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Review Article

The Impact of Pharmaceutical Care in Multidisciplinary Teams on Health Outcomes: Systematic Review and Meta-Analysis

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A B S T R A C T

Objectives: Pharmacists' care has an essential role in multidisciplinary teams in charge of chronic patients. However, data available on the clinical outcomes of these activities appear inconclusive. This study aimed to systematically investigate the effect of multidisciplinary teams that include coordinated pharmaceutical care on clinical outcomes.
Design: Systematic review and meta-analysis. Relevant studies identified from MEDLINE, Cochrane, Web of Science, Scopus and CINAHL databases were analyzed. The search included randomized clinical trials published in 2000-2018. Included studies were all published studies in English that compared the effectiveness of multidisciplinary teams including pharmacist care to usual care. Meta-analysis was carried out using a random effects model, and subgroup analysis was conducted to determine the sources of heterogeneity.
Setting and Participants: 29 studies involving 4186 adult patients were included.
Measures: Follow-up time varied from 30 to 180 days. The most common primary endpoint was the frequency of hospitalizations or readmissions, followed by variation in clinical parameter variables related to quality of prescription, treatment adherence and costs.
Results: Twelve (41.3%) of the included studies scored low risk of bias according to the AMSTAR-2 scale, the remaining 17 (58.7%) being classified as intermediate risk. The intervention of a multidisciplinary team reduced the probability of readmission by 32% [odds ratio (OR) 0.74, 95% confidence interval (CI) 0.62-0.89]. Six of the 29 (20.7%) studies included met the inclusion criteria of the meta-analysis on quality-of-life outcomes. The intervention of the multidisciplinary team represented a significant increase in patients' quality of life (OR 0.58, 95% CI 0.47-0.69). Analysis of heterogeneity showed a significant difference between the studies. No evidence of publication bias was identified.
Conclusions and Implications: Multidisciplinary programs that include pharmaceutical care reduce the risk of visiting hospitals and improve patients' quality of life. This review supports the importance of the pharmacists as part of multidisciplinary teams.

Pharmaceutical care programs (interventions that usually include treatment optimization by reviewing the adequacy of the treatment, reconciling and improving adherence) have clearly demonstrated to resolve situations that could otherwise potentially lead to drug-related problems (DRPs).[1,2] These interventions are encouraged by international health institutions such as the World Health Organization (WHO) in their Third Global Patient Safety Challenge: "Medication without harm"[3] and in the WHO handbook *Developing Pharmacy Practice: A Focus on Patient Care*.[4] The most recently published resolution [CM/Res(2020)3][5] by the Council of Europe on the implementation of pharmaceutical care for the benefit of patients and health services considers that the optimization of medication use is essential for all patient groups and for the overall enhancement of patient safety.

Evidence of the impact of pharmaceutical care programs on health-related quality of life and improving drug-related iatrogenic illness remains uncertain. However, DRPs continue to be an important and unfortunate cause of morbidity and mortality in all settings of care

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and among all patient populations. DRPs are a major iatrogenic illness all over the world, especially prevalent in frail patients, and yet there is strong evidence that morbidity related to DRPs is a major health problem that can be avoided. DRPs are ranked between the fourth and sixth cause of avoidable in-hospital deaths.[6] Up to 38% of emergency department visits are associated with DRPs, and up to 70% of these are considered avoidable.[7–9] Furthermore, DRPs are directly responsible for 5% to 10% of hospital admissions, and 21% of readmissions are also due to medication. Readmissions were deemed preventable in a median of 69% of cases (interquartile range 19%-84%).[10]

Dalleur et al considered that DRPs were responsible for 13% of potentially preventable 30-day readmissions, with most being related to widely used drugs such as diuretics, analgesics, antithrombotics, antibiotics, antineoplastics, and antidiabetics.[11]

Both detection and characterization of DRPs, and especially of those DRPs classified as preventable, are essential for developing effective and targeted strategies to prevent their occurrence and thus improve patient safety. Although previous efforts have been published focusing in adult inpatient and analyzing the effects interventions by clinical pharmacists,[12] the evolution of pharmaceutical care needs to review the implementations of integrated pharmaceutical care in multidisciplinary teams and coordinated actions with different levels of care. Our review has focused on these types of actions, which undoubtedly allow a more complete approach to the patient.

The objective of this systematic review and meta-analysis was to appraise the impact of pharmaceutical care in a multidisciplinary environment and also to identify the most valuable interventions.

Material and Methods

Design

A systematic review and meta-analysis focusing on the effect of hospital admission and quality of life were reported following the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement (PRISMA).[13] Prior to the search, a review protocol based on PRISMA-P[14] was completed and registered at PROSPERO (International Prospective Register of Systematic Reviews) database (ID = CRD42021227736).

