A Study on the Covid – 19 Impact on Telesurgery Service in Healthcare Industry

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Abstract **- The future of healthcare lies at work hand-in-hand with technology comprising telemedicine, health information exchange, electronic health records and lots of more innovative technologies. The COVID - 19 has seized the planet from the 'new normal' to a 'new prospect'. Telesurgery is more practical use of minimal access surgical techniques. This study focus on the impact of COVID - 19 on telesurgery services with relevance to the Healthcare industry. The primary aim of the study is to learn about the patient satisfaction, preference on telesurgery in Tamil Nadu. The purpose of the study is to identify the patient interaction and reliability on telesurgery during pandemic and post pandemic. The benefits and drawbacks of the telesurgery will help us to know the challenges in implementing the concept during pandemic and post pandemic in the healthcare industry.**

Index Terms **- Telesurgery, telemedicine, health information exchange, electronic health records, Healthcare industry, patient satisfaction, preference and interaction, COVID-19.**

INTRODUCTION

Healthcare changes dramatically due to technological developments. Future technical innovation goes to stay transforming healthcare, yet while technologies will drive advance, human factors will remain one in all the stable limitations of breakthrough. Technology has the power to boost, constrict, and convey video signals and other information over long distances. As a promising field, telesurgery system is altering the standard medical approach and may deliver remote operation anywhere within the world. Advances in telesurgery robotic technology has achieved the remote beyond the limitation of distance and special medical environment.

The pandemic has altered the world and impacted several layers of society. The entire frontline workers and particularly those in direct contact with patients have been uncovered to major risk. To reduce the pathogen spread and secure healthcare employees and patients, medical services are mainly limited, including postponement of elective surgeries, which has posed a major burden for patients and massive economic loss for various hospitals. The combination of a robot as a protecting layer, sorting out the healthcare employee and patient, might be a potent tool to conflict the universal fear of pathogen contamination and preserve surgical volume. Digitization and machine intellect are in advance implication in healthcare to fight the virus. This article provides an outline of the important advances and issues in developing the consumption of computer and robotic technologies in surgery.

NEED OF THE STUDY

The need of the study is to identify the impact of COVID – 19 in healthcare industry with regard to the intervention of telesurgery. The unique aim of telesurgery was to permit the transmission of a surgical practice from remote space without contacting the patients. Telesurgery has been demonstrated as a useful platform for surgical training. It is more complex in underdeveloped and underserved communities and lack of robust and reliable networks. The elective surgeries had been postponed to save lives. The telesurgery has not been practiced in Tamil Nadu during COVID-19 when compared to other countries. By interpreting the results, it will give the patient satisfaction and enhance our understanding. It would also draw an outline for the post pandemic

scenario concerning the state of the telesurgery in healthcare industry. The benefits and drawbacks along with suggestions will pave a way towards the enhancement of telesurgery in Tamil Nadu.

OBJECTIVES

1. To identify the patient satisfaction on telesurgery during pandemic and post pandemic.
2. To identify the patient preferences related to the usage of telesurgery and traditional surgery, considering the COVID – 19 pandemic.
3. To study the benefits of telesurgery in healthcare industry.

LIMITATIONS OF THE STUDY

There are certain limitations during the conduct of the study which may help other researchers to develop the study in the future time.

1. Sample size is limited due to time constraints.
2. Location factors are to be considered. This study is limited to responses from Tamil Nadu only.

REVIEW OF LITERATURE

Carlos Fuentes said, "Literature overtakes history, for literature gives you more than one life. It expands experience and opens new opportunities to readers".

Computer – enhanced robotic telesurgery

W.S. Melvin, B.J. Needleman, K.R. Krause, R.K. Wolf and E.C. Ellison (2002) pursued a research on "Computer- enhanced robotic surgery". This study explains about a new type of computer-enhanced tele-manipulator device for robotic surgery. The researchers have evaluated the initial patients undergoing procedures with the new device.

