

In pursuit of integrated care: the contribution of patient portals

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Abstract

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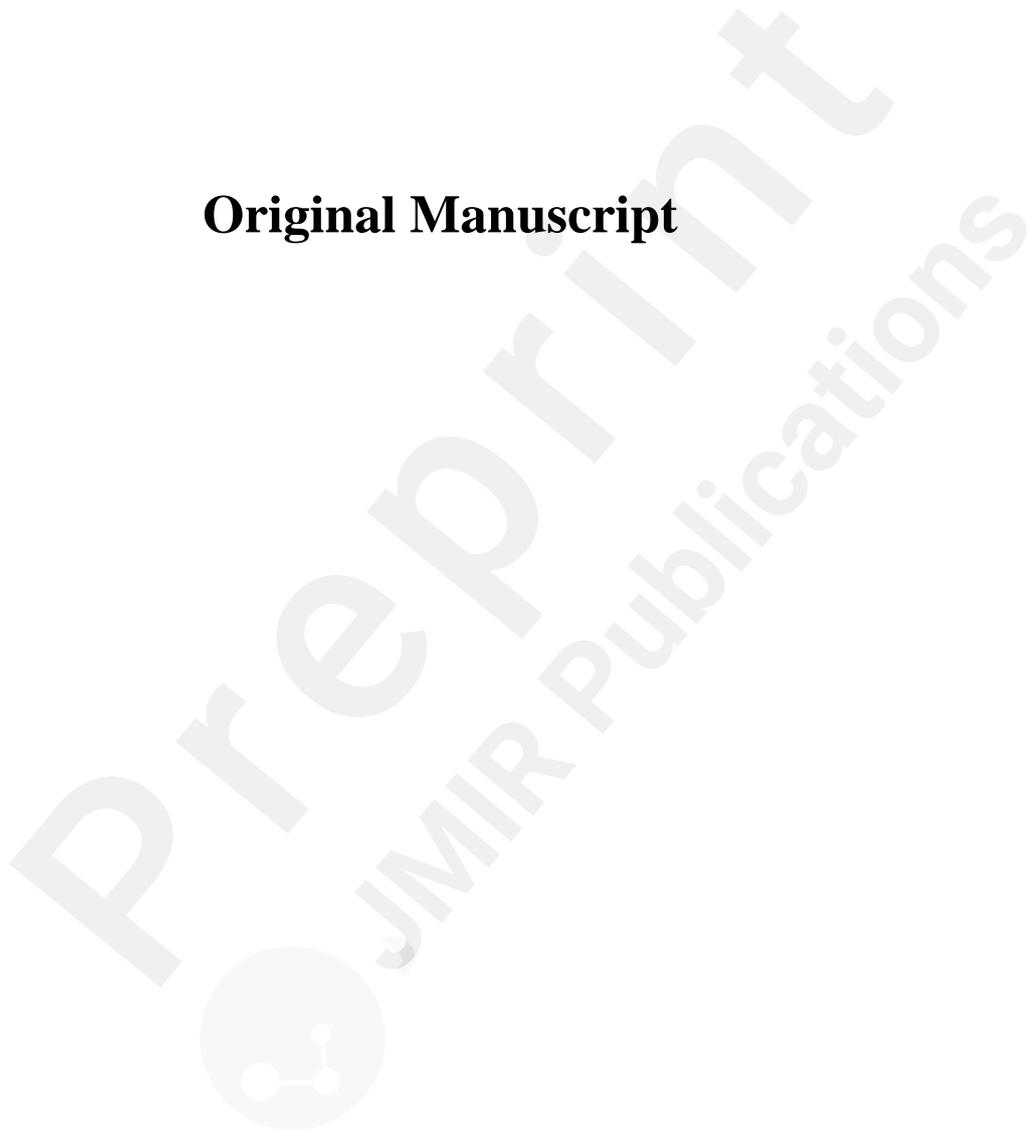
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Abstract

Background: Advocates of patient portals claim that they can strengthen integrated care for patients with complex or chronic health issues. However, it remains unclear how patient portals can achieve this, since indicators of integrated care are absent in most research on the matter.

Objective: This study investigates the claim that patient portals can strengthen integrated care by reviewing the current research with Minkman's model of integrated care.

Methods: A systematic search of PubMed, PsycInfo and Embase was conducted on research literature about patient portals (and related search terms) that was published between 2006 and 2016. Parts of the selected texts were scored on items which contribute to or hinder clusters of the Minkman model, or were absent from the model.

Results: The 22 selected studies we analyzed with the Minkman model implicitly address several clusters of integrated care. Most prevalent were patient-centeredness (55 mentions), delivery system (49 mentions) and performance management (33 mentions); the least prevalent were interprofessional teamwork (3 mentions) and commitment (2 mentions). Five studies showed ways in which portals can hinder integrated care (12 mentions), while four studies showed ways in which they can promote integrated care that is not yet present in Minkman's model.

Conclusions: Since the majority of the studies described items that contribute towards clusters of the Minkman model, the claim that patient portals can strengthen integrated care appears to have some merit. Items with negative impact are few and are primarily related to the implementation of portals for users. Based on our findings, we advocate using all the clusters of the Minkman model, since it can help patient portals be designed and implemented more effectively.

Keywords: electronic personal health record, integrated health care systems, patient portals, meaningful use

Introduction

In recent years, there has been a growing focus on mental-health-related issues and the costs of providing mental health care [1]. In the Netherlands, costs for mental health services have risen from 0.62% of the GDP in 2000 to 0.96% of the GDP in 2010 [2]. A major contributor to these costs is the complexity of treating mental health patients, who often have severe problems in multiple areas [3].

The dominant approach to managing mental health problems is based on the principle of providing minimal support where possible and scaling up to specialized care when needed in a care chain. However, this leads to waiting lists, duplications and gaps, and unnecessary costs. Since most mental health problems, especially chronic or complex problems, affect several domains of a person's life, there is a need for effective (and cost effective) delivery models [4]. As the number of patients with mental health problems and the associated costs rise, mental health service providers and policymakers are questioning the current organization of mental health care. The integrated care model could be a superior model for delivering mental health care [5].

Patients with chronic or complex forms of mental illness are not a new phenomenon, nor is the notion that care for such patients should preferably be easy to access and well-coordinated. Policymakers and researchers describe this notion as a policy of integrated care [5]. Integrated care can be defined as “a coherent and coordinated set of services, which are planned, managed and delivered to individual service users across a range of organizations and by a range of cooperating professionals and informal caregivers” [6]. In theory, integrated care combines the efforts of different professional and informal caregivers in such a way that the best possible solution is accessible for patients at any time [7]. Integrated care appears in a variety of forms such as ‘shared care,’ ‘continuing care,’ ‘disease management,’ ‘transmural care,’ ‘comprehensive care’ or ‘intermediate care.’ It is required when the services of separate agencies and individual professionals do not cover all the needs of clients with multiple problems [5, 7]. Within mental health, integrated care is described by collaborative chronic care models. In their systematic review, Woltman et al. [8] show that “collaborative chronic care models can improve mental and physical outcomes for individuals with mental disorders across a wide variety of care settings, and they provide a robust clinical and policy framework for care integration.”

