HAW Hamburg
Fakultät LS
Life Sciences

University of Applied Sciences
Faculty of Life Sciences
Health Sciences Degree

Comparing Patients Care Coordination in Germany and the United States: A Systematic Review

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Master Thesis

Date of Submission: 17 January 2020

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Abstract

Background: Care coordination (CC) is the holistic approach of interacting care providers across interfaces of care to deliver the appropriate healthcare service. Poorly coordinated care can lead to adverse patient outcomes and increased health expenditure. There is an increasing need for CC in countries like Germany (DE) and the United States (US) who face the challenges of aging population and hence a rise in chronic illnesses which require a continuum of care.

Objectives: The aim of this study is to compare the degree of vertical CC of patient care in DE and the US including the structure of the healthcare system, implemented policies, the available mechanisms for coordinating care as well as the challenges faced by each country.

Research Methodology: For fulfilling this study, a systematic review is conducted for the peer-reviewed articles published in the years from 2013 to 2018 and written in English language in these three databases: PubMed, Cochrane and Google Scholar. The review is conducted in line with PRISMA guidelines.

Results: A total of 24 studies were included for the final analysis of this review: nine for DE and 15 for the US. Almost half of the studies were observational. Findings suggest that despite the several efforts implemented, the degree of CC in both countries is still poor. Designation of case managers is either absent or inconsistent. Fax and paper formats are still being used for recording patient data despite the adoption of EHR in some settings which creates a lack of interoperability and consequent CC gaps. Challenges like physician resistance for using EHR, technical barriers as well as absence of financial incentives for applying CC need to be addressed.

Conclusion: No evidence of CC is seen in both countries. Further strategies are required to tackle the barriers of sharing patient information across different levels of care.

Keywords: Care coordination, vertical integration, integrated care, Germany, US, healthcare system, patient hand-offs, information exchange, interoperability, EHR

Acknowledgement

I would like to thank my respected professor **York Zöllner** for his continuous support, patience and valuable advice. He helped me fine tune my research topic and put me on the right path to complete this work.

I would also like to show my special gratitude to professor **Ralf Reintjes** who guided me with his immense knowledge in the methodology and data extraction part of this work.

Besides, my sincere thanks go to my lovely friend **Wiebke Bendt** who cared, listened carefully and was my motivator. Not to mention, the “master thesis colloquium” she delivered which was of extreme help in writing this thesis.

I am also grateful to **Gunnar Pätzelt**, the first kind-heart I met in Hamburg, who stood by me and helped me out with my first steps in a foreign country.

I would further take this opportunity for thanking **Tobias Lütjohanna** for being an inspiring, appreciative, understanding and motivating manager throughout my internship at SAP.

Equally important is to thank **Marc Meißner** for giving me the opportunity to complete my internship at Krankenhaus Reinbek which allowed me to better understand the mechanisms of interactions among healthcare providers and e-prescribing methods.

I additionally thank my fellow **MPH classmates** for sharing their experiences throughout my master studies, along with all **HAW staff and workers** for their respected effort they have been offering throughout this program.

I dedicate this work to **Mohamed ElGamal**- my husband and life partner- who without his precious support it would not be possible to conduct this research.

I also dedicate this work to **Omar and Hamza**, my lovely boys, who tolerated me being away for some time busy doing this thesis while keeping their lovely smile. Lastly, all thanks and gratitude go to my **family** in Egypt especially my father, mother and sisters for their blessings and support.

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List of Abbreviations

ACO	Accountable Care Organizations
AHRQ	Agency for Healthcare Research and Quality
CAHPS	Consumer Assessment of Healthcare Providers and Systems
CC	Care Coordination
CCD	Continuity of Care Document
CCITI NY	Continuum of Care Improvement Through Information New York
CMS	The Centres for Medicare & Medicaid Services
CPGs	Clinical Practice Guidelines
DALYs	Disability Adjusted Life Years
DE	Germany
DMP	Disease Management Program
DRG	Diagnosis-related Group
ED	Emergency department
EHR	Electronic Health Record
EMR	Electronic Medical Record
FFS	Fee-for-service
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GK	Gesundes Kinzigtal GmbH
HAI	Healthcare-Associated Infection
HC	Healthcare
HCP	Healthcare Professionals/providers
HHA	Home health agency
HIPAA	The Health Insurance Portability and Accountability Act
HIT	Health Information Technology
HIE	Health Information Exchange
HITECH	Health Information Technology for Economic and Clinical Health
HIV	Human Immunodeficiency Virus
HMO	Health Maintenance Organization
IC	Integrated Care
ICN	Integrated Care Network
ICP	Integrated Care Program

ICT	Information and Communication Technology
IHC	Integrative Healthcare
IHI	Institute for Healthcare Improvement
IOM	Institute of Medicine
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
KP	Kaiser Permanente
LTC	long term care
MSSP	Medicare Shared Savings Program
MU	Meaningful use
NCQA	National Committee for Quality Assurance
NQF	National Quality Forum
OECD	Organisation for Economic Co-operation and Development
PAC	Post-acute care
PCC	Patient-Centred Care
PCMH	patient-centred medical homes
PCP	Primary Care Physician
PHI	Personal Health Information
PHM	Population Health Management
PICO	Population, Intervention, Comparison and Outcomes
QOL	Quality of Life
RASHIP	Regional Association of Statutory Health Insurance Physicians
SHI	Statutory Health Insurance
SNF	Skilled Nursing Facilities
TC	Transitional Care
US	The United States of America
VA	Department of Veterans Affairs
WHO	World Health Organization
YPLL	Years of potential life lost
YPLLG	Years of potential life lost and gained

Glossary

- Accountable Care Organization: an organization of healthcare providers that agrees to be accountable for the quality, cost, and overall care of Medicare beneficiaries enrolled in the traditional fee-for-service program who are assigned to it. *[CMS]*
- Case management: a collaborative process of assessment, planning, facilitation, care coordination, evaluation and advocacy for options and services to meet an individual’s and family’s comprehensive health needs through communication and available resources to promote patient safety, quality of care, and cost-effective outcomes. *[Case Management Society of America CMSA]*
- Clinical pathways: a multidisciplinary management tool based on evidence-based practice for a specific group of patients with a predictable clinical course, in which the different tasks (interventions) by the professionals involved in the patient care are defined, optimized and sequenced either by hour (ED), day (acute care) or visit (homecare). Outcomes are tied to specific interventions. *[Wikipedia]*
- Clinical practice guidelines: are statements that include recommendations, intended to optimize patient care, that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options. *[IOM]*
- Co-insurance: is the amount, generally expressed as a fixed percentage, an insured must pay against a claim after the deductible is satisfied. *[Investopedia]*
- Deductibles: is a fixed amount a patient must pay each year before their health insurance benefits begin to cover the costs. *[Investopedia]*
- Discharge planning: is an interdisciplinary approach to continuity of care and a process that includes identification, assessment, goal setting, planning, implementation, coordination, and evaluation. *[Science Direct]*
- Disease management: a system of coordinated healthcare interventions and communications for populations with conditions in which patient self-care efforts are significant. *[Wikipedia]*
- Evidence-based medicine (EBM): is the conscientious, explicit, judicious and reasonable use of modern, best evidence in making decisions about the care of individual patients. EBM integrates clinical experience and patient values with the best available research information. *[National library of Medicine]*

- Insuree: the person or entity protected by or receiving insurance provided by the insurer. *[Wikipedia]*
- Medication Reconciliation: is the process of creating the most accurate list possible of all medications a patient is taking -including drug name, dosage, frequency, and route -and comparing that list against the physician's admission, transfer, and/or discharge orders, with the goal of providing correct medications to the patient at all transition points within the hospital. *[IHI]*
- Patient-centred care: providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions. *[IOM]*
- Population health management (PHM): is a discipline within the healthcare industry that studies and facilitates care delivery across the general population or a group of individuals. *[Search Health IT]*
- Telehealth is the personalised care delivered by both synchronous and asynchronous (such as store and forward) technologies over distance, which enables data to be transferred from the patient to the professional, who then provides feedback.[1]
- Years of potential life lost YPLL measures potential life lost because of premature death (i.e., a person with a mean life expectancy (LE) of 75 years dying at age 65 represents 10 years lost). [2]
- Years of potential life lost and gained (YPLLG) is an adapted individually age-adjusted YPLL indicator depending on the life expectancy. [2]

1. Introduction

1.1. The concept of care coordination

Healthcare is characterized by being a complex system involving "non-linear interactions" [3] that requires good integration between different levels of care. Patients may encounter more than one level of care during their entire episode of illness. Healthcare systems often fail to meet the needs of patients during these transitions because care is usually fragmented, with little communication across care settings and multiple providers.

Care coordination (CC) involves the holistic approach of interacting healthcare providers (HCPs) across interfaces of care to deliver the appropriate healthcare service. The WHO defines CC as "a proactive approach to bringing together care professionals and providers to meet the needs of service users to ensure that they receive integrated, person-focused care across various settings" [4].

Similarly, the Agency for Healthcare Research and Quality (AHRQ) defines CC as "… deliberately organizing patient care activities and sharing information among all of the participants concerned with a patient's care to achieve safer and more effective care" [5]. As the definitions imply, active communication between different HCPs across different levels of care is necessary for ensuring effective, safe and efficient patient outcomes. Care coordination is usually referred to other synonyms like transitional care (TC), continuity of care, patient-centred care (PCC), patient handoffs and integrated care (IC). In this review, care coordination or CC will be the term used.

1.2. Emerging importance of CC

In 1999, the Institute of Medicine (IOM) released a report under the name "To Err Is Human" reflecting the ugly face of the actual quality of healthcare system in the United States (US), making this report a turning point for the provision of healthcare systems worldwide. It stated that about 100,000 patients die annually in the US due to medical errors, 70% of which are due to communication failures [6].

Later, the IOM released another report called "Crossing the Quality Chasm" proposing some solutions to close the gaps in healthcare. "Patient-centred care" was listed as one of the six aims of this report, with CC being added under its domains [7].

In most of the cases, patients rely on their caregivers in sharing their health information when being transferred from one level of care to another. They can even sometimes depend on their memory or their family members for providing their list of medications or the opinions shared by the last caregiver they visited. On the other hand, caregivers also think that their patients know everything about their illness and that they can share all the information they have. This makes the care delivery process looks like “silos” rather than whole, with every HCP retaining the patient’s data and making clinical decisions depending on what he has in hands. Accordingly, a huge gap in communicating the patient information exists that could sometimes lead to serious medical errors including death.

Fragmented care can lead to adverse patient outcomes and increased health expenditure. From a safety point of view, a patient whose medical information is not shared with different HCPs is at risk of being prescribed an unnecessary drug or even a medication with serious interactions with his existing medication. In the same manner, he could be at risk of performing a repeated diagnostic procedure such as X-ray for example. This doesn’t only lead to increased cost of treatment but also to an exposure hazard and eventually a safety issue. Meanwhile, poorly coordinated care can cause frustration to the medical staff as well. A provider who is unable to communicate to other HCPs regarding a patient’s medical status or current treatment may find it difficult and time-consuming to provide the optimum safe care for his patient. Furthermore, lack of CC could be frustrating for patients when they find their information not available at their physician which may lead to demotivation, decreased satisfaction and low adherence to treatment. Redundancy of services, providing unnecessary treatments, insufficient patient follow-up, over or misuse of medications, medication errors, preventable hospital readmissions, and unnecessary emergency department (ED) visits are all consequences of fragmented care and can lead to increased health expenditure and patient risks.

Holistic management of patient care requires the collaboration of all stakeholders in integrating the required care. By coordinating care, the SDG number 3 “Health and well-being” can be fulfilled. It states: “Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all” [7].

Moreover, the Institute for Healthcare Improvement (IHI) issued a framework for improving the performance of the healthcare system and called it the “Triple Aim” [8]. These three aims can be accomplished by having CC in place, and they include:

1. Improving the patient experience of care (including quality and satisfaction);

2. Improving the health of populations; and
3. Reducing the per capita cost of health care.

There are many challenges forcing the countries to improve their efficiency by increasing the quality of care, improving the health outcomes while keeping optimum costs - or in other words - increasing their value of care. The rising costs of healthcare (HC) services is one of these reasons. With the advances of diagnostic procedures, increase in pharmaceutical agents and development of surgical interventions, the costs of care are dramatically increasing which makes healthcare reimbursement systems move from focusing on paying for the maximum number of patients served to the quality of care offered. For instance, moving from "volume" of care to "value" of care.

Germany (DE) and the US are both developed countries with relatively comparable measures. Life expectancy at birth for the US is 78.6 while for Germany 81.1 [9]. Both countries have high expenditure on healthcare. The health expenditure as per the 2018 OECD report is 11,000 USD per capita for the US versus 5,800 USD for DE, or about 17% and 10% share of their GDPs respectively [10] making them in the first five high expenditure countries from 37 countries.

In particular, there is an increasing need for CC especially with the increased prevalence of chronic diseases and the subsequent rise in medical costs. The WHO is estimating a 57% increase in NCDs' burden worldwide by 2020 [11]. Unlike treating acute illnesses, chronic conditions like diabetes or cancer require more integration of care over an extended period of time. That's why, we will see by the end of this chapter how both countries are initiating some population health programs. The problem doesn't only stand at chronically ill patients but further to the patients with complex conditions who could be suffering from more than one chronic condition at a time and hence have rather complex needs to be fulfilled, requiring more seamless care. Visiting a variety of HCPs will be inevitable, and hence alignment of treatment and clinical decisions through information sharing and access to data is essential. For this to happen, there should be regulations that enforce data sharing while keeping them secured in addition to the presence of methods encouraging HCPs to coordinate care. These regulations and methods are different in DE than in the US.

Having in mind that high income countries are capable of introducing computerized system for sharing information and creating better mechanisms of integrating care, it is surprisingly found that the research doesn't confirm this fact. In a study that conducted a survey in 2011measuring the degree of CC in eleven countries with DE and the US as part of them, patients with serious illnesses, serious injuries, or chronic diseases are facing profound challenges with respect to CC in both countries. The survey revealed coordination gaps in the form of failure of information sharing among physicians, delayed access to care and lack of follow up after discharge [12].

To sum up, there are three reasons behind choosing those two countries. First; they both are developed countries facing the same challenges as aging population and increased prevalence of chronic diseases. Second; they have totally different healthcare systems with respect to insurance coverage, regulations and healthcare financing. Thirdly; the US has been working on CC for a long time making it a good candidate to compare to DE who has just stepped in that field.

1.3. Types of integrating care

Integrating patient care can take place by either two means: Vertical or horizontal [13]. Vertical integration involves filling the gaps that occur when patients leave one care setting and move to another care setting. These transitions include patients moving from primary care to specialty physicians; moving or transferring patients from the ED to intensive care or surgery; and when patients are discharged from the hospital to home, home health agencies (HHA)or skilled nursing facilities (SNFs).

The horizontal integration on the contrary includes coordinating care at the same stage of care, for instance across different hospital units.

In this study, I will be focusing on the vertical integration of care.

1.4. Methods of evaluating CC

Several agencies have issued different measures for evaluating CC. The National Quality Forum (NQF) for example issued a list of 12 measures for measuring the transitions of care [14]. The Joint Commission stated seven foundations of safe and effective transitions of care to home including leadership support; multidisciplinary collaboration; early identification of patients at risk; transitional planning; medication management; patient and family engagement; and transfer of information [15]. The National Transitions of Care Coalition (NTOCC) [16] listed "seven essential categories for patient transition to another facility". All these measures are equally important, but in fact using Donabedian paradigm in designing measures for evaluating CC could be the easiest way though.

According to Donabedian paradigm [17], we can look at the CC system with respect to three main components: Structure, process and outcomes (see Figure 1). The **structure** in the first place refers to the inputs required to providing CC such as the policies and regulations which enforce CC, contracting with care providers, the presence of clinical practice guidelines (CPGs) by which the physicians follow for providing the optimum care for each patient based on evidence, assigning a case manager, having financial incentives in place to encourage the HCPs to coordinate care and the abundance of electronic medical records (EMR) which preserve the patient information and share it when needed. The **process** component for instance refers to how the work is actually done to achieve CC. This could take place by assessing the patients or the populations needs for care, delivering care based on the appropriate CPGs, the communication between different players including timeliness and appropriateness of patient information sharing and lastly providing the patients with the pertinent counselling to be able to manage their illness. Finally, the **outcomes** are the results achieved when CC is in place. This could be in the form of reduced rates of hospital readmission, efficient utilization of resources, reduced cost of care, decreased use of emergency services, delayed progression of illnesses to further complications, decreased mortalities, increased patient satisfaction and eventually improved quality of life (QOL) for the served patients and subsequently the whole population.