Telesurgery system

Gary S. Guthart and J. Kenneth Salisbury (2000) pursued a research on "The Intuitive Telesurgery Systems: Overview and Application". This study explains about the surgical telerobot designed to provide enhanced dexterity to doctors performing minimally invasive surgical procedures. To utilize the computers and robotics in the complex and active environment of the operating room stresses the need for creative and seamless man-machine interfaces by changing the traditional roles of surgeons and assistances.

Telesurgery prospects in delivering healthcare

Noman Shahzad, Tabish Chawla and Tanzeela Gala (2019) pursued a research on "Telesurgery prospects in delivering healthcare in remote areas". This study explains about the perception of space between the surgeon and the patient came with the arrival of robotic surgery. It combine the advantages of robotic surgery include enlarged view, improved authenticity, superior ergonomics, dexterity and specification of surgical care in remote areas. Expenditure, accessibility and legislations to deal with legal and ethical issues continued to be addressed.

The rise of robots during COVID – 19

Ajmal Zemmar, Andres M. Lozano and Bradley J. Nelson (2020) pursued a research on "The rise of robots in surgical environments during COVID – 19". This study explains about the existing pandemic reveal the activities that are dependent on human-to-human physical contact. AI and robotic technology can be utilized to face the challenge. Beyond the deadly disease, the use of technologies in surgical environment can afford other benefits to develop safety and efficiency for the patient and to serve rural areas more successfully through remote surgery.

Telesurgery: Surgery in the Digital age

Dylan J. Cahill (2017) pursued a research on "Telesurgery: Surgery in the Digital age". This study explains about the patients can be connected with world class surgeon from their local operating room, provided it is equipped with the telesurgery slave unit. The cost of technology is expected to decrease in upcoming years, making telesurgery system accessible to a wider number of institutions and patients.

Telesurgery – an efficient interdisciplinary approach

Cazac C and Radu G (2014) practiced a research on "Telesurgery – an efficient interdisciplinary approach used to improve the healthcare system". This study explains about to improve the current healthcare infrastructure and eliminate the difficulties associated with a lack of qualified medical personnel in rural areas of the country. This research helps to evaluate the applicability of telesurgery benefits and costs of creating a infrastructure by predicting the possible

obstacles in creating such a system and by signifying conduct in which the obstacles has been avoided.

Telesurgery: Past, Present and Future

Paul J. Choi, Rod J. Oskouian and R. Shane Tubbs (2018) pursued a research on "Telesurgery: Past, Present and Future". This study explain about the auxiliary optimization of practical display, latency time and hepatic feedback technology, blueprint and publication of more randomized prohibited trials and minimization of the factors that limit its clinical conversion, telesurgery's extensive implementation in clinical setting it will become highly sensible and ecological barriers will be eliminated.

Long Distance Tele-Robotic-Assisted Percutaneous Coronary Intervention

Tejas M. Patel, Sanjay C. Shah and Samir B. Pancholy (2019) pursued a research on "Long Distance Tele-Robotic-Assisted Percutaneous Coronary Intervention: A Report of First-in-Human Experience". This study explains about the feasibility of remote tele-R-PCI with the operator 20 miles away from the patients. The researchers have stated that performing long distance tele-R-PCI in patients with CAD is feasible with predictably successful outcomes if reliable network connectivity and local cardiac catheterization facilities are available.

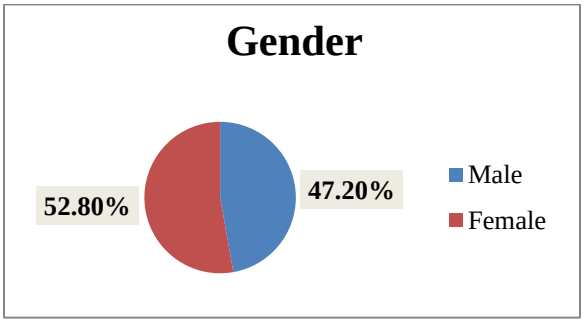
CHALLENGES FACED IN TELESURGERY

1. Legal: The rate of detection of new equipment is outpacing the capability of business; culture and healthcare to incorporate. The perception of receiving medical care from a surgeon without the authentic communication can generate a degree of uncertainty.
2. Technical: Several countries worldwide still do not have the appropriate infrastructure to sustain the similar use of the essential innovative technologies for telesurgery. The achievement of various technologies may create huge data flows that are not functional.
3. Financial: Reimbursement is commonly cited as a major barrier for telesurgery. There is no certification of payment parity between telesurgery and in-person health care.
4. Collaborative: No knowledge of preferred approach to medical problems, surgical interventions are forwarded and hence more likely to be complicated, contextual sound amplification is disturbing rather than supportive and surgeons frequently step away from the robot console.

