

https://dspace.org/

The feasibility of telemedicine based consultation in the primary healthcare sector in Johannesburg

Mistry, Karishma Jivan

2021

University of the Witwatersrand, Johannesburg

https://hdl.handle.net/10539/41413

Mistry, Karishma Jivan. (2021). The feasibility of telemedicine based consultation in the primary healthcare sector in Johannesburg [Master's dissertation, University of the Witwatersrand, Johannesburg]. WireDSpace.

Downloaded from a DSpace repository. https://dspace.org/

The feasibility of telemedicine based consultation in the primary healthcare sector in Johannesburg

Karishma Jivan Mistry

WITS Business School

Research report presented in partial fulfilment for the degree of Master of Business Administration to the Faculty of Commerce, Law, and Management, University of the Witwatersrand

April 2021

DECLARATION

I Karishma Jivan Mistry declare that this research report entitled 'The feasibility of telemedicine-based consultation in the primary healthcare sector in Johannesburg' is my own unaided work. I have acknowledged, attributed, and referenced all ideas sourced elsewhere. I am hereby submitting it in partial fulfilment of the requirements of the degree of Master of Business Administration at the University of the Witwatersrand, Johannesburg. I have not submitted this report before for any other degree or examination to any other institution.



Karishma Jivan Mistry

Signed at Johannesburg on 30 April 2021

Name of candidate	**Karishma Jivan Mistry**
Student number	**451825**
Telephone numbers	**071 048 9009**
Email address	**karishmajivan@yahoo.com**
First year of registration	**2019**
Date of proposal submission	**16 November 2020**
Date of report submission	**30 April 2021**
Name of supervisor	Patrick Zhuwao and Kambidima Wotela

ABSTRACT

Author: Karishma Mistry **Supervisor** Patrick Zhuwao

Thesis title: The feasibility of telemedicine based consultation in the primary healthcare sector in Johannesburg

Healthcare system in South Africa is overburdened and telemedicine is considered a useful tool to make quality healthcare more accessible. In South Africa, regulations imposed by Health Professional Council of South Africa (HPCSA) and restricted access to technological, educational, economic and sociocultural factors has limited the ease of accessing and using telemedicine. In order for telemedicine to gain prominence, it needs to be integrated into everyday practice and be seen as an alternative to face-to-face consultation. Hence, the purpose of this study was to evaluate a combination of factors, in the context of Covid-19 pandemic, namely telemedicine as an engaging platform, seeking written or verbal informed consent for clinical procedures and using information and communication technology (ICT) and availability and knowledge of electronic resources to conduct virtual consultation. In addition, the method used to store patient information was examined to understand the prominence it has in the context of telemedicine.

A quantitative, cross-sectional research strategy was used to collect data from 80 family physicians practicing in either private, state or both sectors. This study reported that a large number of participants have used some form of telemedicine, although only one third use it daily. On average the study population reported to agree that telemedicine is an engaging platform, but half the respondents found that the explanation concerning the disease or treatment is not better.

Verbal consent is used more than written consent for activities relating to clinical examination or when using ICT. While, majority of the respondents indicated that they do have an electronic device to implement telemedicine consultation, only half the respondents had access to quality broadband network. The study also reported that about two-thirds of the respondents reported to stored patient information manually.

Overall, more attention is required to make the functionality of telemedicine more noticeable. Telemedicine may not be valued so much when there is good health infrastructure, however, when health infrastructure is poor, telemedicine is unable to stand on its own. Hence, associated economic, education and socio cultural factors needs to be evaluated further so that behavioural barriers are reduced and telemedicine is used more frequently.

TABLE OF CONTENTS

DECLARATION 2
Abstract 3
Table of contents 4
List of tables 6
List of figures 7
ACKNOWLEDGEMENTS 8
Definition of key terms and concepts 9
Introduction to the research 10
1.1 Background and context 10
1.1.1 Defining telemedicine 13
1.2 Research conceptualisation 13
1.2.1 The research problem statement 13
1.2.2 The research purpose (aim and objectives) statement 15
1.2.3 Research questions 16
1.3 Significance of the research study 16
1.4 Delimitations and assumptions of the research study 17
1.5 Limitations 18
1.6 Preface to the research report 18
2 Literature review 19
2.1 Research problem analysis 19
2.1.1 Introducing telemedicine 20
2.1.2 Challenges to implement telemedicine in South Africa 21
2.2 Research knowledge gap analysis 24
2.2.1 Performance expectancy: Engaging platform 25
2.2.2 Social influence: Written informed consent 26
2.2.3 Facilitating condition: Availability & knowledge of resources to conduct telemedicine 27
2.2.4 Effort expectancy: Storing patient information 28
2.3 Unified Theory of Acceptance and Use of Technology (UTAUT) 29
2.4 Summary and conclusion 32
2.4.1 Summary of literature reviewed 32
3 Research strategy, design, procedure and methods 33
3.1 Research strategy 33
3.2 Research design 34
3.3 Research procedure and methods 34
3.3.1 Research data and information collection instrument(s) 34
3.3.2 Research target population and selection of respondents 36
3.3.3 Ethical considerations when collecting research data 38
3.3.4 Research data and information collection process 38
3.3.5 Research data and information processing and analysis 39
3.4 Research strengthens—reliability measures applied 40
3.5 Research weaknesses—technical and administrative limitations 41
4 Presentation of research results 42

4.1 Socio-Demographic Characteristics of Participants 42
4.2 Telemedicine usage 43
4.3 Telemedicine as an engaging platform 46
4.4 Informed consent preference (written or verbal) to perform a clinical examination or when using ICT 48
4.5 Availability and quality of essential resources to conduct telemedicine 51
4.6 Modalities used to store patient information 53
4.7 Associations - one way Analysis of Variance (ANOVA) 54
4.7.1 Differences of engagement means between age groups 54
4.7.2 Differences of engagement means between gender groups 56
4.7.3 Contingency Analysis of gender by ease of use 58
4.7.4 Contingency Analysis of age by ease of use 59
5 Discussion of reserch findings 61
5.1 Introduction 61
5.2 Socio-Demographic Characteristics of Participants 61
5.3 Telemedicine as an engaging platform 63
5.4 Informed consent preference (written or verbal) to perform a clinical examination or when using ICT 65
5.5 Availability and quality of essential resources to conduct telemedicine 67
5.6 Modalities used to store patient information 70
6 Summary, conclusions, limitations, and recommendations 73
Introduction 73
6.1 Conclusions 73
6.2 Limitations 74
6.3 Recommendations (action plan) 75
6.4 Areas for future research 76
References 78
Appendix 1: Questionnaire 80
Appendix 2: Letter to participate 85
Appendix 3: Ethics approval 86
Appendix 4: Histograms: Differences of engagement means between age groups 87
Appendix 5: Histograms - Differences of engagement means between gender groups 90
Appendix 6: Knowledgeability of telemedicine amongst age groups 92
Appendix 7: Bio 93

