

Article Review

***Telehealth Usage During The Coronavirus Disease 2019 Pandemic:  
A Meta-Analysis***

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**ABSTRACT**

*The recent pandemic has increased telemedicine use tremendously, but it has also pronounced access gaps to telemedicine. This study aimed to investigate factors affecting patient use of telehealth during the Coronavirus Disease 2019 Pandemic. This article was created using a systematic review and meta-analysis study that searched for articles in electronic databases such as Science Direct, PubMed, and Google Scholar. Observational studies are included in full papers with a publication year until 2022 were searched for this study. The Review Manager 5.3 (RevMan) software was used to analyze the articles in this study. We observed heterogeneity with a random-effect model to analyze the effect size from each primary study, and the results were reported as an adjusted odds ratio (aOR) and corresponding 95 percent confidence interval (CI). A total of 9 articles reviewed in the meta-analysis (consisting of 4 articles in each variable) showed that patients whose primary language is non-English (aOR= 0.72; 95% CI= 0.59 to 0.87; p= 0.0008) and have Medicaid insurance English (aOR= 0.86; 95% CI= 0.77 to 0.97; p= 0.02) were less likely to use telemedicine compared to patients who speak English and utilize private insurance. Medication insurance and non-English as a preferred language reduced the likelihood of patients using telemedicine.*

**Keywords:** Telemedicine, Telehealth, Patient Use, Determinants, Predictors, Coronavirus-2019

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## INTRODUCTION

The COVID-19 pandemic raised awareness of telemedicine among the general public to deliver safe, efficient medical care without the risks connected with in-person interaction<sup>1,2,3</sup>. The use of telemedicine is one of the technological breakthroughs in the field of medicine to improve quality health services. Telemedicine can be used to communicate patient needs regarding consultation on his condition to the doctor on conditions in which the patient cannot access health facilities. The use of telemedicine during the pandemic could increase investigations of epidemiology, disease control, and patient case management, asymptomatic or symptomatic. Through the use of telemedicine, patients with mild disease symptoms receive supportive care needed without needing to interact with other potential patients to exacerbate the condition. The provision of health care services through the interchange of trustworthy information for the diagnosis, treatment, and prevention of disease and injury is what the World Health Organization refers to as "telemedicine"<sup>4,5,6,7</sup>.

In the past ten years, telemedicine initiatives and digital health care visits have been investigated and adopted more frequently to increase patient access to care and lessen inequities in health care access<sup>8,9</sup>. Telemedicine as a form of digital health transformation is considered to be the answer to various problems faced in health services. The fear of transmitting the virus made online doctor appointments an option. This will continue to be the case post-pandemic, given the convenience and ability to serve patients even in remote locations. Digitalization will be a fine balancer in

healthcare. This will reduce doctors' hours of work, reduce the number of patients required to be hospitalized and provide access to essential health care information and diagnostic tools for rich and poor, urban and rural dwellers alike, in a safe, more affordable and sustainable manner<sup>10,11</sup>.

As outpatient telemedicine delivery became more common after May 2020, some research has looked into telemedicine utilization patterns. Existing research has also discovered associations between age in older, other races, and preference for a language other than English, together with lower telemedicine use<sup>12</sup>. Some have pointed out healthcare inequalities and rural populations' access to technology, which may put them at risk of lower telemedicine adoption<sup>13</sup>. Several studies have found that Black, Latinx, non-English speaking, older, and Medicare or Medicaid patients are less likely to use telemedicine<sup>14-16</sup>. The recent pandemic has increased telemedicine use tremendously<sup>17</sup>, but it has also pronounced access gaps to telemedicine more. This study aims to investigate more factors influencing telemedicine utilization concluded in a systematic review and further analysis.