Search Strategy and Study Selection

A systematic computerized literature search was performed using 6 online databases: MEDLINE (PubMed), Cochrane, WOS (Web of Science), Scopus, and CINAHL. The search included articles published from January 2008 to December 2018. All databases were searched using the Boolean method with the following medical subject headings (MeSH) terms: *Pharmaceutical Services*, *Outcome Assessment (Health Care)*, *Patient Care Team*, *Organization & Administration*, and *Pharmacists*. The eligibility of the studies was formulated according to the following PICOS criteria:

- Population: adult chronic patients[15]
- Intervention: multidisciplinary team interventions with hospital or primary care pharmacist participation
- Comparison: standard patient care
- Outcomes: hospital admission, emergency department visit, and quality of life were taken into account as a primary outcomes. Drug adverse effects and costs were considered as secondary outcomes.

Studies were included if (1) they were randomized controlled trials with participants randomized into a control group; (2) hospital admission, emergency department visit, or quality of life were included as intervention. Studies were excluded if pharmacists were not included as part of the multidisciplinary team. Only full-text publications in English were considered.

The complete search strategy for each database can be found in Supplementary Material 1. The searches were customized to accommodate the layout and characteristics of each search tool. The reference sections of all identified articles were examined and a hand search of the articles was also conducted for other potentially relevant references.

One author (C.M.) selected papers form the databases to be evaluated. Titles and abstracts obtained by the search were screened and downloaded into Mendeley Desktop (Glyph & Cog) for a subsequent full-text review. Cross references and duplicates were removed. All publications potentially relevant for inclusion in the meta-analysis were independently assessed by 3 reviewers (M.H., A.J., and J.R.). Any discrepancies at this stage were resolved during a consensus meeting, and another reviewer (C.M.) was available if needed.

Outcome Variables

For the primary outcome, hospital admission, emergency department visit, and quality of life were considered. For the secondary outcomes, cost-saving secondary to patient care, treatment adherence, variation in clinical variables, and changes in patients' prescriptions were considered.

Data Extraction

General study information, participants, intervention characteristics, and outcome measures were extracted independently by 3 reviewers (M.H., A.J., J.R.) using a specific standardized form (Supplementary Material 2). When studies provided insufficient data for inclusion in the meta-analysis, the first author of the study made contact with the corresponding author(s) to determine whether additional data could be provided.

Risk of Bias

Methodological quality was not implemented, as no evidence for such appraisals and judgments exist and therefore can be confusing when interpreting results.[16]

A bias is a systematic error, or deviation from the actual effect, in results or inferences. Risk of bias in randomized controlled trials was assessed by the authors in accordance with the Cochrane Collaboration's tool for assessing the risk of bias in randomized trials.[17] The items on the list were divided into 6 domains: selection bias (random sequence generation, allocation concealment), performance bias (blinding of participants and researchers), detection bias (blinding of outcome assessment), attrition bias (incomplete outcome data), reporting bias (selective reporting), and other bias. For each study, bias domain was judged by consensus (J.R., M.H., and A.J.) or third-party adjudication (C.M.) and were characterized as follows: high (plausible bias that seriously weakens confidence in the results), low (plausible bias unlikely to seriously alter the results), or unclear (plausible bias that raises some doubt about the results).

Statistical Analysis

Descriptive data of the participants' characteristics were reported as mean (SD). All meta-analyses calculations were conducted with the R software with meta and metafor packages for meta-analysis (version 3.5.1.). Descriptive analyses and figures of risk of bias were performed using Microsoft Excel for MAC, version 16.29.1 (Microsoft, Redmond, WA). Mean and standardized mean differences (Hedges *g*) and 95% CI for each group were calculated. The analysis of pooled data was conducted using a random effects model to estimate the change for each

group at the same measurement time on primary and secondary outcomes. Heterogeneity was assessed using Cochran Q statistics and its corresponding *P* value as well as the I^2 statistic, which describes the percentage of variability in effect estimates attributable to heterogeneity rather than chance when I^2 was >30% (with 30%-60% representing moderate heterogeneity).[16] Publication bias was assessed with funnel plots and Begg test. Significance was set at $P < .05$.

Results

Study Inclusion

Figure 1 shows the flow chart of the studies reviewed and included in the systematic review and meta-analysis. Of the 10,863 citations reviewed, 113 met the initial inclusion criteria, of which 29 studies[18–46] were included in the systematic review and 14 were analyzed in the meta-analysis, 8[18–21,23,25,32,41] for the hospital admission variable and 6[20,22,24,30,40,46] for quality of life. Studies were excluded at the level of a full-text review for the following reasons: inadequate design (n = 11), pediatric population (n = 3), absence of multidisciplinary action (n = 10), high risk of bias (n = 4), and lack of inclusion of variables of hospital admission or quality of life (n = 56).

