Virtual Care and Health Equity: A rapid literature review to identify equity issues in access to and delivery of virtual care interventions

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Executive Summary

Background

RPA Virtual Hospital (rpavirtual) was introduced by Sydney Local Health District in February 2020 as a new way of delivering hospital level care in the community. In the fifteen months since launch, rpavirtual has delivered a wide range of virtual care to over 13,000 patients, including COVID care, antenatal and paediatric care, a minor fracture clinic, mental health care, medication and symptom monitoring. Although rpavirtual has demonstrated high levels of acceptability of virtual care amongst its patients to date, the service is keen to understand issues to be considered in relation to equity of access to virtual care in order to inform strategic and program planning. This rapid literature review has aimed to consolidate and synthesise existing knowledge from a global perspective about equity issues in access and delivery of virtual care interventions that may then be adopted by rpavirtual.

Methods

This rapid review includes primary studies published between January 2010 and January 2021. A search strategy was developed and potential literature was searched in three electronic databases namely MEDLINE, EMBASE and CINAHL using both Medical Subject Headings (MeSH) and free-text keywords. Grey literature relevant to the Australian context was also searched by consulting relevant stakeholders and websites. Initially identified citations were exported in Covidence and were assessed against predetermined inclusion criteria for inclusion in the final review. Those assessed as relevant were extracted from the included studies using a customised extraction tool while methodological rigour and depth of reporting in the individual studies were done following the method suggested by O'Campo et al (2011). Narrative synthesis was performed as statistical pooling was not possible due to the heterogeneous nature of the studies.

Results

Forty one studies were included in the final review, most of which followed a cross-sectional design and were carried out in the USA. Several forms of virtual care modalities such as video conferencing, teleconferencing and patient portals were described in the included studies. Overall, we found that widespread disparities in accessing virtual care interventions were documented among cultural and ethnic minorities, relatively older people, those socioeconomically disadvantaged, people with limited digital and/or health literacy and those with limited access to digital devices and strong internet connectivity. At the request of rpavirtual, the review pointed towards 'promising practices', That is potential solutions to address these barriers such as having young and educated caregivers present during virtual

care appointments, arranging virtual care appointments in a culturally sensitive manner and improving digital literacy among patients.

Conclusion

The findings of this review will support rpavirtual to learn from documented practices identified in the literature that improve equity of access to virtual care for patients. It is suggested, that future research should focus on implementation of these promising practices.

1. Background

During the COVID-19 pandemic in 2020 (noted as ongoing) many health services rapidly pivoted to virtual care as an emergency method of reaching their clients [4]. The restriction of in-person health services and the rapid implementation of virtual care has been driven by necessity but also presents a significant opportunity to develop and strengthen virtual care-based provision of care [5-7]

RPA Virtual Hospital (rpavirtual) launched in February 2020 as a new model of care that combines Sydney Local Health District's (SLHD) integrated hospital and community care with digital solutions. rpavirtual acts as a bridge between hospital specialist services and patient care in the community. While rpavirtual was planned before the outbreak of COVID-19 it's virtual care model has been central to the SLHD and New South Wales response to the pandemic. It was the first service to introduce virtual care for COVID-19 stable patients in isolation in New South Wales, Australia.

> **Health inequalities** are measurable differences, variations and/or disparities in the health of individuals or groups. Inequalities arise in populations due to a range of factors including age, gender, ethnicity, geographic location and socioeconomic status.
>
> **Health equity**, in contrast, is about equal access to services for equal need, equal utilisation for equal need and equal quality of care for all, with a focus on health outcomes. A health equity approach recognises that not everyone has the same level of health or level of resources to deal with their health problems and it may therefore be important to do things differently in order to achieve similar health outcomes [3].

A foundational principle of SLHD's 2018–2023 Strategic Plan is that "everyone has a fair opportunity to enjoy good health and to access the health services they need". Virtual care has been identified as an approach that can potentially address some causes of health inequities through improving access and availability of services. However, there are also concerns that virtual care services could exacerbate existing health inequities or create new inequities if services are not accessible, available, and acceptable to population groups who need to access these services.

There is a growing body of studies being carried out on the expansion of virtual care interventions, particularly in relation to the COVID-19 pandemic [8, 9]. Recent studies tend to focus on virtual care as a way of minimizing risk of Covid transmission (ADD MONAGHESH, and CHAUGHEN PAPERs), as a way of triaging during emergency responses (Hollander

paper), and monitoring patients within their homes (Hollander). However, the equity issues related to the virtual care intervention have not been adequately explored and summarised. A recent study of rpavirtual [10] demonstrated that the model has been widely accepted by its virtual care patients. At the same time, the authors highlighted the importance of equitable distribution of this intervention and stressed the importance of exploring equity issues in a virtual care model. rpavirtual commissioned this rapid literature review to consolidate and synthesise knowledge about equity issues in access and delivery of virtual care interventions and to investigate the international literature related to equity issues in virtual care programs to identify virtual care strategies that may be adopted by rpavirtual

This report presents findings from the literature review.

2. Methodology

2.1 Approach

We have conducted this scoping study following the methodological framework devised by Arksey and O'Malley [11]. As suggested by them, we carried out the study following these five subsequent steps: 1) identification of the research question, 2) identification of relevant studies, 3) selection of the studies, 4) charting the data, 5) collating, summarising, and reporting the findings.

2.2 Search strategy

Global practices including those from Australia in relation to equity issues in virtual care interventions were identified through searching peer-reviewed articles in electronic databases Medline, EMBASE and CINAHL. Both Medical Subject Headings (MeSH) and free-text keywords were used to search relevant articles in these databases which were published between January 2010 and January 2021. The detailed search strategy is presented in Table 1.

Table 1: Search strategy

Sl.	Search terms
1	"telemedicine"[MeSH Terms] OR "telemedicine"[Text Word]
2	"tele medicine"[Text Word]
3	"telehealth"[Text Word]
4	"tele health"[Text Word]
5	"tele-health"[Text Word]
6	"e-health"[Text Word]
7	"teletherapy"[Text Word]
8	"virtual care" [Text Word]
9	"virtual health" [Text Word]
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11	"disparit*"[Text Word]
12	"health equity"[MeSH Terms] OR "health equity"[Text Word]
13	"equit*"[Text Word]
14	"inequit*"[Text Word]
15	"inequalit*"[Text Word]
16	"healthcare disparities"[MeSH Terms] OR "health care disparities"[Text Word]
17	"health status disparities"[MeSH Terms] OR "health status disparities"[Text Word]
18	10 or 11 or 12 or 13 or 14 or 15 or 16 or 17
19	10 and 18

Relevant grey literatures (technical reports, dissertations, patents, meeting papers, annual reports, or government publications) were also searched for Australian context specific evidence through stakeholder consultation and searching web-based sources as presented in Table 2.

Table 2: Grey literature sources

rpavirtual/SLHD	https://www.slhd.nsw.gov.au/RPA-Virtual-Hospital/
Agency for Clinical Innovation	https://aci.health.nsw.gov.au/
Analysis and Policy Observatory	https://apo.org.au/
Australian Government	https://www.australia.gov.au/
NSW Ministry of Health	https://www.health.nsw.gov.au/about/ministry/Pages/default.aspx
eHealth NSW	https://www.ehealth.nsw.gov.au/
Australian Commission for Safety and Quality in Health Care	https://www.safetyandquality.gov.au/
CSIRO	https://www.csiro.au

2.3 Study selection

The articles yielded in initial searches of the databases were assessed by two independent reviewers in relation to the inclusion and exclusion criteria developed for this study (Table 3). All the steps of study selection procedure were performed in Covidence (https://www.covidence.org). In the first stage, the title and abstract of the articles and abstracts were assessed by two reviewers. The articles which passed this initial screening stage entered full text screening. The full texts of these articles were obtained and more in-depth assessment was carried out against the inclusion and exclusion criteria. The reason for the exclusion for each of the articles was also noted in this stage. Any difference in voting between the reviewers was resolved by discussion.

Table 3: Inclusion and exclusion criteria

Inclusion criteria
- Published in English

- Published between January 2010 and December 2020

- Studies exploring equity in ambulatory services offered via telemedicine

- Carried out in OECD countries

- Empirical studies

Exclusion criteria
- Published in language other than English

- Published before January 2010

- Studies not exploring equity in ambulatory services offered via telemedicine

- Studies exploring robotic/tele-surgery

- Studies carried outside OECD countries

- Commentary/review/opinion pieces

2.4 Quality Appraisal

The included studies were assessed based on Pawson's [12] quality appraisal criteria for realist review: relevance (does the paper include data which addresses the theories under test) and rigour (are inferences from original authors methodologically credible). We did not exclude studies based on design as we wanted to collect a richer understanding of the interventions and due to the recognition that the most useful study information on models and how they work may not be within the reports of studies with the highest quality in evaluation of outcomes.

We used a method described by O'Campo [13]. Studies were classified against the criteria (Table 4). The rigour and relevance/richness of the included studies were assessed initially as yes (1) or no (0) answers to the questions. The rigour of the study was then classified overall as 'high', 'moderate' or 'weak'. and relevance/richness was categorised as 'thick' or 'thin' (see Appendix 2).

Table 4: Quality appraisal*

Assessment of rigour	1. Is there a clear statement of the aims of the research? 2. Did the study include an appropriate comparison group? 3. Did the study use appropriate eligibility criteria to obtain its target group? 4. Did the study use standardised methods for selecting/putting people into the study and state how they did this? 5. Did the study provide details about sample size? How participants were selected? Was any assessment completed of how representative they were of the target population? 6. Did the study have a comparatively long study period (≥6 months)? 7. Is the study methodology appropriate for what they were trying to achieve?
Assessment of relevance / richness	1. Is the intervention program description detailed? 2. Did the study describe factors that affected program implementation? 3. Did the study consider reasons for the results that they achieved? 4. Did the study discuss reasons for program success or failure?

*Based on: O'Campo P, Kirst M, Tsamis C, Chambers C, Ahmad F: Implementing successful intimate partner violence screening programs in health care settings: Evidence generated from a realist-informed systematic review. Social Science & Medicine 2011, 72(6):855-866.

2.5 Data Extraction

The data were extracted from the included studies in a Microsoft Excel template developed by the authors. Information such as country, study setting, study design, study participants, characteristics of the intervention/study, type of virtual care modalities, type of equity issues identified/addressed, main findings, summary of the result and relevance to rpavirtual were extracted.

2.6 Data synthesis

We performed narrative analysis of the information to summarise the findings of the included studies in relation to the objectives of the research. We could not perform the meta-analysis due to heterogenous designs and outcomes in the included studies.

