Health Outcomes, Attitudes, and Improvements of Synchronous Virtual Consultations for Non-Malignant Chronic Illnesses: A Scoping Review

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Abstract

Background: While virtual consultations have experienced a rise in adoption in recent years, retention remains challenging and aspects around the associated experiences and outcomes remain unclear.

Objective: The need to further investigate those aspects were motivating factors for conducting a scoping review with a focus on synchronous virtual consultations for non-malignant chronic illnesses, and the associated health outcomes, attitudes and potentials for technological improvements.

Methods: The Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guided the scoping review process. An inclusion criteria based on the Population, Concept and Context (PCC) framework was designed. A search strategy, informed by the PCC framework, was applied to PubMed (including MEDLINE), CINAHL Complete, APA PsycNet, Web of Science, IEEE and ACM Digital. Screening of articles and data extraction of included articles were performed in parallel and independently by two researchers who corroborated their findings and resolved any conflicts.

Results: 4,167 unique articles were identified from the databases searched. Following multi-layer filtration, 19 studies fulfilled the inclusion criteria and relevant data were extracted from their full texts.

Conclusions: For patients with non-communicable chronic conditions, virtual consultations are generally associated with positive health outcomes that are either directly or indirectly related to their ailment; but sustained improvements remain unclear. These modalities also indicate the potential to empower such patients to better manage their condition. HCPs and patients tend to be satisfied with remote care experience and most are receptive to the modality as an option. Assistance from supplemental technologies mostly reside in addressing technical issues and additional modules could be integrated to address challenges relevant to patients and HCPs. However, positive outcomes and attitudes towards the modality might not apply to all cases, indicating that virtual consultations are more appropriate as options rather than replacements of in-person visits.

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ABSTRACT

Background: While virtual consultations (VCs) have experienced a rise in adoption in recent years, retention remains challenging and aspects around the associated experiences and outcomes remain unclear. The need to further investigate those aspects were motivating factors for conducting this scoping review. With a focus on synchronous VCs between patients with non-malignant chronic illnesses and healthcare professionals (HCPs), this scoping review aims to gain insights into: 1) the available evidence on VCs to improve health outcomes for patients; 2) the associated behaviours and attitudes of patients and HCPs; and 3) how can supplemental technology assist in remote consultations.

Methods: The Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guided the scoping review process. An inclusion criteria based on the Population, Concept and Context (PCC) framework was designed. Criteria for inclusion were as follows: Population - adults with non-malignant, non-communicable chronic conditions; Concept - health outcomes, attitudes and experiences towards synchronous VCs between patients and HCPs; Context - empirical research. A search strategy, informed by the PCC framework, was applied to PubMed (including MEDLINE), CINAHL Complete, APA PsycNet, Web of Science, IEEE and ACM Digital. Screening of articles and data extraction of included articles were performed in parallel and independently by two researchers who corroborated their findings and resolved any conflicts.

Results: 4,167 unique articles were identified from the databases searched. Following multi-layer filtration, 19 studies fulfilled the inclusion criteria and relevant data were extracted from their full texts. The included studies investigated 6 non-malignant chronic conditions and the VC modality varied in each case. Most observed positive health outcomes for patients with chronic conditions employing VCs. Patients generally favoured the modality's convenience but concerns were highlighted around cost, practical logistics, and thoroughness of clinical examinations. The majority of HCPs were also in favour of the technology but a minority experienced reduced job satisfaction during VCs. Supplemental technological assistance was

identified in relation to technical considerations, improved remote workflow, and training in remote care use.

Conclusions: For patients with non-communicable chronic conditions, VCs are generally associated with positive health outcomes that are either directly or indirectly related to their ailment; but sustained improvements remain unclear. These modalities also indicate the potential to empower such patients to better manage their condition. HCPs and patients tend to be satisfied with remote care experience, and most are receptive to the modality as an option. Assistance from supplemental technologies mostly reside in addressing technical issues and additional modules could be integrated to address challenges relevant to patients and HCPs. However, positive outcomes and attitudes towards the modality might not apply to all cases, indicating that VCs are more appropriate as options rather than replacements of in-person visits.

Keywords: telemedicine; virtual consultation; chronic illnesses; cyberpsychology; digital health; scoping review

Introduction

While the underpinning technology has been available for several decades [1], virtual consultations (VCs) in healthcare practice experienced a surge in adoption following the COVID-19 pandemic [2]. In particular for patients with chronic conditions, these modes of care lessens travel-associated pain as well as facilitates the management and treatment of their disease [3,4]. Such technology-mediated consultations are also favoured by physicians treating patients with chronic conditions as they can improve productivity, patient's health and management [4]. Continued interest in VC from researchers, investors and policymakers indicates that VCs are being actively considered as viable options within healthcare systems beyond the pandemic [5-9].

However, persisting issues have been raised regarding aspects such as privacy, reliability, safety and accessibility when employing remote consultation means [10-13]. Due to difficulties in identifying non-verbal cues through such means, Kilvert *et al.* further recommend that the first meeting between the healthcare professional (HCP) and the patient be conducted face-to-face rather than through virtual means [14]; suggesting that the latter approach is not totally apt to fully replace physical meetings. Leone *et al.*'s scoping review also identified discrepancies in telehealth consultation guidelines which indicate that the modality is still nascent and evolving [15].

Recent studies also reflect a need to better understand VC adoption by patients with chronic conditions [16,17]. Notably, a 2021 analysis by McKinsey & Company identified a stabilised use of telehealth following an initial peak early in the pandemic as the latter was borne out of necessity [18]. Even if the use of the modality is higher than pre-pandemic levels, only about 40% of responders in the US would be inclined to use telehealth after the pandemic subsides. However, 40%-60% would be interested in virtual healthcare with more options, such as a "digital front door" or lower-cost virtual-first health plan. While this analysis might be more representative of the US market, it nevertheless indicates the potential for supplemental technologies to telehealth for addressing flailing retention rates and barriers to adoption.

Such challenges to maintaining and encouraging remote care use highlight the importance of

gaining a deeper understanding of the technical and psychological elements - i.e. cyberpsychological elements - involved in VCs, as well as indicate potentials for exploring how novel technological approaches can effectively tackle them [4]. Incorporating supplementary technologies presents an opportunity for innovation and for transforming the adoption of online modalities for patients with chronic conditions. For instance, Yuan *et al.*'s study on the remote care outcomes of heart failure patients during the pandemic found that telephone consultations were associated with increased mortality [19]. By supplementing this modality with other technologies, there is a possibility of achieving better outcomes. Researchers further consider the metaverse and enabling technologies such as extended reality (XR) as potential approaches to supplement remote care [20]. These approaches represent potential novel avenues to consider in VC research.

While recent reviews have analysed the state of VCs from the perspective of either those living with chronic conditions [21-23] or that of HCPs [24], they did not investigate extensively, within the same review, both HCPs and chronic patients' perspectives and their associated behaviours nor potentials for technological improvements during synchronous VCs. A preliminary search for existing scoping reviews and systematic reviews performed in April 2023 on Google Scholar and Open Science Framework further did not identify such investigations. Researchers have recently accentuated the need to better understand the preferences and concerns of remote health users [25]. Others have also recommended further exploration of technological assistance to reduce limitations experienced during VCs [4]. These reflect Hensel *et al.*'s conceptual framework that highlighted the importance of investigating aspects of cyberpsychological obtrusiveness and adoption of telehealth [26]. However, such aspects have not been widely investigated in recent reviews and indicate the need for new research in this area.

In addition to the potentials of VCs, the limited availability of synthesis of the literature in this field was a motivating factor for this current scoping review, which is the first step in an on-going PhD project in Ireland at the Atlantic Technological University [27]. The project aims to develop a novel AI assistive tool to supplement real-time, synchronous VCs between patients with non-malignant chronic illnesses and their HCPs. Considering the higher prevalence of certain chronic conditions in Ireland such as diabetes mellitus, cardiovascular conditions and chronic obstructive pulmonary disease (COPD) [28], particular emphasis is paid on these non-malignant conditions. Therefore, the nascent aspect of VCs [15] and the exploratory nature of this research was deemed appropriate for the adoption of a scoping review design [29,30] which aims to investigate synchronous VCs for non-malignant chronic illnesses through the following research questions: 1) What is the available evidence on synchronous VCs to improve health outcomes for patients with chronic conditions?; 2) What are the associated behaviours and attitudes of patients and HCPs during synchronous VCs?; and 3) How can supplemental technology assist in remote consultations?

Methods

This scoping review was conducted by following the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines and the methodology developed by the Joanna Briggs Institute [31,32]. The protocol for this review was also registered on Open Science Framework on April 28, 2023 [33].

The inclusion criteria was based on the Population, Concept and Context (PCC) framework, which is recommended to design relevant objectives and eligibility criteria for scoping reviews where each component of the framework (Population, Concept and Context) guides the identification of the respective areas of interest of the review [34]. This framework also assisted in designing the search terms to ensure relevance to the review's aims. Table 1 summarises the inclusion criteria of this study based on the PCC framework.

