Zhang *et al.*
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REVIEW

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Can integrated care interventions strengthen primary care and improve outcomes for patients with chronic diseases? A systematic review and meta-analysis

Yuqi Zhang[1], Jonathan Stokes[2], Laura Anselmi[1], Peter Bower[3] and Jin Xu[4*]

Abstract

Background An increasing number of people live with chronic disease or multi-morbidity. Current consensus is that their care requires an integrated model bringing different professionals together to provide person-centred care. Although primary care has a central role in managing chronic disease, and integration may be important in strengthening this role, previous research has shown insufficient attention to the relationships between primary care and integration. This review summarizes primary care involvement in integrated care interventions and assesses the effect of those interventions on a range of measures of primary care functions and wider outcomes.

Methods We searched Medline and Embase using terms for "integrated care", "chronic disease" and "multimorbidity". We included integrated care interventions involving different levels of care organizations or different care sectors. Risk of bias was appraised, and the contents of integrated care interventions assessed using the Sustainable intEgrated care modeLs for multi-morbidity: delivery, FInancing and performancE (SELFIE) conceptual framework. Effectiveness of integrated care interventions was assessed using meta-analysis of primary care functions (access, continuity, comprehensiveness and coordination) and wider outcomes (patient health and mortality, hospital admissions and costs). Sub-group analyses were conducted for different types of primary care involvement.

Results From 17,752 studies screened, 119 studies on integrated care were identified, of which 69 interventions (58%) involved primary care. Meta-analyses showed significant beneficial effects on two measures of primary care function: access (effect size: 0.17, 95% CI 0.05–0.29) and continuity (effect size: 0.32, 95% CI 0.14–0.50). For wider outcomes, the only statistically significant effect was found on costs (effect size: 0.02, 95% CI 0.02–0.03).

Conclusions Integrated care interventions involving primary care can have positive effects on strengthening primary care functions, but these benefits do not necessarily translate consistently to wider outcomes.

Keywords Integrated care, Primary care, Chronic disease, Multi-morbidity

*Correspondence:
Jin Xu
xujin@hsc.pku.edu.cn
Full list of author information is available at the end of the article

Background

An increasing number of people now live with chronic disease, with many having multi-morbidity (the co-existence of two or more chronic diseases) [1–3]. They require support from multiple providers from different healthcare sites and sectors [3, 4]. However, providers working across different organizations may provide uncoordinated or fragmented care because of different priorities, budgets, systems and outcomes [5]. As patients with chronic disease or multi-morbidity account for a disproportionately high share of the clinical workload and costs in the healthcare system, less fragmented care may reduce some of this burden [6].

Integrated care is "a coherent set of methods and models on the funding, administrative, organizational, service delivery and clinical levels" designed to overcome issues of fragmentation through better coordination of services from different providers and services in the healthcare system [7, 8]. It may take different forms, such as horizontal integration (integration between primary care providers on the same level) and vertical integration (between primary and secondary care providers). Integrated care comprises several key components which can take place across different healthcare service domains: service delivery, which can include tailored care plans and integrated pathways to improve population health; workforce integration, which can involve case managers and multidisciplinary teams; information technology, such as initiatives to improve sharing of clinical data; financial integration, such as bundled payments and pay-for-performance to encourage coordination; and leadership, characterized by shared decision-making, transparency and accountability [9]. A previous systematic review revealed that service delivery and workforce are the most frequently mentioned, while financing is the least discussed [10].

However, current evidence on the benefits of integrated care are mainly from high-income countries, which showed some evidence of improved quality of care, patient satisfaction and access to care, although effects on healthcare utilization and costs were more limited [2]. Positive effects on quality of care were also found for patients with chronic disease [11]. Previous studies have identified several barriers to the successful implementation of integrated care, including a lack of commitment across different health organizations, conflicting objectives [5, 12] and traditional payment models, such as fee-for-service, which often fail to support care coordination and resources allocation [13]. Furthermore, successful integrated care requires synchronized changes at multiple levels, well-resourced multidisciplinary teams (MDTs) that communicate frequently and share common values and a focus on targeting services to the appropriate population. Additionally, funding should be realigned to facilitate effective integration [5, 14].

Primary care has been proposed as the cornerstone of both a well-functioning healthcare system and effective integrated care models [15]. The Astana declaration argues for a vision where "primary care and essential public health functions as a core of integrated health services" [16]. Key "primary care functions" include providing first contact access, continuity of care, comprehensive care and care coordination (the so-called 4Cs), and primary care is central to the patient-centred model [17]. Valentijn et al. [18] conceptualized the inter-link between primary care and integrated care. In theory, primary care inherently supports integrated care because it supports the 4Cs. Integrated care also aims to improve access, quality and continuity of services. As a result, primary care is considered a key setting for coordinating care.

Strong primary care, characterized by the 4Cs, is associated with better health outcomes [18–20], lower costs [18, 21] and decreasing hospitalization and emergency department visits [16]. Strengthening primary care is also an important response to current demographic challenges [22], and patients with chronic disease or multi-morbidity should in principle achieve improved outcomes in a strong primary care system [23]. Mitchell et al. reviewed evidence comparing integrated primary–secondary care with usual care [24]. While some evidence suggested improvements in satisfaction and service delivery at a slightly higher cost, the evidence regarding effects on clinical outcomes was limited. Additionally, there is a limited evidence base on whether integrated models of healthcare can strengthen primary care.