There is already a lot of knowledge about the key elements of integrated care. Based on their analysis of integrated care models like the chronic care model, Minkman et al. [9] identified 89 elements for a comprehensive quality management model for integrated care. These elements are brought together in nine clusters (see [Table 1](#)).

Table 1. Description of Minkman's clusters [9].

Cluster	Description
1. Patient-centeredness (9 elements)	This cluster is about developing integrated care and information flows tailored to specific (sub) groups of patients. Elements focus on integrated patient and care process supporting information such as front offices, self-management support or information systems, and delivering care adjusted to individual needs (e.g. multi-morbidity)
2. Delivery system (18 elements)	Chain and client logistics, co-ordination mechanisms and procedures for streamlining the care process for the whole care chain is the main focus of this cluster. Reaching all agreements (e.g. logistics, sharing expertise), procedures (e.g. information exchange) or tools (e.g. care plans) in the care chain that are necessary from the client's initial entry into the care chain until the final contact are reflected in this cluster.
3. Performance management (16 elements)	Measurement and analyses of the results of the care delivered in the care chain is the central theme of this cluster. Elements address performance targets at all levels, monitored by the standardized use of indicators. Indicators address client outcomes, client judgments, organizational outcomes and financial performance data. (Near) mistake analysis, feedback mechanisms and improvement teams are used to improve and manage the level of performance.
4. Quality care (5 elements)	This cluster contains elements that focus on the design of a multi-disciplinary care pathway throughout the care chain, based on evidence-based guidelines and standards and clients' needs and preferences. A needs assessment of the specific client group is required for this purpose, combined with the involvement of client representatives in designing, improving and monitoring the integrated care.
5. Result-focused learning (12 elements)	A learning climate of striving towards continuously improved results in the care chain is this clusters central theme. The elements address essential ingredients for improvement: defining goals for collaboration, identifying bottlenecks and gaps in care, and ways of learning and exchanging knowledge in an open atmosphere. Incentives are used to reward

	improved performance.
6. Interprofessional teamwork (3 elements)	This cluster represents interprofessional teamwork for a well-described client group. The defined client group is the target to be reached by collaborating professionals, working in well-organized multi-disciplinary teams in the care chain.
7. Roles and tasks (8 elements)	The need for clarity about each other's expertise, roles and tasks in the care chain is reflected in this cluster. Effective collaboration at all levels, with new partners and by allocating coordinating roles are the main components.
8. Commitment (11 elements)	This cluster's focus is on collaborative commitment and ambition in the care chain. Commitment towards clearly defined goals and a collaborative ambition, apart from awareness of dependencies and domains. The commitment of leaders to the care chain and the awareness of working in a care chain are also components.
9. Transparent entrepreneurship (7 elements)	This cluster concentrates on space for innovation (experiments), leadership responsibilities for performance achievement and joint financial agreements covering the integrated care. Preconditions for entrepreneurship, including financial preconditions, are represented in the collection of elements.

(See [Multimedia Appendix 1](#) for the elements of each cluster).

These findings have been consistently reported in other studies [10] and are internationally recognized [11]. While, in theory, this knowledge can contribute to making health care utilization easier for patients with chronic or complex illnesses, the integration of care in daily practice is complicated by differences in organizational goals, funding streams and stakeholders or care providers. This leads Woltman et al. to state that a critical issue in integrated care in daily practice is the identification of the most effective implementation strategies to establish and sustain integrated care models [8].

A digital approach: Patient portals

While the framework of integrated care was being developed, new technologies of digital communication, data storage and data sharing created new possibilities to support people with complex or chronic illnesses [12]. Several of these possibilities have led to the development of patient portals. Patient portals are secure electronic portals where patients exchange information or communicate with their treatment team and access or share their (medical) health information [13, 14].

Although most patient portals are still being developed, the basic concept is that a patient portal

constitutes of an electronic patient health record (ePHR) which directly links, or is ‘tethered,’ to a health care provider’s electronic health record (EHR) [15]. Within this construction, the EHR is primarily under the control of health care services and consists of general patient information such as lab test results, diagnoses and a list of prescribed medications. The ePHR part is under control of the patient. This means an individual can manually enter all information or grant permission to view or share information among those who have been given access to the portal.

In addition, patient portals may support patients by offering a variety of different digital tools to organize their health and care, allowing patients to:

- Connect to relevant professional and informal caregivers;
- Access and share medical and other personal data;
- Keep track of their health and treatment history using integrated personal health records;
- Coordinate and organize combined care efforts and plans;
- Use integrated (e-)tools for self-help and health monitoring [14].

While patient portals were first introduced in the late 1990s, widespread use did not start until 2006. Utilization coincided with the broad use of smartphones and social media, which illustrated the general public’s readiness to use digital tools like patient portals [15].

The development of patient portals has been theorized to facilitate integrated care and strengthen a patient-centered approach [16]. A recent review of relevant theories and empirical evidence on Cross-Sectoral Collaboration [17] suggests that the technical design of patient portals can have a major impact on facilitating collaborative behavior. For instance, they can help build greater trust among care providers by sharing information, enhance collaborative planning by sharing goals and care plans, and strengthen the leadership skills of significant individuals in the care process (e.g., patient or their primary representative) by giving them more insight into care providers’ activities.

Most research on patient portals to date has been confined to internal medicine [14], and most patient portals are directed at patients with chronic illnesses and/or at elderly care. But increasing attention is being paid to the use of patient portals in mental health care [14]. For example, Robotham et al. [18] concluded that an ePHR (the centerpiece of patient portals) could be very useful in helping patients with severe mental illness to manage and monitor their own health.

These notions contribute to the idea that patient portals can play a significant role in improving cooperation between care providers and patients, especially where many different disciplines and institutes are involved. As a case in point, Otte-Trojel and colleagues concluded that a patient portal within an interdependent network of cross-sectoral institutions holds the highest ambitions in terms of connectivity [13]. However, they also noted that this kind of patient portal is the most difficult to implement. This appears to be a similar problem integrated care models face.

Due to the difficulty of implementing this kind of patient portal, the scientific literature has not yet reported evidence to support the claim that they can strengthen integrated care. Although experts hypothesize that mechanisms, like patient insight into information and interpersonal continuity of care, are the most relevant to enhancing patient empowerment and improving communication between those involved in the care process [19], these may not be the only important factors. As Otte-Trojel et al. state, “patient portals are complex interventions that work through multiple pathways [mechanisms] to generate multiple outcomes” [19]. This could mean that there are secondary mechanisms which have not yet been taken in account, or that some mechanisms enhance patient empowerment and improve communication, while other mechanisms work against it.

