Interventions to improve care coordination in primary care: A narrative review.

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Abstract

Background: Care coordination in primary care is one of the main challenges for the future of health systems. We reviewed the literature to identify interventions that could improve coordination in the primary care setting.

Methods: We conducted a literature review of articles referenced in the PubMed database between January 2000 and Avril 2020, (MESH terms: "Primary Care / Primary Health Care", "Coordination / Care Coordination / Coordinated Care / Coordinating" and "Physician / General practitioner / Family practitioner / Primary care providers"). Two independent reviewers took part in the selection, data extraction and content analysis. All individual similar interventions were pooled and described for their overall benefit / harm on patients' coordination. Interventions were grouped according to categories described in the literature.

Results: We found 4044 publications, of which 103, evaluating care coordination interventions, met inclusion criteria. We classified 62% of care coordination interventions into the category "Structuring relationships between service providers and patients" and 59% into "Systems to support the coordination of care". The interventions involving "case managers", "multidisciplinary teams", "patient education" "care plans", and "electronic health records" were associated with the greatest number of articles describing positive effects.

Conclusion: This narrative review illustrates the wide variety of studied interventions to optimize the coordination of care in primary care. Future research assessing impact of these interventions on patient management are necessary.

Keywords: Care plan, Case manager, Coordination, Multidisciplinary team, Narrative review, Primary care.

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Introduction

The increasing numbers of elderly and chronically ill patients places a considerable burden on the health care system, including a significant impact on costs [1]. As a result, many industrialized countries have begun reviewing their health systems to provide better care for these types of patients. One of the major challenges is reducing care fragmentation, principally by improving continuity of care and developing care coordination is one way to tackle this [2, 3]. In this context, primary care (PC) is well placed to play a major role in the management of patients with multiple, complex medical problems and functional impairment. For example, promoting care at home by strengthening outpatient management may help respond to hospital congestion, improve the quality of life of patients and reduce costs at the same time [1]. However, this requires a fundamental rethink of primary care organization, especially reinforcing care-coordination aspects within practices without overloading PC teams.

In a literature review on care coordination published in 2007, from more than 40 identified care coordination definitions the authors compiled the following working definition of care coordination: Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care is often managed by the exchange of information among participants responsible for different aspects of care" [4]. A care coordination framework therefore involves several health partners around the care. Ideally, it should provide appropriate patient-centered management, limiting fragmentation of care, loss of information, treatment errors and redundancy of examinations and emergency department visits [5].

In 2006, Powell Davies published a literature review on interventions relating to care coordination in the general practice [6]. The most frequently reported interventions showing beneficial effect on patient health were relationships between service providers (65.5%), coordination of clinical activities (61.3%) and use of systems to support the coordination of care (60.5%) while studies reporting an effect on patient satisfaction were those tending to improve relationships between service providers (66.7%), support for clinicians (57.1%), communication between service providers (54.5%) and support for patients (50.0%).

Many health system organization changes have taken place over the past 14 years worldwide, particularly in PC and interventions aimed at improving care coordination in family practice have been the subject of an increasing number of scientific studies [7, 8].

Our narrative review aims to identify and describe recent care coordination interventions in PC and describe their effects on patient care management from 2000 to 2020.

Methods

This review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement.

Search strategy

We conducted a narrative review of the Medline Ovid SP database (through PubMed) from January 2000 to April 2020, using the following MESH terms: "Primary Care / Primary Health Care", "Coordination / Care Coordination / Coordinated Care / Coordinating" and "Physician / General practitioner / Family practitioner / Primary care providers".

Data sources and search

Two independent reviewers examined and selected articles in two stages. A first selection was based on the article title. The second selection was after reading the article abstract. Disagreements related to selections were resolved through discussion to reach consensus. The inclusion criteria are the MESH terms detailed above. We retained interventional, observational, and qualitative studies as well as expert opinions. The exclusion criteria were no link to care coordination or general medicine, or a too specific target population (for example, children only, American veterans, Australian aborigines, single disease). We also excluded paid articles and non-English- or non-French-language articles.

Data extraction

The same two researchers extracted data from the articles using a standardized predefined data extraction form we built, containing the major characteristics of the articles including, year and country of publication, type of study, care coordination interventions, results obtained. If a study was assessing multiple interventions strategies, each individual intervention was extracted. This explains why the sum of the percentages presented in (Table 1) is greater than 100. We also classified coordination interventions according to the nine categories of Powell Davies et al. with addition of a new category related to practice facilitators (Table 1). Extending the classification of Powell Davis et al, [[6] we now produce a comprehensive directory of the studied care coordination interventions including precise definitions of each individual intervention.

Data synthesis and analysis

"We" has to be dropped the same two researchers qualitatively described and evaluated the different types of interventions as having globally: 1) an effect on care coordination (positive or negative) or 2) no effect on care coordination (as used in other studies). Disagreements were resolved during discussion, and when necessary, a third author was consulted. Our evaluation was according to the results of the intervention study, regardless of the measured outcome (e.g. doctor's experience, measurement of blood pressure, patient satisfaction). Finally, articles not describing interventions but only opinions of professionals regarding care coordination, initially selected, were classified as "not applicable, NA".

RESULTS

Articles included in the study

We identified 4044 articles in the initial screen. After the first selection based on the title, 515 articles were retained and after a second selection step reading the abstracts, 220 were kept. Finally, we read articles entirely and selected 103 articles for analysis and data extraction (Figure 1).

Classification of selected articles according to the types of interventions and their effects

From the 103 articles, we identified 26 different types of intervention (sometimes evaluated in combination) and classified them into the 10 specified categories (the 9 categories proposed by Powell Davis et al and the one added regarding practice facilitators) [6]. More than half of the articles described interventions aimed at 'using systems to support the coordination of care' (59% of articles) and 'structuring the relationships between service providers and patients' (62%). To a lesser extent, articles described interventions targeting 'coordinating clinical activities' (32%), 'support for patients' (31%), and 'support for service providers' (30%). Interventions regularly involving higher organizational levels (associations, federations, governments) or political policies concerning payment methods, laws, or arrangements were significantly less represented (15% in total). (Table 2). The characteristics of the selected studies are presented in detail in (Table 3). Concerning the impact of interventions, most teamwork intervention studies (28/33) report a beneficial effect, followed by case manager (27/36), electronic patient records (20/22), training / education of patients (19/25), and care plans (17/20). (Table 4) and (Figure 2) (and Supplementary Table S1) list the

***Table 1**: Classification of studies included in the review, adapted form Powell Davies et col.*

Category Number	Intervention category	% of papers (N=103)
1	Communication between service providers	21.4
2	Systems to support the coordination of care	59.2
3	Coordinating clinical activities	32.0
4	Support for service providers	30.1
5	Structuring the relationships between service providers and patients	62.1
6	Support for patients	31.1
7	Joint planning, funding and/or management	0
8	Organizational agreements	7.8
9	Organization of the health care system	14.6
10	Facilitator (additional category)	1.9