Although most commentators agree that primary care has a potentially central role in managing chronic diseases, the practical evidence supporting primary care as the cornerstone of integrated care remains lacking, and the role of primary care in integrated care has not been fully assessed. On the basis of current evidence on integrated care, it is still unclear as to which types of integrated care are more effective than other models of care, particularly for patients with multi-morbidity. To address this gap, we systematically reviewed integrated care interventions involving primary care to explore the impact of these interventions on the primary care functions, as well as wider outcomes of patient health and system costs.

Methods

The logic model underpinning the study is shown in Fig. 1. We suggest that certain components are involved in integrated care interventions, and that those components have varying levels of primary care involvement. These components are expected to have diverse effects

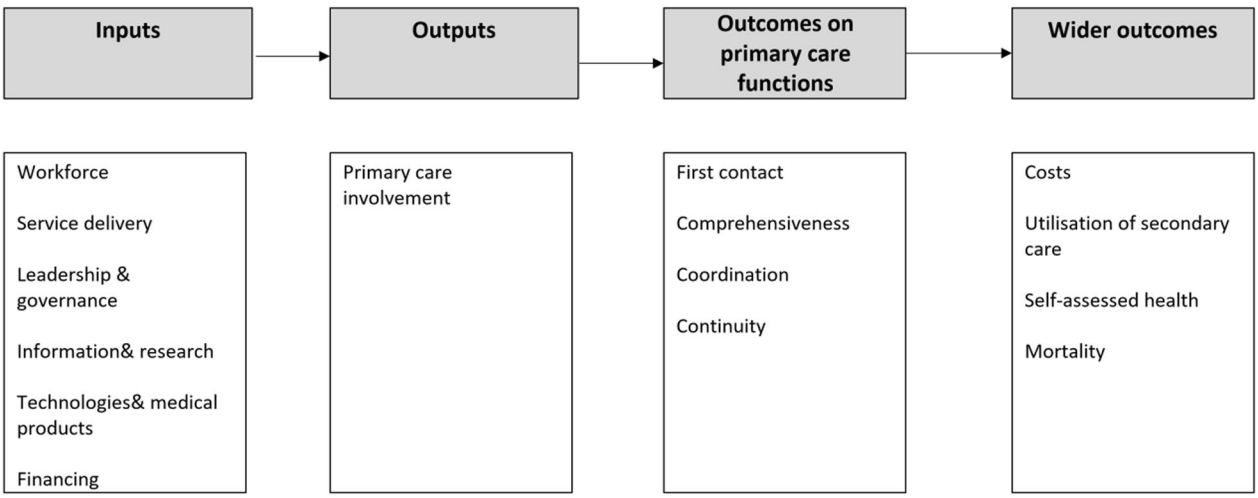


Fig. 1 Logic model underlying the study

on primary care functions, and on wider measures of patient health and system costs.

To explore these relationships, we first identified published papers on integrated care interventions and extracted the subset of those papers where the intervention involved primary care. For interventions involving primary care, we then categorized them on the basis of types of primary care involvement. Then, we evaluated the effects of these integrated care interventions on the measures of the primary care functions, and then assessed the effects of these interventions on wider measures of patient health and system costs.

We used the Cochrane Handbook for Systematic Reviews of Interventions for conducting the systematic and meta-analysis [25]. The protocol was registered in PROSPERO (CRD42022365538) and findings are reported according to Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guideline [26].

Eligibility criteria

We included adult patients (18 years or older) with one or more of the following 14 chronic diseases: diabetes, hypertension, heart disease, cerebrovascular disorder, asthma, chronic obstructive lung disease, hyperlipidemia, rheumatoid arthritis, mental disorder, epilepsy, neoplasm, kidney disease, liver disease and osteoporosis. These diseases are prevalent in adults, incur high management costs, are commonly associated with multimorbidity and have been consistently addressed in previous systematic reviews [3]. Patients with co-morbidity and multi-morbidity were also included as long as they have at least one of the 14 specific diseases. We also included studies where interventions were aimed at broader groups of patients (e.g. those with a range of chronic diseases, elderly, "high-risk" patients and "high-cost" patients), which included those with our predefined list of chronic diseases.

Our inclusion criteria for integrated care interventions were based on the definition provided by Kodner and Spreeuwenberg [7]. Specifically, integrated care interventions involved different healthcare organizations providing the same level of care (e.g. between one hospital and another), those providing different levels of care (e.g. between primary care and hospitals) or across different sectors (e.g. between health and social care sector). We defined primary care as "accessible, comprehensive, coordinated and continual care delivered by accountable providers of personal health services" [27]. Accordingly, we assessed a study with primary care involvement if integrated care intervention explicitly included general practitioners, family physicians, nurse practitioners [28, 29] or it targeting organizational (structural or staffing), financial and reimbursement in primary care.

We included study designs eligible for Cochrane Effective Practice and Organisation of Care (EPOC) reviews [30]: randomized controlled trials (RCTs) and non-randomized studies with comparators.

Exclusion criteria

We excluded interventions which only involved single team-based assessments or screening, or where the interventions only involving shifting responsibility within institutions or shifts in care location (e.g. hospitals to home) without inter-organizational integration. Additionally, we excluded interventions exclusively examining serious psychiatric illness (bipolar disorder, schizophrenia, post-traumatic stress disorder), pain or palliative

care, for such diseases require specific interventions that may not be applicable to patients with other chronic diseases [31, 32].

Search strategy

We searched Ovid MEDLINE and Embase. The search strategy used four groups of terms: terms for integration (such as "integration" and "integrated care"); terms associated with integrated care on the basis of previous reviews (e.g. "multidisciplinary teams", "accountable care organisations" or "medical alliance") [2, 3], terms related to chronic disease, multi-morbidity, comorbidities and medical subject headings (MeSH) terms for the included chronic diseases (Additional file 2). We also included study design terms from the EPOC guidance [30]. Studies had to be in English language and published in peer-reviewed journals since 2010.

