Patient preferences for health information technologies: a systematic review

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Contributions: (I) Conception and design: JFP Bridges, B Weiss, S Hyman; (II) Administrative support: B Weiss, S Hyman; (III) Provision of study materials or patients: None; (IV) Collection and assembly of data: JFP Bridges, B Weiss, S Hyman; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background: Advances in patient-facing health information technology (HIT) promise to improve health care delivery and patient outcomes. Low utilization of HIT suggests that the preferences of patients may not be adequately guiding the development of these technologies. This systematic review offers an assessment of published evidence regarding patient preferences for HIT.

Methods: Articles addressing preferences for HIT from patient and other end-user groups published up through 2020 were identified from PubMed, Web of Science, Scopus and via hand searching. Articles that used quantitative stated-preference methods to explore preferences for HIT were eligible for inclusion. Studies that explored attitudes towards HIT without eliciting trade-offs were excluded. Critical appraisal of study quality was conducted using the PREFS checklist and quality criteria identified by the US Food and Drug Administration including heterogeneity analysis and patient engagement in study design. We conducted thematic analysis of the main preference findings from each study to synthesize patient and end-user preferences for HIT. The review was not registered and authors received no funding to conduct the review.

Results: The search yielded 7,299 unique articles, 59 of which were ultimately included in the review. Studies explored preferences for telemedicine (n=30), patient portals (n=12), mHealth (n=9) or multiple HITs (n=8). Preference elicitation methods included direct elicitation (n=26), discrete-choice experiments (n=13), conjoint analysis (n=6), contingent valuation (n=5), and ranking exercises (n=9). Studies had a mean PREFS score of 3.51 out of 5. Forty-two studies conducted preference heterogeneity analysis and only 20 included patients in study design. Thematic meta-analysis indicated that patients prefer HIT that is convenient and lower cost, but does not sacrifice quality, and preferences varied by demographic features such as age as well as depending on the type of health information being communicated.

Conclusions: Patient and end-users have distinct preferences for the use of HIT in their medical care. It is timely that researchers and healthcare administrators consider these preferences for HIT given its rapid uptake amidst the COVID-19 pandemic. Although this literature demonstrates that patients can be engaged as participants in preference studies to identify meaningful aspects of HIT, the field was limited in its inclusion of patients in the design of such studies. Future development of HIT should be guided by high-quality preference research that integrates patients in all stages in the design and implementation of HIT.

Keywords: Telehealth; mHealth; patient preferences; end-users

Received: 10 July 2020; Accepted: 20 November 2020; Published: 25 September 2021.
doi: 10.21037/jhmhp-20-105
View this article at: http://dx.doi.org/10.21037/jhmhp-20-105

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Introduction

Health information technology (HIT) has become central to the provision of healthcare (1). HIT broadly encompasses the use of electronic hardware to address the storage, retrieval, and sharing of health information to inform communication and decision making (2). The Health Information Technology for Economic and Clinical Health (HITECH) Act in 2009 created incentives for the use of HIT services such as electronic medical records, and widened the scope of privacy and security protections for electronic health data (3). As systems capable of storing, analyzing, visualizing, and communicating data to patients and providers, HIT can facilitate patient reminders, support diagnostics, gather and synthesizing important medical information, and facilitate evidence-based decision making at the point of care (4). In clinical settings, HIT applications range from simple digital charting and clinical e-mail to the integration of advanced decision support tools into virtual patient portals (5). The uptake of HIT has allowed health care providers and patients to securely share health information and more efficiently coordinate care and manage the receipt of health services (6). Data generated from HIT can also inform regulatory decision making given that the 21st Century Cures Act has prompted the inclusion of real-world evidence in product review (7).

There is general agreement that HIT has potential to improve healthcare quality and patient outcomes. A recent systematic review found that over 80% of studies integrating HIT resulted in at least one improved medical outcome among patients (8). Appropriate use of HIT has been demonstrated to reduce human and medical errors (9), improve comprehensive care coordination, monitoring and surveilling patient data over time, and improve clinical health outcomes (5). HIT also has the potential to improve outcomes for providers and health systems, such as through streamlining clinical workflow (10) and reducing health care costs (11). HIT is also thought to increase access to care (12).

Despite the promise of HIT to improve the quality of healthcare it continues to face satisfaction and implementation barriers hindering its success (13,14). A US study indicated that poor system functionalities, difficulty using, and hardware issues reduced clinician satisfaction with the use of HIT such as electronic health records (EHR) (15). A systematic review of problems with HIT spanning studies in six countries found that problems with HIT included issues with functionality, poor user interfaces, fragmented displays, and challenges in accessing the system (16). Patients and clinicians have expressed concerns that the use of technology hinders rapport-building (17), although other reports indicate that HIT can improve doctor-patient relationships by automating workflows and increasing clinician-patient time (10). A systematic review in primary care across seven countries found that neither quality of care, patient safety nor provider/patient relationships were affected by the adoption of EHR, but that implementation success was fostered by insulating features within the health system such as strong leadership, project management, standardization, and training (18). This indicates that successful implementation of HIT may depend not just on the effectiveness of the technologies themselves but on the contexts in which they are applied.

Patient-centeredness involves providing care that is concordant with patients' needs and values and respectful of/responsive to patient preferences (19). Health informatics have the potential to facilitate patient-centered care and the field has evolved to consider technology's role in the acquisition, storage, and usage of health care data (20). Optimized HIT may increase patient satisfaction and perceived satisfaction with and quality of care, as well as improve health outcomes HIT (7,21). Conversely HIT may also detract from the patient-centeredness of care when applied inappropriately (22). Ensuring that HIT systems are aligned with and responsive to patients' preferences, needs and values is essential to making them patient-centered. Doing so is a priority area for the Agency for Healthcare Research and Quality (23).

Methods to measure the preferences of patients have been rigorously applied to explore the preferences of patients in diverse healthcare settings (24,25). Stated-preference methods are a well-established and rapidly growing suite of preference elicitation approaches with application in clinical, policy, and regulatory decision making (26-28). Stated-preference methods can help in identifying what attributes of a given health service individuals value most and what tradeoffs they are willing to make to achieve them. Understanding patient preferences for HIT can help in the development of HIT systems that are acceptable to patients. They can also ensure that HIT is used to support and enhance patient's interactions with healthcare systems rather than detract from them.

This systematic review characterizes how stated-preference methods have been used to explore patient and other end-user preferences for HIT. Previous research has systematically reviewed other processes measures associated with HIT including its adaption (16,29,30), satisfaction and attitudes (7,31,32), and barriers and facilitators (33,34). In addition to providing substantial information regarding patient and other end-user preferences for HITs, we also offer methodological recommendations on how to evaluate the quality and bias in patient preference studies following good research practices, and how to synthesize substantive information about patient preferences using meta-synthesis. We present the following article in accordance with the PRISMA reporting checklist (available at http://dx.doi.org/10.21037/jhmhp-20-105).

Methods

Key questions

We conducted a systematic review and meta-synthesis to explore the use of preference-elicitation methods in evaluating HIT. The review was guided by three overarching questions: (I) In what HIT and healthcare contexts are preference studies being conducted? (II) What is the typology and quality of HIT preference studies? (III) What are patients' and other end-users' preference for HIT? Answers to these questions will make an important contribution to the literature by providing information that can be used to inform the development, application, and evaluation of HIT from a patient-centered perspective. This review follows protocols based on other systematic reviews of preference-elicitation methods (35,36).

Inclusion and exclusion criteria

Studies were eligible for inclusion if they (I) discussed HIT; (II) used a quantitative trade-off based stated-preference method, including: direct-elicitation, discrete-choice experiments, conjoint analysis, and ranking; (III) elicited the preferences of patients, caregivers, or end-users; (IV) were available in English, and (V) were full-text documents. Studies that only assessed the preferences of health care providers for HIT were excluded. Studies in which the preference-elicitation approach did not involve a trade-off, such as "select all that apply" questions or Likert-type rating, were excluded. Abstracts and purely qualitative studies were excluded. For this review HIT was defined following Brailer *et al.*'s description of HIT as "the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making" (2). Studies describing such technologies were eligible for inclusion, prominent examples of which include EHR, patient-portals, and telehealth. Two reviewers assessed studies at the title/abstract and full-text stages to determine inclusion (BW, SH). Conflicts were addressed by a third reviewer (JB).