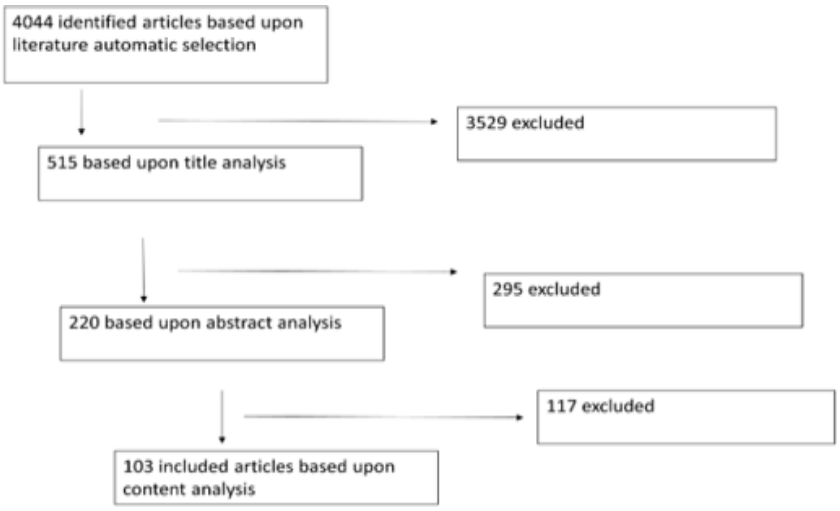

Figure 1. *Review flow chart of the research results.*

Table 2*: Definition of the interventions.*

Category	Intervention	Definition
1. Communication between service providers	Case conference involving PHC providers	Formal meeting between the FD and / or CM and / or other specialists to discuss patient management.
2. Systems to support the coordination of care	EHR	Electronic Health Record: Digital version of a patient's medical file and / or simple administrative list at several levels of interconnection.
	Telephone	Intervention using telephone contact to improve care coordination
	Care plan	Care plan implemented by the CM alone and / or by the FD and / or by the specialist to manage a specific patient
	Proformas	"Pre-formatted" "standardized" forms (such as a physiotherapy voucher) that FDs must complete to address their patient to a specialist
	Telecare	A device plays the role of "care provider" and measures vital parameters or quantifiable values and sends them to appropriate health professional
3. 3. Coordinating clinical activities	Multidisciplinary joint consultation	Consultation with several health professionals at the same time, which does not specify a place or type of carhealth provider
	Joint care provider appointment arrangements	Organization of appointments by someone other than the patient as well as a procedure in the consultation schedule
	Care provider arrangements	A written form, such as a contract, specifying, for example, ways to address patients to any health professional
	Priority access to specialists	Existing agreement between health professionals to facilitate patient access to specialists
4. 4. Support for service providers	Care provider training	Training in the form of workshops or courses to train the FD / health professional for a particular intervention
	Guidelines	Protocols or guidelines promoting the coordination of care within the practice as they determine which health professional (s) is involved
	Reminder system	'Callback' system most often using computers
	Supervision for PC clinicians	Supervision or advice to a health professional from another more experienced health professional (FD, specialist, senior nurse)
5. 5. Structuring the relationships between service providers and patients	Case management /manager	Caregiver generally other than the FD responsible for coordinating care of patient with one or more pathologies
	Co-location	Grouping in the same building of several different health professionals
	Multi-disciplinary team	Several people working in the same team structure (practice team from assistant to doctor)
6. 6. Support for patients	Patient education	Courses given to the patient to increase autonomy concerning care and understanding of the disease
	Assistance for patients for appointment	System to facilitate access to patient care
	Family caregiver education	Same principle as patient education but addressed to 'family' caregivers surrounding patient
7. Joint planning, funding and/or management	No intervention defined	-
8. 8. Organizational agreements	Formal agreement involving PC organization	Operational agreement between primary care group practices (clinics) and other care facilities
9. 9. Organization of the health care system	Gate-keeping / Having a doctor	Gate-keeping Health System (gateway to the health system)
	Pay-for-performance	Compensation payment system based on composite grids.
	Capitation payment	Each doctor receives a sum X per patient he treats according to certain criteria (age, sex, number of comorbidities).
10. Facilitator (additional category)	Facilitator	Person helping the practice to organize and prioritize activities related to quality improvement

Table 3*: Characteristics of the studies included in the review.*

Authors	Setting/Population	Intervention/Objective	Type/Design	Results
Aller, et al. (Spain 2017) [87]	26 primary and 24 secondary care doctors	To analyze doctor's opinions on the contribution of mechanisms to improve clinical coordination between primary/secondary care and the main factors influencing their use.	Qualitative descriptive study	Feedback and programing mechanims : Shared medical record, Clinical case conferences, Shared protocols
Ang et al. (Singapour 2019) [18]	684 patients that were right-sided to Frontier FMC and matched controls (stable chronic condition)	To evaluate the impact of the Right-Site Care Programme with Frontiers Family Medicine Clinics (FMC) in reducing mortality, healthcare utilization frequencies and healthcare utilization charges. Use of common HER and multidisciplinary case conferences	Retrospective quasi-experimental study	↓ 3-year mortality Lower polyclinic attendance frequencies and charges.
Ballo et al. (Italy 2018) [88]	1761 patient with definite chronic heart failure (HF) and 2522 control patients	To investigate the clinical utility of a Chronic Care Model (CCM)-based healthcare project for the management of HF patients	Retrospective matched cohort study (follow-up 4 years)	Higher hospitalization incidence and lower risk of death in the CCM group;
Banfield et al. (Australia 2013) [27]	17 participants with planning and quality improvement roles (nurses, allied health professionals, physicians and managers in practice)	Exploration of the way that information continuity supports coordination	Qualitative study. In-depth semi-structured interview.	Availability of information is not sufficient to ensure continuity for the patient or coordination from the systems perspective
Barsanti et al. (Italy 2019) [62]	178 GP in a primary care center (PCC) and 2958 GP not involved in a PCC	To analyze the possible benefits of the co-location of services in primary care in terms of perceptions regarding various domains of integration.	Cross sectional study	Positive impact in terms of collaboration between professionals No effect in terms of clinical and system integration ↑ providers satisfaction
Bonciani et al. (European countries 2018) [63]	7183 GPs and 61,931 patients	To analyze the relationships between GP co-location with other GPs and/or other professionals (interprofessional collaboration) and the use of clinical governance tool and interprofessional collaboration (from GPs' practices and patients' experience).	Cross sectional study	Association with positive GPs' outcomes ↓ patients experience regarding access, comprehensiveness and continuity
Buja et al. (Italy 2019) [89]	602 GPs total of 753'366 patients (with 47'575 diabetic) (MEDINA project)	Examine how the 3 types of proactive primary care model (CCM, expanded CCM, Kaiser Permanente Model) adopted in Italy were improving the quality diabetes management by GPs.	quasi-experimental before / after study	↑ GPs performance scores related to diabetes management when new models are adopted
Carrier et al. (USA 2012) [73]	31 healthcare providers participating in Care Coordination Agreements (CCAs). 6 national thought experts and/or leaders in care coordination.	To explore factors related to Care Coordination Agreements implementation	Qualitative study. Semi-structured interviews.	Usefulness of CCA that address referral and access processes Successful CCAs in settings where both parties already have stable communication pathways (EHR, designated staff) and strong working relationships
Ciccone et al. (Italy 2010) [24]	30 care managers in offices of 83 GPs. 1,160 patients with cardiovascular disease or at risk ,diabetes, heart failure,	To test the disease and care management (D&CM) model Leonardo with "care manager" nurses in primary health care system	Feasibility study. Impact evaluation.	Good feasibility Highly effectiveness in increasing patient health knowledge, self-management skills, and readiness to make changes in health behaviors
Clarke et al. (USA 2015) [49]	28 primary care practice sites: 1 comprehensive care coordinators (CCC) in each of 14 practices with intervention. CCCs touched 10,500 unique patients over a 1-year period	Evaluation of the implementation of a comprehensive care coordinator (CCC, non-licensed personnel) within the practice on emergency department visits.	Matched case-control differences-in-differences.	CCC intervention group had a 20% greater reduction in its prepost ED visit rate
Cohen et al. (USA, 2016) [26]	328 primary care practices randomly selected, already involved in a program to adopt electronic health record (HER)	To identify barriers in the use of HER to exchange, and reconcile key information during patient care transitions	Cross-sectional design	Identified barriers: - difficulty sending and receiving patient information electronically, - lack of time, - complex workflow changes required.
Cohen et al. (USA, 2011) [56]	9 practice-based research networks in primary care	To explore the use of coordinated care to address patients'health behavior change needs	Qualitative evaluation (multi-methods)	Best way to improve health behaviors: in practice health risk assessment, brief counseling, referral, counseling resource. Facilitators: Automated prompts and decision support tools, trainings in counseling strategies, co-location
Collinsworth (USA 2013) [25]	5 community clinics: 806 patients enrolled in the Diabetes Equity Program (DEP). 5 DEP Community Health Workers and 7 Primary Care Providers (6 physicians and 1 nurse practitioner)	To evaluate the effectiveness of a Community Health Worker (CHW)–led diabetes self-management education (DSME) program	Before-after study Mixed methods	↓ A1C levels and blood pressure ↑ Patients-providers collaboration
Cramm & Nieboer (The Netherlands 2012) [52]	22 Primary care practices that had implemented the Chronic Care Model	To evaluate the impact of Chronic Care Model (CCM) implementation on quality of chronic care delivery	Two repeated cross-sectional surveys	↑ Chronic illness care delivery over time Gains attributed primarily to improved relational coordination, raising the quality of communication and task integration among professionals from diverse disciplines with common objectives