3. Findings

3.1 Search result

The searching of the databases yielded a total of 3021 articles, from which 1990 underwent screening after removal of the duplicates. The assessment of title and abstract of the articles resulted in the exclusion of 1901 articles and 89 articles underwent full text screening. Finally, 41 articles satisfied the selection criteria and were included in the review (Figure 1). We also explored grey literature from some of the websites relevant to the Australian context, however, we did not find any article which presented equity issues in virtual care intervention from their own empirical investigation. The characteristics of the included studies are presented in Annex 1. When the included studies were assessed in terms of their methodological rigour, we found that 22 of the 41 studies were of strong methodological rigour while the remaining 19 studies were of moderate rigour. The majority of the articles (34 of 41 articles) presented with thick description, while the description was thin in 7 articles (Annex 2).
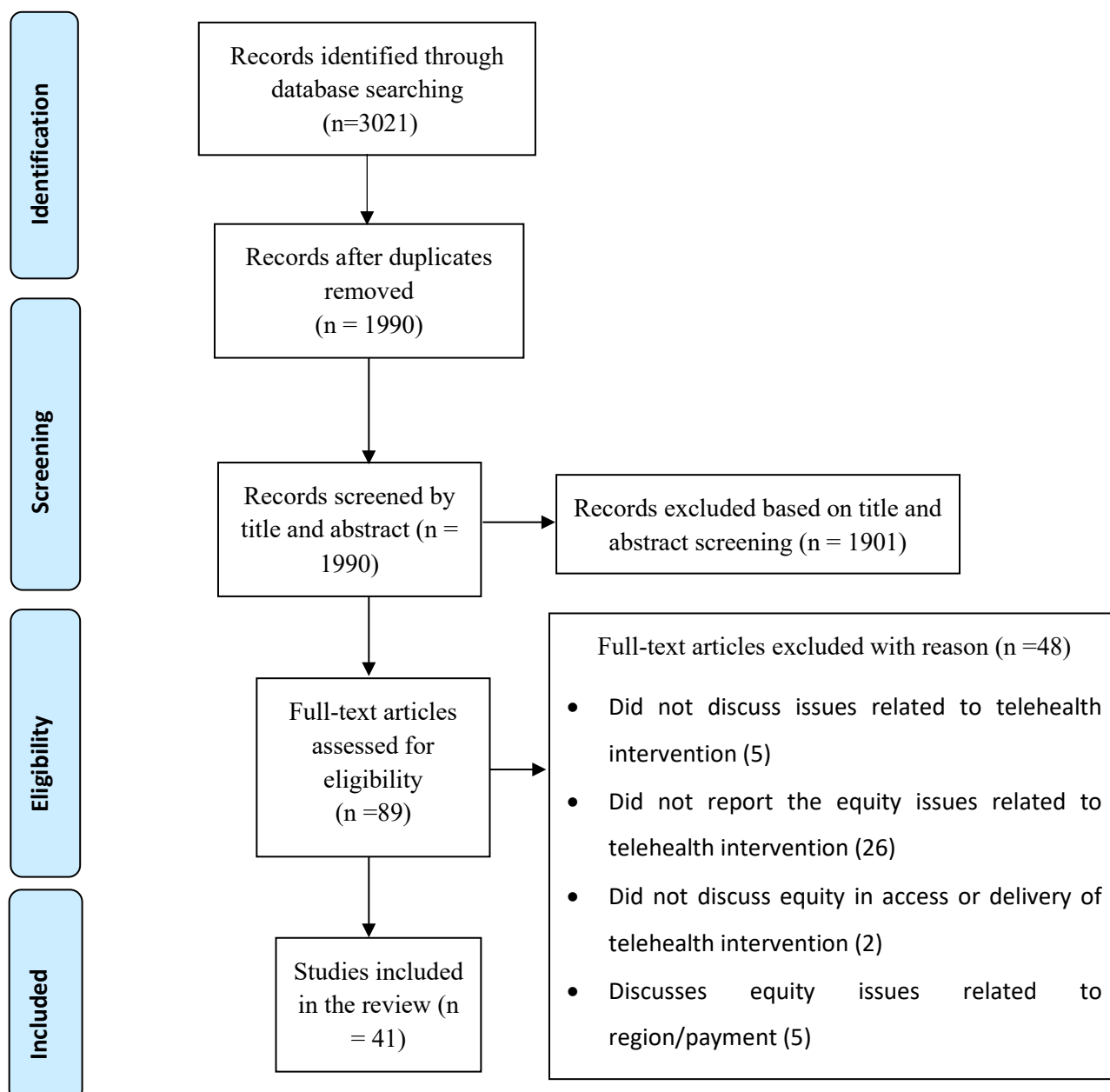

Figure 1: PRISMA diagram of study selection

3.2 Study settings

Of the 41 included studies 31 were conducted in USA, 3 were carried out in Australia [2, 14, 15], 2 in Canada [16, 17], 1 in Italy [1], 1 in China [18], 1 in Germany [19], 1 in Norway [20] and 1 in Scotland [21]. The studies were carried out either in a community or clinical setting including hospital and primary care.

3.3 Study designs

A range of study designs were followed in the included studies. Twenty three of the included studies followed a cross sectional design [1, 2, 14, 17-36], five studies carried out retrospective analysis of the collected data [37-41], six studies followed cohort design [42-47], two were randomised controlled trials [48, 49], and two followed a mixed-method design[15, 50]. One study followed a combination of retrospective analysis and cross-sectional study design [51] while the study design was not clear in two studies [16, 52].

3.4 Type of participants

The participants in most of the studies were adults, often with chronic conditions such as diabetes [26], cardiovascular disease [19], and mental health problems [42]. The studies considered both native English speakers and also those speaking languages other than English. A small number examined study populations who spoke languages other than English exclusively, specifically Spanish [37] and Chinese [2]. Several studies examined outcomes for specific cultural and ethnic minorities, however given these studies were primarily conducted in the U.S. the outcomes for population groups that were most often described were for Black, Hispanic, and African American people[27, 29, 31, 35, 36, 41, 47-49].

3.5 Virtual care modalities

While investigating the equity issues in access and delivery of virtual care interventions, the included studies considered several modalities of virtual care interventions ranging from video conferencing [1, 21, 22, 24, 27, 29, 30, 32, 38, 40-45, 47, 48, 52], teleconferencing [2, 16, 27, 29, 30, 32, 34, 35, 37-39, 41, 43, 44, 47, 52], message [22, 26, 31], emails [22], health app [19, 20, 25, 31], patient portal [39, 42, 49, 51], personal health record [40, 42] and eHealth service use in internet [14, 20, 23, 28, 50].

3.6 Types of equity issues identified/addressed
3.6.1   Cultural and ethnic inequalities

Twenty-one studies [15, 22, 24, 26, 27, 29, 31, 35, 36, 38, 40-49, 51] explored the cultural and ethnic inequalities in access to virtual care services and outcomes. The majority of them found

that cultural and ethnic minorities including those of African American, Black, Hispanic or Latinos, Asian American, Aboriginal and Torres Strait Islander or Filipino were less likely to access virtual care services compared to those of White participants. For example, in a study, Schifeling and colleagues [41] found that non-White patients were less likely to have a video visit than White patients. Likewise, Walker et al [49] found that African American patients used the patient portal less than White patients (40.4% difference, p=0.004). However, four studies [22, 24, 31, 46] reported a different result where the likelihood of using virtual care services was higher among the cultural and ethnic minorities compared to that of the White participants.

Box 1

"A culture sensitive telephone based supportive care for Arabic- and Chinese- speaking cancer patients can be of value in addressing equity issue in telehealth interventions." Shaw et al 2013[2]. This qualitative study was conducted among Chinese and Arabic patients and their careers to explore their willingness to take part in a telephone-based supportive care intervention. Two focus group discussions and two telephone interviews were conducted and most of the participants supported this idea of providing culture sensitive intervention in their own language through an online platform. However, they identified the confidentiality of the clinical information as a concern and also preferred an initial face-to-face contact with patients to increase participation. It was also argued that there should be the provision of at least on call initiated by patients, which would provide patients access to assistance in times of high need between scheduled calls.

3.6.2 Socio-economic inequalities

Older age has been identified as a significant barrier to accessing and using virtual care services among the participants in most of the studies[14, 17-19, 21, 23, 25-31, 36, 41, 42, 44, 46, 49, 51, 52]. For example, Leng et al [21] found that the patients under 60 years were over two times more likely to use video consulting (Odds Ratio (OR) 2.2, 95% CI 2.1–6.6). Nelson et al [26] also pointed out that the probability of responding to texts tended to increase from about age 25 until roughly age 50 years, and then appeared to decrease as age increased. Eberly et al [45] further noted that younger participants were more likely to be engaged with video call appointments compared to the telephone call. However, the only exception was reported by Pierce et al where age of 65 years and above was associated with a higher odds of virtual care use (OR 1.21, 95% CI 1.05–1.40). It is also notable to mention that all the nine studies [15, 19, 27, 34, 38, 42, 44-46] that explored the role of gender in accessing virtual care services, found that females were less likely to use virtual care services

compared to males. Two studies [44, 46] also found that unmarried participants were less likely to access virtual care services. Meanwhile, Wegerman et al [47] found that participants who were single or previously married (separated, divorced, widowed) had higher odds of completing a telephone visit, while the participants who were married had a higher chance of completing video visit.

> **Box 2**
>
> "Patients who had video visits were more likely to have a caregiver present during the consultation."Arighi et al [1]. This study aimed to explore the digital divide in virtual care intervention and was conducted among 108 patients with dementia who were recruited at the Alzheimer Centre of the Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico of Milan, Italy. The study found that nearly 30% of the participants were not able to perform the tele visit and around 70% were successful. It was notable that success or failure to tele visits were not dependent on the age, gender or education of the participants. Instead, successful tele visits were among the participants who were accompanied with a younger generation caregiver such as son or grandson.

Thirteen studies explored the use of virtual care in relation to the socioeconomic status of the participants and all of them found that lower socioeconomic status is associated with lower use of virtual care services [14, 15, 18-20, 25, 28, 29, 31, 32, 42, 44, 48]. Alam et al [14] reported that access to virtual care services was reported as lower by participants from disadvantaged socioeconomic backgrounds. Likewise, other studies [15, 18, 20, 25, 29, 31, 32, 42, 44] also reported that low socioeconomic status was associated with decreased access to virtual care services. Not surprisingly, some of the included studies which explored the role of education of the participants in accessing virtual care services [14, 15, 18-20, 25, 28, 29, 31, 48] also found that participants with lower education status were less likely to access the virtual care services.

3.6.3 Equity issues related to digital/eHealth literacy

Seven studies [14, 18, 19, 21, 26, 37, 50] reported a lack of digital/eHealth literacy among the participants as a significant barrier to accessing virtual care services. In a study Ernsting and colleagues [19] found that mHealth app users had higher levels eHealth literacy compared to non app users. A study [50] also reported that eHealth literacy increase was associated with a 3% increase in the number of searches for health information on the internet (beta=.03, 95% CI 0.00-0.06). Meanwhile, Leng et al [21] found that an increase in computer proficiency correlated with an increased willingness to engage in a video consultation.

3.6.4 Technological inequalities

Several studies [1, 14, 29, 31] also found that access to digital devices and access to the internet can increase access to virtual care services. Arighi et al [1] reported that issues such as a lack of devices (computers, phones or tablets) with internet connection and poor internet connections were the main causes of failed virtual care. Alam et al [14] pointed that access to broadband internet services were associated with increased to virtual care services.

4. Discussion

4.1 Summary findings

The present review was conducted with the aim of exploring equity issues in relation to access to and delivery of virtual care, and to consider the international evidence of program strategies used to target equity issues that may be adoptable or provide learnings to rpavirtual. The main drivers of inequity in access to virtual care identified in the literature review were differences in: digital access (adequate internet connection, available data, equipment etc.); digital literacy; eHealth literacy; language, cultural acceptability; preference for delivery medium; trust and perceived quality of care; levels of interest; perceived benefit and inconvenience.

This review identified some demographic groups that are more likely to use virtual care interventions than others, which needs to be considered when designing a virtual care intervention to ensure equity in access. For example, widespread inequities were observed among the culturally and linguistically diverse and socioeconomically marginalised population groups. Inequity in access to virtual care interventions was also reported among people who had limited digital or eHealth literacy, as well as inadequate access to electronic devices and internet connections.

In recent times, due to the COVID-19 pandemic, virtual care interventions have been widely used due to restricted in-person health service delivery [8, 9]. It has also been documented that the patient experience and their acceptance of virtual care during this pandemic has been generally good [53, 54]. At the same time, it is also notable to mention that the expansion of this digital innovation without due consideration of strategies to address equity of access has the potential to increase health inequities due to poverty, digital health literacy and lack of access to digital technology among some of the population group [55].

Reviews carried out during the COVID-19 pandemic [56, 57] also stressed the importance of virtual care interventions as an alternative to face-to-face health service delivery during a period of restrictions on face to face health service delivery. Doraiswami et al (2020)[56] reported that virtual care could play a pivotal role in the health sector in the future, but its feasibility and implementation in a resource poor setting is challenging. Locally, in New South Wales, virtual care will be influenced by the future strategic direction of NSW Health which is currently developing an updated virtual care strategy.

While some of the recent reviews [58-60] have highlighted the effectiveness of virtual care as a way of delivering health care in a cost-effective way, with improved patient communication,

outcomes, and satisfaction, the equity dimension of the virtual care interventions is not fully addressed in these reviews. This present review has bridged some of the knowledge gap around equity issues associated with virtual care and identified areas for further research.

4.2 Implications for rpavirtual

This review has several implications for rpavirtual and its program design going forward. This review has considered previously identified equity issues relating to virtual care access and delivery.

Equity issues relating to accessing and delivering virtual care services include access to technology, digital literacy, eHealth literacy, language barriers, cultural acceptability, preference for delivery or service medium, trust and perceived quality of care, levels of interest, and perceived benefit and inconvenience. This review uncovered evidence for how these equity issues can be addressed, and this evidence has implications for how rpavirtual can plan to deliver virtual care services now and into the future.

The literature demonstrates that access to virtual care services is particularly limited in culturally and linguistically diverse (CALD) patients which suggests there is a need to carefully tailor services to ensure their equitable access. Multilingual and culturally sensitive virtual care services can be of value in this regard. A culturally sensitive approach documented by Shaw et al (2013)[2] can be adopted by rpavirtual (please see Box 1) while looking towards addressing the cultural diversity in implementing the virtual care intervention.

Access to virtual care services is linked to the level of digital literacy of the patients. For example, Ernsting et al [19] and Guendelman et al [50] strongly emphasised the importance of improving digital literacy of the patients in order to address the inequity in access to virtual care services. Older people and those with higher levels of limited digital health literacy are less likely to access virtual care services and require targeted support. Evidence suggests that availability of younger caregivers or caregivers with higher digital literacy to guide older patients through accessing services during the virtual care appointments, can result in increased access to virtual care services.

