

Review

Impact of Digital Health on Patient-Provider Relationships in Respiratory Secondary Care Based on Qualitative and Quantitative Evidence: Systematic Review

Michaela Senek¹, PhD; David Drummond², MD, PhD; Hilary Pinnock³, Prof Dr Med; Kjeld Hansen⁴, MSc IT; Anshu Ankolekar⁵, PhD; Úna O'Connor⁶, ANP, MSc; Apolline Gonsard², MD; Oleksandr Mazulov⁷, MD, PhD; Katherina Bernadette Sreter⁸, MD, PhD; Christina Thornton⁹, MD, PhD; Pippa Powell⁴, PhD

¹School of Medicine and Population Health, Sheffield Centre for Health and Related Research (SCHARR), University of Sheffield, Sheffield, United Kingdom

²Department of Pediatric Pulmonology and Allergology, University Hospital Necker Enfants Malades, APHP, Université Paris Cité, Paris, France

³Usher Institute, The University of Edinburgh, Edinburgh, United Kingdom

⁴European Lung Foundation, Sheffield, United Kingdom

⁵The D-Lab, Department of Precision Medicine, GROW - Research Institute for Oncology and Reproduction, Maastricht University, Maastricht, The Netherlands

⁶Department of Respiratory, University Hospital Limerick, HSE Mid West, Limerick, Ireland

⁷First Pediatric Department, National Pirogov Memorial Medical University, Vinnytsia, Ukraine

⁸Department of Pulmonology, University Hospital Centre "Sestre Milosrdnice", Zagreb, Croatia

⁹Department of Medicine, University of Calgary, Calgary, AB, Canada

Corresponding Author:

Michaela Senek, PhD

School of Medicine and Population Health

Sheffield Centre for Health and Related Research (SCHARR)

University of Sheffield

30 Regent Street

Western Bank

Sheffield, S14DA

United Kingdom

Phone: 44 7788661390

Email: m.senek@sheffield.ac.uk

Abstract

Background: Digital health technology adoption has accelerated in respiratory care, particularly since the COVID-19 pandemic, supporting various applications from self-management to telerehabilitation. While these technologies have transformed health care delivery, their impact on the patient-provider relationship in specialist respiratory care remains poorly understood.

Objective: This study aims to systematically review the literature on the impact of digital health technology on the patient-provider relationship in respiratory secondary care settings and to understand the factors that enhance or diminish this relationship.

Methods: In December 2023, we conducted a systematic review following Cochrane methodology, searching MEDLINE, Embase, CINAHL, Cochrane databases, and PsycINFO. We included qualitative, quantitative, and mixed methods studies examining digital health interventions in respiratory secondary care. Trained volunteers from the European Respiratory Society CONNECT Clinical Research Collaboration performed screening and data extraction. We conducted a qualitative meta-synthesis of findings, followed by an abductive quantitative data analysis. A total of 3 stakeholder workshops were held to interpret findings collaboratively with patients and health care professionals.

Results: From 15,779 papers screened, 97 met the inclusion criteria (55 qualitative/mixed-methods studies, 42 quantitative studies). Studies covered various respiratory conditions, including COPD (32%), asthma (26%), and COVID-19 (13%). Four main themes emerged: trust (foundational to the relationship), adoption factors (including clinical context and implementation drivers), confidence in technology (based on functionality and the evidence base), and connection (encompassing communication and a caring presence). Digital health technology can either enhance or diminish trust between patients and clinicians, with

patients' perceptions of the motivations behind its implementation being crucial. While technology facilitated access and communication, remote consultations risked depersonalisation, particularly when not balanced with in-person interactions. Self-monitoring and access to information empowered patients and promoted more equitable patient-provider relationships.

Conclusions: Digital health technology can either strengthen or weaken patient-provider relationships in respiratory care, with effects impacted by adoption factors, confidence in technology, connection, and patient empowerment. Maintaining trust in the era of digital care requires transparent implementation of motivations, consideration of individual circumstances, and reliable technology that supports rather than replaces the therapeutic relationship.

Trial Registration: PROSPERO CRD42024493664; <https://www.crd.york.ac.uk/PROSPERO/view/CRD42024493664>

(*J Med Internet Res* 2025;27:e70970) doi: [10.2196/70970](https://doi.org/10.2196/70970)

KEYWORDS

telemedicine; digital health; patient-provider relationship; respiratory care; systematic review; trust

Introduction

Digital Health Technologies and Their Benefits

Digital technologies encompass a broad range of tools, including telemedicine, electronic health records, mobile health apps, wearable devices, and artificial intelligence (AI)-assisted diagnostics [1]. These technologies have significantly transformed health care delivery by improving accessibility, efficiency, and continuity of care. The World Health Organization (WHO) has highlighted digital health as a strategy to achieve universal health care coverage, particularly by facilitating remote care and enhancing support for vulnerable populations [2,3]. Digital health tools also allow for remote monitoring of disease progression, support for assisted living, and implementation of cloud-based health care systems.

Acceleration of Digital Health Adoption During the COVID-19 Pandemic

The adoption of digital health technologies accelerated dramatically during the COVID-19 pandemic as health care systems adapted to the need for remote care. The crisis led to a surge in teleconsultations, virtual wards, home treatments, and digital self-management tools, many of which have persisted beyond the pandemic [4]. Both patients and health care providers embraced these changes, recognizing their potential to enhance access to care while reducing unnecessary hospital visits. However, the rapid shift to digital health care also raised concerns about digital equity, access disparities, and the potential depersonalization of care.

Relevance for Patients With Respiratory Disease

Patients with respiratory diseases were among the groups most affected by the digital transformation of health care [5]. Conditions such as chronic obstructive pulmonary disease (COPD), asthma, and cystic fibrosis require ongoing monitoring and frequent interactions with health care providers. Given the complexity of managing respiratory diseases, the shift to digital care also raised concerns regarding patient engagement, adherence to treatment, and the impact on the patient-provider relationship, particularly in the secondary care setting, where interactions are typically episodic rather than continuous.

Impact of Digital Health on the Patient-Provider Relationship

Predating widespread adoption of digital health, Ridd et al [6] in primary care conceptualized the patient-provider relationship as being built on continuity, interpersonal communication, and trust. Their framework emphasized that long-term patient-provider interactions foster deeper connections, leading to better health outcomes.

In the digital era, the dynamics of these relationships have shifted. In a review of reviews, Ramachandran et al [7] found that eHealth technologies have a mixed impact on relationships and trust in primary care patient-provider interactions, depending on patient perceptions, provider communication skills, technology design, and organizational factors. They concluded that training providers in technology-specific communication skills and ensuring that eHealth implementations were equitable and considerate of diverse patient needs can foster trust and maintain strong relationships. Similarly, a scoping review that explored the theoretical perspectives underpinning research on the physician-patient relationship in digital health practice emphasized the need for ethical considerations in medical practice to ensure that technology enhances, rather than hinders, the quality of care [8].

These reviews have focused on primary care, where patients benefit from long-term relationships with a single local provider. In contrast, in secondary care, interactions may be with multiple specialists sometimes at a substantial distance, typically short-term rather than continuous. This was a key theme raised by patients and professionals within the Institute for Healthcare Improvement-funded Rapid and Secure AI-enhanced Diagnosis, Precision Medicine and Patient Empowerment Centered Decision Support System for Coronavirus Pandemics (DRAGON) project, which focused on care during the COVID-19 pandemic. We, therefore, aimed to systematically review the literature on the impact of digital health technology on the patient-provider relationship and to understand the factors that enhance or diminish it in respiratory secondary care settings.

Methods

Overview

Our systematic review is registered with the International Prospective Register of Systematic Reviews (PROSPERO;

CRD42024493664) and follows the Cochrane methodology [9] and the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. There were no deviations from the registered protocol. We used Covidence software to manage the screening and data extraction process [10].

Search Strategy and Selection Criteria

The search strategy had three components: digital health care, respiratory conditions (including COVID-19), and patient-provider relationships. Detailed methods are outlined

in [Multimedia Appendix 1](#). We applied English-language search filters but no study design or date limits. Searches were conducted in December 2023 in Ovid MEDLINE, Embase, and CINAHL via ESBCO, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, and PsycINFO. Duplicates were detected and removed using Covidence software.

Eligibility Criteria

Our inclusion and exclusion criteria are presented in [Textbox 1](#).

Textbox 1. Inclusion and exclusion criteria.

Inclusion criteria

- Population: respiratory disease patients, both adult and pediatric.
- Interventions: eHealth technology, mobile health technology, or artificial intelligence.
- Comparator: standard care (if appropriate: eg, in controlled intervention studies)
- Outcome: the quality of the patient-provider relationship changes in the patient-provider relationship.
- Study design: qualitative, mixed-methods studies, randomized controlled trials, cross-sectional
- Setting: secondary care settings only. This includes hospital or clinic-based medical specialist care and can consist of urgent and emergency care, or planned elective care.

Exclusion criteria

- Systematic reviews, abstracts, conference papers, protocols or commentaries, and studies in primary care settings.

Screening and Data Extraction

Following a training program, 30 volunteer clinicians and researchers from the European Respiratory Society CONNECT Clinical Research Collaboration [11] contributed to the screening of titles and abstracts. The volunteers came from various health care professions, including doctors, nurses, physiotherapists, clinicians, academic researchers, and basic scientists. The training program consisted of multiple stages. For screening titles and abstracts, reviewers attended a session where they received detailed screening guidelines, including clear criteria for “yes,” “no,” and “maybe” decisions. Articles meeting all 3 key criteria (digital health, patient-provider relationship, and respiratory disease) were marked as “yes.” Articles covering none or only one of these areas were marked as “no.” Any articles where reviewers were uncertain or partially met criteria were marked as “maybe.” Following this initial training, reviewers completed a practical exercise screening 100 test articles to gain hands-on experience with the criteria. After 2 weeks of independent screening practice, a second session was held to address questions that had emerged during the preliminary screening exercise and clarify any areas of uncertainty. All articles marked as “maybe” were subsequently reviewed by 2 senior reviewers to ensure quality and consistency. All authors and DRAGON or CONNECT group members performed the title and abstract stage. A total of 6 reviewers (MS, DD, HP, PP, AK, and KH) led by MS and DD resolved conflicts and oversaw quality [12]. Following a similar multistage training program, MS, DD, PP, HP, KH, OM, AA, CT, AG, KBS, and UC conducted the full-text screening with MS and DD, resolving conflicts and overseeing quality.

Quality Assessment

A total of 2 reviewers assessed the methodological quality of the studies using the relevant Critical Appraisal Skills Programme (CASP) checklist [8]. We selected this tool because it includes an assessment of the paper’s relevance to the review aim (“Will the results help our review?”). We anticipated that the patient-provider relationship was unlikely to be a primary objective in most studies, so using the CASP tool enabled us to identify and emphasize the findings from studies whose aims aligned most closely with our research question. CASP does not generate a total score. We classified the studies as those that explored the patient-provider relationship: (1) as the primary aim, (2) as a secondary objective when the authors had explicitly defined it as such in the methods section, or (3) as a coincidental outcome when it was identified in the results but not prespecified in the methods.

Data Analysis

Qualitative Meta-Synthesis

We initially applied the framework from Ridd et al [6], which defines knowledge, trust, loyalty, and regard as constructs of the depth of a patient-provider relationship within the long-term context of primary care relationships. However, because it did not reflect all aspects of digital health care as described in our included papers, MS and DD undertook a thematic meta-synthesis. The data were coded into subthemes and overarching themes using Quirkos software (version 2.3).

Abductive Analysis for Quantitative and Mixed Methods Findings

Categories emerging from the qualitative meta-synthesis provided a framework to organize the quantitative data. A total of 2 researchers (MS and DD) followed an abduction process [13] to consider narratives around elements of the patient-provider relationship affected (positively or negatively) by digital health care. We integrated objective measures (quantitative surface) and latent phenomena to understand these elements.

Stakeholder Engagement Workshops to Interpret Findings

Our work followed the consultation and application approaches to collaborative analysis defined by Jennings et al [14]. Aligned with the methodology of collaborative analysis [15] we presented our preliminary analysis in 3 workshops with patients, patient representatives, and health care professionals. Following an initial analysis within the research team, we carried out the workshops (one for health care professionals and managers, one for patients and patient representatives, and a final workshop for all stakeholder groups. Participants provided verbal and written feedback using Groupmap [16] and engaged in consensus activities, such as using WordCloud functions [17] to inform the interpretation of the findings. Interactive techniques (Wordclouds, GroupMap, and Chat) facilitated engagement in consensus activities, which we used to inform further analysis and interpretation of the findings.

