

## Effectiveness of Telemedicine on Patient Satisfaction: Meta Analysis

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### ABSTRACT

**Background:** Patient satisfaction is one indicator in the success of a treatment in the health sector. There are several ways to make this happen, including by simplifying the process of consultation, treatment and medication. Effectiveness in health services is very important. Telemedicine is a way offered to increase effectiveness in health services.

**Subjects and Method:** Meta analysis was performed with PICO as follows: The population in this study were patients. Health service intervention is in the form of telemedicine. Comparison in the form of Non Telemedicine/visit services. Outcome in the form of patient satisfaction. The meta-analysis study was applied to this study with electronic data sources: Clinical Key, Google Scholar, MEDLINE/PubMed, Science Direct, Scopus. The article used is a full-text article with a randomized control trial (RCT) study design. There were 8 articles used in this study with a sample size of 2123 people who were divided into two groups (1113 people in the telemedicine group and 1010 people in the control/ non telemedicine group). Articles were analyzed using the

Review Manager 5.3 application. The results of this study aim to determine the Standardized Mean Difference (SMD) and the heterogeneity of the research sample.

**Results:** There is high heterogeneity between one experiment and another ( $I^2 = 81\%$ ;  $P < 0.0001$ ) so that the Random Effect Model (REM) is used. The application of Telemedicine was able to increase patient satisfaction with Standardized Mean Different (SMD) of 0.41 compared to the control/ non-telemedicine group (SMD 0.41; 95% CI= 0.19 to -0.62;  $p = 0.0002$ ).

**Conclusion:** Providing telemedicine services was able to increase patient satisfaction with Standardized Mean Different (SMD) of 0.41 compared to non-telemedicine.

**Keywords:** Telemedicine, patient satisfaction

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### BACKGROUND

The term telemedicine is not very specific. The World Health Organization defined telemedicine in 1997, as “the delivery of health care services, where distance is an important factor, by all health care professionals who use information communication technology for the exchange of valid information for the diagnosis, treatment and prevention of disease and injury,

research and evaluation, and to continue the education of health care providers, all in the interest of advancing the health of individuals and their communities ”(WHO, 1997).

With the increasing use of technology in healthcare, telehealth is highly emphasized as it can extend service providers to long-distance locations and take advantage of the availability of subject matter experts

and overcome proximity barriers. Telehealth expands access, and has the potential to make healthcare more comfortable for patients, especially in rural areas, those with young children (child care) and those with reduced mobility (Muller et al, 2016).

Patient satisfaction is a growing concern in all aspects of health, and as a voice of the customer, it is a quality measure published in the USA through the Health Effectiveness Data and Information Set, and can be attributed to reimbursement from Medicare and Medicaid Centers through the Hospital Consumer Assessment Provider results and Health Care Systems, such as traditional modalities of health service delivery. Telehealth relies heavily on patient satisfaction reports because patients are the only source of information that can report how they were treated and whether the treatment received met patient care expectations (Kruse et al, 2017).

The widespread use of telemedicine in clinical practice and limited evidence to recommend the use of information and communication technology in headache management justifies randomized trials. In fact, telemedicine can help combat misdiagnosis, delay and treatment of sub-optimal headaches, but we need to ensure that new technologies follow diagnostic quality and good clinical practice (Muller et al, 2016).

## SUBJECTS AND METHOD

### A. Study Design

This research is a systematic review and meta-analysis using literature from various electronic databases including: Clinical Key, Google Scholar, MEDLINE / PubMed, ProQuest, Science Direct, Scopus, and Springer Link. The literature search was carried out using the following keywords: "telemedicine", "patient satisfaction", "ran-

domized controlled trial", "telemedicine for patient satisfaction", "patient satisfaction randomized controlled trial", "telemedicine randomized controlled trial", "telehealth", "Telemedicine and visit", "non-telemedicine".

### B. Inclusion Criteria

- 1) The article used is a full paper article
- 2) The article has an appropriate title and relates to the use of telemedicine on patient satisfaction.
- 3) Articles published in English and / or Indonesian
- 4) The article uses a Randomized Controlled Trial (RCT) study design
- 5) Include the results of the study in the form of the number of respondents, the mean value and the value of standard deviation (SD)
- 6) The research subjects were patients in health care
- 7) Intervention on research subjects in the form of telemedicine
- 8) The intervention in the control group was in the form of non telemedicine

### C. Exclusion Criteria

- 1) Not a full paper article
- 2) Articles that use quasi-experimental study design, protocol study, plot study, cohort, case control and cross-sectional study.
- 3) Articles use languages other than English and Indonesian
- 4) The research subjects were animals

### D. Operational Definition of Variables

**Telemedicine** is a medical practice using audio, visual and data communication, including treatment, diagnosis, consultation and treatment as well as medical data exchange and remote scientific discussions. Based on the above understanding, we can understand that the scope of telemedicine is quite broad, including the provision of long-distance health services (including clinical, educational and administrative

services), through the transfer of information (audio, video, graphics), using telecommunication devices (audio- two-way interactive video, computer and telemetry) involving doctors, patients and others.

