Case Management via video conferencing: exploring the barriers and facilitators – a rapid literature review

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Abstract

The 2020 Covid-19 pandemic has forced case managers in the United Kingdom (UK) to use perhaps unfamiliar digital communication technologies to work with clients in the absence face-to-face contact. This rapid literature review aims to identify and explore common barriers and facilitators to video conference use in case management. Searches were carried out via Medline, CINAHL and PsychINFO databases retrieving 395 records dated 2015 to June 2020. Abstracts were screened against exclusion / inclusion criteria, resulting in 26 articles. These articles were assessed for methodological quality, full texts reviewed and data extracted using a template analytic approach. Units of text were aggregated into themes using an interpretive and inductive approach. Discrepancies were discussed by three reviewers. This resulted in 12 emergent themes for discussion. The data analysis is presented to inform the case management industry in the UK.

Background

The 2020 Covid-19 pandemic has presented an unprecedented challenge to the delivery of healthcare. The Institute for Registered Case Managers (IRCM), comprising of representatives from the Case Management Society UK (CMSUK), British Association of Brain injury and Complex Case Management (BABICM) and the Vocational Rehabilitation Association (VRA), issued a Covid-19 guidance document for case managers, which states *"A 'virtual first' approach with remote consultations must remain standard practice during this period."* (IRCM 2020). Both National Health Service (NHS) and private clinicians in the UK have adapted by offering remote consultations. These changes have implications for case managers who source and coordinate rehabilitation services for their clients. It is therefore important to explore barriers and facilitators to this way of working, to identify areas for training, minimise impact on client wellbeing and promote best practice.

As concluded by Lavin & Farrar (2020), "*There are many examples of innovative delivery within community rehabilitation teams… introduced out of necessity rather than choice in reaction to the global crisis…As part of the reflective, evaluative and learning recovery process….these rehabilitation methods need to be evaluated as a continuing mode of care delivery."*

This article uses the terms ‘case manager’ and ‘case management’ as defined by the IRCM. Case management is defined as ‘….a collaborative process which: assesses, plans, implements, co-ordinates, monitors and evaluates the options and services required to meet an individual’s health, social care, educational and employment needs, using communication and available resources to promote quality cost effective outcomes’ (CMSUK, 2020). Case managers must be trained health professionals registered via the Health and Care Professions Council or the Nursing Midwifery Council. When conducting this literature search, it became apparent that virtually no articles exist that are written by or specifically about case managers as defined by the ICRM. The search terms were therefore expanded.

Objectives

The aim of this review is to explore the barriers and facilitators in the use of video-conferencing in case management and to analyse outcomes of interest for practical and clinical application.

Method

Design

A rapid literature review design was chosen due to limited time and funding available. All study methodologies were considered. Grey literature and opinion pieces were excluded.

Search Strategy

Searches were carried out via Medline (2015–2020), CINAHL (2015-2020), and PsychINFO (2015-2020) databases for publications written or translated into English using MeSH and relevant phrases. Search terms were agreed with the reviewers including:

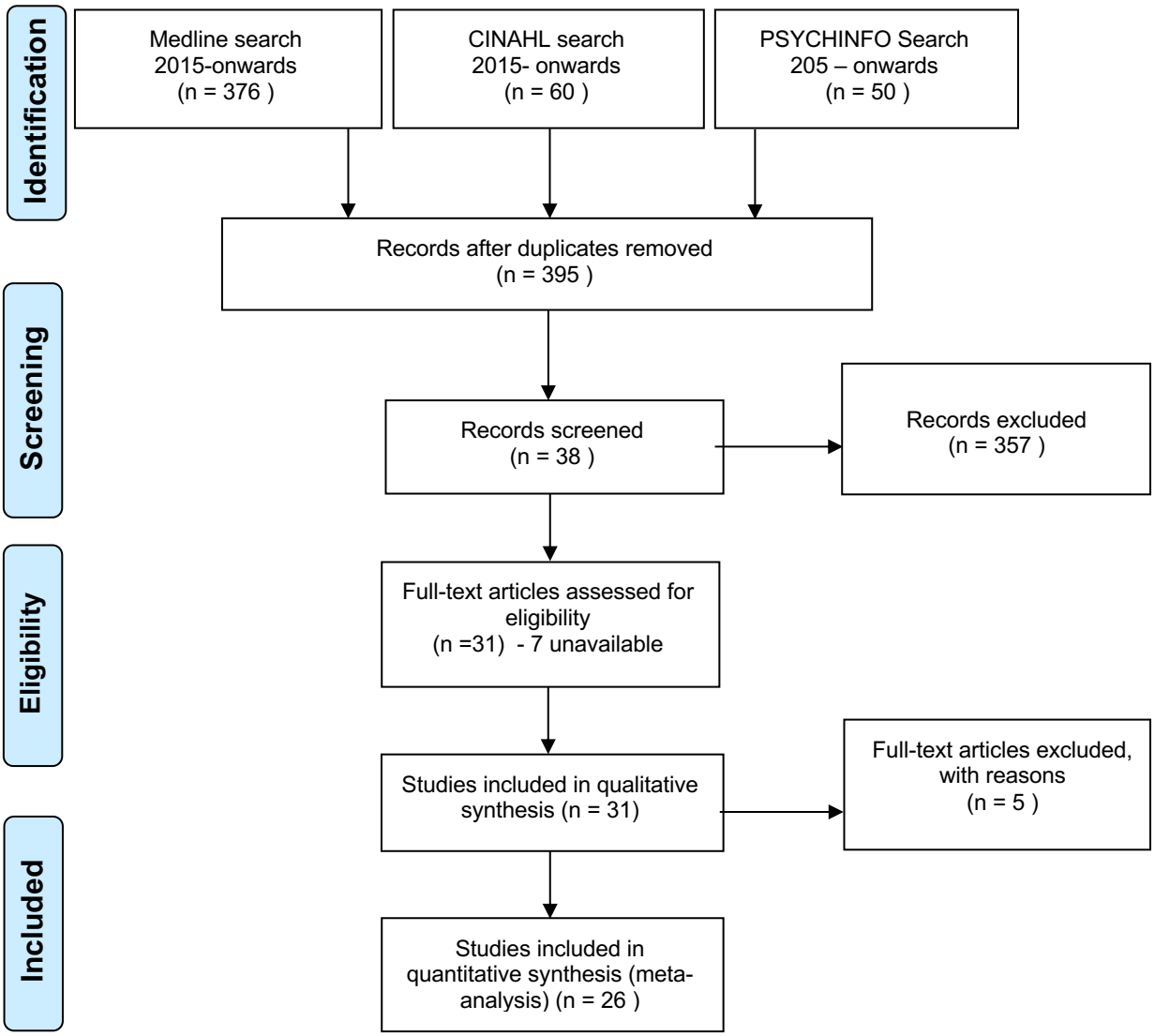
- Medline & CINAHL: telerehab + human
- PSYCHINFO: telerehabilitation or telehealth or telemedicine or remote consultation + human

The term ‘video conferencing’ provided limited results, so the terms ‘telerehabilitation’, ‘telehealth’, ‘telemedicine’ and ‘remote consultation’ were employed to increase numbers. As such, the term ‘telerehabilitation’ is defined as *“…the delivery of rehabilitation services via information and communication technologies.”* (Brennan et al 2010). It also became clear that the term ‘case management’, in much of the literature, was used to describe the medical management of specific patient groups primarily in nursing, so it was excluded in the search terms.

The final search results were imported to EndNote software, duplicates removed and abstracts reviewed against inclusion / exclusion criteria. The search process and numbers of articles selected are depicted in the Prisma flow diagram below.

Prisma Flow Diagram – Search process

From: Mother D, Liberati, A, Tetslaff J, Altman DF, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic *R*eviews and *M*eta *A*nalyses: The PRISMA Statement. PLoS Med 6(07): e1000097. Doi:10.137/journal.pmed1000097



Selection Criteria

Inclusions:
Articles from 2015 – June 2020 were included. Articles prior to 2015 were excluded to ensure technology would be current and relevant today.

Exclusions:
Articles were excluded when other technologies or themes were the focus including:

1. **Cost analysis / cost effectiveness**
2. **Gamification / Gaming software**
3. **Monitoring / wearable technology**
4. **Protocols / proposals / feasibility studies / tool & assessment development**
5. **Repeated studies:** only the most recent were included
6. **Robotic / Artificial Intelligence (AI) / Virtual Reality (VR) technology**
7. **Software- specific platforms, apps, web portals fuzzy logic & biofeedback**
8. **Specific clinical outcomes / interventions:** without video conferencing
9. **Telephone, text message or email only**
10. **Developing countries:** limited internet and tech.
11. **Opinion pieces**
12. **Systematic & rapid literature reviews**

Quality Assessment
All 26 articles were assessed for methodological quality using the standardised Mixed Methods Appraisal Tool (MMAT) 2018 version (Hong et al 2018), based on Pluye et al (2011). No articles were excluded through this process. A summary of MMAT assessment results, can be found in the Results section **(Table 3).**

Data Collection and Analysis
A data extraction tool was developed by the author with the two reviewers' assistance. Units of text relevant to the outcomes of interest were entered onto an excel spreadsheet and coded according to most commonly emerging themes. Please see **Appendix A** for a summary of data extracted. Full data list is available on request of the author.