Systematic Review Results

Table 1 summarizes the characteristics of the studies included in the systematic review. A total of 12,773 patients were included, the studies having included sample sizes of between 40 and 1802 patients. In 14 studies (48.3%), the mean age of patients included was over 65 years. Of the 29 studies included in the systematic review, 13 (44.8%) were multicentre studies. The main scope of action included hospital care, which comprised 14 (48.3%) studies, primary care in 10 (%) and other health institutions in 5 (17.2%). The main inclusion criteria of the patients were advanced age (9; 31.0%), polypharmacy (4; 13.8%), and the presence of cardiac (4; 13.8%) and psychiatric pathologies (4; 13.8%).

The most common primary endpoint was the frequency of hospitalizations or readmissions (n = 13; 48.0%), followed by variation in clinical parameters (n = 6; 20.7%), variables related to quality of prescription (n = 4; 13.8%), and treatment adherence (n = 4; 13.8%). The maximum follow-up period for the patients included was ≤30 days in 7 (24.1%) studies, between 30 days and 1 year in 12 (41.4%) and ≥1 year in 10 (34.5%) studies. Fifteen (55.2%) studies included statistically significant positive results presented in their main endpoint; no negative results for the intervention group were observed in any of the studies.

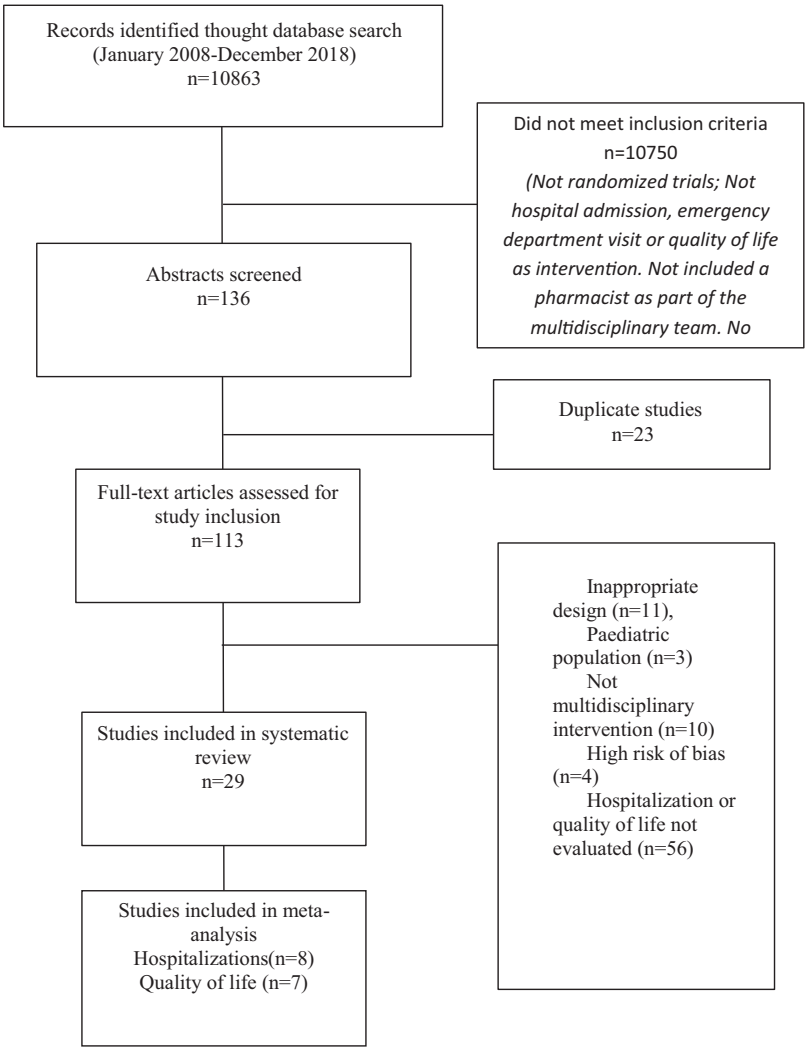

Fig. 1. Flow chart of the literature search and included studies.