RESEARCH METHODOLOGY

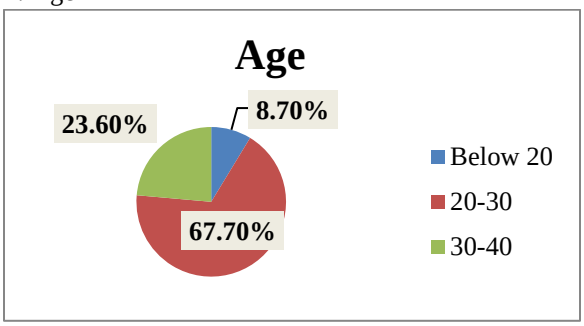
A questionnaire containing 14 structured questions relating to the impact of COVID – 19 on telesurgery in healthcare industry was circulated. 130 responses were collected, and the study was carried out based on the responses.

1.Gender



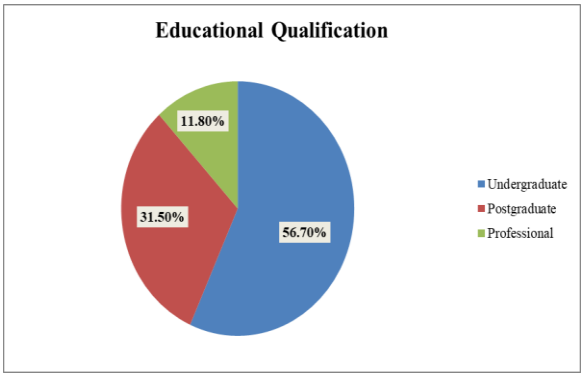
Out of the 130 responses collected, the majority were females accounting for 52.8%.

2. Age



The 67.7% of the respondents are of the age group 20-30 and 23.6% of the respondents are of the age group 30-40.

3.Educational qualification

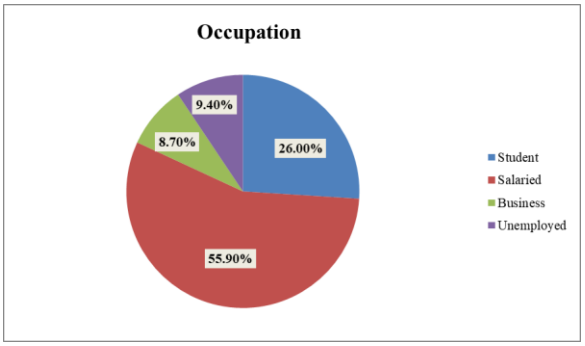


56.7% of the respondents are undergraduates, followed by postgraduates at 31.5%.

4.Occupation

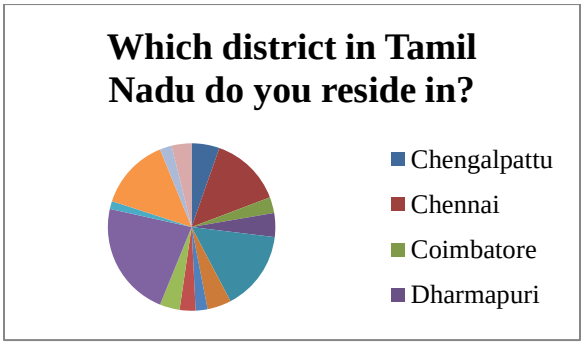
(Note: For this question I have done both percentage method and chi-square method)

Chi-square: i.e., χ^2=3.402. The critical value of χ^2 with 3 degree of freedom is 7.815. Since 3.402 < 7.815 we accept the null hypothesis and conclude that the occupation level does not depends on gender at a 5% significance level.