Consideration of differing levels of digital and health literacy across patients should be part of planning virtual care services. To address digital literacy as a determinant of health, it needs to target either improving the health literacy of the patient or changing the delivery of the service. For example, an educational component can be incorporated to increase virtual care

literacy among the vulnerable patients. Also, delivery methods can be updated, for example, by adapting portals to be comfortably used by the less digitally literate patient or tailoring the information or platforms to the expected audience.

Virtual care service delivery planning should consider the variances in service uptake between different socioeconomic classes. Access to digital resources influences people's capacity to access and utilise virtual care. The digital divide in Australia in terms of access to digital devices and strong internet connectivity is significant for some groups [61]. Australians with lower levels of education, employment and income are less digitally included. When engaging patients with virtual care services, consideration should be given as to whether patients have access to appropriate devices and a reliable internet connection. rpavirtual could emphasise the importance of providing access to the appropriate devices and an effective internet connection in their referral process.

This review has provided some evidence for rpavirtual to draw upon when planning equitable virtual care service delivery now and into the future and provides a number of avenues for the service to focus its efforts on to ensure equitable virtual care service delivery.

Questions to consider for monitoring and ongoing service enhancement:

1. How does rpavirtual currently identify usage patterns?
2. What is rpavirtual currently doing to meet the needs of CALD and Aboriginal and Torres Strait Islander populations?
3. How is rpavirtual currently engaging carers?

4.3 Promising practices for rpavirtual from researchers' perspective

Through carrying out this literature review and analysing the evidence we identified some promising practices that could support equity in access and delivery of virtual care services. These promising practices were identified on the basis of the findings from the literature review and from discussions within the review working group.

1. Supporting the **role of carers** to potentially address equity issues in accessing virtual care:
    a. Enhancing their role as facilitators of virtual care use, including providing capacity building.
    b. Recognising and naming carers in information about rpavirtual.
    c. Investigating the use of terminology such as "family and friends" in information about rpavirtual as many may not identify with their carer role.

2. Developing **multilingual** and **culturally safe** virtual care services:
   a. Enhancing the already good access to health care interpreter services and ongoing quality improvement.
   b. Investigating an advisory body to specifically support enhancing cultural safety.
   c. Ongoing enhancement in the in-language and culturally tailored information, in particular for new and emerging groups.
   d. Investigating the feasibility of providing an in-language call back service.
3. **Disaggregate reporting** data to allow identification of who is not accessing services:
   a. Consider routinely reporting service use by gender, Aboriginal status, language spoken at home, age group, SEIFA index of disadvantage of SA2 of residence, interpreter use, NDIS flag, and number of identified multimorbidity.
4. Carrying out **equity checks** when planning virtual care services.
5. When planning virtual care services **identify target groups** that may be less likely to engage or be engaged with and **develop targeted or alternative approaches**.
6. **Engage with communities** identified as having lower access in planning and developing services.
7. **Identify barriers and enablers** to access and ongoing utilisation of virtual care services.
8. Develop **target and tailored** training resources and programs to support patients and carers in accessing and utilising virtual care.
9. Where possible, identify patient's **preferred method of communication** and provide a range of virtual care options.
10. Investigate ways to **enhance trust** in groups less likely to access virtual care services. The uptake and continued use of the virtual hospital will depend on the **perceived quality of care** patients receive and this builds trust and, past experience is a predictor for the uptake of virtual care services.
11. Consider developing a **digital health literacy responsiveness plan** for the District, which would set out:
    a. The range of activities being undertaken by the District to support consumers' ability to manage their own health and care using digital services.
    b. The range of activities being undertaken by the District to be more responsive as an organisation to differing levels of digital health literacy.

rpavirtual implemented and planned strategies to mitigate equity issues

Prior to this review, rpavirtual had already implemented processes to address potential equity issues. These have been described below.

- Early on, rpavirtual made a commitment to loan devices and/or data sim cards to patients without access to technology to ensure they were not disadvantaged by device or internet access.
- rpavirtual utilises the Sydney Health Care Interpreter Service to ensure patients who speak a language other than English have access to an interpreter for all clinical consults.
- A Digital Patient Navigator position has been introduced to support patients and carers to access and utilise virtual care by providing digital set-up, education, training and support and ensuring patient facing materials are easy to understand and meet the needs of patients and carers.
- Key patient information sheets, including patient welcome letters and videoconferencing instructions, have been translated into 7 of the main community languages.

Other planned initiatives include:

- Distribution of a virtual care readiness survey amongst local Aboriginal communities to understand particular needs and feelings related to virtual care and identify what supports might be required to support Aboriginal patients to access virtual care.
- The rpavirtual Consumer Network is in the process of establishing a checklist to support the review of all patient facing resources. Items will include whether additional information is required for carers, whether the resource is translated or has clear pans for translation and whether cultural communities have been consulted if required.

The findings of this review will support the ground work of rpavirtual, to improve service equity.

4.4 Limitations

This review was subject to some limitations. There are several synonyms used to represent equity issues in the literature. While we were quite broad in searching the literature, we may still have missed some articles with different terminology used. However, we explored both the MeSH terms and keywords to address this. We also limited our searches to three major databases but there could also be some articles in other databases. We searched some of the grey literature sources from Australia but did not find any relevant materials that presented primary findings on equity issues in virtual care interventions.

While we found that none of the articles are of weak methodological rigour, many of them are of moderate methodological rigour that needs to be considered while interpreting the results (see Appendix 2). We considered the quality aspect of the included studies, such as clearly stated study aims, appropriate eligibility criteria, sampling, depth of reporting in the paper and so forth. However we were unable to determine the comparative study quality of different telehealth modalities.

We restricted our searches to English literature only, therefore might have missed some articles that are written in language other than English. Also, we could not perform a meta-analysis due to heterogeneity in methods and outcomes of the included studies.

Overall there was very limited evidence available specific to the Australian context. More research is required to understand the barriers to virtual care use in the Australian context.

4.5 Policy implication

This review has identified equity implications of virtual care delivery to take into consideration when planning equitable virtual care service strategies. These findings complement rpavirtual's existing strategy for providing equitable care and are also applicable to NSW Heath state-wide virtual care interventions, and should be considered in developing strategies relating to the equitable delivery of virtual care services.

5. Conclusion

The present review highlighted that, despite the potential of virtual care to improve health service delivery, particularly amid this COVID-19 pandemic, there can be widespread disparities in access to and delivery of virtual care interventions. These disparities are based on sociodemographic characteristics of the participants such as age, gender, ethnicity as well as other factors such as access to appropriate digital technology, digital and health literacy, cultural acceptability and trust and perceived quality of care. This review also identified several promising practices such as the inclusion of young and educated caregivers, providing culturally sensitive interventions and improving digital health literacy that can be adopted by rpavirtual to ensure equity in access and delivery of virtual care services. However, future research should focus on how these promising practices can be implemented at the practical setting.

6. References

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Appendix 1: Characteristics of included studies

Sl.	Study	Title	Country	Study setting	Study design	Study population/ subject/part icipants	Characteristics of intervention	virtual care modality	Types of equity issues addressed/identified	Main findings	Summary conclusion	Relevance to rpavirtual
1	Abel 2018	Dual Use of a Patient Portal and Clinical Video virtual care by Veterans with Mental Health Diagnoses: Retrospective, Cross-Sectional Analysis	USA	This study was carried out among veterans from a retrospective cohort study evaluating technology adoption in VHA (Veterans Health Administration) users	Retrospective cross-sectional analysis	The study population includes 2,171,325 veterans with one or more mental health diagnoses who were users of services from the Veterans Health Administration.	Two types of virtual care were offered and reviewed - the video virtual care service and the electronic portal and health record.	Clinical video virtual care, a two-way interactive and synchronous videoconferencing between providers and patients. An electronic patient portal and personal health record.	Mental health problems, age and veteran status.	African American and Latino patients were less likely to engage in either virtual care modality compared to white patients. Patients with lower incomes were also less likely to engage in either virtual care modality. Women were more likely to engage in either virtual care modality compared to men. Patients diagnosed with schizophrenia or schizoaffective disorder were less likely to engage in either virtual care modality. Patients who engaged in both virtual care modalities were younger, more likely to be white and less likely to be from low incomes. Rural patients were more likely to use clinical video virtual care services than urban patients.	This study pointed that there is socio-economic, gender based and racial disparities in access to virtual care intervention that need to be addressed to ensure equity.	rpavirtual may care for patients with mental health problems via clinical video virtual care appointments. This article does not provide evidence for an intervention that reduces inequities. This article does not add to the knowledge base for how to establish equitable virtual care interventions

| 2 | Alam 2019 | Determinants of access to eHealth services in regional Australia | Australia | Western Downs Region in Southeast Queensland (~200km from a metropolitan city) | Cross-sectional questionnaire based household survey | A total of 390 randomly selected adults living in the area where the study is set. | N/A | eHealth services - use of internet and related technologies for healthcare services | Living in a regional area. | This study found that approximately 78% of those surveyed had access to virtual care services. Access to virtual care services was reported as lower by participants from disadvantaged socioeconomic backgrounds. Participants who reported being middle aged, living in a house with 3-4 people, and having broadband Internet access and good digital literacy were more likely to access virtual care services. Participants who reported lower levels of education, low socioeconomic status and living very remotely were less likely to access virtual care services. | This study reported on a variety of factors that increase and decrease access to virtual care services in populations living regionally.

A majority of the regional population sampled in this study had access to virtual care services. | rpavirtual may care for patients who live in regional areas, and thus it is important to understand what influences access and use of these services among regoinal populations.

This article does not provide evidence for ways to make virtual care interventions more equitable, however it does point out factors that rpavirtual may need to address to ensure all people living in regional areas can access virtual care services. |

| 3 | Arighi 2021 | Facing the digital divide into a dementia clinic during COVID-19 pandemic: caregiver age matters | Italy | Neurodegenerative Diseases Unit, Dementia Clinic, Alzheimer's Centre. | Cross-sectional analytic | Patients with cognitive impairment. The sample size is 108. | The virtual care intervention in this study involved contacting patients via a video call to perform a telemedicine neurological evaluation. The intervention was assessing what contributed to a successful telemedicine interaction and to a failed telemedicine interaction. | Video calls to conduct telemedicine neurological evaluations using Microsoft Teams. | Access to technology, ability to use technology. | This study found that issues such as lack of devices (computers, phones or tablets) with internet connection and poor internet connections were the main causes of failed virtual care. virtual care interactions were more likely to be successful if the patient was in the presence of a younger caregiver for the interaction. Factors such as age, gender or education level were not associated with success or failure of the virtual care interaction. | This study demonstrated that the presence of a younger caregiver or 'digital native' caregiver for virtual care interactions increased the success of the service. This suggests that virtual care services could be made more equitable if patients can be in the presence of a younger person for their virtual care appointments.

Interestingly, this study did not report that age, gender or education level impacted ability to use virtual care services effectively.

This study suggests that access to devices and internet connection are essential for accessing virtual care services. | rpavirtual may provide care for a lot of older aged patients, who may or may not be diagnosed with neurodegenerative diseases. The evidence from this study suggests that it may be useful for rpavirtual to encourage their patients to have a younger caregiver or family member present with them for their virtual care appointments, as this contributes to the success of the services being delivered well.

This study also emphasises the need to ensure that patients have a good internet connection as well as access to devices that can connect to the internet. |

| 4 | Arora 2013 | Dismantling sociocultural barriers to eye care with tele-ophthalmology: lessons from an Alberta Cree community | Canada | A community-based health clinic for Aboriginal Canadians in Alberta. | The study type is not clear. | Aboriginal Canadian patients who attended the community based health clinic. The paper does not provide the study sample size. | This study refers to its intervention as 'tele-ophthalmology' - the remote provision of eye care. The intervention involves a remote diabetic retinopathy screening program delivered to patients at a community-based health clinic. Information and images collected in the screening session are transferred to | Remote screening for diabetic retinopathy. | Cultural barriers, access to health services, and remote geographical locations. | This study assessed the delivery of a virtual care program that was delivered through a clinic. The clinic was designed to be culturally sensitive and appropriate for the target population (Aboriginal Canadians). The study found that establishing the community-based clinic as a setting for virtual care services improved the patients' access to tele-ophthalmology. | This study showed that virtual care services for patients who are Indigenous or living remotely can be made more equitable if these services can be accessed in a culturally appropriate community-based healthcare clinic. | This study may not be particularly relevant to rpavirtual. This is because while the intervention is a virtual care modality, it was actually delivered in a healthcare settting in a community based clinic. rpavirtual's focus seems to be caring for patients in at home settings. If rpavirtual were to work with community based clinics, this study provides evidence for how these clinics increase equitable access to virtual care services. |

						ophthalmologists to conduct assessments.					

| 5 | Blundell 2020 | Disparities in telemedicine access for Spanish-speaking patients during the COVID-19 crisis | USA | An urban academic outpatient paediatric dermatology clinic. | Retrospective analysis of clinic data. | Spanish speaking patients of the paediatric dermatology clinic who had appointments scheduled in March-July 2019 and or appointments scheduled in March-July 2020.