Summary of Results

Synthesis
Data was synthesised by reviewing and grouping descriptive text from the included papers into themes. Twelve common themes emerged relating to barriers and facilitators to use of video conferencing. These are listed in order of frequency of occurrence below:

Barriers:

- **Technical Difficulties:** including equipment, software and connectivity
- **Lack of physical contact**
- **Limited training / computer skills**
- **Limited broadband speed / equipment access**
- **Challenge to build rapport**

- **Privacy / Information security**

Facilitators:

- **Reduced travel & cost**
- **Convenience & Flexibility**
- **Enhanced individual & group input / feedback:** a broad theme where clients and health professionals perceived increased therapy quality, or enhanced group process
- **Quality time with professional:** where clients perceived increased quality time
- **Family / carers more involved**
- **Time efficient**

Table 1. Summary of common themes relating to Barriers and Facilitators in the use of video conferencing for the provision of healthcare interventions

STUDY ID	AUTHOR	BARRIERS (client & health prof.)						FACILITATORS (client & health prof.)					
		Technical Difficulties	Privacy / Information Security	Limited training / computer skills	Limited broadband speed / equipment access	Challenge to build rapport	Lack of physical contact	Reduced Travel & Cost	Family / Carers more included	Quality time with professional	Convenience & Flexibility	Enhanced individual & group input / feedback	Time efficient
1.	Hwang et al	√	√		√		√	√	√		√		
2.	Antilla et al	√	√	√							√		
3.	Hoaas et al	√					√				√		
4.	Loree et al											√	
5.	Munoz et al	√				√		√	√		√		
6.	Ownsworth et al	√	√	√		√	√	√	√	√	√	√	√
7.	Rawstorn et al	√		√			√				√	√	
8.	Rotveldt et al		√		√	√	√	√			√		
9.	Seidman et al				√*								
10.	Shulver et al			√		√	√	√		√	√	√*	
11.	Brouns et al	√	√	√	√	√	√	√			√	√	√
12.	Eckberg et al	√					√						
13.	Mozer et al	√	√	√			√						
14.	Palazzo et al											√*	
15.	Tyagi et al	√		√	√	√	√	√			√		
16.	Getz et al	√						√		√	√		√
17.	Jansen-Kosterink et al												√*
18.	Macoir et al			√*	√*			√					
19.	Marquis et al	√									√*		
20.	Peterson										√*		
21.	Spindler et al							√			√		
22.	Tsai et al	√						√					
23.	Vasilopoulou et al							√					
24.	Cottrell et al		√	√	√	√	√	√			√	√	
25.	Damhus et al	√			√	√		√				√	
26.	Inskip et al			√					√			√	
	Key: *+ implied barriers & facilitators as not explicitly stated												
	TOTALS	14	7	10	8	8	11	15	4	4	15	9	4

Technology and Platforms

Many technology platforms, devices and software for video conferencing were mentioned in the literature including:

Table 2. Summary of Technology used and discussed in Rapid Review Literature

Specific platform or technology	Specific device or connectivity equipment	*Generic device or description
- Adobe Connect 9.2: video conferencing software - Vidyo: video conferencing software - Skype: video conferencing software - Zoom: video conferencing software	- Dell Lenovo laptop – preloaded software - Inspiron 15 laptop computer - IBM ThinkPad laptop with preloaded software - HP EliteBook 8560p	- Laptop computer (3)
- LogMeIn – remote computer access software	- Dell 790 Optiplex desk top computer	- Computer (PC, desktop) (5)
- Cardiac rehab portal ActiveHeart		- Add-on Webcam (2) - Built in camera (to laptop) (4)
- ORLA – synchronous telerehab software for SLT - ORALYS TeleTherapy – telerehabilitation platform and software for SLT	- 25.5 in Touchsmart embedded computer for video display and interaction with Oralys Therapy software	- External Noise cancelling microphone (1)
- e-SBIRT Software (for substance abuse therapy)	- 3G Wireless broadband device (Huwai USB modem) - Verizon hotspot access	- Installation of fixed broadband (1) - Mobile broadband device (4)
- Phonak Software (Audiology software)		- Web-based diary (1)
- Hospital Internet Portal (QH Telehealth)	- iPad (for Facetime video conferencing) - Lenovo Smart Tab 117	- Tablet computer (2) - Tablet (3)
- Facetime (videoconferencing App via iPhone to iPhone, or iPad to iPad or other Apple Mac computer only)	- iPhone (for Facetime video conferencing)	- Mobile device (1) - Mobile phone (5) - Smart phone (3)
- REMOTE – R (real-time video conferencing software-exercise coaching).	- Cisco Tandberg 550 MXP – with pan tilt zoom wide angle camera & omnidirectional microphone. (1)	- Telephone (1)

