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Telehealth and patient satisfaction: a systematic review and narrative analysis

Clemens Scott Kruse, Nicole Krowski, Blanca Rodriguez, Lan Tran, Jackeline Vela, Matthew Brooks

ABSTRACT

Background The use of telehealth steadily increases as it has become a viable modality to patient care. Early adopters attempt to use telehealth to deliver high-quality care. Patient satisfaction is a key indicator of how well the telemedicine modality met patient expectations.

Objective The objective of this systematic review and narrative analysis is to explore the association of telehealth and patient satisfaction in regards to effectiveness and efficiency.

Methods Boolean expressions between keywords created a complex search string. Variations of this string were used in Cumulative Index of Nursing and Allied Health Literature and MEDLINE.

Results 2193 articles were filtered and assessed for suitability (n=44). Factors relating to effectiveness and efficiency were identified using consensus. The factors listed most often were improved outcomes (20%), preferred modality (10%), ease of use (9%), low cost 8%), improved communication (8%) and decreased travel time (7%), which in total accounted for 61% of occurrences.

Conclusion This review identified a variety of factors of association between telehealth and patient satisfaction. Knowledge of these factors could help implementers to match interventions as solutions to specific problems.

Strengths and limitations of this study

► Inserting technology into a medical intervention should not be without deliberate design. This review serves as a voice of the patient to help guard against the implementation of technology merely for its convenience or shiny appeal.

► This study uses the Preferred Reporting Items for Systematic Reviews and Meta Analysis standard, which is an internationally recognised protocol for the conduct and reporting of systematic reviews that increases the validity of the results.

► A group >30 selected from Medical Subject Headings key terms indexed through established research databases increases the reliability of the review.

► Published studies do not often clearly set out reasons for inserting technology into an intervention, and therefore, it is not clear whether the patient satisfaction observed was congruent with the change of intervention.

► Telehealth, in general, is a relatively new topic in medicine (since the 1990s) so inferences that result from studies are difficult to compare to older, more traditional interventions.

INTRODUCTION
Rationale

The mental image of medical house calls is one of archaic practices in small towns and otherwise rural communities, or something associated with concierge medicine. However, telehealth brings the doctor back into the patient's home. Healthcare has begun transitioning to more technological-delivered services, making it possible to receive healthcare services from the comfort of one's home, without driving to the clinic, or frustratingly trying to find a parking spot before one's appointment. This review examines telehealth and any association it might have with patient satisfaction.

This review uses the definition of telehealth from WHO:

The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies, for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, in all the interests of advancing the health of individuals and their communities.[1]

Following WHO's example, we did not distinguish between telehealth and telemedicine; instead we used the term telehealth to address both telehealth and telemedicine.[1] This broad definition of telehealth encompasses several modes of delivery, such as videoconferencing, mobile applications and secure messaging. WHO recognises several branches of telemedicine: teleradiology, teledermatology, telepathology and telepsychology.[1] With the increased use of technology in healthcare, there has been a great emphasis on telehealth

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Texas State University, San Marcos, Texas, USA

Correspondence to
Dr Clemens Scott Kruse; scottkruse@txstate.edu, scottkruse@sbcglobal.net

because it can extend the services of providers to remote locations and capitalise on the availability of subject matter experts and overcome the barrier of proximity. Telehealth extends access, and it has the potential of making healthcare services more convenient for patients, especially those in rural areas, those with small children (child care) and those with mobility restrictions.[2 3]

Patient satisfaction is a growing concern in all aspects of healthcare, and as the voice of the customer, it is a measure of quality that is published in the USA through its Healthcare Effectiveness Data and Information Set, and it can be tied to reimbursements from the Center for Medicare and Medicaid through results of Hospital Consumer Assessment of Healthcare Providers and Systems. As with traditional modalities of healthcare delivery, telehealth relies heavily on reports of patient satisfaction because the patients are the only source of information that can report how they were treated and if the treatment received met the patients' expectations of care.[4 5] If the patients are not happy with their healthcare services being provided remotely, the service becomes redundant and expensive. With the increase in prevalence of telehealth, it is important to maintain the key quality indicator of patient satisfaction regardless of modality of delivery. The voice of the customer needs to be continuously heard so that telehealth developers can exercise agility in the development process while the healthcare organisation continues to develop more technology-based care that meets the needs of patients and providers. The technology base inherent to telehealth dramatically changes the mode of delivery, but a strong patient-to-provider relationship must be maintained independent of the modality. A definition of patient satisfaction, effectiveness and efficiency is provided at the end of the article.

Objective

We had multiple research questions. R1: Is there an association of telehealth with patient satisfaction? R2: Are there common facilitators of either efficiency or effectiveness mentioned in the literature that would provide a positive or negative association between telehealth and patient satisfaction?