LIST OF TABLES

Table 1:	Socio-demographic representation of the study population	Page 42
Table 2:	Telemedicine usage of the study population	Page 43
Table 3:	Telemedicine as an engaging platform	Page 46
Table 4:	Information exchange during a telemedicine consultation	Page 47
Table 5:	Summary Statistics on written number of procedure	Page 49
Table 6:	Summary Statistics on verbal number of procedure	Page 50
Table 7:	The efficiency of telemedicine software	Page 51
Table 8:	Preference for ease of using telemedicine, learning to operate and usefulness	Page 52
Table 9:	Storage of patient information	Page 53
Table 10:	Efficiency of storing patient information	Page 53
Table 11:	Tests that the Variances are Equal	Page 54
Table 12:	Oneway Anova Summary of Fit for Engaging platform and age	Page 55
Table 13:	Means for Oneway Anova	Page 55
Table 14:	Means and Standard Deviation	Page 55
Table 15:	Analysis of Variance	Page 55
Table 16:	Connecting Letters Report	Page 56
Table 17:	Tests that the Variances are equal	Page 56
Table 18:	Pooled t Test	Page 57
Table 19:	Contingency Table measuring ease of use and gender	Page 58
Table 20:	Pearson correlation test	Page 58
Table 21:	Contingency Table measuring ease of use and age	Page 59
Table 22:	Pearson Correlation Tests	Page 60

LIST OF FIGURES

Figure 1:	Root causes to deteriorating health care system in South Africa	Page 12
Figure 2:	UTAUT model	Page 30
Figure 3:	How often telemedicine is used	Page 44
Figure 4:	Modalities used by study population	Page 44
Figure 5:	Usefulness of telemedicine as per the study population	Page 45
Figure 6:	Study population knowledge about telemedicine	Page 45
Figure 7:	Percentage of respondents that find telemedicine to be an engaging platform	Page 47
Figure 8:	Study population preference on informed consent	Page 48
Figure 9:	Written number of Procedures	Page 49
Figure 10:	Verbal number of Procedures	Page 49
Figure 11:	Study population representation on tools used by doctors for telemedicine	Page 51
Figure 12:	Study population representation on tools used by patients for telemedicine	Page 52
Figure 13:	Test to determine if variances are Equal	Page 54
Figure 14:	Oneway Analysis of Engaging platform by Age	Page 55
Figure 15:	Test to determine if variances are equal	Page 56
Figure 16:	Mosaic Plot measuring ease of use and gender	Page 58
Figure 17:	Mosaic Plot measuring ease of use and age	Page 59

ACKNOWLEDGEMENTS

A special thanks goes out to all medical doctors who participated in the survey. When the survey was launched (January 2021), South Africa was experiencing its second-wave of the Covid-19 pandemic, putting doctors under immense pressure in treating patients. While this was a challenging period, my heartfelt gratitude goes to each and every participant for taking time out to answer the survey.

I would also like to take the opportunity to thank Mr Hennie Gerber for his assistance and guidance in analysing the data.

Lastly, I would like to express my sincere gratitude and appreciation to my supervisor, Mr Patrick Zhuwao for his valued advice, guidance and support.

DEDICATION

I dedicate this work to my late father who always believed in me and supported me in every milestone achieved.

DEFINITION OF KEY TERMS AND CONCEPTS

1. **Telemedicine:** the practice of medicine using electronic communications, information technology or other electronic means between a health care practitioner in one location and a patient in another location (Chifamba, 2018).

2. **Informed consent:** According to the Health Professions Council of South Africa Guidelines For Good Practice In The Health Care Professions Seeking Patients' Informed Consent: The Ethical Considerations (Book 4, page 14), informed consent is an exercise of an informed choice by a patient who has the capacity to give consent: in instances where there are multiple options or alternatives to treatment; or in making a decision whether to withhold or disclose information or allow someone else to disclose information on their medical condition to a defined third party; or in making a decision for purposes of reimbursement by a Medical Scheme.

INTRODUCTION TO THE RESEARCH

1.1 Background and context

The healthcare system in South Africa is overburdened due to underlying factors associated from the apartheid period between 1948 and 1993 (Delobelle, 2013). To date, majority of the South African population rely on public health facilities and unfortunately access to quality service is scarce for this population (Delobelle, 2013).

As part of the National Development Plan aimed to achieve equity, efficiency, effectiveness and quality of healthcare provision by 2030; the Department of Health released a National Digital Health Strategy for South Africa in 2019 (page 8) that sets out a vision of 'better health for all South Africans enabled by digital health' (National Digital Health Strategy for South Africa 2019 - 2024, 2019)

One technique of digital health, called telemedicine, a form of information and communication technology used to deliver a health care service virtually, can be considered a useful tool to make quality health care more accessible (Cilliers & Flowerday, 2013) and an effective solution to alleviate the issues faced by the current health care system in South Africa.

There is a prospect that telemedicine can, insofar, open the door to healthcare service delivery that is of better quality, highly accessible, and more efficient (van Dyk, 2014) to South African communities, particularly the rural and underserved areas. This can be supported by Jack and Mars (2013) research that stated that telemedicine is considered to be a cost-effective and efficient tool to deliver health care to under-resourced areas.

However, implementing telemedicine does come with diverse challenges (Cilliers & Flowerday, 2011). The literature review (chapter 2) conducted for this study identified the root causes for the deteriorating healthcare system that are shown in Figure 1 (page 13). According to Cilliers and Flowerday (2011), limited access to technology can be attributed to the costs associated with required ICT infrastructure such as internet connectivity, high-end videoconferencing systems and sophisticated medical devices. Cilliers and Flowerday (2011) further mentions that the current state of infrastructure often leads to frequent interruptions of electricity supply, poor connectivity and low bandwidth, making telemedicine unreliable.

Another factor to low use of telemedicine is inequality (Petersen, Brown, Pather, & William, 2019) resulting from the South African history that still mirrors the South African population. Inequality had developed a socio-economic divide (Delobelle, 2013) leading to a ripple effect on survival needs, such as quality healthcare and lack of basic computer literacy. Petersen et al (2019) research stated that economic factors (such as the digital divide between the rich and poor), educational factors (such as lack of technology literacy) and sociocultural factors (such as lack of support from family and peers) are contributors to low use of telemedicine.

Moreover, guidelines developed by the Health Professional Council of South Africa (HPCSA) namely seeking written informed consent, quality of care, data protection and prior doctor-patient relationship, is a barrier towards the implementation of telemedicine, especially in an asynchronous or telephonic format (Townsend, Scott and Mars, 2019).