* Numbers in brackets are instances this was mentioned in the article text extraction data
** Video conferencing (the majority of articles made a generic reference to a form of video conferencing)

Table 3. Mixed Methods Appraisal Tool (MMAT) - Summary of Methodological quality criteria assessment and scores

Hong QN, Pluye P, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, Gagnon M-P, Griffiths F, Nicolau B, O'Cathain A, Rousseau M-C, Vedel I. Mixed Methods Appraisal Tool (MMAT), version 2018. Registration of Copyright (#1148552), Canadian Intellectual Property Office, Industry Canada. Web: http://mixedmethodsappraisaltoolplublic.pbworks.com.

*Scoring cf Smith et al (2016) & Pace et al (2012) - *based on previous 2011 version of MMAT, but also valid for the purposes of this report*

ID	AUTHOR	General Screening		Qualitative					Quantitative (RCT)					Quantitative (non RCT)					Quantitative Descriptive					Mixed Methods					*Preliminary Score out of 5 (Smith et al 2016)	*Quality Percentage Score (Pace et al 2012)
		S1	S2	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5		
1.	Hwang et al	√	√																					√	√	√	√	√	5/5	100%
2.	Antilla et al	√	√	√	√	√	√	√																					5/5	100%
3.	Hoaas et al	√	√																					√	√	√	√	√	5/5	100%
4.	Loree et al	√	√						√	√	√		√																4/5	80%
5.	Munoz et al	√	√	√																									1/5	20%
6.	Ownsworth et al	√	√	√	√	√	√	√																					5/5	100%
7.	Rawstorn et al	√	√							√	√		√																3/5	60%
8.	Rotveldt et al	√	√	√	√	√	√	√																					5/5	100%
9.	Seidman et al	√	√											√	√	√	√	√											5/5	100%
10.	Shulver et al	√	√	√	√	√	√	√																					5/5	100%
11.	Brouns et al	√	√	√	√	√	√	√																					5/5	100%
12.	Eckberg et al	√	√	√	√	√	√	√																					5/5	100%
13.	Mozer et al	√	√																√	√									2/5	40%
14.	Palazzo et al	√	√	√	√	√	√	√																					5/5	100%
15.	Tyagi et al	√	√	√	√	√	√	√																					5/5	100%
16.	Getz et al	√	√																		√								1/5	20%
17.	Jansen-Kosterink et al	√	√											√	√	√		√											4/5	80%
18.	Macoir et al	√	√											√	√	√	√	√											5/5	100%
19.	Marquis et al	√	√											√	√	√		√											4/5	80%
20.	Peterson	√	√																	√	√								2/5	40%
21.	Spindler et al	√	√						√	√	√		√																4/5	80%
22.	Tsai et al	√	√						√	√	√	√	√																5/5	100%
23.	Vasilopoulou et al	√	√						√	√	√		√																4/5	80%
24.	Cottrell et al	√	√	√	√	√	√	√																					5/5	100%
25.	Damhus et al	√	√	√	√	√	√	√																					5/5	100%
26.	Inskip et al	√	√	√	√	√	√	√																					5/5	100%
Study type / design totals:		26 passed		12					5					4					3					2					Quality: 16 x 100% / 5 x 80% / 1 x 60% / 2 x 40% / 2 x 20%	

Discussion

While the literature reviewed was mostly written from the perspective of therapists undertaking clinical interventions remotely, the data is deemed relevant to the work of case managers in the UK. The client groups are also assumed to be grossly representative of the diverse population of case management clients in the UK.

Quality of Research

Use of the MMAT (version 2018) screening tool found of the majority of studies were high quality (**Table 3).** The majority of studies reviewed were qualitative (12), reflecting the research question. As the review focus was textual, papers were not excluded based on a low score (<50%).

Themes

Out of the 26 articles, barrier themes were discussed marginally more often, with 58 mentions of barriers and 51 mentions of facilitators, as shown in summary **Table 1**.

Barriers

Two of the three most common barriers discussed were **'technical difficulties'** and **'limited training and computer skills.'** There were frequent problems with connectivity and audio visual quality. Adjusting to diminished non-verbal communication cues can be frustrating and mean these technologies are inaccessible for some clients with speech and language, cognitive or sensory impairments and may exacerbate some psychological conditions. It appears clear that some training is likely required for both case managers and clients. One positive often expressed was that age alone is not barrier to client acceptability of video conferencing, as stated by one client '*Well if the kids can do it, I can do it'* (Shulver et al 2016).