Cramm & Nieboer (The Netherlands 2012) [53]	188 professionals in 19 disease-management programs	To evaluate relational coordination between GPs and other professionals and to assess impact on chronic illness care delivery	Cross-sectional study design	↑ Quality of chronic illness delivery with relational coordination
Davidow et al. (USA 2018) [90]	11 primary care physicians / cardiologists dyad	To improve the efficiency and effectiveness of the referral process between PCP and cardiologists	Before-after study	↑ closed referrals on time and clinical question answered Better understanding of their condition by patients ↑ satisfaction PCP and specialists
De Busk et al. (USA 2004) [36]	462 patients hospitalized for heart failure with clinical criteria	Effectiveness of a telephone-mediated nurse care management program for heart failure	Randomized Controlled Trial (Intervention: 228 / control: 234)	No difference in the rate of first rehospitalization for heart failure and all-cause.
de Stampa (Canada & France 2013) [79]	35 PCPs, 7 Case Managers, and 4 geriatricians from 2 integrated models of care for frail, elderly patients (SIPA and COPA).	To explore the clinical collaboration among (PCPs), case managers and geriatricians in integrated models of care	Qualitative study	- Good collaboration between CMs and geriatricians - Real collaboration between CMs and PCPs only later and mostly fostered by the interventions of the geriatricians - PCPs and geriatricians collaborated only occasionally
Dent & Tutt (UK 2014) [91]	2 National Health Service primary care trusts and their network (e.g. acute hospitals, social care, private care homes): 44 health professionals and information specialists	Examination of the challenges of e-patient information systems' support for integrated care pathways.	Qualitative evaluation of a range of e-patient information systems	Informatics services as well as users have to be adaptable for implementing electronic integrated care pathways, which implies considerable involvement of change facilitators
Desborough et al. (Australia 2016) [40]	678 patients, from 21 general practices, who received nursing care between September 2013 and March 2014. Interviews with 16 nurses, 23 patients and 9 practice managers.	To evaluate nursing care in general practice in terms of patients enablement and satisfaction.	Mixed methods study: Patient enablement and satisfaction quantitative survey. Nurses interviews.	↑ Patient's satisfaction and enablement with longer nurse consultations ↑ Patient's satisfaction when continuity of care with the same general practice nurse ↑ Patients' satisfaction and enablement with nurses with broad scopes of practice and high levels of autonomy
Di Capua (USA 2017) [92]	459 staff and physicians and 13,441 patients in 26 primary care practices	To evaluate the implementation of care coordination program in terms of patients experience and team dynamic	Before-after study	↑ Patient experience with staff No disruption of the team dynamics
Donohue et al. (USA 2015) [93]	46 PCPs members of a research and education Network and 26 PCPs whom patients are included in a survival clinical trial	To assess PCPs' perspectives regarding electronic health record-generated care plans (provider-to-provider communication) for cancer survivors	Cross-sectional survey	EHR-generated plans useful in - coordinating care, - understanding treatments & treatment adverse effects - supporting clinical decisions Facilitators for use: - consistent provision - standard location in medical record - plan tailored to PCP use
Doty et al. (11 countries, 2012) [50]	Patients having participated in the 2010 Commonwealth Fund International Health Policy Survey and who reported seeing more than 1 physician in the past year: 11 207 adults (from 11 countries)	To study associations between having a care coordinator, care access, strong health care provider–patient relationship and care coordination	Cross sectional survey Data from the 2010 Commonwealth Fund International Health Policy Survey (Patients experience with health care system).	- Having care coordinator: ↓ Coordination problems Accessible care: ↓ Coordination gaps - Strong health care provider–patient relationship: ↓ Coordination gaps related to medical records or repeated tests and lack of follow-up after a hospital and/or ER discharge
DuGoff et al. (USA 2019) [57]	142'016 physicians who shared at least one patients with another physician; at least one physician is a PCP	To explore the predictors of and implications of persistence of PCP connections with their colleagues over time	Exploratory study	Regions with higher persistent ties tended to have lower rates of emergency room visits. Regions where PCPs had more physician connections were more likely to have higher emergency room visits.
Duhigg et al. (USA 2018) [94]	895 Primary care practices and 23'292 patients.	To compare practices offering open access (OA) to care to practices without OA in terms of patients' experience of care.	Two-group mean comparisons, matched case-control differences	Minimal impact of OA to care on patients' experience in primary care
Easley et al. (Canada 2016) [95]	58 care providers: 21 FPs, 15 surgeons, 12 medical oncologists, 6 radiation oncologists, and 4 GPs in oncology	To explorer coordination of cancer care between FPs and cancer specialists	Qualitative study, semi-structured telephone interviews	Communication challenges 1. System-level: delays in medical transcription, access to patient information 2. Individual-level: lack of rapport between FPs and cancer specialists, lack of clearly defined and broadly communicated roles
Fabre et al. (USA 2020) [19]	Rural federally qualified health center (FQHC) including 9 primary care centers	to improve internal referral process and to support patients in the process	Before–after study	↓ referrals ordered: decrease ↑ referrals performed: ↑ referrals completed within 90 ↑ referrals reviewed within 90 days

Fagan et al. (USA 2010) [37]	Claims files of a Managed Care Organization (MCO) regarding 20,943 adults aged 65 and older with diabetes, receiving care.	Evaluation of a practice-based care coordination program, plus a pay for performance (P4P) for meeting quality targets, and plus a third-party disease management on quality of care and resource use	Before-after study including a control group. Intervention: 1,587 patients / control: 19,356 patients	↑ Quality of care for both groups. Slight differences between intervention and comparison group trends and changes in trends over time
Fagnan (USA 2011) [96]	6 Rural PC practices. (clinician champions, clinician partners, practice administrators, and nurse care managers)	Evaluation of an office-based nurse care management model for complex patients, Care Management Plus	Qualitative evaluation Semi-structured interviews	Variations in the model acceptability Practice change requires time, and is supported by practice reflection and on-going facilitation
Forrest et al. (USA 2003) [97]	14'709 primary care practice office visits, referred and nonreferred, made by privately insured, nonelderly patients, seen by 139 primary care physicians in 80 practices	Examination of the influence of gatekeeping arrangements and capitated primary care physician (PCP) payment on the specialty referral process in primary care settings.	Analysis of insurance database	No difference in referral process among various health plan type Patients in plans with capitated PCP payment more likely to be referred for discretionary indications than those in non-gatekeeping plans.
Freund et al. (Germany 2016) [28]	115 small primary care practices: 2076 patients with type 2 diabetes, chronic obstructive pulmonary disease, or chronic heart failure and a high risk of hospitalization	Evaluation of a protocol-based care management (structured assessment, action planning, and monitoring) by medical assistants for high-risk patients.	Cluster randomized clinical trial	No differences of all cause hospitalizations ↑ quality of life
Gallo et al. (USA, 2004) [61]	127 primary care clinicians in 54 clinics on 11 sites primary care research in substance abuse and mental health for the elderly (PRISM-E)	To compare 2 models for older patients with mental health disturbances: 1.integrated behavioral health care within primary care practices 2. Enhanced referral care to separate specialty clinics.	Randomized trial. Multisite effectiveness assessment	Integrated care within practices ↑ Communication between primarycare clinicians and mental health specialists ↓ Stigma for patients ↑ Coordination of mental and physical care
García et al. (Spain 2011) [51]	230 GPs and 14 primary health care units. Nephrology Department of the University Corporation. Patients with kidney diseases and difficult-to-control AHT.	To evaluate the implementation of a coordinated programme between nephrology university Department and primary care for referral of patients.	Observational study Data from a clinical information system	↑ Referral criteria between PC and specialized nephrology service ↑ Prioritization of visits ↑ In referrals denied by specialists
Gardner & Sibthorpe (Australia 2002) [42]	All stakeholders (plus patients representatives, pharmacists, specialists and GPs representatives) involved in the implementation of coordinated care for patients with complex needs	To explore the barriers to correctly implement a trial of coordinated care with GPs as coordinators.	Randomised Controlled Trial. Qualitative evaluation (in-depth interviews with key stakeholders and observation of trial processes).	- Stakeholders did not fully endorse the trial's key goals – GPs unable to become effective purchasers - Increased gatekeeping never not fully realized, - Cost-saving strategies were not taken up - Improvements in continuity of care impeded by limited provider networks and GP reluctance to collaborate with other providers
Goetz Goldberg et al. (USA 2012) [9]	6 primary care practices, including 38 clinicians and administrative staff	To explore experiences and perceptions of the use of EHR	Qualitative case study over a 16-month period	↑ Efficiency in retrieving medical records, storing patient information, coordination of care, and office operations.
Graetz et al. (USA 2009) [10]	Integrated delivery structures of care (Kaiser Permanente): 565 primary care clinicians (physicians, nurse practitioners and physician assistants)	Implementation of an integrated EHR system.	Observational Study (2005 & 2006)	↑ Information access ↑ Agreement on treatment goals and plans No association between EHR use and being in agreement on roles and responsibilities with other clinicians.
Graetz et al. (USA, 2014) [14]	Integrated delivery structures of care (Kaiser Permanente): 565 primary care clinicians (physicians, nurse practitioners and physician assistants).	Staggered implementation of an outpatient EHR, followed by an integrated inpatient EHR.	Three repeated observational surveys (2005, 2006 & 2008).	↑ Access to complete and timely clinical information ↑ Agreement on clinician roles and responsibilities for patients transferred across clinicians.
Graetz et al. (USA, 2014) [20]	Integrated delivery structures of care (Kaiser Permanente): 565 primary care clinicians (physicians, nurse practitioners and physician assistants).	Evaluation of an integrated outpatient-inpatient EHR with staggered implementation (2005-2010).	Three repeated observational surveys (2005, 2006 & 2008).	↑ Teams cohesion: ↑ Access to information ↑ Agreement on treatment ↑ Agreement on responsibilities
Gray et al. (USA 2019) [78]	35 patients & 36 family members 21 physicians	Exploration of the concept of the medical team "quarterback" by patients and physician's (actions and themes associated with that role).	Qualitative study - ethnographic approach including 9 focus groups	Associated with 6 major themes: - takes responsability for overseeing the big picture of a patient's care - coordinates care - advocates for the patient - practices proactive communication - engages in proactive and persistent problem solving
Gum et al. (USA 2015) [29]	Home-based providers, primary care practices and 7 older adults requiring coordination.	Evaluation of a communication protocol, 'BRIDGE (Binging Inter-Disciplinary Guidelines to Elders, including scripted telephone calls, structured progress reports sent to primary care practices) in addition to Depression care management (DCM) by home-based providers	Open pilot trial	↓ Depressive symptoms and disability Good satisfaction of participants