METHODS
Information sources, search and study selection

The two sources of data were the Cumulative Index of Nursing and Allied Health Literature (CINAHL) via EBSCOhost and PubMed (MEDLINE). We used the Preferred Reporting Items for Systematic Reviews and Meta Analysis as our basis of organisation.[6] We used a variety of key search terms, as listed in the Medical Subject Headings combined with Boolean operators. Search terms were adapted for use in the different databases. Details for each database are provided as onlinesupplementary file 1.

Inclusion criteria were 2010–2017, English only, full text available and human research. We also filtered for all but academic publications (peer-reviewed in CINAHL) and in CINAHL we excluded MEDLINE to eliminate the duplicates already captured in PubMed. Instead of including reviews in the analysis, two reviews on a similar topic were earmarked for later comparison with our own results. Abstracts were reviewed for suitability based on our research concept that included both telehealth and some assessment of patient satisfaction.

Data collection process

A flow chart of our data collection process is located as online.supplementary material. Before reviewing abstracts for suitability to our objective, we agreed to look for articles that included telehealth and some measure of patient satisfaction. Articles were assessed according to the inclusion and exclusion criteria described above. Discussion sessions and consensus meetings were held to increase the inter-rater reliability of the group as they conducted the screening and analysis. During the consensus meetings, factors and themes were identified through observation and discussion; for example, as we discussed the articles, it became evident that patient satisfaction was often stated in terms of effectiveness and efficiency, so these became the themes.

Standard systematic review procedures were followed to control for selection bias and ensure our search was exhaustive.

Reviewers compiled their notes on patient satisfaction, effectiveness and efficiency in a literature matrix. Another consensus meeting was conducted to discuss findings and make inferences. During the consensus meeting, individual observations were discussed and combined into similar groupings throughout the sample to simplify our assessment of associations. This is a form of narrative analysis and sensemaking.[7] Observations of effectiveness and efficiency were combined and sorted into an affinity matrix for final analysis.

Data items and summary measures

Our litmus test was to include articles that included a combination of telehealth and patient satisfaction, and a measure or assessment of effectiveness or efficiency. We eliminated those that fell short of those goals.

Risk of bias in individual studies and risk of bias across studies

Bias was discussed during consensus meetings. The consensus meetings served as a control on our own selection bias and selective reporting within studies.

Summary measures and synthesis of results

Our review examines articles that combine telehealth intervention with patient satisfaction and include some mention of effectiveness or efficiency. A physical count of these observations was made. After all observations were combined into an Excel file, and after all observations were condensed into themes of effectiveness or efficiency, all themes were displayed in an affinity matrix to identify the number of occurrences of each theme. These were sorted by frequency.
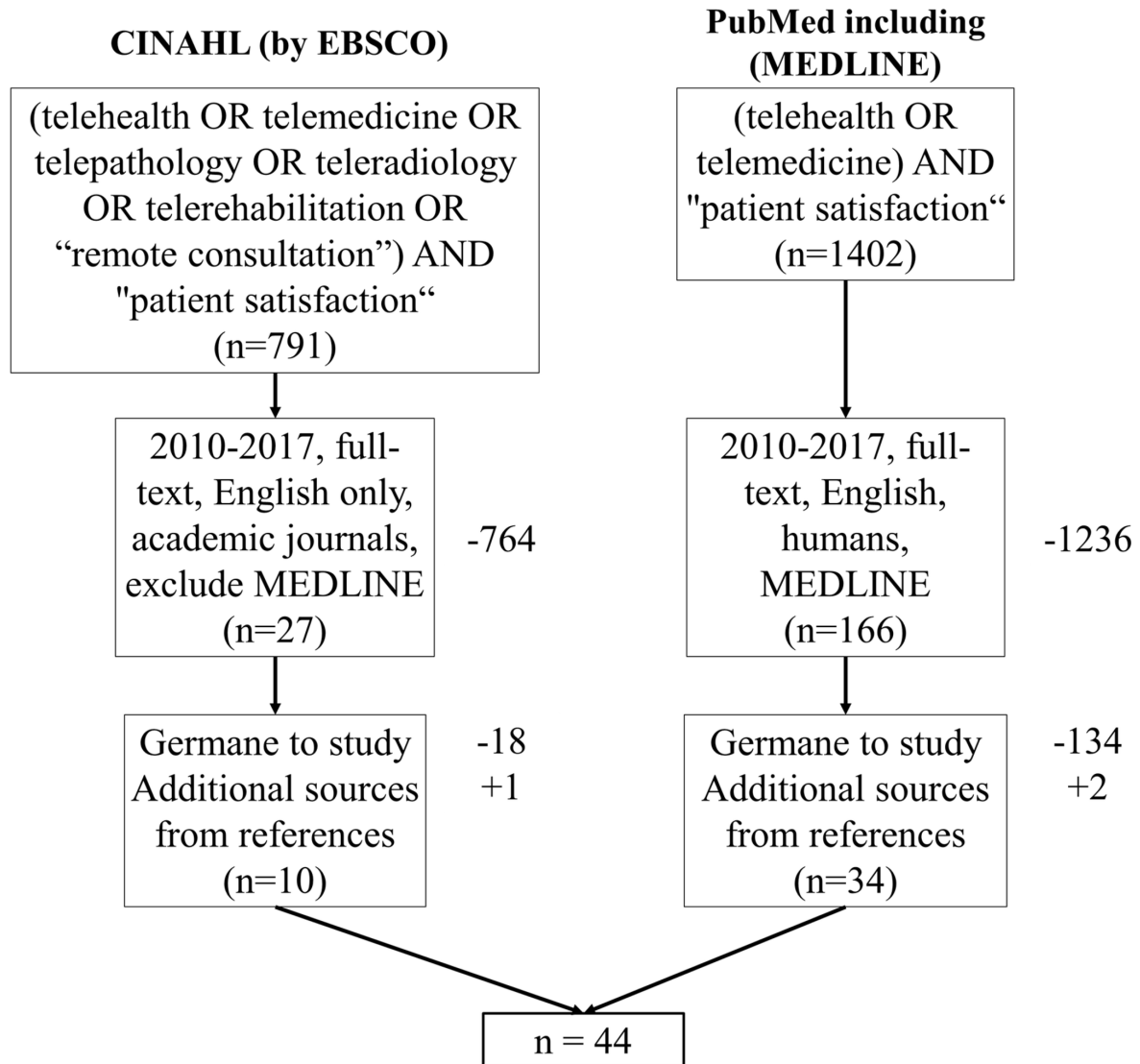
CINAHL (by EBSCO)