'Lack of physical contact' was another frequent theme. Some therapies certainly benefit from a 'hands-on' approach, notably described in a study on physical object play in paediatric speech and language therapy (Ekberg et al 2018). Case managers may get involved in home, workplace and equipment assessments, so there are implications for risk assessment. Careful consideration must be given to what type of interventions can be safely provided remotely and which interventions and assessments are safer to do in-person.

It should also be noted, many articles highlighted simply a personal preference for face-to-face contact, and that video calls should not be used as a complete replacement. As one patient stated '*You cannot replace human contact with contact by digital devices. That is always a loss.'* (Brouns et al 2018).

Facilitators

The two most common facilitators discussed were **'reduced travel & cost'** and **'convenience and flexibility'**. There are certainly advantages to reducing travel time and costs both for health professionals and clients. Scheduling meetings via video conference can make it easier for disbursed groups, multi-disciplinary teams, family members or carers to connect.

On the flipside, the concept of flexibility can hinder. For example, last minute cancellation of video calls are less inconvenient than cancelling face-to-face sessions, and may be perceived by both parties as less formal appointments. This can create uncertainty and reduced continuity of input; *'…with laughter, [the participants] reflected on how the technology made it easier for them to withdraw themselves without confrontation from the collaboration with the tele-physiotherapist.'* (Hoaas et al 2016). While this shows increased client empowerment it may be problematic for those less motivated to engage.

This has implications for risk assessments, which may need updating to protect vulnerable clients who struggle to access technology. Further investigation on best practice in planning and carrying out successful video-based interventions for vulnerable clients is warranted.

Unexpected themes were some clients' perceptions of increased family and carer involvement in therapy when offered remotely. Also some articles discussed clients' perception of having more time and more individually tailored input by the therapist when compared to clinic or face-to-face interventions.These benefits are noteworthy and warrant further investigation.

Digital Platforms and Devices

I have summarised technologies discussed in the literature (**Table 2)**, but it would be unhelpful to discuss these in depth. Technology progresses swiftly and conclusions made will quickly become obsolete. The literature generally described one of two situations. The first was where advanced video conferencing equipment was set up for clients as part of research even including internet installation in their home. This is unlikely to translate to most case management clients. The second situation described clients and therapists using more common and commercially available devices and platforms such as Zoom, Skype, smart phones and tablets.

The general public's use of smart phones and Wi-Fi enabled tablets has greatly increased in recent years among all age groups, along with free apps such as WhatsApp, and Facetime, which many clients are familiar with. The use of commonly available platforms and technologies is likely to be more feasible for clients as it reduces the need for specialised training and may increase engagement. A focus on maintaining GDPR standards and ensuring information security will become more critical going forward. Expert IT advice may be needed as well as frequent revision of policies and procedures to ensure the best and most secure technologies are chosen for each individual's circumstances.

Review Strengths and Limitations

This review has identified a broad range of studies that are related to the use of modern technologies by health professionals. Although not directly describing case management, analysis of these studies is relevant to case managers as they describe rehabilitation activities being carried out via remote digital technologies. A longer review period or searching a wider number of databases may have captured more specific case management literature.

Conclusion

Regardless of the anticipated ongoing Covid-19 restrictions and challenges, it is timely that case managers master new communication technologies for use with their clients. Case managers should be innovative and take advantage of new technologies to enhance work practices, increase efficiency and empower clients. A rapid literature review by Joseph & Melder (2018) states *'Telemedicine or telehealth is an emerging area where information technology is fast being integrated into healthcare service'.* Case managers should maintain a solid understanding of these digital changes and be able to guide their clients' access to new healthcare technologies. It is hoped that by gathering and examining current research, this will encourage more evidenced-based policy making and the development of individual work practices in response to these changes.

Case managers represent a wide spectrum of health and social care professionals and have a unique role to play, bringing critical skills right into the centre of healthcare, often being the first point of contact for many clients with complex needs. More case management–specific research, as defined by the IRMC, would be beneficial to inform best practice.

The Covid-19 pandemic changes are significant and we may be seeing a long-term shift in practice. This was predicted by Damhus et al (2018) who stated, *"TR [telerehabilitation] is not just another way of delivering existing health care. TR introduces new work tasks and is a different way of providing care that redefines the health professionals' identity."* There are certainly some who will struggle with a fast-track introduction to video conferencing and other communication technologies, but equally there are those who will benefit from new and innovative ways of receiving and providing rehabilitation and care.