The sample size is 53 Spanish speaking patients and 1025 non-Spanish speaking patients. | Telemedicine appointments in place of face to face outpatient appointments at the paediatric dermatology clinic. | Patients had to submit photographs, the appointments were scheduled electronically, communications took place via an electronic patient portal, and appointments took place over telemedicine (whether this is a phone call or a video call is not specified in the paper). | CALD barriers, particularly non-English speaking and lower income level. | The study found that having a valid email address on record for Spanish speaking patients was an important factor in delivering virtual care services. It was reported that Spanish speaking patients were less likely to have a valid email address on their record compared to non-Spanish speaking patients. This study also reported that Spanish speaking patients found communication via text messaging easier compared to communication via an electronic patient portal.

The study compared face to face appointments scheduled in 2019 to virtual care appointments scheduled in 2020 for Spanish speaking patients, and found that there were significantly less virtual care appointments made. | This study reported its main finding to be the importance of being aware of patient's communication preferences, particularly for patients whose primary language is not English. The study also suggested that patients being connected via email was an important factor in determining virtual care access. | This study could help inform rpavirtual's procedures for communicating with patients whose primary language is not English. The evidence in this study informs rpavirtual of the importance of communicating with non-English speaking patients via their preferred methods in order to increase their access to virtual care services. |

| 6 | Campos-Castillo 2021 | Racial and ethnic differences in self-reported virtual care use during the COVID-19 pandemic: a secondary analysis of a US survey of internet users from late March | USA | Survey of Internet users. | Secondary analysis of a cross-sectional nationally representative survey of internet users. | The study population was a nationally representative sample of adults living in US households. The sample size is 10624. | This study surveyed whether participants accessed virtual care (via synchronous and asynchronous methods) during the COVID-19 pandemic. | Synchronous (telephone and video calls) and asynchronous (messaging, emails or text messaging). | Race and ethnicity. | This study firstly reports that in March 2020, black participants were more likely to use virtual care services compared to white participants. This was particularly found in black participants who reported being fearful of the COVID-19 pandemic. However, this result may not be able to be generalised across the entire country due to differing restrictions and services being available in different States at this time, which could have impacted participant responses.

This study notes that having a range of virtual care modalities available (synchronous and asynchronous) is important to ensure equitable access for all users. | This study found that at the beginning of the COVID-19 pandemic that black people were more likely to use virtual care services compared to white people, however this may be because of differing restrictions across the country and because black people reported being more fearful of the pandemic.

Another important finding from this study related to ensuring that a range of virtual care modalities are available, as this contributes to equitable access. | Evidence from this study is not particularly relevant to rpavirtual. It may be useful for rpavirtual to note the importance of having a range of virtual care modalities available (synchronous and asynchronous). This is important to increase access to virtual care services for minority ethnic groups. |

| 7 | Chunara 2021 | Telemedicine and healthcare disparities: a cohort study in a large healthcare system in New York City during COVID-19 | USA | New York University Langone Health Service | Cohort study | Patients from New York University Langone Health Service between 19/03/2020 and 30/04/2020.

The sample size is 140184. | This study describes the disparities in people who accessed healthcare via telemedicine during the COVID-19 pandemic. | Telephone and video calls for urgent and non-urgent ambulatory care. | Age, gender, race, ethnicity, non-English speaking, location, education, income and comorbidities. | This study showed that the amount of black patients who accessed virtual care services during the study time frame increased from the same time period in 2019. The study identified that younger, female black patients drove this increase.

Even with this increase, the study showed that black patients were less likely to access virtual care services compared to white patients.

The study showed that black people who did access virtual care services were sicker compared to white people who accessed virtual care services.

This study showed that English speaking patients were much more likely to access virtual care services compared to non-English speaking patients. | This study provides evidence that shows white patients are more likely to access virtual care services than black patients. This study also shows that English speaking patients are more likely to access virtual care services than non-English speaking patients.

This study does not provide evidence for how virtual care services can be made more equitable. | This study provides further evidence for disparities in virtual care access, which is useful information for rpavirtual to keep in mind when planning equitable access to their services.

This study demonstrates the need to carefully tailor services to people from minority backgrounds in order to ensure they can access virtual care services at the same level that white English speaking patients can. |

| 8 | Dar rat 2021 | Socioecono mic Disparities in Patient Use of virtual care During the Coronavirus Disease 2019 Surge | US A | Departmen t of Otolaryngo logy-Head & Neck Surgery, Henry Ford Hospital. Detroit, Michigan. | Cohort study | All patients (paediatric and adult) who had encounters with the Department of Otolaryngolo gy-Head & Neck Surgery at Henry Ford Hospital during 17/03/2020-01/05/2020. All encounters including synchronous (telephone and virtual), face to face and no show visits were included in this study. The sample size is 1162. | The virtual care interventi on in this study incorpora ted virtual visits and telephon e visits. | Virtual (internet based video calls) appointments and telephone appointments. | Insuran ce status, socioec onomic status, age, sex and marital status. | This study found that female patients and patients who had good, preferred provider insurance coverage were more likely to access virtual appointments. This study also found that older patients, black patients, patients with no insurance coverage, and patients from low socioeconomic backgrounds (lower income and lower education levels) were less likely to access virtual appointments. Interestingly, this study also reported that patients who weren't married were less likely to engage in virtual appointments. Patients who were older, with no insurance coverage and who were from low socioeconomic backgrounds were more likely to engage via telephone appointments rather than virtual appointments. Telephone appointments are an acceptable virtual care modality, although this study reports that virtual appointments provide a better standard of care. The study suggests that virtual care initiatives need to include patient education and training to foster access and acceptance of these | This study provides evidence that shows that female patients with good insurance coverage are the most likely demographic to access virtual appointments. Older patients, black patients, patients with no insurance coverage, patients from low socioeconomic backgrounds, and patients who aren't married are less likely to access virtual appointments. When engaging in virtual care, older patients, patients with no insurance coverage and patients from low socioeconomic backgrounds were more likely to access telephone appointments than virtual appointments. | The demographic regarding insurance coverage that was analysed in this study is not particularly relevant to rpavirtual. This study has provided important and useful information regarding the use of virtual appointments compared to the use of telephone appointments, and points out that some demographic groups are more likely to use telephone appointments. This could be useful for informing rpavirtual's planning of services. This study has not provided evidence for how to make virtual care services more equitable, other than suggesting education and training for groups who are less likely to use virtual care services. This may be impractical for rpavirtual to undertake. |

									services. The study suggests that this should be targeted to older patients. The study also notes the importance of considering internet access among target populations when developing virtual care services.		

| 9 | Eberly 2020 | Patient Characteristics Associated With Telemedicine Access for Primary and Specialty Ambulatory Care During the COVID-19 Pandemic | USA | Department of Medicine, Hospital of the University of Pennsylvania.

virtual care was offered in these divisions: cardiology, pulmonology, hemato-oncology, primary care, rheumatology, gastroenterology, infectious diseases and nephrology. | Cohort study | Patients who completed telemedicine visits in the study period (16/03/2020-11/05/2020) with the Department of Medicine, Hospital of the University of Pennsylvania.

The sample size is 80780.

The patients live across large urban, suburban and semirural areas in Pennsylvania and New Jersey. | The telemedicine intervention in this study incorporated video calls and telephone calls. Patients received reminder calls and instructions for setting up video technology for their visit. | Video call appointments and telephone appointments. | Age, sex, race, ethnicity, preferred language, insurance, income, comorbidity status, | This study found that patients who completed telemedicine visits (either via video call or telephone appointments) were more likely to be female, have insurance, be English speaking and come from non-Asian backgrounds. This study found that patients who engaged with video call appointments instead of telephone appointments were more likely to be younger, white, and have a higher socioeconomic status (in terms of income level). Black, Latinx and lower socioeconomic patients were less likely to engage in video call appointments. Patients who were older ages were less likely to engage with either type of telemedicine visit (video call or telephone call) compared to other patients. The study also suggests that language barriers such as a patient's primary language not being English are prohibitive for accessing either type of telemedicine visit. It was also reported that Asian patients were less likely to engage with either type of telemedicine visit. Importantly, this study notes that there does not seem to be better or more sufficient patient care outcomes from video appointments compared to telephone | This study found the following patient characteristics were associated with engaging in both telemedicine modes (video calls and telephone appointments) - being female, having insurance, speaking English and being non-Asian.

This study found the following patient characteristics were associated with not engaging in either telemedicine mode - being older, preferring to speak a language other than English and being Asian.

The study also described characteristics for patients who engaged with telephone appointments rather than video calls. These included being black, Latinx and of lower | This study has provided important and useful information regarding the use of video call appointments compared to the use of telephone appointments, and points out that some demographic groups are more likely to use telephone appointments, where others are more likely to use video call appointments. This could be useful for informing rpavirtual's planning of services.

The study also provides information regarding the demographics and patient characteristics which are associated with lower engagement in telemedicine.

This study does not provide evidence for an intervention that reduces inequities. This article does not add to the knowledge base for how to establish equitable virtual care interventions |

										appointments. However, clinicians note that they prefer video appointments.	socioeconomic status. The study also described characteristics for patients who engaged with video call appointments rather than telephone appointments. These included being younger, white and having a higher socioeconomic status.	

| 10 | Ernsting 2019 | Associations of Health App Use and Perceived Effectiveness in People With Cardiovascular Diseases and Diabetes: Population-Based Survey | Germany | Survey of Internet users. | Cross-sectional survey. | German people aged 35 and over, with cardiovascular disease and or diabetes.

The sample size is 1500. | The telemedicine intervention in this study is a mobile health app/eHealth app. | Mobile health app/eHealth app. | Sociodemographic, health behaviours, health literacy and eHealth literacy, and presence of cardiovascular disease and or diabetes. | The study found that people who engaged with mobile health apps/eHealth apps were more likely to be younger, female, have higher levels of education, and were more likely to engage in health behaviours such as physical activity. The study found that app users have higher levels of eHealth literacy compared to non-app users. In addition to this, users who had higher levels of eHealth literacy more often believed the apps were effective. | An important finding of this study is that eHealth literacy is essential for use of mobile health apps, and this should be considered in health education strategies and in planning virtual care initiatives.

People who are younger, female, have higher levels of education, higher levels of e-Health literacy and who engage in healthy behaviours are more likely to engage in mobile health apps. | This study focuses on mobile health apps and eHealth apps. I am not aware of rpavirtual using such technology to care for their patients, and therefore this study may be irrelevant. However, the information regarding equity in accessing these apps is relevant for virtual care in general and can be used to inform rpavirtual's virtual care services.

This study does not provide evidence for how to improve equity for virtual care services. |
| 11 | Ferguson 2020 | Virtual Care Expansion in the Veterans Health Administration During the COVID-19 Pandemic: Clinical Services and Patient Characteristics Associated with Utilization | USA | Veterans Health Administration | The study type is not clear. | Veterans who had outpatient encounters during the early phase of the COVID-19 pandemic.