Selection of studies

All articles identified were managed using EndNote 20 (Clarivate Analytics) and duplicates were deleted. One reviewer screened all study titles and abstracts, and a 20% random sample was double screened by another reviewer. Cohen's kappa was used to check the inter-rater agreement for each step of screening and data extraction, with a kappa ≥ 0.6 considered acceptable [33]. Full texts were again reviewed by a single reviewer, with a random 20% sample screened by another reviewer, with the process assessed using the same kappa statistic.

Data extraction and management

Only studies on integrated care interventions that explicitly involved primary care were subject to detailed data extraction to answer our further research questions. One researcher extracted data first and the other researchers verified the results, with disagreements resolved by discussion. This approach was previously used by other published studies and some researchers found that this accelerated method of extracting data does not yield significantly different results from dual, independent data extraction [34–36].

Information was recorded on a data extraction sheet including:

1. Study characteristics: title, authors, publication year, country and study design.
2. Population: chronic diseases included in each study.
3. Interventions: we coded components according to the Sustainable intEgrated care modeLs for multi-morbidity: delivery, FInancing and performancE (SELFIE) framework [9], which included the following components: (a) workforce, (b) service delivery, (c) leadership and governance, (d) information and research, (e) technologies and medical products and (f) financing.
4. Outcomes: study outcomes were grouped into eight categories. Starfield outlined four core functions of primary care, often referred to as the 4Cs – first contact, continuity, comprehensive care and coordinated care [37]. The definition of each of the 4Cs was derived from the WHO [38]. For specific indicators of primary care functions, we relied on the Primary Health Care Measurement Framework published by the WHO [39] and a review by Jimenez and colleagues [40]:

(i) Access refers to the first point of contact for prevention and acute or chronic health problems. This was assessed on the basis of the number of primary care visits.
(ii) Continuity describes the ongoing relationship between the patient and a regular care provider. We assessed using patient self-reported continuity.
(iii) Comprehensiveness reflects the range of services offered and the facility's ability to manage common health conditions. This was assessed on the basis of self-reporting or the presence of screening services.
(iv) Co-ordination reflects that healthcare visits and services are connected. It was assessed on the basis of the number of referrals from different healthcare organizations.

We used four categories of wider outcomes:

(i) self-reported health (e.g. SF-32, EQ-5D)
(ii) mortality, based on routine data
(iii) hospital admissions and readmissions, based on routine data
(iv) total costs, based on measures of utilization combined with unit cost

Assessment of risk of bias

We used EPOC criteria to assess the risk of bias [41]. We ranked nine criteria on a three-point scale (low risk, unclear risk and high risk). For the overall risk of bias, the total number of criteria assessed as low risk for each study was reported.

Data analysis

We first described interventions in terms of the components in the SELFIE framework. We then conducted a post hoc categorization of the interventions on the basis of the importance of primary care involvement in the integrated care intervention. We categorized primary care involvement as primary care providers (usually general practitioners, family physicians or nurse

practitioners) who played a central role in providing services.

Within each category of study outcomes described earlier, we conducted meta-analysis using standardized mean differences (SMD) to combine data in each study [42]. Unit of analysis was at the study level.

To convert dichotomous outcomes to SMD, we used a web-based calculator (https://www.campbellcollaboration.org/escalc/html/EffectSizeCalculator-Home.php) or MetaEasy [43]. If a study reported comparisons at multiple follow-ups, we extracted data closest to 12 months. Where studies reported multiple outcomes in the same category, the median of the effect sizes and variances was calculated. Moreover, if an outcome was reported for multiple sub-groups of chronic patients, we treated each sub-group as an individual study [44]. For studies reporting multiple analyses, data were extracted from the adjusted model. Prior to performing meta-analyses, reported within-group standard errors were converted to standard deviations (SDs) [45]. When sample sizes were not reported separately for different arms, we took the average of total sample sizes for each group. Direction of effects was transformed so that a positive effect demonstrated a favourable impact of integrated care.

Given potential clinical heterogeneity, we used a random-effects model to perform meta-analysis, using Stata *metan* [43]. Cohen's rules of thumb were used to interpret results ($d=0.20$: small effect size, $d=0.50$: medium effect size, $d=0.80$: large effect size) [46]. We used the I^2 statistic to explore statistical heterogeneity [47].

Ethical issues/statement

The study utilized published data sources and ethical approval was not required.

Results

Search results

The PRISMA flow diagram is shown in Fig. 2. A total of 119 studies met the initial inclusion criteria, of which 69 (58%) involved primary care.