**Non telemedicine/visit** is a health service that allows patients to consult a doctor or other health worker by meeting in person

**Satisfaction** is the result of an assessment in the form of an emotional response (feelings of pleasure and satisfaction) to the patient due to the fulfillment of expectations or desires in using and receiving nurse services.

**E. Instruments**

Published articles obtained from various appropriate electronic journal databases include: Clinical Key, Google Scholar, MEDLINE/PubMed, Science Direct, Scopus. This research was conducted by searching and selecting the results of research on various races, ethnicities and locations in the world.

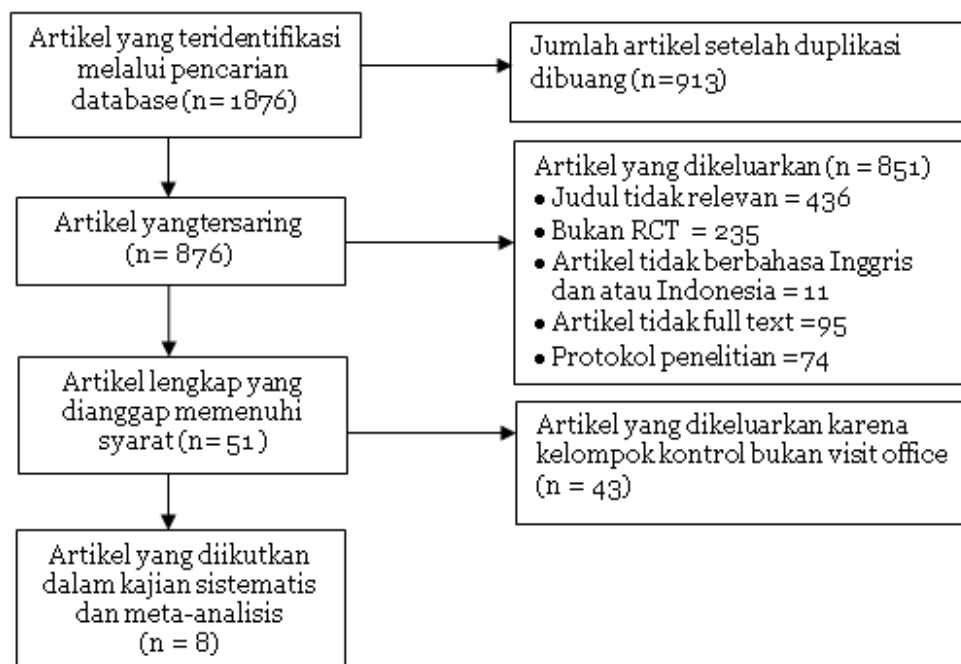
**F. Data Analysis**

This study was conducted using secondary data in the form of data from previous research results and data processing was carried out using the Review Manager (RevMan 5.3).

**RESULTS**

After the checking process was carried out, 913 of the same articles were found, so that the double articles were deleted. Therefore, there are a number of 876 articles that have been filtered. Of the 876 articles, 851 articles were excluded because they did not meet the inclusion criteria. Screening was done once again of the 51 existing articles, there were 43 articles that were not suitable because they did not meet the inclusion criteria.

There are 8 articles which are the final results of article selection that are included in the systematic review and meta-analysis process.