(telehealth OR telemedicine OR telepathology OR teleradiology OR telerehabilitation OR "remote consultation") AND "patient satisfaction" (n=791)

2010-2017, full-text, English only, academic journals, exclude MEDLINE (n=27)   -764

Germane to study Additional sources from references (n=10)   -18 +1

PubMed including (MEDLINE)

(telehealth OR telemedicine) AND "patient satisfaction" (n=1402)

2010-2017, full-text, English, humans, MEDLINE (n=166)   -1236

Germane to study Additional sources from references (n=34)   -134 +2

n = 44

Figure 1 Literature search process with inclusion and exclusion criteria. CINAHL, Cumulative Index of Nursing and Allied Health Literature.

RESULTS

Study selection, study characteristics and results of individual studies

Our search process is illustrated in figure 1.

After the initial search yielded 2193 results, 193 underwent abstract and then full-text review resulting in 44 papers being included in the study.

Table 1 lists a summary of our analysis and observations from our team (n=44). For every article/study in the sample, we made observations for *satisfied*, which was a screening criteria, and *effective* and *efficient*. Studies are listed in order of publication with the most recent at the top. The reference numbers correspond to those in the references section.

Synthesis of results

We analysed the way 44 articles reported patient satisfaction.[8–51] In tota, 24[8 9 11 13 15–18 21–25 27–29 32 33 35 38 40 44 45 47] studies reported patient views on effectiveness, 6[10 12 14 30 41 51] studies reported patient satisfaction and

14[19 20 26 31 34 36 37 39 42 43 46 48–50] studies reported both. The third column lists comments and details that could point to selection bias. Potential risk of bias among papers included no randomisation,[12] small sample size,[11 13 18 21 23 25 28 33 35 36 41 48 50] limited population,[15 20 27 29 31 45–47] gender bias,[19 20 23 38 47] technology bias,[18 23 44 50] selection bias,[24 32 38] geographically limited,[8 9 12 14 16 17 34 37 43] age bias,[20 29 30 38 44 51] education bias[30 38] and racial bias.[44 51]

Additional analysis

Table 2 outlines the frequency with which different factors were raised among the included paper. Through a narrative analysis we identified commonalities among the various studies (19 factors) and compiled them into an affinity matrix to show frequency of occurrence. The matrix is sorted by frequency of occurrence.

We acknowledge that frequency of occurrence does not equate to importance, but it has been used in other literature reviews as simply an issue of probability.[52–54] Five factors were mentioned in the literature 65/119