Haggerty et al. (Canada 2008) [70]	100 primary health care clinics, 221 GPs, secretaries and director, and 2725 patients.	Identification of attributes of clinic organization and physician practice that predict patient-reported accessibility, continuity, and coordination of care.	Cross-sectional observational study	↑ Accessibility and coordination continuity in practices with evening and continuous telephone access and operational agreements access with other health care establishments
Haley et al. (USA 2015) [98]	9 PCPs and 5 nephrology practices. Data collected from 292 eligible patient records, 157 audited pre- and 135 audited post implementation. Patient eligibility: older than 50 years, at risk for chronic kidney disease (CKD), with a diagnosis of diabetes mellitus and hypertension.	To evaluate the use of tools (from Renal Physicians Association toolkit) and to improve identification of CKD, communication, and comanagement between PCPs and nephrologists.	Before-after study. Qualitative evaluation.	Among PCPs: ↑ CKD identification, ↑ Referral to nephrologists, ↑ communication & execution of co-management plans Among nephrologists: ↑ Referral and co-management processes
Hefner et al. (USA 2019) [12]	17 patients with cardiopulmonary conditions at 3 Department of Family medicine clinic sites	To explore how experienced portal users engage with secure messaging to manage their chronic conditions (through an application allowing patients to access their electronic health record, request appointments and medication refills, and communicate with providers through secure messaging)	Exploratory qualitative study 3 focus groups	Motivation - quicker than calling the office - direct to access to physicians Uses for care management: - extension of the office visit - coordination of care Challenges: - technical challenging - worry about physician time spent responding to messages - determining what constitute a "non-urgent" message
Holzel et al. (Germany 2018) [45]	71 primary care physicians and 248 patients >= 60 y. diagnosed with unipolar depression or with moderate depressive manifestations	To compare GermanIMPACT intervention (IG, including a care manager) with treatment as usual (CG, control group)	Cluster-randomized, controlled study	Remission rate at 12 months in IG significantly higher than in group control (25.6% vs10.9%)
Jones et al. (USA, 2015) [11]	58 clinicians, including 32 in four hospitalist focus groups, 19 in three PCP focus groups, and 7 in one hybrid group with both hospitalists and PCPs.	To identify challenges in care coordination from the perspective of PCPs and hospitalists	Exploratory qualitative study (focus group).	Hospitalists and PCPs common themes of successful care coordination: 1. ↑ Efforts to coordinate care for "high-risk" patients, 2. ↑ Direct telephone access to each other, 3. ↑ Information exchange through shared electronic medical records, 4. ↑ Interpersonal relationships, 5. Clearly defined accountability. Hospitalists and PCPs similar care coordination challenges : 1. Lack of time, 2. Difficulty reaching other clinicians, 3. Lack of personal relationships with other clinicians, 4. Lack of information feedback 5. Medication list discrepancies 6. Lack of clarity regarding accountability for pending tests and home health
Katon et al. (USA, 2010) [22]	14 Primary care clinics, 214 participants with poorly control diabetes, coronary heart disease, depression	Collaborative care management (nurse and family physician), provided guideline-based	Randomized Controlled Trial	Improvement HbA1c, LDL cholesterol and score of depression ↑ Patients quality of life & satisfaction
Kautz et al. (USA 2007) [99]	222 patients who received primary unilateral total knee arthroplasty at the same surgical department of a large Integrated Delivery System (IDS)' acute care hospital	Assessment whether receiving care from providers who belong to the same IDS improves patient-perceived coordination of care.	Before-after study (baseline and 6-week post-operation patient surveys)	No consistent effects of IDS membership on patient-perceived coordination of care
Kim (USA 2013) [66]	Medicaid beneficiaries with disabilities, aged 20-64 (N=5064)	Effectiveness of a telephone care management intervention to reduce use of care (ED, hospital admissions, GP and specialists visits)	Randomized Controlled Trial (Intervention: 3540 / control: 1524)	No significant difference between intervention and control group
Krousel-Wood (USA 2018) [13]	53 GPs from primary care clinics	To assess changes in the percentage of providers with positive perceptions of EHR benefit	Longitudinal analysis (baseline, 6/12 months ,12-24 months)	↑ patient communication, hospital transitions, preventive care prompt, satisfaction with system reliability ↓ satisfaction with ease of use
Lee et al. (Corea 2017) [77]	1013 adults with Diabetes Mellitus. (Korean health panel data)	To study the association between having a regular doctor and ED visits.	Cross sectional study	↓ ED visits in patients having a regular doctor, especially for those offering a good comprehensiveness of care and long relationship
Low et al. (Singapore 2015) [41]	259 medically complex patients	To evaluate a Transitional home care program including multi-disciplinary team, nurse case manager, home visits with comprehensive assessment of the patient's care needs within the first week of hospital discharge, individualized patient-centered care plan	Before-after study	↓ Hospital admissions ↓ Emergency department attendances ↓ Hospital bed days at 3 and 6 month post program enrollment
Lubloy et al. (Hungary 2017) [74]	31' 070 patients with diabetes over 40 years with care shared between GPs and specialists	To study the associations between GPs and specialists collaboration and prescription drug cost	Analysis of administrative healthcare data	↓ Prescription drug costs when strong relationship between GP and specialists

Ludwick et al. (Canada 2010) [100]	9 GPs 6 hospital-, and academic-based physicians	To understand how remuneration and care setting affect the implementation of electronic health records (EHRs).	Qualitative study	No remuneration approach supports EHR adoption any more than another
Manski-Nankervis et al. (Australia 2015) [101]	78 general practices:174 GPs, 115 practice nurses	To study the associations between characteristics of GP settings and primary healthcare providers and the degree of relational coordination, in insulin initiation for people with type 2 diabetes	Cross-sectional study	Poor relational coordination in female GPs and older practice nurses ↑ Relational coordination in practice nurses with diabetes educator qualifications and experience in insulin initiation
Martinussen (Norway 2013) [72]	1298 hospital physicians randomly selected	To investigate the quality of referral letters from GPs to hospitals and communities.	Combination of survey data for hospital physicians with information on the hospitals and their communities.	Only 15.6% of the hospital physicians perceived the quality of the referrals to be "usually good" (barriers: lack of information in referrals and inappropriate referrals)
Mastal et al. (USA 2007) [46]	Medicaid beneficiaries with diabilities	Innovative practices in two disability care coordination (DCCO) programs, with DCCO roles of care manager co-located in primary care and behavioral clinical settings	2 Case-studies	↓ Hospital days ↑ Provider knowledge ↑ Patient access ↑ Consumer self-efficacy
May et al. (Scotland 2011) [71]	221 professionals, including health professionals, managers, patients, social care professionals, service suppliers and manufacturers. Involved in telecare services in community and domestic settings	Identification of factors inhibiting the implementation and integration of telecare systems for chronic disease management in the community	Qualitative study	Key barriers: - uncertainties about coherent and sustainable service and business models; - lack of coordination across social and primary care boundaries, - lack of financial or other incentives, - lack of a sense of continuity with previous service provision and self-care work undertaken by patients, - uncertainty about adequacy of telecare systems, - poor integration of policy and practice.
McCullough (USA, 2014) [15]	Physician practices and health centers: 24 providers, physicians, administrators and office staff	Implementation of electronic Health Information Exchange (HIE)	Qualitative study. Key-informant interviews	↑ Care coordination ↑ Productivity
Mills et al. (Australia, 2003) [31]	398 patients with type 2 diabetes, PC professionals	Evaluation of the Patient-centered care plan model with patient goals.	Descriptive part of a matched geographically controlled trial. Before after study	↑ Health outcomes for 40-60% of patients ↓ Hospital and medical expenditure for some patients.
Moe et al. (Canada 2018) [102]	4600 patients with a visit to a family physician in a WPCN (Westside Primary Care Network) at least once in the previous 18 months	To examine patients' perceptions of care outcomes following the introduction of collaborative teams into community family practices	4 cross-sectional studies (2007, 2010, 2013, 2016)	No global improvement of patients experience with team-based initiative. Heterogeneous results according to the indicators
Moore et al. (Canada, 2012) [23]	Elderly people at home, (N=25)	Collaborative Care Program including 1 nurse practitioner, 1 GP, 1 registered practical nurse	Qualitative and quantitative evaluation	↑ Satisfaction patients & care providers
Noël et al. (USA 2013) [54]	Patients with Type 2 diabetes. 283 practice members (i.e., physicians, non-physician providers, and staff) from 39 clinics.	To investigate which components are associated with implementation of chronic care models	Cluster randomized controlled trial	↑ Implementation of care coordination models with relational coordination and reciprocal learning among team members
O'Malley et al. (USA 2010) [21]	52 physicians or staff from 26 practices, 8 thought leaders: clinicians active in HIT efforts and EMR vendor medical directors.	Use of commercial EHRs	Qualitative study. Semi-structured interviews by phone.	↑ within-office care coordination EHRs less able to support coordination between clinicians and settings Challenge of managing information overflow EHRs cannot adequately capture medical decision-making process and future care plans to support coordination. Requires evolution of practice operational processes Current fee-for-service reimbursement encourages EMR use for documentation of billable events and not of care coordination.
O'Malley et al. (USA 2012) [16]	44 primary care physicians, practice managers, nurses and health plan representatives from 28 organizations.	Description of models of afterhours care in the U.S., delivered in primary care sites or coordinated with a patient's primary care provider.	Qualitative analysis of data from in-depth telephone semi-structured interviews.	Identification of 5 models of after-hours care. ↑ PC access ↑ Continuity
O'Malley et al. (USA 2015) [75]	123,760 PC patients with one or more of 4 ambulatory care–sensitive chronic conditions	To study associations between care providers communication, supported by Health Information Technology (HIT) and hospitalizations in ambulatory care–sensitive chronic conditions patients	Linkage of 3 years of Medicare claims data and data from a PCP survey	↓ Avoidable hospitalizations associated with higher levels of communication between PC and specialist physicians No significant main effect between HIT use and ambulatory care– sensitive conditions (ACSC) hospitalizations Associations between interspecialty communication and ACSC hospitalizations magnified if higher HIT use.

