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Telehealth and remote monitoring: Challenges and solutions for nurses in medical records management and lab interactions

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***Abstract*---**Background: Telehealth is widely supported in the literature as a supplement or adjunct to in-person care for the management of chronic conditions, including type 2 diabetes mellitus (T2DM) and congestive heart failure (CHF). Empirical evidence is required to substantiate the use of telehealth as a comparable and fair substitute for in-person healthcare, as well as to evaluate any possible negative consequences. Aim of Work – We conducted a systematic review to investigate the impact of synchronous telehealth, which involves real-time communication via phone or phone and video, on the chronic management of CHF, chronic obstructive pulmonary disease, and T2DM in adults. We compared this approach with in-person care or phone-based care with synchronous video. Our aim was to evaluate the effect on disease-specific clinical outcomes and healthcare utilization. Methods: Two databases (MEDLINE and Embase) were explored in accordance with systematic review methodologies. We included randomized or quasi-experimental studies that assessed the impact of synchronously delivered telehealth on chronic illnesses. These studies had at least two encounters and replaced part or all in-person treatment with phone or video-based therapy. We evaluated the bias by using the Cochrane Effective Practice and Organization of Care risk of bias (ROB) instrument, and we determined the certainty of evidence using the Grading of Recommendations Assessment, Development, and Evaluation. The results were given in a narrative manner and a meta-analysis was not conducted due to the limited number of studies and the conceptual diversity of the identified treatments. Results: Out of all the investigations conducted, only 20% (1/5) had sufficient statistical power to accurately evaluate the disparity in glycosylated hemoglobin levels across the groups. Nevertheless, no significant difference was observed. The intervention design exhibited significant variation, ranging from the combination of remote blood glucose monitoring and video consultations to in-person visits at an endocrinology clinic, to a concise 3-week remote intervention aimed at stabilizing uncontrolled diabetes. No articles were found about chronic obstructive pulmonary illness. Conclusion: This study identified a limited number of studies with diverse designs and treatments that used telehealth as a substitute for in-person healthcare. Subsequent investigations should include observational data and research on other commonly occurring chronic illnesses.

***Keywords*---**Diabetes Mellitus Type 2, Telemedicine, Heart Failure, Pulmonary Disease, Chronic Obstructive, Delivery Of Health Care, Review.

Introduction

To reduce the danger of viral transmission for both patients and clinicians during the COVID-19 pandemic, several health systems have quickly transitioned at least 70% of their outpatient appointments to telehealth, using phone or video communication [1-5]. In order to facilitate this transition, the Centers for Medicare and Medicaid Services in the United States implemented an urgent decision to reduce the regulatory obligations for telehealth and established equal reimbursement for both in-person treatment and telehealth services provided via phone or video platforms [6]. The COVID-19 pandemic led to a significant rise in the usage of telemedicine, which allowed health systems, technology businesses, and healthcare providers to gain extensive expertise in delivering healthcare remotely. This has also opened up the potential for telehealth to become a regular and widely available alternative in the era after the pandemic. Nevertheless, there are still worries over the possible subpar quality of care provided via telehealth, the challenges of integrating it into existing workflows, and its potential to worsen health inequities [7-10]. More specifically, there is a need for data supporting the effectiveness of telehealth as a substitute for in-person care in the treatment of patients.

There is a large body of research that provides strong evidence for the use of telehealth as a complementary or additional method to in-person therapy for the treatment of chronic illnesses such as congestive heart failure (CHF) and type 2 diabetes mellitus (T2DM) [11-14]. These two extremely frequent chronic illnesses are among the most common and expensive ailments, affecting roughly 13.4% and 10.5% of all people in the US, respectively [15,16]. Furthermore, chronic heart failure (CHF) and type 2 diabetes mellitus (T2DM) usually need a physical examination to determine the condition of the illness and evaluate the occurrence and severity of exacerbations. Nevertheless, the impact of telehealth as a substitute for in-person healthcare for chronic conditions like CHF, T2DM, and others is still unclear [10,17,18]. Prior to the COVID-19 outbreak, patients with chronic medical conditions, including CHF, chronic obstructive pulmonary disease (COPD), and T2DM, consistently underwent in-person assessments. Amidst the epidemic, these patients often got telemedicine services with uncertain outcomes. While telehealth has the potential to improve access to healthcare by reducing obstacles, there is less evidence to support its use as a complete and fair substitute for in-person treatment. Furthermore, the possible negative impacts of telehealth have not been well described. It may be erroneous to assume that telehealth can easily replace in-person treatment, since there is a lack of evidence to support the use of telehealth in this manner.