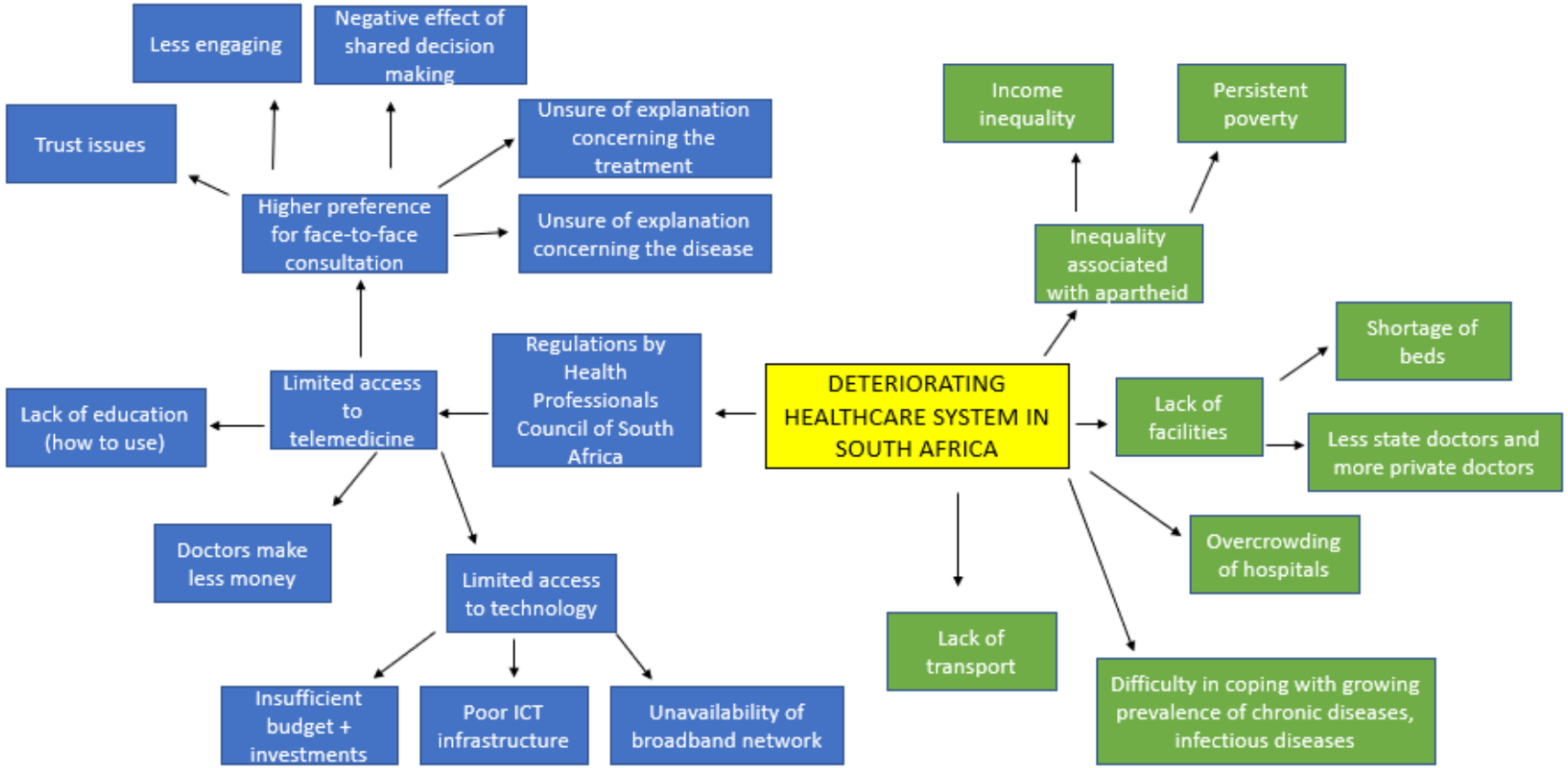


Figure 1: Root causes to deteriorating healthcare system in South Africa

From the onset of Covid-19, this research aimed to evaluate a combination of factors that limit the ease of accessing and use of digital health namely: telemedicine consultation as an engaging platform, seeking written informed consent for clinical procedures and using ICT, and availability and knowledge of resources to conduct virtual consultation. In addition, the method used to store patient information was introduced into the research to examine availability and sharing of patient information in the context of telemedicine.

Concepts from the Unified Theory of Acceptance and Use of Technology (UTAUT) model was used as a guide in developing the research questions to examine the factors that limit the use of telemedicine.

The following section expands on the research problem statement, research purpose statement and research propositions.

1.1.1 Defining telemedicine

According to the American Telemedicine Association, telemedicine is a form of information and communication technology in which medical information between a doctor and patient is exchanged remotely (Chifamba, 2018). Telemedicine is divided into two categories namely asynchronous and synchronous. Asynchronous, also called store and forward telemedicine, is when information is shared between two parties, independent of time and at their own convenience (Chifamba, 2018). For example, images are stored and emailed to a referred medical professional. Synchronous or real-time telemedicine is when communication between a doctor and patient is live and interactive. This form of communication is usually undertaken on a videoconference call (Chifamba, 2018).

1.2 Research conceptualisation

1.2.1 The research problem statement

Jack & Mars (2013) point that in order for telemedicine to gain prominence, it needs to be integrated into everyday practice and be seen as an alternative to face-to-face consultation. Hence, the importance to look into the factors that contribute to the low use of telemedicine.

Whilst, there has been research done to examine the factors affecting healthcare workers' acceptance and use of telemedicine, there has been minimal academic research on measuring a combination of the key contributors of accessibility and usefulness of telemedicine during Covid-

19. Hence, Section 1.2 will cover the following factors and its weaknesses that limit the accessibility and use of telemedicine (a) written informed consent, (b) if telemedicine provides an engaging platform, and (c) availability of resources and knowledge to implement telemedicine. The fourth factor is the method used to store patient information and how this influences the use of telemedicine.

1.2.1.1 **Written informed consent**

In the event of a telemedicine consultation, the HPCSA General Ethical Guidelines For Good Practice in Telemedicine (Booklet 10, page 12) stipulates that healthcare practitioners are required to seek consent in writing from patients to conduct clinical procedures virtually, such as diagnosis and treatment (Human Rights, 2014).

This becomes a challenge for patients because of required paperwork and e-signatures; and a challenge for doctors in the need of asynchronous or telephone consultations. Thus, the need to examine from family physicians if written or verbal informed consent is routinely obtained from patients during clinical examination or when using ICT, before and during Covid-19.

1.2.1.2 **Engaging platform**

As per the HPCSA General Ethical Guidelines For Good Practice in Telemedicine (Booklet 10, page 18), the level of engagement during a telemedicine consultation, between a medical doctor and patient, is highly important to ensure that the patient is provided with sufficient information and fully understands the diagnosis and treatment provided (Human Rights, 2014).

In their research, Jack and Mars (2013), indicated that there is sufficient evidence that a patient would obtain the same level of quality in a virtual consultation (be it synchronous or asynchronous) and a face-to-face consultation. However, there is not sufficient theory to justify the doctor-patient relationship as technology and telemedicine practice evolve.

1.2.1.3 **Availability of resources and knowledge to implement telemedicine**

Restricted access to resources such as electronic devices and good internet connection as well as lack of knowledge needed to operate the telemedicine system is another mechanism that makes the implementation of telemedicine unsuccessful. This is a resultant from the South African history, which still mirrors some parts of the population, in that inequality led to a socio-economic divide (Cilliers & Flowerday, 2011). Hence, the need to investigate if electronic resources and digital literacy is still an implication to low use of telemedicine.

1.2.1.4 **Patient information**

The South African Public healthcare system still follows the traditional method of record keeping that has negative consequences such as patients' folders being misplaced and incorrect patient diagnosis. Hence, the National Digital Health Strategy (2019 – 2024) has prioritised to establish an integrated platform and architecture for the health sector information system, which will ensure interoperability and linkage of existing patient-based information systems. This will have a positive implication on telemedicine because instant accessibility of patient information will improve the quality and continuity of care. Additionally, the transmission of documents between different venues poses a health risk because viruses can easily be transmitted, a learning from the Covid-19 pandemic.

In consequence, the examination of the method used by family physicians to store patient information, its success rate on National Digital Health Strategy and influence it will have on telemedicine.