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Appendix A: Summary Data Extraction Table – Rapid Review Literature

Study No .	Author(s)	Year of Publication	Country of Study	Client Group	Participant sex / age range	No. of Participants	Type of Study / Design	Health Professions	Intervention / Purpose of Study	Methods to Identify barriers & facilitators
1	**Hwang et al**	2017	Australia	Cardiac Failure	88% Male /12% Female Mean age 69 yrs	17	Mixed Methods study design	Physiotherapy	Patient experiences and perspectives of a group-based heart failure (HF) tele-rehabilitation program delivered via online video-conferencing.	Self- report surveys and semi-structured interviews to measure patient experiences and perspectives following a 12-week telerehabilitation program.
2	**Anttila et al**	2019	Finland	Cardiac - coronary artery disease	74% Male / 26% Female Mean age 54.8 yrs	39	Qualitative - Interviews	Psychology	To explore experiences of and attitude toward technology of persons with cardiovascular disease prior to 12 months of remote rehabilitation	Interviews- Data were analysed using Glaser's mode of the grounded theory approach.
3	**Hoaas et al**	2016	Norway	Chronic Obstructive Pulmonary Disease (COPD)	50% Male / 50% Female Mean age 55.2 yrs	10	Mixed Methods approach & triangulation of data	Physiotherapy	Use of telemedicine in pulmonary rehabilitation for COPD in enhancing long-term exercise maintenance – adherence, experiences and factors affecting satisfaction	Two semi-structured focus groups; Individual open-ended questionnaire; & user friendliness questionnaire. Analysis by systematic text condensation.
4	**Loree et al**	2019	USA	Women w. substance use	All Women Mean age 33.9 yrs	439	Qualitative - RCT	Psychotherapy	Comparing satisfaction, alliance and intervention components in electronic and in-person brief interventions for substance use among childbearing-aged Women	Investigated participant ratings of satisfaction and alliance
5	**Muñoz et al**	2017	USA	Children with deafness / hard of hearing (DHH)	50% Female / 50% Male *Children (N=4)* Mean age 2.6 yrs *Caregivers (N=4)* All female Age not recorded	8	Qualitative -6 month longitudinal study	Paediatric Audiologist	Explore the use of virtual visits / telehealth to monitor hearing aid use with data logging measurements and provide parent support for hearing aid management.(Study funded by software Phonak)	Pre- intervention: Family demographic form and a pre-questionnaire about attitude towards virtual visits Post-questionnaire about attitude toward virtual visits. (parents and audiologists).

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6	**Ownsworth et al**	2020	Australia	Acquired Brain Injury (ABI)	*Rehabilitation coordinators (13)* Female 68% / Male 32% Mean age 45.7 yrs *People w. ABI (9)* 44% Female / 56% Male Mean age 39.1yrs *Family Carers (8)* 63% Female / 32% Male Mean age 54.8 yrs	30	Qualitative - semi structured interviews, thematically analysed	Psychology (31%) Occupational Therapy (23%) Social Work (23%) Speech Pathology (15%) Physiotherapy (8%)	Explore perspectives of rehabilitation coordinators, individuals with ABI, and family caregivers on the usability and acceptability of videoconferencing (VC) in community-based / home rehabilitation	Semi-structured interviews were conducted with health professionals, clients, family and carers. Demonstration of telehealth portal prototype during interview. Interview transcripts coded and analysed thematically using Braun & Clarke's six phase approach.
7	**Rawstorn et al**	2018	New Zealand	Coronary Heart Disease	84.15% Male /15.85% Female Mean age 61.9 yrs	162	Qualitative - single blind, randomised controlled noninferiority trial	Physiotherapists & Exercise Specialists	Evaluate user experiences of an exercise-based cardiac telerehabilitation intervention (REMOTE – CR) incl real-time remote coaching and behavioural support from exercise specialists.	Participants completed questions at 12-week follow-up to assess technology ease of use, satisfaction with platform, and content of REMOTE -CR. Responses summarised using descriptive statistics and a thematic inductive approach.
8	**Rortveldt et al**	2018	USA	Paediatric (nonspecific)	not reported	67 surveys sent / 27 responded	Qualitative - self completed survey	Occupational Therapy	Occupational Therapists using telehealth in schools	Online survey to explore attitudes re use of telehealth as in school-based occupational therapy practice. Responses analysed using a technique closely matched to directed content analysis. Common themes identified where possible.
9	**Seidman et al**	2017	Australia	Chronic Respiratory Disease	41% Male / 59% Female Mean age 73 yrs	254	Quantitative - A cross-sectional, multicenter study, non RCT - quantitative survey analysis.	Pulmonary Physiotherapy	Determine level of technology engagement by people attending pulmonary rehabilitation. Are participant demographics and level of technology engagement associated with willingness to use telerehabilitation?	A custom 26 question survey re participants' demographics, engagement with technology, self-rated computer & internet skill competence, & views of technology in healthcare. Questions about access to technological devices, frequency and reasons for use and openness to telerehabilitation.