The final analysis stage involved fully integrating the quantitative and qualitative datasets. The research team's

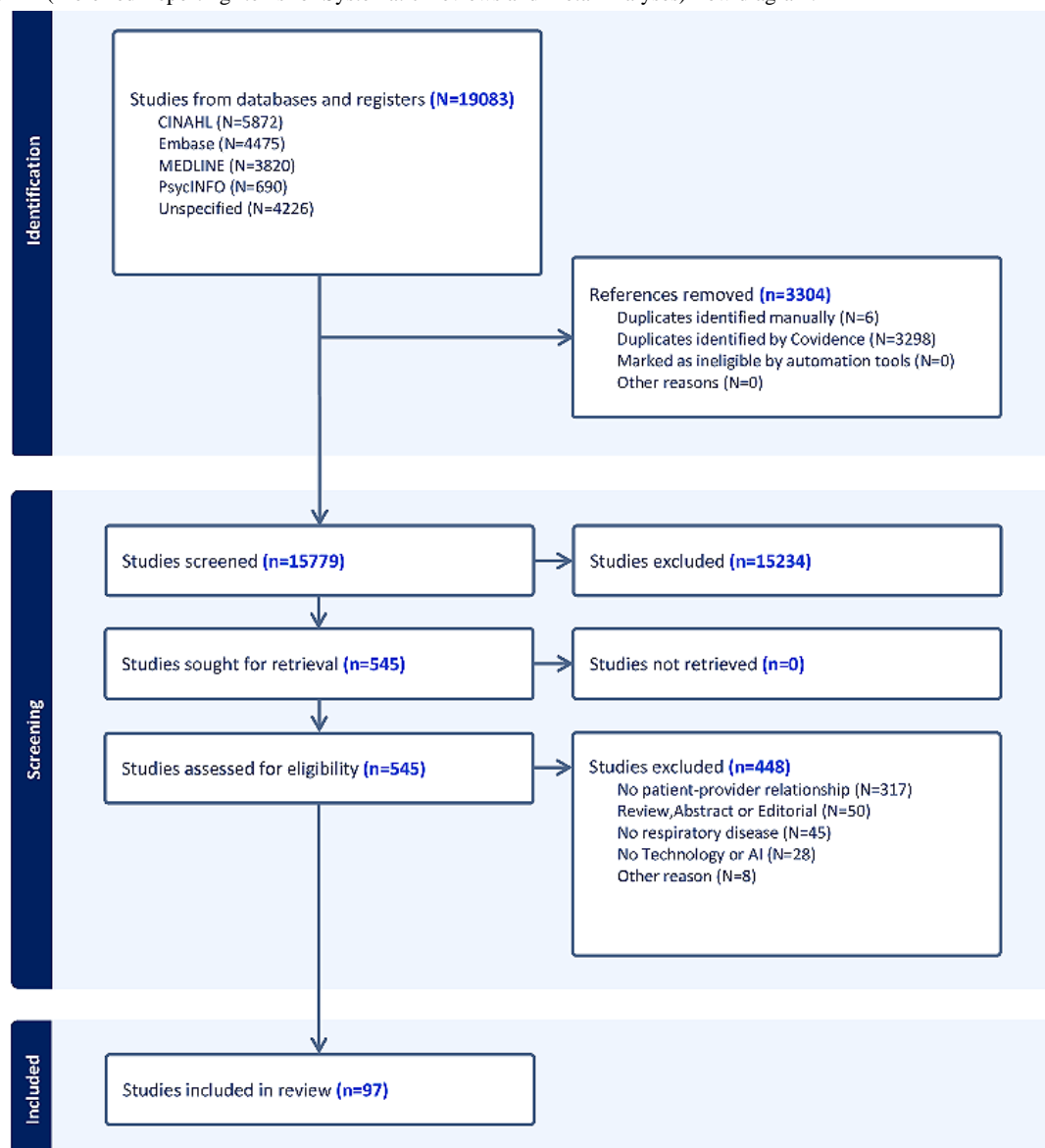
iterative discussions achieved this by aligning the 2 datasets and comparing what is familiar with what is unfamiliar to generate robust explanations [13].

Results

Overview

Following deduplication, we screened titles and abstracts of 15,779 papers; 545 were retrieved for full-text review. We included studies that reported using digital health technologies, including diagnosis, consultations, treatment, and monitoring. We included all studies that comprised respiratory disease patient groups of any age, gender, and disease severity. We excluded studies that did not examine respiratory conditions in secondary care settings or report on the patient-provider relationship.

The primary reason for exclusion at the title and abstract screening stage was the lack of reported primary outcome of interest and the relationship between patient and provider, resulting in 15,234 excluded studies. In the second screening stage of full texts, the main reasons for exclusion were insufficient reporting on the patient-provider aspect (316 full texts excluded), patients with no respiratory disease (45 studies), wrong study design (50 studies in total), and no technology (28 studies). In total, we identified 97 studies that met our inclusion criteria and had sufficiently reported on the aspects of patient-provider relationships (see the PRISMA flow diagram in [Figure 1](#) and checklist in [Multimedia Appendix 2](#)).

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.

Characteristics of the Studies Included

Tables 1 (for qualitative studies, 56/97, 58%) and 2 (for quantitative studies, 41/97, 42%) present the included studies.

A third of the studies (29/97, 30%) were carried out after the onset of the pandemic. The studies included a broad range of respiratory conditions: COPD (23/97, 24%), asthma (22/97, 23%), lung cancer (10/97, 10%), COVID-19 (9/97, 9%), tuberculosis (9/97, 9%), cystic fibrosis (7/97, 7%), sleep apnea

(2/97, 2%), and interstitial lung disease (1/97, 1%) studies. The remaining 14 out of 97 (14%) studies included multiple respiratory conditions (including COVID-19). The primary aim of almost all the studies was testing a device. Only 6 out of 97 (6%) studies had a primary aim directly related to the patient-provider relationship; in 8 out of 97 (8%) studies, the relationship was an explicit secondary objective. Most studies (83/97, 86%) coincidentally reported an outcome relevant to the patient-provider relationship.

Table 1. Included qualitative and mixed methods studies.

Study characteristics						Theme			
Study	Applicability	Country	System type	Disease	COVID-19 era	Adoption factors	Confidence in technology	Connection	Patient empowerment
Mantzounaris ^a [18]	Low	Greece	Telehealth (teleconsultation)	Asthma	Pre	Ctxt ^b	— ^c	Communication	Self-efficacy
Hibbert et al [19]	Moderate	United Kingdom	Telehealth (telemonitoring)	COPD ^d	Pre	—	TP ^e	Depersonalization	—
van Baar et al [20]	Moderate	United Kingdom	Telehealth (teleconsultation)	Asthma	Pre	—	—	Communication, Depersonalization	—
Whitten and Mickus [21]	Moderate	United States	Telehealth (teleconsultation)	COPD	Pre	—	—	Communication	—
Cornwall et al [22]	Moderate	United Kingdom	Communication	Lung cancer	Pre	PoM ^f	—	Communication	—
Mair et al [23]	Moderate	United Kingdom	Telehealth (telemonitoring)	COPD	Pre	Ctxt, PoM	TP, SoE ^g	CP ^h , Depersonalization	—
Hoffman et al [24]	Low	Kenya	Telehealth (telemonitoring)	Tuberculosis	Pre	—	—	Communication	—
Shany et al [25]	Low	Australia	Telehealth (telemonitoring)	COPD	Pre	—	TP	—	Self-efficacy
Cox et al [26]	Low	Australia	Telehealth (telemonitoring)	Lung cancer	Pre	Ctxt	IA ⁱ	Depersonalization	—
Fairbrother et al [27]	High	United Kingdom	Telehealth (telemonitoring)	COPD	Pre	—	TP	Communication, CP, CoC ^j	—
Kim et al [28]	Low	South Korea	Telehealth (telemonitoring)	COPD	Pre	—	—	Communication, CoC	—
Dinesen et al [29]	Moderate	Denmark	Telehealth (telerehabilitation)	COPD	Pre	Ctxt	—	CP	Self-efficacy
Huniche et al [30]	Moderate	Denmark	Telehealth (self-monitoring)	COPD	Pre	—	—	CP	Self-efficacy
Damhus et al [31]	Moderate	Denmark	Telehealth (telemonitoring)	COPD	Pre	—	—	CP	Self-efficacy
Brown-Johnson et al [32]	Low	United States	Education	Lung cancer	Pre	—	—	Communication	Self-efficacy
Kenealy et al [33]	Moderate	New Zealand	Telehealth (telemonitoring)	COPD	Pre	—	—	Communication, CP	Self-efficacy
Maguire et al [34]	Low	United Kingdom	Telehealth (telemonitoring)	Lung cancer	Pre	—	IA	Communication, CP	Self-efficacy, SDM ^k
Roberts et al [35]	Low	United States	Telehealth (teleconsultation)	Asthma	Pre	PoM	—	Communication	Self-efficacy
Dichmann Sorknaes [36]	Low	Denmark	Telehealth (teleconsultation)	COPD	Pre	—	IA	Communication, CP	—
Daftary et al [37]	Moderate	Ethiopia	Communication	Tuberculosis	Pre	Ctxt	TP, SoE	—	—
Hirsch-Moverman et al [38]	Moderate	Lesotho	Communication	Tuberculosis	Pre	PoM	—	Communication, CoC	—
Kopanitsa [39]	Moderate	Russia	Communication	Tuberculosis	Pre	PoM, DoI ^l	SoE	Communication	Self-efficacy
Nhavoto et al [40]	Moderate	Mozambique	Communication	Tuberculosis	Pre	Ctxt	—	Communication	Self-efficacy

Study characteristics					Theme				
Study	Applicability	Country	System type	Disease	COVID-19 era	Adoption factors	Confidence in technology	Connection	Patient empowerment
Nissen and Lindhardt [41]	Moderate	Denmark	Telehealth (teleconsultation)	COPD	Pre	PoM	TP	Communication, CP, CoC	Self-efficacy
Damhus et al [31]	Moderate	Denmark	Telehealth (telerehabilitation)	COPD	Pre	PoM	TP, IA, SoE	Communication	—
Liacos [42] et al	Low	Australia	Telehealth (telerehabilitation)	Mixed	Pre	—	—	Communication, CP	—
Hamilton et al [43]	Moderate	United States	Decision support	Lung cancer	Pre	PoM	—	Communication	SDM
Patel et al [44]	High	United States	EHR ^m	Asthma	Pre	—	—	Communication	—
Rudin et al [45]	Moderate	United States	Telehealth (telemonitoring)	Asthma	Pre	—	—	CP	Self-efficacy
Boström et al [46]	High	Sweden	Telehealth (teleconsultation)	COPD	Pre	—	—	Communication, CP	Self-efficacy
Drabble et al [47]	Moderate	United Kingdom	Telehealth (telemonitoring)	CF ⁿ	Pre	—	—	CP	Self-efficacy
Kuntz et al [48]	Low	United States	Telehealth (teleconsultation)	COVID-19	Post	Ctxt, PoM	—	Communication, CP	—
Lewis et al [49]	Low	United Kingdom	Telehealth (teleconsultation)	COVID-19	Post	Ctxt	—	—	—
Maguire et al [50]	Moderate	United Kingdom	Telehealth (telemonitoring)	Lung cancer	Pre	CC	—	Communication, CP	—
Van Citters ^a et al [51]	Moderate	United States	Telehealth (telemonitoring)	CF	Pre	PoM	—	C P	Self-efficacy, SDM
van Lieshout et al [52]	Moderate	Canada	Telehealth (telemonitoring)	COPD	Pre	Ctxt, PoM, DoI	TP, SoE	Communication, CoC	Self-efficacy
Yamada et al [53]	Low	Canada	Decision support	Asthma	Pre	Ctxt, PoM	—	—	Self-efficacy, SDM
Bains et al ^a [54]	Low	United States	Telehealth (teleconsultation)	COVID-19	Post	—	—	Communication, CP	—
Jácome et al [55]	Low	Portugal	Telehealth (teleconsultation)	Asthma	Pre	—	—	Communication, CoC	Self-efficacy
Kennedy et al [56]	High	United States	Telehealth (teleconsultation)	Mixed	Post	Ctxt	TP	Communication, Depersonalization	—
Legler et al [57]	Moderate	United States	Telehealth (teleconsultation)	COVID-19	Post	PoM	—	Communication, CP, Depersonalization	—
Sekandi et al [58]	Moderate	Uganda	Telehealth (telemonitoring)	Tuberculosis	Pre	Ctxt, PoM	IA	Communication, CP, CoC	—
Thomas et al [59]	Moderate	India	Telehealth (telemonitoring)	Tuberculosis	Pre	PoM	—	CP	—
Wu et al [60]	Low	United Kingdom	Telehealth (teleconsultation)	COPD	Post	Ctxt, PoM	—	—	Self-efficacy, SDM
Gillett and Hope-Gill [61]	Moderate	United Kingdom	Telehealth (teleconsultation)	ILD ^o	Post	PoM, CC	IA	Depersonalization	—
Haynes ^a et al [62]	Moderate	United States	Telehealth (teleconsultation)	Asthma	Post	Ctxt, PoM	—	Communication, Depersonalization	—

Study characteristics					Theme				
Study	Applicability	Country	System type	Disease	COVID-19 era	Adoption factors	Confidence in technology	Connection	Patient empowerment
Jiang et al [63]	Moderate	China	Telehealth (telerehabilitation)	COPD	Post	Ctxt, PoM	IA, SoE	Depersonalization	Self-efficacy
Makhecha et al [64]	Low	United Kingdom	Telehealth (teleconsultation)	Mixed	Post	—	—	Communication, Depersonalization	—
Misplon et al [65]	Low	Belgium	Telehealth (telemonitoring)	Lung Cancer	Post	—	—	Communication	—
Nayyar et al [66]	Moderate	Canada	Telehealth (teleconsultation)	Mixed	Post	Ctxt, PoM	—	Depersonalization	—
Sandau et al [67]	Low	Denmark	Medical device	COPD	Post	PoM	TP	CP, Depersonalization	—
Cox et al [68]	Low	New Zealand	Telehealth (telerehabilitation)	Mixed	Pre	Ctxt	TP	Depersonalization	Self-efficacy, SDM
Hattingh et al [69]	Moderate	Australia	Telehealth (teleconsultation)	COVID-19	Post	Ctxt	—	Communication, CoC	—
Kazmerski et al [70]	Moderate	United States	Telehealth (teleconsultation)	CF	Post	—	IA	—	Self-efficacy, SDM
Robinson et al [71]	Low	United Kingdom	Diagnostics	COPD	Post	—	TP, IA, SoE	CP, CoC	Self-efficacy
Watanabe et al [72]	Moderate	United States	Telehealth (self-monitoring)	CF	Pre	—	—	Communication	Self-efficacy, SDM

^aStudies that included children.