1.2.2 The research purpose (aim and objectives) statement

Following the weaknesses to gain maximum value of telemedicine as discussed in section 1.2.1, the aim of this research was to study a combination of key factors that limit the ease of accessing and using telemedicine by medical doctors specialising as Family Physicians in Johannesburg, in the context of Covid-19. The four factors examined in this research study included:

a) If telemedicine results in an engaging platform in a doctor-patient relationship, especially as technology and telemedicine practice evolve;
b) If written or verbal informed consent is routinely obtained from patients during clinical examination or when using ICT, before and during Covid-19;
c) If electronic resources and digital literacy is still an implication of low use of telemedicine;
d) Over and above and as a contribution to new literature, the research study examined a factor that influences the ease of using telemedicine, the method used to store patient information. This factor links to the National Digital Health Strategy for South Africa's prioritization to establish an integrated information architecture for interoperability and safe sharing of health information across health systems and services. Electronic record keeping, especially for telemedicine consultations, will be beneficial to both medical practitioner and patient because patient information is easier to access and eliminates health risks.

Overall, the results obtained in this research will assist stakeholders in the South African healthcare sector in developing frameworks that will make telemedicine more user friendly and strengthen the current South African health ecosystem.

1.2.3 Research questions

As per the factors and weaknesses identified in section 1.2.1 that influences a low intake of telemedicine and research objectives stipulated in section 1.2.2, the following section represents the research questions established to research the objectives of this study:

1.2.3.1 Question 1: Does consultation using a telemedicine format provide the same level of engagement and satisfaction as face-to-face consultation?

1.2.3.2 Questions 2: Which method of informed consent is used, written or verbal, for the following activities – namely taking history, examinations, ordering a special investigation such as an X-ray or blood test, referring the patient to a specialist, email patient information, prescriptions and virtual consultation?

1.2.3.3 Question 3: How crucial is access to the right resources, such as electronic devices and skills to navigate the technology, to achieving the desired outcome of telemedicine?

1.2.3.4 Questions 4: Which method, manual or electronic, is used to store patient information? If patient information is stored electronically, is patient information protected through encryption?

1.3 Significance of the research study

Telemedicine is an innovative digital solution that has the potential to provide better healthcare services including access to healthcare services in remote areas, thereby minimizing the effect of shortages of healthcare professionals and accessibility. Telemedicine enables a patient to engage with their healthcare providers more frequently, minimising the risk to health deterioration. It may also provide an opportunity to reduce healthcare spending and increase productivity levels of medical practitioners.

Determination of the underlying factors and findings from the study will assist in developing a suitable framework to enable telemedicine to be accessible to the broader population and offer a sufficient number of healthcare workers to treat increasing number of patients. Additionally,

examining the underlying factors will help address what the resource constraints are and develop a model whereby allocation to required infrastructure and equipment is made easily available and is reliable. The frameworks lead to indirect benefits whereby the need to travel long distances to access adequate healthcare will be eliminated.

Hence, in order for telemedicine to gain prominence and integrated into everyday practice, there are key underlying factors that need to be evaluated.

South Africans, especially those that depend on state facilities will continue to be underserved (Delobelle, 2013). Moreover, the number of health care workers needed to meet the increasing number of patients will continue to decelerate as more and more health workers will prefer to work for the private sector, patients will have to travel long distances to access adequate healthcare, and there will be restricted resources to treat patients (Delobelle, 2013).

1.4 Delimitations and assumptions of the research study

The research focused mainly on the factors that influence the ease of accessing and using telemedicine in the primary healthcare sector. Hence, the following section discusses the delimitations and assumptions of the research study.

For the study, family physicians were approached because their specialist is in primary care. The study did not include medical doctors who specialised in other medical specialities because this would impact the objective of the study.

Similar to previous research studies, the sample encompassed only medical doctors and not patients, as research factors (namely, seeking verbal verses written consent, regulations imposed by the HPCSA, storage of patient information, resource availability and knowledge to conduct telemedicine consultation and whether telemedicine is an engaging platform for doctors) was appropriate for this study population.

Furthermore, the research used a quantitative method of research in order to measure the objectives of this study numerically. The intended study population used was from Johannesburg that represents the population. This region was used for the researcher's proximity and familiarity of location.

1.5 Limitations

The following section identifies the limitations experienced during data collection for this research study.

Due to the second wave of the Covid-19 pandemic, between December 2020 and January 2021, the acquisition of the targeted number (120) was a challenge to achieve because doctors especially those that focus on primary healthcare under immense pressure. Furthermore, respondents based their answers in the context of Covid-19 whilst the HPCSA was forced to ease guidelines on the use of telemedicine.

Also, the aim of the present study was to collect data from a sample based in Johannesburg, however, due to the above-mentioned challenge, the sample was stretched to family physicians practicing in other metropolitan areas in of South Africa.

When the study population was approached to participate in the research, it was assumed that they were potential users of telemedicine and could be considered a volunteer sample.

1.6 Preface to the research report

To this end, the report has six chapters. Following Chapter 1 on introduction, Chapter 2 provides a literature review covering the underlying issues of telemedicine using past studies, the four attributes the study focused on and the UTAUT framework. Chapter 3 discusses the research strategy, design, procedures used in this study as well as the, validity measures and research limitations. A quantitative, cross-sectional research strategy was used to collect data from 80 medical doctors who specialize as a family practice physician in Johannesburg.

Chapter 4 provides a presentation of the findings and Chapter 5 is an interpretation of the findings. Chapter 6 concludes the study with limitations of the present research study and recommendations for future research.

2 LITERATURE REVIEW

In the following chapter, four themes namely research problem analysis, research knowledge gap analysis, UTAUT model and key attributes that affect telemedicine implementation will be discussed. Chapter 2 forms the foundation used to develop a framework for interpreting the research findings.

2.1 Research problem analysis

The root cause of the deteriorating health care system in South Africa is primarily due to its history that can be traced back to the apartheid period between 1948 and 1993 (Maphumulo, 2019). During that period, there was a build-up of economic and social inequality as a result of racial segregation, resulting in a highly fragmented and poorly organized healthcare system-(Maphumulo, 2019).

Post 1994, even though all citizens became eligible to access quality healthcare services, including private healthcare, a major part of the population is still restricted to access to basic healthcare needs and rely on the state hospitals for treatment.

To date, state hospitals rely on government funding, such as tax revenues, to fund for required skills and equipment to treat patients (Delobelle, 2013). Every year, government would allocate a certain percentage of its budget to state healthcare facilities in the nine provinces. (Delobelle, 2013). Even though the government contributes about 40% of all expenditure on health, the public health sector is under pressure to deliver services to about 80% of the population (Mvelase, Dlamini, & Dludla, 2015).

On the other hand, the private healthcare sector offered world-class facilities for the smaller population who either had medical insurance or could afford care on an out-of-pocket basis. (Delobelle, 2013). Here, the facilities were independent and did not rely on government for funding (Delobelle, 2013).

Post-apartheid, socio-economic inequality still remains a concern in South Africa and the requirement to build a healthcare system for all is far from complete (Delobelle, 2013). Currently, there are several factors causing the unequitable provision of healthcare in the public sector (Delobelle, 2013). These include the public sector being under-resourced and overused and the highly uneven skills distribution due to the migration of healthcare workers from public sector to

private sector, loss of staff due to illness, absenteeism, low staff morale, and an increased patient load (Delobelle, 2013).

Delobelle (2013) stated in their study that the primary factors, of under-resourced and overused, faced by the public healthcare sector results in additional challenges. These include longer than average waiting period which may increase the health risk of patients, accommodate a certain number of patients for treatment while others in need of medical treatment are either put on a waiting list or turned away and poor hygiene (Delobelle, 2013). Being under-resourced, it further cannot cope with the increased burden of non-communicable & communicable diseases and injuries caused by violence, road traffic and other accidents (Delobelle, 2013).