Characteristics of included studies

Study characteristics are presented in Table 1 (with more detailed information in Additional file 3). According to the EPOC risk of bias tool, 50 (72.5%) studies were rated low risk of bias for five or more criteria out of nine (Additional file 4). Among the nine criteria assessed, random sequence generation was the lowest-rated criterion. Specifically, 26 out of 69 studies used a non-random method

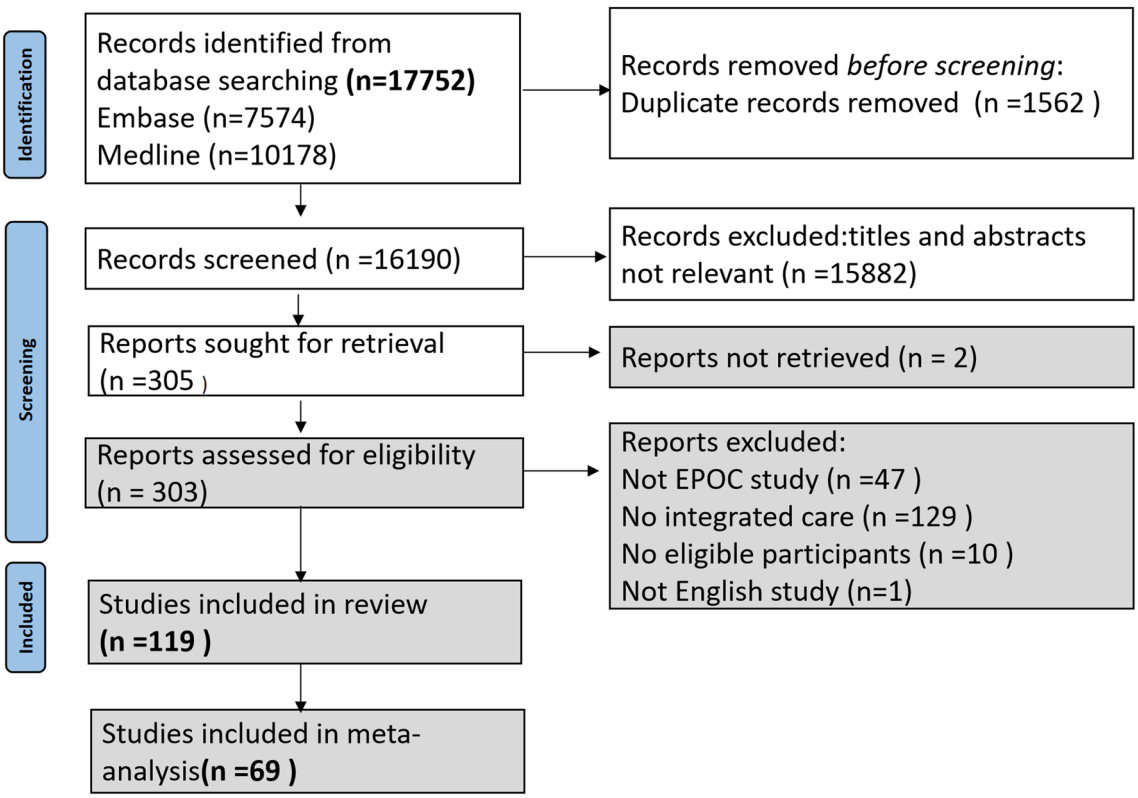


Fig. 2 PRISMA flow diagram

Table 1 Characteristics of the included studies

Characteristic	Number of studies
Context	
High-income countries	58 (84%)
Low- and middle-income countries	11 (16%)
Study design	
Randomized controlled trial	40 (58%)
Non-randomized comparative design	29 (42%)
Target population	
Chronic patients with a specified disease	37 (54%)
Chronic patients with multi-morbidity	17 (25%)
Chronic patients with unspecified diseases	9 (13%)
Elderly/high-risk patients/high-cost patients	6 (8%)
Primary care functions	
First access	8 (12%)
Coordination	4 (6%)
Continuity	7 (10%)
Comprehensiveness	2 (3%)
Wider outcomes	
Self-reported health	14 (20%)
Mortality	9 (13%)
Hospital admissions	20 (29%)
Costs	19 (28%)

(e.g. controlled before–after studies), and 19 studies failed to provide sufficient details on the randomization process. Conversely, selective outcome reporting was the highest-rated criterion. Only two studies did not report all pre-specified outcomes, and eight studies did not provide details.

Elements of integrated care interventions

All integrated care interventions involving primary care incorporated changes in workforce and service delivery. In total, 26 (37%) also incorporated clinical information technologies, such as clinical decision support systems and shared records. Changes to leadership and governance were less frequent ($n=13$, 19%), and interventions including financing were the least frequent ($n=11$, 15%).

On the basis of a post hoc analysis of primary care involvement in the interventions (Table 2), we distinguished studies in which primary care was central to the integrated care intervention ("primary care centred", $n=44$, 64%), and those in which professionals outside of primary care were as central ("specialist outreach", $n=25$, 36%). We used this categorization in sub-group analyses where there were at least 10 studies reporting the outcome. In studies characterized as "primary care centred", service and workforce change involved multidisciplinary teams, enhanced regular home visits through primary care-led teams, additional training for the primary care team and organizational changes among primary care and other healthcare providers (e.g. accountable care organizations, medical alliances), sometimes alongside restructured management responsibilities. Clinical information systems (17.3%) were used to support patient monitoring and facilitate shared decision-making, shared records and interactive communication among primary care providers and specialists. Additionally, financial support (15.9%), such as bundled payments, capitation or pay for performance, was often implemented together with organizational changes to incentivize integration and expand workforce capacity and infrastructure within primary care. In contrast, "specialist outreach" interventions did not incorporate financial changes. Primary care providers primarily contributed through referrals or served in a supportive role to specialists and other allied health professionals in MDTs. Similar to "primary care-centred" interventions, clinical information systems (15.9%) were used to monitor patients or function as help lines for primary care providers.