Osmunden et al. (Norway 2019) [103]	13 GPs, head physician and hospital staff (nurses, research assistant, manager)	Explore how educational program for GP can contribute to enhancing the continuation of care across healthcare providers Educational program: clinical practice, theoretical studies, research and development of integrated care	Qualitative study (semi-structured interviews)	- establishing relations and networks - increased knowledge and competence - shared practices and use of shared standards
Palmer et al. (New Zealand 2012) [39]	15 PC practices and 5 Primary Health Organisation facilitators	Evaluation of an intervention regarding the facilitation of planned care and promotion of quality improvement	Quantitative (before-after comparison) and qualitative mixed methods evaluation	↑ Cardiovascular disease risk assessment, practice-level systems of care, self-management systems and follow-up and coordination for patients ↑ Coordination and teamwork, knowledge of practice populations and understanding of managing long-term conditions
Pariser et al. (Canada 2019) [65]	74 patients (≥3 chronic conditions, aged 18-80 years) from 53 PCP and 4 ED 65 PCP participated in TIP	To evaluate the TIP model TIP (Telemedicine Interprofessional Model of Practice for Aging and Complex Treatment Plus) = 1-time interprofessional consultation with PCP, focus on what is most important to the patient.	Quasi-experimental study	High level of satisfaction in all participants - PCP: ↑ patient communication, efficiency, collaboration and interprofessional learnings - Patients ↑ empowerment
Parkerton et al. (USA 2004) [60]	Practices of 194 family physicians and general internists caring for 320,000 adult members of a health maintenance organization	To study the influence of primary care continuity—both clinician and system—on patient outcomes.	Cross-sectional study	No association between physician continuity and patient outcomes ↑ Cancer screening and diabetic management with shared practice and clinic size ↑ Cancer screening, diabetic management, and patient satisfaction with team tenure
Parry et al. (UK 2019) [104]	1720 patient >50 years old at high risk of ED admission matched to control	To assess the effects of an integrated care pathway on the use of primary and secondary healthcare by patients at high risk of emergency inpatient admission	observational study of real-life deployment of integrated care	No evidence that integrated care pathway reduces patient's healthcare utilization in the first year post-enrollment. Integrated care patients were more likely than matched controls to experience elective inpatient admissions and GP contacts, but other endpoints were not significantly different between the groups
Patel et al. (USA 2011) [105]	144 physicians affiliated with institutions that are stakeholders of a regional health information organization	Characterization of physicians' attitudes and preferences towards electronically health information exchange across institutions (HIE).	Cross-sectional survey at educational conferences and on site at physician practices.	HIE considered as highly valuable to improve providers communication, coordination and efficiency of care Barriers: cost and technical resources
Patterson et al. (Australia 2007) [106]	7 PNs, from 6 general practices including 25 GPs who had actively participated in coordinated care over the last few years	To discuss the role of practice nurses in coordination of care in Australia	Qualitative study. Focus group discussions	PNs could make important contributions to coordinated care and calls for models of coordinated care that include PNs in chronic disease management process
Peikes, D., et al. (USA 2018) [107]	Medicare beneficiaries of PCP practices and controls	To evaluate the CPC's effects on care delivery and outcomes for fee-for-service beneficiaries CPC: Comprehensive Primary Care Initiative - 5 functions: risk stratification, care management, access, care coordination, quality improvement	Quasi experimental study (evaluation design)	↑ in PC delivery, including care management for high-risk patients, enhanced access, and improved coordination of care transitions ↓ ED visit No decrease of cost
Peterson, et al. [67]	106 patients with uncontrolled diabetes type I or 2 who had at least 1 covisit in the last 3 years	To evaluate the impact of physician-pharmacist covisit on clinical outcomes	Retrospective multicenter cohort study	↓ HbA1c from baseline to follow-up after 3 months - no statistically significant difference between 3 and 12 month in mean HbA1c - no significant difference in the proportion of patients receiving recommended vaccination or cardiovascular risk reduction medication
Pols & Battersby (USA 2008) [32]	124 patients with a GP diagnosis of somatization	Evaluation of coordinated care and evidence-based care planning	Randomized Controlled Trial (intervention 89 / Control 35)	↓ Depression and anxiety ↓ Medication use ↑ Physical role functioning
Popejoy et al. (USA 2015) [108]	1 academic medical center including 25 registered nurse care managers, 137 providers in 10 clinics. 8,593 Medicare, Medicaid, or dualeligible patients, allocated to 1 of the 4 tiers according to their chronic medical conditions and health care utilization	Description of the development of a health care coordination intervention and documentation system, The Agency for Healthcare Research and Quality Care Coordination Atlas.	Evaluative study. Calculation of Time and touch data regarding nurse care managers activities in terms of coordination	Main domains of health care coordination activity: communication, assess needs and goals, and facilitate transitions ↑ Activity with level of chronic care conditions Implications for case management: 1. extraction of data to calculate time and touches delivered by NCMs 2. framework to systematically guide work of health care coordination 3. interest for the purpose of reimbursement and communication with payers about quality metrics