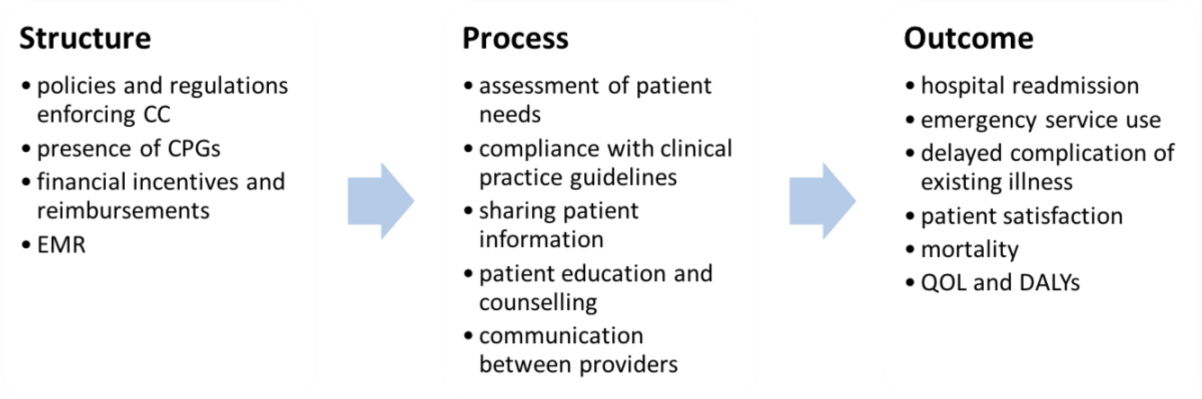


Figure 1: The conceptual system of CC according to Donabedian Paradigm (own design)

Other measures can be used for evaluating the policy goals such as the participation rate of HCPs, percentage of coverage, amount of dollars saved by decreased redundant procedures, tests and unnecessary medications

2. Research Objectives

This study builds on the knowledge that there is an increasing demand among developed countries on reducing healthcare costs and increasing the efficiency of the healthcare system through coordinating care. There is a lack of research addressing the degree of CC in DE in comparison to the US especially after the healthcare reform policies that have been implemented by both countries in the past few years.

The aim of this study is to bridge the gaps of knowledge on the framework of the vertical integration of care in DE in comparison to the US through a systematic review. The main research question is: “How does vertical integration of care compare to Germany and the United States?”

Other sub-objectives include:

a. Investigate the degree of CC in each of DE and the US reflected by outcomes and efficiency of care.
b. Examine the similarities and differences among the healthcare systems in both countries
c. Appraise the impact of the new implemented policies and CC programs applied in each country and how far their objectives have been met.
d. Evaluate mechanisms and tools used for streamlining clinical communications and sharing patient data
e. Summarize the potential barriers for implementation
f. Recommend potential areas for improvement

3. Research Methodology

3.1 Selection of key terms

This study is based on a comparative systematic review which is conducted in line with the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (see Appendix 10 1) [18]

An exploratory Google search was first conducted using the broad keywords “Care coordination in Germany” and “Care coordination in US” to identify the key articles. The articles were then checked and on this basis the search terms were structured. The search terms were then shaped to reveal a high selectivity of research articles desired to answer the research question. Several search strategy tests were conducted to check the level of vagueness and specificity of the search terms.

The search terms were categorized into two types: Primary and ancillary. The primary search terms are those main words reflecting my research question and which were used in every search cycle. These included terms like “integrated care”, “coordinated care”, “continuity of patient care”, “patient handoffs”, “vertical integration of care” and “case management”. The ancillary search terms for instance are the helping ones which I combine with the primary terms to capture the articles of interest. These terms comprised terms like “patient referral”, “patient transfer”, “patient discharge”, “managed care”, “patient-centred care”, “care delivery model” and “healthcare delivery system”. Full details on the primary and ancillary search terms are found under Appendices 10.2 and 10 3 respectively.

A search strategy was then conducted using a combination of MeSH subject headings and free-text terms. The search was carried out using three databases: PubMed, Cochrane and Google Scholar from the period of 20th of November 2018 till 2nd of December 2018. The databases were accessed through HAW VPN portal. To ensure consistency in data collection across the two countries, the search strategy followed for articles for DE was the same as that used for articles for the US throughout all of the three databases. The search was run independently; once for Germany and another time for the US. Further details about the full electronic search strategies for Germany and the US are listed under Appendices 8.4 and 8.5 respectively.

3.2 Eligibility criteria

3.2.1 Inclusion Criteria

Articles included were those covering the following inclusion criteria:

- studying the mechanism of vertical CC between different settings of care, methods of data sharing, the tools used in CC, challenges or barriers the settings are facing
- describing the healthcare system specific to the countries (DE/US) together with the implemented policies
- included one or more of the listed search terms
- discussing the mechanisms of vertical integration of care in DE or the US
- available as full articles
- published in English language
- published in the last five years i.e. from 2013 to 2018
- comparing DE or the US healthcare system to other countries
- involving any type of patients receiving care including but not limited to those with complex, chronic or serious illness
- with any study design published in a peer-reviewed journal
- can be retrieved in the form of a publication or journal article

3.2.2 Exclusion Criteria

On the other hand, articles identified with these criteria were excluded from this study:

- involving horizontal integration of care; across same level of care like across different hospital departments or inside medical home services
- confined to a special population of patients; i.e. elderly, children, gays, alcoholics, black Americans, refugees, underprivileged, etc
- confined to CC efforts for a special disease; i.e. diabetes, psychiatrics, mental illnesses, HIV, orthopaedics, stroke, cancer, dental etc
- published in a language other than the English language
- the free full article is not available
- not discussing the mechanism of CC in either countries
- evaluating the effect of a certain intervention on CC in general; i.e. using EMR, phone calls or team approaches, patient education, pharmacist counselling, mechanism of discharging patients

- discussing staffing ratios, physician behaviour, nursing satisfaction, effect of leadership or patient preferences regarding CC without linking them to the healthcare system of either countries
- unpublished studies which have been not peer-reviewed; i.e. interview, editorial, commentary, conference abstract, dissertation proposal, reprint, WHO papers, white papers, author's manuscripts or book chapters
- focusing on patient outcomes like hospital readmissions, mortality or HAIs without linking them to the degree of CC
- explaining the effects of CC on patient outcomes without linking them to either countries

Table 1 summarizes the inclusion and the exclusion criteria used for this review based on the PICO tool (population, intervention, comparison and outcomes).

Table 1: Summary of the inclusion and exclusion criteria

Element	**Inclusion criteria**	**Exclusion criteria**
Population	Healthcare settings. Patients using the healthcare settings including but not limited to those with complex, chronic, serious illness.	Special population of patients; i.e. elderly, children, gays, alcoholics, black Americans, refugees, underprivileged, etc Special disease; i.e. diabetes, psychiatrics, mental illnesses, HIV, orthropedics, stroke,cancer, dental etc
Intervention	Vertical integration between different levels of care, mechanisms of data sharing, the tools used in CC, challenges or barriers the settings are facing. Describing the healthcare system specific to the countries (DE/US) together with the implemented policies.	Horizontal integration of care; across same level of care. Evaluating the effect of certain interventions on CC; i.e. using EMR, phone calls or team approaches, patient education, pharmacist counselling, mechanism of discharging patients.

Element	**Inclusion criteria**	**Exclusion criteria**
		Discussing staffing ratios, physician behavior, nursing satisfaction or patient preferences regarding CC. Studying the effects of CC on patient outcomes in general. Focusing on patient outcomes like hospital readmissions, mortality or HAIs without linking them to the degree of CC.
Comparison	Confined to DE and/or the US	Not specific to DE or the US.
Outcome	Mechanisms of CC. Effectiveness of available CC programs. Burdens of integration. Patient experiences in CC in either countries.	Not discussing the mechanism of CC in either countries.
Language	English language	Not in English language.
Type of publication	Full free article. Published in a peer-reviewed journal. Published in the last five years: 2013 to 2018.	Not in free full article. Grey literature; not published in a peer-reviewed journal. Published outside the period 2013 to 2018.

3.3 Databases search strategy

PubMed search:

For each search term, the corresponding MeSH terms were identified. The MeSH terms together with the Boolean operators “AND”,” OR” were used to undergo the search. The “advanced search” in PubMed was sorted by English language, free full text; published in the last 5 years; humans and article types as clinical trials, comparative study, review and systematic review. The search results were then saved on “My NCBI collections” in the NCBI website, and finally imported to EndNote for screening. See Appendix 10.4.1 and 10 5 1 for PubMed search results for DE and the US respectively.

Cochrane

The MeSH terms together with the Boolean operators “AND”,”OR” were used to undergo this search. Truncation (*) and inverted commas (“”) were also used to make the keyword searching more effective and comprehensive. The used filters included “Publication Year” from 2013 to 2018 and “Trials”. See Appendix 10.4.2 and 10.5.2 for Cochrane search results for DE and the US respectively.

Google Scholar

A combination of search terms was used. The time range was customized to include the years from 2013 to 2018. The language filter was set to “English” language. The “Related articles” feature was used to display further articles that looked relevant. Promising articles were saved to Zotero reference manager then organized later in EndNote. See Appendix 10.4.3 and 10.5.3 for Google Scholar search results for DE and the US respectively.

3.4 Data collection process

All the retrieved citations from each search were then collected in the reference manager EndNote to be then organized, de-duplicated and screened against the inclusion/exclusion criteria. Each article was fully read on its own. A Microsoft Excel sheet was then created to summarize all the important information from each article. The extracted data included:

- First author, publication year
- Actual study period
- Study design

- Data source
- Specific country location
- Number of study participants
- Study population
- Inclusion and exclusion criteria
- Study outcomes
- Study results
- Study limitations

More details on this data will be shown in the "Results" part.

To categorize and display the characteristics of each study, Pivot tables were created to filter on the required data and extract them in separate tables. Zotero reference manager was used to organize citations in this review.

3.5 Critical appraisal of the included studies

According to the PRISMA checklist, research evidence should be assessed to determine the extent to which each individual study has addressed the possibility of bias in its design, confounding and the degree for generalizing the study findings. As this review included different types of study designs, different evaluation tools were used to critically evaluate each study for the risk of bias and quality based on the corresponding study type.

STROBE Statement [19] was used to report the findings of observational studies. Although this tool is sometimes used to critically appraise observational studies, but Erik von Elm et al. [20] clarifies that it should be used only as a guiding tool in reporting the content of those studies and not to judge them.

Tools from Center for Evidence Based Medicine (CEBM) [21] were used to assess the qualitative studies [22] and the systematic review [23] articles included in this review.

Joanna Briggs Institute (JBI) Critical Appraisal Checklist [24] was used to evaluate the included Quasi-Experimental Study.

The included studies were critically appraised for:

- Risk of bias
- Appropriateness of study design
- Quality of reporting of results
- Choice of outcome measure
- Statistical significance
- Generalizability

More details on the critical appraisal of the included studies is coming up in the "Results" part.

3.6 Synthesis of results

Donabedian paradigm was used as a model to report the findings of the included studies. Findings were categorized into either evolving around structure component of CC, process or outcome. Inspired by the AHRQ CC Framework [25], these components were further categorized as follows:

A. Structure components or "Broad approaches"; including:
    - use of a health IT system to improve coordination
    - designation of a case manager.
    - policies and regulations which enforce CC
    - contracting with care providers
    - the presence of clinical practice guidelines (CPGs)
    - financial incentives
    - abundance of EMRs

B. Process components or "Coordination activities"; including:
    - transferring information
    - assessing patient needs and goals
    - adherence to CPGs
    - communication between different players of care
    - timeliness and appropriateness of patient information sharing
    - patient counselling

C. Outcome components or "Effects"; covering three perspectives:
    a. Patient and/or family:
        - delayed progression of illnesses to further complications
        - increased patient satisfaction
        - improved quality of life (QOL)
    b. Healthcare provider
    c. System:
        - Quality of care (safe, effective, efficient, timely, equitable, patient-centred) measured through analysis of medical chart data, electronic health record, or administrative data

- Health care utilization by a group of patients (e.g., hospital readmissions, emergency room visits)
- Costs of care

4. Background

4.1 An overview on the German healthcare system

Healthcare insurance in DE is mandatory. People are either enrolled in the statutory health insurance (SHI) or also called “sickness funds” or to the private health insurance (PHI). Patients in DE have the free choice to visit a primary care physician (PCP) or go directly to a speciality physician. PCPs do not act as gatekeepers, yet to regulate access to speciality care [26]. 68% of PCPs work in “solo practice” while 31% work in small group practices notably sharing office spaces only and not handing-over patient information among them [27][26]. The concept of medical assistants is not widespread in DE due to the argument of physicians on delivering the medical tasks be confined only to them [26]. The financing of the healthcare system in DE is somehow fragmented. For instance, the financial budget for outpatient services is totally separate from the hospital services [27], posing a potential risk on fragmenting care as well.

Before the year 2000, PCPs were obliged to be members in the association of SHI which in turn negotiates the contracts with the health insurance funds. In January 2000, the Federal Ministry of Health introduced the integrated care delivery system [28] aiming to overcome the four basic deficiencies previously existing in the standard healthcare model. The main targets were:

a. Allowing price negotiations between payers and providers, by regulating market prices where PCPs can voluntarily sign contracts directly with the health insurance funds and choose integrated care schemes or gatekeeper models [26]
b. Considering the population’s needs and customizing care accordingly through disease management programs (DMP)
c. Strengthening cooperation across different care sectors; and finally
d. Considering the quality of service as a basis for competition.

With these intentions, DE introduced in 2002 a nationwide population-based DMPs [26] for managing six chronic diseases basically including diabetes type I and II, breast cancer, asthma, coronary heart disease and COPD. Data shows that the number of enrolled patients from the year 2004 to 2009 has increased from 1.3 million patients to 6.21 which markedly shows an increasing patient engagement in such programs [29]. Although this may be true, little is still known about the effectiveness and impact of these programs.

In its 2006 survey, the Commonwealth Fund International Health Policy stated that only 42% of PCPs routinely use EMRs, 34% have access to patients' tests results and only 7% have electronic access to patients hospital records [30].

Gesundes Kinzigtal GmbH (GK) is one of the integrated care pilots in DE implemented in 2005. It serves the population living in Kinzigtal, a region in southwest Germany, which is estimated to have about 60000 inhabitants [31]. This system consists of a health management company (GK), a group of physician network (MQNK), a health economic management company (OptiMedis AG) and two statutory health insurances (AOK and Baden). It is important to realize that GK managed to overcome a huge obstacle that made previous integrated care attempts fail: Absence of economic justification. They managed to construct their system by convincing stakeholders through an economic analysis justifying the expected financial outcomes and what they called "shared savings" [31]. GK planned to introduce the following programs to the community they served:

1. Individual treatment plan mutually created between the patient and physician to agree on the treatment goals
2. Patient self-management by offering the patients the required trainings that help them manage their illness and be active participants in their care.
3. Follow-up and case management through assigning a "doctor of trust" who can follow the patient's care after discharge
4. Right care at the right time, permitting patients to have an appointment with their psychiatrist on a short notice and skipping the long waiting periods
5. Systemwide electronic patient record, allowing the physicians to have access to the patient's medical record while preserving the privacy of the data.

Any patient who is entitled to one of the health insurers contracted with GK is automatically entitled for membership in this system without any extra charges and can benefit from all the health promotion activities offered [31]. This attempt avoided selecting only the healthy people and leaving out the sick patients, which is also known as "risk selection" but rather performing an "inverted risk selection" in this manner by enrolling the AOK members who could be already older in age.

Furthermore, the physicians who choose to contract with GK are reimbursed for their usual services by AOK ,while 10-15% of their income come from the special services they offer and are reimbursed by GK [31]. Providers are also incentivized when coordinating care and consequently sharing savings.

Earlier in 1997, there was another initiative that started CC efforts: The German Managed Care Association or the “Bundesverband Managed Care” (BMC). It was a membership-based, non-governmental organisation. It aimed at driving innovation and promoting patient-centred care in the German health care system [32], although its role in improving CC is still unclear.

In 2011, the electronic health insurance card (e-Card) was introduced for about 10% of the insured individuals chiefly for coordinating the administrative data across sectors. Despite the fact that it had a high level of privacy having the patient in control of his own data, it sadly didn’t help in sharing clinical information due to the fact that the patient should type in a 12-digit ID number which showed to be “impractical” [27]

A new challenge has just emerged in the EU and may pull back some of the efforts of DE in promoting CC. The General data protection regulation (GDPR) came to light in May 2018, restricting the use of data, including health data, outside the EU. The GDPR allows patients to request their data to be deleted, from the patient medical record for example, and prohibit its further use through what the GDPR called “the right to be forgotten” [33]. It also states that written authorization needs to be obtained from the patient before sharing any of his information.

Other several healthcare reforms have taken place during the years 2004, 2007 and 2012.

4.2 An overview on the American healthcare system

Unlike DE, the US healthcare system is based mainly on the free market type. About 90% of the American population have health insurance coverage which is split between public and private sectors, leaving out about 10.4% totally uninsured [34]. People have private insurance basically through their employers, but other people have it through individually-purchased plans. The publicly funded insurance programs are offered mainly to the older people who are over 65 years of age (namely Medicare) and for the poor (Medicaid) and this constitutes not more than 30% of the total population. Collectively, they are called the Centres for Medicare & Medicaid Services or CMS.