Table 1: Inclusion and exclusion criteria based on PCC framework for study selection

PCC Element	Include	Exclude
Population	Adults with non-malignant, non-communicable chronic conditions	Patients with no/any other condition Below 18 years of age Malignant/communicable conditions
Concept	Health outcomes, attitudes and experiences towards synchronous virtual consultations between patients and healthcare professionals Aspects around: Attitudes, experiences, engagement, behaviours, intentions during such interactions	Traditional/face-to-face/ non-virtual/undefined means of consultations Interactions with non-healthcare professionals Asynchronous virtual care
Context	Clinical settings and beyond Research centres	Non-empirical research (e.g.: reviews, editorials)

Upon agreement among the authors, and with the input from a specialist librarian, the following databases and repositories were selected given their relevance to provide published as well as grey literature around the research questions: PubMed (which includes MEDLINE), CINAHL Complete, APA PsycNet, Web of Science, IEEE and ACM Digital.

A search strategy was devised by the research team in order to identify sources of evidence relevant to the research aims. Terms such as "metaverse" and "mixed reality" were included given their potentials in remote care [20] and to maximise the potential to identify publications that involve novel VC approaches, considering the exploratory nature of this review. The search terms also included specific chronic conditions such as "diabetes mellitus" and "COPD" given their prevalence in Ireland where subsequent stages of a project involving this scoping review will take place and to thus provide more specific results [28].

The selected databases were searched from their inception till March 6, 2023 with no language or article type filters applied while for CINAHL Complete via EBSCOhost, the "Apply equivalent subjects" and "Suggest Subject Terms" filters were selected. The following combination of search terms were used: ("virtual consultation" OR "remote consultation" OR "telemedicine" OR

"telehealth" OR "metaverse" OR "virtual reality" OR "augmented reality" OR "mixed reality" OR "extended reality") AND ("chronic conditions" OR "chronic illnesses" OR "chronic disease" OR "diabetes mellitus" OR "chronic respiratory illnesses" OR "cardiovascular conditions" OR "obesity" OR "COPD") AND ("attitudes" OR "experiences" OR "engagement" OR "behaviours" OR "intentions" OR "motivations" OR "psychology" OR "barriers"). Medical Subject Headings (MeSH) were employed in CINAHL Complete which involved the database's recommended terms. Appendix 1 details the latter search.

The search results were screened independently by two researchers (PD and BK) via the online referencing software Rayyan against the selection criteria (Table 1). Articles were further excluded if their full texts were not in English; if they did not involve real-time consultation with a healthcare professional [35]; if the (virtual) consultation modality was unclear; if no consultation was involved; and if they were not empirical research, thus articles such as reviews and editorials were excluded. Citation tracking was performed on publications identified from the databases whose full text were eligible for data extraction. More specifically, backward search of their respective reference lists and forward search of articles that cite back the individual study was performed as these are recommended practices for added value to health-related reviews [36]. After their respective screening, the reviewers discussed and resolved any conflicts over their selection. This was done by reverting to the selection criteria and consulting with KM. The results of the screening process are summarised in Figure 1 below which is based on the PRISMA 2020 flow diagram.

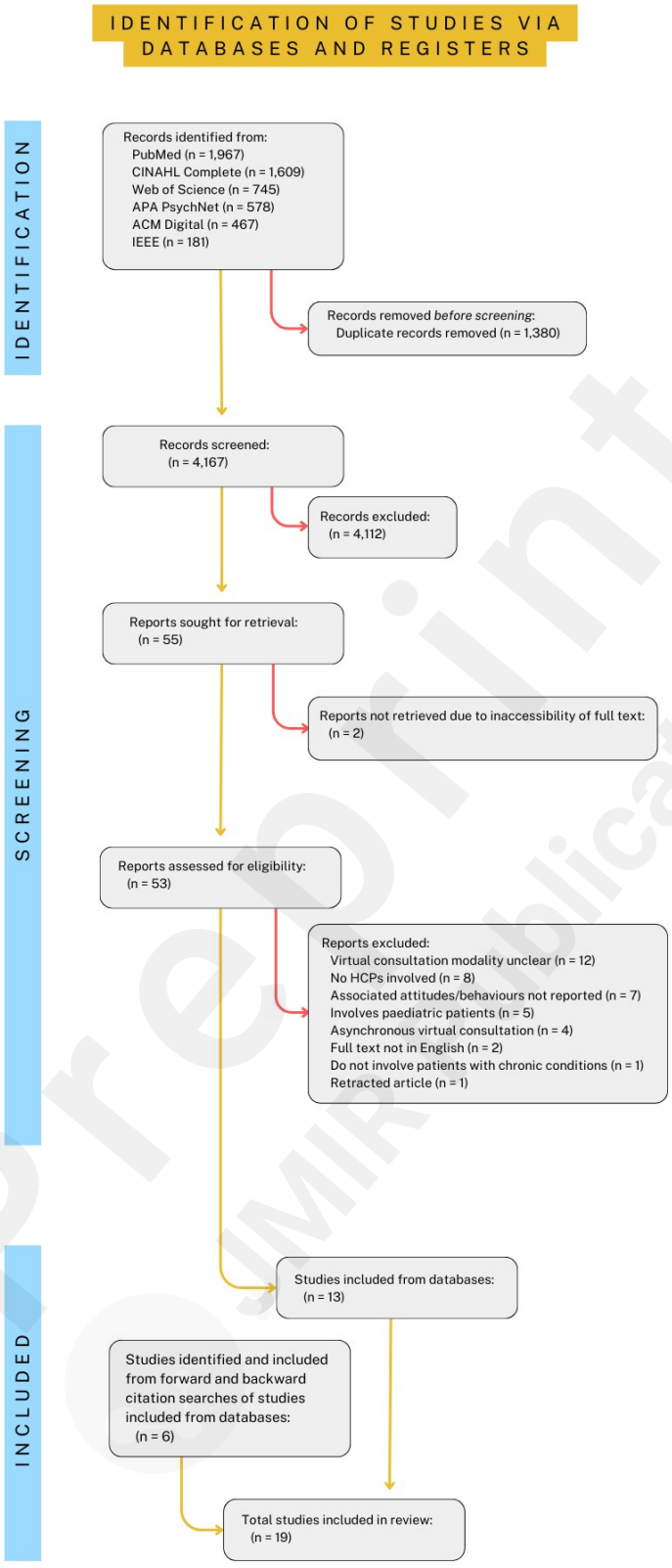

Figure 1: PRISMA 2020 flow diagram. *From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al.* The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ 2021;372:N71. doi: 10.1136/bmj.n71

Data relevant to this scoping review's aims were independently extracted from the final list of included sources of evidence and summarised in a data-charting form by PD and KM who

resolved any conflicts after comparing their findings. This was done by reverting to the individual studies. The data charting form was designed by the research team with items relevant to this review. Data extracted pertained to the study characteristics (author(s), year of publication and country of origin), study design and research aims, chronic condition(s) involved, virtual consultation modality employed, health outcome reported by the studies, related attitudes and behaviours towards the virtual consultation modality, and potentials for technological improvement identified in the articles.

For the synthesis of results, the included studies were grouped based on the chronic condition involved. Thereafter, data on the outcomes, type of virtual consultation employed, associated behaviours and potentials for technological improvements were summarised. As a scoping review design was adopted for this investigation to provide an overview of current evidence relevant to the research questions, no critical appraisal of the included sources was performed, which is typical for such studies [31,37].

Results

Searching the databases yielded a total of 5,547 articles, out of which 4,167 unique articles were identified after the removal of duplicates. Screening of texts and abstracts against the inclusion criteria resulted in 55 texts for full text screening. Following the latter, 13 articles were found to fulfil the inclusion criteria and were selected for further data extraction and analysis. In order to maximise the identification of publications relevant to this review, we performed further backwards and forwards citation searching from these 13 articles. Such citation tracking after initial study selection is recommended practice to enhance identification of potentially eligible reports [36]. This led to the identification of 27 additional articles for full text screening against the inclusion criteria. This yielded 6 additional articles for inclusion in data extraction. Thus, in total, 19 studies were included for data extraction after screening 53 full texts from the database searches (of which 13 were included) and 27 full texts from backwards and forwards searches (of which 6 were included). The data extracted from the 19 included articles are presented in summarised form in Table 2, with more details provided in Appendix 2.