Poremski et al. (Canada 2016) [109]	20 frequent ED users with mental health challenges 13 service providers	To explore barriers and facilitators to continuity of care after a brief intensive case management intervention	Explorative qualitative study. Semistructured interview	Facilitators: strong working relationships between service users and providers, timely access to coordinated services and seamless transitions to needed supports Barriers: difficulties engaging this population, short intervention duration and lack of a single accountable service provider to address health and social needs
Richardson et al. (USA 2017) [68]	1 academically affiliated primary care practice serving older adults with chronic noncancer pain (CNCP) on chronic opioid therapy	Evaluation of the use of smartphone to improve pain management in older adults	Qualitative study Telephone interviews	↑ Communication with care providers, caregivers and personal contacts ↑ Scheduling and coordinating prescribing practices with local pharmacies
Rissi et al. (USA 2015) [110]	Practices in 3 Patient-Centered Primary Care Homes (PCPCH, coordination, patient-centered care, integration of public health services) sites	To explore the factors that influence the implementation of Oregon's Patient-Centered Primary Care Home (PCPCH) program and the adoption of the model by primary care providers	Mixed-methods approach (2 online surveys, qualitative document analysis, 23 key informant interviews)	4 key factors: - support and motivation - administrative barriers and resource constraints - alignment of short- and long-term financial incentives - leadership and interpersonal relationships
Rossignol (Canada 2000) [33]	110 workers compensated for low-back pain, 2 GPs, 1 nurse.	Evaluation of the coordination of primary health care program (CORE) as a mean for implementing clinical practice guidelines.	Randomized controlled trial (Intervention 54 / control 56)	↓ Pain and ↑ Functional status ↓ Specialized imaging tests
Salmon et al. (USA, 2012) [47]	Patients and PC practices in commercial open-access benefit plans (Cigna Insurance Company).	Collaborative accountable care initiative from Cigna: financial incentives to physician groups and integrated delivery systems, registered nurses serving as care coordinators	Comparative study (3 practices with the initiative and practices without the initiative as comparative group)	↑ Quality of care indicators ↓ Costs (Results non statistically significant)
Schillinger et al. (USA 2000) [76]	University affiliated public hospital. 2293 established patients of 28 primary care physicians. (APPROACH program).	Evaluation of the effect of primary care coordination (gatekeeper) on utilization rates and satisfaction with care among public hospital patients.	Prospective randomized study. Intervention: 1121 / control:1172 , 1 year follow-up	↓ Outpatient specialty and yearly hospitalization rates. No difference in patient satisfaction, perceived access to specialist and use of out-of-network service
Shannon (Tasmania, 2002) [43]	Part of the Tasmanian coordinated care trials All GPs in Southern Tasmania 16 care coordinators: 13 with nursing background and 3 from non-nursing backgrounds	To study the relationships of care coordination (Innovative service delivery and funding arrangements; multi-disciplinary teams, care coordinator, care plan; case conferences with health professionals) from the perspective of GPs	Part of a coordinated Care Trial. Multiple methods. Qualitative results.	Relations between care coordinators and other health providers varied considerably by profession
Shi et al. (China 2015) [17]	9 health care organizations: 560 patients aged 50 or over with hypertension or diabetes	To compare community health center (CHC) models: public CHC model vs gatekeeper CHC model vs hospital-owned CHC models in terms of access to and quality of care for patients with chronic illness	Case-comparison design Face-to-face interviews	↑ Access and quality for patients with chronic conditions with gatekeeper model (based on insurance mandate and using family physicians)
Shi et al. (China 2015) [111]	6 health care organizations, 371 patients aged 50 years or over with hypertension or diabetes	Integrated Care Delivery intervention	Case-control study	↑ Quality of care indicators (accessibility, continuity, coordination and comprehensiveness of care, reduction of health inequities, mitigation of disparities for older patients with chronic conditions)
Smith et al. (USA 2016) [81]	Documented communications between nurses and PCP related to 70 individuals, aged 65 years or older	To explore communications between home health care nurses and office-based primary care providers	Secondary analysis of CAPABLE program Qualitative analysis	PCP responded to 86% of phone calls, 56% of letters and 50% of client coaching efforts. PCPs addressed 86% of concerns communicated by phone, 34% of concerns communicated by letter and 41% of client-raised concerns. Nurses' letters addressed 5 key concerns: medication safety, pain, change in activities of daily living, fall safety and mental health diagnostic evaluation.
Singh, et al. (Canada 2019) [112]	3291 physicians providing comprehensive primary care that had at least 4 years of pre-transition and 2 years of post-transition from a traditional fee for service (tFFS) model to the enhanced fee for service (eFFS) model.	To examine the impact of the adoption of a patient rostering enhanced fee-for-service model	Longitudinal study	Continuity and coordination of specialized care slightly decreased upon transition from tFFS to eFFS. - minimal impact on ED visits
Song et al.2017 (USA, 2017) [58]	18 Harvard-affiliated primary care practices: 548 PCPs	Examination of relationships among team dynamics, PCP clinical work satisfaction, and patient care coordination between PCPs	Cross-sectional survey Mixed methods evaluation	Better team dynamics positively associated with clinical work satisfaction and quality of patient care coordination
Sorondo et al. (USA 2016) [64]	92 patients in primary care	Evaluation of the use of a patient portal for communication with care team	Before-after study	↓ ED visits ↓ Hospital admissions No change in self-efficacy, perception of health state or experience with the primary care practice

Steele Gray et al. (Canada & New-Zealand 2018) [113]	9 cases from iCOACH study iCOACH: Implementing Integrated Care for Older Adults with Complex Health Needs - a multi-year international study exploring the implementation of nine models of integrated community-based primary health care in Canada and New Zealand. 13 managers (interviews)	To explore how information communication technology (ICT) is used to support activities of integrated care To describe barriers and enablers to its adoption	Multiple case study -Qualitative part (interviews)	ICT systems support most frequently care coordination by inter-professional teams through information sharing, documentation and clinical level Limited in their ability to efficiently share patient data due to data access issues across organizational and professional boundaries and due to system functionality limitations (such as a lack of interoperability)
Steihaug et al. (Norway 2017) [114]	12 healthcare providers in 4 municipalities: 4 GPs, 6 nurses, 2 physiotherapists	Exploration of structural mechanisms that facilitate or counteract collaboration between GPs and other providers of municipal healthcare	Qualitative study Semi-structured interviews	Structural conditions leading to too little involvement of GPs in potential collaborative efforts: 1. Individual GPs prioritize with whom they want to collaborate, 2. Inter-municipal constraints hamper GPs in contacting collaboration partners 3. GPs fall outside the hospital-municipality collaboration Dedicated staff, sufficient resources, adequate time and proper meeting places are needed to accomplish good collaboration
Tan et al. (USA 2014) [30]	Community-based services. Nurse practitioner, primarycare physicians, 100 patients with dementia, 100 caregivers	Evaluation of the Dementia care program (nurse practitioner acting as a dementia care manager, training and support to caregivers)	Post intervention observational study	High levels of caregiver satisfaction
Thomas et al. (Sweden 2014) [115]	6 Primary care centers in urban settings (around 26 000 patients listed for each of them). 3 interventions with coordinated care model and 3 control centers. Patients around 1 000 / Staff 120 / Managers: 8	To evaluate the implementation of the Coordinated lifestyle promotion intervention (multidisciplinary lifestyle teams) as compared to usual approach for lifestyle promotion	Non-randomized intervention. Impact intervention over time (after 3 and 5 years).	No change regarding reach of patients or adoption among staff Lifestyle teams may have offered opportunities for lifestyle promotion practice and contributed to enabling conditions at centre level but had limited impact on lifestyle promotion practices. Consistent findings over time.
Treadwell & Giardino (USA, 2014) [48]	5 medical homes	Case manager training (nurse), implementation of care coordination with health plan clients.	Before and after study	↓ Costs ↑ Care providers satisfaction
Van Leewen et al. (The Netherlands 2018) [116]	10 GPs participating in monthly oncology meeting with hospital specialists, with at-least one-colon cancer patient	To evaluate the experience of GPs with monthly oncology meetings in a GP-practice to support GP-led survivorship care of colon cancer patients	Qualitative study; individual interviews	Feeling of shared responsibility for the patient by the GP and the specialist High satisfaction from GPs (better informed) GP better equipped to treat comorbidity and were more confident in providing survivorship care
Van de Mortel et al. (Australia 2017) [34]	191 rural community palliative care patients	Care coordination by general practice registrars; liaison among patients & family. Specified risk assessment, care planning and continuity of care	Non-randomized controlled trial (Intervention ; 99 / control : 92)	Intervention group: ↓ Hospital admissions ↓ Bed-days in hospital ↑ Death at home
Van Houdt (Belgium 2013) [117]	5 local community projects with a problem, gap or need across the primary-hospital care continuum for patients with breast or prostate cancer	To determine to which extent care pathways improve care coordination across the primary - hospital care continuum	Multiple case study design Mixed methods: structured face-to-face interviews, participant observations, documentation and focus group	↑ Exchanging information, formulating and sharing goals, defining and knowing each other's roles, expectations and competences and building qualitative relationships
Wagner et al. (USA 2014) [118]	20 practices in the Safety Net Medical Home Initiative (SNMHI).	To evaluate the effectiveness of the implementation of a new Care Coordination Model (12 activities) on care coordination	Longitudinal study (correlation analysis)	↑ Care coordination (patients follow-up seen in emergency department and referrals) with 4 elements of the new model: accountability, connectivity, relationships between care professionals, patients support.
Vassbotn et al. (Norway 2018) [119]	32 GPs from various regions of Norway (rural and urban settings, men and women, various ages)	To explore Norwegian GPs' experiences with care coordination in primary health care	Qualitative study: 5 focus groups	Organizational and financial barriers to be involved in care planning and coordination Lack of experience with interprofessionnal work Need financial compensations Facilitators: recognize as coordinator
Wilson et al. (Canada 2016) [69]	113 Family Physicians, 10 specialists, 2 health system administrators	Evaluation of the RACE (Rapid Access to Consultative Expertise) program (telephone hot-line providing FPs and nurse practitioners with timely access to specialist consultations.	Evaluation study Quantitative & Qualitative mixed methods	60% of RACE calls prevented patients from visiting a specialist 32% of calls prevented FP referrals to hospital ED
Wulff et al. (Denmark, 2013) [44]	280 colorectal cancer patients from a surgical Department	To explore hospital-based Case Management on GPs and hospital collaboration and GPs patients contacts	Randomized Control Trial (Intervention 140 / control : 140).	↑ GPs-hospital relationships ↑ Number of patient contacts to the out-of-hours GP services (negative impact)

Yin et al. (China 2016) [59]	Patients with non-communicable diseases: 1250 in city with intervention, and 841 patients in city without intervention	Evaluation of implementation of the National primary care policy of promoting general practitioner (GP) team service implementation	Before-after and "here-elsewhere" study	↑ Primary care quality scores in city with intervention No significant changes in city without intervention
Zhang et al. (China 2017) [55]	5462 hypertension patients from 6 towns 3 groups: 1. Integrated care model. 2. Integrated care model + provider-level financial incentives. 3. Control group	Implementation of Integrated chronic care models +/- financial incentives	Clustered randomized controlled trial	Group 1 ↓ Blood pressure ↑ Quality of life ↓ Hypertension-related hospitalization Group 2 ↓ Blood pressure ↓ Hospitalization & inpatient spending ↓ Self-assessed health-related quality of life (negative impact)