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10	**Shulver et al**	2016	Australia	Older People with disabilities	35% Male / 65% Female Age range 60 to 92 years	17 13 patients 3 spouses 1 carers	Qualitative - interviews	Physiotherapy	Study of community dwelling participants who received a home telerehabilitation programme as an alternative to conventional rehabilitation in aged care rehabilitation service.	Semi-structured interviews. Clients asked about experiences of program, prior experience & usability of computer & iPad technology, motivations for participation, challenges receiving health care via telehealth, quality of the care, and preferences between traditional care & telehealth. Interviews recorded, transcribed and analysed using NVivo software & thematic analysis
11	**Brouns et al**	2018	Netherlands	Stroke	*Patients (32)* 59% Male / 41% Female Mean age 56.9 yrs, *Caregivers (13)* 27% Male 73% Female Mean 60.6 yrs, *HCPs* (15) 23% Male 73% Female	60	Qualitative - focus group study	Physiotherapy Psychology, Occupational Therapy, Speech Therapists, Physicians, and Managers	Which factors influence the uptake of eRehabilitation (in a stroke rehabilitation service)	Use of Grol model as framework. A semi-structured interview guide included. open-ended questions in (1) the content of an eRehabilitation service, (2) appearance and accessibility, and (3) factors influencing the uptake. Transcripts were then independently analysed using direct content analysis and coded according to the Grol model.
12	**Eckberg et al**	2018 (data collected in 2015)	Australia	Downs syndrome, ASD, development delay	100% Male, Ages 3-6yrs	15 participants / only 4 client therapist interactions analysed (8)	Qualitative - observational study	Speech & Language Therapist	How physical objects such as toys are used in similar and different ways across videoconferences and 'in-person' therapy	Video conferring therapy sessions were recorded and analysed using conversational analytic methods.

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13	Mozer et al	2015	Australia & International	General Disability	HCP participants worldwide	254 (159 used VC regularly for personal use)	Mixed methods - Survey	83 Rehab Med (34%), 60 Nurses (25%), 40 OTs (17%), 18 Geriatricians (7%), 15 Aboriginal Health Workers (6%)	Identify barriers to the utilisation of videoconferencing within a multidisciplinary rehabilitation medicine healthcare team	Survey via Survey Monkey. Quantitative data ranked according to frequency of response and presented with descriptive statistics. Qualitative data was grouped thematically.
14	Palazzo et al	2016	France	Low back pain	Female - 17 Male - 12 Mean age 50.4	29	Qualitative - semi-structured interviews	PT (8), Physical Coach (1), OT (1), Psych(1), Physical Medicine & Rehab Dr (2)Rheumatologist (1)	To assess views of patients with chronic low back pain concerning barriers to homebased exercise program adherence and to record expectations regarding new technologies.	Semi structure interview - Interview protocol incl. a loose list of themes, the interviewer adjusting questions to the specific leads of the interview and pursuing unpredictable emergent data. Interviewed recorded, transcribed and thematically analysed independently by 5 researchers.
15	Tyagi et al	2018	Singapore	Stroke	Males – 7 Female - 6 Mean age 59 yrs	37 Family - 10 Carers - 3 Clients - 13 therapists - 11	Qualitative study – but part of a larger Quantitative RCT	Occupational Therapy & Physiotherapy	To explore the perceived barriers and facilitators of tele-rehabilitation by stroke patients, caregivers and rehabilitation therapists in an Asian setting	Interviews - transcribed and translated to English (when in Chinese and Malay) and coded using NVivo 11 software, then line-by-line coding to analyse transcripts, identifying the main emerging themes.
16	Getz et al	2016	USA	Phonologic Alexia - resulting from L hemisphere stroke	Male - 1, 44 yrs Female - 1, 51 yrs	2	Quantitative Descriptive – Case Series	Speech & Language Pathologist	Evaluate whether treatment of acquired reading disorders by a live clinician can be feasibly, effectively, or efficiently conducted via telerehab.	Analysis of treatment outcome of two of 2 patients and compared against previous research where the same treatment methods were used for in-person treatment
17	Jansen-Kosterink et al	2015	Netherlands	Chronic lower back Pain & Pulmonary disease	Males 62.3% Female 37.7 % Ages 20–70 yrs Mean age 49 yrs	62	Quantitative – non RCT	Physiotherapy	Examine use pattern of telerehabilitation service by chronic disease patients and the association between actual use and clinical benefit experienced by patients.	Only clinical measures carried out, assume any characteristic patterns of use or other details re telerehab were gleaned from this.