2.1.1 Introducing telemedicine

A potential solution to improve the public healthcare system that is overwhelmed is through telemedicine (Chifamba, 2018). In the HPCSA General Ethical Guidelines for Good Practice in Telemedicine (Booklet 10, page 6), Telemedicine is a digital platform used to provide virtual medical consultation between a healthcare practitioner in one location and patient in a difference location through various modes namely video conference, email, and instant messaging, and SMS (Human Rights, 2014).

The HPCSA General Ethical Guidelines for Good Practice in Telemedicine (Booklet 10, page 6) further notes that the practice of telemedicine should involve secure videoconferencing or similar forms of technology to "replicate the interaction of traditional face-to-face consultations between healthcare practitioners and the patient. Telemedicine as defined refers to where information is exchanged electronically either on or off-line, formally, informally or as a need for a second opinion (Human Rights, 2014)."

There are two primary methods that can be used namely synchronous and asynchronous, provided the patient has access to an electronic device (Chifamba, 2018). Both methods can be used in numerous settings such as doctor rooms, clinics and hospitals (Chifamba, 2018). Synchronous is when the consultation between the patient and doctor happens in real time while asynchronous is when the exchange of information happens at no given time (Chifamba, 2018).

Consultation through telemedicine involves the participation of various stakeholders in order for it to be effective and successful. These stakeholders include healthcare workers, information and communication technologists, economists, managers and policy makers (van Dyk, 2014).

2.1.2 Challenges to implement telemedicine in South Africa

Majority of the South African population depend on public healthcare facilities which is currently understaffed, with inadequate resources, especially in rural areas (Delobelle, 2013). Studies have indicated that digital health mediums such as telemedicine can act as a tool to provide improved access to health care to those in need (Adeyelure & Kalema, 2019). However, the implementation of telemedicine has its own unique challenges (Cilliers & Flowerday, 2013).

Telemedicine is a listed health solution strategy in the e-health plan (National Digital Health Strategy for South Africa 2019 - 2024, 2019) executed by the Department of Health of South Africa, and is seen as a cost effective and efficient means of delivering health care needs to communities that are under-resourced. The e-health plan constitutes other sectors such as health informatics (Cilliers & Flowerday, 2013).

Prior to Covid-19 pandemic, the use of telemedicine in South Africa was low due to regulations imposed by the HPCSA. Regulators consider this innovative digital health solution as unproven and risky, thus the need for set regulation in order to protect both participating parties namely patients and doctors and to establish mutual trust (Jack & Mars, 2013).

A regulation posed by the HPCSA General Ethical Guidelines for Good Practice in Telemedicine (Booklet 10, Page 5) is that "all Telemedicine services should involve a healthcare provider where there is an actual face-to-face consultation and physical examination of the patient in a clinical setting. The consulting practitioner will communicate the information to the servicing practitioner, who will then provide the necessary assistance" (Human Rights, 2014). Jack and Mars (2013) reported that this would be an impediment to telemedicine because it is unlikely that patients from underserved areas or rural areas will have had a prior doctor-patient relationship with the distant doctor being consulted.

Section 2.1.2.1 to 2.1.2.4 will further discuss the key contributors of accessibility and usefulness of telemedicine.

2.1.2.1 **Written informed consent**

An imposing factor to Telemedicine is the requirement of a written informed consent. The HPCSA General Ethical Guidelines for Good Practice in Telemedicine (Booklet 10 page 12) states that "informed consent for the use of telemedicine technologies must be obtained in writing" (Human Rights, 2014).

However, this regulation was relaxed during the pandemic to "formal (preferably written) consent for among other things, specific services, including diagnosis and prescriptions and Information Communication Technology equipment to be used must always be secured from the patient" (Guidelines on telemedicine in South Africa, 2020).

The HPCSA General Ethical Guidelines for Good Practice in Telemedicine (Booklet 10, page 16) further states that in an emergency situation "The practitioner must provide the patient with emergency instructions when the care provided by telemedicine indicates that a referral to an acute care or emergency facility is necessary for the immediate treatment of the patient. Furthermore, the emergency instructions should be in writing and appropriate to the services being rendered via telemedicine" (Human Rights, 2014).

Notably, the requirement of written consent and especially obtaining the signature of patient, the patient's parent, the patient's guardian or the patient's caregiver and signature of the witness will make the implementation of telemedicine more difficult because of inaccessibility and cost to meet this requirement.

2.1.2.2 **Engaging platform**

The HPCSA General Ethical Guidelines for Good Practice in Telemedicine (Booklet 10, page 17) states that during a patient & practitioner consultation, "the quality and quantity of patient information received should be sufficient and relevant for the patient's clinical condition in order to ensure that accurate medical decisions and recommendations are made for the benefit of the patient" (Human Rights, 2014).

Tates et al (2017) identified that the three main pillars of communication namely information exchange, interpersonal relationship building, and shared decision making is more successful and of better quality during offline consultations.

Thus, the quality of virtual consultation verses face-to-face consultation poses a challenge to the implementation of telemedicine (Nordal, D, Kvammen, & Løchen, 2001). However, Cilliers and Flowerday (2013) research study presented a different view for the reason that the quality of a physical consultation is similar to a virtual consultation. Although Jack and Mars (2013) found that there are underlying factors that restrain the efficiency of telemedicine, which include poor internet connection that contribute to the low use of telemedicine. Thus, this study considered that further evaluation of effectiveness of telemedicine is needed.

2.1.2.3 **Availability of resources and knowledge to implement telemedicine**

Petersen el al (2019) addressed that lack of awareness about the kinds of technology available, skills needed to apply the technology and its significance are other barriers to telemedicine remaining unsuccessful. Cilliers and Flowerday (2013) indicated in their study that only 54.4% of respondents thought they did have the resources necessary to make use of telemedicine.

Prinsloo (2017), research depicted that fifty-six percent of study population agreed that they did have the knowledge needed to operate the system. Similarly, Cilliers and Flowerday (2011) study on whether computer literacy affect telemedicine acceptance among healthcare workers, pointed that less than fifty percent of the participants considered themselves confident about their knowledge of telemedicine.

However, is there an opportunity to continue with telemedicine in South Africa and will it be the go-to platform in future. Will digital health be able to fix the challenges the healthcare system faces by narrowing the inequality gap through improving access to quality, accessibility and efficiency of healthcare in South Africa.

Public healthcare facilities will become far less under pressured and patients will benefit with accessing a wide range of specialists (Jack & Mars, 2013). There is hope that telemedicine will grant access to healthcare that is more affordable (Chifamba, 2018). Most importantly, patients don't need to travel long distances for treatment (Jack & Mars, 2013).

2.1.2.4 **Patient information**

Maphumulo and Bhengu (2019) points out that poor record keeping can lead to other problems such as unnecessary delays for patients. The research further points that using the traditional method of storing patient information, patients' folders can be misplaced. Nevertheless, healthcare

workers are then forced to look for these files, causing patients to wait extra longer. In worst scenarios, the medical history of the patient is lost, which can create further complications leading to incorrect diagnosis and in some cases death of the patient (Maphumulo & Bhengu, 2019).

In 2019, the Department of Health of South Africa published a white paper, titled National Digital Health Strategy for South Africa2019 – 2024 (page 11), which aims to develop a platform to store patient information electronically that will become easily accessible to stakeholders (such as medical doctors) in the healthcare industry and in preparation for the National Healthcare Insurance (NHI) (National Digital Health Strategy for South Africa 2019 - 2024, 2019).