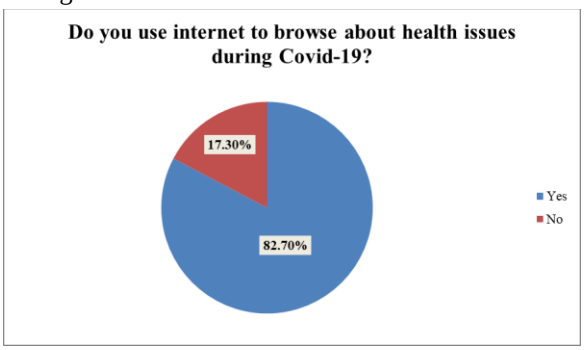
The majority of the respondents were salaried accounting for 55.9%, followed by students at 26%.

5.Which district in Tamil Nadu do you reside in?



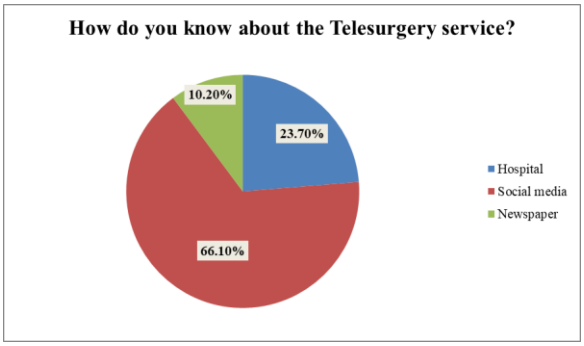
The evidence from the pie chart states that 22.30% of the respondents hail from the Namakkal district, followed by Erode at 15.38%.

6.Do you use internet to browse about health issues during Covid-19?



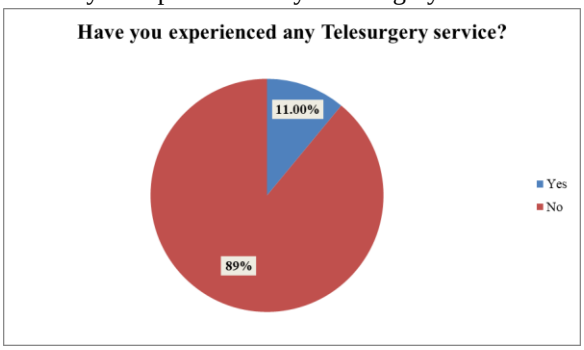
The majority uses internet to browse health issues. This has been one of the significant reasons for the development and progress of the telesurgery services. Nearly 82.7 % of the respondents use internet to know about health issues.

7.How do you know about the Telesurgery service?



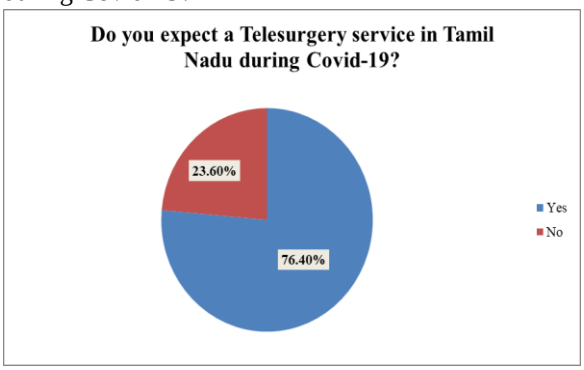
66.1% of the respondents are through social media which gains the highest recognition, followed by hospitals at 23.7%.

8.Have you experienced any Telesurgery service?



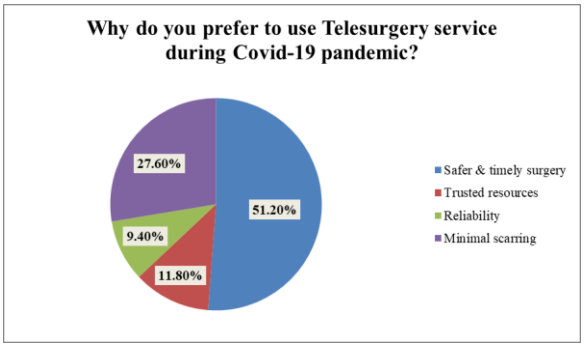
89% of the respondents have said No, while 11% marked yes. This is one reason why Telesurgery should focus on how to increase its patient satisfaction.