^bCtxt: context.

^cNot applicable.

^dCOPD: chronic obstructive pulmonary disease.

^eTP: technology performance.

^fPoM: perception of motivations.

^gSoE: strength of evidence.

^hCP: caring presence.

ⁱIA: interaction anxiety.

^jCoC: continuity of care.

^kSDM: shared decision-making.

^lDoI: drivers of implementation.

^mEHR: electronic health record.

ⁿCF: cystic fibrosis.

^oILD: interstitial lung disease.

Table 2. Included quantitative studies.

Study characteristics						Theme			
Study	Applicability	Country	System type	Disease	COVID-19 era	Adoption factors	Confidence in technology	Connection	Patient empowerment
Pacht et al [73]	Moderate	United States	Telehealth (teleconsultation)	Mix of respiratory diseases	Pre	— ^a	—	Communication	Self-efficacy
Stepnowsky et al [74]	Moderate	United States	Telehealth (telemonitoring)	Sleep apnea	Pre	—	—	Communication, Depersonalization, CoC ^b	—
Varkey et al [75]	Moderate	United States	Telehealth (telemonitoring)	Mix of respiratory diseases	Pre	PoM ^c	TP ^d , SoE ^e	Communication	—
Agha et al [76]	Moderate	United States	Telehealth (teleconsultation)	Mix of respiratory diseases	Pre	—	—	Communication, Depersonalization	—
Zamith et al [77]	Low	Portugal	Telehealth (Teleconsultation)	Mix of respiratory diseases	Pre	CoC, PoM	—	CP ^f	—
Byczkowski et al ^g [78]	Low	United States	Telehealth (Telemonitoring)	CF ^h	Pre	—	IA ⁱ	Communication, Depersonalization	—
Nield and Hoo [79]	Low	United States	Telehealth (Teleconsultation)	COPD ^j	Pre	—	—	CP	Self-efficacy
Chih et al [80]	Low	United States	Telehealth (Teleconsultation)	Lung cancer	Pre	—	—	Communication, CP	Self-efficacy
Pinnock et al [81]	Low	United Kingdom	Telehealth (Telemonitoring)	COPD	Pre	—	—	CoC	Self-efficacy
Cingi et al [82]	Low	Turkey	Telehealth (Teleconsultation)	Asthma	Pre	—	TP, SoE	Communication, CP	—
Apter et al [83]	Low	United States	Telehealth (Teleconsultation)	Asthma	Pre	PoM, CoC	—	Communication, CP	—
Wiecha ^g et al [84]	Low	United States	Telehealth (teleconsultation)	Asthma	Pre	PoM	—	Communication, CP	Self-efficacy
Fadaizadeh et al [85]	Moderate	Iran	Telehealth (Telemonitoring)	Asthma	Pre	—	TP, IA	Communication, CP	—
Rosenberger et al [86]	Low	United States	Telehealth (Telemonitoring)	Mix	Pre	DoI ^k	TP	Communication, CP	—
Poureslami [87]	Low	Canada	Telehealth (Teleconsultation)	Asthma	Pre	—	IA	Depersonalization	Self-efficacy
Sleath ^g et al [88]	High	United States	Telehealth (teleconsultation)	Asthma	Pre	DoI	—	Communication, CP	Self-efficacy
Morita et al [89]	Low	Canada	Telehealth (telemonitoring)	Asthma	Pre	—	—	Communication, Depersonalization	Self-efficacy, Depersonalization
Sonney ^g et al [90]	Low	United States	Telehealth (telemonitoring)	Asthma	Pre	—	TP	Communication	Self-efficacy, SDM ^l
Apter et al [91]	Low	United States	Communication	Asthma	Pre	—	IA	Communication, CP	Self-efficacy
Gaynor et al [92]	Low	United States	Telehealth (teleconsultation)	Asthma	Pre	DoI	—	Communication	Self-efficacy, SDM
Kneuert et al [93]	Low	United States	Telehealth (teleconsultation)	Lung cancer	Pre	—	—	CoC, CP	Self-efficacy
Koff et al [94]	Low	United States	Telehealth (telemonitoring)	COPD	Pre	—	—	—	Self-efficacy, SDM
Opipari-Arrigan ^g et al [95]	Moderate	United States	Communication	CF	Pre	—	—	Communication	Self-efficacy, SDM

Study characteristics						Theme			
Study	Applicability	Country	System type	Disease	COVID-19 era	Adoption factors	Confidence in technology	Connection	Patient empowerment
Perlman et al [96]	Low	United States	Telehealth (teleconsultation)	COVID-19	Post	PoM	—	Communication	Self-efficacy, SDM
Al-Sharif [97]	Low	Saudi Arabia	Telehealth (telemonitoring)	COPD	Post	—	IA, SoE	Communication, Depersonalization	—
Davis ^g [98]	Low	United States	Telehealth (teleconsultation)	Mix of respiratory diseases	Post	PoM	IA, SoE	Depersonalization	—
Gashu et al [99]	Moderate	Ethiopia	Telehealth (teleconsultation)	Tuberculosis	Post	—	—	Communication, CP	Self-efficacy
Hendra et al [100]	Moderate	United States	Telehealth (teleconsultation)	CF	Pre	CoC	IA	—	Self-efficacy
Meshkov et al [101]	Low	Russia	Communication	Tuberculosis	Pre	—	—	Communication	—
Kowatsch ^g et al [102]	Low	Switzerland	Telehealth (teleconsultation)	Asthma	Pre	PoM	—	Communication, Depersonalization	—
Mustafa et al [103]	Low	United States	Telehealth (teleconsultation)	Asthma	Post	Ctxt ^m	—	Depersonalization	—
Sousa [104]	Moderate	Portugal	Telehealth (teleconsultation)	Asthma	Post	Ctxt	—	Communication, Depersonalization	—
Benson et al [105]	Low	United States	Telehealth (teleconsultation)	Lung cancer	Pre	CoC	IA	Depersonalization	—
Bukstein et al [106]	Low	United States	Telehealth (teleconsultation)	Mix of respiratory diseases	Post	—	SoE, IA	Depersonalization	—
Nelson et al [107]	Low	United States	Telehealth (teleconsultation)	Mixed	Post	Ctxt	—	Communication, Depersonalization	—
Shinoda et al [108]	Moderate	Japan	Telehealth (telemonitoring)	Mix of respiratory diseases	Post	PoM	—	Depersonalization	Self-efficacy
Chun et al [109]	Low	United States	Telehealth (telemonitoring)	Sleep apnea	Pre	—	TP, SoE	Communication, CoC	—
Coker ^g et al [110]	Moderate	United States	Telehealth (teleconsultation)	Asthma	Post	—	—	Communication	Self-efficacy, SDM
Lawrence ^g et al [111]	Low	Australia	Telehealth (teleconsultation)	COVID-19	Post	PoM	—	Communication, CoC	—
Varghese et al [112]	High	India	Telehealth (teleconsultation)	COVID-19	Post	—	—	Communication	—
Zhuge et al [113]	Moderate	China	Diagnostics	COVID-19	Post	Ctxt, PoM	—	Communication	—

^aNot applicable.

^bCoC: continuity of care.

^cPoM: perception of motivations.

^dTP: technology performance.

^eSoE: strength of evidence.

^fCP: caring presence.

^gStudies which included children.

^hCF: Cystic fibrosis.

ⁱIA: interaction anxiety.

^jCOPD: chronic obstructive pulmonary disease.

^kDoI: drivers of implementation.

^lSDM: shared decision making.

^mCtxt: context.

Themes from the Integrative Analysis

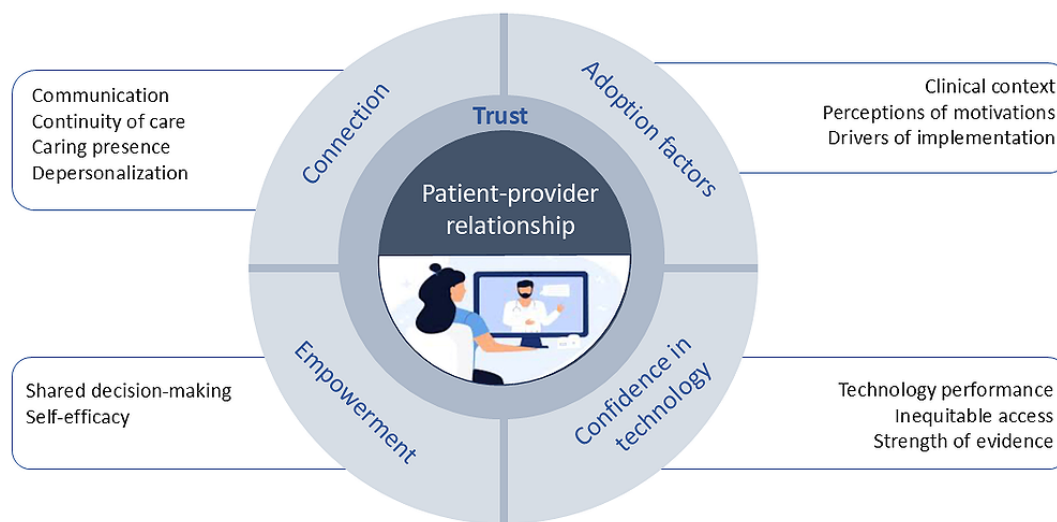
Initial coding resulted in 12 subthemes synthesized into four main themes: adoption factors, confidence in technology, connection, and empowerment (Figure 2). The figure illustrates how each of the four main themes (each described below) influences the trust within the patient-provider relationship. The quantitative data collected corroborated our 4 main themes. Detailed examples of supporting quantitative evidence for each theme and subtheme are presented in Multimedia Appendix 3,

strengthening our thematic framework through methodological triangulation.

Figure 2 should be interpreted from the outer elements inwards, illustrating how each layer influences the next: digital respiratory care affects intermediate themes (eg, continuity of care), which influence core themes (eg, connection), ultimately impacting trust within the patient-provider relationship at the center.

We describe the four themes below using data extracts to clarify and confirm their meanings. Each theme was reasonably equally weighted in frequency of occurrence.

Figure 2. Themes and subthemes.



Trust

Trust emerged as the foundational element in the patient-provider relationship. Trust was defined as “the patient’s confidence that the physician will do what is best for the patient” [6]. Digital care could impact the other four themes (adoption factors, confidence in technology, connection, and empowerment), enhancing or diminishing trust.

Adoption Factors

The clinical context significantly influenced the adoption [61]. In the context of a pandemic, where visiting hospitals was unsafe, remote care was more acceptable [114].

I think it’s (telephone consulting) the norm because of the circumstances...nobody wants to get COVID [61]. [telephone consultations during the pandemic]

The severity of the patient’s condition also affected their confidence in using digital health technologies. Those with milder conditions were more willing to use them compared to those with severe or complex conditions, who may prefer in-person consultations [106], for instance, older patients with respiratory diseases during the pandemic).

Patients’ perceptions of the drivers of implementation and the motivation behind using digital health technologies influenced trust. Policy, organizations, and clinicians could drive technology implementation. Or it could be a complex sequence of these as policy pushed organizations to implement change,

which then pushed professionals to use technology [115]. Patients could also advocate for using digital health technologies [71].

Patients’ trust was enhanced when digital health care was implemented to increase patient safety and convenience and improve outcomes [100], and it was diminished if technology was used primarily to save time and resources [116].

Confidence in Technology

Trust in technology was intertwined with trust in the health care providers who recommended the technology [117], shaping the overall connection and trust built within the relationship [118]. Patients’ trust in clinicians’ professional judgment was interrelated with how trustworthy patients perceived the technology [40].

Confidence in technology is the belief that you can use technology with ease and competence and that it is reliable. Digital health technology’s performance affects confidence in its functionality. Technology that is not intuitive or functions poorly leads to a loss of confidence, negatively impacting the patient-provider relationship.

Due to technical difficulties, data went missing....There was some loss of trust in the system, and some patients had more outpatient visits and hospital visits [33]. [Kenealy et al, 2015]

There was a risk of increasing inequities as socioeconomic and demographic factors affected confidence and trust in the

technology. For some populations, such as older adults [37], or socioeconomically deprived, accessing health care professionals through technology was challenging.

So we speed ahead with the technology. We think this is all great, but many people do not have access to the right environment. How do you have a confidential conversation with somebody living in a one-bedroom apartment with four people? [66] [Nayyar et al, 2022]

For health care providers, the strength of the evidence supporting its use and reliability in clinical practice affected confidence in technology. Clinicians reported instances where technology suggested additional treatment was needed despite their clinical judgment indicating otherwise. In addition, providers were concerned that some patients placed excessive trust in health technology that could prove unreliable [43].

Connection

On a practical level, technology improved patient and professional access and communication:

If I need anything, I have just to phone up...it is a good service [27]. [COPD telemonitoring, prepandemic]

Continuity of care using telehealth technologies enhanced connection and trust [41] and improved treatment adherence [40]. Clinicians valued continuity of care, observing that patients were more trusting when the same provider consistently performed telemonitoring [45].