Yet, the HPCSA is concerned about security of patient information and states that "healthcare practitioners using telemedicine should provide safe procedures to avoid any alteration or elimination of patient data; and patient information should only be transmitted from one site to the other and stored, with the full knowledge and approval of the patient, in line with the informed consent guidelines" (Human Rights, 2014).

2.2 Research knowledge gap analysis

Section 2.2 discusses the following attributes – namely telemedicine as an engaging platform, seeking written informed consent for clinical procedures and using ICT, availability and knowledge of resources to conduct virtual consultation, and method used to store patient information – and why it contributes towards the accessibility, usefulness and low uptake of telemedicine and an individual's readiness to opt for telemedicine, taking into consideration the following studies by Prinsloo (2017) and Adeyelure and Kalema (2019).

Adeyelure and Kalema (2019) examined factors that influenced a user's readiness to accept telemedicine in the context of the South African public healthcare sector. Using a quantitative research strategy, Adeyelure and Kalema (2019) examined environmental and socio-economic factors that influence the use of telemedicine namely organization and environment, technology compatibility, perceived usefulness and perceived ease of use.

The findings reveal that organization, environment, technology, perceived usefulness and perceived ease of use are factors that influence the implementation of telemedicine in South Africa. The study also revealed that external factors such as government regulations and tariffs will have an influence on user readiness to accept telemedicine (Adeyelure & Kalema, 2019).

Prinsloo (2017) also did a study on the factors affecting healthcare workers' acceptance and use of telemedicine in hospitals in Kwa-Zulu Natal. Here the factors explored were technology acceptance; the influence of socio-demographic factors (age, experience, profession, qualification) and acceptance factors on use and behavioural intention to use telemedicine. There were high levels of agreement amongst respondents regarding the value of telemedicine (performance expectancy, and ease of use (effort expectancy), but less so for the role of social influence on use and the presence of facilitating conditions (such as support and assistance).

Examples of factors are trust, demographic features (age and race), personal factors (personal experience), and workplace factors (computer skills, perceived enjoyment, management support).

2.2.1 Performance expectancy: Engaging platform

Satisfaction is defined when an individual's expectations are met and can be achieved through quality, trust and empathy. In telemedicine, satisfaction occurs when there is effective communication between the medical professional and patient and accessibility to the resources needed to implement a virtual consultation and self-care efficacy. This factor links to UTAUT's performance expectancy because the telemedicine user is confident that the system will enable them to meet their expectations.

There have been numerous debates (Nordal, D, Kvammen, & Løchen, 2001) around the satisfaction received when using an online platform. Some of the elements include discomfort, embarrassment, nervousness and difficulty in hearing the doctor. Nevertheless, previous studies have reported that there may be a quality difference between a face-to-face consultation and telemedicine (Nordal, D, Kvammen, & Løchen, 2001).

Nordal, et al (2001) evaluated teledermatology in a comparative study of video conferences versus face-to-face consultations and found that there was no significant difference on patients' satisfaction between teleconsultation and of face-to-face consultation. The only exception was for patients' feelings of contact with the dermatologist.

While Mirzaei and Kashian (2020) did a study to determine if there were any differences in patients' perceptions of communication effectiveness with their physicians through different modes of communication. Here, it was noted that there was no significant difference in satisfaction

perceived, information exchange or interpersonal relationship building between face-to-face or digital consultation.

Additionally, Tates K, Antheunis ML and et al (2017) study on the "Effect of Screen-to-Screen Versus Face-to-Face Consultation on Doctor-Patient Communication" revealed that there was no significant difference between face-to-face and virtual consultation in terms of information exchange, interpersonal relationship building, and shared decision making. The research design used in their study was experimental, quantitative and the setting was in Netherlands (Tates, Antheunis, Kanters, Nieboer, & Gerritse, 2017). The hypothesis was tested using Preacher and Hayes' procedure (Tates, Antheunis, Kanters, Nieboer, & Gerritse, 2017) and a regression method was used to determine the association between medium of consultation and perceived information exchange, perceived interpersonal relationship building, and perceived shared decision making (Tates, Antheunis, Kanters, Nieboer, & Gerritse, 2017).

Taking into consideration the previous studies, this study examined the following factors that contribute to performance expectancy namely satisfaction and confidence, especially in the context of Covid-19. This study also measured the level of communication and information exchange where participants were asked if explanation concerning the disease and treatment was better in telemedicine.

2.2.2 Social influence: Written informed consent

An informed consent is providing permission or access to personal information in order to make an informed decision (Townsend, Scott, & Mars, 2019) through methods such as verbal or written.

Townsend, Scott, & Mars (2019) explains that an informed consent encompasses detailed information about the treatment process and potential risks and benefits provided by the doctor to the patient in a language that they understand. The study also explains the importance of an explanation of how the virtual consultation will occur such as the role and responsibility of the provider and the patient during the telemedicine interaction.

Prior to Covid-19 pandemic, the HPCSA's regulation on telemedicine was that written informed consent for all aspects of telemedicine is important because it implies that when an individual seeks help from a medical professional knowing that there might be some degree of risk/harm involved, they are not able to bring a claim against the consulting party (Jack & M, 2013).

The regulation links to the UTAUT social influence construct because rules and regulations can inhibit one from pursuing telemedicine.

In South Africa, there is debate (Jack & Mars, 2013) on whether informed consent for all forms of telemedicine is needed and whether it has to be in writing. According to Jack and Mars (2013) the riskier the medical intervention, the greater the requirement for written informed consent in a traditional consultation. While the World Medical Association (WMA's) guidelines on the Use of Telemedicine for the Provision of Health Care indicates that that the requirement for written consent is not compulsory, but medical professionals are required to follow relevant protocols for verbal, written or recorded consent and, where appropriate (Jack & Mars, 2013).

Using a quantitative, descriptive, cross-sectional survey, Jack and Mars (2013) measured how often doctors (general practitioners and all specialists) and nurses sought informed consent to take patient history; examine patient; order special investigation; refer patient; email patient information, and whether the consent was written or verbal. The overall findings saw that written consent is not regularly obtained from patients during a clinical examination or when using a digital platform.

Taking into consideration the Covid-19 pandemic resulting in surge of telemedicine consultations and relaxation of HPCSA regulation on informed consent, this research measured how often family physicians sought written and verbal informed consent for the following procedures: patient history, examine a patient, email patient information, refer patient, prescription, and virtual consultation.

2.2.3 Facilitating condition: Availability & knowledge of resources to conduct telemedicine

Venkatesh et al (2003) stated that facilitating conditions play an important role in the acceptance of telemedicine and included the following elements: technical assistance, knowledge of the system and compatibility with other systems already in use.

Cilliers and Flowerday (2013) study on the factors that influence the user acceptance of telemedicine found that there was no significant difference for qualification and knowledge of telemedicine. Findings in their research study reported that forty percentage of the study

population found that telemedicine is not suitable for the systems in place at their workplace; and fifty percent of the study population assumed that they had the required resources in place to make use of telemedicine (Cilliers & Flowerday, Health information systems to improve health care: A telemedicine case study, 2013).

Research by Cilliers and Flowerday (2013) did not make specification on the availability of resources. Whilst in this research, availability of resources namely electronic devices, ease of use and learning to operate the telemedicine system was measured to stipulate their preference of telemedicine.