The cost of healthcare services is a way higher in the US than in any other countries. As it is chiefly derived by the free market, each private insurer has to negotiate for hospital and physician prices. Comparatively, governmental programs can negotiate for better prices given the fact that they have the large number of insurers. Otherwise, providers may lose the business created behind the high flow of governmentally insured people. Furthermore, this derived the CMS to set some performance measures to evaluate the quality of care offered by these providers. Organizations like the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the National Committee for Quality Assurance (NCQA) have initiated accreditation and certification programs for CC initiatives like DMPs.

Most of the people who are privately insured are enrolled in what is called “managed care plans”. These plans negotiate contracts with healthcare players such as physicians, hospitals, pharmacies, radiology centres and laboratories to offer HC services to their clients at a discounted pre-negotiated price rate. This in turn facilitates the share of information across these providers. Patients are encouraged to access care through their contracted network, although they are free to choose providers from outside this network but at higher expenses that they can pay out-of-pocket.

In 2010, the US introduced the Affordable Care Act (ACA) or Obama Care, which allowed the CMS to establish the Accountable care organizations (ACO) specifically for integrating care for its served patients, for instance, a cost-containment strategy [35]. ACOs were operated based on the idea that integrating care across different sectors will improve the quality of care and reduce the unwanted redundancies, hence saving money. For this reason, the linked providers were reimbursed based on that.

Nevertheless, the US ranked only “average” when it was compared to other OECD countries with respect to CC. [36] Two models of coordinating care for chronic conditions have been popular in the US: Kaiser Permanente (KP) and the Veterans Affairs (VA) health system. Emerging from the private sector, KP was founded in 1945. It is considered one of the largest health plans in the US serving the people in California [37] who are estimated to be about 8.7 million members, through 13,000 doctors and 32 medical centres. It offers integrated care among its healthcare system through collaboration of its physician network where most patients are diagnosed and treated by multidisciplinary teams.

On the other hand, the Veterans Affairs (VA) health system is from the public sector. It was formerly founded after the civil war for serving the injured soldiers, and has now grown to include 1600 healthcare facilities, 144 medical centres and 1232 outpatient sites [38]. It established the “Office of Care Coordination” to support the implementation of a nationwide CC program with the help of the telehealth program it utilized [39].

Sharing patient information in the US is regulated by the Health Insurance Portability and Accountability Act (HIPAA) of 1996. This act regulates the use of what is called "Personal Health Information" or PHI by health plans and other HCPs by applying administrative, technical and physical safeguards. Unlike the GDPR, the HIPAA doesn't require a consent from the patient before the use of his medical information and the patient doesn't have the right "to be forgotten" as well. The patient has the right to examine his data and obtain a copy of his medical record though [40].

Furthermore, in the year 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act was issued to overcome the pre-existing gaps in sharing patient information through EHRs. It forced the HCPs to use certified EHR and comply to the requirements of what is called the "meaningful use of data" or MU to be eligible to receive incentive payments through reimbursement. [41] [42].

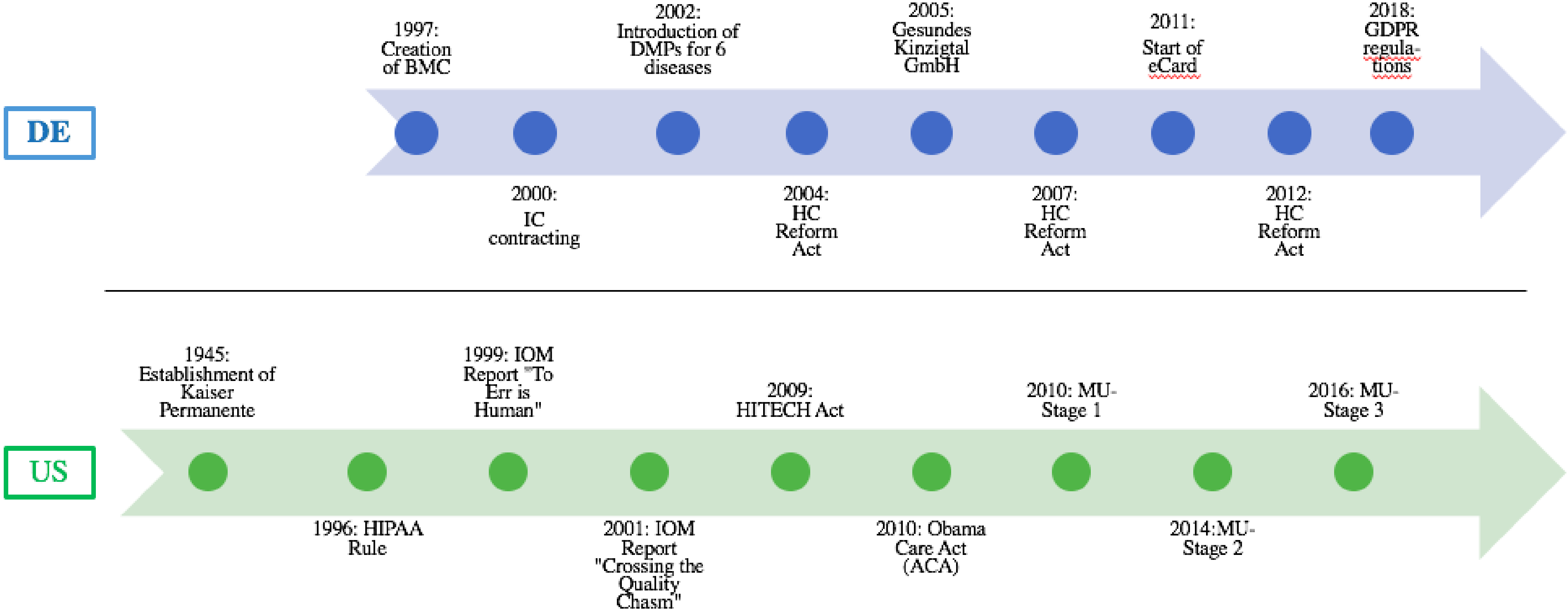
The concept of MU targeted five health outcomes [42]:

1. Improving quality, safety, efficiency, and reducing health disparities
2. Engage patients and families in their health
3. Improve CC
4. Improve population and public health
5. Ensure adequate privacy and security protection for personal health information

In fact, the MU included a set of standards which govern how EHRs are used by providers to fulfil the above goals. This for instance took place at three stages [42]. Stage 1 announced in 2010 and aimed only to have EHR in place for storing, searching and exchanging patient data including public health data. Then in the year 2014 emerged Stage 2 where the concern broadened to include extensive sharing of patient data among providers including e-prescriptions. Two years later Stage 3 was announced with more emphasis on promoting interoperability and health information exchange. The focus is put on both, the patients from one side making them better interact with their providers and on providers on the other hand helping them make more informed decisions, deliver better care or collaborate with other providers.

Figure 2 illustrates a brief summary on the highlighted efforts undergone in both countries for promoting CC.

Figure 2: A summary comparison between DE and the US efforts of promoting CC according to its chronology (own design)



5. Results

5.1. Study selection

The PRISMA checklist[18] has been used as a guide for reporting this systematic review (see Appendix 10 1). Overall, nine articles for DE and 15 articles for the US were included for this systematic review. The search strategy for Germany revealed 886 citations, 41 of which were removed as duplicates, leaving out 845 citations. The titles of those citations were then screened for relevance to the topic and 603 were accordingly excluded. The remaining 242 citations were then screened by title and abstract based on the pre-defined inclusion/exclusion criteria revealing 35 articles. Finally, these were screened by full text and nine articles were included for analysis (see Figure 1). Although, two of the included studies had the same author and were published twice in the same year, they were not counted as redundancies and included in this review and due to the slight differences in information provided in each of them.

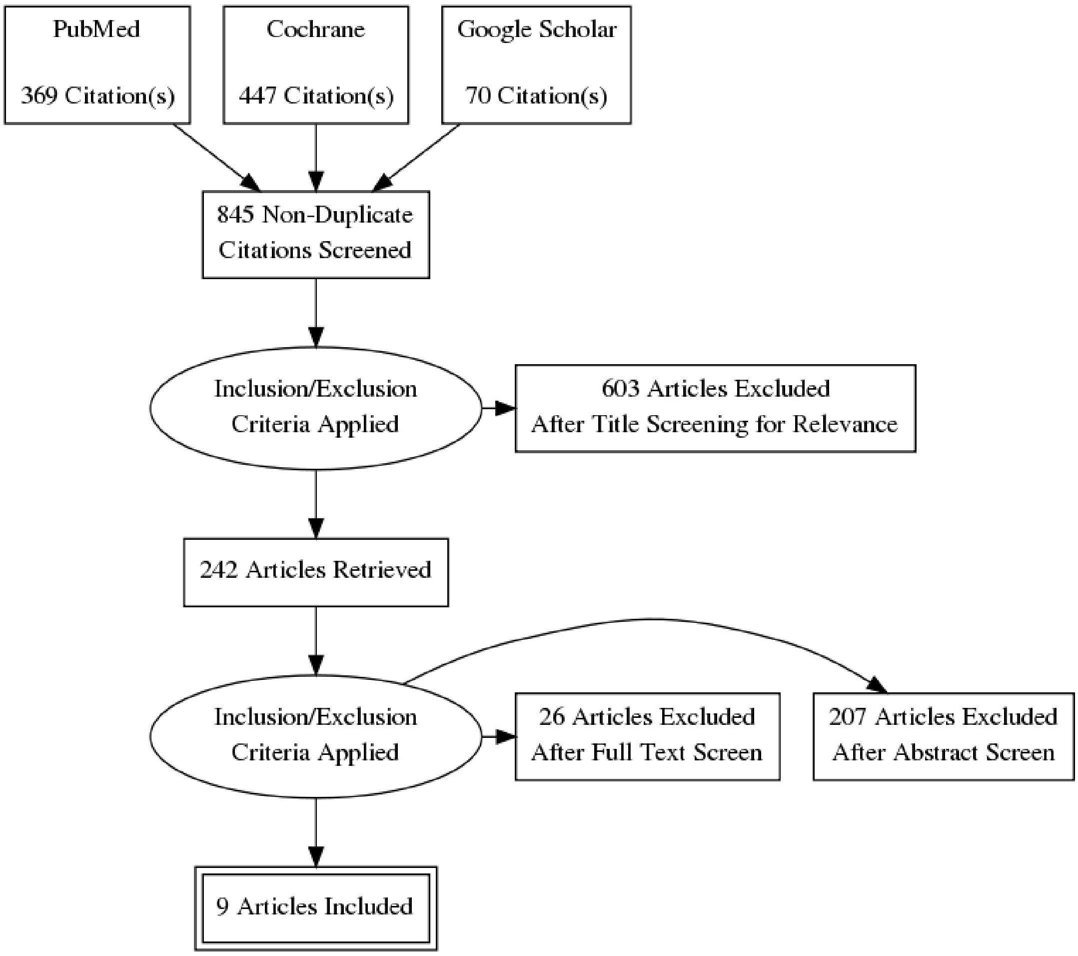


Figure 3: PRISMA diagram for the search process of DE

Similarly, the electronic search for the US retrieved 2356 citations, 495 of which were excluded as duplicates. The remaining 1861 were then screened by title for relevance against the inclusion/exclusion criteria and 1616 citations showed to be irrelevant to the topic under study. 245 citations were then screened by abstract according to the predefined inclusion/ exclusion criteria and 195 were excluded. Consequently, 50 citations were subject to full article screening and 15 citations were included for this analysis. (See Figure 4)

Appendix 10.6 includes a full list of the final articles included in this study for the US and DE respectively.

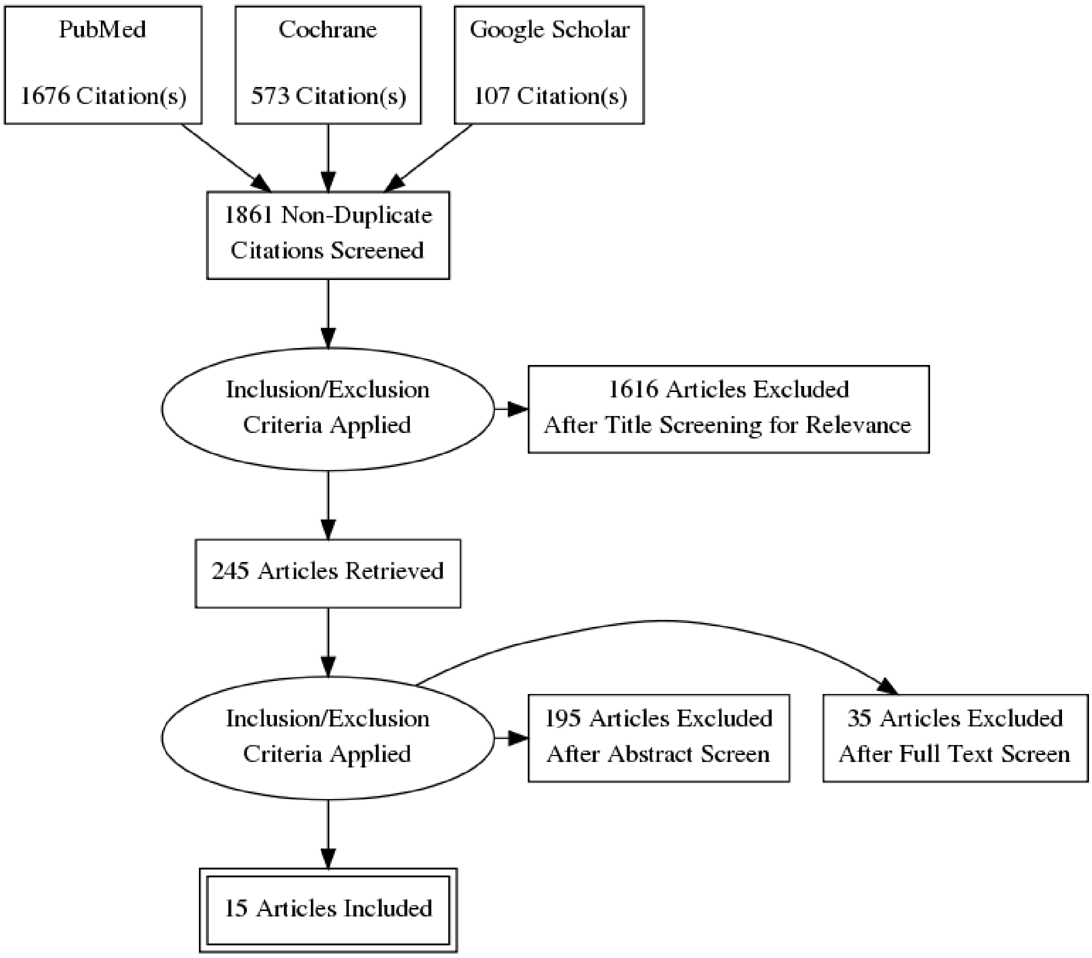


Figure 4: PRISMA diagram for the search process of the US

5.2. Characteristics of the included studies

As shown in Table 2, greater number of studies was revealed for the US than for DE which was expected due to limiting the eligible studies to those published in English language only. Six studies focused on DE alone while 11 studies focused on the US. Two studies compared the two countries with other industrial countries with respect to CC. Two studies compared DE alone to other European countries and only one study compared a US integrated care program to other programs from six different countries. Different types of study designs were revealed in this review. Observational studies counted for most commonly cited study designs (46%) followed by descriptive studies (21%), while only one interventional “quasi-experimental” study and one systematic review were revealed. Two studies had mixed methods approach namely involving interviews and a survey or a literature review.

When it comes to the study perspective, 50 % of the studies involved the patients as the study population. Those patients were either insured by specific insurance programs, or were transferred across different healthcare settings or simply the general patient population of each of the countries.

21% of the included studies addressed providers perspectives. Those providers included clinicians, office-based physicians., integrative healthcare (IHC) practitioners, professionals from EDs, acute care hospitals, SNFs, and HHA settings. Additionally, 13% of studies addressed organizations such as physician medical groups, tertiary care centres or ACOs. The remaining studies involved administrative staff such as informaticians, healthcare administrators, software engineers, HIE representatives or IC and DM programs.

The number of studies were almost evenly distributed across the covered study period from 2013 to 2017. No studies were revealed for the year 2018.

Further details on the study findings will be listed in the following sections.

