analyses; (b) studies that examined pharmacists as a member of a PHC team and/or were integrated or co-located within a PHC setting; (c) studies that primarily examined adults with chronic disease; and (d) studies that included patient outcomes. Patient outcomes were inclusive of changes in biomedical measures, prescribing quality, or medication adherence. Articles were excluded if they were unpublished or not clearly a systemic review or a meta-analysis, if they concerned health professionals other than pharmacists, or if they investigated pharmacists in a community pharmacy or inpatient setting.

Table 1. Population, intervention, comparison, outcome (PICO) scheme of inclusion criteria

Parameter	Description
Population	Inclusion: adults (over 18 years), chronic disease, any sex, any country, any ethnicity
Intervention	Inclusion: pharmacist integrated or co-located in PHC setting, provision of direct patient services or participation in the PHC team Exclusion: pharmacist based in community pharmacy or inpatient setting
Comparison	Usual care, lack of intervention
Outcome	Inclusion: patient outcomes (biomedical measures, prescribing quality or appropriateness, medication adherence) Exclusion: financial outcomes, analysis of interprofessional relationships

2.4 Study selection

In total, 589 publications were identified from searching the electronic databases and an additional two publications from manual searching (134 in Medline, 366 in PubMed, nine in the Cochrane Database of Systematic Reviews, 28 in CINAHL, 52 in the JBI Database of Systematic Reviews and two from manual searching). Of the 591 publications initially identified, five reviews were selected to include in the umbrella review after removal of duplicates and exclusion of publications which did not meet the inclusion criteria. A PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)¹² flow diagram outlining the included and excluded studies is presented in Figure 1.

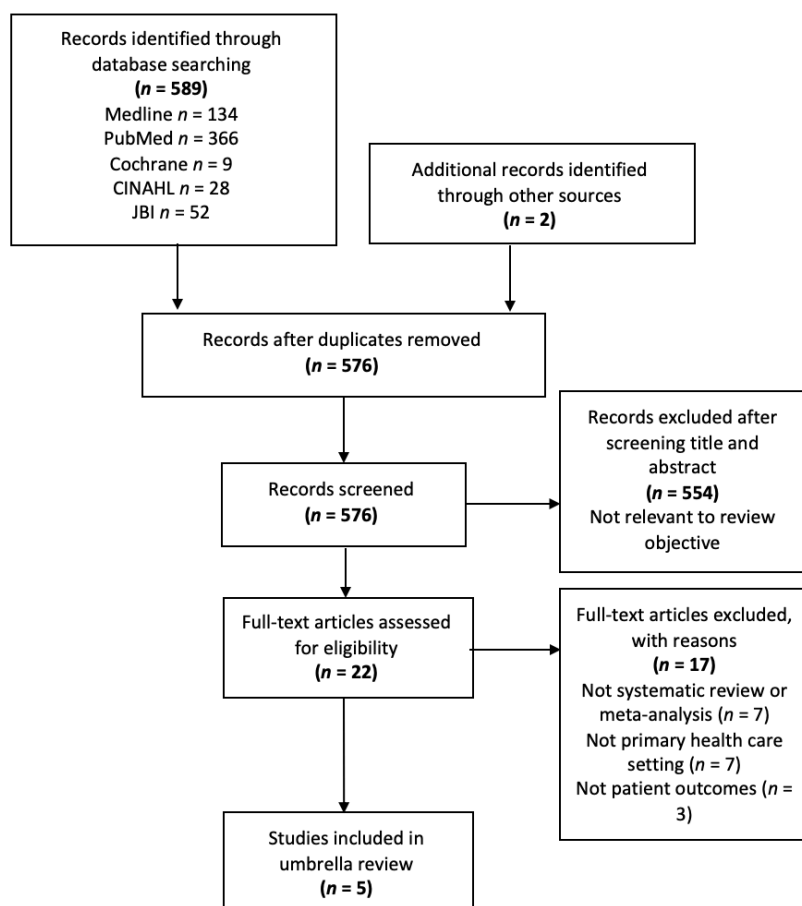


Figure 1. PRISMA flow diagram of included and excluded studies

3. Results

3.1 Assessment of methodological quality of included studies and quality of evidence

Eligible publications were assessed for methodological quality using the critical appraisal tool for systematic reviews and research syntheses developed by The Joanna Briggs Institute¹⁰, presented in Table 2. Each element of the checklist was designated as being 'met', 'not met', 'unclear', or 'not applicable'. This tool allows for an assessment of the quality of the included publications and was not used as part of the inclusion criteria.