2.2.4 Effort expectancy: Storing patient information

Jack and Mars (2013) indicated that even though electronic record keeping can have a security concern, information on 'who, what, when, and why' is easier to access within a national eHealth ecosystem, less time consuming and treatment can be provided soonest. Storing patient health information manually will make the sharing of this data challenging between medical professionals and between hospitals (Coleman, 2013). In the context of telemedicine, availability of patient information will improve the quality and continuity of care of patients.

The 4IR has improved ways to store and safeguard information. Personal data navigates within the health ecosystem leading to extensive sharing and transference and a possible threat to the misuse of such data (Townsend, R E Scott, & Mars, The development of ethical guidelines for telemedicine in South Africa). While, Jack and Mars (2013) pointed that emails and other patient information that is confidential can be encrypted and password protected.

In the South African context, record keeping/data protection requires more consideration as the current frameworks is insufficient to determine the reliance of data protection electronically (Townsend, Scott, & Mars, 2019). Townsend, Scott, and Mars (2019) suggest that the guidelines by the HPCSA called 'Confidentiality: Protecting and providing information', and 'General ethical guidelines for good practice in telemedicine' need to be more aligned with the provisions stipulated in South African legislative law, particularly with regard to data collection, security, storage and transfer, within the national eHealth ecosystem.

Since limited research is available on how patient information is stored, this study, measured the procedure used to store patient information and its link to National Digital Health Strategy for

South Africa. If patient information was stored electronically, how patient information is protected was also studied to identify its alignment with the HPCSA regulation.

In conclusion and from the studies discussed in this section, this research study examined a combination of previously researched and new components in the following categories that maximises the value of telemedicine, especially in the context of the Covid-19 pandemic: quality of information exchange; access and knowledge to the required resources for the consultation to be effective; regulations imposed by HPCSA such as the requirements of written informed consent and method used to store patient information.

2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

Adeyelure and Kalem (2019) stated that ICT can become a vital solution to alleviate some of the challenges faced in public health sectors in South Africa. However, the benefits of this technology can only be seen if healthcare workers have access to the necessary resources, are knowledgeable about navigating required platforms and if they find it useful (Cilliers & Flowerday, 2013).

There are various psychological factors, such as understanding and trust, that make the acceptance of technology challenging. Venkatesh et al (2003), deployed eight theories/models of technology to develop the Unified Theory of Acceptance and Use of Technology (UTAUT). The theories used to study the behavioural intention to use a technology included: Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behaviour (TPB), a combined Theory of Planned Behaviour/Technology Acceptance Model (C-TPBTAM), the Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT) (Venkatesh, Thong, & Xin, 2012).

The model consists of four constructs namely performance expectancy, effort expectancy, social influence, and facilitating conditions as well as key moderators including gender, age, voluntariness and experience (Figure 2).

This study used the definitions of the four constructs to develop the questions in section 1.2.3.

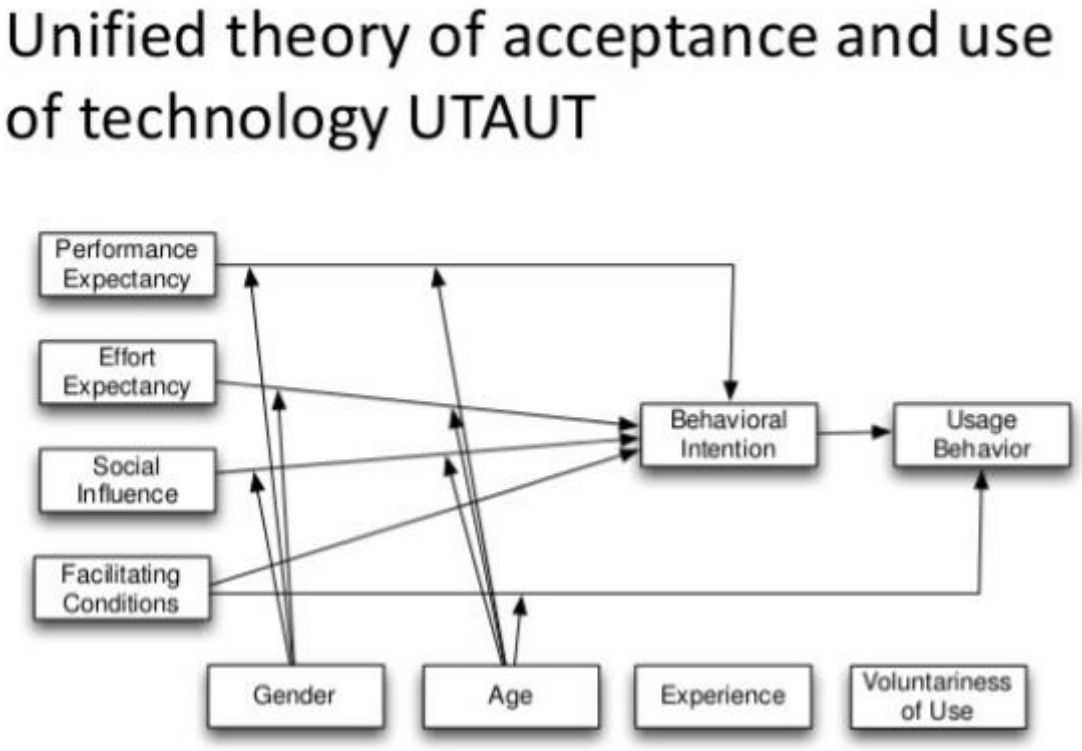


Figure 2: *UTAUT model* (Prinsloo, 2017)

Performance expectancy is defined as the extent to which an employee enjoys certain benefits when using technology for an activity (Venkatesh, Thong, & Xin, 2012). Cohen, Bancilhon, and Jones (2013) explain that performance expectancy is achieved when an individual perceives that a technology works to their advantage, as well as improve productivity and effectiveness.

Effort expectancy is the degree of ease associated with consumers' use of technology (Venkatesh, Thong, & Xin, 2012). In other words, it is about how user friendly a certain technology is and whether it needs a lot of effort to be operational (Cohen, Bancilhon, & Jones, 2013). Petersen et al (2019) observed that if using a technology device is slow and cumbersome, this will likely influence an individual to use it less frequently. Additional studies denote that effort expectancy to be the most important factor influencing health professional satisfaction with an electronic health system (Cohen, Bancilhon, & Jones, 2013).

Social influence is defined by the individuals' decision to use digital health based on the perception of peers on the usefulness of this technology (Venkatesh, Thong, & Xin, 2012).

Facilitating conditions encompass the environmental factors, resources and support available to make it easier to perform a task (Venkatesh, Thong, & Xin, 2012). These include financial and technical resources, support and training.

Based on the UTAUT model, Venkatesh, Thong, & Xin (2012) research identified that factors that influence behavioural intention to use technology are performance expectancy, effort expectancy, and social influence. Facilitating condition is a factor that influences the determination to use a technology (Venkatesh, Thong, & Xin, 2012).

Since the inception of the model, UTAUT serves as a baseline model in technology adoption and has been tested widely including the health sector, both organisational and non-organisational settings (Venkatesh, Thong, & Xin, 2012). The theory was found to explain 70% of the variance in behavioural intention to use a technology and about 50% of the variance in technology use (Cilliers & Flowerday, 2013). The benefit of this model is that it provides for managerial decisions and to determine the effectiveness and value of a technology product is to be implemented.