The difficulty in identifying these mechanisms is also due to the technical character of patient portals. Using digital means of communication and sharing sensitive information are fairly new practices within the health care environment and clear rules of use are not yet common knowledge. This can significantly influence how people use a patient portal and whether portals promote or obstruct integrated care.

An integrated portal approach

A comparison of the literature on integrated care and patient portals suggests that patient portals can be promising agents for integrating care and improving the delivery of care [7, 20]. Within the field of research on eHealth, this is even seen as a strong accelerator because patient portals are viewed as the perfect tool to provide all aspects of a better, more integrated (or coordinated) way of care [14]. We therefore formulate our research question: Does the current research literature support the claim that patient portals promote integrated care?

There has been little research about whether patient portals can and do contribute to integrated care. Most research on patient portals has focused on outcomes such as well-being or on how well-informed patients who use the portal are. However, little has been said about how patient portals may relate to integrated care.

To address this ambiguity, this study uses the quality management model for integrated care proposed by Minkman et al. [9] to explore the current research literature on patient portals. Our goal is to identify the relationship between patient portals and integrated care. This leads to research sub-question a: Do studies on patient portals indicate that they contribute to one or more clusters of the Minkman model?

We use the Minkman model with the understanding that it was constructed before the recent rise in technical possibilities for sharing information or communicating digitally. As can be seen in the descriptions of the clusters, the model presumes that reaching integrated care is primarily a process of establishing interpersonal rules of behavior and making actions, expertise and responsibilities clear between all care partners.

However, we assume that the design or functionalities of patient portals will make them able to contribute to those same aspects of integrated care. We therefore expect that research on patient portals – despite the lack of focus on integrated care – will provide information on how portals relate to the Minkman model.

Additionally, we would like to explore sub-question b: Which clusters of the Minkman model are most prevalent within research on patient portals? Since a significant part of a patient portal is an ePHR [14], we expect that the most mentioned clusters of the Minkman model will be:

- Cluster 1, “patient-centeredness,” since patient portals give patients the tools to “keep track of their health and treatment, use (e-)tools for self-help and health-monitoring,” and
- Cluster 2, “delivery system,” since patient portals provide new ways to “connect to relevant professional and informal caregivers, access and share (medical) data, and coordinate and organize the combined care effort and plans.”

Due to the relative novelty of patient portal research, we suspect that, at this time, not all clusters will be evenly addressed within the current literature. To enhance our understanding of patient portals, we formulated research sub-question c: Which clusters of the Minkman model are least prevalent within research on patient portals? We suspect it will take some time before research on patient portal can address clusters that focus on more extensive aspects of integrated care like clusters 6

(interprofessional teamwork), 7 (roles and tasks) and 8 (commitment).

Considering the recent introduction of patient portals in healthcare, we also expect that not all potential users may be comfortable with digital communication and sharing information, and some may even find it daunting. As such, we suspect that, by design, use or the impact it has on users, we will identify some mechanisms of patient portals that do not contribute to (or even hinder) some clusters of integrated care. Following Otte-Trojel et al. [19], we formulated research sub-question d: Which mechanisms are negatively correlated with clusters of the Minkman model?

Finally, we suspect that patient portals may introduce new ways to facilitate integrated care that were not formulated by Minkman. As such, we formulated research sub-question e: Does the current research describe means to facilitate integrated care that are absent in the Minkman model?

Insight into the knowledge and gaps in current literature that relate to how portals facilitate integrated care will provide input for future research on how to improve the implementation process of the promising role of patient portals.

Methods

Search strategy

We searched for articles that examined the effects that ePHRs, patient portals or similar concepts in health care have on specific elements of integrated care. We used the *Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)* [21] statement as a guideline in processing and reporting this review.

Since 2015, there have been several systematic reviews concerning patient portals. To ensure we stay in line with previous research, we started by replicating the initial results of the latest systematic review on patient portals, conducted by Irizarry et al. [15]. They reviewed literature from 2006 through 2014 in PubMed, Ovid Medline and Psycinfo using the following search terms: “Patient portal” OR “personal health record” OR “electronic personal health record.”

Our primary overall findings were in line with their systematic review [15], which gave us a robust basis for expanding the search by extending the period to 2006-2016 and using the following databases: PubMed, Psycinfo and Embase. We added two additional search terms to the search from another relevant systematic review and from the MeSH search terms database: “Multi-actor networks” [13] OR “Health information exchange”.

All the search terms were formulated in singular and plural form. Our search resulted in 1935 articles through database queries alone (see [Table 2](#) for the query results from each database). We then applied the following inclusion criteria:

1. original, peer-reviewed, qualitative and quantitative research about patient portals, personal health records (enhanced or no) or similar digital support tools (e.g., HIE, EHR)
2. a focus on complex or chronic illness, preferably mental disorders
3. English language

Articles were excluded from the review if they were book chapters, abstracts, dissertations or conference proceedings.

Table 2. Results of database queries

Database	Articles
PubMed	1326
Psychinfo	194
Embase	415
Total database search	1935

In addition to the database search, we performed a citation search. We used Scopus and Web of Science to search for relevant studies that cite key articles (i.e., articles we used to formulate our research question). This resulted in 102 additional articles ([Table 3](#)). Bibliographies and the literature reviews from these key articles added seven more articles, resulting in the addition of 109 articles to the list.

Table 3. Results of the citation search on key articles.

Core article	Number of citations in Web of Science	Number of citations in Scopus
Irizarry et al. (2015) [15]	19	27
Minkman et al. (2012) [7]	4	3
Otte-Trojel et al. (2015) [13]	3	4
Otte-Trojel et al. (2014) [19]	10	24
Turvey & Roberts (2015) [14]	0	0
Robotham et al. (2015) [18]	7	1

All the articles were entered into the reference management tool Endnote for further screening. After eliminating double references, we screened 1720 articles on title and abstract for relevance, leading us to review 66 full-text articles in depth. Of these, we excluded 41 articles because they focused on issues concerning safety or security of the portal, clients' perspectives on the prospect of a yet-to-be-built portal, or global theories about the impact of patient portals on health care as a whole (See [Figure 1](#)). Another three articles could not be related to any of the clusters and were dropped from further analysis. This process resulted in our including 22 articles in the final review (see [Multimedia Appendix 2](#) for summaries of each study).