Search strategy

The search strategy included three concepts: (I) HIT, (II) stated-preference methods, (III) patients, caregivers, and end-users. We performed a preliminary search of PubMed and Web of Science in January 2020. The search strategy was amended, and run in PubMed, Web of Science, and Scopus in April 2020. The final search terms are presented in Table S1. This search was supplemented with additional hand-searching of the reference lists of all included studies, and the journals *Journal of Telemedicine and e-Health*, *Journal of Telemedicine and Telecare*, *Journal of American Medical Informatics*, *BMC Medical Informatics and Decision Making*, *Journal of Medical Internet Research* from 2004 to 2020. These journals were selected for additional hand-searching because they had produced many relevant/nearly relevant hits in database searches.

Data abstraction & critical appraisal

The following categories of information were extracted: author, date, country, preference-elicitation method, sample size, HIT context (i.e., telemedicine, patient portal, mHealth, or multiple HITs), and healthcare context (i.e., receiving healthcare, managing health data, receiving health data, or multiple healthcare contexts), and key preference finding.

We assessed study quality using the PREFS checklist (35) which evaluates the quality of reporting of stated-preference studies according to five criteria: purpose of study, respondent sampling, explanation of assessment methods, findings, significance testing. Studies achieved a score of 1 for every criterion that meet PREFS standards, and a 0 otherwise. The range of possible PREFS scores is 0–5. ANOVA tests were used to explore differences in PREFS scores across preference-elicitation and HIT contexts. We also assessed study quality according to several criteria posed by the US Food and Drug Administrations for patient preference studies, including: justification of sample size, heterogeneity considerations, relevance/comprehension to the patient population (37,38).

General data abstraction was split between two reviewers (BW, SH). PREFS scores and FDA recommended qualities were independently assigned by two reviewers (BW, SH) and discrepancies were resolved through consensus agreement between the reviewers.

Meta-synthesis using thematic analysis

Key preference findings abstracted from all studies were synthesized using thematic analysis. Thematic analysis is a foundational approach in qualitative analysis and is used for identifying, analyzing and characterizing repeated topics and ideas (39,40). The key preference finding was thematically analyzed by three reviewers (NC, BW, SH). The three reviewers independently identified themes, and then collectively revised and refined themes. Two reviewers conducted a final thematic categorization of the key findings from each included article (BW, SH) and a third reviewer (NC) reconciled any conflicts.

The review was not registered and authors received no funding to conduct this review. The review protocol can be accessed from authors upon reasonable request.

Results

Identified studies

The search strategy identified 9,152 results via systematic review methods and 14 results via hand searching as is visualized in the PRISMA diagram presented in *Figure 1*. After removing 1,867 duplicates, titles/abstracts of 7,299 papers were reviewed. A full-text review was conducted for 130 articles, 71 of which were excluded as they did not meet all inclusion criteria. In total 59 articles met all criteria and were included in the review. Several studies met many but not all criteria. For instance, some studies assessed preferences of clinicians rather than patient/caregiver end-users (41,42), and others used qualitative methods rather than quantitative trade-off techniques to describe preferences for HIT (43).

Characteristics of included studies

Table 1 describes the characteristics of included studies. Most studies were conducted in the US (n=29), followed by Australia (n=9), the Netherlands (n=4), South Korea (n=3), Germany (n=3), United Kingdom (n=2), Canada (n=2 each), Italy (n=2) and Israel, Turkey, Sweden, and Japan (n=1 each). Only one study spanned multiple countries (44). The majority of studies were published from 2010 to 2020 and this growth of preference studies for HIT is visualized in *Figure 2*. Study sample sizes ranged from 34 to 20,882 participants. Studies using an experimental preference method (i.e., DCE, conjoint analysis, contingent valuation) had the highest average sample size (average n=1,640) followed by direct elicitation (average n=421) and ranking (average n=178). Data extracted from included studies is available from authors upon reasonable request.

Critical appraisal of study quality

Three studies met all five PREFS criteria (45-47), 28 studies met four criteria, 24 met three criteria, and the remaining four studies met two criteria (*Table 1*). The average PREFS score was 3.51 out of 5 (SD 0.70). Almost all studies met criteria for stating the preference purpose (“P” in PREFS, n=58) and explaining the preference-elicitation methodology (“E”, n=56). Few studies demonstrated that responders were similar to non-responders (“R”, n=5). Three-quarters of studies appropriately included respondents in the findings (“F”, n=43) and used significance tests (“S”, n=45). Average PREFS score did not vary across preference-elicitation (ranking *vs.* direct elicitation *vs.* experimental methods; P=0.73) or by HIT context (P=0.69). Inter-rater reliability of study quality using PREFS was 0.80 before a consensus score was assigned for every study, and 1.00 after consensus.

In assessing study quality using criteria outlined by FDA we found that 71% of studies (n=42) conducted heterogeneity analysis. Preference heterogeneity was generally assessed through sub-group analysis of patient demographics, medical conditions, technology familiarity, health literacy, or some other distinguishing characteristic of the research population. About a third of the articles (n=20) engaged patients in the development of the preference elicitation tool through either a focus group, pilot study, or both. Only 15% of studies (n=9) justified their sample size.

Preference elicitation approaches

We segmented literature into three preference-elicitation categories based on the preference study design: (I) experimental preference methods (DCE, conjoint analysis,

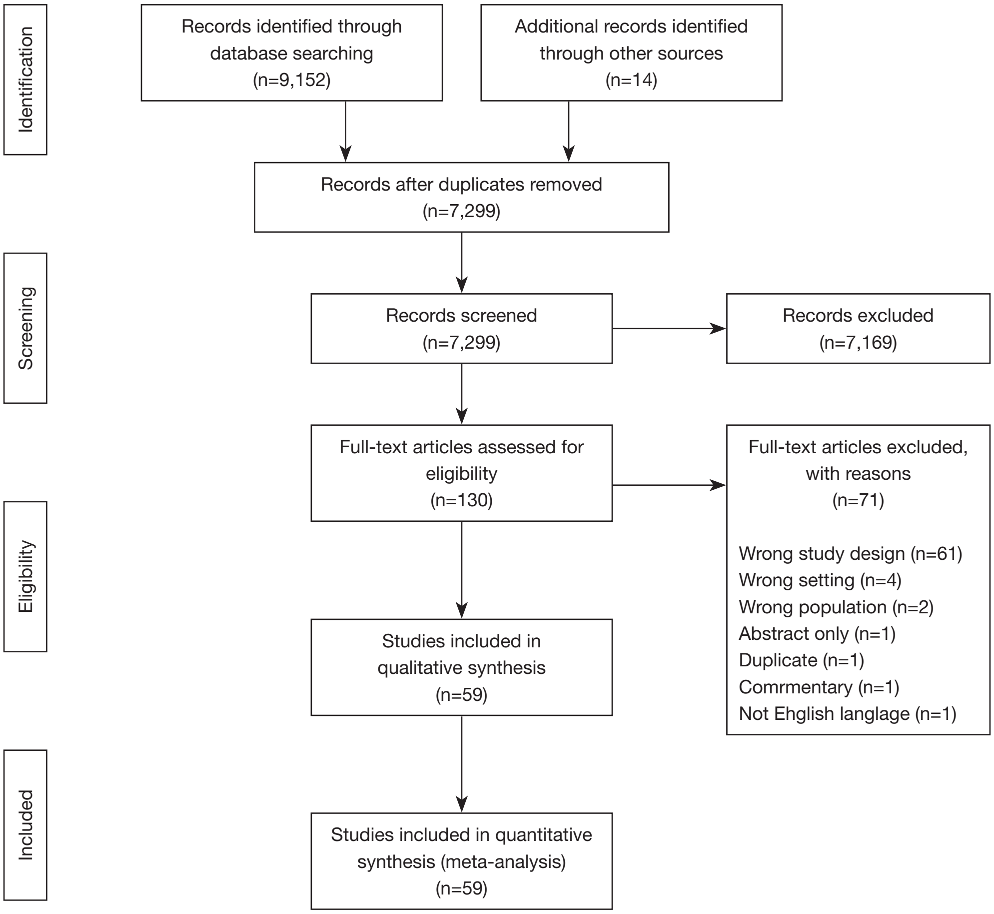

Figure 1 PRISMA flow chart of study identification and selection

contingent valuation), (II) direct elicitation, and (III) ranking exercises.