Table 1 Compilation of observations for our sample

Date	Author	Title	Journal	Summary/relevance	Technology used	Potential bias, sample size, miscellaneous comments
April 2017	Schulz-Heik et al[8]	Results from a clinical yoga program for veterans via telehealth provides comparable satisfaction and health improvements to in-person yoga.	BMC Complement Altern Med	Clinical yoga with US Veterans Affairs population	Videoconferencing	VA population in Palo Alto only (geographically limited), acceptable sample size (n=29 control, n=30 intervention)
January 2016	Iqbal et al[9]	Cost effectiveness of a novel attempt to reduce readmission after ileostomy creation	JSLS	Patient satisfaction: satisfaction scored 4.69 out of 5 Effective: hospital readmission rates decreased $63 821 (71%) (p=0.002)	Telephone call (daily) for 3 weeks after discharge	Limited to one area of the country and beneficiaries to University of Florida health system (geographically limited), good sample size (n=23 preintervention, n=32 postintervention)
May 2016	Muller et al[10]	Acceptability, feasibility, and cost of telemedicine for nonacute headaches: a randomized study comparing video and traditional consultations	J Med Internet Res	Used telehealth to diagnose and treat non-acute headaches Satisfaction: patients satisfied with video and sound quality Efficient: median travel distance for rural patients was 7.8 hours, cost €249, lost income €234 per visit (saved) Effective: intervention group's consultations were shorter than control group	Videoconferencing	Non-acute headache patients from Northern Norway, strong sample size (n=200), participants randomised
April 2016	Dias et al[11]	Voice telerehabilitation in Parkinson's disease	Codas	Satisfaction: reported as high Effective: preference for telehealth intervention	Videoconference and telephone	85% male (gender bias), videoconferencing mimicked the face-to-face rehabilitation for Parkinson's patients, small sample size (n=20)
November 2016	Langabeer et al[12]	Telehealth-enabled emergency medical services program reduces ambulance transport to urban emergency departments	West J Emerg Med	Satisfaction: no decrease Efficient: 56% reduction in ambulance transports and 53% decrease in response time for the intervention group than the control	Telephone	Limited to patients regional to Houston, Texas (geographically limited, no randomisation, strong sample size (n=5570)
2016	Hoaas et al[13]	Adherence and factors affecting satisfaction in long-term telerehabilitation for patients with chronic obstructive pulmonary disease: a mixed methods study	BMC Medical Informatics and Decision Making	Satisfaction: generally highly satisfied Effective: increased health benefits, self-efficacy, independence, emotional safety and maintenance of motivation	Webpage for daily telemonitoring and self-care and weekly follow-up videoconference consults with a physiotherapist	Remote population of northern Norway, small sample size (n=10)
2016	Jacobs et al[14]	Patientsatisfaction with a teleradiology service in general practice	BMC Family Practice	Satisfaction: island residents, the elderly and those with no history of trauma were more satisfied with the technical and interpersonal aspects of the teleconsultation than non-residents, younger patients and those with history of trauma	Teleradiology	Restricted to rural health and Netherlands (geographically limited), strong sample (n=381)
February 2017	Bradbury et al[15]	Utilizing remote real-time videoconferencing to expand access to cancer genetic services in community practices: A multicenter feasibility study	Journal of Medical Internet Research	Satisfaction: all patients reported satisfaction and knowledge increased significantly Effective: general anxiety and depression decreased	Videoconferencing	Restricted to Philadelphia, Pennsylvania (geographically limited), good sample size (n=41)

Table 1 Continued

Date	Author	Title	Journal	Summary/relevance	Technology used	Potential bias, sample size, miscellaneous comments
January 2016	AlAzab and Khader[16]	Telenephrology application in rural and remote areas of Jordan: benefits and impact on quality of life	Rural and Remote Health	Satisfaction: patient satisfaction mean=96.8 Effective: mean SF8 score increased significantly (physical components of quality of life)	Electronic monitoring and telephone calls	Rural health (geographically limited), strong sample size (n=64)
March 2016	Fields et al[17]	Remote ambulatory management of veterans with obstructive sleep apnea	Sleep	Satisfaction: no difference in functional outcomes, patient satisfaction, dropout rates or objectively measured PAP adherence Effective: telemedicine participants showed greater improvement in mental health scores and their feedback was positive	Telemonitoring and telephone follow-up calls	Restricted to veterans in the Philadelphia area (geographically limited), good sample size (n=60)
January 2016	Georgsson and Staggers[18]	Quantifying usability: an evaluation of a diabetes mHealth system on effectiveness, efficiency, and satisfaction metrics with association user characteristics in the US and Sweden	Journal of the American Medical Informatics Association	Satisfaction: good Effective: good but not excellent usability	mHealth application	Younger patients with more experience with information technology scored higher than others (age and technology bias), small sample size (n=10)
March 2016	Polinski et al[19]	Patients' satisfaction with and preference for telehealth visits	Journal of General Internal Medicine	Satisfaction: 33% preferred telehealth visits to traditional in-person visits; women preferred telehealth visits Efficient: telehealth increased access to care. Lack of insurance increased odds of preferring telehealth Efficient: other positive predictors were quality of care received, telehealth convenience and understanding of telehealth	Videoconferencing at Minute Clinics with diagnostic tools operated by a nurse	70% women (gender bias), test was conducted in California and Texas (convenience sample), strong sample (n=1734)
2015	Levy et al[20]	Effects of physical therapy delivery via home video telerehabilitation on functional and health-related quality of life outcomes	Journal of Rehabilitation Research and Development	Satisfied: all but one participant reported satisfied or highly satisfied Effective: participants demonstrated significant improvement in most outcomes measures Efficient: participants avoided 2,774.7 =/– 3197.4 travel miles, 46.3±53.3 hours or driving time, and $1151.50 ± $1326.90 in travel reimbursement	Videoconferencing	Convenience sample, 92% male (gender bias), 69% >64 years (age bias), US Veterans only, small sample (n=26)
2014	Holmes and Clark[21]	Technology-enabled care services: novel method of managing liver disease	Gastrointestinal Nursing	Satisfied: high, patients liked the self-manage aspect Effective: participants lost weight, outcomes improved, readmissions decreased from 12 to 4 Efficient: average cost per patient 68.86 British pounds	Remote monitoring and text messaging	Small sample size (n=12)
2015	Levy et al[22]	The Mobile Insulin Titration Intervention (MITI) for insulin glargine titration in an urban, low-income population: randomized controlled trial protocol	JMIR Research Protocols	Highly satisfied: patients in the intervention group reported higher levels of satisfaction Effective: significantly more in the intervention group had reached their optimal insulin levels	Mobile Insulin Titration Intervention	True experiment (randomised, good sampling technique)