Table 2: Characteristics of sources of evidence

List of abbreviations used in Table 2: CHF - congestive heart failure, CKD - chronic kidney disease, COPD - chronic obstructive pulmonary disease, HCP - healthcare professional , VC- virtual consultation

Author/ Year/ Country	Study design and aim(s)	Chronic condition and VC modality	Reported health outcomes	Related attitudes and behaviours	Potentials for technological improvement
Mair 1999 UK [38]	Mixed method feasibility pilot of technology assistance for COPD exacerbations at	COPD; Video VC	Not reported	Users required getting accustomed to the setup	Need to improve image quality

	home				
Tudiver 2007 USA [39]	Phone survey interview to evaluate HCP perceptions of remote diabetes care delivery	Diabetes; Video VC	Increased control, confidence, compliance and motivation in managing diabetes among patients.	Positivity towards VC	Improve communication between HCPs and remote workflow
Whitten 2007 USA [40]	Mixed method study to evaluate the use of home telehealth for patients with COPD and/or congestive heart failure (CHF)	COPD and/or CHF; Video VC	No significant effects	Satisfied with care delivery and technology	Telehealth may provide added value if the associated costs are reduced, even if the outcomes are similar to traditional care
Trief 2008 USA [41]	Qualitative study to describe the lived experiences of elderly diabetics involved in a telemedicine management intervention	Diabetes; Video VC	Positive physical health changes; some emotional benefit	HCP encouragement can positively influence participation Participation motivated by desire to feel and be healthier	Some frustrations with operating the technology
Nilsson 2009 Sweden [42]	Quantitative evaluation of the feasibility and quality of uncomplicated hypertension care in rural areas, with comparison between telemedicine and face-to-face consultations	Primary hyper-tension; Video VC	Patients treated via VC had a higher probability of improving their blood pressure	**Patients:** Most found VC to be as good as in-person GP meetings **HCPs:** Appreciated detailed remote patient evaluation; VC allowed them to work more independently	Equipment not found to be useful for remote lung examination

Cook 2010 USA [43]	Quantitative evaluation of remote audio nurse counselling to address cognitive and emotional barriers to medication adherence in ulcerative colitis	Ulcerative colitis; Audio VC	Treatment adherence up to 6 months was higher than the expected rate	Treatment discontinuation due to negative beliefs about treatment and breakthrough symptoms	Concerns around cost, and treatment logistics
Sorknæs 2010 Denmark [44]	Mixed method interventional study to investigate the effect on early readmissions of telemedicine video consultations (TVC) for COPD patients in their homes after a hospital discharge	COPD; Video VC	10-14% reduction in readmission risk for TCV patients	High satisfaction rate with patients and nurses Nurses trusted measurement collected from consultations	Minimise audiovisual delay
Campbell 2011 Canada [45]	Mixed method feasibility study of remote care provision to rural communities and to assess the level of satisfaction among patients and HCPs	Chronic kidney disease (CKD); Video VC	Patients experienced less stress than in-person visits	High level of satisfaction and appreciated the ease of access to care, and time and cost savings	Improve flow of paperwork and access to patient information
Berkhof 2014 The Nether-lands [46]	Quantitative pilot study to determine the effects of telemedicine on health-care utilisation and health status of COPD patients	COPD; Audio VC	No improve-ment of health status among VC group Worsened score for VC group	Use of audio telephone consultations led to little loss to follow up	Include educational/ pulmonary rehabilitation/ training component to drive a more successful telemedicine model
Mathar	Qualitative	COPD;	No special	Patients are	Interference

2015 Denmark [47]	interviews investigating the VC experiences and preferences of COPD patients	Video VC	value attributed	receptive of the technology and to adopt at-home monitoring equipment	with daily routines, cost considerations and unwanted obligations
Raymond 2016 USA [48]	Pilot study to investigate the feasibility and acceptability of a telemedicine intervention	Diabetes; Video VC	Potentials improve mental health, diabetes education, and condition management	Satisfactory experience given improved convenience, ease of access to HCP insights and time efficiency	N/A
Reid 2018 USA [49]	Quantitative cohort pilot study to assess feasibility and acceptability, care retention and follow-up rates, patient satisfaction, and adherence to guidelines in a telemedicine intervention	Diabetes; Video VC	No significant change in HbA1c values in either VC or control group	Higher engagement, adherence and frequency of clinical visits in VC group Higher satisfaction rates among VC group regarding care experiences and technology	Barrier to access encountered due to institutional Internet firewall settings
Lambooy 2021 Australia [50]	Quantitative case-controlled longitudinal observational cohort study to assess the feasibility, sustainability, and clinical outcomes of telehealth videoconferencing (TVC) for this patient population.	Chronic kidney disease; Video VC	No between-group differences during follow-up for 2 years	Very high patient satisfaction with the care provided TVC was comparable to standard care TVC uptake reduced over time	Reduce concerns with technology and reminder that TVC is an option
Magliah 2021	Cross-sectional quantitative	Diabetes; Audio VC	Improved diabetes	**Patients:** Satisfied with	Improve internet access

Saudi Arabia [51]	analysis of online surveys to evaluate patient perception of virtual phone clinics during COVID-19 pandemic		control and reduced risk of contracting COVID-19	modality; most expressed interest in remote audio follow-ups **Physicians:** Good understanding of patients' condition	
Singh 2021 USA [52]	Online surveys with quantitative analyses to determine the limitations of telehealth accessibility, patient satisfaction with telehealth relative to in-person visits, and the perceived advantages and disadvantages to telehealth	Cardiac condition; Any VC modality	None reported	High level of satisfaction with time and cost savings seen as advantageous Clinical exam not perceived as thorough by some patients	Improve internet connectivity, improve coordination of telehealth appointments; incorporate remote patient monitoring solutions
Balut 2022 USA [53]	Mixed methods study to understand telemedicine use before and after COVID-19, and identify relevant barriers and facilitators to its implementation	Cardiology; Audio or video visits	None reported	**Patients:** Minority groups less likely to use telemedicine; preference of telephone over video visits **Physicians:** Preferred video to phone visits; willingness to keep using VC after pandemic	Improve access to video consultations with equipments, video bandwidth and user-friendliness of video conferencing platform
Heyck Lee 2022 Canada	Quantitative cross-sectional observational survey to	Chronic kidney disease; Audio VC	Reduced anxiety related to contracting	**Patients:** Comfortable with modality	Improve translation and auditory feedback to

[54]	evaluate patient and physician perspectives on the key advantages and disadvantages of telephone consultations in a nephrology out-patient clinic setting during COVID-19		COVID-19 by travelling to clinic	Low preference for video VC **HCP:** Reduced job satisfaction and sense of connection with patients	increase patient access to audio consultations
Hitchcock 2022 UK [55]	Online questionnaire and telephone interviews to understand patients' perspectives on VC, the accessibility of the service and inform its development	Diabetes; Audio or video VC	Not reported	Appreciated at-home convenience	Increase flexibility and access to service/team
Lohnberg 2022 USA [56]	Quantitative programme evaluation with phone surveys to report on the transition to a remote modality for a weight management programme during COVID-19	Obesity; Audio VC	Not reported	About half found telephone visits comparable to in-person visits. Half indicated preference for remote visits after pandemic Time and cost efficiency of remote care compared to in-person care favoured	Video meetings for interdisciplinary team cumbersome due to hardware and software requirements; and require adequate training

Characteristics of sources of evidence

Details about the 19 included studies' authors, origin, year of publication, aims, design and

participants can be found in Table 2. They were published between 1999 and 2022 [38-56], and were conducted in eight different countries; with nine from the USA [39-41,43,48,49,52,53,56], two from the UK [38,55], two from Denmark [44,47], two from Canada [45,54], one from Sweden [42], one from The Netherlands [46], one from Australia [50] and one from Saudi Arabia [51]. Figure 2 summarises the origins and publication year of the included studies.

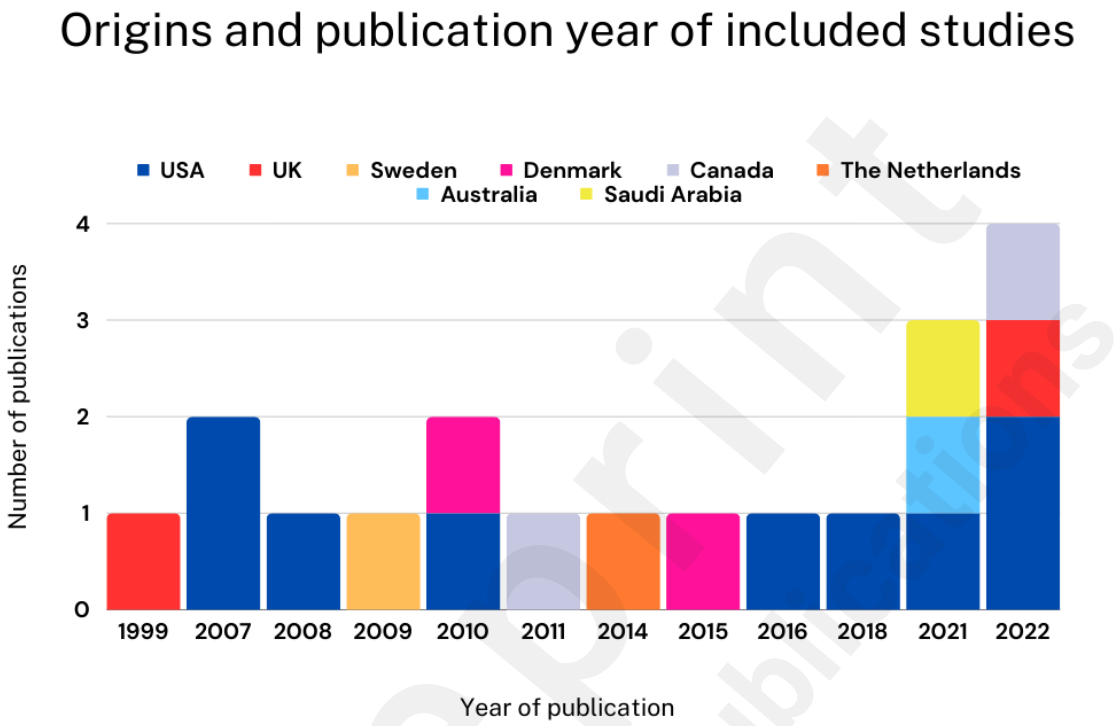

Figure 2: Bar chart of origins and publication year of included studies

Of the included studies, nine adopted a quantitative design [42,43,46,49,50-52,54,56], seven adopted a mixed method design [38-40,44,45,48,53], and three adopted a qualitative design [41,47,55]. As each study had differing aims and scopes, the number of participants varied in each case and averaged at 392.