Meta-analysis of effects of integrated care interventions on the primary care functions

We found significant effects of integrated care interventions on access (SMD 0.17, 95% CI 0.05–0.29,

Table 2 Types of primary care involvement in integrated care interventions

Type	Studies
Primary care centred (GPs or nurse practitioners played a central role in the intervention) ($n=44$)	
Primary care centred with changing service delivery/workforce only ($n=21$)	[48–68]
Primary care centred with clinical information support ($n=12$)	[69–80]
Primary care centred with payment reform support ($n=11$)	[81–91]
Specialist outreach (other health professionals played a central role in the intervention) ($n=25$)	
Specialist outreach with changing service delivery/workforce only ($n=14$)	[92–105]
Specialist outreach with clinical information support ($n=11$)	[106–116]

$I^2 = 23.1\%$, $p = 0.23$, Fig. 3a) and continuity of care (SMD 0.32, 95% CI 0.14–0.50, $I^2 = 0\%$, $p = 0.75$, Fig. 3b). The magnitude of effect for comprehensiveness (SMD 0.77, 95% CI −0.73 to 2.26, $I^2 = 98.4\%$, $p < 0.001$, Fig. 3d) and co-ordination (SMD 0.55, 95% CI −0.19 to 1.29, $I^2 = 91.4\%$, $p < 0.001$, Fig. 3c) were both large, but were not statistically significant and displayed high heterogeneity. Comprehensiveness was assessed through a combination of self-reports and the presence of screening services, which contributed to the heterogeneity, as indicated by the high I^2 values in the random effects model. For co-ordination, most studies measured it through referrals between healthcare organizations, while one study used a broader definition that also included reminders. This inconsistency in measurement likely increased heterogeneity in the results.

In sub-group analysis, the pooled effect for "primary care centred" interventions yielded a small but statistically significant effect on access (SMD 0.14, 95% CI 0.05–0.22, $p = 0.49$, $I^2 = 0\%$). The pooled effect for "specialist outreach" interventions was not significant, though of larger magnitude (SMD 0.34, 95% CI −0.11 to 0.78, $I^2 = 58.2\%$, $p = 0.09$).

Meta-analysis of effects of integrated care interventions on wider outcomes

Patient health

The meta-analysis included 10 studies (14.5%) that assessed patient health using self-reported instruments to measure quality of life, such as SF-32 and EQ-5D. The effect of integrated care interventions was small and not statistically significant (SMD 0.13, 95% CI −0.01 to 0.26, $I^2 = 0\%$, $p = 0.94$, Fig. 4a). We also found small, non-significant effects in "primary care centred" interventions (SMD 0.14, 95% CI −0.04 to 0.31, $I^2 = 0\%$, $p = 0.88$) and "specialist outreach" interventions (SMD 0.11, 95% CI −0.09 to 0.31, $I^2 = 0\%$, $p = 0.57$).

Mortality

A total of six studies (8.7%) were included in the meta-analysis for mortality (Fig. 4b). The pooled effect was small and not statistically significant (SMD 0.06, 95% CI −0.06 to 0.18, $I^2 = 0\%$, $p = 0.92$).

Hospital admissions

The effects of integrated care interventions on hospital admissions were not statistically significant (SMD 0.01,

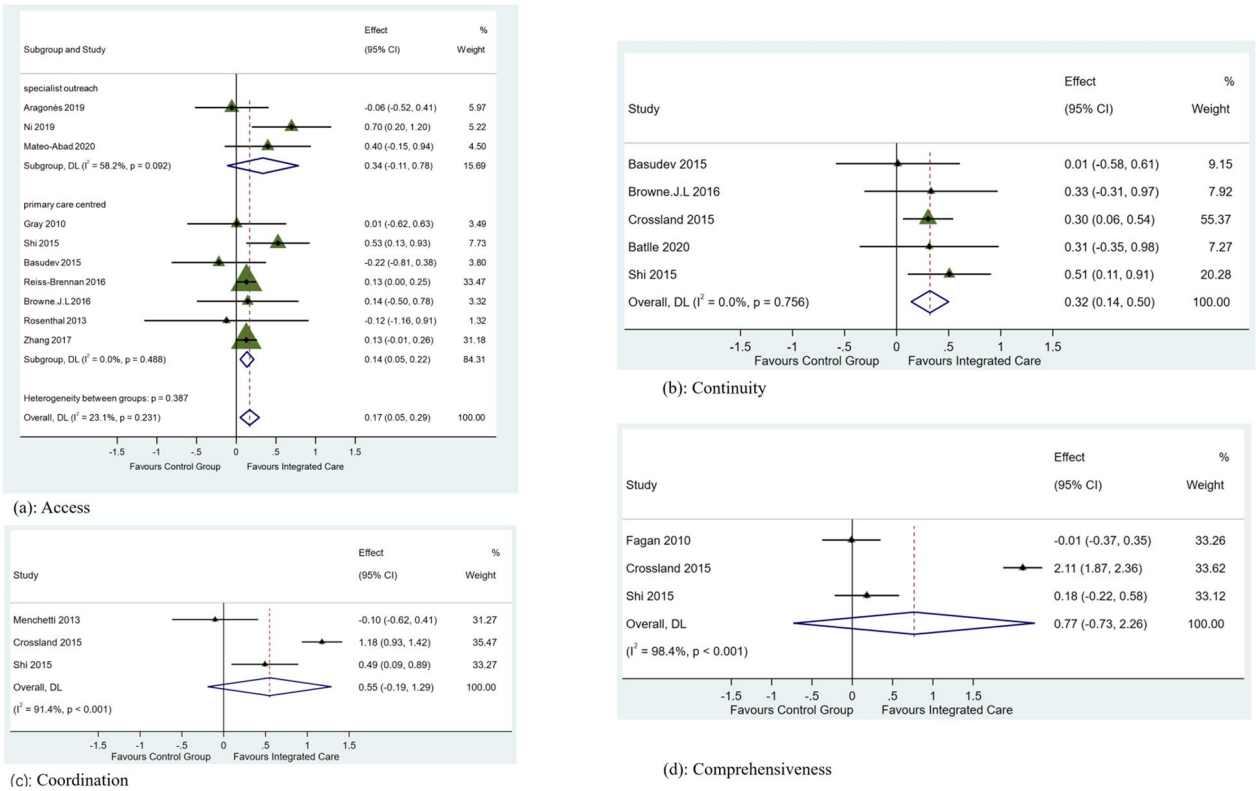
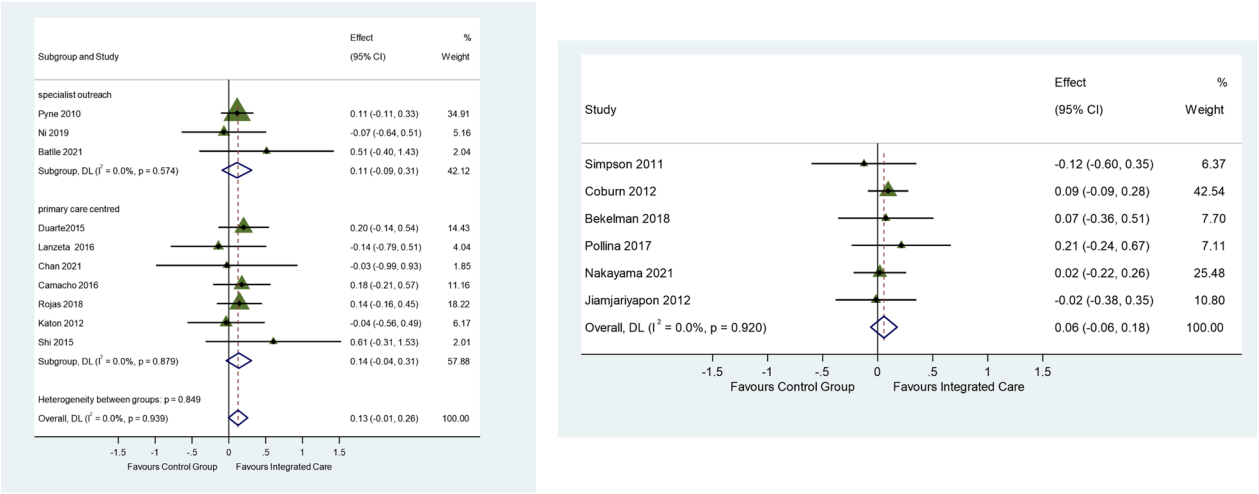