Experimental preference methods

Twenty-four studies used experimental preference elicitation approaches including DCEs (n=12) (44,46,48-56), conjoint analysis (n=7) (57-63), and contingent valuation (n=5) (64-68). Of the 19 studies that used a DCE or conjoint analysis, 14 had a choice-based design (44,46,48-56, 61,63,69), three had a rank-based design (57-59), one used a value-based conjoint (60), and one used a take-it-or leave conjoint analysis (62).

In the choice-based designs, multiple choice tasks were presented to respondents, each consisting of two or more profiles described by various attribute levels relevant to the healthcare and HIT context. Seven of the studies using choice-based designs offered an opt-out choice in which the respondent could choose none of the presented profiles (44,50,53,54,56,61,69). For example, Determann *et al.* included an opt-out option in their DCE that explored EHR preferences in order to make the experiment resemble the real-life situation where respondents are not obligated to have a EHR (53).

The total number of choice tasks presented to respondents in a given preference study using a choice-based design ranged from 5–22 (mean 11.36, SD 4.78). Eight of these studies used blocked-designs wherein a given respondent received a subset of the total choice tasks (44,46,48-50,52,56,69). In these studies, the total number of choice tasks ranged from 12–120. One such study was a pan European survey of online patient portal preferences that analyzed a total of 120 choice tasks through surveys that only presented five choice tasks to each respondent (44). In choice-based design studies, the number of attributes

Table 1 Characteristics of included HIT preference studies

1st author, year	Country	Method	N	HIT context	Healthcare context	PREFS
Brick, 1997	USA	DE	461	Telemedicine	Telemedicine services for rural populations[a]	3 EFS
Lowitt, 1998	USA	DE	131	Telemedicine	Teledermatolgy examination of veterans[a]	2 EF
Tsuji, 2003	JAP	CV	291	Telemedicine	WTP for telemedicine services[a]	3 PES
Dick, 2004	CAN	VAS	57	Telemedicine	Care support following hospital discharge[a]	3 PES
Hassol, 2004	USA	DE	1,421	EHR	EHR web-based communication[b]	3 PEF
Bradford, 2004	USA	CV	126	Telemedicine	WTP for CHF telemedicine services[a]	4 PEFS
Bradford, 2005	USA	CV	366	Telemedicine	WTP for CHF and hypertension telemedicine services[a]	3 PES
Qureshi, 2007	USA	CV	92	Telemedicine	WTP for telemedicine services[a]	3 PEF
Mofid, 2007	USA	DE	98	Telemedicine	Teledermatology vs face-to-face consultation[a]	4 PEFS
Basoglu, 2010	TUR	CA	161	Telemedicine	Remote clinical service[a]	3 PEF
Park, 2011	SKR	CA	118	Telemedicine	Diabetes Management Service[a]	3 PES
Basu, 2011	USA	DE	129	mHealth	Receiving imaging results[c]	4 PEFS
Vandelanotte, 2011	AUS	DE	803	Telemedicine	Physical activity intervention[a]	4 PEFS
Johnson, 2012	USA	DE	53	OPP	Receiving radiological reports[c]	3 PEF
Ranney, 2012	USA	DE	664	mHealth, Telemed	Technology-based behavioral Interventions[a]	5 PREFS
Jung, 2012	SKR	DE	243	Telemedicine	General telemedicine services[a]	3 PES
Grande, 2013	USA	CA	3,064	OPP	Secondary uses of health data[b]	4 PRES
Ahn, 2014	SKR	CA	400	Telemedicine	General telemedicine services[a]	4 PEFS
Quinlivan, 2014	AUS	DE	474	PCEHR	Health record storage system[b]	4 PEFS
Muench, 2014	USA	DE	277	mHealth	Messaging for behavioral interventions[a,b]	3 PES
Stephen, 2014	UK	CV	34	Telemedicine	WTP for dementia telecare services[a]	4 PEFS
Stypulkowski, 2015	USA	DE	346	Telemedicine	Surgery postoperative follow-up[a]	3 PEF
Lal, 2015	CAN	DE	67	Telemedicine	Receiving mental health services and information[a]	3 PEF
Choudhry, 2015	USA	RE	301	mHealth, OPP	Receiving skin biopsy results[c]	4 PEFS
Cabarrus, 2015	USA	DE	617	mHealth, OPP	Receiving radiological reports[c]	4 PEFS
Cabitza, 2015	IT	RE	385	PHR	PHR functionalities[b]	4 PEFS
Kaambwa, 2016	AUS	DCE	330	Telemedicine	Health care services for older people[a]	4 PEFS
Wallin, 2016	SWE	DE	343	Telemedicine	Internet based psychological Interventions[a]	3 PES
Determann, 2016	NET	DCE	1,443	PHR	Managing health data access, sharing, and storage[b]	4 PEFS
Patil, 2016	EU	DCE	20,882	OPP	Managing health data access, sharing, and storage[b]	3 PES
White, 2016	UK	RE	201	EHR	EHR functions and access needs[b]	4 PREF
Ray, 2016	USA	DE	439	mhealth	Receiving ED discharge information[c]	4 PEFS
Spinks, 2016	AUS	DCE	35	Telemedicine	Teledermoscopy for melanoma screening	4 PEFS

Table 1 (*continued*)

Table 1 (*continued*)

1st author, year	Country	Method	N	HIT context	Healthcare context	PREFS
Granger, 2016	AUS	DE	1,865	mhealth	mhealth intervention & info. delivery[b]	4 PEFS
Brazeal, 2017	USA	RE	125	mhealth, OPP	Breast biopsy result notification[c]	4 PEFS
Chang, 2017	USA	DCE	5,921	Telemedicine	Online health services[a]	5 PREFS
Cranen, 2017	NET	DCE	104	Telemedicine	Pain rehabilitation[a]	3 PES
Marchell, 2017	USA	RE	201	Telemedicine	Teledermatology examination methods[a]	3 PES
Andino, 2017	USA	VAS	108	Telemedicine	Video visits at outpatient urology clinic[a]	2 PE
Boyde, 2018	AUS	DCE	200	mHealth, Telemed	Delivering cardiac rehabilitation services[a]	4 PEFS
Deidda, 2018	IT	DCE	2,000	Telemedicine	Cardiology services[a]	3 PES
Snoswell, 2018	AUS	DCE	113	Telemedicine	Teledermoscopy for skin cancer screening[a]	4 PEFS
Saraswathula, 2018	USA	DE	107	OPP	Communication of biopsy results[c]	4 PEFS
Nayyar, 2018	USA	CA	774	mHealth	Aesthetic surgery information[c]	3 PEF
Wildenbos, 2018	NET	DCE	1,294	OPP	Patient portal functionalities[b]	3 PES
Russell, 2018	USA	RE	46	mHealth	Medication self-management app features[b]	2 PF
Apolinario-Hagen, 2018	GER	DE	646	mHealth, Telemed	Internet based therapies[a,b]	2 PE
Cronin, 2018	USA	DE	480	OPP	Online PROMIS health assessment dashboard[b]	3 EFS
Offermann-van Heek 2019	GER	CA	140	mHealth, Telemed	Ambient Assisted Living (ALL) technologies[c]	2 PE
Chudner, 2019	IL	DCE	508	Telemedicine	Video consultations in primary care[a]	4 PEFS
Nagao, 2019	USA	DE	40	Telemedicine	Audiometry telehealth services[a]	4 PEFS
Morland, 2019	USA	RE	180	Telemedicine	PTSD treatment preferences[a]	4 PEFS
Woolen, 2019	USA	DCE	418	OPP	Releasing cancer radiological test results[c]	4 PEFS
Plinsinga, 2019	AUS	DE	259	mHealth	Osteoarthritis self-management support groups[b]	3 PEF
Edwards, 2020	USA	DE	112	mHealth, OPP	Communication of pediatric radiology results[c]	4 PEFS
Slightam, 2020	USA	DE	764	Telemedicine	Clinical services for veterans with access barriers[a]	5 PREFS
Lim, 2020	AUS	CA	547	mHealth	Digital health administration[b]	4 PEFS
Nguyen, 2020	GER	DE	65	mHealth	Reporting adverse events following immunization[b]	3 PEF
Barsom, 2020	NET	DE	50	Telemedicine	Video follow-up consultations for colorectal cancer[a]	4 PEFS

Healthcare Context Groups: [a], receiving healthcare; [b], managing health data and healthcare; [c], receiving health data. USA, United States; UK, United Kingdom; CAN, Canada; SKR, South Korea; EU, European Union; AUS, Australia; SWE, Sweden; IT, Italy; GER, Germany; NET, Netherlands; IL, Israel; DE, direct elicitation; CV, contingent valuation; VAS, visual analogue scale to facilitate a ranking exercise; EHR, electronic health record; CA, conjoint analysis; OPP, online patient portal; RE, ranking exercise; PHR, personal health record; PCEHR, personally controlled electronic health record; WTP, willingness to pay; DCE, discrete-choice experiment; ED, emergency department; CHF, chronic heart failure.

presented per tasks ranged from three to eight (mean 5.43, SD 1.45).