I think it is probably best if [telemonitoring is done by] people that are dealing with the patients every single day and have that bit of a relationship with them ... people are more trusting, and it is something more personable for the patient [27]. [COPD telemonitoring, prepandemic]

Technology can reassure patients that someone is “watching over them” and create a feeling of a “caring presence” compensating for depersonalization due to a lack of physical presence [71].

Grateful that someone kept an eagle eye on my son as it was a very stressful time given his other health issues. Stress levels were significantly reduced by being in his home environment and knowing [the doctor] was a video call away, and he was being monitored remotely. [71] [Physical activity intervention for COPD]

However, both patients and providers reported depersonalization due to a lack of in-person interactions, and both expressed a preference for a combination of in-person and remote consultations: In-person consultations could form a stronger bond and strengthen the relationship.

A physical meeting creates more opportunities to instil security and peace. It has an inherent energy, creating a connection, where patients and relatives can ask questions and be recognised. [113] [COPD management in the Swedish population]

A study by Jiang et al [63] further emphasized the sense of depersonalization that may occur due to the physical distance during remote consultations.

It is not just the exchange of disease information ... eye contact and a gesture from a doctor or a nurse will give the patient much psychological comfort, which is very difficult to achieve on a mobile phone. [63] [COPD management study for older patients]

Both clinicians and patients found remote interactions with a new provider difficult and highlighted that it was difficult to establish trust and rapport with a new provider using telemedicine [62].

Empowerment

Empowerment is important for a balanced patient-provider relationship. Empowered patients have more control and are often involved in decisions about their care, such as how and where services are delivered. Technology helped patients be better informed about their condition [65] and increased their self-efficacy and confidence through home-collected data [33]. This enabled active participation in self-management, enhanced self-efficacy, supported shared decision-making, and facilitated a more equal patient-provider relationship.

Patients feel empowered when contacting the clinician because they have vital readings and their sense of health to explain how they feel and get support. [29] [COPD self-monitoring, prepandemic]

Stakeholder Workshops and Interpretation of Findings

Our work followed the consultation and application approaches to collaborative analysis [14]. Following data analysis, and once we had preliminary findings, we carried out stakeholder engagement sessions, where we presented initial findings from the review to stakeholders for feedback. The sessions were conducted remotely and were interactive. All participants were asked to provide verbal and written feedback using Groupmap, WordCloud, and group chat.

The discussion among clinicians and patients at the stakeholder workshops resonated with our findings. The word associations related to digital health technology collected in WordCloud at the start of the session generally reflected positive features of technology identified in our analysis (accessibility, convenience, modernization, and education). At the end of the meeting, after considerable discussion, views were more nuanced, and some of the associations were neutral or more negative (accessibility, followed by disparities, frustrating, potential, complex, and challenge). These views increased confidence in our conclusions as the very positive interpretations from some papers were tempered by the more cautious considerations highlighted in other studies.

Discussion

Principal Findings

We have synthesized the findings of 97 papers on the impact of digital health technology on the patient-professional relationship in specialist practice. Both qualitative and

quantitative evidence were used to identify the themes and subthemes, with the qualitative findings revealing underlying nuances and contextual factors. This approach enabled us to quantify key patterns in technology adoption, confidence, connection, and empowerment, while simultaneously understanding the mechanisms through which these factors influenced the patient-provider relationship. Trust was the foundational theme, and digital health technology could either enhance or reduce trust between patients and clinicians. Patients' perception of why digital health technology was implemented (eg, whether it was used to benefit patient care or used to save time and resources) was a significant factor. The technology could connect patients and clinicians by facilitating access, communication, and continuity of care, but remote consultations risk depersonalization, especially if they are not balanced with in-person interactions. Self-monitoring and access to information can empower patients and promote a more equal patient-provider relationship. Combining qualitative and quantitative measures has provided a fuller picture of patient-provider interactions, as each method offers unique insights into different aspects of the relationship. Qualitative insights into how technology empowers patients to seek information and engage in health care decisions are supported by quantitative data showing improved service engagement and compliance. Integrating qualitative and quantitative data has enriched our understanding of patient-provider relationships by linking communication styles and patient engagement with measurable outcomes. These findings complement each other and can lead to more effective healthcare strategies and improved patient care.

The Pivotal Role of Trust

Trust in the patient-professional relationship was intertwined with trust in technology. While Ridd et al [6] identified trust as a critical factor in determining the depth of the patient and professional relationship in their 2009 primary care study, digital health care technology has introduced a third actor, which can positively or negatively influence relationship formation, development, and maintenance.

Patients' trust in technology was fundamentally linked to their trust in clinicians. We found that patients trusted technology when they trusted their clinicians to provide the best care and achieve desired outcomes, reflecting broader evidence that patients build trust through receiving quality care in well-functioning health systems [119]. When technology or systems fail, patients' distrust extends to their providers. This has important clinical implications, as a lack of trust between patients and clinicians is associated with reduced treatment adherence and care-seeking behaviors [37].

In contrast, clinicians approached technology trust differently, primarily based on evidence. They expressed concern that patients might over-rely on technology rather than trusting clinical judgment, highlighting a fundamental tension in how different stakeholders view the role of technology in care delivery.

The Value of Hybrid Delivery

Building on the foundation of trust, our findings emphasize the importance of balancing digital and in-person care. Previous

research has shown that psychological and emotional bonds are strengthened through in-person interactions, where nonverbal cues play a crucial role [120]. Our review confirms that in-person and remote consultations can best promote trust and maintain therapeutic relationships. Hybrid arrangements that offer flexibility and choice in consultation mode can help prevent depersonalization while retaining the benefits of digital care [121]. In addition, multiple recent studies have recommended that for effective implementation and to ensure high-quality telehealth care, it is essential to support implementation at each stage of the process. Organizations must provide guidelines and support for health care professionals, anticipating both technological and human challenges and their corresponding solutions [122]. Based on our findings and those from the literature, we recommend providing education and training to support individuals with access to technology effectively, as well as advocating for those who do not have access to these technologies. This could prevent disadvantaged groups from being excluded further. Although we found no trial evidence for specific interventions, it is widely recommended that training not only focus on professional development [123] but also supports to benefit from digital health care [124].

Implementation of Technology

Perceived threats to patient and health care professional relationships have been identified as one of the main barriers to implementing technology [125]. It is thus disappointing that only 11 out of 97 (12%) of our included papers focused explicitly on this crucial issue. Research is needed to ensure that the future application of digital technology aligns with patients' wishes, and their ability to cope, and build confidence and trust in health technologies [126]. Keywords and phrases include hybrid systems, flexibility, and recognizing individual preferences.

Recognizing that the perceived motivation behind using health technology influences trust in the provider and the relationship [49] enables those driving the implementation of technology to shape perceptions. For instance, Adjekum et al [126] responded to the observation that users trusted public institutions and universities more than profit-making entities.

Multiple contextual factors may influence whether and how digital health care is adopted, as well as its impact on the patient-professional relationship. Time and resource constraints within health care systems already negatively impact patient-professional relationships [127]. Improved communication and efficiency benefits of technology may mitigate these effects—or, conversely, exacerbate them if digital health care places additional demands on services or raises unrealistic expectations. Patient demographics such as gender and age [128] may affect preferences for delivery of care, so the introduction of digital health care will have a different impact on the underlying patient and professional relationship; disease type and severity will further affect the potential of technology to a patient's ability to interact and engage with health care professionals.

Strengths and Limitations

A key strength of our review was the robust methodology. We followed established systematic review procedures, including duplicate screening and data extraction, supported by a comprehensive search strategy developed in collaboration with a medical librarian. Our novel “crowdsourcing” approach, involving trained volunteers, enabled the timely completion of tasks while maintaining quality through extensive training, careful oversight, and verification of all data extraction by senior reviewers (MS and DD). Another significant strength was the involvement of stakeholders from the CONNECT and DRAGON projects in the design and interpretation of findings. The stakeholder workshop enabled us to “sense-check” our analysis, helping us refine the synthesis and interpretation, as reflected in the schema, which underwent significant revision following the workshop. Using the CASP checklist is a strength because it focuses on the applicability of studies to answer our research question, highlighting that only a minority of the studies had an explicit aim related to exploring the patient-professional relationship. CASP requests an assessment of “validity” but does not provide a summary score for the risk of bias. Whilst

this is a limitation of this tool, we were not planning to assess effect size given the highly heterogeneous contexts and secondary outcome measures.

However, several limitations should be noted. We may have missed relevant papers despite screening over 15,000 titles and abstracts. A fundamental limitation was that most included studies were designed to test the efficacy and safety of technology rather than exploring the patient-professional relationship. Few papers explicitly addressed our aim as their primary objective, with most reporting incidental findings about the patient-provider relationship; however, the findings were notably consistent across studies. Our workshop was likely to have attracted participants interested in digital technology and comfortable with the online format. Exploring the perspectives of individuals who are less confident with digital tools is a research priority.

Implications

Recommendations for maintaining a positive patient-provider relationship using digital health technology in respiratory health care are summarized in [Textbox 2](#).

Textbox 2. Recommendations for maintaining a positive patient-provider relationship using digital health technology.

<p>Recommendations</p> <ul style="list-style-type: none">• Be transparent about implementation motivations.• Ensure technology performance is reliable.• Account for individual circumstances and access.• Offer hybrid care combining remote and in-person consultations.• Consider establishing initial relationships in person.• Maintain continuity of care with the same health care provider.• Offer hybrid care combining remote and in-person consultations.• Support access to self-monitoring tools and health information. <p>Rationale</p> <ul style="list-style-type: none">• Trust was enhanced when digital health care was used to increase patient safety and convenience but diminished if technology was perceived as primarily cost-saving.• Poor functionality led to loss of confidence and negatively impacted patient-provider relationships, with evidence of missing data from monitoring devices leading to loss of trust.• Socioeconomic factors affected confidence and trust in technology, with some populations (older adults and socioeconomically deprived) finding access challenging.• Both patients and providers reported depersonalization with remote-only care.• Both clinicians and patients found remote interactions with new providers difficult and highlighted challenges in establishing trust and rapport.• Patients were more trusting when the same provider consistently performed telemonitoring.• Both patients and providers reported depersonalization with remote-only care.• Technology helped patients be better informed about their condition and increased their self-efficacy through home-collected data, enabling active participation in self-management.

Conclusion

Digital health technology impacts trust in respiratory care through four key mechanisms: adoption factors, confidence in technology, connection, and patient empowerment. Our findings emphasize that successful integration of digital health

technology in respiratory care requires transparent implementation motivations, consideration of individual patient circumstances, and maintenance of human connection—all underpinned by reliable technology that supports rather than replaces the therapeutic relationship.

Acknowledgments

We thank all patients and health care providers who participated in the meetings to discuss the systematic review's findings. We also thank all the members of the DRAGON/CONNECT group consisting of Animesh Ray, Angelos Vontetsianos, Ayşe Önal Aral, Carmine Ruggiero, Christina Anagnostopoulou, Christiana Lekka, Dimitrios Megaritis, Efthymia Papadopoulou, Enya Daynes, Kathleen Condon, Larry Ellee, Nyanti Malek Chaabouni, Miguel Barbosa, Milan Mohammad, Nikolaos Chynkiamis, Roisin Cahalan, Sara Souto Miranda, Shailesh Kolekar, Tonje Reier-Nilsen, Vishakha Kapadia, and Wieke Bouwes. DRAGON received funding from the Innovative Medicines Initiative 2 Joint Undertaking (JU; grant agreement 101005122). The JU receives support from the European Union's Horizon 2020 research and innovation program and EFPIA.

Authors' Contributions

HP, DD, PP, KH, AA, and MS were responsible for conceptualization and methodology of the research. AG, KBS, UC, OM, CCT, and AG joined at the investigation stages. MS, HP, PP, AA, KH, and DD carried out the formal analysis. MS, DD, and HP wrote the original draft.

Conflicts of Interest

Author HP received a Teva Pharmaceuticals Speaker fee for a sponsored symposium and a Sandoz Pharmaceuticals Speaker fee for a sponsored symposium. All other authors listed no conflicts of interest.

Multimedia Appendix 1

Search strategy.

[\[DOCX File, 35 KB-Multimedia Appendix 1\]](#)

Multimedia Appendix 2

PRISMA checklist.

[\[DOCX File, 33 KB-Multimedia Appendix 2\]](#)

Multimedia Appendix 3

Quantitative findings.