Among the studies included in this review, 6 non-malignant chronic conditions were investigated altogether, namely COPD, diabetes, chronic kidney disease, ulcerative colitis, hypertension and congestive heart failure. However, some were more frequently investigated than others and some studies involved more than one chronic condition. Six studies involved diabetic patients [39,41,48,49,51,55], five studies involved patients with COPD [38,40,44,46,47], four studies involved patients with chronic cardiovascular conditions (CCCs) [40,42,52,53], three studies involved patients with chronic kidney disease (CKD) [45,50,54], one study involved patients with ulcerative colitis [43] and one study involved patients with obesity [56]. Among the studies that involved CCCs, one involved both COPD and congestive heart failure patients [40], one involved patients with hypertension [42] and two studies did not specify the condition(s) but involved patients with unspecified CCCs [52,53]. For clarity, Figure 3 provides an overview of the group of chronic conditions investigated and their occurrences in the included studies.

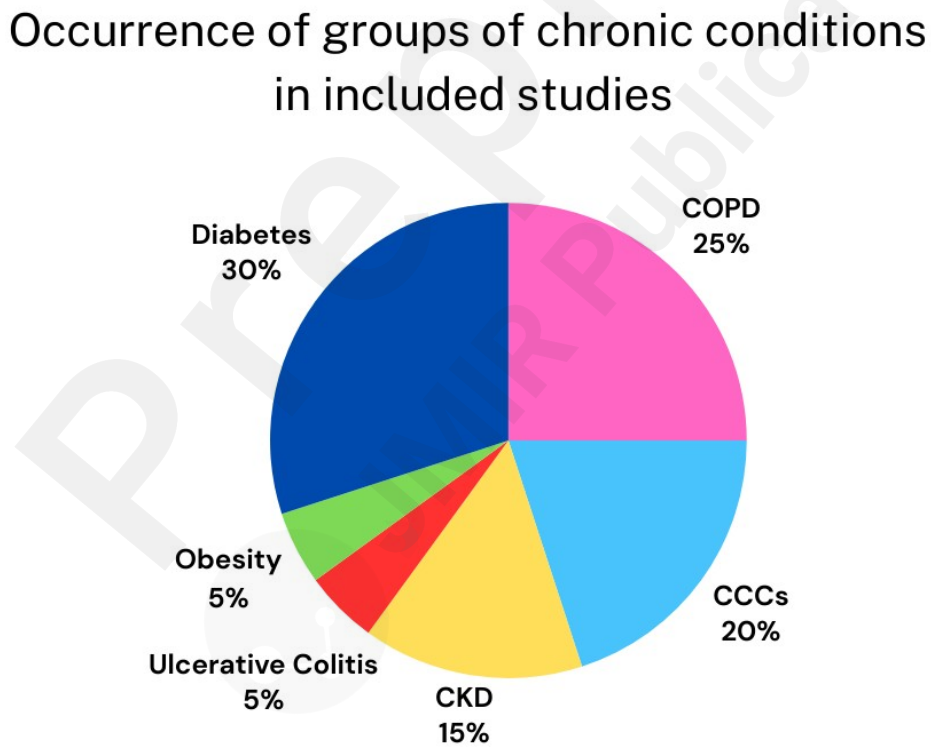

Figure 3: Occurrence of chronic conditions in included studies

The remote consultation modality varied in each case, with 12 studies employing only videoconferencing [38-42,44,45,47-50,55] and 5 employing only telephone visits [43,46,51,54,56]. One study considered all telehealth modalities [52] and one study involved both telephone and video visits [53]. For included studies that were published

before the COVID-19 pandemic [38-49], the vast majority employed video consultations [38-42,44,45,47-49] while only two employed only telephone visits [43,46]. In comparison, the included studies that were published after the pandemic [50-56] the VC modality was more diverse, with three studies involving telephone consultations only [51,54,56], two involving video consultations only [50,55], one study involved both video and telephone means [53] and one study considered any VC modality [52].

Reported health outcomes

The majority of included studies (n=14) reported the health outcomes of the patients undertaking virtual consultations while five did not provide such data due to different scopes of their research aims [38,52,53,55,56]. Of the reviewed articles that reported on these, most (n=9) observed positive health outcomes for patients with chronic conditions employing VC modalities [39,41-45,48,51,54]. The latter modes of care delivery were associated with better condition management [39,51], improved physiological parameters [41,42], higher treatment adherence [43], and reduced risk of readmission [44]. Remote visits also positively impacted patients' mental health with reported reduction in anxiety [45,48,54]. Some articles found no notable improvements or particular contribution to addressing health-related issues when employing VCs [40,46,47,49,50]. One of the included studies even found deteriorating symptoms among patients in the telemedicine group based on the adopted Clinical COPD Questionnaire (CCQ) scale [46].

Diabetes and COPD were the most commonly investigated conditions in the included studies with reported health outcomes. Patients with diabetes generally experienced positive health outcomes relating to their physical and mental health as well as the management of their condition [39,41,48,50], while a minority experienced no changes compared to in-person consultation [49]. In the case of COPD patients, most of the included studies with reported health outcomes indicated no additional health benefits via VCs [40,46,47], while only a minority associated VCs with positive health outcomes [44]. However, despite technological improvements over the timeline of the included studies, the reported health outcomes in either diabetes or COPD cases do not seem to be strictly related to the VC technology.

Associated behaviours and attitudes of patients and HCPs

All of the included studies reported on the behaviours and attitudes of patients and/or HCPs associated during their participation in VCs. Patients were generally comfortable, receptive and satisfied with the approach [39,41,49-51]; even if it required the adoption of supplemental at-home monitoring equipment [47]. They appreciated the convenience [45,48,55], time [45,52,56] and cost efficiency [45,52,56] that remote care offered; as well as the ease of access to HCP insights [47,48]. Some also perceived the technology as a welcome source of information [39,47]. In some studies, patients found remote consultations to be as good as in-person visits [40,42,50,56]; with some indicating an interest in or preference for remote visits for follow-up appointments [45,51,53,56]. However, some patients raised concerns about cost, treatment and practical logistics, and that clinical examinations were not thorough during virtual visits [38,43,52,55]. HCPs viewed certain aspects of remote care delivery as helpful such as having access to patient data, specialist's insights, and user-friendliness [39,42]. Despite expressing a

need to get better acquainted with the remote modality, HCPs appreciated that they could gain comprehensive insights into their patient's conditions remotely [38,42,44,51]. However, a minority of HCPs reported a reduction in job satisfaction and a diminished sense of connection with their patients [54].

VCs for diabetic patients in the included studies were met with positive attitudes. Diabetic patients were more motivated during VCs [39,41,49], favoured the convenience provided by VCs [48,55] and expressed a preference to have follow-up appointments remotely [51]. HCPs appreciated the assistive aspect of VCs with diabetic patients and the insights they could derive remotely [39,51]. While most studies involving diabetics employed video VCs only [39,41,48,49], one study involved only audio visits [51] and one study included both video and audio visits [55], the satisfactory experience and positive attitude was shared in all VC modalities among this patient group. Among the included studies that involved COPD cases, patients and HCPs were satisfied with the technology [40,44,47], while a fraction required some familiarisation with the setup [38] which is likely reflective of the time of publication (1999). COPD patients were receptive to VCs [46], and were willing to adopt supplemental technologies for remote monitoring [47]. HCPs further trusted the remote readings [44]. The majority employed video consultations [38,40,44,47] and only one study involved audio-only VCs [46], but the satisfaction rate was similar in either VC mode for COPD patients.

Potentials for supplemental technology assistance

From the included studies, potentials for supplemental technology assistance during virtual consultations were inferred in most studies based on the barriers and concerns reported. Most concerns were related to technical considerations such as malfunctioning computers, audiovisual delay, internet firewall settings, video bandwidth, internet access and connectivity [41,44,49,51-53]. The need to improve communication and coordination between HCPs for more efficient workflow during remote consultations was also identified [39,52,56]. Minimising associated paperwork, data load, resource use and associated expenses could improve adoption among HCPs [39,40,43,45,47]. Improvements were identified to be associated with the assessment and monitoring of patients remotely which could involve better image quality or supplemental equipment for specific physical examinations [38,42,52]. Some suggestions included incorporating an educational component for patients to the telemedicine modality, improving user-friendliness of the platform, improving translation and auditory feedback [46,53,54].