Rank-based conjoint analysis involved respondents ranking multiple profiles described by various attribute levels from most preferred to least preferred. Only three studies used this approach (57-59). Five studies used a

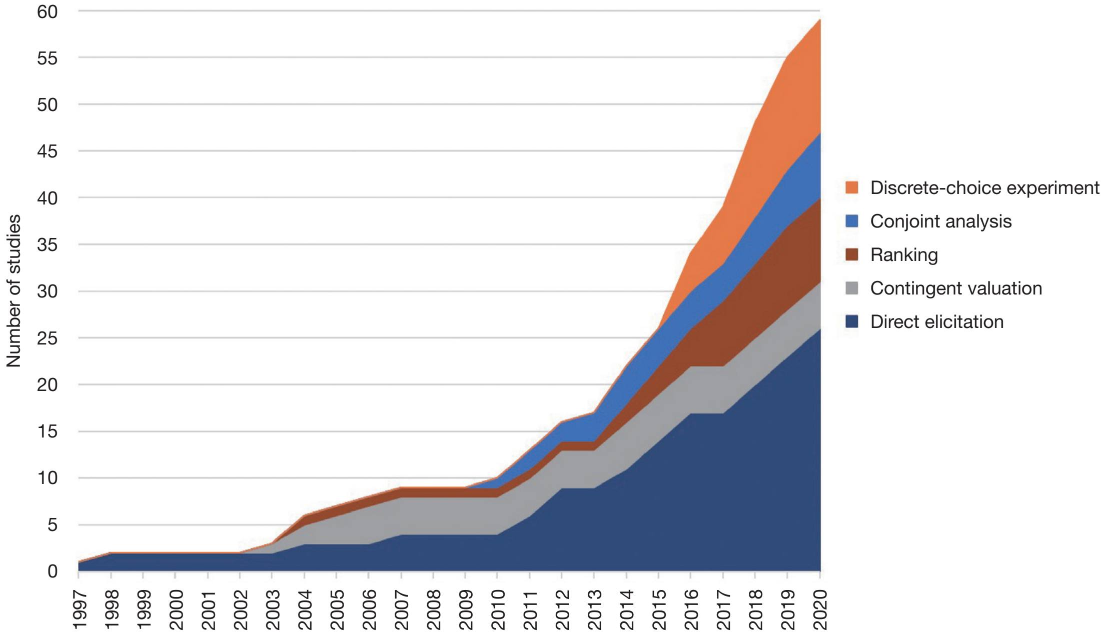

Figure 2 Growth of HIT preference research over time

contingent valuation approach, including those using open-ended (64,67), bounded (65,66), and both open-ended and bounded (68) methodologies. These five studies all explored willingness to pay for access to telemedicine services.

Direct elicitation

A total of 26 studies including (45,47) and (70-93) used direct elicitation approaches to identify HIT preferences. . The direct elicitation methodologies involved questions in which respondents chose between multiple options related to the HIT context. Twelve studies included an opt-out option wherein participants could choose neither offered option. Examples of direct elicitation type questions included: "What is your preferred platform for delivery of personalized health information?" (87) and "In case of emotional problems, which of the described interventions would you most likely personally use?" (93). Most direct elicitation studies (n=18) used one or two questions to address a particular HIT healthcare context, but eight studies utilized three or more questions. Only one study asked more than seven preference elicitation questions (86).

Ranking exercises

Nine studies used ranking methods to identify preferences for HIT (94-102). The ranking exercises involved questions or tasks in which respondents ranked HIT attributes, such as modalities for receiving biopsy results (101,102) or electronic health records/personal health record functions (98,99), from most important to least important. In three studies, a ranking exercise was paired with another research task (95,97,100). Two studies utilized a visual analogue scale to perform a ranking task (94,96).

HIT and healthcare context

The most studied HIT context was telemedicine (n=30) followed by patient portals including electronic health records (n=12), mHealth (n=9) and multiple HITs (n=8). A matrix visualizing HIT context and the preference-elicitation approaches used to evaluate them is presented in *Table 2*.

In comparing across healthcare contexts, we found that studies fell into one of three groups including measuring preferences for: (I) receiving health data, (II) receiving healthcare, and (III) managing health data and healthcare. Ten studies were categorized as regarding the receipt of health data (*Table 1*). This included studies assessing receipt of clinical information such as biopsy results or radiological reports. Thirty-three studies described preferences for HIT with regards to receiving healthcare (*Table 1*). These explored preferences for clinical interventions, therapies, or rehabilitation. Clinical areas

Table 2 HIT typology and preference elicitation method

HIT type	Direct elicitation	Discrete-choice experiment	Conjoint analysis	Ranking exercise	Contingent valuation
Telemedicine	Brick, 1997	Kaambwa, 2016	Basoglu, 2010	Dick, 2004	Tsuji, 2003
	Lowitt, 1998	Spinks, 2016	Park, 2011	Marchell, 2017	Bradford, 2004
	Mofid, 2007	Chang, 2017	Ahn, 2014	Andino, 2017	Bradford, 2005
	Vandelanotte, 2011	Cranen, 2017		Morland, 2019	Qureshi, 2007
	Jung, 2012	Snoswell, 2018			Stephen, 2014
	Stypulkowski, 2015	Deidda, 2018			
	Lal, 2015	Chudner, 2019			
	Wallin, 2016				
	Nagao, 2019				
	Slightam, 2020				
	Barsom, 2020				
Patient portal	Hassol, 2004	Determann, 2016	Grande, 2013	Cabitza, 2015	
	Johnson, 2012	Patil, 2016		White, 2016	
	Quinlivan, 2014	Wildenbos, 2018			
	Saraswathula, 2018	Woolen, 2019			
	Cronin, 2018				
mHealth	Basu, 2011		Nayyar, 2018	Russell, 2018	
	Muench, 2014		Lim, 2020		
	Granger, 2016				
	Ray, 2016				
	Plinsinga, 2019				
	Nguyen, 2020				
Multiple HITs	Ranney, 2012	Boyde, 2018	Offermann-van Heek, 2019	Choudhry, 2015	
	Cabarrus, 2015			Brazeal, 2017	
	Apolinario-Hagen, 2018				
	Edwards, 2020				

of study in this category included diabetes management (58), mental health/psychological interventions (76,77), cardiology services (51), skin cancer screening with teledermatology (49,50,71,72,95), pain rehabilitation (69), and cardiac rehabilitation (56). Sixteen studies examined preferences for managing health data and healthcare (*Table 1*). These studies described preferences for EHR management and self-management of healthcare. Most studies in this area were process-oriented rather than clinically focused, although two studies did focus specifically on managing healthcare with regards to osteoarthritis (89), and adverse event reporting following immunization (90).

Themes from key preference findings

Thematic analysis of the key preference results from all 59 studies (Table S2) resulted in the identification of 6 substantive themes regarding patient and end-user preferences for HIT. First, that preference for HIT vary based on patient characteristics. Second, communication modality preferences depend on the type of exchange. Third, HIT is preferred when it facilitates expedience and convenience. Fourth, patients are concerned with their data being used outside of direct clinical encounters. Fifth, patients care about the cost of HIT. Sixth, HIT should not sacrifice quality of care.

Preferences for HIT vary based on patient characteristics

Sub-group and heterogeneity analysis conducted in many studies revealed that demographic characteristics such as age (47,54,62,65,66,70,71,74,78,86,87,97,101), race (60,102), gender (51,62,86,97), education (62,86,87,101), income (46,70) and proximity to care (46,79) were associated with patient preferences for HIT. Younger patients and higher income patients generally placed higher utility on HIT services.