[\[DOCX File, 19 KB-Multimedia Appendix 3\]](#)

References

1. Pinnock H, Poberezhets V, Drummond D. Introduction. In: Digital Respiratory Healthcare. Lausanne. European Respiratory Society; 2023:8.
2. Future of digital health systems: report on the WHO symposium on the future of digital health systems in the European region. World Health Organization. 2019. URL: <https://iris.who.int/handle/10665/329032> [accessed 2019-02-06]
3. Global diffusion of eHealth: making universal health coverage achievable: report of the third global survey on eHealth. World Health Organization. 2016. URL: <https://www.who.int/publications/i/item/9789241511780> [accessed 2025-04-09]
4. Pérez Sust P, Solans O, Fajardo JC, Medina Peralta M, Rodenas P, Gabaldà J, et al. Turning the crisis into an opportunity: digital health strategies deployed during the COVID-19 outbreak. JMIR Public Health Surveill. 2020;6(2):e19106. [FREE Full text] [doi: [10.2196/19106](https://doi.org/10.2196/19106)] [Medline: [32339998](https://pubmed.ncbi.nlm.nih.gov/32339998/)]
5. Digital Respiratory Healthcare. 2023. URL: https://www.ersbookshop.com/products/digital-respiratory-healthcare?srltid=AfmBOopFT_ubXJnwyKQ0pMHIsA_5l8pgykWU5-99XH0IYG_y5_fAfnPb [accessed 2025-04-04]
6. Ridd M, Shaw A, Lewis G, Salisbury C. The patient-doctor relationship: a synthesis of the qualitative literature on patients' perspectives. Br J Gen Pract. 2009;59(561):e116-e133. [FREE Full text] [doi: [10.3399/bjgp09X420248](https://doi.org/10.3399/bjgp09X420248)] [Medline: [19341547](https://pubmed.ncbi.nlm.nih.gov/19341547/)]
7. Ramachandran M, Brinton C, Wiljer D, Upshur R, Gray CS. The impact of eHealth on relationships and trust in primary care: a review of reviews. BMC Prim Care. 2023;24(1):228. [FREE Full text] [doi: [10.1186/s12875-023-02176-5](https://doi.org/10.1186/s12875-023-02176-5)] [Medline: [37919688](https://pubmed.ncbi.nlm.nih.gov/37919688/)]
8. Nassehi D, Gripsrud BH, Ramvi E. Theoretical perspectives underpinning research on the physician-patient relationship in a digital health practice: scoping review. Interact J Med Res. 2024;13:e47280. [FREE Full text] [doi: [10.2196/47280](https://doi.org/10.2196/47280)] [Medline: [38748465](https://pubmed.ncbi.nlm.nih.gov/38748465/)]
9. Higgins J, Thomas J. Cochrane Handbook for Systematic Reviews of Interventions. Cochrane Training. 2019. URL: <https://training.cochrane.org/handbook> [accessed 2024-08-22]
10. Branca Vergano L, Monesi M, Vicenti G, Bizzoca D, Solarino G, Moretti B. Posterior approaches in malleolar fracture: when, why and how. J Biol Regul Homeost Agents. 2020;34(3 Suppl. 2):89-95. [Medline: [32856446](https://pubmed.ncbi.nlm.nih.gov/32856446/)]

11. van Boven JFM, Drummond D, Chan AHY, Hew M, Hui CY, Adejumo I, et al. ERS "CONNECT" Clinical research collaboration - moving multiple digital innovations towards connected respiratory care: addressing the over-arching challenges of whole systems implementation. *Eur Respir J*. 2023;62(5):2301680. [doi: [10.1183/13993003.01680-2023](https://doi.org/10.1183/13993003.01680-2023)] [Medline: [37945041](https://pubmed.ncbi.nlm.nih.gov/37945041/)]
12. Blog post: crowdsourcing as a way to embed society's norms and values in digital health innovation. Dragon. URL: <https://europeanlung.org/dragon/blog-post-crowdsourcing-as-a-way-to-embed-societys-norms-and-values-in-digital-health-innovation/> [accessed 2025-04-04]
13. Lipscomb M. Abductive reasoning and qualitative research. *Nurs Philos*. 2012;13(4):244-256. [doi: [10.1111/j.1466-769x.2011.00532.x](https://doi.org/10.1111/j.1466-769x.2011.00532.x)]
14. Jennings H, Slade M, Bates P, Munday E, Toney R. Best practice framework for Patient and Public Involvement (PPI) in collaborative data analysis of qualitative mental health research: methodology development and refinement. *BMC Psychiatry*. 2018;18(1):213. [FREE Full text] [doi: [10.1186/s12888-018-1794-8](https://doi.org/10.1186/s12888-018-1794-8)] [Medline: [29954373](https://pubmed.ncbi.nlm.nih.gov/29954373/)]
15. Richards KAR, Hemphill MA. A practical guide to collaborative qualitative data analysis. *J Teach Phys Educ*. 2018;37(2):225-231. [doi: [10.1123/jtpe.2017-0084](https://doi.org/10.1123/jtpe.2017-0084)]
16. GroupMap. URL: <https://www.groupmap.com/> [accessed 2025-04-04]
17. Fellows I. Wordcloud: Word Clouds, R Package version. 2012. URL: <https://cran.r-project.org/web/packages/wordcloud/wordcloud.pdf> [accessed 2025-04-04]
18. Mantzouranis EC. User friendliness aspects of home care telematics. *Methods Inf Med*. 2018;41(05):370-375. [doi: [10.1055/s-0038-1634454](https://doi.org/10.1055/s-0038-1634454)]
19. Hibbert D, Mair FS, May CR, Boland A, O'Connor J, Capewell S, et al. Health professionals' responses to the introduction of a home telehealth service. *J Telemed Telecare*. 2004;10(4):226-230. [doi: [10.1258/1357633041424386](https://doi.org/10.1258/1357633041424386)] [Medline: [15273033](https://pubmed.ncbi.nlm.nih.gov/15273033/)]
20. van Baar JD, Joosten H, Car J, Freeman GK, Partridge MR, van Weel C, et al. Understanding reasons for asthma outpatient (non)-attendance and exploring the role of telephone and e-consulting in facilitating access to care: exploratory qualitative study. *Qual Saf Health Care*. 2006;15(3):191-195. [FREE Full text] [doi: [10.1136/qshc.2004.013342](https://doi.org/10.1136/qshc.2004.013342)] [Medline: [16751469](https://pubmed.ncbi.nlm.nih.gov/16751469/)]
21. Whitten P, Mickus M. Home telecare for COPD/CHF patients: outcomes and perceptions. *J Telemed Telecare*. 2007;13(2):69-73. [doi: [10.1258/135763307780096249](https://doi.org/10.1258/135763307780096249)] [Medline: [17359569](https://pubmed.ncbi.nlm.nih.gov/17359569/)]
22. Cornwall A, Moore S, Plant H. Embracing technology: patients', family members' and nurse specialists' experience of communicating using e-mail. *Eur J Oncol Nurs*. 2008;12(3):198-208. [doi: [10.1016/j.ejon.2007.09.008](https://doi.org/10.1016/j.ejon.2007.09.008)] [Medline: [18406667](https://pubmed.ncbi.nlm.nih.gov/18406667/)]
23. Mair FS, Hiscock J, Beaton SC. Understanding factors that inhibit or promote the utilization of telecare in chronic lung disease. *Chronic Illn*. 2008;4(2):110-117. [doi: [10.1177/1742395308092482](https://doi.org/10.1177/1742395308092482)] [Medline: [18583448](https://pubmed.ncbi.nlm.nih.gov/18583448/)]
24. Hoffman JA, Cunningham JR, Suleh AJ, Sundsmo A, Dekker D, Vago F, et al. Mobile direct observation treatment for tuberculosis patients: a technical feasibility pilot using mobile phones in Nairobi, Kenya. *Am J Prev Med*. 2010;39(1):78-80. [doi: [10.1016/j.amepre.2010.02.018](https://doi.org/10.1016/j.amepre.2010.02.018)] [Medline: [20537846](https://pubmed.ncbi.nlm.nih.gov/20537846/)]
25. Shany T, Hession M, Pryce D, Galang R, Roberts M, Lovell N, et al. Home telecare study for patients with chronic lung disease in the sydney west area health service. *Stud Health Technol Inform*. 2010;161:139-148. [Medline: [21191167](https://pubmed.ncbi.nlm.nih.gov/21191167/)]
26. Cox A, Illsley M, Knibb W, Lucas C, O'Driscoll M, Potter C, et al. The acceptability of e-technology to monitor and assess patient symptoms following palliative radiotherapy for lung cancer. *Palliat Med*. 2011;25(7):675-681. [doi: [10.1177/0269216311399489](https://doi.org/10.1177/0269216311399489)] [Medline: [21474620](https://pubmed.ncbi.nlm.nih.gov/21474620/)]
27. Fairbrother P, Pinnock H, Hanley J, McCloughan L, Sheikh A, Pagliari C, et al. TELESOT programme team. Continuity, but at what cost? The impact of telemonitoring COPD on continuities of care: a qualitative study. *Prim Care Respir J*. 2012;21(3):322-328. [FREE Full text] [doi: [10.4104/pcrj.2012.00068](https://doi.org/10.4104/pcrj.2012.00068)] [Medline: [22875143](https://pubmed.ncbi.nlm.nih.gov/22875143/)]
28. Kim J, Kim S, Kim HC, Kim KH, Yang SC, Lee CT, et al. Effects of consumer-centered u-health service for the knowledge, skill, and attitude of the patients with chronic obstructive pulmonary disease. *Comput Inform Nurs*. 2012;30(12):661-671. [doi: [10.1097/NXN.0b013e318261c1c](https://doi.org/10.1097/NXN.0b013e318261c1c)] [Medline: [23266537](https://pubmed.ncbi.nlm.nih.gov/23266537/)]
29. Dinesen B, Huniche L, Toft E. Attitudes of COPD patients towards tele-rehabilitation: a cross-sector case study. *Int J Environ Res Public Health*. 2013;10(11):6184-6198. [FREE Full text] [doi: [10.3390/ijerph10116184](https://doi.org/10.3390/ijerph10116184)] [Medline: [24247995](https://pubmed.ncbi.nlm.nih.gov/24247995/)]
30. Huniche L, Dinesen B, Nielsen C, Grann O, Toft E. Patients' use of self-monitored readings for managing everyday life with COPD: a qualitative study. *Telemed J E Health*. 2013;19(5):396-402. [doi: [10.1089/tmj.2012.0135](https://doi.org/10.1089/tmj.2012.0135)] [Medline: [23531094](https://pubmed.ncbi.nlm.nih.gov/23531094/)]
31. Damhus CS, Emme C, Hansen H. Barriers and enablers of COPD telerehabilitation – a frontline staff perspective. *Int J Chron Obstruct Pulmon Dis*. 2018;13:2473-2482. [doi: [10.2147/copd.s167501](https://doi.org/10.2147/copd.s167501)]
32. Brown-Johnson CG, Berrean B, Cataldo JK. Development and usability evaluation of the mHealth tool for lung cancer (mHealth TLC): a virtual world health game for lung cancer patients. *Patient Educ Couns*. 2015;98(4):506-511. [FREE Full text] [doi: [10.1016/j.pec.2014.12.006](https://doi.org/10.1016/j.pec.2014.12.006)] [Medline: [25620075](https://pubmed.ncbi.nlm.nih.gov/25620075/)]
33. Kenealy TW, Parsons MJG, Rouse APB, Doughty RN, Sheridan NF, Hindmarsh JKH, et al. Telecare for diabetes, CHF or COPD: effect on quality of life, hospital use and costs. a randomised controlled trial and qualitative evaluation. *PLoS One*. 2015;10(3):e0116188. [FREE Full text] [doi: [10.1371/journal.pone.0116188](https://doi.org/10.1371/journal.pone.0116188)] [Medline: [25768023](https://pubmed.ncbi.nlm.nih.gov/25768023/)]
34. Maguire R, Ream E, Richardson A, Connaghan J, Johnston B, Kotronoulas G, et al. Development of a novel remote patient monitoring system: the advanced symptom management system for radiotherapy to improve the symptom experience of