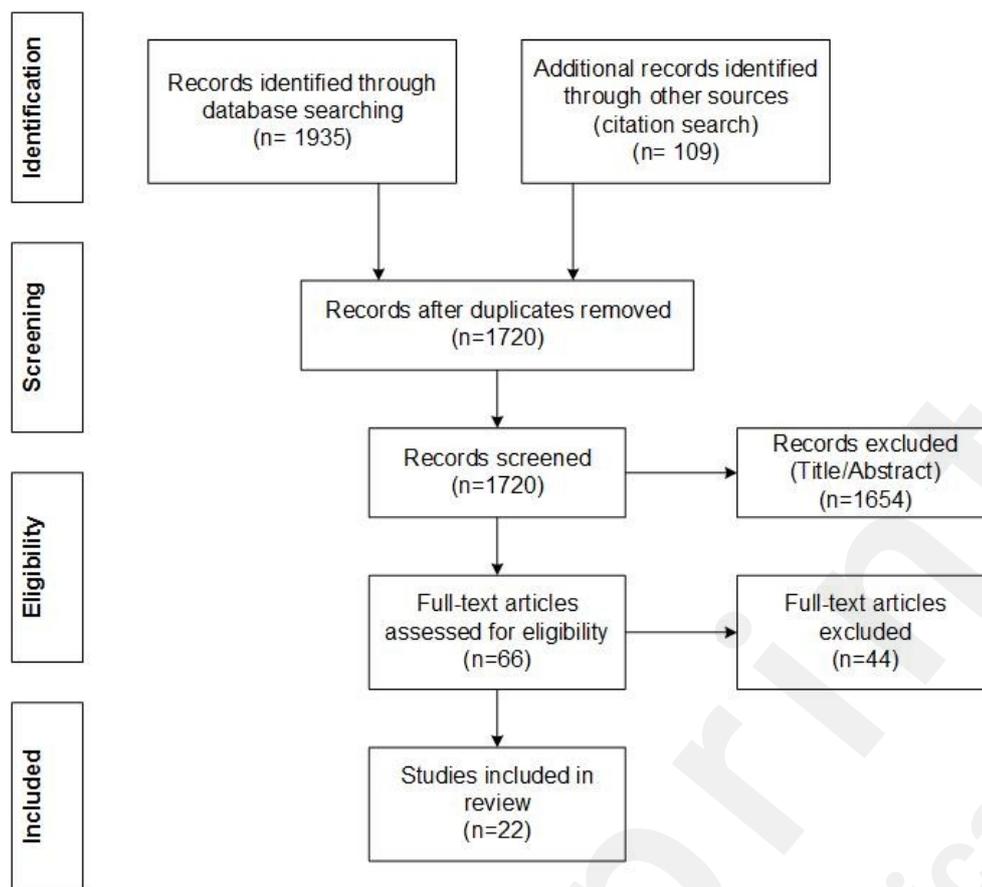


Figure 1. Flow chart of the literature review.

Data analysis

We reviewed the 22 articles using the nine clusters of integrated care from the Minkman model [9] (see [Table 1](#)). We constructed a scoring form, based on the model, to assist reviewers in the analysis. We addressed the research sub-questions as follows:

- a through c: we identified different parts of the text (e.g., a keyword, sentence or phrase) from each study and marked them as items that represented and contributed to one of these clusters
- d: we labeled parts that were followed up by a negative remark for users, sharing information or the organization of care (e.g., complicate, resolve issues) as negative with a cluster
- e: the scoring form included an open field for functionalities of the portal that did not represent one of Minkman's clusters, but which the researchers described as beneficial to integrated care.

Each article could have more than one item per cluster, provided that it was a different item (e.g., keyword, sentence or phrase). For example, a study might describe how the portal can “help streamline discussions and improve the quality of communication,” which lines up with cluster 2 (delivery system). The same study might also contain another item that scores on cluster 2: “it allows for administrative efficiencies by reducing the need to call patients about test results.” By allowing multiple items per cluster per article, clusters can be scored more frequently to better grasp how that portal impacts integrated care.

To ensure inter-observer reliability, we drafted a second researcher to assist in analyzing the article. Each article was analyzed independently by two reviewers (NZ, DK). Any inconsistencies between the reviewers were resolved through discussion.

Initial pilots in scoring the articles revealed that the perspective of the study (e.g., client perspective, organizational perspective or care coordination/trans-institutional perspective) led to a difference in the ability to score the articles towards some of the clusters of integrated care. As a result, we added this information to the summaries of each study (see [Multimedia Appendix 2](#): Summary of reviewed articles).

Results

Overview

We reviewed 22 articles from different fields of research, including patient portals used in the care of elderly people or children, people with diabetes and mental health care. Of those 22 articles, 11 were qualitative or mixed-method studies, 5 were non-experimental descriptive studies, 4 were pilot studies or case reports and 2 were randomized controlled trials (see [Multimedia Appendix 2](#)).

Sub-question a: Do studies on patient portals indicate that they contribute to one or more clusters of the Minkman model?

None of the articles mentioned all nine clusters of integrated care. Two studies (Juhr [28] and Urowitz [23]) mentioned six clusters and one (Otte-Trojel et al.'s [22] study of Kaiser Permanente's patient portal) mentioned five clusters. Four articles [24, 27, 30, 31] mentioned four different clusters, 11 articles [25, 26, 29, 32, 33, 34, 35, 37, 38, 41, 42] mentioned three clusters, and four articles [36, 39, 40, 43] mentioned two clusters.

Sub-question b: Which clusters of the Minkman model are most prevalent within research on patient portals?

The most frequently mentioned cluster to which patient portals seem to contribute was cluster 1, patient-centeredness (55 mentions). This was followed by cluster 2, delivery system (49 mentions) and cluster 3, performance management (33 mentions).

Sub-question c: Which clusters of the Minkman model are least prevalent within research on patient portals?

The least-mentioned clusters were cluster 6, interprofessional teamwork (3 mentions) and cluster 8, roles and tasks (2 mentions) (see [Table 4](#)).

Cluster results for sub-questions a–c

To describe the individual results for each cluster, we will follow the layout of the Minkman model.

Cluster 1. Patient-centeredness

Aspects of this cluster were described 55 times in 19 of the 22 articles. Patient-centeredness seems, therefore, to be a key component in the design and implementation of patient portals. In many studies, the main driver for developing a patient portal is to improve the position of patients in the care process. Looking in more detail at the items that are scored for this cluster, the main benefits of patient portals appear to be providing understandable and client-centered information, and creating a single entry point for client information. Items for this cluster include: “Next the [interactive preventive health record] IPHR makes personalized recommendations, based on nationally endorsed, evidence-based guidelines and relevant patient characteristics” [24], “an overview of health care and welfare professionals involved in the care of the frail older person and their contact information” [30], and “one of the most important features of a [personal health record] PHR described by the participants was 24/7 access to the system” [36].

Cluster 2. Delivery system

Since patient portals address the digital way to deliver health care, it is not surprising that items related to cluster 2 were some of the most frequently mentioned. They were described 49 times in 16 articles. The most frequently mentioned aspects of this cluster were items focusing on developing connections between databases of partners in the care chain and using a single client-monitoring record accessible to all care partners. Other items include “in fragmented contexts can give patients an overview of their health information” [22] or “simplifies the usage and sharing of diagnostic modalities in the prefecture” [28].