9.Do you expect a Telesurgery service in Tamil Nadu during Covid-19?



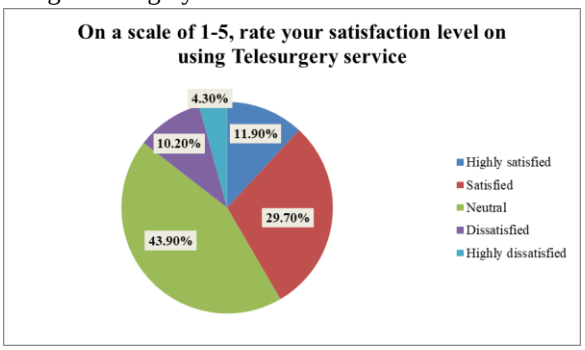
76.4% of the respondents state that they expect a Telesurgery services in the healthcare industry. The usage of the telesurgery services is limited by the respondents.

10.Why do you prefer to use Telesurgery service during Covid-19 pandemic?



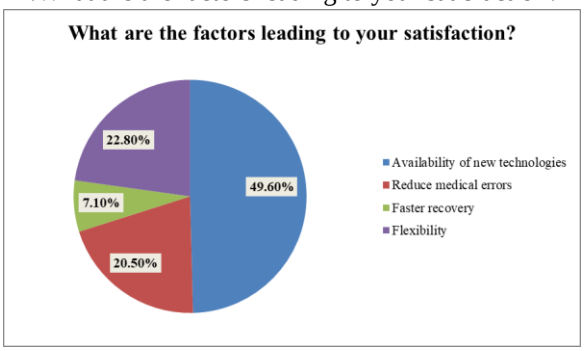
During the pandemic, execution of the surgery was an issue. Due to the lockdowns and transmission of infection patient can prefer Telesurgery. 51.2% of the respondents said that safer and timely services followed by this 27.6% accounted for minimal scarring.

11.On a scale of 1-5, rate your satisfaction level on using Telesurgery service.



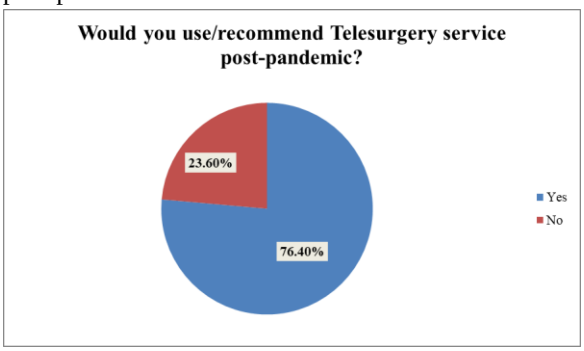
As shown in the pie chart above, 43.9% are neither satisfied nor dissatisfied with the Telesurgery. Following that, 29.7% of the people are satisfied using the Telesurgery services.

12.What are the factors leading to your satisfaction?



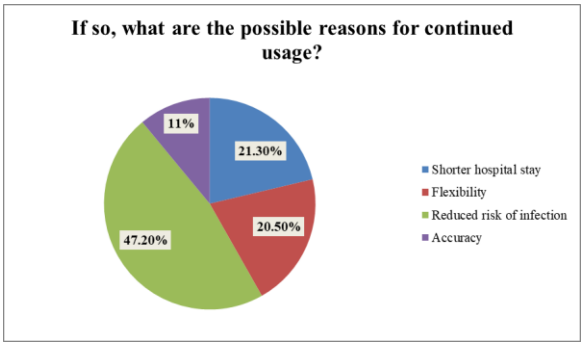
With the information shown in the pie chart, it is a close call between availability of new technology recording 49.6%, flexibility at 22.8% and reduced medical errors recording for 20.5% of the responses. This pie chart tells us that, it availability of new technology and flexibility in the telesurgery service are the major factor leading to satisfaction.

13.Would you use/recommend Telesurgery service post-pandemic?



76.4% of the respondents say that they will use the Telesurgery services in the post-pandemic scenario. While 23.6% says no.