Table 2: Summary of the characteristics of the included studies

Characteristic	total number of studies	% of total studies	article ID
Types of included studies			
Descriptive	5	21%	S03, S07, S11, S20, S21
Interventional	1	4%	S24
Mixed	2	8%	S02, S12
Observational	11	46%	S01, S04, S05, S06, S08, S09, S14, S16, S17, S18, S22
Qualitative	1	4%	S10
Review	3	13%	S15, S19, S23
Systematic review	1	4%	S13
Perspective			
Patients	12	50%	S15, S18, S17, S23, S24, S04, S20, S21, S16, S13, S08, S01
HCP	5	21%	S02, S05, S06, S10, S11, S12
Organizations	3	13%	S05, S07, S14
Administrative staff	2	8%	S03, S09
Program	2	8%	S11, S19, S22
Represented country in the study			
DE	6	25%	S16, S17, S19, S21, S23, S24
US	13	54%	S01, S02, S03, S05, S06, S07, S08, S09, S10, S12, S13, S14, S15
Both	2	8%	S04, S18
US with other	1	4%	S11
DE with other	2	8%	S20, S22
Publication year covered			
2013	4	17%	S13, S20, S21, S22
2014	7	29%	S03, S04, S09, S10, S12, S15, S23
2015	3	13%	S06, S11, S16
2016	6	25%	S01, S02, S07, S14, S17, S19
2017	4	17%	S05, S08, S18, S24

Author name and publication year corresponding to each article ID S01:Wells et al, 2016; S02:Samal et al, 2016; S03:Richardson, Malhotra, and Kaushal, 2014; S04:Osborn et al, 2014; S05:Huber, Shortell, and Rodriguez, 2017; S06:Hsiao et al, 2015; S07:Herrigel et al, 2016; S08:Hernandez-Boussard et al, 2017; S09:Hassol et al, 2014; S10:Grant and Bensoussan, 2014; S11:Wodchis et al, 2014; S12:Dykes et al, 2014; S13:Dy et al, 2013; S14:Colla et al, 2016; S15:Barnes et; al, 2014; S16:von Kluchtzner and Grandt, 2015; S17:Schneider et al, 2016; S18:Penm et al, 2017; S19:Milstein and Blankart, 2016; S20:Lluch and Abadie, 2013; S21:Lluch, 2013; S22:Conklin, Nolte, and; Vrijhoef, 2013; S23:Busse and Stahl, 2014; S24:Pimperl et al, 2016

5.3. Risk of bias of the included studies

Each individual study was critically appraised by the appropriate tool corresponding to its type. The STROBE statement [19] was used to report the content of the 11 observational studies included in this review. The Centre for Evidence-based Medicine (CEBM) tool [21] was used to evaluate the risk of bias for the included qualitative studies and the systematic review. The single interventional quasi-experimental study was evaluated by the JBI Critical Appraisal Checklist [24]. This review failed to critically appraise the descriptive studies due to inability to find an appropriate assessment tool. Appendix 10 7 includes all the risk of bias tables for the studies included in this review.

5.4. Study Findings

For each of the included studies, a thorough data extraction took place. The findings of all the 24 included studies are summarized in Table 3. The extracted data includes the first author, publication year, actual study period, aim of the study, study population including the setting and the number of participants, inclusion criteria, exclusion criteria, data source and outcome measures of the study.

Table 3: Table of extracted data

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
Wells et al, 2016 - (not stated)	Compare the differences between three groups of individuals based on their health care needs and costs to demonstrate their health care burden and opportunity for CC.	n= 3.7 million people insured by UnitedHealthcare Insurance Company (+) had 12 months of continuous coverage between July 1, 2013 and June 30, 2014	Administrative data files from UnitedHealthcare Insurance company	• number of annual visits to a family or internal medicine provider, specialist, surgeon, nonphysician health care provider, or to a therapist of any type, other than behavioural health • total number of health care visits • number of unique providers seen • number of unique providers who wrote a prescription for pharmacotherapy • number of drug classes prescribed • number of ED[1] visits

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[1] ED: Emergency department

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
				• number of hospitalizations. • Guideline adherence • Medication adherence • Health care expenditure
Samal et al, 2016 - (Jun 2012)	To determine, from a clinician perspective, how care is coordinated and to what extent HIT is involved when transitioning patients between emergency departments, acute care hospitals, skilled nursing facilities (SNF), and home health agencies in settings across the United States	n= 29 clinicians from different types of facilities in 6 US regions	Focus group-style interviews and a structured literature review	Type of CC activities at: Provider-level: 1)Establish Accountability or Negotiate Responsibility 2) Communicate a. Interpersonal communication b. Information transfer 3) Facilitate transitions Patient-level 4) Assess needs and goals 5) Create a proactive plan of care 6) Monitor, follow up, and respond to change

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
				7) Support self-management goals System-level 8) Link to community resources 9) Align resources with patient and population needs
Richardson, Malhotra, and Kaushal, 2014 - (May and October 2011)	Describe the efforts of the Continuum of Care Improvement Through Information New York (CCITI NY). Determine the barriers and promoters to implementing HIE for inter-organizational patient transfers between one hospital ED and one SNF.	n=18 informaticians, healthcare administrators, software engineers, and providers from a skilled nursing facility.	Semi-structured telephone and in-person interviews	Barriers and promoters to implementing HIE for inter-organizational patient transfers between one hospital ED and one SNF.

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
Osborn et al, 2014 - (May 2014)	Assess the overall experience of the older adult patients with complex needs in whether care is accessible, patient-centered, and coordinated.	n= 547 for DE n= 1116 for US, adult patients aged >=65 years	The 2014 Commonwealth Fund International Health Policy Survey data	• Health and healthcare use • Healthcare costs and access • Timeliness of care • CC and safety • Doctor-patient relationship • Health promotion • End-of life planning • Management of chronic conditions and caregiving
Huber, Shortell, and Rodriguez, 2017- (Jan 2012-May 2013)	Examine the extent to which physician organization participation in ACO and EHR functionality are associated with greater adoption of care transition management (CTM) processes. Identify the organizational	n= 1398 physician organizations (+) Medical groups of less than 20 physicians where at least 40% of physicians in the group were PCPs or specialists (+) Medical groups of	Data from the third wave of the National Study of Physician Organizations (NSPO3) survey	• Dependent variable: care transition processes • Independent variable: ACO participation, EHR functionality

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	characteristics of physician practices that can promote or deter the effective management of care transitions. Examine the association of ACO participation and electronic health record functionality with the use of CTM processes by medical practices, controlling for practice type, size, public reporting, and pay-for-performance participation.	20+ providers, at least 30% of physicians had to be PCPs or specialists treating these conditions (+) patients with chronic illnesses, including asthma, congestive heart failure, depression, and diabetes.		
Hsiao et al, 2015 - (2012)	Examine the extent to which office-based physicians in the United States receive patient health information necessary to	n= 4545 Office-based physicians in all 50 states and District of Columbia (-) radiologists,	2012 National Electronic Health Records Survey (NEHRS)	1. The overall percent of physicians receiving information needed to coordinate care with providers outside of practice.

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	coordinate care across settings. Determine whether receipt of information needed to coordinate care is associated with use of HIT.	anaesthesiologists and pathologists		2. The association between use of HIT and receiving patient health information necessary to coordinate care between providers.
Herrigel et al, 2016 - (Sep 2013- Sep 2015)	To describe the demographics of large transfer centres, to identify common handoff practices. Describe challenges and notable innovations involving the interhospital transfer handoff process. Identify common practices in communication and documentation during interhospital patient transfers.	n= 32 tertiary care centres (+) directors or managers with nursing background	Survey	• Number of patients transferred monthly per receiving institution. Degree of identified EMR interoperability. • Methods of hand-off used.

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	Understand the structure of the handoff process, the role of the transfer centre, and how EMR and interhospital communication play a role in this care transition.			
Hernandez-Boussard et al, 2017- (2009 and 1993-2011)	Describe patient and hospital characteristics associated with transfer status. Compare the outcomes of transfer versus non-transfer patients at a population level using hierarchical modelling.	n= 1,397,712 patients with emergent conditions who were transferred between acute care hospitals (+) adult patient discharges (age ≥ 18 y) admitted in 2009 (-) routine/ planned admissions (-) patients admitted from	Two national data sources: 1. Nationwide Inpatient Sample (NIS) by the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project	• Primary outcomes included transfer status, risk-adjusted inpatient mortality, and quality of care represented as 4 adverse events identified by PSIs: 1. Death among surgical inpatients with serious treatable complications (failure to rescue [PSI04]), 2. Postoperative (PO) respiratory failure (PSI11),

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
		a non–acute care facility, including LTC[2] facilities or SNF[3] (-) admissions involving routine births (-) patients missing admission source	2.Web tool HCUPnet	3. PO deep vein thrombosis or pulmonary embolism (PSI12), and 4. PO sepsis (PSI13). • Secondary outcomes included: LOS, total charges, and patient disposition at discharge
Hassol et al, 2014 - (not stated)	1. To measure the awareness of and interest among state HIEs in a LTPAC[4]-to-CCD[5] translation tool. 2. To measure whether any state HIE[6]s currently integrates patient information from	n= 29 HIE representatives in all 50 states and District of Columbia	Online survey	• Whether respondents were aware of Key-HIE Transform or were interested in a LTPAC-to-CCD translation tool; • What information respondents currently import from LTPAC

[2] LTC: Long term care
[3] SNF: Skilled nursing facility
[4] LTPAC: Long term post-acute care
[5] CCD: Continuity of care document
[6] HIE: Health information technology

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	LTPAC providers 3. To measure HIE representatives' opinions about anticipated benefits of and barriers to using this new tool.			providers and how common this approach is in their state; • What barriers and benefits respondents anticipate might occur in using such a tool; and what types of information respondents believe clinicians are likely to want about their patients from LTPAC providers.
Grant and Bensoussan, 2014 - (May - June 2012)	To better understand the process of care in IHC[7] - the way in which patients are triaged and treatment plans are constructed.	n= 14 IHC practitioners in 9 University-based, privately-owned and hospital-based clinics (+) integrative healthcare leaders in US	Face-to-face interviews	1- Organizational structure of IHC 2- Process of care including: patient intake or triage treatment and charting the use of guidelines, protocols and programs

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[7] IHC: integrative health care

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
Wodchis et al, 2014- (not stated)	To identify important lessons from integrating care programs for policy makers and service providers to enable better design and implementation of integrated care.	n= 7 integrated care program from 7 countries (USA: Massachusetts General Care Management Program) (+) Population focus on older people with complex needs (+) Process focus on integrating health and social care (+) Community-based models of care (+) Outcome focus on user experience, functional ability, quality or costs (e.g.	Document review and key informant interviews with program leaders, providers and agencies.	(1) Intended aims and objectives of the integrated care model (2) The client population, eligibility, engagement, assessment and care planning processes; (3) Organizational structure and governance for the program; (4) Integrating activities of the program; participating providers and agencies; (5) Use of technologies and electronic health records; (6) Program funding; (7) Evidence of impact, sustainability and spread; and (8) Transferrable lessons for practice and policy.

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
		reduced/prevented use of hospital/acute/institutional settings) (+) Established models of care (not pilots) covering a population/geography		
Dykes et al, 2014-(not stated)	Explore the current state of documentation, communication, and reconciliation of care plan data across settings and levels of care from the perspectives of providers in six geographic regions in the USA.	n=22 professionals from emergency departments, acute care hospitals, SNF, and HHA[8] settings in 6 regions in the US	Surveys and interviews	Organizational readiness to support CC including: • teamwork focused on coordination • health care home • care management • medication management • health IT-enabled coordination

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[8] HHA: Home health agencies

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
Dy et al, 2013, (2000 - December 2011)	Evaluate the impact of interventions targeting continuity, coordination, and transitions of care for patients with serious and advanced illness. To identify which components are associated with effective interventions.	n= 13014 Patients with advanced illness (+) all ages of patients (+) all settings, including inpatient facilities, outpatient care, nursing homes and hospices (+) seriously ill patients or those with advanced disease who were unlikely to be cured, recover, or stabilize	Electronic databases PubMed, CINAHL, PsycINFO, Cochrane, and DARE	• Components of interventions: Patient/family/caregiver involvement refers to an intervention focused directly on them, for example through education. • Coordination refers to interventions which utilized an additional provider to coordinate health care. • Care plans refers to interventions that incorporated care plans or order sets with directions to follow for providers (e.g., comfort care orders, flow sheets).

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
				• Palliative care specialist refers to interventions employing any type of specialist palliative care providers. • Additional assessments refer to any assessment (e.g., questionnaires, predefined assessment lists) that was added to usual care as part of the intervention.
Colla et al, 2016- (September 2013 and March 2014)	Evaluate the impact of ACO[9]s on CC and care management for older populations by exploring the extent to which ACOs incorporate post-acute	n= 269 ACOs	National Survey of ACOs (NSACO)	The ACO was asked whether post-acute care is offered within the ACO, is contracted outside the ACO, or if the ACO has no formal relationship with a service provider.

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[9] ACO: Accountable care organization

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	care under existing programs and contracts.			
Barnes et al, 2014- (not stated)	Provide a general, explanatory overview of ACOs in the U.S. and parallel developments in Europe. Describe the current state of ACOs in the US and what makes them different from previous payment and health care delivery reform efforts.	NA[10]	NA	NA
von Kluchtzner and Grandt, 2015- (not stated)	Explore the current role of hospitalization in prescribing error exposure and medication-related communication as	n= 187 patients receiving treatment in Essen university hospital (+) patients aged 18 years	Screening of medication profiles	Inadequate prescribing of medications defined by 8 evidence-based criteria:

[10] NA: Not applicable

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	patients are transferred from and back to ambulatory care by comparing pre-hospital admission medication regimen to the discharge medications.	or older (+) treated with at least one previously prescribed drug at the time of admission (-) Transfers from and/or to other institutional health care facilities		• Inappropriate dosing (e.g. with respect to impaired kidney function) • Adverse or redundant combination of drugs • Contraindicated drug choice • Unjustified omission of an indicated drug • Medication without indication • Inappropriate drug choice for the therapeutic goal • Medication for a patient aged 65 or older which is acknowledged as potentially inappropriate in this age group • Prescription of inappropriate tablet fractions

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
Schneider et al, 2016- (not stated)	Compare the costs of coordinated versus uncoordinated patients (UP) in ambulatory care; with additional subgroup analysis of patients with mental disorders.	n= 3 616 510 insurees (+) all statutorily insured patients in Bavaria (+) contacting at least one ambulatory specialist in the first quarter of 2011 (+) minimum age of 18 years (+) at least of one regular specialist visit within a quarter	Bavarian Association of Statutory Health Insurance Physicians (Kassenärztliche Vereinigung Bayerns, KVB) claims data	1. Total cost of ambulatory care, 2. Secondary outcome variables were financial claims of GPs, specialists and medication costs
Penm et al, 2017- (not stated)	Determine whether population or health care system issues are associated with primary CC gaps in the United States and other high-income countries. Study the factors associated	n= 13958 respondent adults (777 for DE and 1395 for US) - respondents to IHP survey from 11 industrial countries	Data from the 2013 Commonwealth Fund International Health Policy (IHP) survey	OR is used to quantify the association of patient-physician relationship on CC -test results or medical records were not available, -patients received conflicting

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	with CC in high income countries like insurance status, relationship with PCP, age and chronic patients.			information, -their doctors ordered a medical test that they felt was unnecessary -their specialist did not have basic medical information or test results from their regular doctor -after the patients saw their specialist, their regular doctor did not seem informed and up to date about the care received from the specialist
Milstein and Blankart, 2016-(not stated)	Present the historic development of integrated care services and offer insights into the construction of integrated care programs in the German health-care system.	NA	NA	NA

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	Share lessons learned of the German approach across countries and health systems.			
Lluch and Abadie, 2013- (not stated)	Identify the role of telehealthcare in the provision of integrated care across eight different European countries. Identify good practices in implementing telehealthcare and strategies to address some of these challenges.	n= 31 telehealth initiatives across 8 European countries involving 20000 patients ,335 users reviewed for DE in two telehealth projects (+) programs having a component of cooperation between tiers of care (+) with a relatively advanced level of implementation in terms	Interviews with key stakeholders and patients.	• Good practices in implementing telehealthcare • Strategies to address some of these challenges. • Technological innovation of ICT[11] • Organizational innovation of ICT • Governance and policy context • Impact of ICT program

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[11] ICT: Information and communication technology

First author/Publication year, (actual study period)	Aim of study	Participants (n), type, (+) inclusion, (-) exclusion criteria	Data source	Outcome measures
		of sustainability and population (+) including telehealthcare (+) unique experience (+) easy research access		
Lluch, 2013- (not stated)	Understand the role played by incentives and reimbursement schemes in the development of integrated care and information and communication technologies uptake. Emphasize the gaps and good practices in incentives and reimbursement mechanisms for telehealthcare services and integrated care.	n= 31 telehealth initiatives across 8 European countries involving 20000 patients, 335 users reviewed for DE in two telehealth projects (Baden-Wuerttemberg Heitel and Hessen WohnSelbst case studies) (+) programs having a	Interviews with key stakeholders and patients.	• Incentive mechanisms across tiers of care. • Barriers to widespread deployment of telehealth.