Cluster 3. Performance management

Aspects of this cluster were mentioned 33 times in 19 articles. The Minkman model describes performance management as an effort to keep improving the way care is being delivered by monitoring the actions and impact of care. While no study directly described how a portal monitors care progress, there are several hints in this cluster. For example, one sentence – “this transparency of information to patients was thought to make them better able to participate in their care as informed partners” [22] – closely relates to element 13 of cluster 3 (making transparent the effects of the collaboration on the production of the care partners). Another study [25] referred to element 2 of the cluster (providing feedback to care partners on transfers) when it described the ability of patient portals to “deliver automated messages to [patient-centered medical home] PCMH clinicians whenever patients were admitted to, transferred within, or discharged from any local hospital.”

Some articles did not specifically refer to one element of this cluster, but referred to it in a more general sense. For example, a study [24] said that “after the patient uses the IPHR, a summary is transmitted directly to the EHR of the patient’s clinician, listing the patient’s updates/corrections, health behaviors, and overdue preventive and chronic care.”

Cluster 4. Quality of care

Five articles [23, 24, 27, 29, 31] described an item that could be related to cluster 4, mentioning it five times. Elements 3 and 5 of this cluster assert that involving client representatives in the care chain for monitoring or improving patient care helps to enhance the quality of integrated care. This is represented in a study [27] that states that “the iHealthSpace Copilot program is designed to allow patients to grant caregivers access to their health record and to the services offered through iHealthSpace on their behalf.” Element 4 focuses on the use of evidence-based guidelines and standards. As mentioned before, a study [24] states that “the IPHR makes personalized recommendations based on nationally endorsed, evidence-based guidelines.”

Cluster 5. Result-focused learning

Only two articles [22, 28] could be related to this cluster, which was mentioned six times. This can be seen in the study of Kaiser Permanente’s patient portal [22]: “The portal’s alignment with organizational and physician incentives and programs to improve care delivery [...] has allowed for large investments and support of the use of the portal.” This relates to element 8 of the cluster, which states that care partners can come to result-focused learning by “integrating incentives for rewarding the achievement of quality targets.”

Cluster 6. Interprofessional teamwork

Interprofessional teamwork is mentioned in just three articles [23, 27, 41], with one mention each. These studies describe how patient portals were deployed within a multi-disciplinary team. For instance, one study [41] notes that “users of [the] patient portal [...] linked to the EHR [...] of a multispecialty academic group practice and 10 affiliated community primary care clinics.”

Cluster 7. Roles and tasks

Four studies [25, 28, 38, 39] described items concerning roles and tasks (five mentions). Researchers

in one study [28] reported that one of the portals they reviewed also “provides telemedicine and communication services like video and teleconference services as well as a secure mail system.” These communication services are not just intended for patient-provider communication, but also for “realizing direct contact among professionals in the care chain” in rural areas, which is a direct link with element 6 of the cluster.

Cluster 8. Commitment

Two articles [23, 30] included items that relate to this cluster, with a total of two mentions. One study [30] states that “as a rule, messages that are communicated within the [Health and Welfare Information Portal] ZWIP are visible for all professionals with access to the ZWIP as well as for the frail older person and informal caregiver.” This is a clear way in which a patient portal can stimulate trust among care partners, as stated in element 9 of the cluster.

Cluster 9. Transparent entrepreneurship

Although only three articles mention transparent entrepreneurship, they do so ten times. One study was conducted by Juhr [28] and the other two by Otte-Trojel and her team [22, 26]. In their 2014 study [26], the researchers describe how the Meaningful Use Criteria, a US national EHR incentive program, has ensured that caregivers commit to a 5% target of patients viewing, downloading or transmitting their information. To illustrate this point, they noted that: “A manager from one medical center pointed out that a positive consequence of this incentive mechanism could be that providers will encourage each other to adopt the [Health Information Exchange] HIE-sponsored portal.” This relates the study to element 9 of the cluster (making a commitment to a joint responsibility for the final goals and results to be achieved).

Their 2015 study [22] found that Kaiser Permanente’s patient portal has “continuous innovation [...] built into the development strategy for the patient portal.” This study ties in with several elements of cluster 9, like elements 4 (allocating financial budgets for the implantation and maintenance of integrated care), 5 (involving leaders in improvement efforts in the care chain) and 6 (creating an open environment that encourages experiments and pilot projects). These elements are represented in the study [22] respectively as: “We’ve had some very bold, and brave, physician leaders who [...] understand that the industry was changing and needed to change” and “as a result of [the process of continuous innovation], each year a number of projects are prioritized and receive funding.”

Table 4. The number of times articles mention a contribution of patient portals on a cluster of integrated care of the Minkman model.

Study	Clusters of integrated care [9]								
	1	2	3	4	5	6	7	8	9
Otte-Trojel et al. [22]	4	8	2	-	5	-	-	-	6
Urowitz et al. [23]	5	3	3	1	-	1	-	1	-
Krist et al. [24]	10	1	4	1	-	-	-	-	-
Richardson et al. [25]	-	5	4	-	-	-	1	-	-
Otte-Trojel et al. [26]	2	2	-	-	-	-	-	-	2

Chung et al. [27]	3	5	2	1	-	-	-	-	-
Juhr et al. [28]	1	7	3	-	1	-	2	-	2
Nagykaldi et al. [29]	3	-	1	1	-	-	-	-	-
Robben et al. [30]	3	2	1	-	-	-	-	1	-
Druss et al. [31]	4	2	1	1	-	-	-	-	-
Fiks et al. [32]	1	3	2	-	-	-	-	-	-
Forchuk et al. [33]	3	1	1	-	-	-	-	-	-
Forster et al. [34]	3	2	1	-	-	-	-	-	-
Fuji et al. [35]	3	3	1	-	-	-	-	-	-
Gee et al. [36]	2	-	1	-	-	-	-	-	-
Lau et al. [37]	1	1	-	-	-	1	-	-	-
Aberger et al. [38]	-	1	1	-	-	-	1	-	-
Graetz et al. [39]	-	3	-	-	-	-	1	-	-
Lau et al. [40]	3	-	1	-	-	-	-	-	-
Neuner et al. [41]	1	-	1	-	-	1	-	-	-
Pecina et al. [42]	1	-	2	-	-	-	-	-	-
Riippa et al. [43]	2	-	1	-	-	-	-	-	-

Sub-question d: Which mechanisms are negatively correlated with clusters of the Minkman model?

Few items described portals having a negative impact on a cluster of the Minkman model. In just five studies [23, 24, 26, 33, 36] we were able to find negative impacts of patient portals on the following clusters: patient-centeredness (6 mentions), delivery system (4 mentions), performance management (1 mention) and interpersonal teamwork (1 mention) (see [Table 5](#)).