Continued

Table 1 Continued

Date	Author	Title	Journal	Summary/relevance	Technology used	Potential bias, sample size, miscellaneous comments
2015	Moin et al[23]	Women veterans' experience with a web-based diabetes prevention program: a qualitative study to inform future practice	*Journal of Medical Internet Research*	Effective: improved behavioural outcomes, more appropriate for women. Satisfied: participants felt empowered and accountable, they felt it was convenient and a good fit with their health needs and lifestyle	Web-based	Women veterans, computer literacy was an issue for some (gender bias), small sample size (n=17)
2015	Cotrell et al[24]	Patient and professional user experiences of simple telehealth for hypertension, medication reminders and smoking cessation: a service evaluation	*BMJ Open*	Satisfied: positive patient satisfaction indicators. Effective: improvements were made over Florence, and users took an active approach to achieve their goals, patients felt empowered	Telemonitoring and medication reminders	Satisfaction with the service appeared optimal when patients were carefully selected (selection bias), strong sample (n=1707)
2014	Tabak et al[25]	A telehealth program for self-management of COPD exacerbations and promotion of an active lifestyle: a pilot randomized controlled trial	*International Journal of Chronic Obstructive Pulmonary Disease*	Satisfied: satisfaction was higher with the control group than the telehealth group. Effective: better clinical measures in the telehealth group	Web-based and smartphone application with an activity coach	Strong study design, small sample size (n=19)
2014	Kim et al[26]	Costs of multidisciplinary parenteral nutrition care provided at a distance via mobile tablets	*Journal of Parenteral and Enteral Nutrition*	Satisfied: easy to use, very convenient. Effective: outcomes similar to in-clinic visits. Efficient: cost $916.64 per patient	Telephone with semistructured interviews	Good sample size (n=20 visits for 45 patients)
2014	Cancela et al[27]	Wearability assessment of a wearable system for Parkinson's disease remote monitoring based on a body area network of sensors	*Sensors*	Satisfied: overall satisfaction high, but some concern over public perceptions about the wearable sensors. Effective: for remote monitoring, wearable systems are highly effective	Remote monitoring based on a body area network of sensors	An extension of the Body Area Network sensors (limited population), good sample size (n=32)
2014	Casey et al[28]	Patients' experiences of using a smartphone application to increase physical activity: the SMART MOVE qualitative study in primary care	*Br J Gen Pract*	Satisfied: good usability. Effective: transformed relationships with exercise	Smartphone application	Small sample size (n=12)
January 2014	Tsai et al[29]	Influences of satisfaction with telecare and family trust in older Taiwanese people	*International Journal of Environmental Research and Public Health*	Satisfied: user satisfaction very high. Effective: user perception of high quality	Telemonitoring, web-based, telephone	Focus was on older users and their families, convenience sample, good size (n=60)
2014	Oliveira et al[30]	Telemedicine in Alentejo	*Telemedicine and e-Health*	Satisfied: positive impact on patient experience. Efficient: average time and cost of a tele-appointment is 93 min for teleconsultation and 9.31 pounds versus 190 min and 25.32 pounds for a face-to-face	Telephone	Participants are older and less educated than the rest of the population of Portugal (age and education bias)
2013	Minatodani et al[31]	Home telehealth: facilitators, barriers, and impact of nurse support among high-risk dialysis patients	*Telemedicine and e-Health*	Satisfaction: patients reported high levels of satisfaction with RCN support because of the feedback on identification of changes in their health status, enhanced accountability, self-efficacy and motivation to make health behaviourchanges. Effective: through telehealth, greater self-awareness, self-efficacy and accountability. Efficient: feedback was more efficient	Telemonitoring with nurse support	Limited population, good sample size (n=33)