Fig. 3 Meta-analyses of effects of integrated care interventions on primary care functions. Each line in the graphical display represents a study. The midpoint of the triangle symbolizes the effect: SMD and a horizontal line through the triangle (95% confidence interval) and the size of triangle is the weight of the study. The diamond below the studies represents the overall pooled effect. The dashed line indicates the overall effect size and I^2 is the degree of the heterogeneity

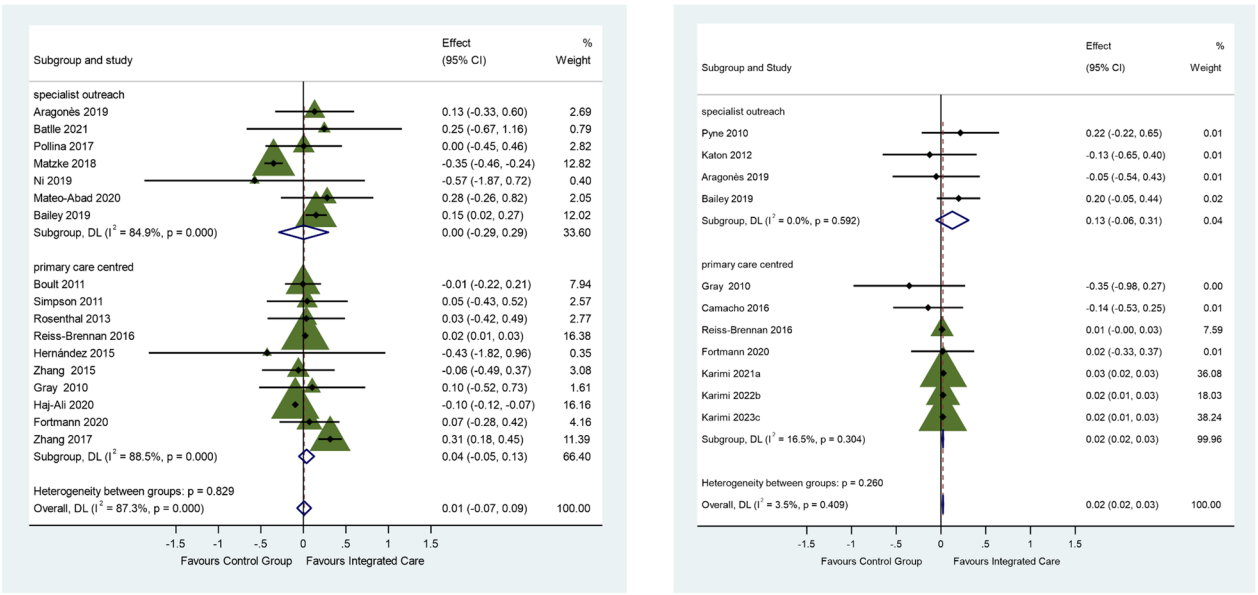


(a). Meta analysis results of integrated care interventions on patient health

(b). Meta analysis results of integrated care interventions on mortality

Fig. 4 Meta-analysis results of integrated care interventions on patient health and mortality. Each line in the graphical display represents a study. The midpoint of the triangle symbolizes the effect: SMD and a horizontal line through the triangle (95% confidence interval) and the size of triangle is the weight of the study. The diamond below the studies represents the overall pooled effect. The dashed line indicates the overall effect size and I^2 is the degree of the heterogeneity