## METHOD

### Data sources and search strategy

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed for this systematic review and meta-analysis<sup>18</sup>. From their inception to the 31st of July 2022, only English-language-based literature was used in the search term for an electronic search of Google Scholar, PubMed/Medline, and Science-Direct: "telemedicine OR telehealth AND patients use AND factors

OR determinants OR predictors AND COVID-19 OR coronavirus 2019". In addition, we manually searched the cited articles of prior meta-analyses and review articles for any pertinent studies.

### Study selection

The following eligibility requirements were satisfied by all studies to be included: (a) articles about the factors affecting patients use of telemedicine; (b) independent variables influencing patients use of telemedicine including having medicaid insurance and patients use non-English language as the preferred language; (c) associations measured by an adjusted odds ratio; and (d) respondents were general patients with variety of disease. Additionally, PECOS was used as the research strategy: 1) P (population): general patients; 2) E (exposure): medicaid/public insurance and patients use non-English language as the preferred language; 3) C (control): private insurance and patients use English

language as the preferred language; 4) O (outcome): telemedicine use (telephone only, video only, or both); 5) S (Studies): observational studies that were only released in English. Studies that did not fulfill the inclusion criteria were excluded, along with case reports, case series, literature reviews, editorials, human-based randomized controlled trials, and further studies.

### Data extraction and quality assessment of studies

The electronic databases were searched independently by two reviewers. After the studies were exported to Mendeley Desktop 1.19.8, duplicates were screened and removed. Two reviewers worked simultaneously and independently to extract data and assess the quality of included studies. The Critical Appraisal Skills Program (CASP) was used to assess the quality of the cohort. Score two means Yes; one is maybe, and 0 is no (Table 1 contains scoring information).

**Table 1. Quality Assessment by Critical Appraisal Skills Program (CASP)**

No	Assessment Indicator	Study (Author and year)								
		Chen et al., (2020)	Darrat et al., (2021)	Duan et al., (2022)	Eberly et al., (2020)	Eruchalu et al., (2022)	Haynes et al., (2021)	Javier-DesLoges et al., (2022)	Lattimore et al., (2021)	Xiong et al., (2021)
1.	Does this research address a clearly focused problem?	2	2	2	2	2	2	2	2	2
2.	Was the group recruited in an acceptable way?	2	2	2	2	2	2	2	2	2
3.	Is exposure accurately measured to minimize bias?	2	2	2	2	2	2	2	2	2
4.	Was the outcome	2	2	2	2	2	2	2	2	2

	accurately measured to minimize bias?									
5.	Did the author identify all the important confounding factors? Has the author taken into account confounding factors in the design and/or analysis?	2	2	2	2	2	2	2	2	2
6.	Was the follow-up subject complete enough? Was the follow-up of the subject long enough?	2	2	2	2	2	2	2	2	2
7.	Are the results of this study reported in aOR?	2	2	2	2	2	2	2	2	2
8.	is the result precise?	2	2	2	2	2	2	2	2	2
9.	Are the results reliable?									
10	Can the results be applied to the local population?	2	2	2	2	2	2	2	2	2
11	Are the results of this study consistent with other available evidence?	2	2	2	2	2	2	2	2	2
12	Does the implications of this research for suitable for practice?	2	2	2	2	2	2	2	2	2
<b>Total Score</b>		<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>

### Statistical analysis

Review Manager (v. 5.3. The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, 2014) was used for all statistical analyses. A

random-effects model was used to pool the data from the studies. The adjusted odds ratio (aOR) with respective 95% confidence intervals was used to analyze

the results (CI). According to Higgins et al., the heterogeneity scale was as follows:  $I^2 = 25-60\%$  - moderate,  $50-90\%$  - substantial,  $75-100\%$  - considerable, and  $p < 0.1$  – significant heterogeneity. For all analyses, a  $p < 0.05$  was considered significant.

initial search brought up 4051 possible research. The entire texts of 56 studies were evaluated for potential inclusion after exclusions based on titles and abstracts. There were still 9 studies<sup>19-28</sup> available for quantitative analysis. The findings of our literature search are summarized in Figure 1.