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Table 1
Summarized Details From All Randomized Clinical Trials Included

Author/Year	Multicenter	Number of Patients	Mean Age (SD or 95% CI)	Description of Pharmacist Interventions	Intervention Place	Main Outcome (Period)	Hospital Admission Results	Quality of Life Results	Other Main Results
Zillich et al, 2014[18]	Yes	895	73.0 (13.0)	Phone call; medication review	Domiciliary care	Readmission (30 and 60 d)	Readmissions 60 d (OR 1.26, 95% CI 0.89-1.77) and 30 d (OR 1.22, 95% CI 0.84-1.78)	ND	
Bonetti et al, 2018[19]	No	104	65.0 (10.0)	Patient education; phone call	Hospital	Mortality, readmission, ED visits (30 d)	Readmission 30 d: 7.8% vs 13.2% ($P = .374$); cardiologist readmissions: 0.0% vs 11.4% ($P = .027$)	ND	Emergency visit: 0.0% vs 7.5% ($P = .118$); mortality: 0.0% vs 5.7% ($P = .243$)
SUREPILL Group, 2015[20]	Yes	1094	ND	Medication reconciliation; treatment review	Hospital	Preventable adverse events	Readmission 3 mo: 17.7% vs 23.2% ($P = .064$)	EQ-5D: 0.81 (0.69-1.00) vs 0.81 (0.71-1.00) ($P = .337$); EQ-VAS: 70 (60-80) vs 70 (60-80) ($P = .102$)	Reduction preventable DRPs: RR 0.71. (0.37-1.39; $P = .324$)
Leendertse et al, 2012[21]	Yes	674	75.8 (74.9-76.4)	Pharmacist interview; treatment discussion with physicians	Primary care	Readmission (1 y)	Readmission 12 mo: 1.6% vs 3.2%; HR 0.50 (0.12-1.59)	EQ-VAS: RR 1.73 (0.37-3.68); EQ-5D: RR 0.16 (−0.01 to −0.42))	Mortality: RR 0.78 (95% CI 0.13-1.94); DRPs: 1.02 (0.94-1.08)
Dashti-Khavidaki et al, 2012[22]	No	92	53.6 (15.0)	Multidisciplinary treatment review	Hemodialysis center	Quality of life (HRQoL)	ND	HRQoL: Intervention: from 56.9 (37.7-71.7) to 72.2 (55.3-83.7) ($P = .001$); Control: from 50.45 (38.6-68.1) to 49.5 (33.8-65.0) ($P = .15$)	
Gillespie et al, 2009[23]	No	400	87.1 (4.1)	Medication review; primary care communication; phone call	Hospital	Readmissions and costs (1 y)	Readmission reduction in 12 mo: 16% [0.84 (0.72-0.99)]. Readmission due DRP reduction: 80% [0.20 (0.10-0.41)]	ND	ED visits: 47% lower; costs per patients $230 lower
Hogg et al, 2009[24]	No	241	69.6 (−)	Phone call or home visit; treatment review	Primary care	Quality of care (CDM) score (12-18 mo)	ND	SF-36: Physical (41.6 vs 40.4; $P = .18$); Mental (53.6 vs 52.3; $P = .44$); HRQoL difference: 0.1 (−12.8 to 13.1; $P = .98$)	ED visits difference: −0.10 (−0.31 to 0.2; $P = .48$); Quality of care (CDM) score difference: 0.091 (0.037-0.144; $P = .013$)
Jack et al, 2009[25]	No	749	50.1 (15.1)	Treatment review; medication reconciliation; phone call; education	Hospital	ED visits and hospitalization (30 d)	Readmission 30 d: 15.1% vs 6.5% (P = ND)	ND	Costs: $21389 vs $11285
Makowsky et al, 2009[26]	Yes	452	74.9 (13.9)	Clinical round; treatment review	Hospital/ primary care	Quality of prescription	Readmission reduction 3 mo: OR 0.63 (0.42-0.94). Readmission reduction 6 mo: OR 0.78 (0.53-1.15)	ND	Adherence to indicators overall: 56.4% vs 45.3% [mean difference adjusted 10.4 (5.0, 15.7)]
Mateti et al, 2018[27]	Yes	153	51.9 (13.1)	Treatment review; nutritional support; education	Hemodialysis center	HRQoL KDQoL-36 6 y 12 mo	ND	HRQoL scores improved compared to usual care group ($P < .05$)	ICER: 86,230 Indian rupees; QALY: 231,016 Indian rupees
Painter et al, 2017[28]	No	265	51.9 (14.0)	Teleassistance	Primary care/ Veterans center	Quality of Well-Being (QWB) scale (12 mo)	ND	SF-12 (Mental): 31.9 (10.4) vs 31.8 (10.8) ($P = .86$); SF-12 (Physical): 34.9 (12.0) vs 35.2 (13.6) ($P = .47$);	HSCL-20 depression severity score: 2.2 (6) vs 2.1 (7) ($P = .47$); cost-effectiveness ratio: $185,565 per QALY (IQR $57,675-$395,743)