Cluster 1. Patient-centeredness

According to four studies [24, 26, 33, 36], patient portals can have a negative impact on patient-centeredness in several ways. For example, one study [24] found that patients thought the portal still did not provide all the relevant health information online: “I’d like to be able to see all of my lab results.” This refers to element 1.7 (developing a front office: a single entry point for client information) of the Minkman model. Missing relevant information to provide users with a front office appears to be caused by limited integration of the care provider’s EHR with a patient portal [26].

To overcome this problem, some parties suggest referring patients from the portal to the relevant provider's EHR [26]. The authors conclude that this “would require patients to use a separate login for each individual provider, thus contradicting the rationale behind a shared portal.” This again refers to element 1.7 of patient-centeredness (described above). Thus not offering enough information or having limited connections seems to inhibit the use of a portal to facilitate integrated care.

Another study described how patients can be overwhelmed by all the possibilities the portal offers [33]. Overwhelming patients with information contradicts element 1.1 of patient-centeredness: to provide “[...] understandable and client-centered information.” However, the researchers showed that many of these fears are overcome when patients become more familiar with the technology [33].

In a related problem, another study [36] found that patient portals also require thought about how information is shown to patients. It noted that “medical jargon in the system was frequently cited as a frustration” and patients were “having problems understanding numbers related to their individual health conditions.”

Cluster 2. Delivery system

To avoid confronting patients with medical jargon or charts they do not understand, some portals create different views for the patient and for care providers. However, as one study [33] showed, this also needs to be in a good balance as “participants struggled with differences in the client and care provider views of the [portal]. Since the two views were not identical, this often creates challenges when care providers were attempting to assist clients in using the [portal].”

On a more technical level, research [36] shows that “the lack of interoperability between provider offices and health care systems” is a crucial issue for patient portals. The study found that the main frustration around this issue was related to care coordination between offices that use EHR or ePHR systems and “those still using paper-based record systems.” This finding makes element 2.5, “developing connections between databases of partners in the care chain,” very difficult.

Another study [26] found problems around connecting new patient portals with hospitals' existing health information exchanges (HIEs). These interoperability problems may derive from differences in how databases are organized. The same study [26] noted that “one HIE uses 17 patient identifiers.” Not only does this hinder interoperability between care providers, it also contradicts element 2.9 of the delivery system cluster, which states that care partners should be “using uniform client identification numbers within the care chain.”

Cluster 3. Performance management

A patient portal having a solid technical design is not only relevant for interoperability issues, but it can also affect integrated care more directly. One study [33] showed that patients found flaws in the prompts and reminder system. This resulted in patients receiving far too many reminder e-mails. This contradicts element 3.5, “using feedback and reminders [by professionals] for improving care.”

Cluster 6. Interprofessional teamwork

Finally, one study [23] described how a patient portal can negatively impact element 6.3, “reaching agreements on the availability and accessibility of professionals.” The study found that among users there was “a widespread notion that physicians were often too busy and may be unable to fulfill [their] role [in the portal] as much as they would have liked.” While the portal made contact with health care professionals easier and more accessible on a technical level, it caused problems for care professionals because it did not correspond with the way patient contact was envisioned and agreed upon on an organizational and professional level.

Table 5. The number of times articles negatively mention integrated care clusters from the Minkman model.

Study	Clusters of integrated care [9]								
	1	2	3	4	5	6	7	8	9
Urowitz et al. [23]	-	-	-	-	-	1	-	-	-
Kirst et al. [24]	1	-	-	-	-	-	-	-	-
Otte-Trojel et al. [26]	1	2	-	-	-	-	-	-	-
Forchuk et al. [33]	2	1	1	-	-	-	-	-	-
Gee et al. [36]	2	1	-	-	-	-	-	-	-

Sub-question e: Does the current research describe means to facilitate integrated care that are absent in the Minkman model?

Several studies [22, 36, 37, 41] described how patients welcomed the tools patient portals provide to directly communicate with their care providers through a secure digital connection (e-mail or chat). The studies described how the ability to “ask questions whenever you can” gets patients more involved in their own care process and the organization of their care. As a patient in one study [36] described: “That’s the core of it – all the other stuff is just handy, but being able to communicate with your doctor is what it is all about.” In the same study, several patients stated that “they wish they could message pharmacists, therapists, dietitians and so on, within the same provider organization using the PHR,” which could further contribute to integrated care.

The Minkman model did not clearly describe the ability of patients to communicate with care providers in such a direct and patient-driven way. Although patients’ ability to communicate with care providers would seem to be part of cluster 1, patient-centeredness, we did not find any element or description to correctly fit this aspect of patient portals, here or in any other cluster.

Another way patient portals provide patients with tools for playing a more proactive role in their own care is by giving them a “personal data vault” [35]. This self-maintained, self-controlled complete record of a patient’s health information can be shared with healthcare providers when needed, or in emergency situations. The researchers noted that it is beneficial to integrate different care providers in a pre-existing care process.

We could not find this notion of patients controlling their own health information and the access to that information in the Minkman model. While the clusters do mention the need to develop “a single client-monitoring record accessible for all care providers” and “connections between databases of partners in the care chain,” this primarily addresses the care providers’ databases rather than personal data vaults controlled by patients.

Study outcome

Most studies focused their research on how patient portals offer patients more insight into their

medical conditions, and how patients use these patient portals. A second primary theme that emerges is the need and possibilities for further technical development of patient portals. Only a select number of studies addressed the multi-connectivity patient portals may create between professionals.

Reviewing the outcome of studies related to the number of items on the Minkman model yielded some interesting results. Articles with the most items (ten or more) on the Minkman model [22, 23, 24, 25, 27] primarily have outcomes that state that the attitudes of users, both patients and professionals, is a major factor in the functional use of a patient portal. Articles reporting on portals with a medium number of functionalities (five to eight) differentiated between outcomes on design and development of a patient portal [26, 28, 29, 30], positive effects on health-related issues [31, 32] or creating awareness and self-management among patients [33, 34, 35]. Surprisingly, the group of articles with the fewest items (three to four) on the Minkman model are studies that focus primarily on care coordination [36, 37, 38, 39, 40, 41, 42, 43].

Functionalities of the portal

Most portals share the same functionalities. Reviewing the articles on patient portals reveals that, depending on their stage of development, the number of functions of a patient portal grows. Most patient portals start with only a few tools, such as the ability for patients to view appointments, medication lists and relevant medical literature. In the second stage of development, the function of the patient portals seems to focus more on providing a digital way of communication via secure messaging, sending reminders and connecting the patient portal with the health care institution's HIE or EHR. This connection gives patients access to care plans and lab results, and allows them to order medication refills. Third-stage development seems to add more interactive ways to use the portal, such as communicating via video and teleconference, providing a personal diary, self-help and self-monitoring tools, and sharing the portal with care providers.