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
		component of cooperation between tiers of care (+) with a relatively advanced level of implementation in terms of sustainability and population (+) including telehealthcare (+) unique experience (+) easy research access		

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
Conklin, Nolte, and Vrijhoef, 2013-(not stated)	Describe the methods and metrics used in Europe to evaluate chronic disease management programs.	n=? not stated, DM[12] programs in 12 European countries (+) approaches aimed at managing people with established chronic disease (+) include a broad range of possible models such as care pathway, case management, chronic care model, coordinated care, multidisciplinary team(s), nurse-led clinic, and/or provider network	Survey	1- Types of evaluation designs 2- Metrics used to measure program effects 3- Aim of evaluation designs

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[12] DM: disease management

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
Busse and Stahl, 2014- (not stated)	To examine the efforts of CC and gain insights into whether newer integrated care models achieved the stated objectives and the crucial factors in the models' success.	n= 19 integrated care programs in three European countries n for DE= one program (Gesundes Kinzigtal) (+) programs evaluated using both control and intervention groups (+) published in journals, grey literature (-) narrow approaches with few patients or limited interventions (-) unevaluated programs	Experts contact and internet search	• Mortality rate of patients enrolled in ICP • Use of hospital care • Patient experience • Provider experience • Cost per patient per year
Pimperl et al, 2016- (not stated)	Identify an appropriate study design for evaluating population health outcomes of	n= 32595 insurees by SHI: AOK and LKK	GKT deidentified insuree-level master data	• Mortality ratio (observed number of deaths/total of subjects in the studied population)

First author/Publication year, (actual study period)	**Aim of study**	**Participants (n), type, (+) inclusion, (-) exclusion criteria**	**Data source**	**Outcome measures**
	ACOs on the basis of claims data. Discuss methodological implications and the feasibility of the approach to evaluate ACOs using routine data from the ACO GKT. Evaluate the impact of the ACO GKT on population health. Provide guidance to future evaluations of ACO impacts on population health using routine data sources.	living in Germany-Kinzig valley region		• Age at the time of death (statistically expected number of years of life in the studied population) • Years of potential life lost and gained (YPLLG) • Survival time (time between the start of the observation [enrolment in the ACO] and the end of the study period or an event [death])

In following few paragraphs, I will explain in further details the results of each study demonstrating the similarities and differences in findings with respect to each country.

Using Donabedian paradigm and inspired by the AHRQ Care Coordination Framework (see Figure 5), I created a scheme for reporting and categorizing the study findings. The scheme consists of the three components of Donabedian paradigm: Structure- Process – Outcome, and under each component lies some domains which comprise CC. Each study finding was mapped under the relevant domain. Some studies discussed more than one domain and were mapped more than once accordingly. Table 4 describes the reporting scheme used here together with the description of each domain.

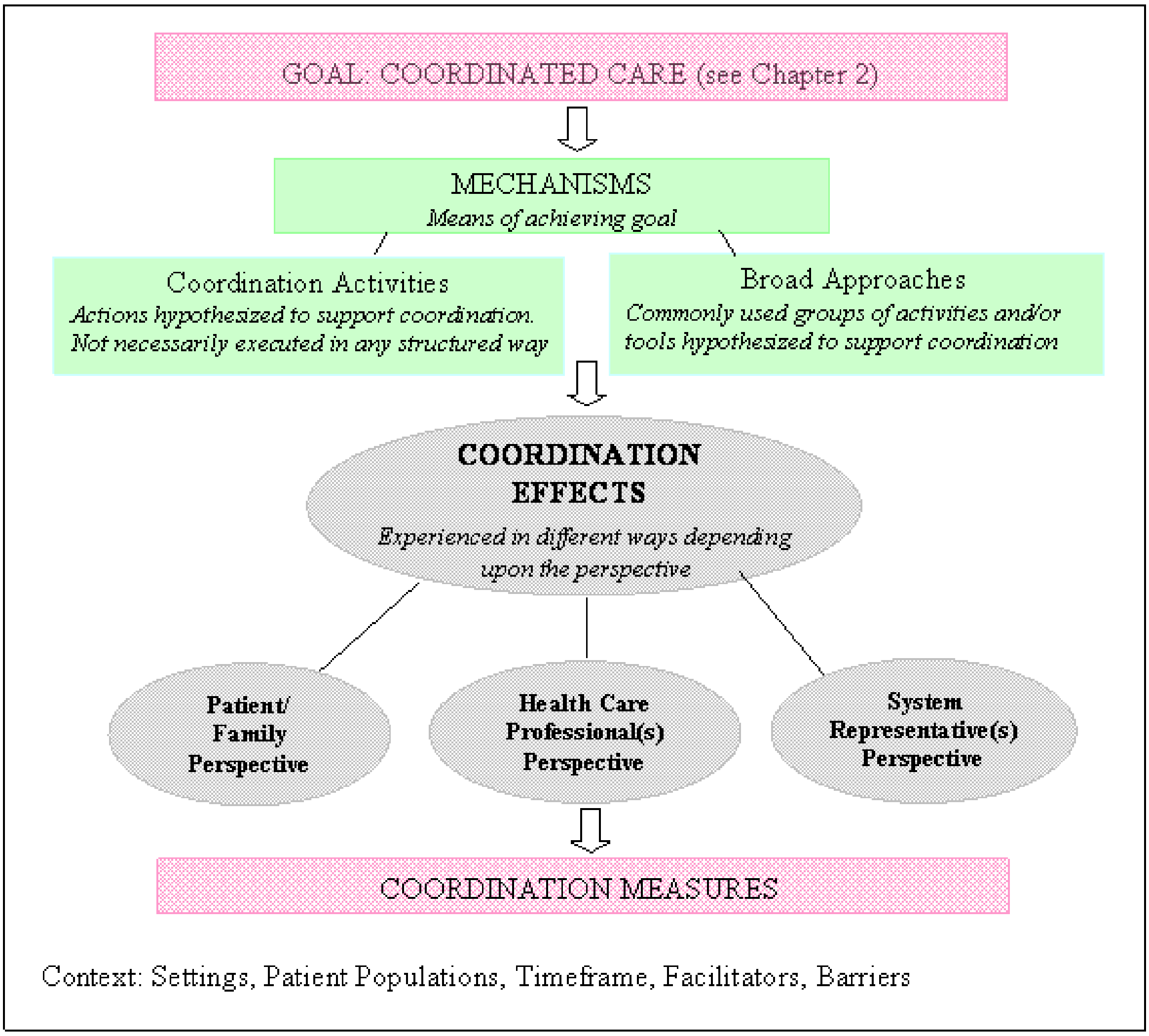

Figure 5: CC Measurement Framework Diagram by AHRQ

Table 4: Scheme for CC domains and their description

Domain	Description
Structure domains	
Designation of a case manager	Assigning a person who acts as a key player in coordinating care
ACO contracting	Includes types of ACOs, contracting with care providers in addition to policies and regulations which enforce CC.
Financial reimbursement	Refers to the method of paying back healthcare providers for the medical care and CC activities they provide to patients.
Health IT-Enabled Coordination	*Using tools, such as electronic medical records, patient portals, or databases, to communicate information about patients and their care between health care entities.*[13]
Other tools for CC	Includes tools used to CC like papers, templates, CCD document
Care Management	*A process designed to assist patients and their support systems in managing their medical/social/mental health conditions more efficiently and effectively. Case management and disease management are included in this definition*
Medication Management	*Reconciling discrepancies in medication use in order to avoid adverse drug events associated with transitions in care. This can involve review of the patient's complete medication regimen at the time of admission/transfer/discharge, including assessing use of over-the-counter medications and supplements; comparison across information sources and settings; or direct communication between patients and providers.*
Process domains	
Information transfer	*The flow of information, such as medical history, medication lists, test results, and other clinical data, from one participant in a patient's care to another.*
Interoperability	*The ability of systems to talk to each other and share information*
Assessing patient needs and goals	*Determine the patient's needs for care and for coordination, including physical, emotional, and psychological health; functional status; current health and health history; self-management knowledge and behaviours; current treatment recommendations, including prescribed medications; and need for support services.*
Challenges and barriers to information exchange	Includes all the difficulties the care providers report that hinder them from sharing patient data
Outcome domains	
Quality of care	Includes measures of effectiveness of CC like mortality rate, medication errors, degree of patient access to care
Health care utilization	Includes any forms of inefficient use of healthcare resources such as hospital readmissions, emergency room visits, hospitalization, repeated doctor visits
Costs of care	Includes healthcare expenditure as a result of poor or strong CC, financial claims, out-of-pocket expenditure

[13] *AHRQ definitions*

5.4.1. Structure domains

Designation of a case manager.

In his study for evaluating CC of patients across US healthcare settings, Samal et al.,2016 found that few organizations hired case managers for facilitating care transitions. Grant and Bensoussan, 2014 also confirmed this finding in their qualitative study for integrative healthcare practices stating that assigning a case manager or "a patient navigator" was too costly and that it was left for the patient to decide. In USA Massachusetts General Care Management Program (Wodchis et al.,2014), the self-management support to the patients as well as direct professional care integration is offered by case managers. The study also referred that they contact the patients through face-to-face meetings in physician offices in addition to telephone calls and home visits. Their role is to work jointly with the physicians and update them with the patient's status as well as helping the patients attend their appointments and adhere to their medications. Moreover, in evaluating the handoff practices in interhospital transitions across academic US tertiary care centres, Herrigel et al, 2016 concluded that a critical care nurse is usually used as a "centre coordinator "in 38% of US tertiary care centres. The study additionally reported that multiple hand-off methods were used such as assigning what they called a "quarterback" physician who was responsible for providing "uninterrupted communication".

Nevertheless, no studies reported the designation of a case manager for DE.

ACO Contracting

Barnes et al., 2014 provided in their study an overview on the current status of ACOs in the US. They reported two types of ACO: one serving CMS patients (Medicare Shared Savings Program (MSSP)) and the other as Private ACO Programs. MSSPs serve patients who are assigned to them by the CMS and are responsible for coordinating their clinical care beside being financially responsible. Under this model, ACOs can receive financial benefits either by only sharing the savings with CMS "one-sided model" or by sharing the savings as well as the losses "two-sided models". For this to happen, ACOs must meet a set of "performance targets" that show their compliance with standards of care.

On the other hand, private ACO programs were created by private insurers who contracted with ACO forming "Insurer ACO" with the aim of coordinating care and reducing costs. Barnes et al., also revealed that the number of Medicare ACOs was around 338 in 2014 and this figure would exceed 400 if private ACOs were added. The study also mentioned that in 2013, 51% of ACOs were dominantly run by physician groups rather than hospitals. Physician groups preferred to participate in ACOs rather than relying on Medicare payments only due to the availability of the infrastructure (i.e. IT solutions) at the providers which help them comply with the ACO requirements, beside their expectation of the reduction in Medicare reimbursement over time. The authors also presented the similarities and differences between ACOs and other models of CC already present in the US and why ACOs show a promising future. To summarize these comparisons, I can say that

1. In comparison with health maintenance organizations (HMOs): ACOs allow their patients to visit providers outside their networks while HMOs confined patients from using services outside the contracted provider network. Besides, ACOs place less financial risk on provider groups and have real integrated care beside being more focusing on outcomes.
2. In contrast to patient-centred medical homes (PCMHs), ACOs offer financial incentives to coordinating care while PCMHs don’t.

In their study for evaluating the effect of ACO participation on CC, Huber, Shortell and Rodiguez, 2017 reported that the US medical practices (including PCPs and specialists) who were participants in ACOs had a highly statistically significant rate of CC than non-participants. They were able to contact the patients within 48 hours of hospital discharge in order to manage their medications and support with their follow-up care visits. In addition, the physicians were notified when their patients were admitted to the hospital or to the ED within 48 hours as well as receiving discharge summaries from ED within 48 hours. However, the study found no significant association between ACO participation and EHR functionality.

Colla et al.,2016 reported in their study for evaluating whether ACOs included post-acute care facilities (PAC) like rehabilitation, SNFs or HHAs to coordinate their care- that half of the ACOs have a formal PAC included inside it, 21% outsource this service and 27% do not have any formal relationship with PAC. Total spending was found to be significantly lower when PAC was included. Additionally, only 45% of Medicare ACOs include PAC while around 64% of commercial contract ACOs include it. ACOs with this service were more likely reducing preventable hospital readmission and were more capable of creating a counselling plan for the patient across different settings with “smoother care transitions”. The authors also emphasized that the lack of formal inclusion of PAC in ACOs may result in adverse consequences. First, it will affect the resource utilization of ACOs and healthcare spending. Second, they may lose the high-cost patients who use these types of services heavily and represent a significant potential for saving for ACOs.

The study by Milstein and Blankart 2016 exclusively presented the development of integrated care programs (ICPs) in DE from the years 2000 till 2015. The authors explained the basic structure of ICPs in the year 2000 at the time of introducing the Healthcare Reform Act 2000, where integrated care networks (ICNs) composed of physicians, hospitals and specialists who created a contract with payers, namely sickness funds. ICNs, payers and the patients had no obligation to join the ICP but were rather incentivised to do so. One drawback though was the need of Regional Association of Statutory Health Insurance Physicians (RASHIP) approval for creating such programs which created a high bureaucratic administrative barrier. RASHIPs are part of the medical self-government regulated by the public law. Their main role is to guarantee high quality of medical care, revise the office-based doctors' fee schedule, keep the federal registry of physicians and advocate the doctors' positions in legislative processes [43].

In the year 2004, the Healthcare Modernization Act was introduced in DE and eventually offered better circumstances for ICPs. It prohibited the RASHIP approval, offered "start-up funding" by allowing payers to withhold 1% of the in- and outpatient budget and lastly it offered "budget adjustments". It also extended eligible contract partners to include individual physicians and outpatient clinics while excluded RASHIPs. Because of this, the number of ICPs has dramatically increased in 2008 to count for 6400 ICPs serving around one and half million patients.

Meanwhile by the end of year 2008 the number of ICPs had dropped down as the start-up funding has stopped beside the emergence of the mandate by the Health Provision Act which forced sickness funds to calculate the savings of the ICP in advance to get permission from the Federal Insurance Authority (Bundesversicherungsamt).

The authors then acknowledged the new Healthcare Strengthening Act of 2015 as "lowering the barriers for ICPs". Although it reintroduced RASHIPs as eligible partners, the authors reported that this law was advantageous in three ways:

1. It re-introduced start-up funding of total 300 million euros annually, where funds are offered to good performers with respect to quality and efficiency.
2. It lowered the bureaucratic effort by removing the prerequisite of preapproval of ICP by regulatory bodies
3. It integrated what is called "structure contracts" or "selective contracting" into integrated care framework. Selective contracting is a method by which insurance

> companies contract only with providers with high quality and low cost, while excluding the inefficient and poor performing providers.[44]

Given these points, the authors imagined two scenarios for the effect of this act which could take place in four years (in the year 2018 for instance). The “optimistic scenario” would be an increase in the number of ICPs as a result of start-up funding. On the contrary, a “pessimistic scenario” through the saturation of the market by the newly created ICPs allowing RASHIPs as new eligible partners to create new smaller ICN. This will eventually drive sickness funds to contract with larger providers and so ICP number declines by time. Finally, the authors recommended to have a mandatory public reporting mechanism for ICPs to allow for evaluating their quality and cost savings.

Financial reimbursement

When it comes to reimbursement, Lluch and Abadie, 2013 concluded in their study for identifying the good practices for using information technology in CC that “outcome-based incentives”, “bundled payments” and “DRG- reimbursement rates” promoted electronic information sharing in contrast to fee-for-service (FFS) schemes which were more abundant in DE. The authors explained that FFS are meant to increase the practitioners’ productivity but doesn’t encourage them to be involved in complex cases or CC. This contraindicates with Busse and Stahl, 2014 findings who reported that financial incentives in the form of bundled payments and shared savings are being more applied in DE.

Lluch, 2013 on the other hand found that capitation and FFS were the incentive mechanisms used for PCPs and specialists in DE while in the hospital care level, “mixed payment” incentives including DRGs were used. Integrated personal healthcare services were funded by insurers and government grant. It is also important to mention that sickness funds hold about 1% of funding for implementing integrated care contracts.

Health IT-Enabled Coordination

Samal et al., 2016 reported in their study that HIT was used in numerous CC activities in US healthcare system. In their conducted interviews, some clinicians from an acute care hospital reported that they use different tools like standardized templates in the EHR and email triggers on the readmission of a patient to the hospital. Another clinician reported the use of “patient portals” in which the patient can follow-up with his medication list although the software was not flexible enough to allow them to tailor the information to the level of patient literacy. Another respondent declared the use of an electronic tool which stratifies patients according to their severity of illness who in return receive home visits. Another HHA professional stated that they used a tool called “LACE: Length of stay, Acute admissions through ED, Co-morbidities and ED visits in the past 6 months”. This tool was integrated in the EHR. Despite this, he found that HIT was rarely used for coordinating care among providers or for linking the patients to community resources, like for instance social services or support groups which eventually lead to patient readmission in some cases. Conversely, HIT was found to be occasionally used to assess patient needs and goals. Finally, the authors advised that the future potential of HIT in transferring information, monitoring and following-up the patients and linking the patient to community resources are much higher than its current capabilities.