- patients with lung cancer receiving radiotherapy. *Cancer Nurs*. 2015;38(2):E37-E47. [doi: [10.1097/NCC.0000000000000150](https://doi.org/10.1097/NCC.0000000000000150)] [Medline: [24836956](#)]
35. Roberts NJ, Ghiassi R, Partridge MR. Health literacy in COPD. *Int J Chron Obstruct Pulmon Dis*. 2008;3(4):499-507. [Medline: [19281068](#)]
 36. Dichmann Sorknaes A. Nurses' and Patients' experiences of tele-consultations. *Stud Health Technol Inform*. 2016;225:885-886. [Medline: [27332392](#)]
 37. Daftary A, Hirsch-Moverman Y, Kassie GM, Melaku Z, Gadisa T, Saito S, et al. A qualitative evaluation of the acceptability of an interactive voice response system to enhance adherence to isoniazid preventive therapy among people living with HIV in ethiopia. *AIDS Behav*. 2017;21(11):3057-3067. [FREE Full text] [doi: [10.1007/s10461-016-1432-8](https://doi.org/10.1007/s10461-016-1432-8)] [Medline: [27221743](#)]
 38. Hirsch-Moverman Y, Daftary A, Yuengling KA, Saito S, Ntoane M, Frederix K, et al. Using mHealth for HIV/TB treatment support in lesotho: enhancing patient-provider communication in the START study. *J Acquir Immune Defic Syndr*. 2017;74(Suppl 1):S37-S43. [FREE Full text] [doi: [10.1097/QAI.0000000000001202](https://doi.org/10.1097/QAI.0000000000001202)] [Medline: [27930610](#)]
 39. Kopanitsa G. A qualitative study of the barriers and opportunities for adoption of web-portals for doctors and patients in Russia. *J Med Syst*. 2017;41(4):62. [doi: [10.1007/s10916-017-0713-8](https://doi.org/10.1007/s10916-017-0713-8)] [Medline: [28271462](#)]
 40. Nhavoto JA, Grönlund Å, Klein GO. Mobile health treatment support intervention for HIV and tuberculosis in Mozambique: perspectives of patients and healthcare workers. *PLoS One*. 2017;12(4):e0176051. [FREE Full text] [doi: [10.1371/journal.pone.0176051](https://doi.org/10.1371/journal.pone.0176051)] [Medline: [28419149](#)]
 41. Nissen L, Lindhardt T. A qualitative study of COPD-patients' experience of a telemedicine intervention. *Int J Med Inform*. 2017;107:11-17. [doi: [10.1016/j.ijmedinf.2017.08.004](https://doi.org/10.1016/j.ijmedinf.2017.08.004)] [Medline: [29029687](#)]
 42. Liacos A, Burge AT, Cox NS, Holland AE. Promoting physical activity using the internet: Is it feasible and acceptable for patients with chronic obstructive pulmonary disease and bronchiectasis? *J Aging Phys Act*. 2018;26(3):372-381. [doi: [10.1123/japa.2017-0123](https://doi.org/10.1123/japa.2017-0123)] [Medline: [28952865](#)]
 43. Hamilton JG, Genoff Garzon M, Westerman JS, Shuk E, Hay JL, Walters C, et al. "A Tool, Not a Crutch": Patient perspectives about IBM watson for oncology trained by memorial sloan kettering. *J Oncol Pract*. 2019;15(4):e277-e288. [doi: [10.1200/jop.18.00417](https://doi.org/10.1200/jop.18.00417)]
 44. Patel MR, Smith A, Leo H, Hao W, Zheng K. Improving patient-provider communication and therapeutic practice through better integration of electronic health records in the exam room: a pilot study. *Health Educ Behav*. 2019;46(3):484-493. [FREE Full text] [doi: [10.1177/1090198118796879](https://doi.org/10.1177/1090198118796879)] [Medline: [30196720](#)]
 45. Rudin RS, Fanta CH, Qureshi N, Duffy E, Edelen MO, Dalal AK, et al. A clinically integrated mHealth app and practice model for collecting patient-reported outcomes between visits for asthma patients: implementation and feasibility. *Appl Clin Inform*. 2019;10(5):783-793. [FREE Full text] [doi: [10.1055/s-0039-1697597](https://doi.org/10.1055/s-0039-1697597)] [Medline: [31618782](#)]
 46. Boström E, Ali L, Fors A, Ekman I, Andersson AE. Registered nurses' experiences of communication with patients when practising person-centred care over the phone: a qualitative interview study. *BMC Nurs*. 2020;19(1):54. [FREE Full text] [doi: [10.1186/s12912-020-00448-4](https://doi.org/10.1186/s12912-020-00448-4)] [Medline: [32577097](#)]
 47. Drabble SJ, O'Cathain A, Scott AJ, Arden MA, Keating S, Hutchings M, et al. Mechanisms of action of a web-based intervention with health professional support to increase adherence to nebulizer treatments in adults with cystic fibrosis: qualitative interview study. *J Med Internet Res*. 2020;22(10):e16782. [FREE Full text] [doi: [10.2196/16782](https://doi.org/10.2196/16782)] [Medline: [32697197](#)]
 48. Kuntz JG, Kavalieratos D, Esper GJ, Ogbu N, Mitchell J, Ellis CM, et al. Feasibility and acceptability of inpatient palliative care e-family meetings during COVID-19 pandemic. *J Pain Symptom Manage*. 2020;60(3):e28-e32. [FREE Full text] [doi: [10.1016/j.jpainsymman.2020.06.001](https://doi.org/10.1016/j.jpainsymman.2020.06.001)] [Medline: [32505643](#)]
 49. Lewis S, Blundell A, Conway J, Meddick E. A virtual respiratory clinic to support patients with Covid-19 after discharge. *Nursing Times*. 2020. URL: <https://tinyurl.com/4jrtp8h> [accessed 2020-07-27]
 50. Maguire R, Connaghan J, Arber A, Klepacz N, Blyth KG, McPhelim J, et al. Advanced symptom management system for patients with malignant pleural mesothelioma (ASyMSmeso): mixed methods study. *J Med Internet Res*. 2020;22(11):e19180. [FREE Full text] [doi: [10.2196/19180](https://doi.org/10.2196/19180)] [Medline: [33180025](#)]
 51. Van Citters AD, Gifford AH, Brady C, Dunitz JM, Elmhirst M, Flath J, et al. Formative evaluation of a dashboard to support coproduction of healthcare services in cystic fibrosis. *J Cyst Fibros*. 2020;19(5):768-776. [FREE Full text] [doi: [10.1016/j.jcf.2020.03.009](https://doi.org/10.1016/j.jcf.2020.03.009)] [Medline: [32354650](#)]
 52. van Lieshout F, Yang R, Stamenova V, Agarwal P, Cornejo Palma D, Sidhu A, et al. Evaluating the implementation of a remote-monitoring program for chronic obstructive pulmonary disease: qualitative methods from a service design perspective. *J Med Internet Res*. 2020;22(10):e18148. [FREE Full text] [doi: [10.2196/18148](https://doi.org/10.2196/18148)] [Medline: [33034565](#)]
 53. Yamada J, Kouri A, Simard S, Segovia SA, Gupta S. Barriers and enablers to using a patient-facing electronic questionnaire: a qualitative theoretical domains framework analysis. *J Med Internet Res*. 2020;22(10):e19474. [FREE Full text] [doi: [10.2196/19474](https://doi.org/10.2196/19474)] [Medline: [33030437](#)]
 54. Bains J, Greenwald PW, Mulcare MR, Leyden D, Kim J, Shemesh AJ, et al. Utilizing telemedicine in a novel approach to COVID-19 management and patient experience in the emergency department. *Telemed J E Health*. 2021;27(3):254-260. [doi: [10.1089/tmj.2020.0162](https://doi.org/10.1089/tmj.2020.0162)] [Medline: [32821027](#)]

55. Jácome C, Almeida R, Pereira AM, Amaral R, Mendes S, Alves-Correia M, et al. Feasibility and acceptability of an asthma app to monitor medication adherence: mixed methods study. *JMIR Mhealth Uhealth*. 2021;9(5):e26442. [FREE Full text] [doi: [10.2196/26442](https://doi.org/10.2196/26442)] [Medline: [34032576](https://pubmed.ncbi.nlm.nih.gov/34032576/)]
56. Kennedy NR, Steinberg A, Arnold RM, Doshi AA, White DB, DeLair W, et al. Perspectives on telephone and video communication in the intensive care unit during COVID-19. *Annals ATS*. 2021;18(5):838-847. [doi: [10.1513/annalsats.202006-729oc](https://doi.org/10.1513/annalsats.202006-729oc)]
57. Legler S, Diehl M, Hilliard B, Olson A, Markowitz R, Tignanelli C, et al. Evaluation of an intrahospital telemedicine program for patients admitted with COVID-19: mixed methods study. *J Med Internet Res*. 2021;23(4):e25987. [FREE Full text] [doi: [10.2196/25987](https://doi.org/10.2196/25987)] [Medline: [33872187](https://pubmed.ncbi.nlm.nih.gov/33872187/)]
58. Sekandi JN, Kasiita V, Onuoha NA, Zalwango S, Nakkonde D, Kaawa-Mafigiri D, et al. Stakeholders' perceptions of benefits of and barriers to using video-observed treatment for monitoring patients with tuberculosis in uganda: exploratory qualitative study. *JMIR Mhealth Uhealth*. 2021;9(10):e27131. [FREE Full text] [doi: [10.2196/27131](https://doi.org/10.2196/27131)] [Medline: [34704961](https://pubmed.ncbi.nlm.nih.gov/34704961/)]
59. Thomas BE, Kumar JV, Periyasamy M, Khandewale AS, Hephzibah Mercy J, Raj EM, et al. Acceptability of the medication event reminder monitor for promoting adherence to multidrug-resistant tuberculosis therapy in two Indian cities: qualitative study of patients and health care providers. *J Med Internet Res*. 2021;23(6):e23294. [FREE Full text] [doi: [10.2196/23294](https://doi.org/10.2196/23294)] [Medline: [34110300](https://pubmed.ncbi.nlm.nih.gov/34110300/)]
60. Wu F, Burt J, Chowdhury T, Fitzpatrick R, Martin G, van der Scheer JW, et al. Specialty COPD care during COVID-19: patient and clinician perspectives on remote delivery. *BMJ Open Respir Res*. 2021;8(1):e000817. [FREE Full text] [doi: [10.1136/bmjresp-2020-000817](https://doi.org/10.1136/bmjresp-2020-000817)] [Medline: [33414261](https://pubmed.ncbi.nlm.nih.gov/33414261/)]
61. Gillett M, Hope-Gill B. Telephone clinics during the Covid-19 pandemic-the experiences of interstitial lung disease patients and their carers. *J Patient Exp*. 2022;9:23743735221133638. [FREE Full text] [doi: [10.1177/23743735221133638](https://doi.org/10.1177/23743735221133638)] [Medline: [36330230](https://pubmed.ncbi.nlm.nih.gov/36330230/)]
62. Haynes SC, Kamerman-Kretzmer R, Khan SS, Crossen S, Lieng MK, Marcin JP, et al. Telemedicine use for pediatric asthma care: a mixed methods study. *J Asthma*. 2022;59(12):2431-2440. [doi: [10.1080/02770903.2021.2019265](https://doi.org/10.1080/02770903.2021.2019265)] [Medline: [34913803](https://pubmed.ncbi.nlm.nih.gov/34913803/)]
63. Jiang Y, Sun P, Chen Z, Guo J, Wang S, Liu F, et al. Patients' and healthcare providers' perceptions and experiences of telehealth use and online health information use in chronic disease management for older patients with chronic obstructive pulmonary disease: a qualitative study. *BMC Geriatr*. 2022;22(1):9. [FREE Full text] [doi: [10.1186/s12877-021-02702-z](https://doi.org/10.1186/s12877-021-02702-z)] [Medline: [34979967](https://pubmed.ncbi.nlm.nih.gov/34979967/)]
64. Makhecha S, Eftychiou L, Tsang V, Vas V, Christiansen N, Crook J, et al. Patient and family perceptions of the provision of medicines as part of virtual outpatient consultations for children during COVID-19 pandemic. *BMJ Open Qual*. 2022;11(4):e001916. [FREE Full text] [doi: [10.1136/bmjopen-2022-001916](https://doi.org/10.1136/bmjopen-2022-001916)] [Medline: [36572442](https://pubmed.ncbi.nlm.nih.gov/36572442/)]
65. Mispion S, Marneffe W, Himpe U, Hellings J, Demedts I. Evaluation of the implementation of value-based healthcare with a weekly digital follow-up of lung cancer patients in clinical practice. *Eur J Cancer Care (Engl)*. 2022;31(6):e13653. [doi: [10.1111/ecc.13653](https://doi.org/10.1111/ecc.13653)] [Medline: [35819130](https://pubmed.ncbi.nlm.nih.gov/35819130/)]
66. Nayyar D, Pendrith C, Kishimoto V, Chu C, Fujioka J, Rios P, et al. Quality of virtual care for ambulatory care sensitive conditions: patient and provider experiences. *Int J Med Inform*. 2022;165:104812. [FREE Full text] [doi: [10.1016/j.ijmedinf.2022.104812](https://doi.org/10.1016/j.ijmedinf.2022.104812)] [Medline: [35691260](https://pubmed.ncbi.nlm.nih.gov/35691260/)]
67. Sandau C, Poulsen I, Nørholm V, Hansen EF, Ringbaek TJ, Suppli Ulrik C, et al. Patients' perspective on automated oxygen administration during hospitalization for acute exacerbation of chronic obstructive pulmonary disease: a qualitative study nested in a randomized controlled trial. *COPD*. 2022;19(1):345-352. [FREE Full text] [doi: [10.1080/15412555.2022.2141620](https://doi.org/10.1080/15412555.2022.2141620)] [Medline: [36416665](https://pubmed.ncbi.nlm.nih.gov/36416665/)]
68. Cox NS, Lee JYT, McDonald CF, Mahal A, Alison JA, Wootton R, et al. Perceived autonomy support in telerehabilitation by people with chronic respiratory disease: a mixed methods study. *Chest*. 2023;163(6):1410-1424. [doi: [10.1016/j.chest.2022.12.023](https://doi.org/10.1016/j.chest.2022.12.023)] [Medline: [36574926](https://pubmed.ncbi.nlm.nih.gov/36574926/)]
69. Hattingh HL, Edmunds C, Gillespie BM. Medication management of COVID-19 patients during transition to virtual models of care: a qualitative study. *J Pharm Policy Pract*. 2023;16(1):127. [FREE Full text] [doi: [10.1186/s40545-023-00633-1](https://doi.org/10.1186/s40545-023-00633-1)] [Medline: [37880768](https://pubmed.ncbi.nlm.nih.gov/37880768/)]
70. Kazmerski TM, Stransky OM, Wright CE, Albanowski M, Pilewski JM, Talabi MB, et al. Feasibility testing of a web-based reproductive decision support tool for cystic fibrosis. *J Cyst Fibros*. 2024;23(3):404-411. [doi: [10.1016/j.jcf.2023.10.003](https://doi.org/10.1016/j.jcf.2023.10.003)] [Medline: [37833123](https://pubmed.ncbi.nlm.nih.gov/37833123/)]
71. Robinson SA, Shimada SL, Sliwinski SK, Wiener RS, Moy ML. Stakeholder perceptions of a web-based physical activity intervention for COPD: A mixed-methods study. *J Clin Med*. 2023;12(19):6296. [FREE Full text] [doi: [10.3390/jcm12196296](https://doi.org/10.3390/jcm12196296)] [Medline: [37834938](https://pubmed.ncbi.nlm.nih.gov/37834938/)]
72. Watanabe AH, Willis C, Ragsdale R, Biskupiak J, Moore K, Brixner D, et al. Patient perspectives on the use of digital technology to help manage cystic fibrosis. *Pulm Med*. 2023;2023:5082499. [FREE Full text] [doi: [10.1155/2023/5082499](https://doi.org/10.1155/2023/5082499)] [Medline: [36727045](https://pubmed.ncbi.nlm.nih.gov/36727045/)]
73. Pacht ER, Turner JW, Gailiun M, Violi LA, Ralston D, Mekhjian HS, et al. Effectiveness of telemedicine in the outpatient pulmonary clinic. *Telemed J*. 1998;4(4):287-292. [doi: [10.1089/tmj.1.1998.4.287](https://doi.org/10.1089/tmj.1.1998.4.287)] [Medline: [10220468](https://pubmed.ncbi.nlm.nih.gov/10220468/)]