Communication modality preferences depend on the type of exchange

Patients in many studies preferred that new, sensitive, complex, or urgent health concerns be communicated through conversation with a provider rather than electronically (47,69,70,72,77,80,82,85,101,102). In one study, patients' preferred direct physician communication particularly for the return of abnormal biopsy results (85) though other studies reported participant indifference to communication method (81,101) and one study reported preference for return of biopsy results via the telephone rather than in-person (102). As waiting time for in-person care increased, patients became more willing to accept electronic communication regarding health information (54,55,70,85). Patients also expressed preferences for different modalities and functionalities of HIT based on the information being communicated (e.g., preference for text message *vs.* email) (87,98-100).

HIT is preferred when it facilitates expedience and convenience

Several studies demonstrated that using HIT was preferred relative to a traditional, in-person appointment when it was less burdensome to patients. Participants in one study indicated that the ideal circumstance for HIT was one wherein the patient lived far away from the clinic and would save money by using HIT (48). Visits that were outside of work hours (57) or located near other normal activities were preferred (49).

Patients are concerned with data use outside of clinical encounters

Patients expressed preferences for sharing their healthcare data with their health care team to inform medical decision making and improve care quality (44,63). However, patients also expressed concerns regarding the use of their data to inform non-clinical encounters. Patients generally opposed the use of their health data for marketing purposes (60) and for pharmaceutical and academic research (44). In one study younger patients had more liberal preferences for the storage and use of sensitive information than older patients (44). Data storage was among the most important concern of people reluctant to use electronic medical record systems (53).

Patients care about the cost of HIT

Patients expressed concern for the cost of HIT services in several studies. Cost was the most important service attribute regarding telemedicine (58) and the most decisive attribute for those who refused the use of electronic health records (53). Respondents in several studies expressed that telemedicine should be of lower cost than in-person care (48,51). Recurring service fees for HIT was more important to patients than single-time costs associated with devices needed to facilitate visits (59). Numerous studies investigated WTP for diverse HIT services (46,49,50,58,59,64-68,96). Several of these studies found that increasing age was associated with decreased WTP for HIT (65,66).

HIT should not sacrifice quality of care

There was concern among patients that HIT offered lower quality care as compared to in-person visits (49). Among a group of patients who expressed preferences for in-person care over telehealth, care quality was rated as the most important attribute of healthcare (52). Comprehensiveness of care was a highly prioritized attribute (58) and patients were more likely to prefer video-based care if they believed all of their concerns could be addressed during the appointment (45). In two separate studies patients were indifferent to in-person *vs.* HIT-facilitated healthcare as long as the provider was a specialist rather a general practitioner (50,61).

Discussion

The uptake of HIT over the past twenty years has altered the process of both providing and receiving medical care (103).

The current review demonstrates that patients have distinct preferences regarding both their own use and their care team's use of HIT, namely that HIT is more appropriate in some settings than others, and that it ought to be convenient, low-cost, and high quality. This review contributes to calls to use and evaluate technologies from the perspective of patients by characterizing preferences for both the context and modality of HIT.

Despite technological advances there continues to be low satisfaction and uptake of HIT. Holistic understanding of patient and other end-user preferences for HIT can inform patient-centered development and application of HIT which should improve uptake (104). Doing so has the potential to improve patient engagement in health and self-management of health conditions (105,106). In addition to improving uptake of HIT more broadly, preference research can also help identify how preferences might vary across sub-groups of patient populations. The current review identified that preferences for HIT vary based on characteristics such as age, income, and education. Optimizing use of HIT might require tailoring it to meet the needs of unique individuals or groups of patients.

Thematic analysis of primary preference outcomes from included studies revealed that patients are reluctant for their personal health data to be used for drug development research. This is an important finding in light of the 21st Century Cures Act which encourages the use of real-world data such as that from patient medical records (7). To be patient-centered means to act in ways that are consistent with patients' preferences and values (19). There is a tension in how to be patient-centered in this context; patients may not want to share data but also may enjoy the benefit of more expedient access to treatments facilitated by the sharing of their health data. This concern warrants further consideration from informatic, regulatory and bioethical perspectives and research. Preference research itself may be a useful tool to parse out acceptable tradeoffs between data sharing, data privacy, and development of new drugs.

In addition to being an area that can be informed by patient preferences, HIT might also facilitate the collection of patient preference information. There is a growing call to systematically and routinely collect patient preference information (23). Almost all stated-preference research is conducted cross-sectionally and as a result is it unknown whether preferences change over time or in response to medical events. Integrating preference-elicitation tasks into medical data, much in the way that patient-reported outcomes are currently captured now, is a potential area for new research. Knowing patient preferences at the point-of-care—for many aspects of that care, not just for HIT specifically—could improve medical decision making in clinical settings.

It is important to note that not all preference studies need be complex and experimentally designed in order to provide meaningful information about what patients want, be it with regards to HIT or elsewhere. While there has been a surge in the use of experimental methods such as DCEs in many aspects of health (107), other approaches can also be fit-for-purpose and appropriate to gauge preferences. For instance, direct elicitation approaches, wherein the researcher directly asks the respondent about what they do or do not want, composed half of studies in the current review.

This review has several limitations. First, we opted to include only quantitative preference elicitation methods that required participants to make trade-offs. Other preference elicitation methods including qualitative approaches can also speak to patient and end-user preferences for HIT (26). Another limitation is that of HIT's conceptual ambiguity and identifying what was and was not HIT. While we conducted a systematic search, it is possible that not all articles on the topic of HIT preferences were captured. One reason for this is the conceptual ambiguity surrounding HIT. Our search followed a very broad definition of HIT (2), as specific descriptions of what does and does not constitute HIT are somewhat lacking. Such conceptual ambiguity creates difficulty in defining appropriate search terms. While our search strategy was based on our selected definition, choosing a different definition of HIT may have modified the returned set of studies and altered findings. The current review primarily captured preferences for HIT related to telemedicine, EMR, patient portals, and mHealth. Today's rapidly-evolving technological and informatics environment means that there continue to be changes in electronic delivery of health information. On the horizon we anticipate that more HIT literature will address wearables, wireless medical devices, and personalized care (108), as well as HIT in a peri-COVID-19 world.

The current review used thematic analysis to synthesize findings from the primary preference results. Standard considerations of both meta-synthesis and qualitative analysis apply here, including that there are methodological challenges in combing results across multiple studies and that the reviewers are instruments of the research processes (109,110).

The growth of HIT in wake of the COVID-19 pandemic strengthens the imperative of this work. COVID has acted as a push-strategy forcing the rapid rollout of HIT, rather than fostering a strategic rollout purposefully aligned with patient preferences. As HIT systems become ubiquitous in everyday medical care it is important that they be built with patient preferences in mind. As the digital era evolves it is important to consider not only whether people have access to and are able to adequately operate electronic health care services but also whether electronically-acquired information can be translated into positive health outcomes (107,111,112).

To further consider the preferences of patients in the construction of HIT systems, health information developers and health care administrators should seek to collect input from patient/caregiver end-users to identify and implement user-friendly systems that are responsive to patient need. However, healthcare administrators, rather than patients, are often primary stakeholders when examining organizational factors of patient-centeredness (113). As patients may have different ideal uses for HIT than other groups it would make sense to include patients in the identification of organizational outcomes for intervention. Failing to consider the wants of patients in the development of HIT systems may exacerbate health care disparities (114).

Acknowledgments

We would like to thank Tanya Huwig for her support in hand-searching journals as well as Naleef Fareed and Rebecca Carter for their input in conceptualizing the manuscript. An earlier version of this manuscript was completed as a Masters of Public Health capstone paper by Brent Weiss at The Ohio State University.
Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the Guest Editors (Naleef Fareed, Ann Scheck McAlearney, and Susan D Moffatt-Bruce) for the series “Innovations and Practices that Influence Patient-Centered Health Care Delivery” published in *Journal of Hospital Management and Health Policy*. The article has undergone external peer review.