In their study for evaluating the effect of ACO participation on CC, Huber et al., 2017 reported that medical practices who are using “more advanced or expanded” EHR functions were associated with a higher statistically significant rate of developed care transitions process. They described “advanced functionality” as using EHRs for resolving drug interaction issues, creating alerts for abnormal test results, accessing the ED data for patients, creating hospital discharge summaries and communicating with the patients via emails.

Hsiao et al., 2015 concluded in their cross-sectional study that 25.4% of the sampled US office-based physicians neither used EHR nor shared patient health information among other practitioners electronically and this action was restricted to only 33% among the 4545 physicians survey. Although, when HIT was used a significantly higher number of PCPs managed to receive the patient’s data from other practitioners. Furthermore, around 76% of the PCPs who received the patient information did not receive it electronically but rather through other methods like fax for example.

Grant and Bensoussan, 2014 reported in their qualitative study for the process of care in integrative care settings that referrals to those settings were either through the PCPs, specialists or even the patients themselves. In all cases, the patient’s EMR was shared with all the integrative care practitioners although they didn’t clarify the method this was done. They added that EMR was sometimes not relevant to some practices which made them rely on emails and “corridor conversations” for sharing patient’s information.

In their study exploring the role of information and communication technology (ICT) among eight European countries, Lluch and Abadie,2013 found that DE showed “little progress” in using ICT for sharing patient information across different levels of care.

Physicians resisted telehealth use as they found it a threat to the patient-physician relationship together with the lack of the incentives that can encourage them to use it. Innovation in services and processes or “reorganization” as referred to in the study, was shown to be “discrete or absent” in DE affecting the mainstreaming of data.

Lluch,2013 on the other hand found that some of the telehealth initiatives were launched by sickness funds except for “WohnSelbst initiative” which used patient homes as the primary location for healthcare services coordinated by a hospital and a social housing association. This initiative struggled due to resistance created by practitioners who felt not involved in the program. The lesson learned from this program was that without a proper change management strategy and attractive financial incentives, practitioners will not be involved in such initiatives and such programs will eventually abort.

Other Tools used for CC

Two studies (Dykes et al.,2014 and Richardson, Malhotra, and Kaushal, 2014) reported the use of what is called a Continuity of Care document or CCD by some US healthcare settings. The CCD is an electronic document with standard format used to report patient data like allergies, conditions and medications. Dykes et al.,2014 additionally reported that discharge summaries were offered in the form of a “free text format” instead of electronically. One group interview revealed a best practice in that they were providing the patients with a paper copy of their care plan and advise them to show it to any provider they visit.

Herrigel et al, 2016 reported in their study other tools used in transferring patients among US academic tertiary care centers like “electronic transfer notes”, a standardized feedback system for referring hospitals and “expect note”. The “expect note” for instance referred to a free-text document that replaced verbal communication and was added to the patient’s medical record.

Care Management

Dykes et al.,2014 reported that there is no one master care plan for the patient across the surveyed hospitals in the US system. In the first place, they defined a “care plan” as a coordinated longitudinal treatment plan for the patient across all settings in contrast to a “plan of care” which is confined to one setting like acute care for example.

In fact, the International Survey of Patients studied by Osborn et al.,2014 showed the US and DE were almost similar in having health promotion activities in the form of the physicians talk who discuss with the patients their medications, exercise and stress management. US respondents affirmed having a treatment plan for their chronic condition in which they can use to manage their daily activities while DE respondents were less likely to have such plan (83% vs 30% respectively)

Medication Management

Dykes et al.,2014 evaluated in their study the degree of communicating patient's data across different settings from the perspective of providers in six geographical regions in the US. They found that providers from many settings offered medication management plans to their patients, while other settings reported contacting high-risk patients post discharge to verify their medications. Besides, one group interview stated that they reconcile medications using a tool which lists all the medications and translates the plan to a "patient-friendly language".

On the other hand, Osborn et al.,2014 reported in his study that US is improving its CC efforts by offering community pharmacists financial incentives and expanding their roles for providing medication reviews for the patients. However, respondents from both countries who take four or more prescriptions revealed that their medications were not reviewed by an HCP in the past year.

5.4.2. Process domains

Information transfer

Osborn et al.,2014 reported that DE respondents to their study survey expressed having gaps in hospital discharge planning than those in US (56% vs 28% respectively). The gaps were in the form of failure to receive a written plan, not obtaining an appointment for follow-up, not given instructions on using their medications or missing a point of contact for further questions after discharge. Besides, the study revealed that 23% of US patients responding to the survey reported that their medical records or test results were not available at the time of physician appointment while only 15% for DE. Also, more patients reported that the specialist lacked the medical history, or the doctor was not informed about the specialist care in DE than US (31% vs 19%)

Herrigel et al, 2016 stated in their study that clinical patient information required to coordinate patient care (e.g. lab tests, patient history, discharge summary) was available in only 29% of the US tertiary care hospitals who received transfer patients.

Similarly, when evaluating the exchange of continuity of care documents from long term care (LTC) among the US states, Hassol et al, 2014 found that only 17% of the survey respondents confirmed that data is being exchanged. Finally, in Wodchis et al, 2014 study, USA Massachusetts General Care Management Program was found not to have a fully integrated information system.

Hsiao et al., 2015 reported in their study that 64% of the US PCPs sampled in his study received results of patients' consultations when referred to another speciality, 45% received the reason of consultation and the patient's history from the referring physician and 54.4% received the hospital discharge information to follow-up with the patient's care.

This comes also in line with Dykes et al.,2014 findings. They reported that the patient's care plan was not reconciled when a patient was transferred from one setting to another but instead a new care plan was created each time. To emphasize, one group interview revealed that when they discharge a patient from an ED, they do not routinely call his PCP and alternatively send a "rudimentary fax" saying "your patient was here" without sending any specific details about the type of treatment the patient received. PCPs have no access to the medical records either.

Both the US and DE showed poor CC when compared to other nine industrial countries in the Commonwealth Fund International Health Policy (IHP) Survey of 2013 (Penm et al, 2017). Adult primary care patients were categorized as having poor CC if they answered "No" to three of the five following questions:

1. test results or medical records were not available at the treating physician
2. they received conflicting information about their treatment
3. their doctors ordered a medical test that they felt was unnecessary
4. their specialist did not have basic medical information or test results from their regular doctor
5. after they saw their specialist, their regular doctor did not seem informed and up-to-date about the care received from the specialist

There was no statistically significant difference in CC gaps among US and DE. In both countries, respondents reported that test records were not available (OR=0.4; 95% CI, 0.3-0.5),unnecessary tests were ordered (OR=1; 95% CI, 0.8-1.3), both the specialist and PCP were not informed about their care (OR=1; 95% CI, 0.8-1.4) and they received conflicting information about their care (OR=0.9; 95% CI, 0.7-1.2)

Interoperability

Samal et al., 2016 reported in their study severe CC gaps due to lack of interoperability among different US healthcare settings. Emails were mainly used for interpersonal communication among physicians and that due to lack of interoperability, medical records were printed out and hand-carried among care levels to transfer the patient information which created significant CC gaps. One nurse reported in his interview that they have to check multiple hospital systems (e.g. Medication administration system, order entry system, outpatient system) to find up the patients' information which ends up doing "a lot of clerical work". The authors explained that the EHR was not sending and receiving information electronically which causes a weakness in the care process and creates an urgent need for HIT enablement.

Dykes et al., 2014 reported also lack of interoperability together with communication challenges when transitioning patients from acute care hospitals to HHAs in the US. Some of the surveyed settings reported using "nurse liaisons" to manually enter the patient data from the inpatient paper record to the electronic referral system. The use of emails, fax and telephone calls was remarkable despite that the surveyed settings were noted as health IT deployment pioneers in the US. This also coincides with the findings of Herrigel et al, 2016 which stated that only 23% of the US tertiary care centres surveyed reported EMR interoperability.

Assessing patient needs and goals

In their study for describing the process of integrative care among nine different Integrative Healthcare (IHC) settings in the US, Grant and Bensoussan (2014) reported that creating a treatment plan which is patient-centred and relevant to the patient's treatment goals was essential. IHC practitioners took into consideration the preferred treatment modality for the patient together with his social and financial situation to guide his treatment plan. In contrast, Dykes et al.,2014 reported in their study that the patient involvement in care plan was not included.

US and DE were almost similar when it came to end-of life planning. The study of Osborn et al.,2014 reported that surveyed patients declared that they had a discussion with an HCP about the kind of treatment they need if they were ineligible to make these decisions because of illness. Meanwhile, the US showed to engage patients in managing their chronic conditions through connecting them to medical homes, supporting patient self-management and improving these services through collecting patient feedback using the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey for example. On the contrary, Wodchis et al, 2014 concluded that even though the USA Massachusetts General Care Management Program offered patient-centred care management, patients were not engaged in planning their care.

Challenges and barriers to information exchange

Richardson, Malhotra, and Kaushal, 2014 illustrated in their study the importance of undergoing usability testing for health information softwares before implementing them. They were evaluating in their study a project called CCITI NY which took place in New York city. The project was based on using an e-Transfer Form to enable inter-organizational patient transfer through exchanging the patient's data such as the patient's demographics and medication lists between hospital EDs and SNFs. The form was not successfully used by the end users for different reasons. The ED physicians had to receive the form as a paper fax to be able to use it and not through the electronic form as intended. Additionally, the SNF physicians were not able to find the form through the user interface which caused the project to fail at the end. The authors recommend that future projects should focus on the perspectives of end-users and consider their training needs as well as the actual process workflow. Despite the findings of the study, data couldn't be generalized as the sample of recruited participants failed to include physicians and relied only on administrative staff in conducting the interviews.

When HIE representatives were questioned about how patient information was exchanged among LTC facilities in the US, they mentioned various barriers (Hassol et al ,2014). Some reported technical barriers at LTC facilities like nursing homes and HHA. 67% of them were concerned about the cost of implementing technology. Others expressed their worries about managing the patient's authorizations along with lack of EHR in transferring settings.

Moreover, several reasons which hinder sharing patient data by PCP were reported in USA Massachusetts General Care Management Program (Wodchis et al, 2014). PCPs didn't see themselves as partners with the integrated care initiative and acted as "independent practitioners". Additionally, the high working loads stood as a time barrier for doing such activities. Finally, the article reported that payments and absence of incentives also played a role.

5.4.3. Outcome domains

As defined by the AHRQ, this category should include other domains such as patient and family satisfaction together with the degree of HCP satisfaction with CC activities. Given the fact that none of the included studies reported these domains, they were not included here as well.

Quality of care

Significant findings for both countries were represented in the International Survey of Patients studied by Osborn et al., 2014. The survey reported that 36% of DE patients were hospitalized overnight in the past two years versus 29% in the US. Similarly, 39% of DE patients visited four or more physicians in the past year versus 25% in the US implying more access to care by chronically ill patients in DE. Additionally, US patients reported a low ability to access care stating that they were unable to get a same or next day appointment when being sick compared to better access by patients in DE (57% vs 81% respectively).

Dy et al, 2013 concluded in their systematic review that little evidence was available evaluating the outcomes of CC like the cost of care or quality of life.

Similarly, in evaluating the effectiveness of two CC programs in DE, Busse and Stahl, 2014 found that the mortality rates for patients enrolled in such programs were reduced by half compared to those unenrolled. Enrolled patients also died at higher age (78 years vs 76.6 years for unenrolled).

In their quasi-experimental design evaluating the success of Gesundes Kinzigtal (GK) ACO in DE in fulfilling the “population health goal” under the Triple Aim, Pimperl et al, 2016 acknowledged that the program resulted in a decrease in mortality rate. Individuals who were enrolled in GK had lower mortality rates in the first three years of their enrollment although it was higher in the fourth year compared to those unenrolled. It was also observed that they die at 1.4 more years of age (78.9 enrolled vs 77.5 unenrolled). Additionally, the YPLLG indicator (see glossary) showed 635.6 fewer YPLL in the ACO intervention group (2005.8 vs. 2641.4 years of potential life lost). The survival time estimated by using the Kaplan–Meier method was also 6.7 days higher in the ACO intervention group.

Meanwhile, prescription safety was at the stake in one of the German university hospitals. In their study on the effect of patient transfer from and to ambulatory care on their prescription safety in the form of medication errors, Kluchtzner and Grandt, 2015 concluded that 90% of the sampled patients suffered from "potentially inadequate prescribing" of medications in transition between pre-hospital admission and post-discharges. They also confirmed that the discharge information was missing crucial medication information required to ensure safety and care continuity.

Hernandez-Boussard et al, 2017 studied the quality of care of the US acute care patients who were transferred across hospitals. The study revealed that transfer patients (defined as patients being discharged from a hospital other than the initial admitting one) had a higher risk-adjusted inpatient mortality compared with non-transfer patients (4.6% versus 2.1% [$P < 0.0001$]). Additionally, transfer patients had a longer LOS (13.3 versus 4.5 days [$P < 0.0001$]) and were significantly associated with increased mortality compared with non-transfer patients.

Lastly, when evaluated by its funding sponsor, the Massachusetts General Care Management Program showed an increase in patient and physician satisfaction, together with improvement in mortality (Wodchis et al, 2014)

Health care utilization

Wells et al.,2016 discussed in their article the concept of "Supplement insurance plans" or "Medigap plans". These are insurance plans in which individuals enroll in to cover the out-of-pocket expenses associated with the US Medicare plan. In their study, they stratified those individuals having those kind of plans into three groups according to their healthcare needs (based on their diseases) and costs. 75% of individuals in the highest need/cost group were found to have visited 16 or more providers in a year, visited the ED more frequently, 25% had seven or more different providers writing their prescriptions and were more hospitalized. This therefore implied that those individuals lack coordination in their care.

Meanwhile, Osborn et al., 2014 study revealed that 13% of US patients vs 3% in DE reported that they had avoidable ED visits in the past year.

Penm et al 2017 estimated by regression models that patients with poor CC would have an increased rate of being hospitalized (OR=3.4; 95% CI, 3-4) and were visiting ED for urgent and non-urgent care as compared to patients with good CC.On the other hand, the Mass General program showed a reduction in inpatient admissions along with ED visits. (Wodchis et al, 2014)

As for DE, Schneider et al, 2016 study revealed that ambulatory patients who received uncoordinated care visited more than one specialist for the same illness which the authors coined as “doctor shopping”. Only 50% of patients were referred to specialists by general practitioners.

Costs of care

Wells et al., 2016 concluded in their study that individuals with high burden of medical conditions in US Medigap plan had an average healthcare expenditure of $102,798 compared to $7634 for individuals of low burden. As a matter of fact, Medigap plans pay the deductibles and coinsurance of most of fee for service (FFS) Medicare. The Mass General program showed significant cost savings to Medicare; although the exact saving amount is not stated by the study. (Wodchis et al, 2014)

In comparing the US and DE to another nine industrial countries based on an international patient survey, Osborn et al.,2014 concluded that older adults with chronic conditions from the US reported that the cost of care stood as a barrier against their access to healthcare settings. One fifth of the respondents clarified that they “didn’t visit a doctor, skipped a medical test or treatment, didn’t fill a prescription or skipped doses” because of cost. More US patients than DE reported that they had out-of-pocket medical expenses of $2000 or more in the past year.

Busse and Stahl, 2014 reported in their study for evaluating two integrated care programs in DE that the “contribution margin” improved by by €151 (US$203) per person per year in the integrated care population, compared to the unenrolled population. They defined the contribution margin as “the difference between what the insurer gets from the central health fund pool and the insurer’s spending”

Another study (Schneider et al, 2016) compared the cost of care of coordinated ambulatory patients who were statutory insured to those who were uncoordinated.

Uncoordinated patients had higher average financial claims than those coordinated regardless the age differences. The study also revealed that coordinated patients were older in age and suffered from chronic diseases. Finally, they added that the cost of treating those patients increased with age.

Conklin, Nolte, and Vrijhoef, 2013 found in their cross-sectional study six different DM programs in DE. It was noticed that the programs were mainly evaluated for their efficacy and cost-effectiveness although the study didn’t mention the results of those evaluations.

6. Discussion

This systematic review aims to compare the vertical CC in DE and the US through examining the different pillars of CC. As the table of extracted data implies, the 24 included studies varied with respect to the study design, study population and outcomes. In fact, more studies were retrieved for the US than DE which could be explained by the language search filter applied in this review.

CC is influenced by different drivers which are represented here as "domains" covering the three components of Donabedian, to which eventually the study findings were mapped against those domains. According to the scheme created for reporting the study findings, it is noticed that the included studies for DE focused more on outcome domains of CC programs like the quality of care, healthcare utilization and cost of care in contrast to US studies which focused on structure and processes required for CC (see Figure 6).