**Figure 1. Flow Chart of Article Review Process**

**Table 1. PICO (Population, Intervention, Comparison and Outcome) of each study**

<b>Author</b>	<b>P (Population)</b>	<b>I (Intervention)</b>	<b>C (Comparison)</b>	<b>O (Outcome)</b>
Hwang et al (2017)	Patients with heart failure (n= 54)	Telemedicine with video on software	Traditional outpatient / visit office.	Average value of the patient satisfaction questionnaire
Buvik et al (2018)	Orthopedic patients (n = 389)	telemedicine (remote consultation)	Clink standard visit service	Patient-complete questionnaire or a three-level Euro-pean five-dimensi-onal quality of life index (EQ-5D-3L)
Ruiz et al (2019)	Patients with Type 1 DM (n = 379)	PLATEDIAN (Telemedicine on Metabolic Control in Type 1 DM Andalusian Patients)	Direct daily injection service	Average value of the patient satisfaction questionnaire
Vonstorc et al (2019)	Patients with Type 2 DM (n = 115)	tablet computer, glucometer, and step counter	Standard clinic care	Average value of the patient satisfaction questionnaire
Richter et al (2015)	Counseling patients stop smoking (n = 566)	Skype-like video counseling	Face-to-face trained counselors	Value of the patient satisfaction questionnaire
Kravitz et al (2018)	Patients with musculoskeletal pain (n = 215)	MHealth support n-of-1 intervention	Regular service	Standard patient satisfaction questionnaire
Sood et al (2017)	DM patients (n = 282)	Telemedicine consultation	Standard service	Patient satisfaction service scoring
Moffet et al (2017)	Patients after Total Knee Arthroplasty (n = 180)	Home Telereha-bilitation After Total Knee Arthroplasty	Regular service	Patient satisfaction using the Satisfac-tion Questionnaire (HCSQ) at E4

There were 8 randomized controlled trial (RCT) studies as a source of systematic review and meta-analysis of the effectiveness of telemedicine on patient satisfaction in this study. An overview of the PICO (Population, Intervention, Comparison, Outcome) of 8 articles used in the systematic study and meta-analysis in this study can be seen in table 1.

Interpretation of the results of the meta-analysis of the 8 primary research articles in this study can be seen in the

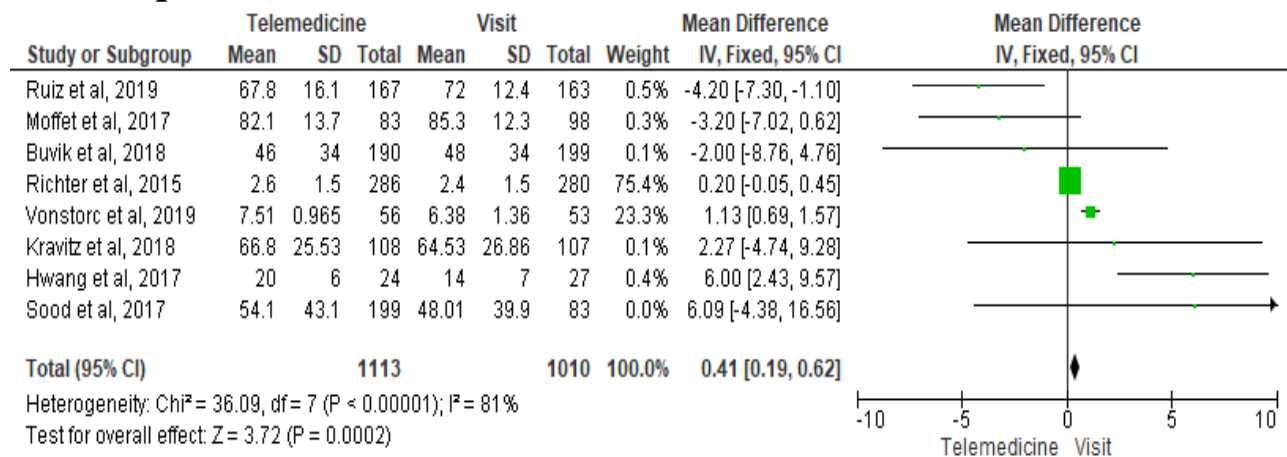
forest plot image (Figure 2). Based on the results of the analysis using RevMan 5.3 software, it is known that there is high heterogeneity between one experiment and another ( $I^2= 81\%$ ;  $P<0.0001$ ) so that the Random Effect Model (REM) is used. The provision of telemedicine services was able to increase the score of patient satisfaction with Standardized Mean Different (SMD) by 0.41 compared to without telemedicine (SMD= 0.41; 95% CI= 0.19 to 0.62;  $p= 0.0002$ ).

**Table 2. Research Quality Assessment (Critical Appraisal)**

Items	Author (year)							
	Hwang et al (2017)	Buvik et al (2018)	Ruiz et al (2019)	Vonstore et al (2019)	Richter et al, (2015)	Kravitz et al (2018)	Sood et al (2017)	Moffet et al (2017)
Relevance of goals and problems	1	1	1	1	1	1	1	1
Relevance of methods and problems	1	1	1	1	1	1	1	1
Sample adequacy	1	1	1	1	1	1	1	1
Sample validation	1	1	1	1	1	1	1	1
Comparable Cases and Controls	1	1	1	1	1	1	1	1
There is no bias	1	0	1	1	1	1	1	0
Information data tracking	1	1	1	1	1	1	1	1
Analysis of relevant and valid data	1	1	1	1	1	1	1	1
Relevance Effect Size	1	1	1	1	1	1	1	1
95% CI reporting	1	1	1	1	1	1	1	1
Reported confounding factor	1	1	1	0	1	1	1	1
Results can be applied	1	1	1	1	1	1	1	1
<b>Total</b>	<b>12</b>	<b>11</b>	<b>12</b>	<b>11</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>11</b>