Reporting Checklist: The authors have completed the PRISMA reporting checklist. Available at http://dx.doi.org/10.21037/jhmhp-20-105

Peer Review File: Available at http://dx.doi.org/10.21037/jhmhp-20-105

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/jhmhp-20-105). The series “Innovations and Practices that Influence Patient-Centered Health Care Delivery” was commissioned by the editorial office without any funding or sponsorship. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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doi: 10.21037/jhmhp-20-105

Cite this article as: Crossnohere NL, Weiss B, Hyman S, Bridges JFP. Patient preferences for health information technologies: a systematic review. J Hosp Manag Health Policy 2021;5:25.

Supplementary

Table S1 Search terms

PubMed

(("HIT"[All Fields] OR "health information technology"[All Fields] OR "health IT"[All Fields] OR "Electronic Health Records"[MESH] OR "Electronic Medical Record"[All Fields] OR "EMR"[All Fields] OR "Health Records, Personal"[Mesh] OR (Epic[All Fields] AND "mychart"[All Fields]) OR (Cerner[All Fields] AND "patient portal"[All Fields]) OR "Microsoft Health"[All Fields] OR "Google Health"[All Fields] OR "GE Healthcare"[All Fields] OR "Telemedicine"[Mesh] OR "telecare"[All Fields] OR "Consumer Health Information"[Mesh] OR ("mobile applications"[MeSH] AND "health"[All Fields]))
AND
("patient preference"[MeSH] OR "consumer behavior"[MeSH] OR (("patients"[MeSH] OR "caregivers"[Mesh] OR "end-user"[All Fields] OR "end user"[All Fields] OR "consumer"[All Fields]) AND ("preference"[All Fields] OR "perception"[MeSH] OR "priority"[All Fields] OR "Health Priorities"[Mesh] OR "stated preference"[All Fields] OR "stated choice"[All Fields] OR "rating"[All Fields] OR "ranking"[All Fields] OR "perspective"[All Fields] OR "preference-based approach"[All Fields] OR "preference-based method"[All Fields] OR "tradeoff"[All Fields] OR "trade-off"[All Fields] OR "TTO"[All Fields] OR "BWS"[All Fields] OR "best worst scaling"[All Fields] OR "best-worst scaling"[All Fields] OR "maximum differential"[All Fields] OR "maxdiff"[All Fields] OR "max diff"[All Fields] OR "discrete choice experiment"[All Fields] OR "DCE"[All Fields] OR "discrete choice"[All Fields] OR "Conjoint analysis"[All Fields] OR "ngene"[All Fields] OR "conjoint.ly"[All Fields] OR "sawtooth"[All Fields] OR "Point allocation"[All Fields] OR "magnitude estimation"[All Fields] OR "pairwise comparison"[All Fields] OR "budget allocation"[All Fields] OR "self explicated method"[All Fields] OR "self-explicated method"[All Fields] OR "direct assessment"[All Fields] OR "direct elicitation"[All Fields]))))
AND
("patient preference"[MeSH] OR "consumer behavior"[MeSH] OR (("patients"[MeSH] OR "caregivers"[Mesh] OR "end-user"[All Fields] OR "end user"[All Fields] OR "consumer"[All Fields])

Web of Science

("HIT" OR "health information technology" OR "health it" OR "EHR" OR "electronic health record" OR "EMR" OR "electronic medical record" OR "patient portal" OR (Epic AND "mychart") OR (Cerner AND "HealtheLife") OR "Microsoft Health" OR "Google Health" OR "GE Healthcare" OR ("mobile application" AND "health") OR ("health portal" AND "web") OR "personal health record" OR "PHR" OR "ehealth" OR "e-health" OR "electronic health" OR "telecare" OR "telemedicine" OR "telehealth" OR "mobile health technology" OR "mobile health application" OR "m-health" OR "mhealth" OR "consumer health information" OR "social media" OR "instagram" OR "facebook" OR "twitter" OR "snapchat")
AND
("Patient Preference" OR "Consumer Behavior" OR "preference" OR "perception" OR "priority" OR "Health Priorities" OR "stated preference" OR "stated choice" OR "rating" OR "ranking" OR "perspective" OR "preference-based approach" OR "preference-based method" OR "tradeoff" OR "trade-off" OR "TTO" OR "BWS" OR "best worst scaling" OR "best-worst scaling" OR "maximum differential" OR "maxdiff" OR "max diff" OR "discrete choice experiment" OR "DCE" OR "discrete choice" OR "Conjoint analysis" OR "ngene" OR "conjoint.ly" OR "sawtooth" OR "Point allocation" OR "magnitude estimation" OR "pairwise comparison" OR "budget allocation" OR "self explicated method" OR "self-explicated method" OR "direct assessment" OR "direct elicitation")
AND
("patient" OR "caregiver" OR "enduser" OR "end user" OR "end-user" OR "Consumer")

SCOPUS

(TITLE-ABS ("HIT" OR "health information technology" OR "health it" OR "electronic health record" OR "ehr" OR "electronic medical record" OR "emr" OR "personal health record" OR "health record,personal" OR ("epic" AND "mychart") OR ("cerner" AND "patient portal") OR "microsoft health" OR "google health" OR "gehealthcare" OR "telemedicine" OR "telecare" OR "consumer health information" OR ("mobile application" AND "health")))
AND
(TITLE-ABS ("patient" OR "caregiver" OR "enduser" OR "end user" OR "end-user" OR "consumer"))
AND
(TITLE-ABS ("patient preference" OR "preference" OR "stated-preference" OR "stated preference" OR "preference based approach" OR "preference-based approach" OR "preference based method" OR "preference-based method" OR "consumer behavior" OR "perception" OR "perspective" OR "priority" OR "health priority" OR "health priorities" OR "stated choice" OR "rating" OR "ranking" OR "tradeoff" OR "trade-off" OR "TTO" OR "BWS" OR "best-worst scaling" OR "best worst scaling" OR "maximum differential" OR "maxdiff" OR "max diff" OR "discrete choice experiment" OR "DCE" OR "discrete choice" OR "conjoint analysis" OR "ngene" OR "conjoint.ly" OR "sawtooth" OR "point allocation" OR "budget allocation" OR "magnitude estimation" OR "pairwise comparison" OR "self explicated method" OR "self-explicated method" OR "direct assessment" OR "direct elicitation"))) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))