Pyne et al, 2010[29]	Yes	360	58.8 (11.4)	Teleassistance	Primary care	Day- [illegible] depression quality of life (SF-12) (12 mo)	[illegible]	QALY s based on SF-12: β = 0.018, SE = 0.009 (P = .04); QALYs based on QWB scale: β = 0.015, SE = 0.008 (P = .08)	Cost reduction: β = $1528, SE = $298 ($P$ = .001); Cost/QALY: $85,634
Sharp et al, 2018[30]	No	244	53.8 (10.5)	Medication reconciliation; therapeutic goals identification; plan of care; phone call	Primary care	%HbA1c (1 and 2 y)	ND	Quality of life (4-item Diabetes Distress Scale); mean (SD): Pharmacist: 13.8 (6.3); pharmacist + CHW: 13.4 (5.7); P = .69	HbA_{1c} change (mean): Intervention: −0.45% (−0.96 to 0.05); Control: −0.42% (−0.93 to 0.08]). No significant changes in weight, systolic blood pressure, cholesterol, self-reported medication adherence, and diabetes knowledge
Siaw et al, 2017[31]	Yes	411	59.2 (8.2)	Treatment review; domiciliary visit or phone call	Primary care	Cardiovascular variables (3 and 6 mo)	ND	DTSQ (6 mo): intervention: 25.6 (5.7) to 28.5 (5.2); control: 25.0 (6.3) to 25.7 (5.9) (P < .01).	Cost: US$516.7 vs US$607.7 (P < .001); Mean HbA_{1c}: intervention: 8.6% (1.5%) to 8.1% (1.3%) (P = .04); control: remained unchanged in 8.5% (1.4%)
Sjolander et al, 2019[32]	Yes	460	83.1 (6.6)	Medication reconciliation; clinical round	Hospital	DRP readmissions (180 d)	Readmissions 180 d: 31.3% vs 27.4% (P = .31)	ND	Cost reduction per patient: 290€
Wathne et al, 2018[33]	Yes	1802	67.1 (−)	Treatment review	Hospital	Guidelines adherence, antibiotic use, prescription changes (30 d)	Readmission 30 d: 7.5% vs 6.8% % (P = .11)	ND	Adherence to guidelines increase from 60% to 66% (P = .04); increase of 30% in the use of penicillin G for pneumonia and COPD exacerbations (P < .001)
Jarab et al, 2012[34]	No	133	64.0 (15.0)	Clinical interview; education	Hospital	Quality of life 6 mo (SGRQ)	Readmissions 6 mo: 52% vs 57% (P = .56)	Change in SGRQ (6 mo): intervention: −2.9 (−6.1 to 0.9) vs Control: −2.1 (−5.91 to 0.20); P = .51	Intervention increased COPD knowledge (P < .001) and medication adherence (P = .017); no significant changes in ED visit: 61% vs 66% (P = .51)
Olesen et al, 2014[35]	No	630	74.0 (70-80)	Domiciliary visit; phone call	Primary care	Adherence (1 y)	Admission 2 y: 30% vs 28% (P = .47)	ND	Adherence (12 mo): 89% vs 90%, OR 1.14 (0.62-2.00); mortality (24 mo): 7.5% vs 5%, OR 1.41 (0.71-2.82)
Bell et al, 2016[36]	Yes	851	61.0 (14.0)	Medication reconciliation; education	Hospital	Revisit (30 d)	Revisit 30 d: HR = 1.04 (0.78-1.39)	ND	ED visits: HR = 1.03 (0.76-1.39)
Lenander et al, 2014[37]	No	209	79.0 (77.6-80.4)	Treatment review	Primary care	Reduction in number of drugs and DRPs (12 mo)	Readmissions 12 mo. (mean 1.7 vs 2.7; median 1 vs 2); P = ND	ND	No significant differences regarding self-rated health (2.7 vs 2.8; P = ND)
Carrión et al, 2013[38]	No	447	42.0 (1.0)	Domiciliary visit; education; adherence promotion	Hospital	Adherence, costs (11 mo)	ND	QALYs: 16.317 vs 15.814 (P = ND)	Adherence: 94.6% vs 78.9% (P < .05); sustained viral response: 77.1% vs 61.9 (P < .05); cost per patient: €13.319 vs €16.184
Casper et al, 2019[39]	No	40	52.3 (8.2)	Phone call; DRP resolution; adherence promotion; education	Hospital	Cardiovascular variables and quality of life (SF-36) (3 mo)	ND	SF-36 (General Health): intervention: 50 (41.2-63.7) vs 70 (56.25-75); control: 47.5 (36.2-58.7) vs 45 (30-58.75) (P = .008)	DRPs, median: −100 vs 5.882 (P = .0001); adherence score, 39.13 vs −14.58 (P = .0001); knowledge score, median: 30.28 vs −5.19 (P = .0001)

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Table 1 (*continued*)