In particular for patients with diabetes, improvements for video VCs pertained to the online workflow [39] and functioning of the setup [41,49], while audio VCs could be improved with increased internet connectivity and flexibility of the remote care team [51,55]. For COPD patients, video consultations would benefit from improved audiovisual quality [38,44] and reduced associated costs and less disruptions to daily routines [40,47]. Identified improvements for audio VCs for COPD patients could involve educational and training components for both patients and HCP in order to better employ the modality [46].

Critical appraisal

No critical appraisal of the included studies was conducted as it is generally not conducted in scoping reviews [31].

Discussion

This scoping review set out to investigate, in relation to synchronous virtual consultations for non-malignant chronic illnesses: 1) the available evidence on virtual consultations to improve health outcomes for patients; 2) the associated behaviours and attitudes of patients and HCPs; and 3) how can supplemental technology assist in remote consultations.

Study characteristics

We identified 19 studies that fulfilled the selection criteria and these were published between 1999 and 2022. Among these, 12 were conducted prior to the COVID-19 pandemic in only two continents (Europe and North America) while the remaining 7 publications included studies conducted in Australia and Saudi Arabia. This potentially indicates that the expansion of interest in remote care-related research to more locations might have been precipitated by the shift to adopting such consultation modalities amidst the pandemic [57].

The higher number of identified studies relating to diabetes, cardiovascular conditions and COPD likely results from these specific terms being included in the search strategy. However, recent systematic reviews investigating remote consultations also identified more studies that relate to those conditions [58,59]; which could indicate a higher likelihood of remote care being adopted for consulting patients with such conditions, considering their higher prevalence [60-63].

As the majority of included studies in this scoping review employed video consultations, this modality appears to be the most popular one. This is contrary to certain cases such as in the UK where remote audio consultations appear to be preferred [64]. Nevertheless, based on the reviewed studies, there appears to be high satisfaction rate among adopters of video consultations [39,40,44,45,48-50,52] and even a preference for video consultations by some HCPs for the non-verbal cues and visual insights that this modality enables [42,53]. While most of the included studies published before the pandemic employed video visits [38-42,44,45,47-49], studies that were conducted after the state of the COVID-19 pandemic was declared adopted more heterogeneous means [50-56], with slightly more investigating audio-only VCs [51,54,56]. The higher diversity in VC means after the pandemic could be attributed to the necessity of employing remote care options during the health crisis [18,65]. While significant technological improvements have been achieved since 1999 [66], which is the publication year of this review's earliest included study, it appears that there has not been much change in terms of remote modalities adopted but their means of access has evolved. More novel means of VC such as the XR and the metaverse, which researchers have considered as

potential supplements to VCs [20], have not been identified in the included studies. This potentially indicates their nascent aspect which has not been extensively investigated and could represent future research topics.

Reported health outcomes for patients with chronic conditions employing virtual consultations

From the included studies, 14 reported on the health outcomes of patients employing virtual consultations. The majority experienced positive health outcomes, with improvements directly related to their chronic condition [41,42,44] as well as their mental health [45,48,54]. Improvements were also noticeable regarding treatment control, adherence and condition management [39,43,51]. Considering these findings from this scoping review, VCs indicate the potential to not only be beneficial for patients' physical health but also to aspects that are, to some extent, tangential to their chronic conditions; improvements to which have been associated with better health outcomes [67,68]. This was highlighted by Salah *et al.*'s recent study investigating the psychological impact of the pandemic on patients with chronic conditions among the Egyptian population [69]. While their findings are limited to the latter population, the researchers found increased rates of anxiety, depression, and stress among this demographic, partly associated with the fear of contracting the SARS-CoV-2 virus and subsequently did not attend follow-up consultations. Similar effects were also identified by Dubey *et al.*'s review on the psychosocial impact of COVID-19 [70].

As studies identified in this present scoping review indicated an improvement in mental health as well as adherence, this indicates the potential for remote care models to address no-shows and anxiety related to in-person visits. This corroborates with Kendzerska *et al.*'s review which identified benefits of telemedicine for chronic disease management to include improved treatment compliance and follow-up rates [71]. Thus, remote care could potentially be associated with empowering patients with chronic conditions to better manage their condition and treatment regime, while being beneficial for their physical and mental health.

However, these findings might not be applicable to every case as a minority of studies did not find VCs to add any significant contribution and were comparable to traditional in-person modalities in regards to health outcomes, even if participants were receptive or satisfied with the virtual care experience [40,46,47,49,50]. One of the included studies [46] even identified deteriorating symptoms among patients employing telemedicine based on the CCQ scale, which is a validated and reliable measure [72-74]. Such findings are in accord with previous research that highlighted that virtual care does not offer a "one size fits all" approach [75,76]. Even if a minority of the included studies did not find added health value or even identified adverse health outcomes with VCs, such modalities could be better considered as potential options tailored for individual patients' needs rather than replacement of traditional face-to-face visits in every case.

Considering the most investigated conditions in the included studies, diabetes and COPD, the tailored VC approach is further highlighted. For instance, patients with diabetes employing VCs experienced positive health outcomes in most cases [39,41,48,50]. In comparison, positive health outcomes for COPD patients were only

identified in a minority [44], while most experienced no particular health benefits [40,44,46]. These could be attributed to the varying needs of diabetics and COPD patients, and VCs might provide more health benefits for the former group of patients. However, this represents potentials to enhance VCs for COPD patients with supplemental technology aimed at improving outcomes for this specific group.

Behaviours and attitudes of patients and HCPs associated during virtual consultations

Each of the 19 included studies provided data relating to the behaviours and attitudes of patients and/or HCPs during VCs. Based on these studies, it is notable that even prior to the pandemic, most patients and HCPs were receptive and satisfied by the technology-mediated consultations [39,41,42,44,45,47-49]. As for identified studies that were conducted after the state of the pandemic was declared, patients' and HCPs' acceptability towards or satisfaction with remote care was high in every case [50-56]. This is in line with previous studies that found a positive attitude towards telemedicine use among patients and HCPs during the pandemic [77,78]. However, such attitudes might have been influenced by the need to adopt remote care technologies imposed by the pandemic [65], rather than these being an optional alternative. Given that pre-pandemic studies identified in this scoping review still reported a general receptiveness and satisfaction with the modality, VCs might be considered as a viable option.

From patients' perspectives, the reported benefits of VCs are related to their convenience, time and cost efficiency, ease of access to HCP insights and informational aspects [39,45,47,48,52,55,56]. Barriers to these aspects have been identified as limitations to healthcare access for patients with chronic conditions [78-81]. The findings of this scoping review indicate that virtual modalities can potentially address some of those pertinent barriers, especially considering that some patients viewed virtual visits as comparable to in-person visits [40,42,50,56]. Considering VCs for diabetic patients, the approach, whether audio or video based, was positively received in each case [39,41,49,48,51,55]; and acceptance was also high among COPD patients [40,44,47], although a minority needed to get accustomed to the video VC setup [51]. This need could be attributed to the outdated equipment used in the study conducted in 1999 and video VC setup has likely improved in recent years.

Nevertheless, such a positive outlook towards VCs might not be applicable to every patient as a minority of studies included in this review reported that patients were less receptive towards remote care. They expressed negative attitudes towards the modality's cost, meeting scheduling and logistics, and the thoroughness of clinical examinations [38,43,52,55]. One of the included studies found that minority groups were less likely to use telemedicine [53]. In addition to reinforcing the notion that virtual care might not be appropriate in every case [75,76], it reflects the observation of recent studies that highlighted limited adoption by and accessibility of telemedicine for minority groups [82,83]. However, these behaviours towards VCs were identified in only a minority of the included studies and could indicate avenues for further investigations.

Regarding included studies that reported on HCPs' relevant attitudes and behaviours, the majority indicated positive attitudes and behaviours towards VCs. Through these modalities, they appreciated access to patient data, specialist's insights and user-

friendliness of the technology [39,42]. They were also satisfied with and trusted the interpretation of patients' conditions remotely [42,44,51], even if some were unfamiliar with the modality [38,51]. In one of the included studies, HCPs further expressed interest in the continued use of telemedicine post-pandemic [53]. In the case of audio or video VCs with diabetic patients, HCPs were receptive towards the technology [39,41,48,49,51,55]. This finding was similar among HCPs involved in VCs with COPD patients [38,40,44,46,47]. Recent studies in different countries have also identified positivity in attitude from HCPs towards remote care [84-86].

However, those same recent studies have identified limitations to telemedicine from the perspectives of HCPs. For instance, Ma *et al*'s nationwide survey in China found HCPs' concerns with the modality to relate to infrastructure, service process, cost and popularity of such services [85]. Andronic *et al*'s quantitative study on HCPs' perception of telemedicine in Romania found limitations to virtual care associated with lack of human interaction, dependency on technology and legislative concerns [84]. The exploratory survey conducted by Ncube *et al* among HCPs in Botswana identified privacy, associated cost, required infrastructure and human resource among inhibitors to telemedicine use [86]. While in minority, this present scoping review also identified similar behaviours from HCPs [39,54]. They reported mixed perceptions of telemedicine efficiency in regards to the number and length of visits, diminished job satisfaction and a lowered sense of connection with their patients during virtual consultations. This could potentially indicate that some HCPs might have some reservations in regards to remote care use which could be investigated in future studies in order to determine factors that could increase satisfaction with virtual consultations.