## RESULTS

### Literature search results

The three electronic databases'

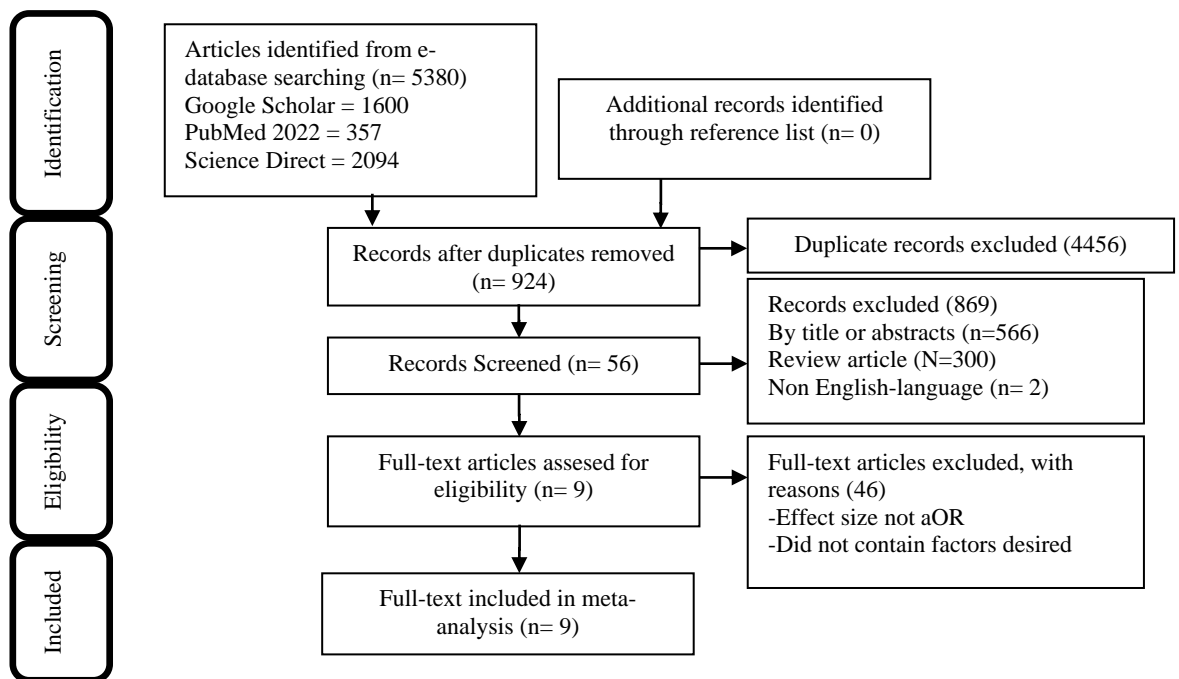


Figure 1. PRISMA flow diagram

### Study characteristics

The fundamental attributes of the included research are shown in Table 2. Ten published studies were considered in our analysis. Each one was a cohort study. 129,867 patients in all took part in this investigation. All studies were from

United States of America. Eight and nine studies examined the association between medicaid/ public insurance and patients using non-English as the preferred language and telemedicine-use, respectively.