Author/Year	Multicenter	Number of Patients	Mean Age (SD or 95% CI)	Description of Pharmacist Interventions	Intervention Place	Main Outcome (Period)	Hospital Admission Results	Quality of Life Results	Other Main Results
Chen et al, 2014[40]	Yes	542	63% > 60 y	Treatment review; education; phone call	Hospital	Pain scale (6 mo), adverse events, quality of life	ND	QLICP-GM: 48.3 vs 37.6 (P = .032)	Reduction in pain score (P < .05); gastrointestinal adverse events (P < .05); psychological problem (P > .05)
Cossette et al, 2017[41]	No	231	81.5 (7.7)	Treatment review; pharmacotherapy plan	Hospital	Treatment modification 48 h after alarm	Readmissions 30 d: 22 vs 16% (P = ND)	ND	Hospital mortality: 9% vs 5% (P = .30); 30-day ED visit: 21.1% vs 21.4% (P > .99); drug cessation or dosage decrease more frequent at 48 h post-alert (absolute difference 30.0%, 13.8% to 46.1%) and at discharge (absolute difference: 20.8%, 4.6% to 37.0%)
Wu et al, 2018[42]	Yes	250	65.8 (8.7)	Education session	Primary care	Cardiovascular (UKPDS) risk (13 mo)	Revisits 13 mo: 18.1% vs 15.8% (P = .10)	SF-36 Physical: 39.2 (9.7) vs 39.3 (9.8), P = .33; Mental: 48.8 (11.0) vs 50.4 (11.7), P = .70	UKPDS coronary event risk reduced for patients: visit: −0.02 (0.09) vs control: −0.04 (0.09) P < .05; costs per participant: +$4656 vs +$2645; P = .16
Karapinar-Çarkıt F et al, 2017[43]	No	319	64.5 (16.5)	Medication reconciliation; education; primary care communication.	Hospital	Readmissions (3 mo)	Readmissions 3 mo: 21.4% vs 20.5%, OR 0.90 (−8.85 to 8.51)	EQ-5D 3 mo: 0.15 vs 0.17 [difference adjusted (95% CI) −0.008 (−0.0170 to 0.0001)]	Costs: €6845 vs €7052 [difference adjusted: −€1107 (−3108 to 893)]
Lin et al, 2017[44]	Yes	288	74.3 (5.3)	Education; motivational interview; phone messages	Hospital	Adherence (3, 6, and 18 mo)	ND	PCS: B = 1.77 (P = .02); MCS: B = 1.68 (P = .04)	18 mo: Medication Adherence Scale, B = 4.24 (P < .01), cholesterol = −8.60 mg/dL (P < .01), triglycerides (B = −18.21 mg/dL (P < .01).

CDM, chronic disease management; CHW, community health worker; DRPs, drug-related problems; DTSQ, Diabetes Treatment Satisfaction Questionnaire; ED, emergency department; EQ-5D, EuroQol−5D; EQ-VAS, EuroQol visual analog scale; HR, hazard ratio; HRQOL, health-related quality of life; ICER, incremental cost-effectiveness ratio; IQR, interquartile range; KDQOL, validated disease-specific quality of life instrument; MCS, Mental Component Summary; ND, no data available; ns, nonsignificant; PCS, Physical Component Summary; QLICP-GM, Quality of Life Instruments for Cancer Patients; QALY, quality-adjusted life-year; RR, rate ratio; SGRQ, St George Respiratory Questionnaire; SF-36, 36-Item Short Form Health Survey; UKPDS, UK Prospective Diabetes Study Group risk score; HbA1c, glycosylated hemoglobin.

Table 2
Most Frequent Interventions Carried Out by the Multidisciplinary Team

Intervention	n	Percentage of Studies
Medication reconciliation	15	51.7
Phone call interview	13	44.8
Information at discharge	15	51.7
Adherence planning	7	24.1
Communication with other health care assistance levels	2	6.9

In the set of variables evaluated, both as primary or secondary endpoints, the assessment of clinical results (except for hospital admission or emergency visit) was present in 11 (37.9%) of the studies, emergency health care or nonhospital health institution visits in 8 (27.6%) and mortality in 6 (20.7%). The costs were evaluated in 9 (31.3%) of the included studies, with the intervention group demonstrating improved of cost-effectiveness or cost per QALY.

Interventions Carried Out by Multidisciplinary Teams

The multidisciplinary teams of the studies evaluated included pharmacists (n = 29, 100%), physicians (n = 27, 93.1%), nurses (n = 15, 51.7%), psychologists (n = 3; 10.3%), and occupational therapists (n = 2; 6.9%). Table 2 summarizes the described interventions performed by these multidisciplinary teams, the most common being the review and reconciliation of the prescribed treatment (n = 15, 51.7%) and the clinical interview with patients (n = 15, 51.7%).