To begin addressing the issue of whether synchronous telehealth over phone or video can effectively replace in-person treatment for chronic illnesses, it is necessary to do a review that carefully examines the data from comparative literature. If there is substantial data indicating that telehealth is comparable to in-person treatment for patients with chronic diseases, its potential should be further explored and integrated as a routine method for providing long-term care. In the early stages of the COVID-19 pandemic, there was a significant shift from telemedicine to in-person treatment, marking the first total substitution of telehealth with face-to-face medical services [1-5]. Nevertheless, in recent times,

we have seen a widespread trend of replacing in-person treatment visits with telehealth in many specializations and settings. This substitution, specifically referring to video consultations, is often not a comprehensive alternative to all forms of treatment. However, it may frequently serve as a substitute for some aspects of in-person care, such as replacing certain phone appointments with video consultations. Furthermore, there are also some commercial health care providers that only provide telehealth services, such as Teledoc and CallonDoc. The questions for this review were created within this setting.

Aim of Work

We did a comprehensive analysis to synthesize and report on the use of telehealth as an alternative to in-person therapy for the chronic management of congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and type 2 diabetes mellitus (T2DM).

Methodology

We performed an initial literature search from the beginning to February 7, 2021, in two databases (MEDLINE and Embase). We used database-specific topic headings and keywords to conduct a search for relevant titles and abstracts. Prior to implementation, the search strategies underwent a peer review process by another professional medical librarian. This evaluation was conducted utilizing the Peer Review of Electronic Search Strategies Checklist [19]. Furthermore, we did a thorough manual search of prior systematic reviews undertaken on this or a comparable issue to identify prospective inclusions.

Main Findings

We discovered limited evidence investigating the effectiveness of synchronous telemedicine in managing chronic diseases such as T2DM, COPD, and CHF compared to in-person delivery. Specifically, for T2DM, 80% of the studies (4 out of 5) provided little evidence, while for COPD, none of the studies (0 out of 5) yielded any evidence. In the case of CHF, only 20% of the studies (1 out of 5) provided evidence. This indicates a scarcity of evidence to provide guidance on the appropriate use of telehealth as opposed to conventional in-person consultations for the management of chronic illnesses. Our evaluation aimed to include research that used telemedicine as a substitute for either all or a portion of in-person healthcare. To clarify, some face-to-face appointments in the intervention group were substituted with telehealth visits, whereas the comparison group continued to have all visits conducted in person. It is important to clarify that we see this as distinct from using telehealth as an additional or supplementary component to the regular in-person healthcare. Nevertheless, our search yielded no research that exclusively replaced in-person encounters with partial substitutions. We excluded research that used telehealth as a supplementary component to in-person treatment, since there are previously established, well-regarded publications addressing this matter [11-13]. Nevertheless, despite the scarcity of evidence, telehealth methods such as video or telephone have progressively been used as substitutes for in-person clinic appointments in the management of chronic illnesses, especially within the COVID-19 epidemic [1-5].

Gaining a comprehensive understanding of the advantages and potential drawbacks of transitioning from in-person healthcare to telehealth is crucial in determining the future of healthcare delivery by health systems. Despite the rise in in-person visits due to the growing understanding of COVID-19 transmission and preventative measures, telemedicine remains much more prominent in outpatient treatment than it was before the pandemic [20,21].