Regarding studies that reported on the HCPs' attitudes towards different remote care modalities, most were inclined towards video, rather than audio-only, consultation for the audiovisual feedback and non-verbal cues such remote care modalities provide [42,53]. In contrast, a minority showed a more positive attitude towards telephone consultations considering its accessibility for the elderly or those with physical impairments [54]. While the low number of included studies that reported on this aspect limits the ability to draw a consensus, this finding might indicate that video consultations might be a preferred option while audio-only visits could be a consideration based on individual needs and preferences [64].

Potentials identified for supplementing virtual consultation with additional technological support

Based on the included studies' reported barriers and concerns regarding VC use for patients with non-communicable chronic conditions, potentials for supplemental technology assistance were inferred. The majority of the included studies reported the need to improve certain technical aspects related to VCs. These include malfunctioning computers, audiovisual delay, internet firewall settings, video bandwidth, internet access and connectivity [41,44,49,51-53]. Considering VCs specifically for the most common illnesses investigated, patients with diabetes experienced challenges related to the VC equipment in both video or audio format [41,49] while audiovisual quality was the major technical issue for COPD patients employing video VC [38,44]. It is somewhat surprising that relatively basic and infrastructural issues were encountered during

recent studies when in parallel researchers are encouraging the adoption of more advanced technologies such as the Internet of Things and Blockchain in the healthcare setting [87,88]. This potentially indicates challenges to effectively implementing remote care technologies due to inadequate resources and infrastructure. Such challenges have also been shown to be tied to design aspects, where remote consultation areas in hospitals require a different setting and design from traditional and existing infrastructures [89]. In relation to supplemental technologies providing assistance to address such issues, these could be extrapolated from Baker and Stanley's review of technical aspects of telemedicine technology [90]. The authors suggest that planning for successful telemedicine programmes should consider technical aspects and include features such as high-speed and secure internet access, a "telemedicine hub" for conducting remote interactions, patient access software, and access to IT professionals who can address malfunctioning issues.

As some studies included in this review identified the need for better communication and coordination between HCPs [39,52,56], this could potentially indicate the need to better train and support HCPs in effectively employing telehealth. Both patients with diabetes and COPD, the two most commonly investigated conditions in the included studies of this review, indicated challenges with the remote workflow [39,47,55], which potentially indicate a need for better training in order to effectively employ remote care. Researchers have also identified a lack of standard recommendations for telemedicine curricula, as well as a limitation in telehealth education and training among HCPs [91-93]. A potential technological assistance could include within telemedicine softwares an HCP training module based on a competency-based, outcomes-oriented framework as recommended by Stovel *et al*. [91]. This could be integrated in tandem with an educational component for patients, according to their specific condition as well as for telemedicine use, given that this was a suggestion in one of the included studies in this review [46].

In regards to other suggestions for improvement from the included studies, user-friendliness and improving translation and auditory feedback were highlighted [53,54]. While involving a limited number of studies from those included in this review, these observations might indicate the need for a participatory design approach in designing telemedicine services [94]. Fouquet and Miranda's review further concluded that telemedicine design flaws could be circumvented by involving stakeholders, from HCPs to patients, in the design and implementation of such services [95]. As such, improvements to factors such as user-friendliness and auditory feedback could be undertaken by an iterative development approach such as that highlighted in the IDEAS framework [96]. During development cycles, supplemental technologies could be integrated to address identified needs such as translation [54], which is a real-time feature of virtual healthcare company CirrusMD [97]. Other needs identified in the included studies pertained to reducing associated paperwork and data load, resource use and expenses [39,40,43,45,47]. These could, to some extent, be addressed by integrating speech recognition software for automated medical reporting, which have been identified to reduce administrative burden and lower associated costs [98].

Supplemental technologies can also extend beyond software to include hardware. This could address the need for better assessment and monitoring of patients remotely as identified in some of the included studies [38,42,52]. VCs could integrate the use of

wearable devices appropriate for patients' conditions with remote capture of patient data that can be shared to HCPs online [99], which de Farias *et al.'s* review found to improve patient care and treatment effectiveness [100].

In order to better help visualise the identified potentials for supplemental technology assistance during virtual consultations, we summarised and illustrated this scoping review's findings in this regard in Figure 4.

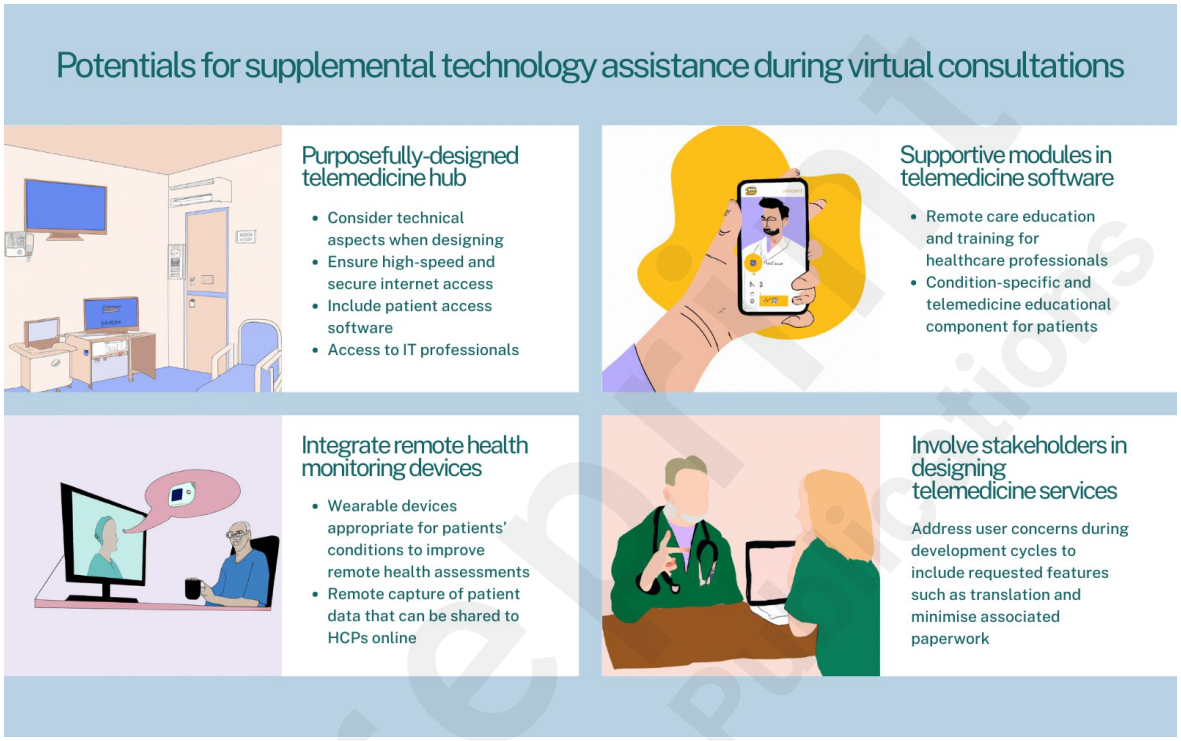

Figure 4: Potentials for technological improvements during virtual consultations with patients with non-malignant chronic conditions. (Individual images were generated with assistance from the generative AI tool Dall-E)

Limitations

There are some limitations to the included studies as well as to the scoping review process that require a measure of caution when generalising the findings. Regarding limitations of the included sources of evidence, while the average participant size was 392, this number was disproportionately affected by one study that included over 5,000 participants [53], which can influence the research findings [101]. Some measure of discretion is advised regarding the generalisability of the findings of health outcomes as only a minority of the included studies included patients through a follow-up period [39,41,43,46] or involved control groups [40,42,44,46,49,50]. Only one of the included studies included both follow-ups and control groups [46]. Despite the difference in study design and scope, including follow-ups and control groups are recommended practices in telemedicine research to gain more comprehensive insights into outcomes [102,103]. As a minority of included studies did not specify the conditions involved [52,53], the results need to be interpreted with a layer of caution.

While we followed recommended guidelines for conducting this scoping review, some limitations persist. Most prominently, the number of included studies can limit the generalisability of the findings. This is due to the filtration process which, for example, excluded studies that did not involve synchronous consultations or studies that did not involve interactions with HCPs; and insights from excluded studies were not considered. However, the inclusion criteria was designed by the research team to adhere to the research aims. In addition, this review considered extracted data and synthesised insights from different chronic conditions and did not consider individual conditions in relation to the review's objectives. Thus, caution is advised when extrapolating the findings to specific conditions.