Table 2. Joanna Briggs Institute critical appraisal checklist for systematic reviews and research syntheses

Checklist	Fish et al. 2002	Tan et al. 2014	Riordan et al. 2016	Fazel et al. 2017	Hazen et al. 2018
Review question clearly and explicitly stated	Met	Met	Met	Met	Met
Inclusion criteria appropriate for the review question	Met	Met	Met	Met	Met
Appropriate search strategy	Met	Met	Met	Met	Met
Adequate sources and resources used to search for studies	Met	Met	Met	Met	Met
Critical appraisal conducted by two or more reviewers independently	Met	Met	Met	Met	Met
Appropriate methods used to combine studies	Not applicable	Met	Not applicable	Met	Met
Likelihood of publication bias assessed	Unmet	Met	Met	Met	Unclear
Recommendations for policy and/or practice supported by reported data	Unclear	Met	Met	Met	Met
Appropriate specific directives for new research	Met	Met	Met	Unmet	Unclear

3.2 Data extraction and characteristics of included studies

For each eligible publication, the following data was extracted: author, year and journal of publication, objective(s) and outcome(s) of interest, type of review, participants, setting, number of databases searched, date range of database searching, publication date range, number of studies, types of studies, country of origin and conclusions provided by the authors. This information is presented in Table 3.

Of the five included publications^{13, 14, 15, 16, 17}, all presented a systematic review of the evidence, and two^{14, 16} also presented a meta-analysis. A total of 161 studies were assessed across the five reviews, and included randomised controlled trials (RCTs), non-randomised controlled trials (non-RCTs), quasi RCTs, cohort studies, controlled before and after studies and pretest-posttest studies. Approximately 60% (97 of 161) of the studies were conducted in the US.

The studies were heterogenous in regard to 'integration' of NDPs into primary health care teams. Involvement of the NDP in the health care team ranged from short educational visits from pharmacists to primary health care providers, to pharmacists who had a regular relationship with a clinic or health centre, to fully integrated NDPs who were permanently employed by a primary care organisation, had a significant clinical role within the practice and had shared access to information systems and administrative support. One study¹⁶ assessed pharmacists who provided direct patient care within a health care team, however involved a number of settings such as hospital outpatient clinics, community pharmacies, community clinics and primary care physician offices. Only 10 of the 35 included studies in this publication specified that the nature of the pharmacist intervention was a 'collaborative practice agreement'.¹⁶ All other publications^{13, 14, 15, 17} specified 'primary health care' or a related term as a search or inclusion criterion. Only one review¹³ assessed the impact of the degree of integration of NDPs into health care teams on patient health outcomes in PHC settings.

All studies primarily examined interprofessional collaboration between pharmacists and GPs. In terms of characteristics of the patient populations assessed, only two specified particular age ranges (over 18 years¹⁶, and over 65 years¹⁵). Across the included studies patients were either categorised according to a particular chronic

disease; or were considered more broadly as patients prescribed multiple medications, those at risk of an adverse health issue or those at risk of a medication-related adverse event. Chronic diseases or medication-related issues considered in the studies included hypertension^{13, 14, 15, 17}, dyslipidaemia^{13, 14, 15, 17}, diabetes mellitus^{13, 14, 15, 16}, metabolic syndrome^{13, 14}, heart failure¹³, depression^{13, 14}, osteoporosis¹³, cardiovascular disease^{13, 14}, pain¹⁴, chronic obstructive pulmonary disease (COPD)¹⁴, menopause¹⁴, and polypharmacy.¹⁷ One study¹⁶ only investigated diabetes mellitus. None of the included studies identified if participants were from marginalised groups such as Indigenous peoples or peoples residing in remote geographical locations.