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18	**Macoir et al**	2017	Canada	Post-stroke Aphasia	Male - 14 Female - 6 49 to 78 yrs	20	Quantitative – a quasi-experimental pre-/post-test design	Speech & Language Therapists	To investigate effectiveness of remotely delivered synchronous pragmatic telespeech language therapy for improving functional communication in aphasia.	Only clinical measures carried out, no separate subjective measures. Statistical analysis via mixed model analysis of variance (mixed-ANOVA) and then using SSPS software.
19	**Marquis et al**	2015	Canada	COPD	Female 57.7% Male 42.3% Mean age 65yrs	26	Quantitative – pre-experimental pre/post-test design	Physiotherapy	This study aims to investigate the effect of telerehabilitation on exercise tolerance and quality of life and to document patient satisfaction and adherence.	Pre and post-test clinical assessments and demographic information recorded (with double pre-test). 6 min walk test for exercise tolerance and QOL Ax using the Chronic Respiratory Questionnaire. Statistical analysis performed using SSPS software
20	**Peterson**	2017	USA	Chronic low back pain (CLBP)	100% Female Mean age 45 yrs	3	Quantitative – Case Series	Physiotherapy	To describe the implementation of telerehabilitation booster sessions and remote patient monitoring in three patients with CLBP	Various functional and clinic outcome measures for function, pain & self-efficacy. Questionnaire with patients 6 & 12 months post input.
21	**Spindler et al**	2019	Denmark	Cardiac - coronary artery bypass, valve surgery, heart failure or artery sclerosis	Male 79.9% Female 20.1% Mean age 62.5 yrs	136	Quantitative – RCT, part of a larger Telediallog study	Physiotherapy	Study examined how patients responded to telerehabilitation and whether it provided adequate support for lifestyle changes and self-care efforts when compared to conventional rehabilitation	Questionnaire at baseline on enrolment, and at 3, 6, and 12 months. A variety of psychological baseline measures were taken prior to engaging in the TR program. Also non-formalised personalised feedback by health care staff was offered. Statistical analysis via ANOVA using SPSS software.

Study No .	Author(s)	Year of Publication	Country of Study	Client Group	Participant sex / age range	No. of Participants	Type of Study / Design	Health Professions	Intervention / Purpose of Study	Methods to Identify barriers & facilitators
22	Tsai et al	2017	Australia	COPD	Female 50% Male 50% Mean age 74 yrs	37	Quantitative – prospective blinded RCT	Physiotherapy	Determine effect of supervised, home-based, real-time videoconferencing telerehabilitation on exercise capacity, self-efficacy, health-related quality of life and physical activity in patients with COPD compared with usual care without exercise training.	Various clinical Outcomes were measured at baseline and following the intervention. Chronic Respiratory Disease Questionnaire to measure Health-related Quality of Life (HRQol)
23	Vasilopoulou et al	2017	Greece	COPD	Male 80.9% Female 19.1% Mean age 65.8 yrs	147	Quantitative – unblinded RCT	Physiotherapy Exercise Scientist, Dietician, Physician, Respiratory Consultant	Investigate effectiveness of home-based maintenance tele-rehabilitation vs hospital-based maintenance in reducing COPD exacerbations, and ED visits.	Health-related Quality of Life (HRQoL), COPD Ax questionnaire (CAT), Hospital Anxiety & Depression Scale (HADS), modified Medical Research Council dyspnoea scale (mMRC), twice weekly for 12 months. Statistical analysis via ANOVA & using SPSS
24	Cottrell et al	2017	Australia	PTs working with Chronic musculoskeletal conditions	Female 61.5% Male 38.5% Age not mentioned	26	Qualitative – descriptive design	Physiotherapy	Evaluate service providers' views on: barriers to patients' accessing N/OPSC & MD (Queensland) rehab services; and implementation of telerehabilitation	Semi structure interviews completed with therapists (mostly PTs).Template analysis resulted in six themes using NVIVO 10 system.
25	Damhus et al	2018	Denmark	Nurse & PTs working with clients with COPD	Female 92% Male 8% Mean age 42.2 yrs	25	Qualitative – semi structured ind. & focus group interviews	Nurses (6) Physiotherapists (19)	Examine barriers and enablers of health professionals to online exercise based TR use in patients with COPD	Semi-structured individual and focus group interviews. Theoretical Domains Framework directed interview & used as a coding model. Independent coding, content analysis and discussion by 2 authors
26	Inskip et al	2018	Canada	Chronic lung disease	Female 50% Male 50% Mean age 71.5 yrs	52	Qualitative – focus group & questionnaire	Registered Nurse 4% Respiratory therapist 50% Physiotherapist 46%	To identify necessary features of pulmonary telerehabilitation (TR) from the perspectives of individuals with chronic lung disease and health care professionals who deliver pulmonary rehabilitation. (PR)	Questionnaires & focus groups. Questions included participants' PR experiences, their vision of technology-delivered PR, and what parameters are critical to PRTR. Inductive approach to analysis was used and emergent themes catagorised using NVIVO.