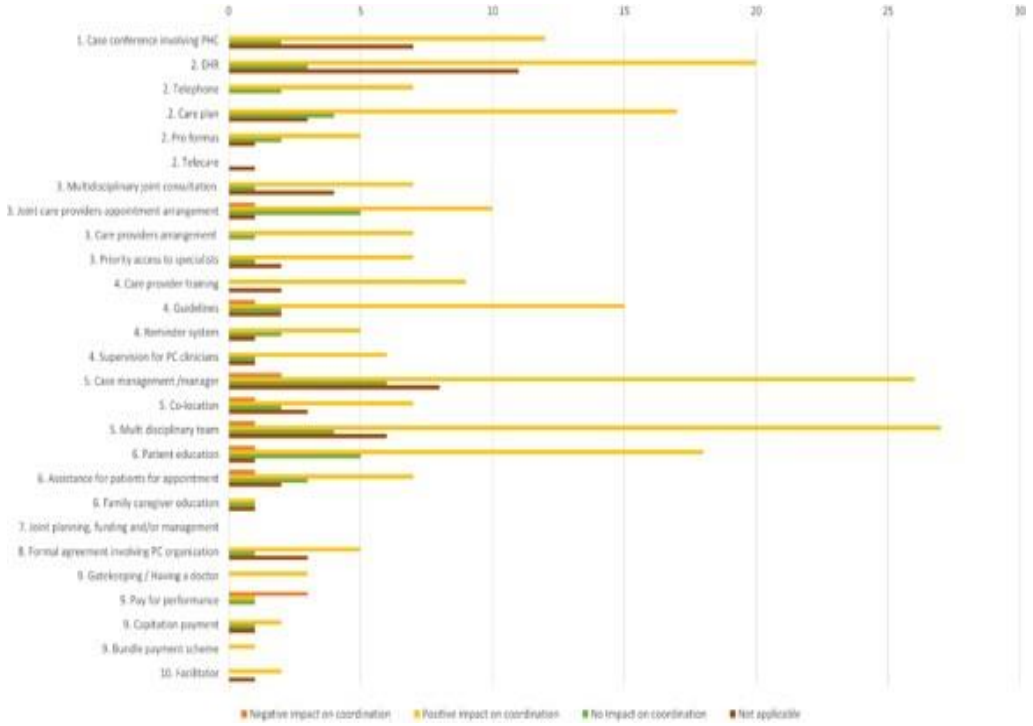

Figure 2. *Number of studies according to their category of intervention and their outcome.*

26 types of interventions we identified and their global impact on care coordination namely (positive, negative (only 4 studies reported strict negative associations), none or not applicable).

Narrative synthesis of identified interventions

Electronic Health Records (EHRs) is one of the most investigated interventions, showing several levels of interconnection between caregivers, in most surveys. Studies show EHRs improve information sharing [9-13] and care coordination [9, 10, 13-19]. However, this depends on good team cohesion [20] and limited use within the practice [21]. EHRs are also positively associated with patient [22, 23] and physician [13, 22, 23] satisfaction. Their use could have an impact on certain quantifiable clinical parameters such as blood pressure or glycated hemoglobin [22, 24, 25]. Some authors, however, have highlighted the limitations of using EHRs, such as their complexity and lack of fit to existing software or with medical decision-making processes and care plans [26]. Lastly, the information content of EHRs alone is not sufficient to ensure care coordination in complex cases [27] and has little influence on distribution of roles and responsibilities between physicians [10].

Care plans mainly correspond to individualized patient-procedures (as opposed to guidelines) and are put into place by the practice care coordinator (or case manager (CM), the FD and / or a specialist, in cases of complicated single disease management (for example diabetes). Care plans are rarely used for management of multi-morbid patients (for example adding blood pressure, LDL cholesterol and glycosylated hemoglobin measures). Several studies reported positive effects of a care plan on patient [23, 28, 29] and health professional satisfaction [23, 30], for controlling patient symptoms [29, 31-33] and vital signs [22, 24], as well as a decreasing length of hospital care and therefore health costs [34]. A 2013 literature review [35] concluded that care plans promoted care coordination by the clinician, but this was rarely perceived by patients.

Case management intervention can take many forms. It frequently includes health professionals other than the PC physician, often nurses [24, 30, 34, 36-41], whose mission is to coordinate care of patients having one or more pathologies. Tasks were found to mainly involve managing a care plan and vary from overseeing patient parameters to patient 'empowerment'. Others who took on the case manager role include PC physicians [18, 42, 43], medical assistants [28, 37] and sometimes family caregivers [38], particularly if they are the patient's guardian. Positive effects observed encompass improved patient [28, 40] and health professional satisfaction [30, 44], improved patient

outcomes [18, 31-33, 45] or of vital signs [24]. Additionally, a decrease in hospital stay and therefore hospital costs [18, 28, 31, 33, 34, 41, 46-49]. Analysis of the 2010 Commonwealth study [50] showed that presence of a care manager both reduced the risk of problems arising from failure to coordinate care after hospitalization and had a positive effect on outpatient care. In addition, an Australian study from 2002 describes the "care coordinator" as an "information supplier" rather than a provider of health care [43].

Training of care providers covers workshops and courses designed to improve a health professional's skills for a particular intervention. In this respect, a Spanish study on collaboration in a nephrology department [51], showed FDs considered feedback from nephrologists as a form of teaching, which lead them to feel more satisfied. In Cramm and Niboer's 2012 study in Holland [52], health professional training was an integral part of the process of various Disease Management Programs. An American study from 2007 [46], analyzing two models of disability care coordination organization in which CMs taught other health professionals, showed a clear benefit of teaching in the reduced number of hospitalizations, and improved self-management of patients.

The use of the Guidelines has been studied frequently. Interventions covered in the Chronic Care Model [52-55] that use guidelines and protocols, correlate with improved relational coordination. In other interventional approaches with several interacting components, guideline use appears to facilitate care coordination, in particular behavioral changes that [25, 56] lead to physician satisfaction [51] and improvement of certain patient parameters, such as blood pressure or HbA1c control [25, 33, 55].

A multi-disciplinary team is a specific collaboration among several categories of health professionals where teams can be spread over multiple sites. On the other hand, a co-location corresponds to a health professional team whose members work in the same building (such as a primary care center). We distinguish the two as often, health professionals working under the same roof do not work together. Several studies have shown positive effects of working as a team, including beneficial changes in patient behavior, improvement of patient vital signs [24] and symptoms, decreased use of emergency services and hospitalizations [41, 57], lower health costs [33, 48], improved patient satisfaction [23, 58] and better connection [52, 53, 58, 59].

Co-location benefits include promoting teaching of constructive health-related behaviors to patients [56, 60], improving communication between FDs and specialists, particularly in the mental health area, with a less stigmatizing approach to patient mental health care and better coordination between somatic and psychic care [61]. But the results are inconsistent [62] [63].

Patient education can take many forms but is usually via a series of courses that increase a patient's autonomy towards understanding and managing their disease. Powell-Davis et al. restricted this category to joint teaching for several health professionals or education about shared care. We devised a less restrictive patient education category, including any intervention where a patient receives education about their illness or general healthy living advice, usually as part of a multi-level approach. Of note, most patient education intervention studies have been carried out in specialized areas such asthma or diabetes, showing significant benefits of treatment education for disease control. Education also brings benefit in terms of relational coordination [52-54], patient symptoms [32, 33], behaviors related to health [46, 56] ("health behavior"), vital parameters [24, 25], some quality and satisfaction scores [40], such as the ACIC score [52] (Assessment of Chronic Illness Care, often used to evaluate the chronic care model) as well as being linked to decreased hospitalizations [64] and health costs [33].

A Case conference is any intervention where there is a formal meeting between the PCP and / or case manager and / or other specialists to discuss patient management [6]. Often associated with the care plan, this intervention has been linked positively to patient [22, 23, 65] and physician satisfaction [23] and decreased hospitalizations [34] and health costs [18, 48, 65].

Multidisciplinary consultations are consultations involving multiple health professionals at the same time. This could be a council in the presence of the patient in a broad network context [18, 67].

Two studies [36, 66] on the use of telephone intervention by CMs did not show benefit whatever the outcome measure. However, if a hotline was in place, other studies identified telephone contact as a facilitator of care coordination in particular cases [11, 68, 69], or as a factor promoting a sense of care coordination by the patient [70]. Similarly, in combination with other interventions, such as the care plan, telephone use may lead to improvement in patient symptoms [29, 68]. A form of telemedicine, telecare, used to coordinate remote care, provides a device that acts as care provider, measuring vital parameters and other quantifiable values and sending them to the FD, case manager or nurse in charge. The only study we identified looked mainly into facilitators and barriers of integrating a telecare system for patients with chronic conditions and therefore nothing relevant can be drawn from it in terms of impact [71].