The sample size is | The telemedicine intervention in this study incorporates virtual care including phone and video appointments. | Virtual appointments - phone and video appointments. | Sociodemographic and clinical needs. | This study found that patients who had higher disability levels and more chronic conditions were more likely to receive virtual care in the pandemic. It was also reported that older patients were less likely to use video appointments compared to younger patients. Furthermore, rural and homeless veterans were also less likely to use video appointments compared to veterans who lived in urbans | This study showed that in the early phase of the COVID-19 pandemic, veterans who had higher clinical and social needs were more likely to use virtual health services. Another important finding was that older veterans and veterans who lived rurally and were | This study was particularly focused on the early phase of the COVID-19 pandemic and how veterans engaged with virtual care services at that time. However, the findings from this study are relevant for rpavirtual to apply when planning their services for older patients. |

											areas and were not homeless.	homeless, were less likely to access video appointments.	
1 2	Fol ey 202 0	Exploring access to, use of and benefits from population-oriented digital health services in Australia	Aust ralia	Participant s were recruited from the online health information website 'Healthdire ct Australia', and waiting rooms of 'General Practice (GP)' services	Mixed method s includin g Quantit ative surveys and qualitati ve telepho ne intervie ws	A total of 441 participants were included from the online health information website 'Healthdirect Australia' (already using digital health services) and 40 qualitative telephone interviews were conducted among participants recruited from the waiting rooms of 'General Practice (GP)' services.	N/A	eHealth Literacy, digital health services	Equity issues related to sociode mograp hic charact eristics and trust.	The study found that being older, having low socioeconomic status, being male, being Aboriginal or Torres Strait Islander and having no tertiary education was negatively associated with access to digital health services. The study also pointed that trust in digital health services has an important influence on their use.	The study summarizes that individuals without tertiary education, identifying as Aboriginal or Torres Strait Islander, or from socioeconomically disadvantaged areas were less likely to access digital health services.	It is very important form rpavirtuals perspective that these issues are urgently addressed to prevent exacerbating already existing health inequities in Australia.

| 13 | Gilson 2020 | Growth of Ambulatory Virtual Visits and Differential Use by Patient Sociodemographic at One Urban Academic Medical Center During the COVID-19 Pandemic: Retrospective Analysis | USA | University of Chicago Medical Centre. | Retrospective analysis of clinic data. | Patients who had clinic encounters between 15/03/2020 and 31/05/2020. | The virtual care intervention in this study incorporated virtual visits and telephone visits. | Virtual (including video) appointments and telephone appointments. | Race, sex, age and insurance coverage. | Firstly, younger patients (aged 0-17) were less likely to attend a virtual appointment. Men were less likely to attend a virtual appointment than women. There was no difference between black and white patients in terms of engaging with virtual appointments. Patients who categorized their race as 'other' were more likely to attend a virtual visit compared to white patients. Patients with insurance were more likely to attend a virtual appointment compared to patients without insurance. | There are a variety of factors including age, sex, race and insurance coverage that were shown to impact engagement with virtual appointments in this study. | This study has provided important and useful information regarding the use of virtual appointments, and points out that some demographic groups are more likely to enage with virtual appointments than other. This could be useful for informing rpavirtual's planning of services. rpavirtual could focus efforts on reaching the groups who have been identified as being less engaged with using these services.

This study does not provide evidence for an intervention that reduces inequities. This article does not add to the knowledge base for how to establish equitable virtual care interventions. |

| 14 | Gordon 2018 | Older adults' readiness to engage with eHealth patient education and self-care resources: a cross-sectional survey | USA | Kaiser Permanente Medical Care Program in Northern California. | Cross-sectional survey. | Members of Kaiser Permanente Medical Care who are aged 65-79 years with English as their primary language. There were white, black, Hispanic, Filipino and Chinese participants. The sample size is 5420. | The virtual care intervention in this study incorporated web-based and other digital technologies to obtain health information and advice. | Web-based and other digital technologies for online health information, and mobile health monitoring tools. | Age was the primary issue examined in this study. Sociodemographic, sex, race, ethnicity, level fo education, self-rating of health and use of medication were also considered as equity variables in this study. The study also investigated participant's | About 3/4 of the sample could easily access a device with an internet connection. However, ease of access declined with age and was reported more often in white participants. Nearly all participants reported being able to access the internet at home, and a majority reported being able to access the internet by themselves or with help from someone to research health information on the internet. The participants who responded in this way could also use email for communication with ease. Those aged 65-69 years were more likely to be internet users, as were white and Chinese participants. | Overall, this study shows that a majority of this sample of older aged patients can access the internet easily. This is an important consideration for virtual care services. | This study does not provide evidence or information specific to actual virtual care services or appointment types. However, it does provide rpavirtual with some data regarding how easily older patients from different ethnic backgrounds can access the internet, which is an important consideration for virtual care services. This study does not provide evidence for an intervention that reduces inequities. This article does not add to the knowledge base for how to establish equitable virtual care interventions. |

								access to and use of digital technology on the internet.			

| 15 | Gordon 2016 | Differences in Access to and Preferences for Using Patient Portals and Other eHealth Technologies Based on Race, Ethnicity, and Age: A Database and Survey Study of Seniors in a Large Health Plan | | Kaiser Permanente Medical Care Program in Northern California. | The study type is not clear. It seems to be both a cohort study (analysing a database) and a cross-sectional study (conducting a survey). | Two studies were conducted. Both used this population: Members of Kaiser Permanente Medical Care who are aged 65-79 years with English as their primary language. There were white, black, Hispanic, Filipino and Chinese participants.

The first study was a database analysis and the sample size was 213173.

The second study was a survey of participants from the above sample. The sample size was 2602. | The virtual care intervention in this study is based on eHealth technologies such as patient portals. | eHealth technologies such as a patient portal - used to interact with health care system. | Race, ethnicity and age. | Older participants were significantly less likely to be registered to use the online patient portal. Older participants who were registered to use the online patient portal engaged with this service much less than younger participants who were registered.

White and Chinese participants were the most likely to use and engage with the online portal.

Black, Latino and Filipino participants, as well as participants aged over 75, were significantly less likely to own digital devices, be able to use the internet and email communication, and be willing to use the online portal.

Overall, even among participants who could use the Internet, most preferred non-digital interactions with their health care system, ie not use the online portal. | Older patients and ethnically diverse patients are less likely to use the online portal. Ethnically diverse patients are less likely to be able to access digital health services. Most older patients preferred non-digital modalities. | This study does not provide evidence or information specific to actual virtual care services or appointment types. However, it does provide rpavirtual with some data regarding how older patients from different ethnic backgrounds feel about accessing digital health services, which is an important consideration for virtual care services. It also provides rpavirtual with data regarding how easy it is for older patients from different ethnic backgrounds to access digital health services. |

16	Guendelman 2017	Listening to Communities: Mixed-Method Study of the Engagement of Disadvantaged Mothers and Pregnant Women With Digital Health Technologies	USA	Low income communities in San Francisco, New York and Kentucky.	Mixed methods. 14 focus groups conducted, in total 92 participants. Quantitative data collected at FG	92 first-time pregnant women and mothers of children under the age of 5. Recruited from community clinics, federally qualified health centres, Women, Infants and Children (WIC) clinics and NGOs. Age 25-32years, The majority was black or Hispanic, married or have partner, college education, unemployed or not in labour force, on Medicaid. Reported in good health. Housing or employment was their primary concern rather than health.	Descriptive study, with statistical modelling	Websites, apps, wearables, social networks, video chats and patient portals	Socio-economic status, A particular vulnerable group (pregnant and mothers). Functional health literacy opposed to eHealth literacy	Among the low-income study population, the study found a very high access to smartphones and computers. Number of internet health-seeking behaviour in the past 12 months: 97% of participants did internet search for health information in the past 12 months. Of them, 25% conducted a high number of searches (>9). But a low use of internet or other digital tools for health management practices (accessing personal data, making appointments, email communication, video chats etc.); 27% used 4 or more practices while 42% engaged in none. 49% of non/low users are potential users with interest in using digital health management tools, but some reported not being taught how to do so. eHealth literacy increase associated with 3% increase in number of searches (beta=.03, 95% CI 0.00-0.06). Internal health orientation scores corelated with the total no. of digital health management activities (beta=.13, 95% CI 0.02-0.24). Trust in digital information was associated with the current level of use (p=.05) .	Web-based information search was widespread, while the use of digital health management practices was far less common in the study group. A significant relationship between health search activities and digital-heath management practices. (Internet search activities is a gateway to digital health management practices). The study demonstrated eHealth literacy is strongly associated with internet search activities, internal orientation (motivation to engage in healthy attitudes, beliefs and behaviour) was more strongly associated with digital health management practices. Trust in digital information is associated with potential adoption of digital tools.	Pregnant women and mothers demonstrated a wide spread behaviour of internet health information seeking. But to go beyond search activities and actively engage with digital health management practices, they need encouragement from health professionals to endorse such behaviour with credible information sources and give practical tips on how to use digital health management tools.

					Residing in the study area and able to read, write and speak English.					Relative contributions of these factors to be explored to develop better tools and intervention.	

| 17 | Hansen 2019 | Inequalities in the Use of eHealth Between Socioeconomic Groups Among Patients With Type 1 and Type 2 Diabetes: Cross-Sectional Study | Norway | Monitoring and follow-up of diabetes patients | Cross sectional | Members of Norwegian Diabetes Association (18-89 years) with Type 1 and Type 2 DM. 1,063 participants in total | N/A | • Apps,
• Search engines,
• Video services,
• Social media sites | Socioeconomic status - education, household income, age, gender, marital status. | 87% of T1D and 78% of T2D (82 % in total) used 1 or more form of eHealth in the previous year. Search engines is commonest (78%), followed by Apps (53%), social media (38%) and video services (18%). Strong association of higher level of education and use of search engine (OR 3-6 compared to low education group), This may be explained by the capabilities of the group to seeking out, finding, understanding and utilising the information. No association of education level with the use of Apps, social media or video services. Higher income associated with the use of Apps in both groups (OR 3), may be reflecting the cost to download. Among T1D group, an association between lower income and video service use. | Information though Apps, social media and video services may be better choice when targeting the lower educational group. Be aware of inequalities in eHealth use to design communication strategies to different target groups, particularly that of education level. | Communication strategies to varying educational level to be developed, eg; tailor the information or select platforms to the expected audience. |

| 18 | Jaffe 2020 | Health Inequalities in the Use of virtual care in the United States in the Lens of COVID-19 | USA | Primary care during Pre Covid and at the beginning of the pandemic (March 2019 and March 2020) | Retrospective cohort study. Used linked data from National Health and Wellness Survey (NHWS) and Komodo Health's encounter data (closed claims). | >18 years.in total 35,376 persons, who had more than >1 health care encounter in the study period. | N/A | Not clearly explained | Age, Gender, Ethnicity, Marital status, employment status, geographic location (socioeconomic), urban/rural, Self-reported medical diagnosis (SRMD) | virtual care clams increased 0.2% in March 2019 to 1.9% (845% increase)in March 2020 across the age groups. In March 2020, 5.8% of total encounters in March 2020 was virtual care. Younger people (18-44) used it substantially more (p<0.005). Other significant users (p<0.001) included female, Hispanic, married or living with a partner and employed. Urban respondents had a higher usage of virtual care compared to rural respondents (92% to 89% respectively, p=0.005) . SRMD: People with cardiovascular or metabolic conditions associated with lower usage (51% virtual care encounter TE to 43% in-person encounter PE , p<0.001) and Those with anxiety and depression used more (50% TE to 32% PE). (my comments-May be age related?) Predictor modelling-After adjusting respondents characteristic, age, marital status, geographic location and urbanisation, SRMD anxiety and depression were predictor for the use of virtual care. Married couple is less likely to use in this model. Single people used more. | virtual care should help reduce inequalities in health care access. However, inequalities were observed. Greater outreach, education, and infrastructure support are needed for older individuals, those residing in South (higher poverty) and those residing in rural areas. | Covid pandemic increased the use of virtual care. Use of virtual care seems to be age, marital status, socio-economic status. May need to see actual user patterns to optimise rpavirtual hospital access. |

| 19 | Jiang 2020 | Equal Access to Telemedicine during COVID-19 Pandemic: A Pediatric Otolaryngology Perspective | USA | Study conducted during the hospital clinic was closed for unurgent visits, commence on 19 March and lifted on 4 May 2020. Paediatric tertiary care clinic, attended by referral. Serves a urban metropolitan area with 3 million population | Retrospective case series. 6 week between 23 March and 1 May 2020. (OPD closed during this period) | 1,495 patients data who accessed telemedicine and 1,983 patients data who had in-person visits of the period in 2019 | Telemedicine services introduced 3 years ago was ramped up to address increase in its use after the pandemic started. | Video conference (Zoom integrating access to patients: electric Medical record (EMR), which allows simultaneous recording to EMR.) Patient can access through the portal via PC or smart phone. Telephone only access was also available. | Age, gender, language, zip code of residence (poverty level by US census 2019), primary insurance plan. | None of variable in relation to telemedicine use demonstrated statistically significant differences.

Examined the characteristics of patients who needed to reschedule telemedicine visits. Spanish speaking patients had a higher rescheduling needs compared to overall patients rescheduled, (17% to 12%, p=0,083).Authors explain tertiary paediatric care nature may contribute to this findings- parents tend to be younger and familiar with technology. | Language barriers exist. Language service, increased staff support and longer appointment time, video digital education. It is essential to evaluate, understand and address potential barriers to technology-based platforms for delivering care to prevent further disparities in access to healthcare.