Risk of Bias

Twelve (41.3%) of the included studies scored low risk of bias according to the AMSTAR-2 scale,[47] with the remaining 17 (58.7%) being classified as intermediate risk.

Results of the Meta-Analysis

Hospital admission result

Of the 29 included studies, 8 (27.6%)[18–21,23,25,32,41] met the inclusion criteria of the meta-analysis, with 6[19,20,23,25,32,41] activities carried out in hospital care, 1[19] in home care and 1[21] in primary care. The follow-up time varied from 30 to 180 days and the sample size from 115 to 1036 patients, with a sample size for the meta-analysis of 4186 patients. Figure 2 shows the forest plot of readmission odds ratios (ORs) for the composite meta-analysis. The analysis showed that the intervention of a multidisciplinary team represented a significant reduction in the probability of readmission of 32% (OR 0.74, 95% CI 0.62-0.89). Analysis of heterogeneity showed a significant difference between the studies ($I^2 = 76.9\%$, $P < .001$). No evidence of publication bias was identified (Kendall τ with continuity correction P value = .254).

Results on the quality of life

Six of the 29 studies included (20.7%) met the inclusion criteria of the meta-analysis on quality-of-life (QoL) outcomes.[20,22,24,30,40,46] The forest plot of quality-of-life ORs for the composite meta-analysis is shown in Figure 3. The scales used included 36-Item Short Form Health Survey questionnaire[48] (n = 2),[22,24] EuroQol–5D (n = 2),[20,46] EuroQol visual analog scale (n = 1),[20] QoL for cancer patients (n = 1),[40] and 4-item Diabetes Distress Scale (n = 1),[30] the follow-up time being between 6 months and 2 years. The sample size ranged from 36 to 543 patients, with the sample size for the meta-analysis comprising 1391 patients. The intervention of the multidisciplinary team represented a significant increase in the QoL of the patients (OR 0.58, 95% CI 0.47-0.69). Analysis of heterogeneity showed a significant difference between the studies ($I^2 = 92.0\%$, $P < .001$). No evidence of publication bias was identified (Kendall τ with continuity correction P value = .286).

Discussion

This systematic review and meta-analysis provides an extensive overview of the literature available on interventions by multidisciplinary teams. It comprehensively included 29 studies, 14 of which were analyzed in the meta-analysis, and included a significant number of patients (12,773 review and 4186 meta-analysis). The objective of this review was to know the impact of pharmaceutical care in a multidisciplinary environment in terms of hospital readmissions, quality of life, and costs.

The results of the meta-analysis indicated that interdisciplinary intervention leads to a significant reduction in the probability of readmission (32%, OR 0.74). Readmissions after discharge are a huge concern owing to the clinical consequences and the cost to health care systems internationally. For instance, some authors associated admissions due to an adverse drug reaction with a projected annual cost

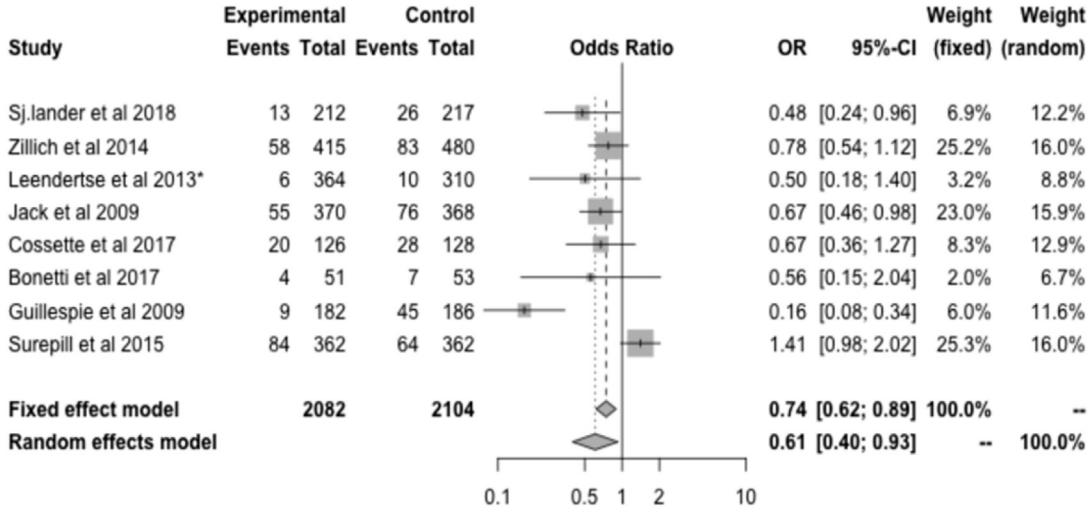

Fig. 2. Effect of the multidisciplinary team in comparison with the control group on hospital admissions.