Proformas or transmission documents, are standardized forms of predefined templates for PCPs to fill to be able to send their patients to specialists, or, conversely for specialists to complete to respond to PCP's requests [6]. The few studies that focused on this intervention [29]; associate the documents with better patient satisfaction and improvement of patient symptoms. However, a Norwegian study in 2014 [72] showed that hospital doctors rated the quality of PCP Med faxes good in only 16.5% of cases and perceived the lack of associated information and fact that some patients were referred to hospitals without good reason as important barriers to cooperation with family doctors (not accounted among studies having an impact).

Multi-disciplinary joint consultations are consultations in the presence of multiple caregivers [6]. This could be council in the presence of the patient, built into a broad framework [66].

The joint-care provider appointment arrangement involves the intervention of a third party to assist the patient. It is usually a case manager or direct integration into a multidimensional intervention framework and is positively associated with relational coordination [52-54] and decreased hospitalizations [41, 49]. According to a 2012 study [73], the care provider

arrangements are usually in written form, such as contracts and specify, for example, patient-specialist referral (templates) or the referral procedure (chronology of care). In a guideline format, most health professionals considered arrangements for patient transfer processes useful, however this intervention worked better if health professionals had good prior relationships. The few studies on this type collaboration between FDs and specialists reported a decrease in numbers of drug prescriptions [74], specialized consultations and "inappropriate" enquiries as well as PCP satisfaction and interest for this specialized consultation [51, 69, 75].

Priority access to a health service, like gatekeeping, is an official or informal arrangement between the PCP and specialists to refer "priority" patients; described in an Italian 2010 study [24]. This intervention showed convincing results for improving patients' self-health knowledge and ability to make changes beneficial to their health ("empowerment"). This type of self-management organization could optimize referral to specialists or hospitals [69].

Reminder systems are interventions put in place to remind a health professional to do a particular test or procedure, for example using computer systems or specified in the CM's protocol. They are usually part of other interventions and have shown a positive association with relational continuity [52-54], behavioral changes [24, 56], and vital signs, such as blood pressure [24].

Supervision for PHC clinicians involves some form of verification of the work done by one health professional by another, such as supervision of CMs by experienced nurses [24], or by the PCP following the patient. Studies show positive associations with behavioral change [24], patient satisfaction [23], and improvement of vital signs, such as blood pressure [22, 24].

Assistance for patient appointments facilitates a patient's access to care, for example, when the CM makes the appointment with the health professional. This intervention is associated with patient satisfaction [23, 28, 41], improvement of their symptoms [29, 33], and decreased emergency services use [49] and health costs [33, 48]. Caregiver education is like training patients, but in this case applies to the patient's caregiver companions or entourage. The only study [30] clearly mentioning this intervention is part of a treatment plan, with a team comprising a CM in place and showed a high level of satisfaction from the patients' entourage.

Gatekeeping is an intervention regulating access to specialized consultations and costly examinations and therapies. It requires a patient to see a predefined health professional, usually the PCP, before consulting secondary health professionals. A gate-keeping study from 2000 [76] showed a significant decrease in the number of specialist visits and hospitalizations, without however, reducing the number of emergency room visits, or influencing patient satisfaction or the patient's impression of easier access to specialists. However, a second study from 2015, reported improved quality of care [17]. Of note, is another study exploring 'own GP's' in a population of diabetic patients showing a link to decreased use of emergency services [77].

Along these lines, formal agreement intervention is an agreement between group practices and other health care establishments [18]. One study concluded that formal agreements have a positive impact on the continuity and accessibility of care [70]. Several studies using different study designs investigated the mode of personnel remuneration, but results are inconclusive. A 2010 study [37] investigating a combined pay-for-performance intervention with a practice case manager intervention did not show quality of care improvement of this combined interventions, while a 2017 Chinese study combining a chronic care model with financial incentives for healthcare professionals, reported a positive effect on hospitalizations but a negative effect on patient quality of life [55]. An article on the effect of capitation funding and presence of a care coordinator did not show significant association with improved quality of care or health costs [47].

Practice facilitators help the practice organize and prioritize its quality improvement activities ("quality improvement"). They also help practice staff build a culture of "teamwork" and make them more "responsive to change" as suggested by Gray et al [78]. Facilitators are usually outside the practice, do not necessarily need medical training and have no contact with patients. A New Zealand study published in 2012 [39] showed that use of a facilitator led to improvements in coordination, teamwork, knowledge of the patients being treated as well as chronic disease management.

Discussion

This review of the recent literature of the past 17 years highlights the large number of interventions evaluated concerning coordination of care within PC or in connection with other health care providers. Many of the care coordination interventions, though sometimes contrasting, bring tangible benefits of transferring clinical and / or organizational information leading to improved care pathways, better objective health parameters and lower health costs. The interventions that deliver the most concrete coordination benefits involve presence of a case manager, individualized care plans and patient electronic health records. Overall, these interventions favor multi-disciplinary teamwork within the PC practice.

Concerning the actors of care coordination, the PCP appears to play a central role. On the other hand, many interventions concern nurses with varying degrees of specialization, in care coordinator or case manager roles [24, 30, 36, 37, 79], sometimes but not always linked to the PCP practice. Other players regularly involved in coordination activities are medical assistants [37] and sometimes caregivers [38], described in large-scale studies but without mention of their specific role. In the definition of care coordination adopted in this study, the patient is also an important player, evidenced by the number of studies seeking to improve patient autonomy about their disease (s) and day-to-day disease management ("empowerment"). This element has been pointed out by Reynolds in 2017 in her systematic review about chronic diseases management interventions in PC [7].

Comparing to the review conducted ten years ago by Powell Davis [3], we found the same main types of intervention, but the number of studies has significantly increased, allowing better identification of interventions that might positively modify care coordination.

It is important to note that the twenty-six interventions identified here do not only relate to care coordination, indicating the same interventions have several interacting roles in other aspects of health care. This is the case, for example, of case managers, the subject of abundant literature, including systematic reviews, investigating their role in case management of complex patients [80-82]. Our review is therefore complementary to existing publications of interventions with other important effects in primary care.

Strengths and limitations

One of the greatest difficulties for this study was to define the keywords, choose the interventions and categorize them. This was partly due to language, the definition of terms such as coordination of care, continuity, integration of care, case management, care management varies from one study to another. Often these terms overlap or are integrated into each other. In addition, many articles only give partial descriptions of the interventions studied, which often boil down to one term. While we relied in part on the work of the 2006 Powell-Davies team, it was not always possible to use the same definitions, influenced particularly by variations in the meaning of "coordination". Sometimes we used broader definitions for interventions; as for patient or caregiver training, where we did not restrict choice solely to interventions specifying training linked to care coordination. Many of the studies explored several types of interventions simultaneously and so it is common for us to cite the same article more than once in our categories, which may influence the number of "positive" or "negative" interventions. Some articles described interventions vaguely (e.g. simple communication between health professionals) and were not retained, even though an impact on coordination was possible. Finally, as this review has so many complex variables the findings should be placed alongside the findings of other more focused studies.

One of the strengths of this study is the systematic andrigorous identification of the most recently evaluated interventions for care coordination in primary care. In addition, the synthesis provides a clear overview of the interventions most likely to modify favorably care coordination.

Future perspectives

We describe many investigated interventions with several correlating with improved coordination of patient care. However, there is still a long way to go before putting these beneficial innovations into practice. For instance, some countries implement electronic health records of patients or managers irregularly, as shown in the 2015 survey of the Commonwealth Fund [83]. The reasons for slow adoption of evidence-based interventions are multiple. The health care context (governance, health policy) may not necessarily favor implementation of new organizational models (due to lack of resources, inadequate remuneration, etc). In addition, the medical community is relatively reluctant to changes in practice, especially if it concerns non-clinical areas, as it is not perceived as activities that directly modify patients' health outcomes. Overall, implementation requires clear political commitment and strong partnerships between the different domains. From this perspective, it seems important to develop research projects aimed at realizing proven interventions to establish a culture of implementation science [84]. In this regard, this narrative review should help to better identify priority interventions as it offers a global overview of interventions rather than focusing on a specific intervention.

An element that comes out from this study is the large range of measures used to evaluate an intervention's impact. Measures can be directly related to care coordination components (better circulation of information, numbers of registered patients), indirect measures on health parameters (blood pressure, glycated hemoglobin), on aspects of experience and satisfaction or on costs. This makes of evaluation difficult, especially for objective comparisons even if a study concerns only one intervention. It therefore seems appropriate for researchers to agree on appropriate impact measures for health systems research. [85-86].

Conclusion

This narrative review of the recent literature shows that a significant number of interventions have been studied to optimize care coordination in primary care. Among the most compelling are electronic patient health records, individualized care plans and presence of case managers in the primary care practice. Future research is needed to assess the extent to which these interventions are implemented and what impact they have on patient management.

Disclosures

Ethics

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Conflict of interest statement

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Data availability statement

NA

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