Suggests patient survey and provider satisfaction survey to maximise benefits of telemedicine. | Examine the access to virtual care by CALD population. |

| 20 | Kemp 2020 | Barriers associated with failed completion of an acute care general surgery virtual care clinic visit | USA | Surgery dept's e-clinic (University of Michigan) | Retrospective patient electronic health records review. Examined the characteristics of patients who completed or not completed e-clinic visits. | 199 post-operative follow-up encounters of emergency, urgent and elective patients managed by an acute care surgery and had been referred to E-clinic between Jan 2019 to June 2019. Exclusion criteria for e-clinic included surgical complications, open wounds, patient's requests for face-to face clinic. | N/A | Cell phone, tablet, PC. Video or telephone visits. Use electronic health record's secure virtual platform (Epic) | Race, marital status. Authors suggest that race and marital status are associated with socioeconomic status and insurance. Marital status is associated with support at home. Travel distance had no consistent impact. Other variables (age, sex, medical characteristics, operati | E visit completion rate was 78% (156/199). Data unable to determine who cancelled the scheduled e-clinic visit. Video e-clinic 71%, telephone 29%). A higher proportion of Caucasian patients completed compared to non-Caucasians (87% to 74% p=0.04) and married patients completed e-clinic visits compared to single patients (49% to 26%, p<0.05) Cancellation or no-show associated by travel distance (Patients living 30 to 44.9Km away had a higher cancellation p<0.05). Higher frequencies of 30-day reoperations/procedure in the incomplete group.(p<0.05) Characteristics of 36 patients with incomplete e-clinic visits include medical issues (47%), patients' preference to see a physician in person (25%), preference and technical issues (8%) and technical issues (6%). | E-clinic is safe and feasible method for providing postoperative care in well-selected patients. Racial disparities still exist in accessing virtual care. Medical complications were the commonest reasons for cancellation of the e-clinic visit. Authors recommend a triage system. Patients' preference and comfort to be taken into consideration and suggest the importance of discussing with patients about how and who conducts E- clinic and (data) security. Technical issues – to encourage patients to establish access to the portal and have them tested before discharging from hospital to alleviate technical discomfort. | Selection of patients to virtual care taking their preference, technical environment, support at home and their medical conditions into consideration is important for reducing the cancellation of virtual care clinic appointments. |

									on, readmission, reoperation/procedure, visit prior to scheduled e-clinic visit, mortality within 30days of discharge) had no impact.			

2 1	Khoong 2020	Patient interest in and barriers to telemedicine video visits in a multilingual urban safety-net system	USA	Women's health and general medicine clinic in an urban safety-net system, where most patients are uninsured or Medicare insured. (Low socio-economic status, high racial/ethnic diverse population.)	Cross sectional phone survey and data review of patients' records.	298 called and 202 were reached. 88% identified as persons of colour and /or preferred on-English language (56%)- mainly Spanish. The survey was conducted in the patients' preferred language.	Patients who were interested in the video-visit was asked to download a video-visit application and tested completion of video-visits.	Video-visits (testing only)	Digital device with video capability, access to mobile data/internet/ and prior se of smartphone applications. Age, language.	65% of the participants were interested and 54% completed a simulated video visit. People with <55 years completed video visits more than those older. Non-English speakers were more likely to be interested in video visits (76% to 51%, p<0.05). Prior smart phone application use was associated with interest and completion of test video visits.(p<0.001) Barriers: 50% of participants reported at least one barrier. Data/internet access (50%), security, privacy and lack of time (each <10%). Of those who had incomplete video-visits, >30% reported data/internet access(45%) , hesitancy about technology (36%) , no access to device (33%) or belief that video visits were not better than telephone visits (33%). Younger people were more likely to have devices but reported video-visits were no better than phone visits. 25% of people who completed video visits needed support, particularly non-English/Spanish speakers (P<0.002) and older people (P <0.001)	Diverse low-income patients are interested in video visits and many are able to complete simulated video visits. However, policies and infrastructure development are needed to address gaps in access to broadband or mobile data. Health care system/providers to provide technical assistance to older patients and to those with limited digital literacy. Deliberate implementation and advocacy are crucial to ensure health care providers address patients' interest in virtual care video visits.	Most people are interested in virtual care provided access to digital device and support are provided. Older patients and those with limited digital literacy need targeted support for equitable access to virtual care.

| 2 2 | Leng 201 6 | The use of video consulting in general practice: semi-structured interviews examining acceptability to patients | Scot land | This study was carried out in three purposively chosen general practice in Lothian, Scotland | Cross-section al | A total of 270 adult patients aged 18 years or above from three general practice of Lothian, Scotland were interviewed using a semi-structured questionnaire. Sequential patients attending the practice at different times of day were invited to participate. | N/A | Patients perceptions with video consulting was assessed | Equity issue related to the sociode mograp hic charact eristics of the particip ants were analyse d | The study revealed that the patients under 60 years were over two times more likely to use video consulting (Odds Ratio (OR) 2.2, 95% CI 2.1–6.6). A positive trend was also observed between increasing computer proficiency and willingness to video consulting (χ2 = 43.97, p < 0.0005, n = 270). Also, patients who had used commercial video services (such as Skype) were approximately six times more likely to favour video consulting than those who had not (OR 5.9, 95% CI 3.5–9.9). | The study summarizes that despite possibilities of video consultation in primary care, its use can be compromised among older adults and less technically able person | It is important to consider the digital literacy level of the people and age of the participants while developing a virtual care intervention. Tailored approach can be useful can be of value in ensuring equity in this regard. |

| 23 | Li 2020 | Patients' Perceptions of Barriers and Facilitators to the Adoption of E-Hospitals: Cross-Sectional Study in Western China | China | 1 tertial hospital, 1 secondary hospital and primary health care centres (PHC) in Chengdu, the capital of Sichuan province in west China from June to August 2019. | Cross sectional, self-administered questionnaires or administered by a research investigator. Quantitative study. | 1108 patients attending the survey sites, aged 18 years and above. Of them, 1032 patients completed the survey in full. 76 incomplete surveys were excluded. No particular inclusion or exclusion criteria set. | N/A | e-hospitals that are administered by physical hospitals, where patients able to reach physicians in tertial hospitals via internet and are referred to PHCs or secondary hospitals. (comment: No clear description. sounds like a triage system to refer patients to an appropriate level of care) | Sociodemographic, medical, current and past use of web-based health care service. Age, employment, education level, living with children (technical help), IT skills and previous experience were found to be important factors. | 66% of participants willing to use e-hospitals, while 22% was familiar with e-hospitals. Predictors to use included employment status (working) (p=0.02), living with children (p<0.001), higher education level (p=0.046) information technology skills (p<0.001), and prior experience with web-based health care service (p<0.001). Facilitators: Convenience (95%) and access to skilled medical experts (72%) were main facilitators. Age related variance-Younger people (18-34 years) reported better health outcomes, protect privacy and self-management as facilitators compared to older people. Barriers: Overall, inability to operate technological device (67%), familiarity with dace-to-face health care (30%) and doubts regarding authenticity and reliability of e-hospitals (10%). Age variance – inability to operate devices among older people >65 years (87%), concerns over authenticity and reliability (35%) among people aged 35-49 years, and accustomed to face-to-face consultation (75%) and concern about insurance reimbursement (25%). | Efforts to increase the adoption of e-hospitals should focus on making target populations accustomed to web-based health care services while maximising ease of use of providing assistance for technological inquiries. | Tailored App design with technical services to increase usage among elderly population. The uptake and continued use of virtual hospital will depend on the perceived quality of care patients receive, as this study indicate that past experience is a predictor for the uptake of virtual care services. |

24	Mangin 2019	Multimorbidity, eHealth and implications for equity: a cross-sectional survey of patient perspectives on eHealth	Canada	Primary care clinics under the McMaster University sentinel and information collaboration (MUSIC) network. Mid-Dec 2014 to Mid Jan 2015.	Cross sectional survey collecting quantitative and qualitative data. Self-administered questionnaire, except when a patient cannot due to disability. Then the questionnaire was administered by research member.	Consecutive patients attending primary care appointments with physicians who are part MUSIC primary care practice-based research network. Excluded patients aged less than 18, too ill to complete the survey and those who did not speak English. In total, 693 patients completed the survey.	N/A	eHealth defined as "activity in booking appointments, gathering health information, communicating with your family health team and personalised monitoring and information around your health online".	Demographic, multimorbidity, home internet access, degree of confidence using internet, types of devise used, level of interest in eHealth and concerns about eHealth and privacy issues. Increasing age and multimorbidity (taking 5 or more long-term medications) are two	87% had internet access at home, which decreased significantly with age (p<0.001). 76% of people aged 70-79 had a computer/phone with internet access at home while 57% had Wi-fi access. 60% of people >80 years had computer/phone access with internet at home but 40% access to Wi-fi. 82% of participants overall felt comfortable using the internet, this decreased with age. People <70 years are more comfortable (p<0.001). People taking <5 medications felt more comfortable than those taking 5 or more medications (p<0.001). 58% of participants expressed interest in eHealth and 20% expressed disinterest. People on 5 or more medications and those over 70 years were less likely to be interested in eHealth. 73% of participants had concern over privacy, which was the same across all the age groups. People on 5 or more medications were less likely to be concerned with privacy. Qualitative data indicated concern over data security/privacy and loss of human connection/interaction and communication with clinicians as 2 main concerns.	Older age groups and those with on 5 or more medications (multimorbidity) are less comfortable using eHealth. Multimorbidity is strongly associated with less interest, less access and less comfort in using eHealth. Privacy issues need to be explained well. Concern over loss of connection/interaction with clinicians is an important issue to address, particularly with people with multimorbidity, in primary care context where patient-centred care is essential.	Multimorbidity may be an issue for population covered by SLHD too. eHealth strategies addressing people with chronic diseases need to take the burden of treatment that patients have into consideration to make it more accessible and effective.

								strong negative predictors for the interest and use of eHealth.			

| 25 | Marrie 2019 | Use of eHealth and mHealth technology by persons with multiple sclerosis | USA | North American Research Committee on MS Registry (NARCOMS) | Cross sectional based on the survey data. Descriptive study, with multivariate logistic regression to analyse factors | Patients enrolled in the NARCOMS spring survey, 2017. 7281 responded to the survey. (11,214 patients were invited for the survey – 65% response rate) Non-respondents were younger, non-white and less educated compared to respondents (all p<0.001). | N/A | eHealth, mobile Apps, virtual care | Age, sex, region of residence, race, education, age of onset of symptoms and diagnosis, annual household income, marital status, insurance status, employment status, disability status, health behaviours and comorbid conditions. Use of eHealth technologies, connect | 91% of all respondents (6423) had reported any internet use. Data of these were analysed – see non respondents in the "study population". The majority of respondents were female, white, with a mean age of 59.7 years. Overall, 84% (5,408) exchanged medical information with a health professional, often using secure online portal (27%), followed by email (21%). The interest in exchanging health information electronically with a provider varied; test results being highest (70%) followed by appointment reminders and diagnostic information. Of the 5,529 smartphone and tablet users, 46% used a mHealth App. 99% of app users reported it was helpful, and 71% reported at least one benefit, such as achieving a health-related goal followed by communicating with providers. Increase smartphone use associated with higher income, being single and any physical activity, 3 or more comorbidity while advanced age, smoking and disability were associated reduced use of smartphone. Factors associated with a higher likelihood of reporting use of smartphones or tablets, mHealth apps and perceived | Use of eHealth technologies in common among MS patients and facilitates the exchange of health care information with healthcare providers. Use of mHealth apps is perceived to have health benefits. However, use of eHealth and mHealth technologies varies substantially with sociodemographic factors, and health care providers need to be aware of these disparities as these technologies are increasingly leveraged in health care setting. | Be aware of disparities in the use of virtual care. |

									ion and devices, softwar e/Apps, benefits of using Apps. Commu nication with health care provide rs electro nically.	benefits of using these apps included online survey response, younger age, having comorbidities, and higher income and education levels.		

| 26 | Nelson 2016 | Disparities in the use of a mHealth medication adherence promotion intervention for low-income adults with type 2 diabetes | USA | Participants were recruited from a Federally Qualified Health Center (FQHC) in Nashville, Tennessee. | Cross-sectional | A total of 80 adult patients were recruited who were at least 18 years of age, English-speaking, diagnosed with T2DM, prescribed diabetes medication(s), owned a cell phone with SMS capability, and had a Social Security number | The MED (Messaging for Diabetes) intervention was designed to improve medication adherence among low SES, diverse adults with Type 2 Diabetes Mellitus (T2DM). The MED intervention includes three components: 1) a unique, daily, one-way text message addressing user-specific barriers to medication adherenc | Text messaging and automated voice call | Equity issues related to age, gender, race, income, and health literacy was addressed | The probability of responding to texts tended to increase from about age 25 until roughly age 50 years, and then appeared to decrease as age increased. Compared to White participants, non-White participants had a 63% decreased relative odds (AOR: 0.37, 95% CI, 0.19-0.73) of participating in voice calls. In addition, lower health literacy was associated with a decreased odds of participating in voice calls (AOR=0.67, 95% CI, 0.46-0.99, P=.04). | Racial/ethnic minorities, older adults, and persons with lower health literacy appeared to be the least engaged in a mHealth intervention. | To have more equitable virtual care intervention, rpavirtual should focus on to provide more focus on to aged participants. They also need to make strategies to involve racial minority population as well as improving virtual care literacy among the participants. |

						e; 2) a daily, two-way text message asking if the user took all of his/her diabetes medicatio ns for the day, and 3) an automate d weekly IVR call.					