95% CI −0.07 to 0.09, $I^2 = 87.3\%$, $p < 0.001$). The effects were also not statistically significant for both "primary care centred" interventions (SMD 0.04, 95% CI −0.05 to 0.13, $I^2 = 88.5\%$, $p < 0.001$) and "specialist outreach" interventions (SMD 0.00, 95% CI −0.29 to 0.29, $I^2 = 0\%$, $p < 0.001$) (Fig. 5a). They also yielded high heterogeneity.



a) Meta results of integrated care interventions on hospital admissions

b)Meta results of integrated care interventions on costs

Fig. 5 Meta results of integrated care interventions on hospital admissions and cost. Each line in the graphical display represents a study. The midpoint of the triangle symbolizes the effect: SMD and a horizontal line through the triangle (95% confidence interval) and the size of triangle is the weight of the study. The diamond below the studies represents the overall pooled effect. The dashed line indicates the overall effect size and I^2 is the degree of the heterogeneity

Costs

In total, 19 (27.5%) studies measured costs and 9 (13%) of them were included in the meta-analysis (Fig. 5b). The overall effect was small but statistically significant (SMD 0.02, 95% CI 0.02–0.03, $I^2=3.5\%$, $p=0.41$). We found a statistically significant impact of "primary care centred" interventions (SMD 0.02, 95% CI 0.02–0.03, $I^2=16.5\%$, $p=0.30$). For "specialist outreach" interventions, we observed a small effect that was not statistically significant (SMD 0.13, 95%CI −0.06 to 0. 31, $I^2=0\%$, $p=0.59$).

Discussion

Summary of key findings

Our results showed that just over half (57%) of integrated care interventions involved primary care. Meta-analysis demonstrated small but significant effects on some measures of primary care functions (access and continuity). However, the effects of these interventions on patient health, mortality, hospital admissions and total costs were small and generally not statistically significant.

Interpretation of the results in the context of other studies

Similar to other integrated care studies, our systematic review identified service delivery and workforce changes as the most frequently included interventions in integrated care with primary care involvement [24]. Information technology and financial interventions were much less frequently utilized. Moreover, "primary care centred" interventions often incorporated financial interventions alongside organizational changes, such as establishing "primary care medical home" and "accountable care organizations", whilst this is lacking in "specialist outreach" interventions.

Our systematic review found that integrated care with primary care involvement has positive effects on primary care functions, including not only on access, but also on continuity. Although it has been recognized that primary care is critical to integrated care, previous studies have not analysed the pathway between integrated care interventions, primary care outcomes, and wider impacts in detail [3, 24, 40]. A narrative analysis conducted by Jimenez and Matchar found that broader interventions in primary care (e.g. multidisciplinary team) could enhance access of primary care [40]. The current review provided a more detailed assessment of the role of primary care in integrated care by characterizing its involvement in terms of two types ("primary care centred" and "specialist outreach") and assessing impacts on primary care functions. Sub-group analysis further suggests that "primary care centred" interventions, where primary care plays a deeper role in integrated care, show more consistent benefits in access compared with "specialist outreach".

Valentijn et al. [18] has highlighted the theoretical link between primary care and integrated care, emphasizing the importance of primary care as a foundation for integrated care. Additionally, several studies have demonstrated the benefits of primary care and high-quality primary care (characterized by the 4Cs) showing better self-reported health, higher patient satisfaction, lower mortality [117] and greater equity [118]. These studies also highlighted the importance of considering primary care involvement in integrated care. Our meta-analysis revealed that integrated care studies with primary care involvement revealed small positive effects on costs, which was statistically significant. However, we did not find any statistically significant effects on wider outcomes of hospitalization, mortality and quality of life for patients with chronic conditions or multi-morbidity.

Previous studies on integrated care have yielded inconsistent results, with or without considering primary care. Several narrative reviews evaluating the effects of integrated care between primary care providers and hospitals reported mixed evidence on broader outcomes, despite some positive findings for hospital admissions. Other systematic reviews analysing integrated care without considering primary care involvement also reported mixed results. For example, Mitchell et al. evaluated 14 studies and found improvements in service utilization, but also observed slightly higher costs and inconsistent effects on quality of life [24]. In contrast, a systematic review from China involving 47 studies showed improvements in cost management and quality of life for patients with chronic diseases [119]. Similarly, Murtagh et al. reviewed 22 studies implemented in primary care, which found fewer hospital admissions and better quality of life, but limited effects on costs [17]. Baxter et al. reviewed 67 studies of more general integrated care interventions and found limited improvements in service utilization and cost outcomes for the general population, despite improvements in access to care [2]. Conversely, a systematic review of 27 integrated care studies in Asia found that these interventions primarily focussed on individual-level care coordination, with improvements observed in quality of life and hospital admissions [10].