Continued

Table 1 Continued

Date	Author	Title	Journal	Summary/relevance	Technology used	Potential bias, sample size, miscellaneous comments
2013	Akter et al[32]	Modelling the impact of mHealth service quality on satisfaction, continuance and quality of life	Behaviour & Information Technology	Satisfied: satisfaction is related to service quality, continuance intentions and quality of life Effective: mHealth should deliver higher-order, societal outcomes	Smartphone application	Selection bias
2014	Hung et al[33]	Patient satisfaction with nutrition services amongst cancer patients treated with autologous stem cell transplantation: a comparison of usual and extended care	Journal of Human Nutrition and Dietetics	Satisfied: higher use was indicative of higher satisfaction Effective: higher use was clinically important to outcomes	Telephone	Small sample size (n=18)
December 2015	Buis et al[34]	Use of a text message program to raise type 2 diabetes risk awareness and promote health behavior change (part II): assessment of participants' perceptions on efficacy	Journal of Medical Internet Research	Satisfied: 67.1% reported very high satisfaction Effective: txt4health messages were clear, increased disease literacy and more conscious of diet and exercise Efficient: low participant costs	Text messaging	Michigan and Cincinnati only (geographically limited), strong sample (n=159)
2013	Houser et al[35]	Telephone follow-up in primary care: can interactive voice responsecalls work	Studies in Health Technology and Informatics	Satisfied: strong satisfaction reported for the interactive voice response system, IVRS Effective: patients felt informed	Telephone	Small sample of those who received the call IVRS, small sample size (n=19)
2013	Kairy et al[36]	The patient's perspective of in-home telerehabilitation physiotherapy services following total knee arthroplasty	International Journal of Environmental Research and Public Health	Satisfied: feeling an ongoing sense of support Effective: tailored challenging programmes using telerehabilitation Efficient: improved access to services with reduced need for transportation, easy to use	Videoconferencing	Convenience sample, single case, small sample size (n=6)
2013	Bishop et al[37]	Electronic communication improves access, but barriers to its widespread adoption remain	Health Affairs	Satisfied: easier access to and better communication with provider Effective: patients with repeat issues of a condition are able to reset the treatment for the most recent episode Efficient: it takes about 1 min per email, and it improves the efficiency of an office visit	Email and videoconferencing	New York City only, strong resistance to change cited (geographically limited), strong sample (n=630)
2013	Pietta et al[38]	Spanish-speaking patients' engagement in interactive voice response (IVR) support calls for chronic disease self-management: data from three countries	Journal of Telemedicine and Telecare	Satisfied: 88% patients reported 'very satisfied', 11% 'mostly satisfied' Effective: 100% patients felt the interactive voice response: IVR were helpful, 77% reported improved diet, 80% reported improved symptom monitoring, 80% reported improved medication adherence	Telephone	73% women, average 6.1 years of education (age and education bias), strong sample (n=268)
2013	Gund et al[39]	A randomized controlled study about the use of eHealth in the home health care of premature infants	BMC Medical Informatics and Decision Making	Satisfied: parents felt that the Skype calls were better than regular follow-up, and it often replaced an in-home visit Effective: same or better outcomes because the parents did not have to bring infants in Efficient: Nurses took <10 min of work time daily to answer questions	Videoconferencing	Randomisation used Semistructured interviews were only used for 16 families, small samples (n=13, 12, 9)

Continued

Table 1 Continued

Date	Author	Title	Journal	Summary/relevance	Technology used	Potential bias, sample size, miscellaneous comments
2013	ter Huurne et al[40]	Web-based treatment program using intensive therapeutic contact for patients with eating disorders: before-after study	Journal of Medical Internet Research	Satisfied: high satisfaction Effective: significant improvements in eating disorder psychopathology, body dissatisfaction, quality of life, and physical and mental health; body mass index improved for obesity group only Efficient: task completion rate was 80% for the younger group and 64.6% for the older group	Web-based	Not all participants reported the same diagnoses, strong pre-post design, strong sample (n=89)
2012	Chun and Patterson[41]	A usability gap between older adults and younger adults on interface design of an Internet-based telemedicine system	Work	Satisfied: on a seven-point scale, satisfaction scores were 3.41 younger and 3.54 older, although there was equal dissatisfaction with the design of the system	Web-based	Small sample size (n=16)
2012	Lee et al[42]	The VISYTER Telerehabilitation system for globalizing physical therapy consultation: issues and challenges for telehealth implementation	Journal of Physical Therapy Education	Satisfied: reported as high and very high Effective: increases access where proximity is an issue Efficient: links multiple providers together for teleconsultation	Videoconferencing	Limited scope for conclusions, patients in Mexico, providers in the USA (cultural bias), small sample (n=3)
2012	Saifu et al[43]	Evaluation of human immunodeficiency virus and hepatitis C telemedicine clinics	The American Journal of Managed Care	Satisfied: 95% reported highest level of satisfaction Effective: 95% reported a preference for telemedicine versus in-person visit Efficient: reported a significant reduction in health visit-related time, mostly due to decreased travel	Videoconferencing	Veterans in Los Angeles, California, only, convenience sample (geographically limited), strong sample (n=43)
2012	Lua and Neni[44]	Feasibility and acceptability of mobile epilepsy educational system (MEES) for people with epilepsy in Malaysia	Telemedicine and e-Health	Satisfied: 74% reported very or quite useful Effective: excellent modality for education, drug-taking reminder and clinic appointment reminder	Text messaging	Good mix of genders, homo-ethnic sample: 92.2% Malay (racial bias), median age 25 (age and technology bias— younger may already be more receptive to technology), good size sample (n=51)
2012	Finkelstein et al[45]	Development of a remote monitoring satisfaction survey and its use in a clinical trial with lung transplant recipients	Journal of Telemedicine and Telecare	Satisfied: 90% of the subjects were satisfied with the home health telehealth service Effective: frequency of communication increased	Remote monitoring	Limited population
2011	Gibson et al[46]	Conversations on telemental health: listening to remote and rural First Nations communities	Rural and Remote Health	Satisfied: 47% positive response, 21% neutral, 32% negative Effective: increased comfort in the therapeutic situation, increased usefulness Efficient: increased access to services	Videoconferencing	First-nations communities only (limited population), strong sample (n=59)