74. Stepnowsky CJ, Palau JJ, Marler MR, Gifford AL. Pilot randomized trial of the effect of wireless telemonitoring on compliance and treatment efficacy in obstructive sleep apnea. *J Med Internet Res*. 2007;9(2):e14. [FREE Full text] [doi: [10.2196/jmir.9.2.e14](https://doi.org/10.2196/jmir.9.2.e14)] [Medline: [17513285](https://pubmed.ncbi.nlm.nih.gov/17513285/)]
75. Varkey P, Schumacher K, Swanton C, Timm B, Hagen PT. Telemedicine in the work site: a study of feasibility, and patient and provider satisfaction. *J Telemed Telecare*. 2008;14(6):322-325. [doi: [10.1258/jtt.2008.080512](https://doi.org/10.1258/jtt.2008.080512)] [Medline: [18776079](https://pubmed.ncbi.nlm.nih.gov/18776079/)]
76. Agha Z, Roter DL, Schapira RM. An evaluation of patient-physician communication style during telemedicine consultations. *J Med Internet Res*. 2009;11(3):e36. [FREE Full text] [doi: [10.2196/jmir.1193](https://doi.org/10.2196/jmir.1193)] [Medline: [19793720](https://pubmed.ncbi.nlm.nih.gov/19793720/)]
77. Zamith M, Cardoso T, Matias I, Marques Gomes MJ. Home telemonitoring of severe chronic respiratory insufficient and asthmatic patients. *Rev Port Pneumol*. 2009;15(3):385-417. [FREE Full text] [Medline: [19401791](https://pubmed.ncbi.nlm.nih.gov/19401791/)]
78. Byczkowski TL, Munafo JK, Britto MT. Variation in use of internet-based patient portals by parents of children with chronic disease. *Arch Pediatr Adolesc Med*. 2011;165(5):405-411. [doi: [10.1001/archpediatrics.2011.55](https://doi.org/10.1001/archpediatrics.2011.55)] [Medline: [21536954](https://pubmed.ncbi.nlm.nih.gov/21536954/)]
79. Nield M, Hoo GWS. Real-time telehealth for COPD self-management using Skype™. *COPD*. 2012;9(6):611-619. [FREE Full text] [doi: [10.3109/15412555.2012.708067](https://doi.org/10.3109/15412555.2012.708067)] [Medline: [22946768](https://pubmed.ncbi.nlm.nih.gov/22946768/)]
80. Chih M, DuBenske LL, Hawkins RP, Brown RL, Dinauer SK, Cleary JF, et al. Communicating advanced cancer patients' symptoms via the Internet: a pooled analysis of two randomized trials examining caregiver preparedness, physical burden, and negative mood. *Palliat Med*. 2013;27(6):533-543. [FREE Full text] [doi: [10.1177/0269216312457213](https://doi.org/10.1177/0269216312457213)] [Medline: [22988042](https://pubmed.ncbi.nlm.nih.gov/22988042/)]
81. Pinnock H, Hanley J, McCloughan L, Todd A, Krishan A, Lewis S, et al. Effectiveness of telemonitoring integrated into existing clinical services on hospital admission for exacerbation of chronic obstructive pulmonary disease: researcher blind, multicentre, randomised controlled trial. *BMJ*. 2013;347:f6070. [FREE Full text] [doi: [10.1136/bmj.f6070](https://doi.org/10.1136/bmj.f6070)] [Medline: [24136634](https://pubmed.ncbi.nlm.nih.gov/24136634/)]
82. Cingi C, Yorgancioglu A, Cingi CC, Oguzulgen K, Muluk NB, Ulusoy S, et al. The "physician on call patient engagement trial" (POPET): measuring the impact of a mobile patient engagement application on health outcomes and quality of life in allergic rhinitis and asthma patients. *Int Forum Allergy Rhinol*. 2015;5(6):487-497. [doi: [10.1002/alr.21468](https://doi.org/10.1002/alr.21468)] [Medline: [25856270](https://pubmed.ncbi.nlm.nih.gov/25856270/)]
83. Apter AJ, Bryant-Stephens T, Morales KH, Wan F, Hardy S, Reed-Wells S, et al. Using IT to improve access, communication, and asthma in African American and Hispanic/Latino adults: Rationale, design, and methods of a randomized controlled trial. *Contemp Clin Trials*. 2015;44:119-128. [doi: [10.1016/j.cct.2015.08.001](https://doi.org/10.1016/j.cct.2015.08.001)] [Medline: [26264737](https://pubmed.ncbi.nlm.nih.gov/26264737/)]
84. Wiecha JM, Adams WG, Rybin D, Rizzodepaoli M, Keller J, Clay JM. Evaluation of a web-based asthma self-management system: a randomised controlled pilot trial. *BMC Pulm Med*. 2015;15(1):17. [FREE Full text] [doi: [10.1186/s12890-015-0007-1](https://doi.org/10.1186/s12890-015-0007-1)] [Medline: [25885418](https://pubmed.ncbi.nlm.nih.gov/25885418/)]
85. Fadaizadeh L, Najafizadeh K, Shajareh E, Shafaghi S, Hosseini M, Heydari G. Home spirometry: assessment of patient compliance and satisfaction and its impact on early diagnosis of pulmonary symptoms in post-lung transplantation patients. *J Telemed Telecare*. 2015;22(2):127-131. [doi: [10.1177/1357633x15587435](https://doi.org/10.1177/1357633x15587435)]
86. Rosenberger EM, DeVito Dabbs AJ, DiMartini AF, Landsittel DP, Pilewski JM, Dew MA. Long-term follow-up of a randomized controlled trial evaluating a mobile health intervention for self-management in lung transplant recipients. *Am J Transplant*. 2017;17(5):1286-1293. [FREE Full text] [doi: [10.1111/ajt.14062](https://doi.org/10.1111/ajt.14062)] [Medline: [27664940](https://pubmed.ncbi.nlm.nih.gov/27664940/)]
87. Poureslami I, Shum J, Lester RT, Tavakoli H, Dorscheid DR, FitzGerald JM. A pilot randomized controlled trial on the impact of text messaging check-ins and a web-based asthma action plan versus a written action plan on asthma exacerbations. *J Asthma*. 2018;56(8):1-13. [doi: [10.1080/02770903.2018.1500583](https://doi.org/10.1080/02770903.2018.1500583)] [Medline: [30003851](https://pubmed.ncbi.nlm.nih.gov/30003851/)]
88. Sleath B, Carpenter DM, Davis SA, Watson CH, Lee C, Loughlin CE, et al. Improving youth question-asking and provider education during pediatric asthma visits. *Patient Educ Couns*. 2018;101(6):1051-1057. [FREE Full text] [doi: [10.1016/j.pec.2018.01.013](https://doi.org/10.1016/j.pec.2018.01.013)] [Medline: [29402570](https://pubmed.ncbi.nlm.nih.gov/29402570/)]
89. Morita PP, Yeung MS, Ferrone M, Taite AK, Madeley C, Stevens Lavigne A, et al. A patient-centered mobile health system that supports asthma self-management (breathe): design, development, and utilization. *JMIR Mhealth Uhealth*. 2019;7(1):e10956. [FREE Full text] [doi: [10.2196/10956](https://doi.org/10.2196/10956)] [Medline: [30688654](https://pubmed.ncbi.nlm.nih.gov/30688654/)]
90. Sonney J, Duffy M, Hoogerheyde LX, Langhauser E, Teska D. Applying human-centered design to the development of an asthma essentials kit for school-aged children and their parents. *J Pediatr Health Care*. 2019;33(2):169-177. [FREE Full text] [doi: [10.1016/j.pedhc.2018.07.008](https://doi.org/10.1016/j.pedhc.2018.07.008)] [Medline: [30228032](https://pubmed.ncbi.nlm.nih.gov/30228032/)]
91. Apter AJ, Bryant-Stephens T, Perez L, Morales KH, Howell JT, Mullen AN, et al. Patient portal usage and outcomes among adult patients with uncontrolled asthma. *J Allergy Clin Immunol Pract*. 2020;8(3):965-970. [FREE Full text] [doi: [10.1016/j.jaip.2019.09.034](https://doi.org/10.1016/j.jaip.2019.09.034)] [Medline: [31622684](https://pubmed.ncbi.nlm.nih.gov/31622684/)]
92. Gaynor M, Schneider D, Seltzer M, Crannage E, Barron ML, Waterman J, et al. A user-centered, learning asthma smartphone application for patients and providers. *Learn Health Syst*. 2020;4(3):e10217. [FREE Full text] [doi: [10.1002/lrh2.10217](https://doi.org/10.1002/lrh2.10217)] [Medline: [32685685](https://pubmed.ncbi.nlm.nih.gov/32685685/)]
93. Kneuert PJ, Jagadesh N, Perkins A, Fitzgerald M, Moffatt-Bruce SD, Merritt RE, et al. Improving patient engagement, adherence, and satisfaction in lung cancer surgery with implementation of a mobile device platform for patient reported outcomes. *J Thorac Dis*. 2020;12(11):6883-6891. [FREE Full text] [doi: [10.21037/jtd.2020.01.23](https://doi.org/10.21037/jtd.2020.01.23)] [Medline: [33282391](https://pubmed.ncbi.nlm.nih.gov/33282391/)]