| 27 | Pierce 2020 | Disparities in use of virtual care at the onset of the COVID-19 public health emergency | USA | Academic medical Centre, University of Missouri Health System, MU Health | Cross-sectional | The study includes all finalized ambulatory clinic encounter documentation ('Family Medicine Clinic Note') completed Between 17 March to 16 April 2020. Final analysis included 7742 encounters representing 3938 face-to-face encounters and 3804 virtual care encounters. | Encounters with charges for services associated with a virtual care appointment type was classified as virtual care. Of the virtual care encounters, 2937 were full audio-video and 867 were audio-only. | Both audio-video and audio-only consultations | Equity analysis was based on region, sex, race and payment type. | virtual care visit was higher among aged 65 years and above (OR 1.21, 95% CI 1.05–1.40), female (OR 1.15, 95% CI 1.04–1.26) and those who were not under private insurance. virtual care visits were less frequent among those who were residing in rural areas (0.81, 95% CI 0.74–0.90) and who were Black (OR 0.65, 95% CI 0.56–0.75) or of another race (0.64, 95% CI 0.50–0.82) compared to those of white. | This paper pointed that disparities are existed in virtual care use in terms of age, race, residence and payer at the onset of the COVID-19 in USA. It suggested for future research to clarify underlying causes these disparities and to inform policymaking during the COVID-19 emergency and beyond. | This study has identified diverse race and rural residence as a significant factor for seeking less virtual care consultations which can be a case for rpavirtual as well. rpavirtual also need to make strategy to engage patients of Culturally and Linguistically Diverse (CALD) Background and those who were residing in remote areas. |

| 28 | Potdar 2020 | Access to internet, smartphone usage, and acceptability of mobile health technology among cancer patients | USA | The study was conducted in the outpatient clinic and infusion center at an academic medical center in Philadelphia | Cross-sectional | A total of 151 cancer patients attending the outpatient centre and infusion centre were included in the study | N/A | N/A | Equity issues in terms of education and age was considered | Participants aged 61–70 years (OR 0.24, 95%CI 0.07–0.90), 71–80 years (OR 0.05, 95%CI 0.01–0.23), and > 80 years (OR 0.04, 95%CI 0.01–0.22) were significantly less likely to utilize a daily mHealth application than individuals < 50 years. Also, acceptability of a daily mHealth application was significantly higher in patients with a college-level degree (OR 2.78, CI95% 1.25–5.88). | The acceptability of daily mHealth application was significantly higher among relatively educated and younger patients. | While looking to address the equity issues in virtual care intervention, rpavirtual also need to consider that the use of this service would be lower among relatively aged and less educated people. Therefore, focus should be provided to develop a more user friendly mHelath app that can be understood by less educated and older participants. Emphasis is also warranted to engage more educated carer for old age population. |

| 29 | Rodriguez 2021 | Differences in the use of telephone and video telemedicine visits during the COVID-19 pandemic | USA | Mass General Brigham (MGB) in Boston, Massachusetts, a large, integrated health system with 16 member organizations across New England | Cross-sectional | 231,596 visits to primary care and specialty practices of 162,102 adult patients aged 18 years or above that includes telephone, video, and in-person visits between March 1 and June 1 2020 were analysed. | The study analysed health service visits in a large, integrated health system that includes telephone, video, and in-person visits. | Both telephone and video visits were considered | Age, race, internet access, education, socioeconomic status was considered while assessing the equity in accessing virtual care intervention | Patients who were older than 65 years (adjusted odds ratio [AOR], 0.41; 95% CI, 0.40-0.43), Black (AOR, 0.60; 95% CI, 0.57-0.63), Hispanic (AOR, 0.76; 95% CI, 0.73-0.80), Spanish-speaking (AOR, 0.57; 95% CI, 0.52-0.61), living in areas with the lowest broadband internet access (AOR, 0.93; 95% CI, 0.88-0.98), lowest median income (AOR, 0.49; 95% CI, 0.46-0.52), and lowest educational attainment (AOR, 0.84; 95% CI, 0.80-0.88) were less likely to use video visits. | Older age, non-white background, lack of access to internet, less educational attainment and poor socioeconomic status were significant factors in inadequate accessing to the video visits. | Efforts are needed to ensure access to virtual care intervention among the CALD population and those who are aged, and less educated people with poor e-health literacy. It is also need to consider that people with low socioeconomic status and lesser access to internet are supported to have access to the services. |

30	Schifeling 2020	Disparities in Video and Telephone Visits Among Older Adults During the COVID-19 Pandemic: Cross-Sectional Analysis	USA	Two primary care clinics in Colorado	Retrospective cross-sectional study	Electronic health record (EHR) review of 190 visit of patients aged 75 years or over	Information of 190 appointments were collected from EHR chart review, that includes 100 telephone visits and 90 video visits.	Both telephone and video visits were considered	Equity issues in terms in terms of age, race, presence of caregivers, requirement of interpreters and receipt of Medicaid was considered	Patients who had video visits were younger (mean 81.3 years, SD 6.4 years vs mean 83.5 years SD 5.9 years; P=.01), and more likely to have a caregiver present during the visit (n=31, 64.6% vs n=17, 35.4%; P=.01) compared to patients who had telephone visits. Non-White patients, patients who needed an interpreter, and Medicaid beneficiaries, were less likely to have video visits than White patients, patients who did not need an interpreter, and non-Medicaid beneficiaries (P=.003, P=.01, P<.001, respectively).	Relatively older people, non-while background and those who need an interpreter are less likely to use videos visits. Presence of caregiver plays a positive role in increasing video visits.	In order to reduce inequity of access to virtual care services, particularly among the older adults, presence of educated caregiver can play significant positive role. It is also crucial that strategies are being developed to engage more people from CALD background in virtual care services.

| 31 | Sever e 2020 | Factors Influencing Patients' Initial Decisions Regarding Telepsychiatry Participation During the COVID-19 Pandemic: Telephone-Based Survey | USA | The study was carried out in the Outpatient Psychiatry Clinics at the University of Michigan health care system, known as Michigan Medicine | Cross-section al | The study participants included a total of 244 patients whose in-person appointment s were scheduled during March 23 and April 13, 2020 but cancelled due to statutory arrangement s to not to go outside home due to COVID-19 | The study involved the initial decision of the participa nts to join a telepsych iatry program was launched by the Outpatie nt Psychiatr y Clinics at the Universit y of Michigan health care system | Both telephone and video visits were considered | Equity issues in terms of age, race, sex and type of insuran ce were analyse d | The study revealed that patients aged ≥44 years were more likely than patients aged 0-44 years to opt for telephone visits compared to video visits (relative risk reduction [RRR] 1.2; 95% CI 1.06-1.35). | The study results summarizes that patient age correlates with the choice of virtual visit type, with older adults more likely to choose telephone visits over video visits. | The findings of the study suggest that considering the challenges to patient-facing technologies can address health equity issues, particularly those related to age. |

3 2	Sh aw 201 3	Reducing disparity in outcomes for immigrants with cancer: a qualitative assessment of the feasibility and acceptability of a culturally targeted telephone-based supportive care intervention	Aust ralia	Patients and family members attending community -based Chinese-speaking or hospital-based Arabic-speaking cancer support groups in Sydney, Australia	Cross-section al qualitati ve design	This qualitative research was conducted among the patients and family members attending community-based Chinese-speaking or hospital-based Arabic-speaking cancer support groups in Sydney, Australia. They were invited to participate in a focus group conducted in their native language, or if unable to attend, in a semi-structured telephone interview.	The interventi on comprise s five telephon e calls in the patients' native language commen cing soon after diagnosis and then at 1, 2, 4 and 6 months after enrolmen t. The call schedule correspo nds to times of high unmet need, possible participati on in adjuvant therapy and unplanne d health service contact.	Telephone calls	Equity issues related to the Cultural ly and Linguist ically Diverse (CALD) populati on.	The participants viewed the intervention favourably as a means of providing information and support in the patient's language. Cultural considerations included assurances of confidentiality, as cancer is not openly discussed within communities. An initial face-to-face contact was highlighted as the most important factor facilitating participation.	The study highlighted the importance to develop a culture sensitive telephone-based supportive care intervention for Arabic- and Chinese- speaking cancer patients.	Developing culture sensitive virtual care intervention would be useful to ensure access of CLAD population in virtual care interventions. It can also be effective to initiate the first contact face-to-face.
3 3	Sp oon er	eHealth patient-provider	US A	This study used data from the	Cross-section al	The participants for the study	N/A	Interest to virtual care services	Equity issues were	The study revealed that younger respondents (<50 years), Hispanics, and those	The study summarizes that patients online	This study once again poses the importance of increasing e-health

#	Author/Year	Title	Country	Study setting	Study design	Population	Visit types/Intervention	Focus	Equity issues	Results	Summary	Conclusion
	2017	communication in the United States: interest, inequalities, and predictors		Health Information National Trends Survey (HINTS) 2014, conducted by the National Cancer Institute		were adults population aged 18 years or more and present analysis was carried out among 3677 participants (HINTS 4 Cycle 4 data)		include online patient-provider communication	analysed in terms of age, race, education, internet use and socio-economic status	from higher income households were more likely to be interested in online PPC. It was also notable that, Internet users (odds ratio, OR= 2.87, 95% CI, 1.35-6.08), and college graduates (OR= 2.92, 95% CI, 1.42-5.99) had a higher likelihood of online PPC via email or fax, while Hispanics and those from higher-income households were 2–3 times more likely to communicate via text messaging or phone/mobile apps.	communication with providers can be varied by age, race/ethnicity, education, income, and Internet access/behaviours.	literacy and special effort need to be given on older adults, ethnic minorities and socio-economically deprived population group.
34	Tam 2020	Disparities in the Uptake of Telemedicine During the COVID-19 Surge in a Multidisciplinary Head and Neck Cancer Population by Patient Demographic Characteristics and Socioeconomic Status	USA	The study was conducted in Henry Ford Health System (Detroit, Michigan)	Cross-sectional	A total of 401 patient encounters were analysed and the patients were aged 18 years and older with a head and neck cancer-related diagnosis evaluated between March 17 to April 24, 2020.	Visit types included (1) virtual visits (completed using live audio and video), (2) telephone visits (completed only using telephone), (3) in-person visits, and (4) no-show visits.	Virtual visit and telephone visit	Equity issues considered was age, sex, household income and insurance status	In the multivariate analysis Medicaid/none/other public insurances (odds ratio [OR], 0.26; 95% CI], 0.10-0.66) and low median household income (second quartile OR, 0.33; 95% CI, 0.14-0.82; lowest quartile OR, 0.22; 95% CI, 0.07-0.74) had lower completion of virtual visits.	This study particularly pointed the importance of insurance status and family income as a determinant of virtual visit	While ensuring equity in virtual care intervention it needs to be considered that strategies are being developed to increase access of socio-economically vulnerable population.
35	Tong	Identifying the barriers	USA	This study was	Cross-section	This study involves	N/A	N/A	This study	The study identified several factors that was responsible	This study summarizes some	To ensure racial equity in virtual care