Note:  
Yes = 1  
No = 0

**a. Forest plot**

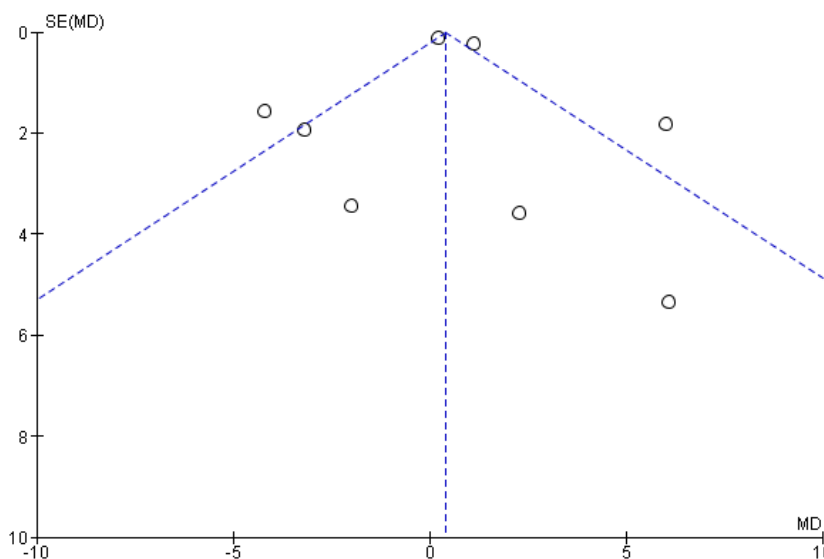


**Figure 2. Forest Plot**

A funnel plot is a plot that depicts the effect size of each study on the estimate of its accuracy which is usually the standard error. The interpretation of the funnel plot results shows that there is no publication bias, indicated by: 1. The plot is symmetrical on the right and left sides, 2. The distance between the plots is balanced, 3. The SE value  $< 0.5$ .

**b. Forest plot**

The funnel plot image in this study shows that there is no publication bias. This is indicated by the symmetry of the right and left sides of the plot. On the right side there are 4 circles and on the left there are 4 circles. The standard error on the right is between 0 and 2 and the standard error on the left lies between 0 and 6.



**Figure 3. Funnel Plot**

**DISCUSSION**

Telemedicine can be more simply defined as the application of information and communication technology to provide health care services remotely without the need for direct contact with patients (Siegel, 2017). This study shows that telemedicine can be more effective than direct visits to health facilities

Telemedicine is already widely used in medicine. When telemedicine was evaluated in 2012, nearly half of US hospitals were found to have an active program. The impetus for this expansion is partly to keep up with the times, but telemedicine is also uniquely positioned to address rising healthcare costs, a focus on patient-centered care. Telemedicine to provide health

care as a service, and address growing problems with access to service providers in a timely manner (Siegel, 2017).

Telemedicine can also be called telehealth can provide high quality services, increase access to care, increase self-awareness and items empower patients to manage their chronic conditions. Health care should embrace telehealth because reducing missed appointments, is a good modality for education, reduces waiting times, reduces readmissions and improves treatment adherence. Most importantly, however, policymakers need to help laws catch up with technology by enabling additional means of reimbursement for telehealth as these modalities increase out-

comes, which improve public health (Kruse et al, 2017).

Telemedicine has been shown to provide effective treatments for a variety of behaviors and health outcomes. Telemedicine versus direct patient care found telemedicine and direct care to be equally effective, and both achieved high levels of satisfaction among both patient and provider (Ritcher, 2015).

Some of the researchers mentioned above that telemedicine was more effective than direct visits to health facilities, while others said that telemedicine was as effective as direct visits. There is also research that states that direct visits are better and more effective in increasing patient satisfaction. This is related to various demographic conditions, culture, and lifestyle factors.

In some areas, it is not possible to use technological equipment for various reasons, for example electricity and grids will experience difficulties. On the other hand, in areas that have experienced development, it is possible to develop telemedicine.

The results of data processing using technology applications will save time and effort.

#### **AUTHOR CONTRIBUTION**

Sri Umiati as the main researcher is as a research implementer, collecting research data, formulating research articles, and processing data. Bhisma Murti played a role in the formulation of a framework for thinking and the process of analyzing research data. Rita Benya Adriani was involved in the background writing and discussion of the research.

#### **CONFLICT OF INTEREST**

There is no conflict of interest in this study.

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