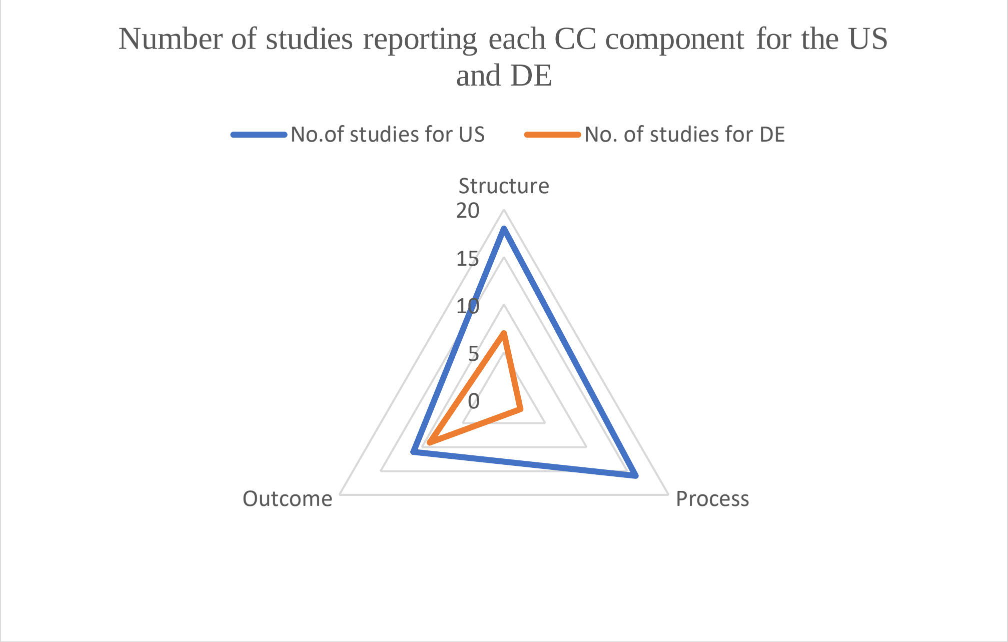

Figure 6: Radar diagram showing the number of studies reporting each CC component for each country

Overall, the findings show that the **degree of care coordination** in each of DE and the US is still unclear. The Commonwealth Fund International Health Policy survey of 2013 concluded that both countries are lacking the proper methods for transferring patient information which results in poor follow-up care and subsequent CC gaps. However, this data should be studied with care due to the low response rate of DE with respect to the US which can introduce a possible bias. The review draws attention to the over-utilization of

US healthcare services through unnecessary ED visits, multiple access to prescribers and increase in the mortalities of transfer patients which may indicate fragmented care. It is found that patients were engaged in their care in Massachusetts General Care Management Program, although this cannot be generalized to all US settings. Moreover, findings reflect the presence of care management programs in the US for treating chronic patients as well as medication management services for high risk patients.

In comparison, DE comprised what was called “doctor shopping” phenomenon which also indicates the mis-utilisation of the healthcare resources. Both countries were found to have a good end-of -life planning services as well as health promotion plans.

The **healthcare system** is different in both countries. ACOs in the US are mainly regulated and operating under the CMS umbrella, while in DE ICPs are being formed independently in the frame of the public regulations.

In fact, chronically ill patients in DE had a better opportunity to access medical services and obtain appointments at providers office. Whereas, the elevated cost of care in the US made healthcare services sometimes inaccessible which also was the reason why patients started to enroll in plans like Medigap to cover the out-of-pocket expenses.

The findings likely reflect that **new policies and programs were implemented for CC** in both countries. In DE for example, ICPs show different changes from the years 2000-2015. Since the emergence of Strengthening Act of 2015, an ever-present challenge has been there to improve CC. The act introduced start-up funding, simplified budget adjustment procedures and removed the condition of approving ICPs by regulatory agencies which subsequently encouraged the introduction of more ICPs in the market.

Gesundes Kinzigtal GmbH (GK) stood as one of the success stories of integrated care pilots in DE where studies show its improved outcomes in the form of reduced mortality rates, decreased cost of treatment and improved life expectancy. Given that most of the studies evaluating GK performance are conducted by the program itself, it is recommended to include external public evaluations for unbiased assessments. The findings also reflect that DM programs implemented in DE were assessed using longitudinal studies for efficiency, cost-effectiveness, economic impact and cost reductions resulting from GP contracts. Although, none of these outcomes were publicly reported.

Lastly, the effect of GDPR is not reflected in any of the included studies in this review.

Similarly, findings reflect that two laws have highly contributed in shaping CC in the US: Obama Care of 2010 and HITECH Act of 2009. Obama Care encouraged the emergence of ACOs which managed to attract the US physician groups who found it more beneficial to join than depending only on Medicare payments especially after offering financial incentives when fulfilling performance targets. ACOs were found to be more advantageous than HMOs and PCMHs along as being preferable for physicians to participate. Findings suggest that medical practices who participate in ACOs have a better chance of CC than non-participants. Being part of a network, they can follow-up with patients after discharge like for instance receiving notifications when the patient is admitted to the hospital or visiting the ED as well as receiving discharge summaries. Furthermore, the review findings reveal that only 45% of Medicare ACOs contracted with PAC services like rehabilitation services, SNF or HHA. Given the fact that Medicare serves patients who are above 60 of age have complex and ongoing care needs and require support from multiple agencies and various professionals, having ACOs not taking the overall responsibility may result in fragmented care and can put those patients at risk. Likewise, the HITECH Act encouraged physicians to adopt certified EHR and receive financial incentives in return, with an aim of achieving a national health information network. With the announcement of Stage 3 MU requirements, providers were encouraged to provide e- prescriptions electronically and record valuable patient information with focus on promoting interoperability. Even where the law is in place, the review findings conclude that automated systems act as silos and the use of technology is still not optimized. Providers have difficulty maintaining the proper use of EHR and show limited exchange of data elements.

It is important to note that Kaiser Permanente (KP) and the Veterans Affairs (VA) health systems were not addressed in this review while Massachusetts General Care Management Program was reviewed by one of the included studies. It showed improved service utilization such as patient admissions and efficient ED visits.

Different mechanisms and tools for streamlining clinical communications and sharing patient data were revealed for both countries. HIT is being used in enabling CC, taking place in the form of standardized templates added to the EHR, using patient portals, using stratification tools to categorize the patients according to their illness severity and tailoring the care accordingly. Despite the prolonged use of HIT in the US, the review reveals that Health IT-enabled coordination is not widespread which could be explained by the lack of interoperability between systems. Sharing patient information took non-consistent forms varying from faxes to paper copies handed to the patient. The CCD tool was the only standardized form reported, although the findings reveal that it is not widely used by all organizations. Besides, EHR was being in place but not highly functional leaving it often to the individuals and their families to transfer their medical information as best as they can. For these reasons, poor information flow and handoffs between health care entities resulting from poor information handover suggest poor CC. However, US facilities who used advanced EHR functionality had better CC processes.

Findings further reveal that case managers were being used in different HC settings in the US to provide seamless communication among other care players. These case managers were either physicians or nurses whom the patient can hire or who are part of an ICP like Massachusetts General Program.

As for DE, the use of e-Card was not revealed in any of the included studies for this review.

Potential barriers and challenges for implementing HIT or sharing patient data to coordinate care was revealed in both countries. Although it is difficult to generalize findings from the included studies due to methodological differences, they highlight communication challenges especially those related to HIT and lack of interoperability. The patient data is stored in different systems, which can vary between paper and electronic forms, making the ability of electronic systems to pull data together and to eventually to coordinate care diminished.

It is also possible that the absence of incentives to providers coordinating care made it more difficult for them cooperate viewing coordination efforts as an overwork having no tangible payment in return. Other barriers include technical barriers, lack of EHR and the increased cost of implementing HIT. Regarding DE, the review also points to an important concern of having physicians resisting the application of CC for different reasons. Firstly, for not being engaged in such programs from the early stages like what happened with “Wohnselbst initiative”. Secondly, having the fear of disrupting the physician-patient relationship especially after involving third parties like case managers as mediators to CC.

As a matter of fact, we can say that the review described two types of financial incentives: FFS and the prospective payment methods in the form of bundled payments, shared savings, capitation and DRGs. Two studies concluded that FFS as a reimbursement method doesn't show to be effective in improving CC but rather a disincentive. FFS hinders information sharing in contrast to bundled payments or DRG-reimbursement rates. The reason could be possibly that having a practitioner being paid per service makes it more difficult to focus on the quality of treatment than the quantity of patients being treated and consequently reimbursed for.[45].

Despite the growing efforts undertaken by the two countries to improve CC, the findings suggest that **areas of potential improvements** are still in place. Engaging end-users who will eventually use the system like nurses and practitioners is an essential change management strategy. Equally important is to undergo usability testing for software used before full implementation. This will in return uncover the existing usage barriers and facilitate the application of CC activities and consequently result in better outcomes. Finally, it is recommended to evaluate the effect of CC programs introduced by an unbiased entity and to publish those assessment results publicly and transparently. This will give the population the freedom of choosing the best performing program and consequently creating competition among those programs for attracting more patients and eventually increasing their market shares.

Limitations to this study may include language restriction which could have resulted in less representation of DE articles and underestimating its strength. Additionally, generalizability of this study is of concern because not all the regions in neither the US nor DE were represented in the included studies. Also, the heterogenicity of the included study designs didn't allow for a fair comparison or for developing a meta-analysis. Furthermore, some studies had insufficient power by having a relatively small sample size. However, a critical evaluation for the risk of bias was undergone for the majority of the studies which in turn may give this review an increased credibility.

Ideally, **future studies** should focus on addressing the perspectives of providers with respect to the standard way of sharing patient information. Besides, studies should examine the degree of association between the announced laws and their actual impact on the ground. Further attention should also be given to the existing DM programs and the degree of impact they made on CC and improving patient outcomes. Finally, future research should consider uncovering the root causes of lack of communication and the optimum way of using EHRs.

7. Conclusion

This study provides a comprehensive summary on the current state of knowledge about the state of vertical CC in DE and the US with the aim of identifying central issues, bridging the gaps, evaluate and interpret the available research evidence relevant to my research question. While several efforts have been implemented, the review shows that the degree of CC in each of DE and the US is still lagging behind. To clarify, designation of case managers in both countries is either absent or inconsistent. Fax and paper formats are still being used for recording patient data despite the presence of EHR in some settings which creates a lack of interoperability and consequent CC gaps. US-provider contracting with ACOs is becoming abundant since the emergence of Obama Care. Similarly, a rise in number of ICPs is achieved in DE especially after the start-up funding created by the Healthcare Strengthening Act 2015, however high bureaucratic administrative barriers should still be considered.

Nonetheless, challenges like physician resistance for using HER, lack of interoperability, technical barriers as well as absence of financial incentives for applying CC activities remain in place for both countries and need to be addressed.

8. Funding

This review is conducted by a master student who holds no scholarships. No external funding was received. Supervision of this work is done by professors employed by Hamburg University of Applied Sciences.

There is no additional source of funding for this work.

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10. Appendix

10.1. PRISMA Checklist

Section/Topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Cover page
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	i
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known	1
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	6
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Not available
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	8

Section/Topic	#	Checklist item	Reported on page #
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	7
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix 10.4
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	21
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	11
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	11
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	12
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Not applicable
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., for each meta-analysis.)	13
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Not available
Additional analysis	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Not applicable

Section/Topic	#	Checklist item	Reported on page #
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	21
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	23
Risk of boas within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	25
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	26
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Not applicable
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Not available
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Not available
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	65

Section/Topic	#	Checklist item	Reported on page #
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	69
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	70
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	70

10.2. List of Primary Search Terms

Primary keywords	**MeSH Term**
integrated care	"Delivery of Health Care, Integrated"[Mesh]
coordinated care	"Home Care Services"[Mesh]
continuity of patient care, care continuum	"Continuity of Patient Care"[Mesh]
seamless care	*Not available*
patient handoffs	"Patient Handoff"[Mesh]
vertical integration of patient care	*Not available*
case management	"Case Management"[Mesh]

10.3. List of Ancillary Search Terms

Ancillary keywords	**MeSH Term**
patient referral	"Referral and Consultation"[Mesh]
patient transfer, care transitions	"Patient Transfer"[Mesh]
patient discharge	"Patient Discharge"[Mesh]
accountability care	*Not available*
managed care	"Managed Care Programs"[Mesh]
patient care approach	*Not available*
patient-cantered care	"Patient-Centered Care"[Mesh]
care delivery model	*Not available*
quality of patient care	"Quality of Health Care"[Mesh]
healthcare delivery system	"Delivery of Health Care"[Mesh]
disease management	"Disease Management"[Mesh]
interoperability	"Health Information Interoperability"[Mesh]
patient care plan	"Patient Care Planning"[Mesh]
patient care process	"Outcome and Process Assessment (Health Care)"[Mesh]
medical documentation	"Medical Records Systems, Computerized"[Mesh]

Ancillary keywords	**MeSH Term**
	"Electronic Health Records"[Mesh]
patient confidentiality	"Confidentiality"[Mesh]
meaningful use	"Meaningful Use"[Mesh]
case manager	"Case Managers"[Mesh]
comprehensive care	"Comprehensive Health Care"[Mesh]
episode of care	"Episode of Care"[Mesh]
progressive patient care	"Progressive Patient Care"[Mesh]
	"Patient Care Management"[Mesh]
	"Patient Navigation"[Mesh]
	"Medical Informatics Applications"[Mesh]

10.4 Full Electronic Search Strategy for Germany

10.4.1 PubMed Search

https://www.ncbi.nlm.nih.gov/pubmed/

Date accessed: 20 November 2018

Search terms	**# Retrieved hits:**
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND ("Referral and Consultation"[Mesh]))) AND germany[MeSH Terms] AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	2
(((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient Transfer"[Mesh]) AND Germany AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	8
(((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient	55

Search terms	**# Retrieved hits:**
Discharge"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Managed Care Programs"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	1
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient-Centered Care"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	4
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Delivery of Health Care"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	140
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Disease Management"[Mesh]) AND GERMANY[MeSH Terms] AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	3
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Health Information Interoperability"[Mesh]) AND GERMANY	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient Care	23

Search terms	**# Retrieved hits:**
Planning"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND ("Outcome and Process Assessment (Health Care)"[Mesh])) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	213
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Medical Records Systems, Computerized"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	1
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Electronic Health Records"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	1
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Confidentiality"[Mesh]) AND GERMANY AND free full text[sb]	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Meaningful Use"[Mesh]) AND GERMANY	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Case Managers"[Mesh]) AND GERMANY	0

Search terms	**# Retrieved hits:**
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Episode of Care"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat]	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Progressive Patient Care"[Mesh]) AND GERMANY	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient Navigation"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat]	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Medical Informatics Applications"[Mesh]) AND GERMANY AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	25
(("Delivery of Health Care, Integrated"[Mesh]) AND "Patient Care Management"[Mesh]) AND "Germany"[Mesh] AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	8
(("Delivery of Health Care, Integrated"[Mesh]) AND "Comprehensive Health Care"[Mesh]) AND "Germany"[MeSH Terms] AND free full text[sb] AND "last 5 years"[PDat]	0
("Health Information Interoperability"[Mesh]) AND "germany"[MeSH Terms]	0
(("Continuity of Patient Care"[Mesh]) AND "Case Managers"[Mesh]) AND "Germany"[Mesh]	0

Search terms	**# Retrieved hits:**
seamless care in germany AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	4
vertical integration of patient care in germany AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	1

10.4.2 Cochrane Search

https://www cochranelibrary com/advanced-search

Date accessed: 26 November 2018

Search terms	**# Retrieved hits:**
patient handoff in Keyword OR Delivery of Health Care Integrated in Keyword OR Continuity of Patient Care in Keyword OR Case Management in Keyword AND Germany in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	428
Case Management in Keyword AND "Patient Transfer" in Keyword AND GERMANY in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	0
Case Management in Keyword AND "Patient-Centered Care" in Keyword AND "Germany" in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	0
"Health Information Interoperability" in Keyword AND "Germany" in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	0

Search terms	**# Retrieved hits:**
Comprehensive Health Care in Keyword AND germany in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	5
"Patient Navigation" in All Text AND GERMANY in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	0
coord* care in Keyword AND germany in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)	0
contin* care in Keyword AND germany in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	14

10.4.3 Google Scholar Search

https://scholar.google.de/

Date accessed: 1-2 December 2018

Search terms	**# Retrieved hits**
allintitle: integrated care in germany	26
allintitle: coordinated care in germany	2
allintitle: patient handoff and germany	0
allintitle: accountable care "Germany"	3
related articles	22
"Patient Care Planning" coordination OR continuity OR integration "Germany"	17

10.5 Full Electronic Search Strategy for the US

10.5.1 PubMed Search

https://www ncbi nlm nih gov/pubmed/

Date accessed: 20 November 2018

Search terms	**# Retrieved hits**
(((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND ("Referral and Consultation"[Mesh]))) AND "united states"[MeSH Terms]	69
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient Transfer"[Mesh]) AND "united states"[MeSH Terms]	149
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient Discharge"[Mesh]) AND "united states"[MeSH Terms]	574
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Managed Care Programs"[Mesh]) AND "united states"[MeSH Terms]	25
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient-Centered Care"[Mesh]) AND "united states"[MeSH Terms]	79
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Delivery of Health Care"[Mesh]) AND "united states"[MeSH Terms]	925