Continued

Table 1 Continued

Date	Author	Title	Journal	Summary/relevance	Technology used	Potential bias, sample size, miscellaneous comments
2010	Doorenbos et al[47]	Satisfaction with telehealth for cancer support groups in rural American Indian and Alaska Native communities	Clinical Journal of Oncology Nursing	Satisfied: participants reported high levels of satisfaction with support groups via videoconference Effective: results of this descriptive study are consistent with other research that shows the need for support groups as part of overall therapy for cancer survivors	Voice teleconference for group meetings	All participants were women (gender bias), rural care only, participants were members of American Indian or Alaskan Native (limited population), strong sample size (n=900)
2010	Breen et al[48]	Formative evaluation of a telemedicine model for delivering clinical neurophysiology services part II: the referring clinician and patient perspective	BMC Medical Informatics and Decision Making	Satisfied: teleneurophysiology improved satisfaction with waiting times, availability of results and impact on patient management Effective: telephysiology and control groups were equally as anxious about their procedure, telephysiology can improve access to CN services and expert opinion Efficient: reduced travel burden and need for overnight journeys	Teleneurophysiology which included an EEG	Remote-rural population of Northern Ireland, small sample of physicians (n=9physicians, 116 patients)
2010	Everett and Kerr[49]	Telehealth as adjunctive therapy in insulin pump treated patients: a pilot study	Practical Diabetes International	Satisfied: patients reported more understanding, insight and control by viewing data and easy access to health professional Effective: intervention group demonstrated improved diabetes control Efficient: health professional time was <10min each day to review data and was incorporated into current workload	Telemonitoring and text messaging	Each user's home was visited to set up and demonstrate the system (good control for validity), small sample (n=16)
2010	Gardner-Bonneau[50]	Remote patient monitoring: a human factors assessment	Human Factors Horizons	Satisfied: the intervention device was intuitive to use Effective: telehealth group showed clinical improvements Efficient: economic analysis showed savings in the COPD telemonitoring group, software issues caused many interventions by medical staff which consumed time	Remote monitoring	Medical literacy became an issue when the device asked patients if their readings were normal, small sample size (n=27 control, n=19 intervention)
2010	Shein et al[51]	Patient satisfaction with Telerehabilitation assessments for wheeled mobility and seating	Assistive Technology	Satisfied: higher satisfaction with telerehabilitation Efficient: great time savings in travel	Videoconferencing	89.6% Caucasian, average age was 55, (racial and age bias), good sample (n=32)

CN, Clinical Neurophysiology; COPD, Chronic Obstructive Pulmonary Disease; IVRS, Interactive Voice Response System; PAP, Positive Airways Pressure; RCN, Remote Care Nurse; VA, Veterans Affairs.

Table 2 Affinity matrix

Factor	Article reference number	Frequency
Improved outcomes	8 9 11 13 15–18 20–26 31–33 38–41 47 50	24
Preferred modality	8 9 11 14 15 19 22 26 34 43 44 46	12
Ease of use	18 19 23 26 28 36–38 46 49 50	11
Low cost or cost savings	10 14 16 20 21 23 26 34 50	9
Improved communication	24 27 31 36 37 39 42 45 49	9
Travel time	10 12 20 30 36 43 48 51	8
Improved self-management	13 21 23 28 31 32 48	7
Quality	16 19 29 32 40	5
Increased access	19 42 46 48	4
Increased self-awareness	31 34 35 38	4
Decreased wait times	16 43 48 49	4
Fewer miles driven	10 14 20 51	4
Decreased in-person visits	12 39 43	3
Improved self-efficacy	13 23 31	3
Good modality for education	15 34 44	3
Low time to manage	37 39 49	3
Improved medication adherence	13 38 44	3
Decreased readmissions	9 21	2
Fewer missed appointments	44	1
		119

occurrences (55%): *improved outcomes,*[8 9 11 13 15–18 20–26 31–33 38–41 47 50] *preferred modality,*[8 9 11 14 15 19 22 26 34 43 44 46] *ease of use,*[18 19 23 26 28 36–38 46 49 50] *low cost* or *cost savings,*[10 14 16 20 21 23 26 34 50] and *improved communication.*[24 27 31 36 37 39 42 45 49]