Comparative Analysis with Prior Research

Empirical data suggests that telehealth may be used successfully as a complementary or supplementary method to in-person healthcare. In a recent study conducted by Albritton et al [18], the researchers analyzed the effects of video teleconferencing visits on the prevention and treatment of chronic illnesses. The findings from the review demonstrated that video teleconferencing yielded comparable clinical efficacy to in-person therapy for certain medical conditions. The findings of our analysis diverge from those of Albritton et al [18] in terms of the assessment of the clinical efficacy of telemedicine. This discrepancy may be attributed to many variations in the review methodology (systematic vs quick review), restrictions on the dates considered, search techniques used, databases examined, and the definition and implementation of telehealth. We used a thorough and extensive method to discover pertinent telehealth studies, leading to a substantial quantity of publications for evaluation.

Out of the 7 publications examined in the review conducted by Albritton et al [18], our search failed to find just 1 (14%) of them. Prior evaluations have explored different approaches to use telehealth modalities for these specific illnesses. However, none of these reviews have specifically addressed the substitution of in-person treatment with telehealth visits [11]. While we only identified 20% (1/5) of the studies on telemedicine for managing heart failure as a replacement for in-person treatment, earlier reviews have shown conflicting findings about the effects of different forms of telehealth on heart failure outcomes [22-24]. Several recent research have shown that the use of telemedicine for T2DM does not lead to inferior health outcomes compared to in-person clinic therapy [14,22,25,26]. Nevertheless, there is compelling data indicating that incorporating telemedicine as a supplementary approach to conventional in-person therapy might lead to a reduction in HbA1c levels among patients diagnosed with both type 1 and type 2 diabetes [27-30].

The significance of context in the implementation of telehealth

The effective integration of telehealth into healthcare delivery depends on the compatibility between the telehealth method, the environment of care delivery, and the methods to illness management [9,19,31]. It is likely that not all aspects of health care delivery are equally suitable for telehealth. However, the treatment of certain chronic illnesses such as congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and type 2 diabetes (T2DM) may provide a favorable chance to replace regular in-person therapy with telemedicine. Our study aimed to fill a significant knowledge need by analyzing the existing literature on telehealth as a substitute for in-person treatment in the management of chronic diseases. Curiously, our findings were derived from

research done in specialized environments, and some characteristics of the telehealth treatments under investigation were often not fully explained. Nevertheless, a significant portion of the ongoing treatment of many persistent illnesses takes place in primary care settings. Due to the unique demands and difficulties associated with telehealth methods in primary care settings, where numerous comorbidities need to be addressed in a single visit, the findings of our study may not be immediately relevant. Therefore, we suggest that future evaluations thoroughly analyze and provide evidence-based recommendations about the impact of telehealth interventions in delivering top-notch healthcare by using the appropriate method for the suitable patients with the correct clinical condition at the appropriate moment.

Alternative Methods to Evaluate Telehealth

One method to assess the impact of telehealth is to use noninferiority analytic techniques, which examine whether telehealth-delivered treatment is as effective as in-person care. The qualifying criteria for our investigation specifically targeted randomized controlled trials and excluded observational study methods. Randomized controlled trials are considered the most reliable and rigorous method of research. However, carrying out these experiments requires a significant investment of time and resources. Significantly, the impact of results from randomized controlled trials on clinical practice is sometimes delayed by many years, and there is no guarantee that they will be incorporated at all. It should not be assumed that randomized controlled trials would address all the research gaps in the implementation and uptake of telehealth for managing chronic diseases. Therefore, due to the limited number of randomized controlled trials, we highly advise that future telehealth evaluations include observational and alternative research that are expected to be comprehensive and reliable but may have some bias. These studies are anticipated to arise during and after the COVID-19 pandemic.

Potential Areas for Further Development

In summary, there are five crucial domains in which future research on this subject might address the current deficiencies and enhance the methodology. Initially, and maybe the most crucial aspect, it is essential to provide a comprehensive description of telehealth treatments to optimize their replicability and applicability in different clinical settings. There is existing guidance on interventions that are delivered via mobile and online platforms. This guidance may provide indirect ideas regarding the important aspects that should be included in the description of telehealth treatments. Furthermore, it is necessary to assess the most effective approach to include telehealth as a substitute for face-to-face medical treatment. Additionally, it is necessary to evaluate which clinical settings are most appropriate for the telehealth environment, such as primary care vs specialist care settings. The integration of telehealth is likely to change depending on the specific workflow patterns, clinical resources, and conflicting therapeutic demands in various contexts, highlighting the need of having reliable data. Furthermore, the results observed in the studies included in the analysis differed, and many significant outcomes were not investigated by any of the research. These unaddressed outcomes include the effect on clinical