Table S2 Key hit preference findings

1st author, year (ref number)	Key findings
Brick, 1997, (71)	In the case that a doctor was not available to treat a chronic condition, 47% of respondents would use telemedicine, 27% would go out of town, 25% would wait for the doctor, and 1% had no preference. Younger respondents and those w/ higher income tended to choose telemedicine for chronic conditions. In the case of an emergency, 58% of respondents would go out of town, 41% would use telemedicine, and 1% had no preference.
Lowitt, 1998, (72)	Veteran's preferred video examination close to home over traveling 2 hours for in-person visit and preferred video examination with a dermatologist over in-person examination. Both of these preferences were stronger among younger participants.
Tsuji, 2003, (65)	Japanese respondents were WTP an average of ¥4519 (~$37 USD) per month for telehealth. WTP was decomposed into four main components, three of which had a significant effect on the regression equation: Stabilizing illness (¥349), Enhancement of health consciousness (¥1834), and less anxiety in day-to-day life (¥929).
Hassol, 2004, (81)	Patients preferred e-mail communication for getting prescription renewals (64%) and for getting answers to general medical questions (53%), but preferred in-person communication for instructions about treatment (46%) and getting test results (36%). Telephone and written communication types were not preferred for any healthcare interaction.
Dick, 2004, (95)	Before a telehome care trial, over half (59%) of adults with recently hospitalized children expressed strong preference for using telehome care support over standard care. Following the trial, preferences in favor of telehome care increased significantly and did not differ by demographics or clinical diagnosis.
Bradford, 2004, (67)	55% of respondents were WTP $20 USD for access to telemedicine but only 19% were WTP $40 USD. Age had a marginally significant negative effect on WTP, suggesting older patients may have lower WTP for access to telemedicine.
Bradford, 2005, (66)	Hypertensive patients had a lower WTP at all price ranges for telemedicine compared to CHF patients. WTP is also lower among older patients compared to younger patients, and patients with a longer travel time to the clinic were WTP more for telemedicine.
Qureshi, 2007, (68)	73% of Patients with a history of psoriasis or melanoma chose telemedicine over in-person care when it offered faster care. Most of these respondents (95%) were WTP for the service ($5-500, median $25). Only 19% of the cohort preferred telemedicine when time for service was the same, with 58% WTP for the service ($10-$125, Median $25).
Mofid, 2007, (73)	52 patients choose to be evaluated via teledermatology and 46 choose a face-to-face consultation. Patient's reporting excellent health status were more likely to choose teledermatology whereas patients with possible skin cancer diagnosis were more likely to choose face-to-face consultation. Younger patients (<56) were more likely to choose telemedicine, but this was not significant (P<0.06).
Basoglu, 2012, (58)	The remote clinical service attribute with the highest average importance score among a cohort of diabetes and obesity patients in Istanbul, Turkey was Input Effort (27.380) followed by availability face-to-face communication (24.684), response time (18.349), technical support (15.237), and cost (14.350).
Vandelanotte, 2011, (74)	Prior to performing a physical activity intervention, text mode (61.4%) was the most preferred delivery modality followed by the combined video and text mode (26.9%) then video mode (11.7%). After performing the intervention in which patients were either matched or unmatched with their preferred modality, 20% of participants in the matched group changed preferences and 34% of participants in the mismatched group changed preferences, but these changes in preferences were not significant to baseline preferences.
Park, 2011, (59)	The five most important telemedicine service attributes were service cost (29%) followed by availability of comprehensive diabetes care (12%), mobile phone telecommunication (12%), a General Hospital provider (11%), and Assurance of service through direct contact (9%). WTP was largest for comprehensive diabetes care at $14 USD. The five least preferred attributes were type of service provider (0%) followed by responsiveness (4%), Privacy/security (4%), 24-hr accessibility (5%), and Reliability (6%).
Basu, 2011, (86)	Preferences for the delivery of imaging results differed depending on whether results were normal or abnormal, with 'whichever is fastest' (31%) and 'telephone' (35%) being the most preferred methods respectively. More respondents preferred receiving normal results through email (22% normal, 8% abnormal) while the opposite was true for in-person (8% normal, 21% abnormal). Most respondents preferred to communicate any result type with a physician.
Ranney, 2012, (48)	Nearly half of all respondents indicated that a technology-based intervention would be their first choice for each of the seven intervention topics. Age was the only variable with significant associations for intervention preference, with younger (<25) participants preferring technology-based interventions for unintentional injury and peer violence. The second most preferred intervention for all topics was in-person interview.
Jung, 2012, (75)	Korean respondents preferred telemedicine to traditional care (73.3% vs 16.7%). Patients < 50 years old were more likely to prefer telemedicine than older patients and patients with a higher income were also more likely to prefer telemedicine. There was no association between the respondent's awareness of telemedicine and their preferences for telemedicine.
Johnson, 2012, (82)	Patient's had similar preference for online access to normal, Indeterminate, and seriously abnormal radiologic reports. 'Want to see results immediately' was the most preferred option followed by 'after 3 days', 'only after talking with physician', 'after 7 days', or 'not at all' for each report type.
Grande, 2013, (61)	The most important factor in determining user's willingness to share EHR data was "use of data" (64.3%), followed by "data user" (32.6%) and "data sensitivity" (3.1%). Participants were least willing to share data for marketing purposes as compared to research or quality improvement purposes. Willingness to share for African Americans and Hispanics differentiated less than whites between these three different research uses.
Cabitza, 2015, (99)	The PHR functionality with the highest mean rank was booking appointments followed by appointment reminders, a Free-text Diary, the ability to Upload medical documentation, and messaging. Sharing-related features, such as sharing data with doctors, peers, or other institutions were given the lowest rankings.
Quinlivan, 2014, (83)	Nearly half of pregnant women visiting an antenatal clinic preferred hospital-held paper-based system and One third preferred a personally controlled electronic health record. Preferences did not differ by age, computer access, internet availability, and familiarity with computers.
Muench, 2014, (87)	More than 90% of respondents preferred behavioral intervention messages that did not include textese, a sad emoticon, incorrect grammar, or an external locus of control. Clear preferences (selected by >75% of respondents) for one message type were seen in ten of the message dyad groupings. Differences in preferences were seen based on demographics such as sex, age, and educations as well as personality trait variables.
Ahn, 2014, (60)	Monthly service fee was the most important telemedicine service attribute (40.34%), followed by reply time (14.55%), wearable device type (14.01%) and device price (11.78%). Respondents were WTP $69 USD per month to receive personalized service and $525 USD to switch from a smartphone to a wearable device.
Stephen, 2014, (69)	The average WTP for telecare among carers of people with dementia was £310 when answering an open-ended question and £242 for a bounded question. Carers who rated the dementia as moderate severity provided significantly higher WTP values when answering the open-ended questions.
Lal, 2015, (77)	The most preferred format for receiving mental health intervention information was mixed formats (47.8%), followed by text (31.3%), video (14.9%), graphics (3.0%), audio (1.5%), and Other/no preference (1.5%)
Stypulkowski, 2015, (76)	The most preferred method of postoperative follow-up appointment among veteran respondents was face-to-face (50.1%), followed by no preference (21.4%), landline call (12.4%), televisit (9.0%), smartphone (4.0%), and secure email (2.8%)
Choudhry, 2015, (102)	Overall, patients prefer receiving biopsy results over the phone followed by face-to-face, voice message, and email. Among the sub-group of patients (40.5%) that stated they had different preferences for abnormal vs. normal biopsy results, preferences for abnormal results were similar to the overall results, but for normal results voice-message was most preferred followed by email, over the phone, and online patient portal. Younger, more educated persons preferred electronic methods (patient portal & email) for normal biopsy results.
Cabarrus, 2015, (92)	Most participants (63%) preferred that the ordering provider communicate imaging results. Academic medical center patients expressed similar preferences for mail, e-mail, and online portal delivery modalities (33%, 31%,36% respectively) while county hospital patients preferred mail followed by e-mail, and online patient portal (55%, 28%, 17%, respectively).
Determann, 2016, (54)	Three latent classes of PHR users were found based on preferences: refusers, reluctant adopters, and eager adopters. Data storage provider was the most important attribute for eager and reluctant adopters. Cost was most decisive attribute for refusers. Independent organizations and care providers were the most preferred "storage providers" for all classes. Only 20% of respondents were influenced to uptake a PHR due to its characteristics.
Patil, 2016, (45)	Respondents preferred devices/systems that stored "identification data w/ information on lifelong health conditions" and preferred that doctors, nurses, and paramedics had access to the data. Respondents were averse to additional access by emergency services and to sharing data with pharmaceutical companies, academic researchers, and health insurance companies. Younger respondents had stronger positive preferences for the storage of any health information including sensitive lifelong conditions, sexual health, and mental health conditions.
White, 2016, (100)	Fifteen EHR functions were ranked by Cystic Fibrosis patients. The top three EHR functions by mean rank score were: "Access to your clinical measurements", "Access to your list of medications", & "Access to your full summary record". The three lowest ranked functions were "Access a knowledge portal", "Comment on errors in EHR", and "Comment on experience of care".