DISCUSSION
Summary of evidence
Telehealth has the potential to extend the boundaries of providers' practices by overcoming the barrier of proximity. Along with the introduction of a new modality of care comes change, and the literature mentioned various reactions to this change. One study identified heavy resistance to change,[29 37] while others mentioned an embrace of the change.[29 48] Older patients, in general, do not embrace change, but recent studies have identified a generational acceptance of technology and mHealth in general.[55]

Our findings from this systematic review and narrative analysis identify some issues that are salient in the literature. To help overcome provider resistance to change to telehealth, it should be noted that over the last 7 years 20% of the factors of effectiveness in the literature were improved outcomes. Providers and patients should embrace telehealth modalities because of its ease of use,[18 19 23 26 28 36–38 46 49 50] its tendency to improve outcomes[8 9 11 13 15–18 20–26 31–33 38–41 47 50] and communication,[24 27 31 36 37 39 42 45 49] and its low cost.[10 14 16 20 21 23 26 34 50] It can decrease travel time[10 12 20 30 36 43 48 51] and increase communication with providers. Telehealth can provide a high-quality service, increase access to care,[19 42 46 48] increase self-awareness[31 34 35 38] and item powers patients to manage their chronic conditions.[13 21 23 28 31 32 48] Healthcare organisations should embrace telehealth because it decreases missed appointments,[44] is a good modality for education,[15 34 44] decreases wait times,[16 43 48 49] decreases readmissions[9 21] and improves medication adherence.[13 38 44] But most importantly, policymakers need to help legislation catch up with the technology by enabling additional means of reimbursement for telehealth because the modality improves outcomes,[8 9 11 13 15–18 20–26 31–33 38–41 47 50] which improves public health.

Comparison
The results of our review and narrative analysis are consistent with other reviews. Health outcomes have been identified as a factor of effectiveness in chronically ill patients in multiple studies.[56] Improvements have been identified for both physical and behavioural conditions. The review by de Jong *et al*, did not identify a significant decrease in use.[56] This review also focused on interventions that used asynchronous communication, like email and text messages, with an older population. Our study included both asynchronous and synchronous interventions with all ages.

We were able to locate a study from 2011 that also evaluated telehealth and patient satisfaction.[57] The researchers used secondary data analysis as the basis

for their study. Their study focused on patient satisfaction and home telehealth in US Veterans. Similar to the de Jong review, this study focused on an older population ranging from 55 to 87, while our analysis included younger age groups. Its focus on US Veterans while ours included this group as only part of our population. Our approach can equate to a greater external validity to our analysis. The Young *et al* review found that its participants were extremely satisfied with the care coordination/home telehealth programme. The US Veterans in this review embraced the new modality. The researchers found a decrease in use associated with the telehealth modality.

Limitations

We identified several limitations in the conduct of our literature review and narrative analysis. Selection bias is possible within this study; however, our group consensus methods will have mitigated against this risk. Publication bias is another risk, particularly as we did not extend our search to the grey literature. Limiting our search to only two databases could easily have omitted valid articles for our review. We controlled for inter-rater reliability through the initial focus study of the topic followed by several consensus meetings held along the iterative process. By continuing to review our findings, we follow the example of other reviews and narrative analyses.[52–55]

The final limitation that we identified was the young age of the telehealth modality of care. It has existed since the early 1990s, but compared with traditional medicine, it is quite young. Because it is technologically based, we chose to only look at the last five years, which could also limit our findings, but the rapid advancement of a technologically based modality drives a more recent sample to make current observations and conclusions.

CONCLUSIONS

Overall, it was found that patient satisfaction can be associated with the modality of telehealth, but factors of effectiveness and efficiency are mixed. We found that patients' expectations were met when providers delivered healthcare via videoconference or any other telehealth method. Telehealth is a feasible option for providers who want to expand their practices to remote areas without having to relocate or expand their footprint of their practice. As telehealth continues to be developed, special care should be given to incorporate features that enable acceptance and reimbursement of this modality.

Basic definitions

Patient satisfaction: The U.S. Center for Medicare and Medicaid Services defines this term as the patient's perspective of care which can be objective and meaningful to create comparisons of hospitals and other healthcare organisations.[58]

Effective: Successful or achieving the results that you want.[59] Usually associated with outcomes.

Efficient: Performing or functi8oning in the best possible manner with the least waste of time and effort; having and using requisite knowledge, skill and industry.[60]

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