Conclusion

This scoping review provided important insights into the health outcomes, attitudes and potentials for technological improvements in relation to employing virtual consultations for patients with non-malignant chronic illnesses. Based on the reviewed studies, patients with non-communicable chronic conditions who employ such remote care modalities are mostly patients with COPD or diabetes, although other chronic conditions also employ remote means for providing care. According to our findings, patients with chronic conditions generally experience positive health outcomes that are either directly or indirectly related to their ailment. However, sustained improvements cannot be confidently established due to limited follow-up data and positive health outcomes might depend on the condition, with diabetics mostly experiencing positive outcomes while COPD patients generally did not find added health benefits. Nevertheless, our findings also identified that VCs could be considered as an empowering tool for patients within this demographic to assist them in better managing their condition and treatment regime.

This review indicates a general receptiveness towards virtual consultations based on the positive related attitudes and behaviours when such consultations are an option. Most patients favour the convenience, increased access to care, expert insights and health education that remote care options provide. HCPs tend to be satisfied with the interpretation of patients' conditions remotely; and have an apparent preference for video-based modalities considering the audiovisual feedback and non-verbal cues that they provide.

Potentials for supplemental technological assistance in virtual consultations have also been identified from the included studies. These mostly relate to technical challenges due to inadequate resources and infrastructure; and could be addressed during the planning stages of telemedicine programmes. Telemedicine software could also integrate telehealth education and training modules for HCPs and patients to address the respective challenges they experience. It could further be recommended that the design of telemedicine services adopts a participatory aspect with stakeholders.

However, this review highlights that VCs might not be the most appropriate option for a minority of cases. In relation to remote care, some patients with non-malignant chronic conditions might not experience positive health outcomes, might not find it accessible or might not be satisfied by the modality. A portion of HCPs might hold reservations to

employing telehealth due to diminished sense of job satisfaction and a reduced sense of connection with their patients during VCs. This reinforces the notion that VCs might not represent a “one size fits all” approach and should be better considered as an option that can be tailored based on specific needs rather than a complete replacement of in-person visits.

Nevertheless, considering the general receptiveness and positive health outcomes associated with such modalities, VCs might be considered as viable options to be recommended to patients with non-communicable chronic conditions and their HCPs; with the potential to improve their perception of the modality with supplemental technology.

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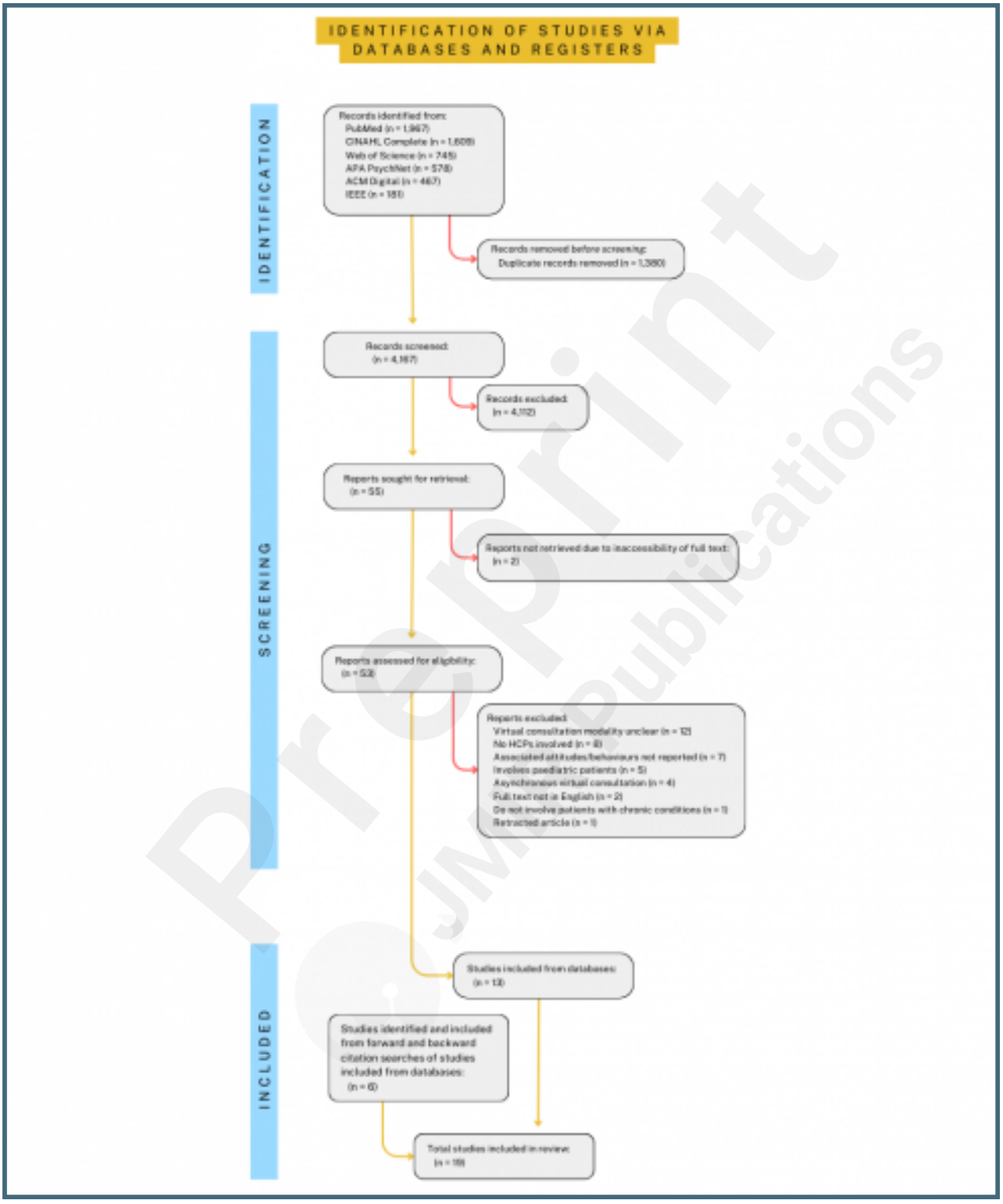
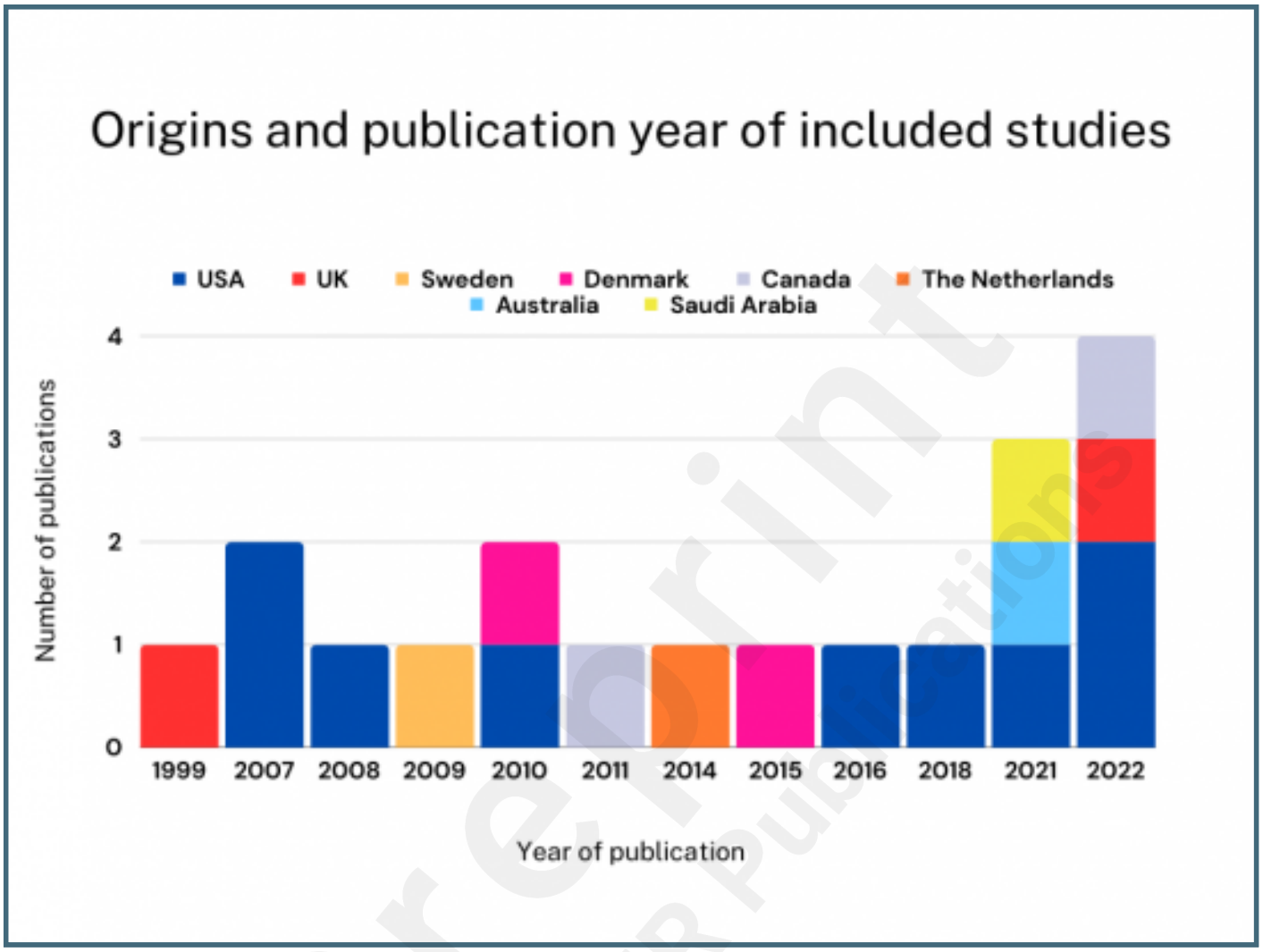
Supplementary Files