Granger, 2016, (88)	The delivery modality that most of the cohort preferred for general intervention information was a Desktop Computer (24.2%) followed by None of the options (19.7%), laptop computer (15.8%), tablet (12.9%), e-mail (11.5%), and smartphone (10.2%). For personalized info, they preferred None of the options (20.6%) followed by Desktop computer (19.9%), e-mail (16.0%), laptop computer (13.2%), smartphone (10.2%), and tablet (10.1%). Respondents were more likely to prefer a tablet or smartphone as the modality for generalized and personalized interventions if they had more familiarity with that modality. Younger Participants and those with a university education were more likely to prefer smartphones for both personalized and general health interventions.
Wallin, 2016, (78)	In two different samples (sample 1, sample 2), most participants significantly preferred face-to-face interventions (66.9%, 65.1%) over internet-based therapies (6.5%, 2.6%) and over an equal preference for both (20.8%,21.7%). A small portion of participants preferred no intervention at all (5.8%, 10.6%). Preferences were not significantly different between samples, but use of online support for health problems was a significant predictor of preferring Internet-based interventions or both intervention types in both samples.
Spinks, 2016, (50)	Participants were WTP 110 AUD to have teledermoscopy with a dermatologist as a screening option for melanoma. Participants were averse to skin self-examination and preferred screening/diagnosis when results were reviewed by a dermatologist, had a high detection rate, fewer non-cancerous mole removals to find one melanoma, and less time spent away from usual activities
Kaambwa, 2018, (49)	Participants significantly preferred telehealth services be available to someone at a lower cost living 15-100km away from a clinic that had some experience with technology. Participants also preferred that all aspects of care could be addressed with telehealth but that some assessments were still done face-to-face. women felt more strongly than men that all or some assessments be conducted face-to-face.
Ray, 2016, (89)	Most adolescents were interested in receiving test results, followed by appointment reminders, and discharge instructions. Email was the preferred modality for discharge instructions, physician referrals, and test results but text message was preferred for medication and appointment reminders.
Cranen, 2017, (70)	Chronic pain patients preferred rehabilitation that incorporated only face-to-face physician consultations, utilized feedback monitoring technology, with exercise done individually at a Gym. When creating hypothetical telerebilitation scenarios, only one had more utility than traditional care: 75% of consultations done over video, feedback monitoring technology utilized, exercise performed individually at a gym.
Marchell, 2017, (96)	After experiencing three different examination methods, Patients significantly preferred receiving in-person examinations (mean rank: 1.19) compared to remote examinations. Mean ranked scores for store-and-forward (2.40) vs. live video (2.41) were not significantly different.
Andino, 2017, (97)	Median WTP for video visits was $20 (Max: $174, IQR: $39.25) on a scale that ranged from $0–$200. Interest in video visits received a median score of 72 (IQR: 51.25) on a scale from 0–100.
Chang, 2017, (47)	The estimated household WTP for telehealth was $4.39 USD per month. This value was higher for households living more than 20 miles away ($6.22) and with higher income ($5.85). The marginal utility was highest for "very fast" and "fast" upload and download speeds.
Brazeal, 2018, (103)	Respondents preferred to receive breast biopsy results over the telephone (71.6%) followed by in-person (22.4%), email (5.6%), US mail (4.0%), and online portal (2.4%). African-American women, women w/o internet access, and single women were more likely to have a preference for face-to-face notification.
Wildenbos, 2018, (55)	Respondents preferred access to a patient portal via computer (laptop/desktop) but respondents younger than 65 were less negative towards using tablets to access records. Direct publication of health information was preferred over waiting 2 weeks for publication regardless of whether the information was discussed with a provider. Respondents strongly preferred the option to have an online in-patient consult and the possibility to ask questions online.
Russell, 2018, (101)	App features that were ranked in the top five (out of 21 features) by older adults (>55) were Drug interaction warnings followed by medication list, medication alerts, refill reminders, and individual medication information. Apps features that were never ranked in the top five include finding a pharmacy and pharmacy information.
Cronin, 2018, (85)	Two cohorts of individuals (healthy & depressed/anxiety) had similar preferences for viewing health assessment results after completing an online dashboard health assessment. Most preferred simple graphic & text (57.7%,53.5%) followed by comparison of score to other populations (25.1%, 29.9%), simple graphic (12.1%, 10.8%), and text only (5.0%, 5.8%).
Apolinario-Hagen, 2018, (94)	Therapist guided self-help internet interventions (39.0%) were the most preferred delivery mode followed by Videoconferencing psychotherapy (22.8%), unguided self-help internet intervention (19.8%), and no internet therapy at all (18.8%). No differences in preferences by demographics were seen but experience with psychotherapy and awareness of internet therapies significantly predicted preferences for guided internet therapies.
Boyde, 2018, (57)	Most respondents preferred a cardiac rehabilitation program with a short length (4 weeks), a program time that was outside of working hours, and a program start within 2 weeks of discharge. Exercise within a group was preferred and using telehealth was disliked. Respondents overall had a preference against delivery of lifestyle information by smart phone. The researchers Identified 5 latent classes of respondents.
Snoswell, 2018, (51)	Respondents were WTP $1.18 AUD to change from GP to mobile teldermoscopy. Respondents preferred to have results viewed by teledermoscopy dermatologist rather than standard GP but did not have significant preference for screening type method (teldermoscopy, Skin cancer clinic visit, or Visit GP).
Deidda, 2018, (52)	Overall, respondents preferred intromenia (visit at hospital) for cardiology services over telemedicine but heterogeneity in individual preferences was found. Respondents preferred lower cost and shorter wait times. One cluster of individuals who were mostly female and spent more on cardiology services were more favorable towards telemedicine.
Nayyar, 2018, (62)	The most important factor for determining aesthetic surgery information preferences was the type of social medial platform that was used (Facebook most preferred) for all three surgery patient groups. Patient's also preferred delivery of comprehensive information, a live video delivery mechanism, and the surgeon as the messenger.
Saraswathula, 2018, (84)	Most patients prefer communication of biopsy results over the telephone (51%), followed by provider in person (31%), and patient portal (18%). The most frequently selected "longest acceptable weight time" was 3-5 days for all three communication methods. Patient's who prioritized clear explanations were more likely to prefer in-person communication.
Plinsinga, 2019, (90)	Most of the respondents that were interested in joining a support group preferred the online format (48.7%) followed by In-person meeting (25.9%), email (22.4%), and phone (2.9%).
Morland, 2019, (98)	Most veteran's ranked home-based telehealth (HBT, 42.8%) as their first choice followed by in-person-in-home (31.7%) and office-based telehealth (OBT, 25.6%). HBT was significantly preferred over OBT. Older women were more likely to prefer HBT over OBT, but No age-group differences were found for men
Offermann-van Heek, 2019, (64)	Data access (27.5%) had the highest relative importance among four AAL technology attributes followed by data handling (24.7%), safety (24.7%), and relief (23.1%). Respondent's preferred that their "most trusted people" had access to data and least preferred "relatives" to have data access and preferred "short-term" over "long-term" data handling. Two demographically distinct groups were defined through LCA analysis: "Care Novices" that placed higher importance in data handling (27.0% vs 12.6%) and "Care Experienced" that valued data access more (44.6% vs 33.8%)
Chudner, 2019, (53)	Patients expressed higher preference in-clinic consultations compared to video consultation. "Quality of consultation" was the most important attribute followed by "Time until appointment", "Relationship to physician", and "Queuing time before consultation". The Probability of choosing video-consultation was 68% among patients.
Nagao, 2019, (79)	More Children preferred a tablet-based method for audiometry services (59%) and this preference was stronger in 6 years old compared to 7–12 years old. Linear regression suggests that test preference negatively effects test results conducted with the tablet method but not with the conventional method.
Woolen, 2018, (56)	Patients preferred faster receipt of imaging results from physicians over the telephone. The cohort preferred immediate receipt through patient portal If made to wait more than 6 days to get the results in office or more than 11 days to get the results by telephone. Older respondents preferred receipt through telephone or in office over patient portal.
Edwards, 2020, (93)	Most Parents preferred to receive imaging results from the child's doctor either in-person (37%) or by phone/email (26%). Other respondents preferred to receive results from a radiologist in person (16.0%), by a paper copy from the radiology department (6.9%), Secure patient portal (6.1%), and through mail (3.1%). No significant differences were seen between preferences for radiologist over a child's doctor by parent demographics (child's age, distance to hospital, etc.)
Lim, 2020, (63)	Respondents strongly preferred a shorter app registration time and governance of health data by the government or medical centre as compared to a private consultancy firm or no governance. Respondents were also averse to providing research data to pharmaceutical companies. Younger people, those with a higher education, and women were more willing to use a health app for health administration.
Nguyen, 2020, (91)	The app gamification option for adherence reporting that was preferred by most participants was collecting points with the app (34%), followed by a ranking system (18%), and receiving medals (15%). However, 35% of participants did not provide any information concerning their preferences.
Barsom, 2020, (80)	Among 50 colorectal patients, 29 elected to receive follow-up care face-to face and 21 choose a video consultation (VC). Private use of VC was significantly higher in the VC-group and patients choosing VC follow-up tended to live farther away, but this was not a significant association.
Slightam, 2020, (46)	Veteran tablet recipients reported similar preferences for the video visits vs in-person visits: 32.1% preferred video, 31.8% preferred in-person, and 35.7% preferred either. Veterans were more likely to prefer video-based care if they reported barriers to VA settings, had a substance use disorder, and believed they could address all concerns before the end of the appointment. Veterans were less likely to prefer video-based care if they had many chronic conditions.