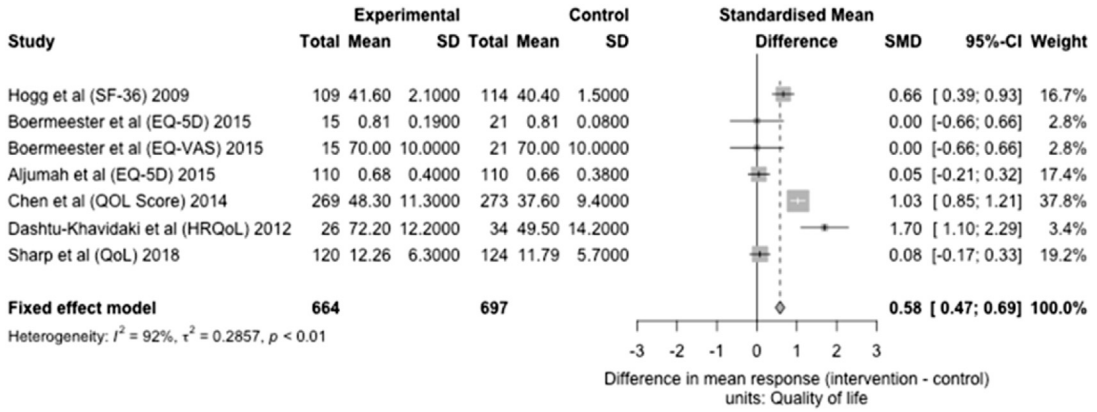

Fig. 3. Effect of the multidisciplinary team in comparison with the control group on quality of life.

to the National Health Service in the United Kingdom of £466 million.[49]

Furthermore, in these studies, population mean age was higher than 65 years and the risk of readmission is known to be even higher because of polypharmacy and multimorbidity associated with this population. Some authors associated polypharmacy specifically with an increase in mortality rates.[50] In addition, the evidence regarding the quality of the prescriptions add another concern. Inadequate drug treatment is recognized as a high risk for geriatric patients and has been widely described.[51] Explicit and implicit criteria have been developed over the years to manage inappropriate prescription risk in these patients. This process can be assessed and prevented by interventions as described in the review. In addition to a return on investment, particularly in pharmacy, staffing has proven to be cost-effective in managing medication assessment and readmission prevention (£5-£8 was achieved for each £1 invested).[52]

In this review, we show that the main interventions used by these teams are the review and reconciliation of a prescribed treatment (51.7%), information at discharge (51.7%), and clinical interview with the patient (44.8%). Pharmacist-led medication reconciliation was one of only 4 strategies for improving patient safety deemed to be also economically worthwhile, according to Etchells et al[53] and recognized by the resolution CM/Res(2020)3 of the Council of Europe,[5] which also encourages regular follow-up and periodic interprofessional meetings to discuss the benefits and risk of each medication. Limitations in workforce capacity and capability are a frequent barrier to improving medication safety, despite evidence that there is a return on investment that exceeds expenditure. Moreover, we find positive results in the effect on the quality of life of patients (OR 0.58), although there were important differences between the ways studies were performed. Based on our review, patients included in these interventions also achieved better results in the overall control of chronic diseases due to patient education on their disease, medications, and adherence to treatment.[26,28,30,31,33–35,38–40,42,44]

Despite the positive results, we find some areas for improvement, the implementation of which should be encouraged. Only 6.9% of the interventions were focused on enhancing communication with other health care assistance levels. It is known that the lack of coordination between health care levels is associated with a greater number of readmissions and adverse effects.[54–57] In addition, better coordination is recommended by WHO as one of the strategies to ensure patient safety and medication without harm.[10]

The main limitations of the current evidence with regard to the efficacy of interventions to improve health outcomes are due to the large heterogeneity of study characteristics, settings, and social or economic determinants that would include an additional dimension to the diversity of impact across groups and have to be considered in further research. Added to this difficulty are the different information systems used and the different health care and pharmaceutical policies that health care systems follow, which can be public and full coverage, mixed or private. Consequently, the clinical outcomes used to determine the efficacy need to be standardized to allow implementation and assessment to improve.

Conclusions and Implications

On the basis of the currently available information, we have to promote standardization and definition of the roles of health professionals and reinforce the communication regarding the different levels of care to reduce readmissions and improve the quality of life of patients. The evidence highlights that pharmacists should be integrated in the multidisciplinary teams, especially with regard to leading the medication reconciliation and patient interview. These professionals receive appropriate competency-based education and training to ensure positive results for patients and the sustainability of health systems. In order to improve patient safety in transitions, interlevel communication should be a priority.

Supplementary Data

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.jamda.2021.05.038.

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