**Table 2. Basic characteristics of selected studies**

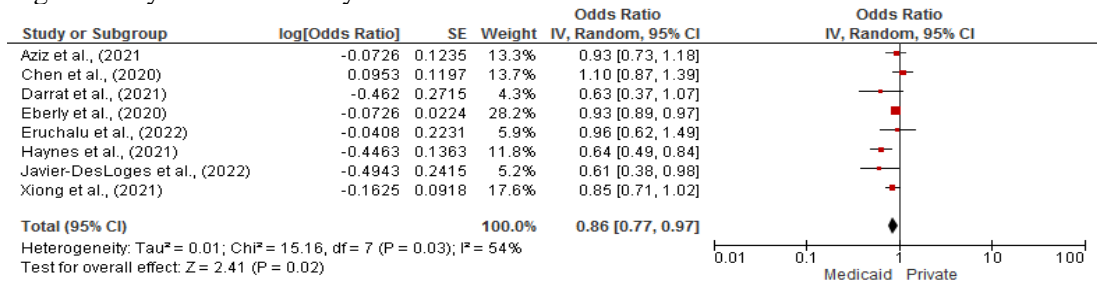
No	Author (year)	Country	Study Design	Duration of follow up	Sample	Intervention	Control	Factors affecting telemedicine (aOR (CI 95%))
1.	Chen et al., (2020)	USA	Cohort	March 1 to August 31, 2020	5023	Telemedicine visit	In-person visit	Non-English 0.71 (0.50-0.98) Medicaid insurance 1.10 (0.87-1.37)
2.	Darrat et al., (2021)	USA	Cohort	March 17 to May 1, 2020	1162	Telemedicine visit	In-person visit	Medicaid insurance 0.63 (0.37-1.07)
3.	Duan et al., (2022)	USA	Cohort	June 1, 2019 to January 22, 2021	1444	Telemedicine visit	In-person visit	Non-English 0.28 (0.08-0.95)
4.	Eberly et al., (2020)	USA	Cohort	March 16 to May 11, 2020	80,780	Telemedicine visit	In-person visit	Non-English 0.84 (0.78-0.90) Medicaid insurance 0.93 (0.89-0.97)
5.	Eruchalu et al., (2022)	USA	Cohort	March 24 to June 23, 2020	985	Telemedicine visit	In-person visit	Non-English 0.96 (0.62-1.48) Medicaid insurance 0.96 (0.71-1.28)
6.	Haynes et al., (2021)	USA	Cohort	March 19 to June 30, 2020	1292	Telemedicine visit	In-person visit	Non-English 0.53 (0.31-0.91) Public Insurance 0.64 (0.49-0.84)
7.	Javier-DesLoges et al., (2022)	USA	Cohort	March 15 to September 30, 2020	4234	Telemedicine visit	In-person visit	Non-English 0.92 (0.63-1.35) Medicaid insurance 0.61 (0.38-0.97)
8.	Lattimore et al.,	USA	Cohort	July 1, 2019 to	21,980	Telemedicine visit	In-person	Non-English 1.22 (0.48-862)

	(2021)			May 31, 2020			visit	3.10)
9.	Xiong et al., (2021)	USA	Cohort	March 24 to May 18, 2020	11,056	Telemedicine visit	In-person visit	Non-English insurance 0.34 (0.18-0.65) Medicaid insurance 0.85 (0.71-1.02)

### Results of the meta-analysis

A detailed forest plot of eight studies were used to analyze the association between medicaid insurance and telemedicine use. The random analysis of pooled aOR suggests that patients with medicaid insurance were significantly less likely to use

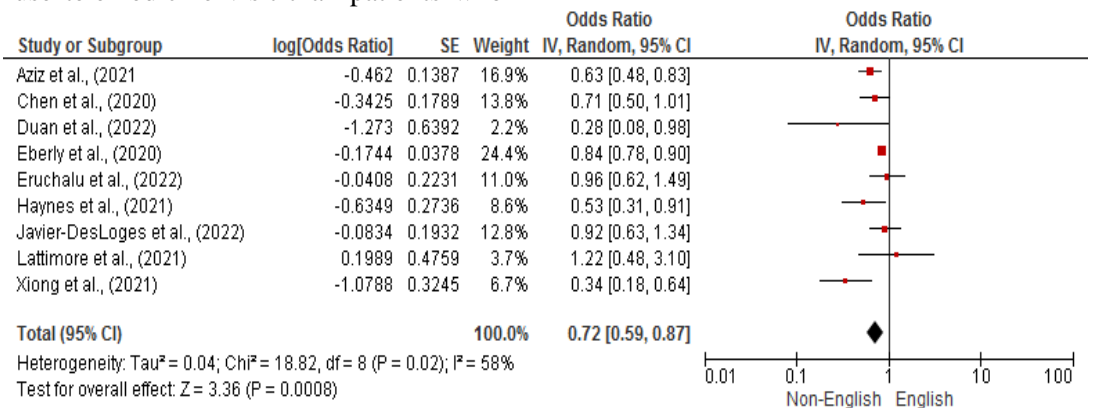
telemedicine visit than patients with private insurance (aOR= 0.86; 95% CI= 0.77 to 0.97; p= 0.02). The heterogeneity ( $I^2$ ) showed a moderate category with a value of 54% and it was significant p= 0.03 (Figure 2).