94. Koff PB, Min S, Freitag TJ, Diaz DLP, James SS, Voelkel NF, et al. Impact of proactive integrated care on chronic obstructive pulmonary disease. *Chronic Obstr Pulm Dis*. 2021;8(1):100-116. [doi: [10.15326/JCOPDF.2020.0139](https://doi.org/10.15326/JCOPDF.2020.0139)]
95. Opipari-Arrigan L, Dykes DMH, Saeed SA, Thakkar S, Burns L, Chini BA, et al. Technology-enabled health care collaboration in pediatric chronic illness: Pre-post interventional study for feasibility, acceptability, and clinical impact of an electronic health record-linked platform for patient-clinician partnership. *JMIR Mhealth Uhealth*. 2020;8(11):e11968. [FREE Full text] [doi: [10.2196/11968](https://doi.org/10.2196/11968)] [Medline: [33242014](https://pubmed.ncbi.nlm.nih.gov/33242014/)]
96. Perlman A, Vodonos Zilberg A, Bak P, Dreyfuss M, Leventer-Roberts M, Vurembrand Y, et al. Characteristics and symptoms of app users seeking COVID-19-related digital health information and remote services: retrospective cohort study. *J Med Internet Res*. 2020;22(10):e23197. [FREE Full text] [doi: [10.2196/23197](https://doi.org/10.2196/23197)] [Medline: [32961527](https://pubmed.ncbi.nlm.nih.gov/32961527/)]
97. Alsharif AH. Cross sectional E-health evaluation study for telemedicine and m-health approaches in monitoring COVID-19 patients with chronic obstructive pulmonary disease (COPD). *Int J Environ Res Public Health*. Aug 12, 2021;18(16). [FREE Full text] [doi: [10.3390/ijerph18168513](https://doi.org/10.3390/ijerph18168513)] [Medline: [34444261](https://pubmed.ncbi.nlm.nih.gov/34444261/)]
98. Davis J, Gordon R, Hammond A, Perkins R, Flanagan F, Rabinowitz E, et al. Rapid implementation of telehealth services in a pediatric pulmonary clinic during COVID-19. *Pediatrics*. 2021;148(1):e2020030494. [doi: [10.1542/peds.2020-030494](https://doi.org/10.1542/peds.2020-030494)] [Medline: [33632935](https://pubmed.ncbi.nlm.nih.gov/33632935/)]
99. Gashu KD, Gelaye KA, Lester R, Tilahun B. Effect of a phone reminder system on patient-centered tuberculosis treatment adherence among adults in Northwest Ethiopia: a randomised controlled trial. *BMJ Health Care Inform*. 2021;28(1):e100268. [FREE Full text] [doi: [10.1136/bmjhci-2020-100268](https://doi.org/10.1136/bmjhci-2020-100268)] [Medline: [34172505](https://pubmed.ncbi.nlm.nih.gov/34172505/)]
100. Hendra K, Neemuchwala F, Chan M, Ly NP, Gibb ER. Patient and provider experience with cystic fibrosis telemedicine clinic. *Front Pediatr*. 2021;9:784692. [FREE Full text] [doi: [10.3389/fped.2021.784692](https://doi.org/10.3389/fped.2021.784692)] [Medline: [34900879](https://pubmed.ncbi.nlm.nih.gov/34900879/)]
101. Meshkov I, Petrenko T, Keiser O, Estill J, Revyakina O, Felker I, et al. Variations in tuberculosis prevalence, Russian Federation: a multivariate approach. *Bull World Health Organ*. Nov 01, 2019;97(11):737-745A. [FREE Full text] [doi: [10.2471/BLT.19.229997](https://doi.org/10.2471/BLT.19.229997)] [Medline: [31673189](https://pubmed.ncbi.nlm.nih.gov/31673189/)]
102. Kowatsch T, Schachner T, Harperink S, Barata F, Dittler U, Xiao G, et al. Conversational agents as mediating social actors in chronic disease management involving health care professionals, patients, and family members: multisite single-arm feasibility study. *J Med Internet Res*. 2021;23(2):e25060. [FREE Full text] [doi: [10.2196/25060](https://doi.org/10.2196/25060)] [Medline: [33484114](https://pubmed.ncbi.nlm.nih.gov/33484114/)]
103. Mustafa SS, Yang L, Mortezaei M, Vadmalai K, Ramsey A. Patient satisfaction with telemedicine encounters in an allergy and immunology practice during the coronavirus disease 2019 pandemic. *Ann Allergy Asthma Immunol*. Oct 2020;125(4):478-479. [FREE Full text] [doi: [10.1016/j.anai.2020.06.027](https://doi.org/10.1016/j.anai.2020.06.027)] [Medline: [32585178](https://pubmed.ncbi.nlm.nih.gov/32585178/)]
104. Sabina Sousa C, Trigueiro Barbosa M, Aguiar R, Benito-Garcia F, Morais-Almeida M. What do asthmatic patients think about telemedicine visits? *Eur Ann Allergy Clin Immunol*. May 2021;53(3):138-142. [FREE Full text] [doi: [10.23822/EurAnnACI.1764-1489.182](https://doi.org/10.23822/EurAnnACI.1764-1489.182)] [Medline: [33191719](https://pubmed.ncbi.nlm.nih.gov/33191719/)]
105. Benson J, Bhandari P, Lui N, Berry M, Liou DZ, Shrager J, et al. Use of a personalized multimedia education platform improves preoperative teaching for lung cancer patients. *Semin Thorac Cardiovasc Surg*. 2022;34(1):363-372. [doi: [10.1053/j.semtcvs.2021.03.003](https://doi.org/10.1053/j.semtcvs.2021.03.003)] [Medline: [33711462](https://pubmed.ncbi.nlm.nih.gov/33711462/)]
106. Bukstein DA, Eghrari-Sabet J, Hart M, Hill T, Parikh P, Winders TA. COVID-19 pandemic impact on telehealth use and perceptions for atopic and respiratory disease: Survey results. *Allergy Asthma Proc*. 2022;43(3):194-201. [FREE Full text] [doi: [10.2500/aap.2022.43.220019](https://doi.org/10.2500/aap.2022.43.220019)] [Medline: [35524354](https://pubmed.ncbi.nlm.nih.gov/35524354/)]
107. Nelson SE, Steuernagle J, Rotello L, Nyquist P, Suarez JJ, Ziai W. COVID-19 and telehealth in the intensive care unit setting: a survey. *BMC Health Serv Res*. Jun 20, 2022;22(1):797. [FREE Full text] [doi: [10.1186/s12913-022-08197-7](https://doi.org/10.1186/s12913-022-08197-7)] [Medline: [35725458](https://pubmed.ncbi.nlm.nih.gov/35725458/)]
108. Shinoda M, Hataji O, Miura M, Kinoshita M, Mizoo A, Tobino K, et al. A telemedicine approach for monitoring COPD: a prospective feasibility and acceptability cohort study. *Int J Chron Obstruct Pulmon Dis*. 2022;17(101273481):2931-2944. [doi: [10.2147/copd.s375049](https://doi.org/10.2147/copd.s375049)]
109. Chun VS, Whooley MA, Williams K, Zhang N, Zeidler MR, Atwood CW, et al. Veterans health administration TeleSleep enterprise-wide initiative 2017-2020: bringing sleep care to our nation's veterans. *J Clin Sleep Med*. 2023;19(5):913-923. [FREE Full text] [doi: [10.5664/jcsm.10488](https://doi.org/10.5664/jcsm.10488)] [Medline: [36708262](https://pubmed.ncbi.nlm.nih.gov/36708262/)]
110. Coker TR, Mitchell SJ, Lowry SJ, Klein EJ, Stout JW, Brown JC, et al. Text2Breathe: Text-message intervention for parent communication and pediatric asthma. *Acad Pediatr*. 2023;23(1):123-129. [FREE Full text] [doi: [10.1016/j.acap.2022.05.004](https://doi.org/10.1016/j.acap.2022.05.004)] [Medline: [35577281](https://pubmed.ncbi.nlm.nih.gov/35577281/)]
111. Lawrence J, Truong D, Dao A, Bryant PA. Virtual hospital-level care-feasibility, acceptability, safety and impact of a pilot Hospital-In-The-Home model for COVID-19 infection. *Front Digit Health*. 2023;5:1068444. [FREE Full text] [doi: [10.3389/fdgh.2023.1068444](https://doi.org/10.3389/fdgh.2023.1068444)] [Medline: [37090066](https://pubmed.ncbi.nlm.nih.gov/37090066/)]
112. Varghese MP, Selwyn T, Nair S, Samuel S, Chacko B, Pichamuthu K. Assessment of family satisfaction with remote communication for critically ill COVID-19 patients: an observational cohort study. *Indian J Crit Care Med*. 2023;27(8):537-544. [FREE Full text] [doi: [10.5005/jp-journals-10071-24504](https://doi.org/10.5005/jp-journals-10071-24504)] [Medline: [37636852](https://pubmed.ncbi.nlm.nih.gov/37636852/)]
113. Chang E, Penfold RB, Berkman ND. Patient characteristics and telemedicine use in the US, 2022. *JAMA Netw Open*. Mar 04, 2024;7(3):e243354. [FREE Full text] [doi: [10.1001/jamanetworkopen.2024.3354](https://doi.org/10.1001/jamanetworkopen.2024.3354)] [Medline: [38517438](https://pubmed.ncbi.nlm.nih.gov/38517438/)]

114. Pinnock H, Murphie P, Vogiatzis I, Poberezhets V. Telemedicine and virtual respiratory care in the era of COVID-19. *ERJ Open Res*. 2022;8(3):00111-2022. [[FREE Full text](#)] [doi: [10.1183/23120541.00111-2022](https://doi.org/10.1183/23120541.00111-2022)] [Medline: [35891622](#)]
115. Connell A, Black G, Montgomery H, Martin P, Nightingale C, King D, et al. Implementation of a digitally enabled care pathway (Part 2): qualitative analysis of experiences of health care professionals. *J Med Internet Res*. 2019;21(7):e13143. [[FREE Full text](#)] [doi: [10.2196/13143](https://doi.org/10.2196/13143)] [Medline: [31368443](#)]
116. Paloumpi E, Ozieranski P, Watson MC, Jones MD. Pharmacy users' perceptions, awareness and future expectations of community pharmacy in England: a focus group study. *Int J Pharm Pract*. 2024;32(1):39-45. [[FREE Full text](#)] [doi: [10.1093/ijpp/riad082](https://doi.org/10.1093/ijpp/riad082)] [Medline: [37978897](#)]
117. Walker RC, Tong A, Howard K, Palmer SC. Patient expectations and experiences of remote monitoring for chronic diseases: systematic review and thematic synthesis of qualitative studies. *Int J Med Inform*. 2019;124:78-85. [[FREE Full text](#)] [doi: [10.1016/j.ijmedinf.2019.01.013](https://doi.org/10.1016/j.ijmedinf.2019.01.013)] [Medline: [30784430](#)]
118. Montague E. Patient source of learning about health technologies and ratings of trust in technologies used in their care. *Ergonomics*. 2010;53(11):1302-1310. [[FREE Full text](#)] [doi: [10.1080/00140139.2010.520746](https://doi.org/10.1080/00140139.2010.520746)] [Medline: [20967654](#)]
119. Sutherland BL, Pecanac K, LaBorde TM, Bartels CM, Brennan MB. Good working relationships: how healthcare system proximity influences trust between healthcare workers. *J Interprof Care*. 2022;36(3):331-339. [[FREE Full text](#)] [doi: [10.1080/13561820.2021.1920897](https://doi.org/10.1080/13561820.2021.1920897)] [Medline: [34126853](#)]
120. Antonacci G, Benevento E, Bonavitacola S, Cannavacciuolo L, Foglia E, Fusi G, et al. Healthcare professional and manager perceptions on drivers, benefits, and challenges of telemedicine: results from a cross-sectional survey in the Italian NHS. *BMC Health Serv Res*. Oct 18, 2023;23(1):1115. [[FREE Full text](#)] [doi: [10.1186/s12913-023-10100-x](https://doi.org/10.1186/s12913-023-10100-x)] [Medline: [37853448](#)]
121. Wilson S, Tolley C, Mc Ardle R, Beswick E, Slight SP. Key Considerations When Developing and Implementing Digital Technology for Early Detection of Dementia-Causing Diseases Among Health Care Professionals: Qualitative Study. *J Med Internet Res*. Aug 22, 2023;25:e46711. [[FREE Full text](#)] [doi: [10.2196/46711](https://doi.org/10.2196/46711)] [Medline: [37606986](#)]
122. Breton M, Sullivan EE, Deville-Stoetzel N, McKinsty D, DePuccio M, Sriharan A, et al. Telehealth challenges during COVID-19 as reported by primary healthcare physicians in Quebec and Massachusetts. *BMC Fam Pract*. Sep 26, 2021;22(1):192. [[FREE Full text](#)] [doi: [10.1186/s12875-021-01543-4](https://doi.org/10.1186/s12875-021-01543-4)] [Medline: [34563113](#)]
123. Lee G, Caton E, Ding A. Evaluating digital competencies for pharmacists. *Res Social Adm Pharm*. May 2023;19(5):753-757. [[FREE Full text](#)] [doi: [10.1016/j.sapharm.2023.01.012](https://doi.org/10.1016/j.sapharm.2023.01.012)] [Medline: [36710173](#)]
124. Bagot KL, Bladin CF, Vu M, Bernard S, Smith K, Hocking G, et al. Factors influencing the successful implementation of a novel digital health application to streamline multidisciplinary communication across multiple organisations for emergency care. *Evaluation Clinical Practice*. Sep 18, 2023;30(2):184-198. [doi: [10.1111/jep.13923](https://doi.org/10.1111/jep.13923)] [Medline: [37721181](#)]
125. Jones WD, Rodts MF, Merz J. Influencing Discharge Efficiency: Addressing Interdisciplinary Communication, Transportation, and COVID-19 as Barriers. *Prof Case Manag*. 2022;27(4):169-180. [doi: [10.1097/NCM.0000000000000549](https://doi.org/10.1097/NCM.0000000000000549)] [Medline: [35617531](#)]
126. Adjekum A, Blasimme A, Vayena E. Elements of Trust in Digital Health Systems: Scoping Review. *J Med Internet Res*. Dec 13, 2018;20(12):e11254. [[FREE Full text](#)] [doi: [10.2196/11254](https://doi.org/10.2196/11254)] [Medline: [30545807](#)]
127. Scott V, Mathews V, Gilson L. Constraints to implementing an equity-promoting staff allocation policy: understanding mid-level managers' and nurses' perspectives affecting implementation in South Africa. *Health Policy Plan*. Mar 2012;27(2):138-146. [doi: [10.1093/heapol/czr020](https://doi.org/10.1093/heapol/czr020)] [Medline: [21450839](#)]
128. Alkureishi MA, Choo Z, Rahman A, Ho K, Benning-Shorb J, Lenti G, et al. Digitally Disconnected: Qualitative Study of Patient Perspectives on the Digital Divide and Potential Solutions. *JMIR Hum Factors*. Dec 15, 2021;8(4):e33364. [[FREE Full text](#)] [doi: [10.2196/33364](https://doi.org/10.2196/33364)] [Medline: [34705664](#)]

Abbreviations

AI: artificial intelligence

CASP: Critical Appraisal Skills Programme

DRAGON: The Rapid and Secure AI-enhanced Diagnosis, Precision Medicine and Patient Empowerment Centered Decision Support System for Coronavirus Pandemics

COPD: chronic obstructive pulmonary disease

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PROSPERO: International Prospective Register of Systematic Reviews

WHO: World Health Organization

Edited by T de Azevedo Cardoso; submitted 08.01.25; peer-reviewed by S Ajayi, O Kehinde, O Ogorry; comments to author 31.01.25; revised version received 27.02.25; accepted 28.03.25; published 30.05.25

Please cite as:

Senek M, Drummond D, Pinnock H, Hansen K, Ankolekar A, O'Connor Ú, Gonsard A, Mazulov O, Sreter KB, Thornton C, Powell P. *Impact of Digital Health on Patient-Provider Relationships in Respiratory Secondary Care Based on Qualitative and Quantitative Evidence: Systematic Review*

J Med Internet Res 2025;27:e70970

URL: <https://www.jmir.org/2025/1/e70970>

doi: [10.2196/70970](https://doi.org/10.2196/70970)

PMID:

©Michaela Senek, David Drummond, Hilary Pinnock, Kjeld Hansen, Anshu Ankolekar, Úna O'Connor, Apolline Gonsard, Oleksandr Mazulov, Katherina Bernadette Sreter, Christina Thornton, Pippa Powell. Originally published in the Journal of Medical Internet Research (<https://www.jmir.org>), 30.05.2025. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in the Journal of Medical Internet Research (ISSN 1438-8871), is properly cited. The complete bibliographic information, a link to the original publication on <https://www.jmir.org/>, as well as this copyright and license information must be included.