In terms of interventions, all studies considered pharmacist interventions that were educational, clinical, or both, and included direct patient services (for example medication reviews) and involvement in team-based care (for example providing recommendations to other health care providers or participating in team-based decision making). All reviews except one¹⁷ stipulated that the comparison group was usual care or no intervention.

Outcomes examined across the included studies were also heterogenous, consisting of biomedical markers, changes in prescribing practices and medication adherence, as well as patient reported factors such as quality of care, quality of life and satisfaction. Four studies^{12, 14, 16, 17} examined biomedical or clinical markers including HbA1c^{13, 14, 16}, lipids^{13, 14, 16, 17}, blood pressure^{13, 14, 16, 17} and the Framingham risk score.¹⁴ Improvement in prescribing practices, medication adherence and detection of medication-related problems were also outcomes assessed in four studies.^{13, 14, 15, 17} One review¹⁵ focused on changes in prescribing quality by examining the reduction in inappropriate prescribing using one of the following tools: Beers criteria, STOPP/START (Screening Tool for Older Persons Prescriptions/Screening Tool to Alert doctors to Right Treatment) and MAI (Medication Appropriateness Index). Studies also considered secondary outcomes such as improvement in quality of care^{13, 17}, improvement in health-related quality of life^{13, 15, 17}, and patient satisfaction.^{15, 17} One study¹³ examined 89 health outcomes inclusive of clinical health outcomes (biomedical markers such as HbA1c or blood pressure), patient-reported health outcomes (such as quality of life) and proxies of health outcomes (such as medication errors). One review¹⁷ also contained a cost analysis of the included studies, however this was disregarded for the purposes of the umbrella review as cost was not an outcome of interest.

4. Discussion

4.1 Findings

Outcomes assessed in this review can be classified broadly as changes in biomedical markers (blood pressure, HbA1c, cholesterol, lipids, Framingham risk score), changes in prescribing practices or appropriateness (prescribing quality, reduction of inappropriate prescribing), and patient-reported outcomes (quality of life, patient satisfaction). Studies examined a range of interventions which were either pharmacist-led or involved a pharmacist for a range of diseases or medication-related problems. While most studies were conducted in PHC settings (general practice, family medicine clinic, community health centre), some included hospital outpatient clinics and community pharmacies in their analysis.¹⁶ Due to the specific inclusion criteria used, only five publications were considered eligible for inclusion. Because of this significant heterogeneity and small number of included publications, a narrative synthesis of the evidence was considered the most appropriate method to discuss the findings.

In four reviews, pharmacist intervention had a positive effect on blood pressure, producing reductions in both systolic and diastolic blood pressure.^{13, 14, 16, 17} However, only two reviews^{16, 17} stated that these reductions were statistically significant. Pharmacist intervention was also found to reduce HbA1c in three publications^{13, 14, 16}, and cholesterol in four publications.^{13, 14, 16, 17} One study¹⁶ assessed all three of these biomedical markers in patients with diabetes, and found that pharmacist intervention reduced HbA1c, SBP and LDL-C, with significantly improved outcomes compared to the comparison group ($P < 0.01$). One review¹⁴ assessed the impact of pharmacist intervention on the 10-year Framingham risk score and found a statistically significant reduction in cardiovascular risk (-1.83%). However only two studies were included in this assessment. One study¹³ assessed 51 surrogate clinical health outcomes (such as blood pressure, cardiovascular risk, HbA1c), and found a positive effect of pharmacist intervention in 67% (a statistically significant difference following the intervention compared with controls).

Three of the publications assessed prescribing quality. Pharmacist interventions were found to reduce inappropriate prescribing and improve prescribing quality.^{14, 15} Positive effects on medication-related problems and medication adherence was reported.¹⁴ One study¹⁵ found that pharmacist intervention showed an improved MAI score and reduced inappropriate prescribing compared to the control group. One trial included in the review found that 'pharmaceutical care' provided by community pharmacists had no effect on appropriate prescribing.¹⁵ Another publication¹⁷ found that while medication reviews and patient prescribing advice achieved one or more of the outcomes of interest in seven of the eight included studies, some studies showed no statistically significant improvements and were of poor design.