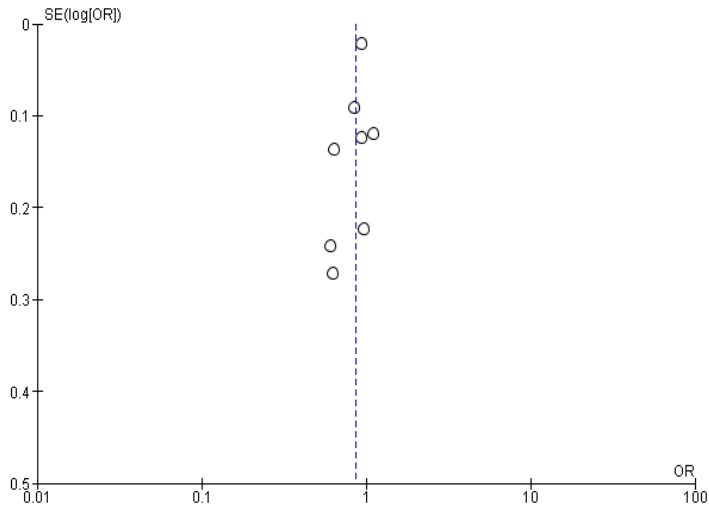
**Figure 2. Forest plot showing association between medicaid insurance and telemedicine use**

The random analysis of pooled aOR from 9 studies suggests patients with non-English as their preferred language were significantly less likely to use telemedicine visit than patients who

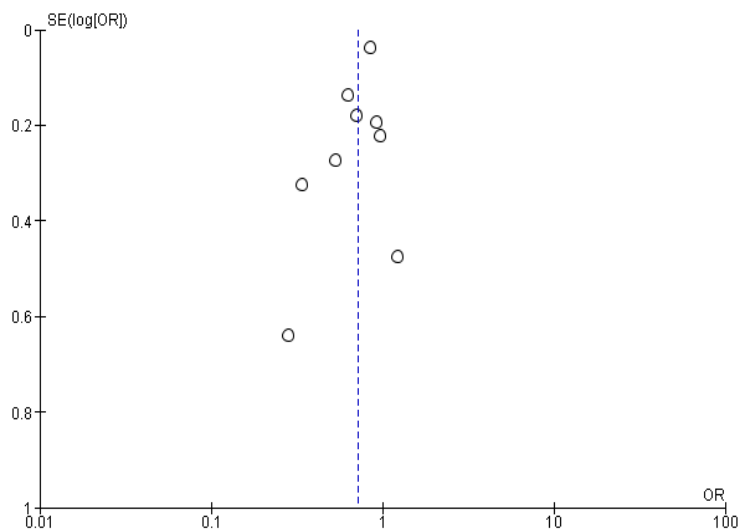
speaks English (aOR= 0.72; 95% CI= 0.59 to 0.87; p= 0.0008). The  $I^2$  showed a moderate category with a value of 58% and was significant (p= 0.02) (Figure 3).