14.If so, what are the possible reasons for continued usage?



The majority of the respondents, 47.2% would continue to use the Telesurgery service because of reduced risk of infection. Shorter hospital stay seconds by 21.3%. Followed by flexibility recorded 20.5%.

DATA ANALYSIS

Due to the COVID-19 pandemic, safety has grown to become a major concern. People shifted from conventional surgery to telesurgery. Though the hospitals were fully functioning, people who had existing health problems found it unsafe because of the transmission.

From this survey, we reckon;

1.Patient satisfaction

The satisfaction levels are neutral when it comes to telesurgery. Majority of the users find it neither satisfied nor dissatisfied, opting for neutral. Availability of new technologies and flexibility are the top reasons which make the patient feel satisfied. The flexibility of robotic instruments makes easier to

accomplish. The improved flexibility and accuracy of the robot allow medical surgeon to the right entry.

2.Patient preferences

The usage of the telesurgery services is limited by the respondents. The major conventional surgeries haven't grown during the Covid-19 pandemic. The users expect a telesurgery service according to the survey. The most preferred criteria are through safer and timely surgery and minimal scarring. The possible reasons for continuing the telesurgery service that it reduces the risk of infection and shortens the hospital stay.

BENEFITS OF TELESURGERY

There are several advantages of telesurgery while compare to conventional surgical method.

- Reduce long distance travel: It is a tremendous key to get medical awareness without the patient required to move away from their local hospital through which the surgeons can offer surgical care for patients around the world.
- Reduced length of hospital stay: It is an important indicator for the efficiency of hospital management. It may results in the decreased risk of infection, medication side effects and improvement in the quality of treatment.
- Improve surgical accuracy: It is potential to access the area in the body which is extremely rigid to access. It is useful to eradicate surgeon's physiological tremor and helps surgeon's concern.
- Lower rate of infection: During the pandemic, surgical interference is being held in reserve only for critical patients due to the risk of viral transmission and it is a feasible option for the safety of both surgeon's and the patients.
- Eliminates shortage of surgeon's: Globally there is a shortage for qualified surgeons and anesthetists by implementing telesurgery it will be a potential solution.

DRAWBACKS OF TELESURGERY

From an individual's perspective, there are numerous situations that make telesurgery unwelcome.

- Expense of surgery: The highest cost of installing a telesurgery system can increase the cost of surgical procedures and it is costly to maintain and also the surgery requires additional training which is expensive.
- Lack of sensory feedback: It setback in transferring sensory and motor modalities between two extensive locations. Time lag is the major disadvantage in the field of telesurgery.

FINDINGS

1. Telesurgery service should provide service to remote areas in case of natural calamities, disasters and space operations.
2. Virtual consults could reduce the hospital stays and unnecessary hospital acquired infections.
3. The telecommunication infrastructure should be expanded so that the surgery can be done safely at the right time.
4. Respondents would like their doctors to provide more opportunities for Telesurgery even after the pandemic.

CONCLUSION

Information technology has the potential to transform the field of surgery. Patients in distant areas can have access to the most recent surgical procedures through telesurgery. Tele-monitoring program will allow guidance of surgeons in performing complicated procedures. In this study, the patient satisfaction, preferences and reliability were analyzed along with the usage of telesurgery services during the pandemic and the post pandemic situations. Only 76.4% people expect a telesurgery service in Tamil Nadu during pandemic and post-pandemic. Other 23.6% person does not expect a telesurgery service. From the research we conclude that, telesurgery services can be a boon to the healthcare industry. Applying all these procedures during COVID-19 pandemic can also have an impact on the post-pandemic scenario by retaining and expanding the patient satisfaction. Furthermore, the advantages, disadvantages will helps in bridging the gap for better user experiences.

SUGGESTIONS

1. Increase awareness of resources available to surgeon's to implement telesurgery including grants.
2. Advertising and public relations campaign to increase demand for telesurgery among patients.

3. Communicate benefits to special practice for more patients, less traffic and overall patient satisfaction
4. Target support groups and foundations to provide literature and in-person speaking engagements on telesurgery to patients.

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