Search terms	**# Retrieved hits**
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Disease Management"[Mesh]) AND "united states"[MeSH Terms]	37
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Health Information Interoperability"[Mesh]) AND "united states"[MeSH Terms]	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient Care Planning"[Mesh]) AND "united states"[MeSH Terms]	113
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND ("Outcome and Process Assessment (Health Care)"[Mesh])) AND "united states"[MeSH Terms]	427
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Medical Records Systems, Computerized"[Mesh]) AND "united states"[MeSH Terms]	81
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Electronic Health Records"[Mesh]) AND "united states"[MeSH Terms]	79
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Confidentiality"[Mesh]) AND "united states"[MeSH Terms]	10

Search terms	**# Retrieved hits**
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Meaningful Use"[Mesh]) AND "united states"[MeSH Terms]	2
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Case Managers"[Mesh]) AND "united states"[MeSH Terms]	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Episode of Care"[Mesh]) AND "united states"[MeSH Terms]	8
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Progressive Patient Care"[Mesh]) AND "united states"[MeSH Terms]	0
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Patient Navigation"[Mesh]) AND "united states"[MeSH Terms]	18
((((((("Delivery of Health Care, Integrated"[Mesh]) OR "Home Care Services"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Handoff"[Mesh]) OR "Case Management"[Mesh])) AND "Medical Informatics Applications"[Mesh]) AND "united states"[MeSH Terms]	158
(("Delivery of Health Care, Integrated"[Mesh]) AND "Patient Care Management"[Mesh]) AND "united states"[Mesh]	279
(("Delivery of Health Care, Integrated"[Mesh]) AND "Comprehensive Health Care"[Mesh]) AND "united states"[MeSH Terms]	84

Search terms	**# Retrieved hits**
("Health Information Interoperability"[Mesh]) AND "united states"[MeSH Terms]	2
(("Continuity of Patient Care"[Mesh]) AND "Case Managers"[Mesh]) AND "United States"[Mesh]	1
seamless care in united states AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh]	26
vertical integration of patient care in united states AND free full text[sb] AND "last 5 years"[PDat] AND Humans[Mesh] AND English[lang]	11

10.5.2 Cochrane search

https://www cochranelibrary com/advanced-search

Date accessed: 26 November 2018

Search terms	**#retrieved hits**
patient handoff in Keyword OR Delivery of Health Care Integrated in Keyword OR Continuity of Patient Care in Keyword OR Case Management in Keyword AND United states in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	454
Case Management in Keyword AND "Patient Transfer" in Keyword AND United states in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	0
Case Management in Keyword AND "Patient-Centered Care" in Keyword AND United states in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	1

Search terms	**#retrieved hits**
"Health Information Interoperability" in Keyword AND UNITED STATES in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	0
"Comprehensive Health Care" in Keyword AND united states in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	2
"Patient Navigation" in All Text AND united states in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	32
coord* care in Keyword AND united states in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	9
contin* care in Keyword AND united states in Keyword - with Publication Year from 2013 to 2018, with Cochrane Library publication date Between Jan 2013 and Jan 2018, in Trials (Word variations have been searched)'	75

10.5.3 Google Scholar Search

https://scholar.google.de/

Date accessed: 1-2 December 2018

Search terms	**#retrieved hits**
allintitle: integrated care in united states	11
allintitle: coordinated care in united states	2
allintitle: patient handoff and united states	2
allintitle: accountable care "United States"	13
related articles	22

Search terms	**#retrieved hits**
united states coordination OR continuity OR integration "Patient Care Planning"	57

10.6 List of Articles Included in This Review

First Author/Publication Year	Reference Details
Wells et al., 2016	Wells TS, Bhattarai GR, Hawkins K, Cheng Y, Ruiz J, Barnowski CA, et al.,. **Care Coordination Challenges Among High-Needs, High-Costs Older Adults in a Medigap Plan**. Professional Case Management 2016;21:291–301. doi:10.1097/ncm.0000000000000173.
Samal et al., 2016	Samal L, Dykes PC, Greenberg JO, Hasan O, Venkatesh AK, Volk LA, et al.,. **Care coordination gaps due to lack of interoperability in the United States: a qualitative study and literature review.** BMC Health Services Research 2016;16:143. doi:10.1186/s12913-016-1373-y.
Richardson, Malhotra, and Kaushal, 2014	Richardson JE, Malhotra S, Kaushal R. **A case report in health information exchange for inter-organizational patient transfers.** Applied Clinical Informatics 2014;5:642–50. doi:10.4338/aci-2014-02-cr-0016.
Osborn et al., 2014	Osborn R, Moulds D, Squires D, Doty MM, Anderson C. **International survey of older adults finds shortcomings in access, coordination, and patient-centered care.** Health Affairs 2014;33:2247–55.
Huber, Shortell, and Rodriguez, 2017	Huber TP, Shortell SM, Rodriguez HP. **Improving Care Transitions Management: Examining the Role of Accountable Care Organization Participation and Expanded Electronic Health Record Functionality**. Health Services Research 2017;52:1494–510. doi:10.1111/1475-6773.12546.
Hsiao et al., 2015	Hsiao C-J, King J, Hing E, Simon AE. **The role of health information technology in care coordination in the United States.** Medical Care 2015;53:184–90.
Herrigel et al., 2016	Herrigel DJ, Carroll M, Fanning C, Steinberg MB, Parikh A, Usher M. **Interhospital transfer handoff practices among US tertiary care centers: A descriptive survey.** Journal of Hospital Medicine 2016;11:413–7. doi:10.1002/jhm.2577.
Hernandez-Boussard et al., 2017	Hernandez-Boussard T, Davies S, McDonald K, Wang NE**. Interhospital Facility Transfers in the United States: A Nationwide Outcomes Study**. Journal of Patient Safety 2017;13:187–91. doi:10.1097/pts.0000000000000148.

First Author/Publication Year	Reference Details
Hassol et al., 2014	Hassol A, Goodman L, Younkin J, Honicker M, Chaundy K, Walker JM. **Survey of state health information exchanges regarding inclusion of Continuity of Care Documents for long-term post-acute care (LTPAC) patient assessment.** Perspectives in Health Information Management 2014;11:1g.
Grant and Bensoussan, 2014	Grant SJ, Bensoussan A. **The process of care in integrative health care settings - a qualitative study of US practices.** BMC Complementary and Alternative Medicine 2014;14:410. doi:10.1186/1472-6882-14-410.
Wodchis et al., 2014	Goodwin N, Dixon A, Anderson G, Wodchis W. **Providing integrated care for older people with complex needs: lessons from seven international case studies.** King's Fund London; 2014.
Dykes et al., 2014	Dykes PC, Samal L, Donahue M, Greenberg JO, Hurley AC, Hasan O, et al.,. A patient-centered longitudinal care plan: vision versus reality. Journal of the American Medical Informatics Association : JAMIA 2014;21:1082–90. doi:10.1136/amiajnl-2013-002454.
Dy et al., 2013	Dy SM, Apostol C, Martinez KA, Aslakson RA. **Continuity, coordination, and transitions of care for patients with serious and advanced illness: a systematic review of interventions**. Journal of Palliative Medicine 2013;16:436–45.
Colla et al., 2016	Colla CH, Lewis VA, Bergquist SL, Shortell SM. **Accountability across the Continuum: The Participation of Postacute Care Providers in Accountable Care Organizations**. Health Services Research 2016;51:1595–611. doi:10.1111/1475-6773.12442.
Barnes et al., 2014	Barnes AJ, Unruh L, Chukmaitov A, van Ginneken E. **Accountable care organizations in the USA: types, developments and challenges.** Health Policy 2014;118:1–7.
Von Kluchtzner and Grandt, 2015	von Kluchtzner W, Grandt D. **Influence of hospitalization on prescribing safety across the continuum of care: an exploratory study**. BMC Health Services Research 2015;15:197. doi:10.1186/s12913-015-0844-x.
Schneider et al., 2016	Schneider A, Donnachie E, Tauscher M, Gerlach R, Maier W, Mielck A, et al.,. **Costs of coordinated versus uncoordinated care in Germany: results of a routine data analysis in Bavaria**. BMJ Open 2016;6:e011621.

First Author/Publication Year	Reference Details
Penm et al., 2017	Penm J, MacKinnon NJ, Strakowski SM, Ying J, Doty MM. **Minding the Gap: Factors Associated With Primary Care Coordination of Adults in 11 Countries**. Annals of Family Medicine 2017;15:113–9. doi:10.1370/afm.2028.
Milstein and Blankart, 2016	Milstein R, Blankart CR. **The Health Care Strengthening Act: The next level of integrated care in Germany**. Health Policy (Amsterdam, Netherlands) 2016;120:445–51. doi:10.1016/j.healthpol.2016.04.006.
Lluch and Abadie, 2013	Lluch M, Abadie F. **Exploring the role of ICT in the provision of integrated care—Evidence from eight countries.** Health Policy 2013;111:1–13.
Lluch, 2013	Lluch M. **Incentives for telehealthcare deployment that support integrated care: a comparative analysis across eight European countries.** International Journal of Integrated Care 2013;13.
Conklin, Nolte, and Vrijhoef, 2013	Conklin A, Nolte E, Vrijhoef H. **Approaches to chronic disease management evaluation in use in Europe: a review of current methods and performance measures**. International Journal of Technology Assessment in Health Care 2013;29:61–70.
Busse and Stahl, 2014	Busse R, Stahl J. **Integrated care experiences and outcomes in Germany, the Netherlands, and England**. Health Affairs 2014;33:1549–58.
Pimperl et al., 2016	Pimperl, A., Schulte, T., Mühlbacher, A., Rosenmöller, M., Busse, R., Groene, O., Rodriguez, H.P., Hildebrandt, H., 2017. **Evaluating the Impact of an Accountable Care Organization on Population Health: The Quasi-Experimental Design of the German Gesundes Kinzigtal.** Popul. Health Manag. 20, 239–248. https://doi.org/10.1089/pop.2016.0036

10.7 Risk of Bias of Included Studies

10.7.1 Risk of Bias Summary for Observational studies using STROBE Tool

Component	Domain	Wells et al, 2016	Osborn et al, 2014	Huber, Shortell, and Rodriguez, 2017	Hsiao et al, 2015	Hernandez-Boussard et al, 2017	Hassol et al, 2014
Title and abstract	Study design is stated in title	no	yes	no	no	no	yes
	Abstract is balanced/informative	yes	yes	yes	yes	yes	yes
Introduction	Background/rationale explained	yes	yes	yes	yes	yes	yes
	Study objectives clearly defined	yes	yes	yes	yes	yes	yes
Methods	Study design stated	no	yes	no	no	yes	yes
	Setting described	yes	?[14]	yes	yes	yes	yes
	Eligibility criteria and data sources included	yes	yes	yes	yes	yes	?
	Study outcomes are defined	yes	yes	yes	yes	yes	?
	Bias is addressed	no	no	?	?	?	no
	Study size	yes	yes	no	yes	no	no
	Control for confounding is explained	?	no	?	yes	no	?
	Missing data addressing explained	?	yes	?	?	?	no
Results	No. of participants reported	yes	yes	yes	yes	yes	yes
	Descriptive data of study participants reported	yes	no	yes	yes	yes	no
	Outcome data reported	yes	yes	yes	yes	yes	yes
	Report estimates (eg, CI, p-value)	no	no	yes	yes	yes	no
Discussion	Summarize key results	yes	yes	yes	yes	yes	no
	Limitations discussed	no	yes	yes	yes	yes	no
	Generalizability discussed	no	no	no	no	no	no
	Funding source given	yes	no	no	no	?	no

[14] ?: means not clearly stated in the study

(Continued) Risk of Bias Summary for Observational studies using STROBE Tool

Component	Domain	Colla et al, 2016	von Kluchtzner and Grandt, 2015	Schneider et al, 2016	Penm et al, 2017	Conklin, Nolte, and Vrijhoef, 2013	Dykes et al, 2014
Title and abstract	Study design is stated in title	no	yes	no	no	no	yes
	Abstract is balanced/informative	yes	yes	yes	yes	yes	yes
Introduction	Background/rationale explained	yes	yes	yes	yes	yes	yes
	Study objectives clearly defined	yes	yes	yes	yes	yes	yes
Methods	Study design stated	yes	yes	no	yes	no	yes
	Setting described	yes	yes	yes	?	?	yes
	Eligibility criteria and data sources included	?	yes	yes	?	yes	?
	Study outcomes are defined	yes	yes	yes	yes	?	yes
	Bias is addressed	yes	?	?	?	?	?
	Study size	yes	yes	yes	no	no	yes
	Control for confounding is explained	?	?	?	?	?	?
	Missing data addressing explained	no	?	?	no	?	no
Results	No. of participants reported	yes	yes	yes	yes	yes	yes
	Descriptive data of study participants reported	yes	yes	yes	yes	yes	yes
	Outcome data reported	yes	yes	yes	yes	yes	yes
	Report estimates (eg, CI, p-value)	yes	yes	yes	yes	no	no
Discussion	Summarize key results	yes	yes	yes	yes	yes	yes
	Limitations discussed	yes	yes	yes	yes	no	yes
	Generalizability discussed	no	yes	no	no	no	yes
	Funding source given	no	yes	yes	yes	?	yes

10.7.2 Risk of Bias Summary for Qualitative studies using CEBM Tool

Domain		Samal et al, 2016	Grant and Bensoussan, 2014	Dykes et al, 2014
Was a qualitative approach appropriate for the question being asked?		yes	yes	yes
Was the sampling strategy appropriate for the approach?	Is the method of recruiting the participants/setting(s) described?	yes	?	yes
	Does the sample include a range of experiences (maximum variation sample), where all relevant 'variables' are accounted for?	yes	yes	no
What were the data collection methods?	Are data collection methods described in sufficient detail to allow you to repeat the study?	?	yes	yes
	Are they transparent and appropriate?	yes	yes	yes
How were data analyzed and how were these checked?	Was the data analysis approach appropriate for the methodology used? E.g. A grounded theory study needs to include constant comparison.	yes	yes	yes
	Are the analytical steps explained in detail (are they transparent)?	yes	yes	yes

(continued) Risk of Bias Summary for Qualitative studies using CEBM Tool

Domain		Samal et al, 2016	Grant and Bensoussan, 2014	Dykes et al, 2014
	Are the steps to ensure 'quality control' described? E.g. Double coding, research team discussion of identified item, respondent validation.	yes	yes	?
Is the researcher's position described?		yes	yes	yes
	Have the authors provided a range of data (quotes) to support their interpretation (themes/ theoretical concepts) of data?	yes	yes	yes
Do the results make sense?	Are the quotes indexed so they could be traced back to the original data set? For example: patient/participant #2	yes	yes	no
	Have authors provided 'negative cases' i.e. narratives that do not fit the identified themes/ theoretical framework.	yes	yes	yes
	Have the authors provided context (background to participant) for quotes in order to interpret meaning?	yes	yes	yes
Are the conclusions drawn justified by the results?		yes	yes	yes
Are the findings transferable to other clinical settings?		no	yes	?

10.7.3 Risk of Bias Summary for Systematic Review using CEBM Tool

Domain	Description	Dy et al, 2013
Is the research question clearly stated?		yes
Is it unlikely that important, relevant studies were missed?	Were data sources other than the major bibliographic databases searched?	yes
	Is the search strategy limited to English language only?	?
	Does the search strategy should include both MESH terms and text words?	?
Were the criteria used to select articles for inclusion appropriate?	Are the inclusion and exclusion criteria defined as priori?	yes
Were the included studies sufficiently valid for the type of question asked?	Was the quality of each study was assessed using predetermined quality criteria appropriate to the type of clinical question?	yes
Were the results similar from study to study?	Are the results of the different studies similar or homogeneous?	yes
	Are the possible reasons for the heterogeneity explored?	N/A[15]
What were the results?	Is a summary of the data from the results of the individual studies provided?	yes
	Are the results statistically combined using a meta-analysis?	no
	Are the results displayed in a forest plot?	no

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[15] N/A: not applicable

10.7.4 Risk of Bias Summary for Non-Randomized Trials using JBI Checklist

Dimension/ criteria	Pimperl et al, 2016
Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e. there is no confusion about which variable comes first)?	yes
Were the participants included in any comparisons similar?	yes
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	yes
Was there a control group?	no
Were there multiple measurements of the outcome both pre and post the intervention/exposure?	yes
Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	?
Were the outcomes of participants included in any comparisons measured in the same way?	yes
Were outcomes measured in a reliable way?	?
Was appropriate statistical analysis used?	yes

Declaration of independent work

“I hereby declare that I wrote this thesis without any assistance and used only the aids listed. Any material taken from other works, either as a quote or idea have been indicated under ‘References’.

Engy AbdelMaguid
17.01.2020