#	Ref	Title	Country	Setting	Design	Method	Intervention	Intervention details	Racial inequity	Results	Findings	Conclusion
	2020	and perceptions of non-Hispanic black and Hispanic/Latino persons with uncontrolled type 2 diabetes for participation in a home Telemonitoring feasibility study: a quantitative analysis of those who declined participation, withdrew or were non-adherent		conducted among the patients from an ongoing randomized controlled trial (RCT) being conducted at Northwell Health, 'Feasibility of virtual care Management of Diabetes Mellitus type 2 (T2DM) in Black and Hispanic Minority Patients'.	al qualitative design	conducting of eight semi-structured interviews comprised of open-ended questions and prompts conducted by telephone. The participants were patients purposively selected from an ongoing randomized controlled trial (RCT) being conducted at Northwell Health, 'Feasibility of virtual care Management of Diabetes Mellitus type 2 (T2DM) in Black and Hispanic Minority Patients'.			highlighted racial inequity in terms of access to virtual care intervention	for not accessing the virtual care service such as disinterest (47%), inconvenience (33%), lack of perceived benefit (13%), lack of awareness of diabetes diagnosis (7%) and perceived lack of ability to fully participate in the study (7%).	of the important factors that are responsible for limited access to virtual care services such as disinterest, inconvenience and lack of perceived benefit.	intervention greater awareness and understanding of these issues will be critical.
36	Trief 2013	Adherence to diabetes self-care for white, African-American and Hispanic American	USA	The study was carried out in SUNY Upstate Medical University, Syracuse,	RCT	Participants (n=1665) were recruited through primary care providers (PCPs) and	The intervention, The Informatics for Diabetes Education and	The intervention involved regular (every 46 weeks throughout the 5 years of the project)	Racial inequity was analysed in terms of adhere	Hispanic and African-American participants (p<0.001 for both) spent fewer days performing diabetes self-care activities overall (controlling for all covariates). Also, participants who	The findings summarized that African-American and Hispanic American participants were less adherent than white participants	It is important to consider the racial differences in adherence to delivered virtual care intervention. It is also important to consider how adherence can be

		telemedicine participants: 5 year results from the IDEATel project		New York and Columbia University in New York City (NYC)		included if they were receiving Medicare benefits, were]55 years of age, and diagnosed with diabetes. 821 randomized to usual care, and 844 randomized to the telemedicine intervention.	Telemedicine (IDEATel), funded by the Centers for Medicare and Medicaid Services (CMS), evaluated the feasibility, acceptability, and effectiveness of a home telemedicine intervention in ethnically diverse, medically underserved, older adults with diabetes.	tele-visits with nurse case managers and dietitians via a home telemedicine unit (HTU). The HTU consisted of a web-enabled computer with a camera for the video visits.	nce to the virtual care intervention.	had with more education (p=0.002) spent more days performing diabetes self-care activities	at all time points despite an individualized and accessible intervention. Also, lesser education exacerbated the condition.	improved among less educated participants.
3 7	van Ve en 201 9	Potential of Mobile Health Technology to Reduce Health Disparities in Underserved Communities	US A	This study was carried out in an urban emergency department (ED) in Detroit, Michigan	Cross-section al	A total of 560 patients participated in the study. Most of the patients were adults (449, 80%) and	N/A	N/A	Equity issues considered based on sex and digital device.	The study found that adults were less likely to have access to phone consultation than parents of children (odds ratio [OR] 0.49, 95% confidence interval [CI], 0.32 – 0.74), as were males compared to females (OR 0.52, 95% CI, 0.37– 0.74).	The study highlighted that there is huge opportunity to scale up virtual care intervention. However, the study identified that phone	More emphasis should be given to engage more male and adult patients in virtual care intervention if that is the case with rpavirtual.

						360 (64%) were female.				Most participants (92%) indicated that they would use a mHealth application.	consultations can be limited to males and adult patients.	
3 8	Wa lker 202 0	Exploring the Digital Divide: Age and Race Disparities in Use of an Inpatient Portal	US A	This study was conducted at a large Midwester n academic medical center (AMC) that provides services across the continuum of care at six hospitals.	RCT	The study was conducted among 842 patients selected from six hospitals affiliated with a large, Midwestern academic medical center from July 2017 to July 2018.	The patients were provided with access to a tablet equipped with an inpatient portal and recruited to participat e in the study.	In-patients portal	Equity issues in terms of age and race was explore d	The study revealed disparities in use of the inpatient portal in terms of age and race. Patients aged 60–69 (45.3% difference, p < 0.001) and those over age 70 (36.7% difference, p = 0.04) used the inpatient portal less than patients aged 18–29. Moreover, African American patients used the portal less than White patients (40.4% difference, p = 0.004).	The findings of the present suggest that access to technology may not be the only barrier that needs to be addressed to reduce the digital divide in terms of using patient portal use. It is also important to address other barriers to reduce the digital divide.	This study findings share a crucial message that only making access to the technology may not ensure equity in service delivery. Promoting culture sensitive intervention, educational component to increase virtual care literacy and support older people through providing the assistance of educated caregiver can be of higher importance.
3 9	Wa ng 201 8	Immigrants' Use of eHealth Services in the United States, National Health Interview Survey, 2011-2015	US A	This study used data from the adult sample of the 2011-2015 National Health Interview Survey (NHIS).	Cross-section al	A total of 156355 adult respondents aged 18 years and above from the 2011-2015 National Health Interview Survey (NHIS) took part in the study.	The outcome s of the study included 3 self-reported uses of eHealth services: making medical appointm ents online, refilling prescripti ons online, and communi	Telephone and online virtual care services	Equity issues based on immigr ation status was analyse d.	The study findings revealed that, 18763 US natives (16.1%) reported using any eHealth services in the past 12 months, compared with 1738 (13.0%) naturalized citizens and 1020 (7.8%) noncitizens. Adjusting for socioeconomic factors reduced initial gaps: naturalized citizens (adjusted odds ratio [aOR] = 0.81; 95% confidence interval [CI], 0.75-0.87) and noncitizens (aOR = 0.81; 95% CI, 0.72-0.90) had approximately 20% lower odds of using eHealth services than did US natives. Als, Immigrants with higher English-language proficiency	The study concludes that inequity exists in terms of using eHealth services among the immigrants that would require targeted intervention address.	This study pointed targeted intervention in virtual care specs to address inequity in terms of immigration status. Multilingual and culture sensitive portal use can be of value in this regard.

							cating with health care providers through email.			were more likely to use eHealth services than were immigrants with lower English-language proficiency.		
40	We ber 2020	Characteristics of virtual care users in NYC for COVID-related care during the coronavirus pandemic	USA	This study used data from a large health system in NYC, the Mount Sinai deidentified COVID-19 database The data contain all patients diagnosed with, placed under investigation for, or screened negative for COVID-19 with any Mount Sinai system provider starting March 20, 2020.	Cross-sectional	This study analysed 76 845 encounters for 52 585 unique patients diagnosed with, tested for, or placed under investigation for COVID 19 between March 20 and May 18, 2020.	The study analysed virtual care encounters versus ER encounters versus office visits	Not clearly explained	Equity issues pertaining to demographic factors such as race/ethnicity and age were analysed	The study findings revealed that, compared to Whites, Blacks had higher adjusted odds of using both the ER versus virtual care (OR: 4.3, 95% CI: 4.0-4.6) and office visits versus virtual care (OR: 1.4, 95% CI: 1.3-1.5). For Hispanics versus Whites, the analogous ORs were 2.5 (95% CI: 2.3-2.7) and 1.2 (95% CI: 1.1-1.3). Compared to any age groups, patients 65+ had significantly higher odds of using either ER or office visits versus virtual care.	The study highlighted racial and age related disparities in access to virtual care services compared to in-person services amid this COVID-19 pandemic	Older adults and CALD people are subjected to the digital divide. It is therefore recommended to look for strategies to address this digital divide.

| 4 1 | Weger mann 2020 | Black, older, unmarried, and medicaid patients were less likely to complete hepatology video visits during COVID-19 | USA | This study was performed in the hepatology clinics at Duke University Health System from January 1, 2020, through May 30, 2020 | Retros pective cohort study. | A total of 13,628 visit attempts by adult patients were analysed for the study. Of these, 3238 took place during the pre-COVID period, 3771 during the COVID period, and 6619 were outside study timeframe. | All patients were offered video visits first, and if the patient was unable to complete a video visit or declined, a telephone visit was offered. | Both video visit and telephone visit was considered | Equity issues related to race and socioec onomic charact eristics were analyse d | The study revealed that Black race/ethnicity was associated with increased odds of completion of a telephone over a video visit, compared to White (OR=1.99, 95% CI 1.47, 2.68). It was also found that increasing age was associated with higher odds of a phone or incomplete visit (cancelled, no-show, or rescheduled after May 30,2020). It was also found that being single or previously married (separated, divorced, widowed) was associated with increased odds of completing a phone compared to video visit compared to being married. | The study summarized that vulnerable populations including those that are older, non-Hispanic Black had lesser use or suboptimal use (phone versus video) of virtual care interventions during this COVID-19. | Widespread disparities can exist among the vulnerable populations particularly among aged and ethnic minorities that need to be addressed to ensure equity in virtual care intervention. |

Appendix 2: Quality assessment of the included studies

| . | Study | Is there a clear stateme nt of the aims of the | Did the study include an appropria te | Did the study use appropri ate eligibility | Did the study use standardized methods for selecting/putt ing people | Did the study provi de detail | Did the study have a comparativ ely long study | Is the methodolo gy appropriat e for what they were | Total QA (Rigor) | Is the interventi on program descripti | Did the study describe factors that affected program | Did the study conside r reasons for the | Did the study discuss reason s for | Total QA (richnes s) |

		researc h?	comparis on group?	criteria to obtain its target group?	into the study and state how they did this?	s about sampl e size?	period (≥6 months)?	trying to achieve?		on detailed?	implementati on?	results that they achieve d?	progra m succe ss or failure ?	
1	Abel 2018	1	1	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
2	Alam 2019	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
3	Arighi 2021	1	1	1	N/A	1	N/A	1	Strong	1	0	1	1	Thick
4	Arora 2013	0	N/A	1	N/A	1	N/A	1	Modera te	1	0	1	0	Thin
5	Blundell 2020	1	N/A	1	N/A	0	N/A	1	Modera te	0	0	1	0	Thin
6	Campos-Castillo 2021	1	N/A	1	N/A	1	N/A	0	Modera te	1	1	1	1	Thick
7	Chunara 2021	1	N/A	1	N/A	1	N/A	0	Modera te	1	1	1	1	Thick
8	Darrat 2021	1	N/A	1	N/A	1	N/A	1	Strong	0	1	1	1	Thick
9	Eberly 2020	1	N/A	1	N/A	1	N/A	1	Strong	0	1	1	1	Thick
1 0	Ernsting 2019	1	N/A	1	N/A	1	N/A	1	Strong	1	0	1	1	Thick
1 1	Ferguson 2020	1	N/A	1	N/A	1	N/A	1	Strong	0	1	1	1	Thick
1 2	Foley 2020	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
1 3	Gilson 2020	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
1 4	Gordon 2018	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
1 5	Gordon 2016	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
1 6	Guendelman 2017	1	1	1	NA	NA	NA	1	Modera te	NA	1	1	1	Thick
1 7	Hansen 2019	1	1	1	1	1	NA	1	Strong	1	1	1	1	Thick
1 8	Jaffe 2020	1	NA	1	NA	1	1	1	Strong	1	1	1	1	Thick
1 9	Jiang 2020	1	1	1	NA	1	NA	1	Strong	1	1	1	1	Thick
2 0	Kemp 2020	1	1	1	NA	1	NA	1	Strong	1	1	1	1	Thick

221	Khoong 2020	1	1	0	NA	0	NA	1	Moderate	1	1	1	1	Thick
222	Leng 2016	1	NA	1	NA	0	NA	0	Moderate	1	0	1	1	Thick
223	Li 2020	1	1	0	NA	0	NA	1	Moderate	1	1	1	1	Thick
224	Mangin 2019	1	NA	1	NA	0	NA	0	Moderate	1	1	1	1	Thick
225	Marrie 2019	1	NA	NA	NA	0	NA	0	Moderate	1	1	1	0	Moderate
226	Nelson 2016	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
227	Pierce 2020	1	N/A	1	N/A	1	N/A	0	Moderate	0	1	1	1	Thick
228	Potdar 2020	1	N/A	1	N/A	1	N/A	0	Moderate	1	1	1	1	Thick
229	Rodriguez 2021	1	N/A	1	N/A	1	N/A	0	Moderate	1	0	1	1	Thick
230	Schifeling 2020	1	N/A	1	N/A	1	N/A	0	Moderate	1	1	1	1	Thick
231	Severe 2020	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thich
232	Shaw 2013	1	N/A	1	N/A	1	N/A	1	Strong	1	0	1	1	Thick
233	Spooner 2017	1	N/A	1	N/A	1	N/A	1	Strong	1	1	1	1	Thick
234	Tam 2020	1	N/A	0	N/A	0	N/A	1	Moderate	0	1	0	0	Thin
235	Tong 2020	1	N/A	0	N/A	1	N/A	1	Moderate	0	1	1	1	Thick
236	Trief 2013	1	1	1	1	1	1	1	Strong	1	1	1	0	Thick
237	vanVeen 2019	1	N/A	1	N/A	0	N/A	1	Moderate	0	1	1	0	Thin
238	Walker 2020	1	N/A	1	N/A	1	N/A	0	Moderate	0	0	1	0	Thin
239	Wang 2018	1	1	1	N/A	1	1	1	Strong	1	1	1	1	Thick
240	Weber 2020	0	N/A	1	N/A	1	N/A	1	Moderate	0	1	1	0	Thin

| 41 | Wegermann 2020 | 1 | 1 | 1 | N/A | 1 | N/A | 1 | Strong | 1 | 0 | 1 | 1 | Thick |