While these three stages are found throughout most of the articles, there is no fixed path towards developing a patient portal. Some patient portals focus on secure messaging before anything else, while others start with self-help tools. In addition, starting from a pre-existing digital environment, like an HIE or EHR, changes the initial approach to developing a patient portal.

Discussion

Main findings

In response to our research question (Does the current research literature support the claim that patient portals promote integrated care?) we were able to identify several clusters of the Minkman model in the use and functionalities of patient portals.

Sub-question a: Do studies on patient portals indicate that they contribute to one or more clusters of the Minkman model?

As hypothesized, we were able to use the Minkman model to identify several aspects of patient portals. Those aspects coincided with clusters that are deemed necessary for reaching integrated care.

Sub-question b: Which clusters of the Minkman model are most prevalent within research on patient portals?

In line with our expectations, patient portals had the most positive impact on patient-centeredness (cluster 1) and delivery system (cluster 2). Performance management (cluster 3) was also frequently mentioned within the research literature.

The large number of items we were able to connect to patient-centeredness (cluster 1) suggests that making an ePHR a core part of patient portals, stimulating the patient to be in control, is the primary way in which patient portals contribute towards integrated care. However, it is necessary to remember that Minkman's patient-centeredness cluster does not specifically aim to give patients more control, but, instead, to encourage care providers to collaborate to provide integrated care. Being able to connect patient portals to this cluster means that having the patient perspective as a primary focus of the design of portals also fosters the process of integrated care between care providers.

When addressing delivery system (cluster 2), it is also necessary to take a closer look at Minkman's description. Minkman describes that cluster as the necessity to reach various agreements between care providers on how to collaborate to create integrated care. This concerns agreements about using similar records and codes, and similar protocols for planning and inviting others to the care process. When care providers make these agreements, they create a 'virtual' system of delivering care (or integrated care).

With regard to patient portals, this process of reaching agreements goes beyond an interpersonal arrangement between care providers. Patient portals, by their digital design, directly embody and enforce these agreements. A patient portal uses records, codes and protocols in a set format for shared planning and clarifies who is involved in the care process. The fact that cluster 2 can be found in so many studies of patient portals shows that, when developing a multi-actor patient portal, developers must try to consider and embed existing agreements and consensus over records and codes. Otherwise, implementation of such a patient portal could be difficult, as caregivers may try to work around the patient portal to uphold interpersonal agreements not present in the portal.

The same process could also apply to cluster 3 (performance management) when it comes to monitoring the performance of care. By their digital nature and abilities around data collection, patient portals can be used to monitor the progress and performance of care. Several of the studies we reviewed showed this process in practice. This suggests that embedding uniform performance indicators, relevant client performance data and feedback tools in a patient portal could be beneficial to improving the care provided.

Sub-question c: Which clusters of the Minkman model are least prevalent within research on patient portals?

All other clusters are less clearly linked to patient portals. The least prevalent are clusters 6 (interprofessional teamwork) and 8 (commitment). This seems to coincide with our hypothesis that patient portals have not been embedded within healthcare long enough to fully address these clusters of integrated care.

Sub-question d: Which mechanisms are negatively correlated with clusters of the Minkman model?

We found only a limited number of items that were negatively related to a cluster of integrated care. Although the fact that we found some supports our hypothesis that there are mechanisms of patient portals that hinder integrated care, it is worth mentioning that researchers saw almost all the negative items as things that would disappear over time as portals are further developed or users and organizations gain more experience with them. This suggests that patient portals' negative impact on integrated care is primarily a matter of proper implementation. To further grasp that negative impact, more research on the implementation of patient portals seems prudent.

Sub-question e: Does the current research describe means to facilitate integrated care that are absent in the Minkman model?

Several studies show how patients and care providers welcome the ability to be able to use direct digital communication or to have patients control their own health and medical data. As described before, we were unable to connect these functionalities of patient portals to one of Minkman's clusters. The Minkman model seems to lack the perspective of the patient as an active member in the integrated care approach. A prime example of this is element 7.6, which mentions "realizing direct contact among professionals in the care chain" but does not mention patients.

We suspect that this lack of patient perspective is due to the fact that Minkman's model was constructed before patient portals existed and when it was less common to consider the patient an active member of the care team. As patient portals seem to endorse this notion of the patient as an active member of the integrated care process, we suggest viewing Minkman's model in this respect.

Additional findings

Study outcome

When looking at the outcome of patient portals, it struck us as odd that studies that focus on care coordination as an outcome measure mention the fewest clusters, while studies that focus on the attitude of users as an outcome mention the most clusters. This suggests that the most thorough studies on patient portals arrive at the most resilient aspect of using portals for integrated care: users' attitudes. Studies with less connection with integrated care clusters find factors which play a part in the early stages of patient portal development and use, but mainly appear to scratch the surface when it comes to implementation in the real world and the more intricate use of patient portals to enhance health care delivery.

Functionalities of the portal

We also found that all patient portals share similar functionalities, although they do not all share the same stage of development. This suggests that all patient portals could technically support integrated care if this were prominently addressed by developing parties.

Limitations

The limitations of this study are primarily related to the interpretation of the text in the studies on patient portals, as well as the descriptions of clusters and elements in the Minkman model. To score the articles, we needed a clear interpretation of the description of each cluster and a clear interpretation of the sentence or part of the text in the article. However, most studies did not focus on integrated care. In some cases, we had to read 'between the lines.' This approach means that it could also be possible that some of the researched patient portals actually contribute to some or all of the integrated care clusters without being described as such.

Additionally, we noticed that the clusters in the Minkman model were constructed without addressing digital means of delivering care. The model is based on identifying interpersonal agreements and working conditions. Within a patient portal, these processes and conditions are technically facilitated or stimulated by the digital nature of the portal. Because of this difference, we were forced to 'translate' the clusters and elements into a more digital approach. For example, a description like "reaching agreements [e.g., on procedures for ...]" is, in the case of patient portals, best interpreted as "facilitating [procedures for ...]." The ambiguity between the Minkman model and scientific literature on patient portals is also illustrated by the discussions between the reviewers who scored the articles.

Finally, there were some examples in which an item in an article could count towards two clusters, because of overlap in the description of those clusters. These dilemmas were solved by discussion between the two reviewers.

Comparison with prior work

To the best of our knowledge, this study is the first review study on patient portals with a focus on integrated care. One of the main expectations of patient portals is that they can provide more patient-centered and integrated care. Our research supports this claim. We set out to find studies that could provide some clues for how patient portals can foster patient-centered and integrated care. With patient portals becoming more common within different sectors of health care, we expect that more evidence on their use and functionalities will become available.

Conclusions

Rising costs of mental health care urge the need for effective (and cost effective) delivery of care. Since most mental health problems, especially chronic or complex problems, affect several domains of a person's life, the integrated care model is suggested to organize care more effectively. Despite robust knowledge about the key elements of integrated care, the integration of care in daily practice remains complicated. With the rise of the use of digital tools in healthcare, an alternative route for integrating care is suggested.