**Figure 3. Forest plot showing association between non-English as patients' language and telemedicine use**



**Figure 4. Funnel plot showing the association between Medicaid insurance and telemedicine use**



**Figure 5. Funnel plot the association between non-English as patients' language and telemedicine use**

**Publication bias and quality assessment**

We use a funnel plot to assess publication bias. The bullets were representing each of the primary studies that are a part of the meta-analysis. Both

funnel plots showed no biased publication and underestimate effects based on a bullet leaning at the left side of the middle line. All the studies showed an excellent qualified article based on the total score described in Table 1.



## DISCUSSION

The COVID-19 pandemic has made it difficult for healthcare systems to provide adequate patient care<sup>29,30,31,32</sup>. To meet this demand, telemedicine practices have expanded across the country and around the world. Health providers must understand and identify gaps in this approach to reduce the risk and consequences of suboptimal care. Use of telemedicine can help the general public to accessing health services. Patient can consult a doctor related to the illness he experienced telemedicine without needing to go to the hospital, so that the patient can travel time to health services. Effectiveness telemedicine also impacts necessary medical financing in terms of transportation to patient visits, home visit practice by doctor or hospitalization which was not planned. Telemedicine can help solve the problem of medical practice on a regional scale area, where is the distance between the patient to impact health services health care costs and outcomes patient's illness. The impact of telemedicine will improve patient satisfaction for access health services and improve health conditions patient<sup>33,34</sup>. During the COVID-19 pandemic, telemedicine helps with patient care chronic as patients with immunocompromise, cancer, diabetes mellitus and hypertension. Use telemedicine in disease care chronic easy to control treatment of patients so that it is beneficial on the decline in the number of visits to hospital and arrival to the emergency department emergency. Telemedicine can support patient self-management start setting and the role of medication, lifestyle modification as well as the patient's emotional regulation effectively to improve quality patient outcomes. Through use the telemedicine,

the patient with chronic diseases can be avoided from infection COVID-19 and risk increasing patient's risk of death<sup>35,36</sup>.

In this review, we sought to identify the factors affecting patients' preference for telemedicine services compared to in-person visits. The results of our study disparities in insurance and non-English speaking in the utilization of telemedicine visits during the COVID-19 pandemic. Medicaid insurance is associated with lower utilization of telemedicine among patients in the general population. It was supported by Ruberto et al., (2022) based on multiple logistic regression mode analysis stated that non-commercial insurance were linked to lower telemedicine utilization (aOR 0.510 CI 95% (0.465-0.559)<sup>37</sup>. Government assistance is provided through Medicaid. It supports persons with low incomes of all ages. Most of the time, patients are not accountable for any costs connected with reimbursed services. Sometimes there is a small co-payment required. Federal and state governments collaborate on Medicaid. It differs from state to state. State and municipal governments manage it following federal regulations. To see if you qualify for your state's Medicaid (or Children's Health Insurance) program<sup>38</sup>. A study by Hsiao et al. (2021) also suggested that telemedicine visits were positively associated with getting older, having Medicaid or Medicare as a payer, and having the patient portal activated<sup>39</sup>.

Patients who do not speak English use telemedicine at a lower rate than patients who use English as a first language in the general population. This was similar to the results of the study by Reed et al., (2020) based on the effect size, patients with a known preference for a language other than English were noticeably less likely to select either type

of telemedicine than English speakers. The relative risk ratio (RRR) for English speakers on telemedicine visits is 1.18 and 1.15 compared to in-person clinic visits, respectively <sup>40</sup>.

## CONCLUSION

This is the first review paper, as far as we are aware that looked into the factors that influence patients' telemedicine visits versus in-person visits. The meta-analysis found that having Medicaid insurance and not speaking English decreased the likelihood of patients using telemedicine. Using predetermined criteria, the two researchers separately determined whether the identified studies were eligible and thoroughly evaluated the caliber of those studies. The factors that must be considered when developing health promotion activities were highlighted in this study. Health literacy, counseling, and education programs are also required in clinical and community settings. Future research should concentrate on refining the analysis by subspecialty services and delving deeper into utilization patterns. More research is needed to quantify the effects on health outcomes and costs.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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