Other outcomes assessed included secondary or patient-reported outcomes such as quality of life and patient satisfaction. These were not the focus of any of the included studies and their discussion of these is limited. Pharmacist interventions were found to have little or no effect on quality of life.^{13, 14, 16}

Authors commented on factors considered important to promote the success of NDP integration into primary care teams. In particular, multifaceted interventions (medication reviews, adherence assessments, advice, monitoring) were more likely to improve outcomes, as were those that encouraged verbal and written communication with GPs and patients.^{14, 15} Access to medical notes was also deemed important for success.¹⁵ One study¹³ assessed the impact of the degree of integration of an NDP into the primary health care team on health outcomes. Integration was categorised as either none, partial or full based on organisational, informational, clinical, functional and normative integration. The review found that the degree of integration did not impact health outcomes overall. However, full integration of an NDP (one who is permanently employed as part of a multidisciplinary team with shared access to information and administrative support) had a positive effect on patient-centred pharmacy services (for patients with multimorbidity) such as resolving medication errors (70% of patient-centred services with fully integrated NDPs showed improved health outcomes).¹³

4.2 Limitations of the included publications

A majority of the studies included in the systematic reviews discussed were conducted in the US (97 of 161). Only five of the total 161 studies were conducted in Australia.^{13, 16, 17} This limits the applicability of the results to the Australian health care context. Also, a number of the authors commented that the methodological quality of many of the included studies was poor^{14, 15, 17}, and all reviews stated that significant heterogeneity across interventions and outcomes made aggregation and generalisability of results difficult.^{13, 14, 15, 16, 17}

4.3 Limitations of this umbrella review

There was significant heterogeneity of the populations, interventions and outcomes of interest in the included studies. This limits the degree to which this review can draw conclusions regarding the impact of integration of NDPs into PHC settings and patient outcomes. Due to the nature of an umbrella review, only systematic reviews and meta-analyses were included. As such, other publications that may offer useful insights were not included.

4.3 Implications

The aggregated results from the included reviews suggest that the integration of an NDP in PHC settings can improve patient outcomes and quality of care. Biomedical markers, such as HbA1c, blood pressure and cholesterol improved with pharmacist intervention across a number of trials. Pharmacist intervention also improved quality use of medications and reduced inappropriate prescribing. There was no effect on quality of life. Greater integration of pharmacists into the health care team with access to medical records and administrative services, as well as shared goals and responsibilities, may improve patient outcomes.

Research in this area is heterogenous, and therefore it is difficult to draw strong conclusions. Standardisation of populations, interventions and/or outcomes could improve the quality of research and allow for better applicability and generalisability. In particular, strategies that encourage better pharmacist integration into primary health care teams to deliver multifaceted interventions need further investigation.¹⁸ The potential for pharmacists and community pharmacy to influence patient chronic disease outcomes can be constrained by a lack of pharmacist time (in lieu of dispensing medications), limited integration and interprofessional collaboration with clinicians to increase patient continuity of care (eg lack of access to medical records and respectful partnerships), and suboptimal timing to influence patient outcomes.¹⁹ A clearer understanding of ways

to reduce barriers to pharmacist integration might better harness their pharmaceutical skills in primary health care settings.

5. Conclusion

Primary health care services in Australia, comprised of a range of health care providers, are faced with the challenge of addressing increasingly complex and chronic disease. When integrated into primary practice, non-dispensing pharmacists provide a range of clinical services within a team-based model of care that can improve patient outcomes and quality use of medications. Overall, the results of the included systematic reviews and meta-analyses suggest that the integration of a non-dispensing pharmacist has a positive effect on patient outcomes.