The expectation that these tools can lead to more efficiently and effectively organized healthcare is nowhere greater than with regards to patient portals. However, although research on patient portals is growing, the number of studies that address the particular potential of patient portals in facilitating integrated care remains small. Most research is focused on the experiences and expectations of patients and/or caregivers as individual users. Few studies have reflected on how portals can help (or obstruct) integrated care. With patient portals increasingly being developed and deployed in health care, this appears to create a knowledge gap concerning patient portals (and their effective implementation). To address this issue, we used the model of integrated care proposed by Minkman et al. [9] to review the current research on patient portals. Using this model, we were able to show that several studies on patient portals encompass items of integrated care, while not explicitly addressing the concept of integrated care.

Our review shows that, one way or another, all patient portals appear to be able to bring about integrated care. All the studies we examined described patient portals having a positive impact on at least one of the nine clusters of integrated care identified by Minkman, with patient-centeredness, delivery system and performance management being the most prominent. This shows that the promise of using patient portals to strengthen integrated care seems to have some merit.

All the negative impacts of patient portals on integrated care that we found seemed primarily linked to limits of user experience, technical development or incorporation of the portal in existing healthcare processes. All these themes relate to how patient portals are introduced and implemented. As such, it seems wise to focus research on patient portals on the process of implementing them in healthcare.

Minkman's model proved to be a feasible way to identify relevant parts of patient portals that promote or hinder integrated care, with one major distinction. The model primarily describes integrated care as a process organized and designed by care providers. However, this review shows that patient portals particularly contribute to integrated care when organized and designed from the

perspective of the patient being an active member in their own care. Whether this active role of patients to promote integrated care is only relevant to patient portals, or should be added to the Minkman model, remains open for debate.

Finally, we found that the most resilient factor in using patient portals for integrated care appears to be the attitude of users (both patients and care providers). Whether this attitude is similar across different users, and whether the attitude concerns the digital nature of patient portals or the interpersonal nature of integrated care, remains unclear. Further research on this subject seems to be necessary.

Based on our overall findings, we advocate using all the clusters of the Minkman model when investigating patient portals to foster integrated care, since this model can help design and implement patient portals more effectively.

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Conflicts of Interest

None Declared

Multimedia Appendix 1

Minkman's nine cluster description and their elements of integrated care

Multimedia Appendix 2

Summaries of each article in the review

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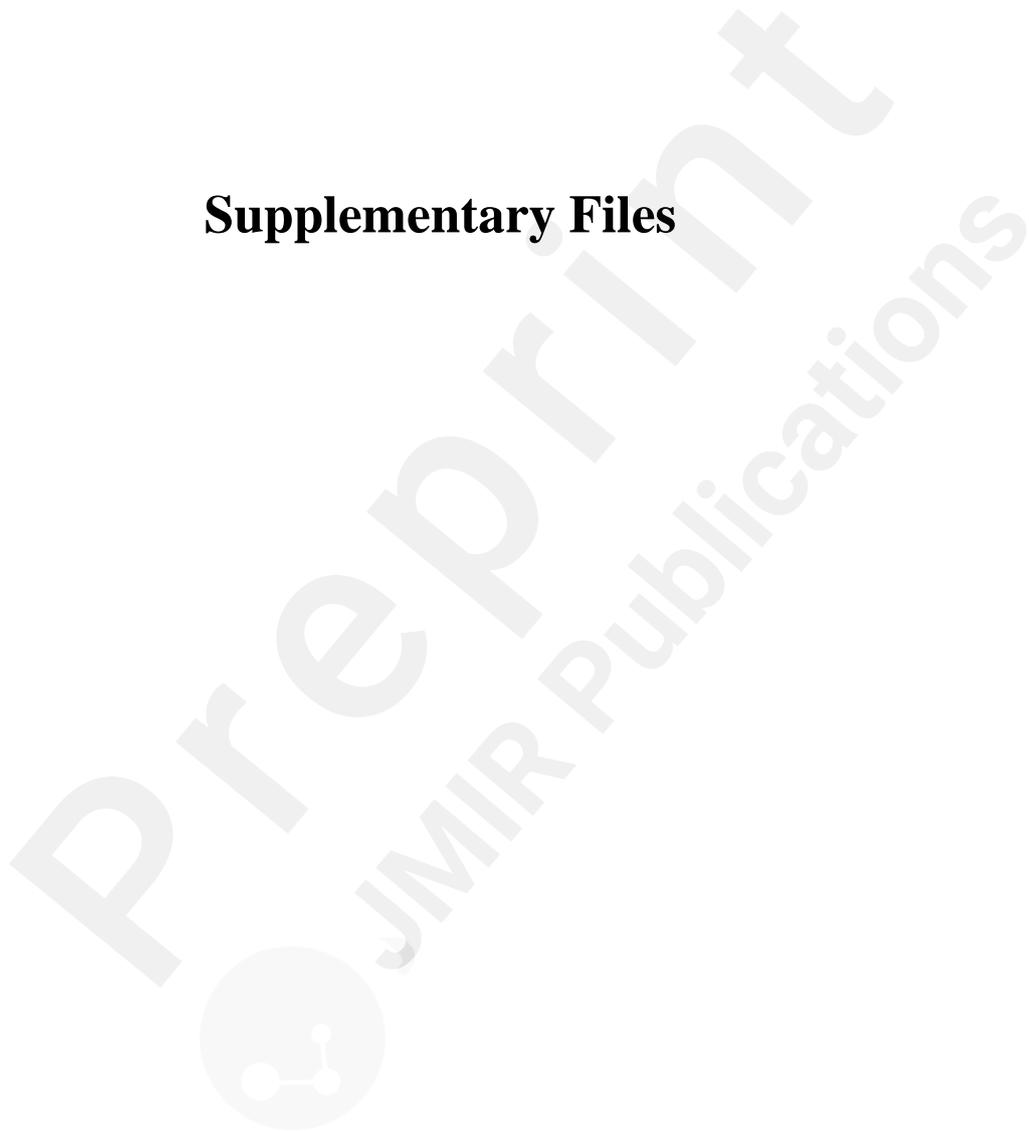
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Abbreviations

EHR	electronic health record
ePHR	electronic patient health record
GDP	gross domestic product
HIE	health information exchange
IPHR	interactive preventive health record
PCMH	patient-centered medical homes
PHR	personal health record

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Supplementary Files



Multimedia Appendixes

Overview of all the elements of each cluster of the Minkman Model.

URL: <https://asset.jmir.pub/assets/2d0be14832fa721cc85e414b1319de90.docx>

Summary of reviewed articles.

URL: <https://asset.jmir.pub/assets/f832f5c57445cdbadc801143c3b6bc41.docx>