Figures

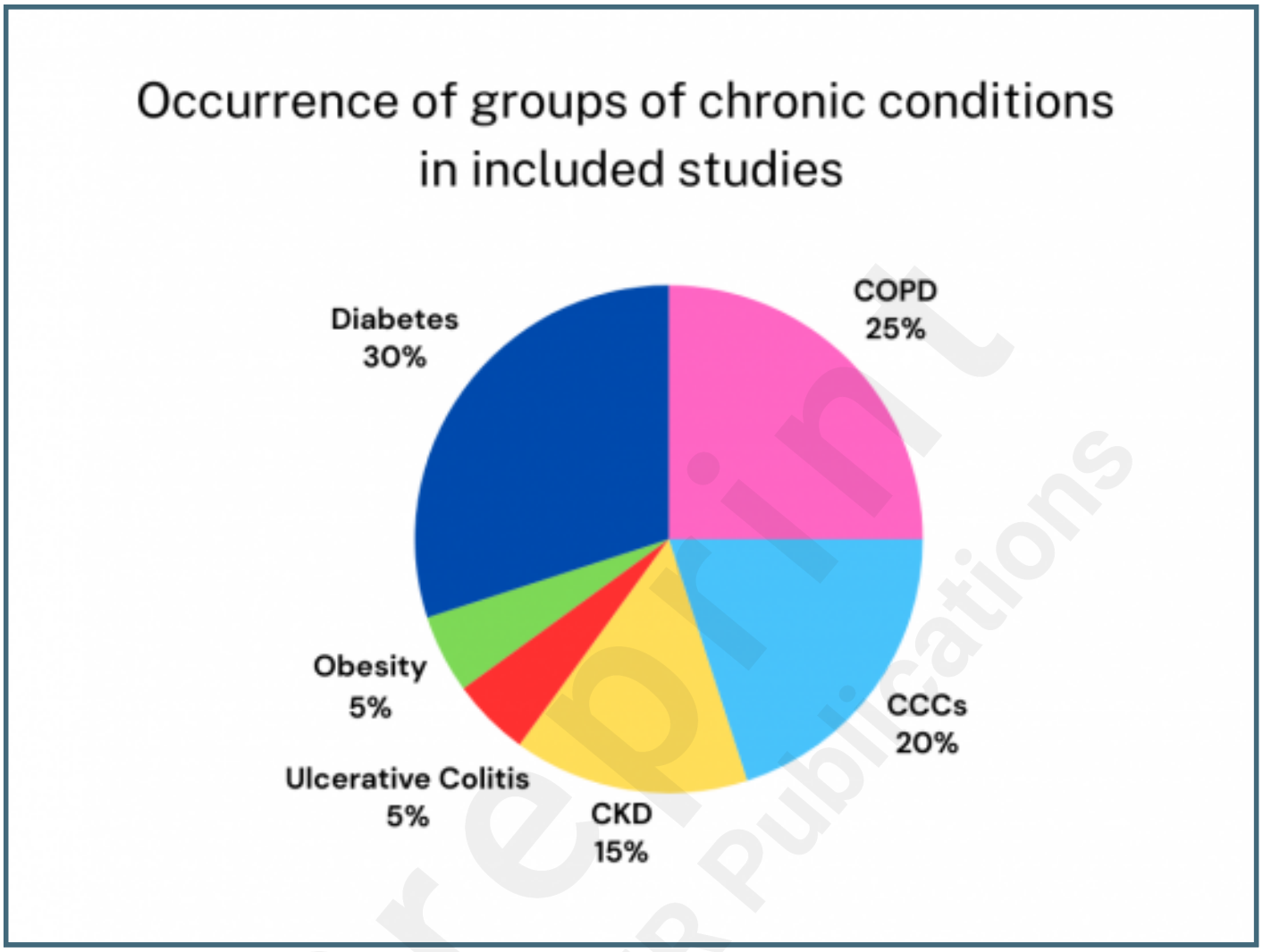
PRISMA 2020 flow diagram. From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ 2021;372:N71. doi: 10.1136/bmj.n71.



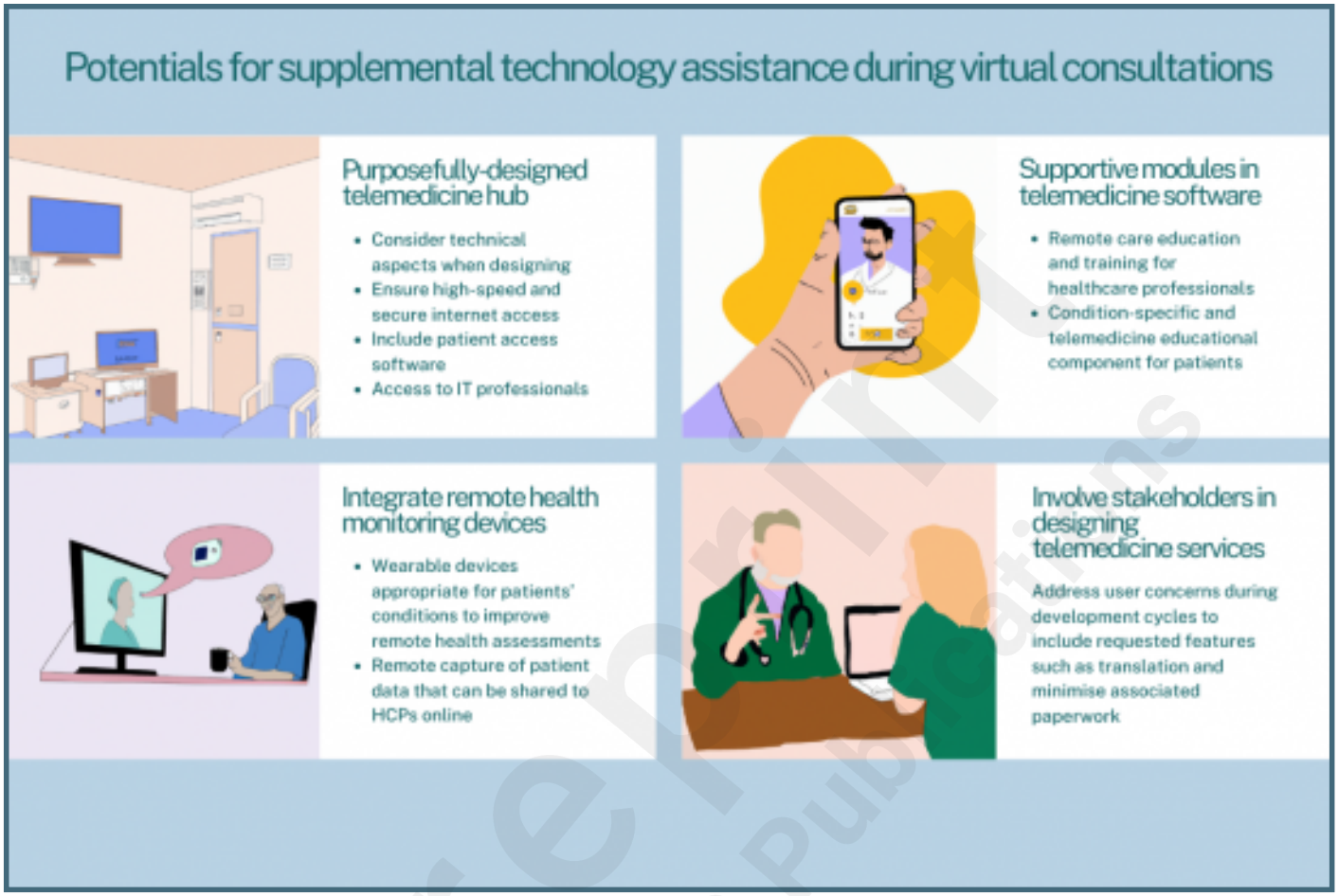
Bar chart of origins and publication year of included studies.



Occurrence of chronic conditions in included studies.



Potentials for technological improvements during virtual consultations with patients with non-malignant chronic conditions. (Individual images were generated with assistance from the generative AI tool Dall-E).



Multimedia Appendixes

Search terms combination used in in CINAHL Complete (via EBSCOhost).
URL: http://asset.jmir.pub/assets/4453ad50ff504d6aef72adaa8ca65fb9.docx

Extracted data from included studies.
URL: http://asset.jmir.pub/assets/0d8e2f041278a1db4ffeb7a351d263d1.docx

CONSORT (or other) checklists

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist for this particular scoping review.
URL: http://asset.jmir.pub/assets/284be2842c380c6b6f0e5b5afdf34eab.pdf