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Table 3. Characteristics of included studies

Author, year, journal	Objectives	Outcomes	Type of review	Participants	Patient characteristics	Setting	No. of data-bases searched	Date range of database searching	Publication date range	No. and types of studies, country of origin	Conclusions
Fish et al. 2002 The International Journal of Pharmacy Practice	Effect and cost of practice-based pharmaceutical services	Changes in prescribing practices Prescribing quality Cholesterol BP Medication compliance QoL	Systematic review	Physicians/GPs Pharmacists/ Pharmaceutical prescribing advisors	Adults with chronic disease (hypercholesterolaemia, hypertension, polypharmacy, COPD) Patients at risk of medication-related errors	GP practice Community health centre	5	Jan 1980-March 2001	1983-2000	16 studies RCTs UK Australia Sweden Canada US	Educational outreach visits, medication reviews and patient specific prescribing advice were effective in achieving desired outcomes There is insufficient evidence to generalise about cost-effectiveness of the interventions
Tan et al. 2014 Research in Social and Administrative Pharmacy	Effectiveness of clinical pharmacist services delivered in primary care general practice clinics	HbA1c BP Cholesterol Framingham risk score	Systematic review and meta-analysis	GPs Pharmacists	Adults with chronic disease (CVD, diabetes, depression, metabolic syndrome, pain, COPD, menopause) or polypharmacy Patients at risk of medication-related errors Patients at risk of adverse health problem	GP practice	4	1966-2013	1996-2013	38 studies RCTs US UK Canada Brazil Chile Japan Thailand Jordan	Pharmacist co-location in GP clinics delivered a range of interventions with favourable results in chronic disease management and quality use of medications
Riordan et al. 2016 SAGE Open Medicine	Effect of pharmacist-led interventions in optimising prescribing	Change in prescribing appropriateness: Beers criteria STOPP/START MAI Clinical or patient-reported outcomes eg QoL or patient satisfaction	Systematic review	Pharmacists Physicians Nurses	Community-dwelling older adults (>65 years) with polypharmacy, drug-related problems	GP practice Family medicine clinic Veterans Affairs medical centre	11	Inception-Dec 2015	1996-2010	5 studies RCTs Quasi-RCTs Controlled before and after studies Interrupted time series US UK New Zealand	Pharmacist-led interventions involving access to medical notes and medication reviews conducted in physician practices with feedback to physicians may improve prescribing appropriateness

Fazel et al. 2017 Annals of Pharmacotherapy	Impact of pharmacist interventions as part of the health care team on diabetes therapeutic outcomes in ambulatory care settings	HbA1c Systolic BP LDL-C	Systematic review and meta-analysis	Pharmacists	Adults with Type 1 or Type 2 diabetes mellitus	Hospital-based outpatient clinics Community pharmacies Primary care physician offices Community clinics	9	1995-Feb 2017	1996-2016	42 studies (Systematic review = 42 studies Meta-analysis = 35 studies) RCTs Non-RCTs Pretest-posttest studies US Australia Iran Jordan Thailand	Pharmacists' interventions as part of the patient's health care team improved diabetic therapeutic outcomes by significantly reducing HbA1c, SBP, LDL-C
Hazen et al. 2018 Research in Social and Administrative Pharmacy	Impact of degree of integration of a non-dispensing pharmacist on medication related health outcomes in primary care	Real clinical health outcomes eg mortality Surrogate clinical health outcomes eg HbA1c, lipids, BP Patient reported outcomes eg QoL Proxies of health outcomes eg quality of care performance indicators	Systematic review	Pharmacists GPs	Adults with chronic disease (diabetes, hypertension, dyslipidaemia, metabolic syndrome, heart failure, depression, cardiovascular disease, osteoporosis)	Primary care practice	2	1966-June 2016	1996-2015	60 studies RCTs Two group cohort studies One group cohort study US UK Brazil Canada Hong Kong Jordan Australia Sweden	Full integration of a non-dispensing pharmacist into a primary health care setting adds value to patient-centred (heterogeneous patients such as those with multimorbidity and polypharmacy), but not disease-specific (patients with specific chronic conditions), clinical pharmacy services

BP = blood pressure, SBP = systolic blood pressure, LDL-C = low-density lipoprotein C, HbA1c = haemoglobin A1c, CVD = cardiovascular disease, COPD = chronic obstructive pulmonary disease, QoL = quality of life, GPs= general practitioners, RCT = randomised controlled trial, STOPP/START = Screening Tool for Older Persons Prescriptions/Screening Tool to Alert doctors to Right Treatment, MAI = Medication Appropriateness Index

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