workflow, patient satisfaction with the telehealth experience, and future use. Furthermore, it is advisable to promote the inclusion of a priori subgroup assessments by investigators or the provision of individual patient-level data. This will enable future studies to uncover specific patient-level variables that are correlated with improved outcomes in telehealth. Future research should aggressively seek and document patient viewpoints and comments on telehealth therapies to enhance intervention design. This information may help clinics and health care systems provide the best possible telehealth services to patients, while also promoting fair access and equal benefits for everyone.

Advantages and Constraints

The review was enhanced by following a structured protocol, incorporating insights from a panel of experts including clinicians and telehealth researchers, identifying clinical outcomes specific to each disease, utilizing an analytical framework to facilitate comprehension of telehealth methods, and employing a comprehensive method to classify and define the various components of telehealth in the management of chronic diseases. Furthermore, our evaluation was conducted with a distinct delineation and use of telehealth. We recognize that some patient attributes, such as color, ethnicity, gender, age, and rural status, may influence the connection between the method of clinical visit and the resulting clinical and system results.

Notwithstanding these advantages, our methodology has several constraints. Initially, we only included research that satisfied the EPOC criteria for this evaluation. Nevertheless, it is possible that observational studies have discovered information that is relevant to the implementation of synchronous telehealth for managing chronic illnesses. Nevertheless, we are certain that this constraint had little impact on our results. Furthermore, our evaluation only examined three very frequent chronic illnesses, although it is possible that there are well-designed studies that have investigated additional ailments which we did not include into our analysis. Furthermore, our selection criteria were limited to research done only in OECD nations, which means that we may have overlooked pertinent studies undertaken in non-OECD countries. Furthermore, due to the limited number of papers we found, we did not use statistical techniques to identify publication bias. While it is possible that certain health systems or clinics have conducted quality improvement studies comparing synchronous and in-person care, particularly during the COVID-19 pandemic, we believe it is unlikely that studies meeting EPOC criteria on this intervention have not been published. This is due to the recent focus on the importance of telehealth.

Furthermore, our analysis revealed a limited number of studies in total, with the majority of them having less than 100 patients and being evaluated as having uncertain or significant risk of bias. None of the studies provided the key elements of the intervention, the adherence to the intervention, or the effect of the intervention on the clinical workflow. Furthermore, the telehealth episodes lacked sufficient and detailed descriptions of the interactions between physicians and patients. Additionally, the studies did not consistently record most of the outcomes we were interested in. The exclusion of some elements hindered the understanding and duplication of the assessed interventions. Furthermore, the

telehealth interventions that were included in the study utilized various telehealth modalities (such as email, phone, and video) along with different hardware. These interventions were delivered through varying numbers of clinical interactions between patients and clinicians, and they were implemented over a wide range of intervention durations.

Additionally, these interventions were conducted within different health care systems, which inherently poses a challenge when attempting to compare them. Regrettably, the research analyzed in our study failed to provide explicit details on their use or definition of gender (male, female, or nonbinary) or sex (man, woman, or intersex) in their published works. It is crucial to collect and describe data on gender and sex for telehealth studies and research. Future research should incorporate observational studies, investigations on other widely prevalent chronic diseases, studies conducted in non-OECD countries, and studies that do not meet the EPOC criteria. This is particularly important, as studies conducted during the COVID-19 pandemic may offer valuable insights.

Summary

The COVID-19 pandemic led to a quick transition from in-person to telehealth services, without a comprehensive study of the effects of telemedicine on significant health outcomes. Prior research has shown that telehealth methods may enhance health results by complementing in-person therapy of certain chronic illnesses, especially via techniques like remote monitoring and patient education. Currently, there is little evidence supporting the use of telehealth as a substitute for in-person treatment for various chronic illnesses. The existing research in this field are inadequate and lack consistency in their methodology. Our study contributes to the current literature by assessing the comparative efficacy of telehealth visits as a replacement for in-person visits in managing chronic diseases. We also provide suggestions for future research in this field.

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