Our study found that integrated care involving primary care is likely to strengthen specific primary care functions but has limited effects on broader outcomes. The small reduction in costs observed may be attributed to cost savings when primary care providers replace specialists for treatment, as primary care services are generally less expensive. Simply involving primary care in integrated care interventions may not be sufficient for achieving broader improvements. The positive effects on strengthening primary care functions suggest that future integrated care interventions

need to consider strengthening primary care as a pathway to achieving improved broader outcomes. For instance, the Netherlands implemented an organizational change in primary care and introduced shared savings, where primary care providers could share in savings if they performed better than a set benchmark. A critical factor for success in the Netherlands was that primary care providers were empowered to coordinate care, influence treatment decisions and avoid unnecessary speciality care [120]. In addition, the tiered healthcare system reform in Xiamen, China demonstrated improved clinical quality and cost savings for patients with hypertension and diabetes. This model implemented a so-called specialist + general practitioner + health manager team-based approach. The potential mechanism behind its success lies in gradually strengthening primary care. Primary care providers enhance their clinical expertise with support from specialists in large hospitals, progressively assuming a gatekeeping role while implementing and monitoring healthcare plans [121]. It is likely that integrated care, by strengthening primary care, can ultimately lead to improved wider outcomes.

It is important to acknowledge that these discrepancies in wider outcomes are also likely influenced by the specific elements of integrated care implemented, participant characteristics and duration of follow-up. In our included studies, the Guided Care study in the United States has a large sample of patients with chronic disease. There was no overarching effect on hospital admissions in the whole sample, but a subgroup analysis focussing on participants in the Kaiser-Permanente system revealed positive outcomes [70]. In addition, the duration of included studies may have been too short to detect effects of the intervention which may become more apparent over the longer term. For example, one study included in the review only reported positive effects using the simulation method for a long-term finding [64]. It may not be plausible for integrated care policies to make large reductions of healthcare utilization in the short term [122].

Overall, positive effects of integrated care interventions on primary care functions did not generalize to improved wider outcomes, even in studies with primary care involvement. Often, included studies prioritized reporting on wider outcomes without adequately measuring any impacts of integrated care interventions on primary care functions. Our study highlights the importance of linking primary care functions to wider outcomes.

Strengths and limitations

To our knowledge, this is the first systematic review to analyse integrated care studies from the perspective of primary care involvement and to assess effects on both primary care functions and wider outcomes. Although we restricted our search to two databases which were most likely to report controlled studies of integrated care, and to recent literature, our strategy identified a substantial number of studies for assessment (over 16,000) and analysis. We employed a clear definition of integrated care, and by detailing the exact nature of primary care involvement, we were able to explore the impact of integrated care interventions involving primary care in meta-analysis but also explore different types of primary care involvement.

While our analysis primarily focussed on outcomes assessed at approximately 12 months, we acknowledged that this may have limited our ability to capture longer-term effects. Additionally, our analyses were constrained by limited reporting in the included studies (for example, it only allowed for a binary categorization of primary care involvement) and by fewer eligible studies reporting data suitable for meta-analysis. Moreover, combining different measurements allowed us to capture a broader perspective on comprehensiveness and coordination, reflecting the real-world complexity of integrated care evaluation. However, this diversity also contributed to the overall heterogeneity, which in turn restricted our ability to draw definitive conclusions. It is important to note that we are unable to formally assess the causal relationship between impacts on primary care functions and wider outcomes because of imperfect overlap of the studies reporting each outcome. Lastly, among included studies, the majority were from high-income countries. This also implies the need for more evidence from low- and middle-income countries.

Policy and research implications

Primary care is recognized as fundamental to integrated care, however, we found there is still a significant number of integrated care studies that do not clearly report involving primary care. If policymakers expect integration to act via strengthened primary care, there is a need to clearly specify how integrated care interventions will achieve this, and to measure and report impacts on measures of primary care functions as an intermediate outcome. Given that few integrated care interventions included changes to clinical information or payment/incentive systems, it will be important for future research to explore such areas. It may be important to incorporate incentives for healthcare providers in integrated care interventions to strengthen primary care. Future research should also aim to identify which specific components of

integrated care are most effective in strengthen primary care functions. Additionally, studies investigating the effectiveness of integrated care intervention involving primary care should also report outcomes related to primary care functions to help unpack the potential causal chain further.

Conclusions

This systematic review and meta-analysis showed that just over half of integrated care interventions involved primary care. Integrated care studies with primary care involvement demonstrated positive effects on primary care functions, but did not consistently demonstrate positive effects on hospitalization, costs, mortality and quality of life.

Abbreviations

CI	Confidence interval
EPOC	Cochrane Effective Practice and Organisation of Care
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
RCTs	Randomized controlled trials
SDs	Standard deviations
SELFIE	Sustainable intEgrated care modeLs for multi-morbidity: delivery, FInancing and performancE
SMD	Standardized mean differences
WHO	Word Health Organization

Supplementary Information

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Supplementary material 1. PRISMA checklist.

Supplementary material 2. Logic model and search strategy.

Supplementary material 3. Description of included studies.

Supplementary material 4. Risk of bias assessment.

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Author contributions

All authors conceptualized and designed the study and final manuscript. Y.Z. primarily performed searches, data extraction, data analysis and drafted the manuscript. J.S., L.A., P.B. and X.J. performed double screen. All authors contributed to the interpretation of the data, the edit and critical revision of the manuscript. All authors have read and approved the final manuscript.

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Availability of data and materials

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This study does not require research approval.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Health Organisation, Policy and Economics, School of Health Sciences, University of Manchester, Manchester, UK. [2]MRC/CSO Social and Public Health Sciences Unit, School of Health and Wellbeing, University of Glasgow, Glasgow, Scotland, UK. [3]Division of Population Health, Health Services Research and Primary Care, University of Manchester, Manchester, UK. [4]China Center for Health Development Studies, Peking University, 38 Xueyuan Rd, Haidian District, Beijing, China.

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