Hennington and Janz (2007) were the first researchers to study the UTAUT model in the acceptance of technology in the health sector. While (Chang, Hwang, Hung, & Li, 2007) recently suggested that UTAUT is a useful framework to use in research related to electronic health adoption; other studies have shown that the UTAUT model can be modified to gain maximum usefulness across different countries. Elsewhere, the UTAUT framework was used to examine physicians' acceptance of a pharmacokinetics-based clinical decision support system in Taiwan and acceptance of telemedicine in South Africa's public healthcare system (Cohen, Bancilhon, & Jones, 2013).

Some of the limitations of UTAUT Petersen et al (2019) include community, culture, country, organisation, agency, department, person, use of students to explore workplace issues, no use of moderating variables, and lack of exogenous factors. It does not include external factors that can affect the performance of the behaviour. It also does not take into consideration factors such as contexts and situations that may impact usage (Petersen et al, 2019).

2.4 Summary and conclusion

2.4.1 Summary of literature reviewed

This chapter explored telemedicine and factors that reduce the use of this technology. Telemedicine is a form of information and communication technology used to provide healthcare service virtually and is likely to fix the challenges the healthcare system faces by narrowing the inequality gap through improving access to quality, accessibility and efficiency of healthcare.

However, in South Africa economic factors (the digital divide between the rich and poor), educational factors (such as lack of technology literacy) and sociocultural factors (such as lack of support from family and peers) hinder the accessibility and usefulness of telemedicine (Petersen et al, 2019).

Hence, the purpose of this study was to use a quantitative, cross-sectional research strategy to evaluate the following factors: written informed consent (social influence), record keeping (effort expectancy), if telemedicine is engaging (performance expectancy) and availability & quality of resources to conduct telemedicine (facilitating condition).

3 RESEARCH STRATEGY, DESIGN, PROCEDURE AND METHODS

This chapter looks into the research strategy, the research design as well as the procedure and methods undertaken in this study based on the four questions (section 1.2.3) that this research report examined - that is, is telemedicine an engaging platform; method used to seek informed consent to perform a clinical examination or when using ICT; availability and knowledge of resources to implement telemedicine successfully; and the method is used to store patient information.

3.1 Research strategy

A research strategy (Research methodology: Research Starters Topic, 2018) is the method undertaken in order to pursue information to meet the objectives of this study. The strategy builds a foundation by developing a consensus on what problems need to be investigated, how will the investigation take place and how will the findings help resolve a current societal issue (Research methodology: Research Starters Topic, 2018). It constitutes of three elements namely qualitative, quantitative, and mixed (Goertzen, 2017).

In order to measure the objectives of this study, a quantitative research strategy was implemented. The purpose of using this research strategy, was to study human behaviour by collecting numerical data from the sample representing a population. It involved obtaining numerical data across a certain time (i.e. Covid-19 pandemic) and profession (for the purpose of this study) through statistical inference procedures. Also, questions used in the survey were direct and quantifiable – such as percentage, what proportion, what extent and how much – so that the data could be analysed using statistical models and to gain an understanding about needs of the targeted sample. (Goertzen, 2017). In order to test for reliability, a sample size of 50 or more was needed.

Cilliers and Flowerday (2013) used a positivistic, quantitative research methodology to investigate if user acceptance is a factor for the poor uptake of telemedicine in the Eastern Cape using the four major constructs of the UTAUT model as a baseline. The study comprised of hypothesis per construct and required statistical models to prove the hypothesis.

Hence, for this study, the UTAUT constructs was used as a foundation to establish the factors that influence the ease of accessing and use of telemedicine leading to the research questions.

3.2 Research design

A research design is a framework used to collect and analyse data (Goertzen, 2017). The motive of the research design is to find evidence for each research question and for a certain set of criteria namely validity, replication, trustworthiness and authenticity. There is more than one type of research design namely: cross-sectional; longitudinal; quasi-experimental; case study; comparative design.

More specifically, a cross-sectional design involves the collection of data at one specific time with one specific sample. It can be used in both qualitative and quantitative research. It is like a status report or even a 'snapshot' of reality in a very focused and specified manner (Merriam & Tisdell, 2016).

Thus, for this study, the cross-sectional design was leveraged to understand the prevalence of a behaviour in the usage of telemedicine by family physicians during Covid-19 pandemic (single point in time). This research design was highly useful in collecting data in connection with two or more variables. Additionally, the design was used to identify the association of the causes of low use of telemedicine and outcome of interest.

Adeyelure and Kalema (2019) research study on examining factors that influence the use of telemedicine used a cross-sectional research design to study the association between dependent and independent variables quantitatively. The motive for the design was to also gather data from participants at one specific point in time (Tope Samuel Adeyelure & Kalema, 2019).

3.3 Research procedure and methods

This section documents the actual procedure and methods employed in this research to collect, collate, process, and analyse empirical evidence.

3.3.1 Research data and information collection instrument(s)

Research data collection instrument are tools used to collect data from a specified sample to ensure the seamless translation from raw data captured to interpretation (Merriam & Tisdell, 2016).

Types of data collection methods include primary data where information is collected by the researcher from scratch and secondary data is using information collected by others such as government publications, websites, ethno-statistics and journal articles. (Merriam & Tisdell, 2016).

For this study, a primary data collection method was used so that the findings are most current, taking into consideration preface of Covid-19.

According to Merriam and Tisdell (2016), in a primary data collection method, there are various tools used to collect information. Common tools (Merriam & Tisdell, 2016) include questionnaires/surveys (mailed, online, group/collective, individual, panel); interviews (structured, semi-structured, unstructured); observations (participant, non-participant); experiments (experimental, semi-/quasi-experimental).

Since this research focused on a quantitative research strategy, the type of instrument structure used was an online questionnaire encompassing close ended questions. The aim of this instrument structure was to minimize differences in responses and to keep it as standard as possible so that true variation is achieved.

This research study was associated with the structure of the data collection instrument implemented by Prinsloo (2017) due to its relevance and to generalise findings of the specified sample. Prinsloo (2017) research on factors affecting healthcare workers' acceptance and use of telehealth in hospitals in KwaZulu-Natal (KZN), used a structured and close ended questionnaire so that the responses can be analysed using relevant statistical models such as t-tests and regression models. The research by Prinsloo (2017) further used a questionnaire that covered demographic variables (gender, age), behavioural intention, performance expectancy, effort expectancy, social influence, and facilitating conditions. Different formats of questions and responses were included in the questionnaire such as yes/no, and degree of agreement or disagreement in Likert scale questions which will be used as a guide for the current research study.

Additionally, questions for this study were sourced from previous research studies that investigated the questions stated in Section 1.2.3 to understand the factors affecting low use of telemedicine. The questionnaire was introduced with questions on demographics such as geographic area, gender and age. This was followed by questions based on the four overarching research propositions in section 1.2.3. Each research question comprised sub-questions for the purposes of obtaining more data and statistical models relevant to this research study.

While collecting data, each question had a multi-item scale allocated for statistical analysis purposes. Various measurement tools were used to assist with interpreting the data. This included

categorial data to interpret gender, geographic area of practice, work place description, telemedicine modalities, profession and how informed consent is taken; **ordinal data** to interpret age; **Likert scale** to interpret if telemedicine is engaging, factors that cause low use of telemedicine and how patient information is stored.

3.3.2 Research target population and selection of respondents

3.3.2.1 **Research target population**

When conducting the research, it is important to decide which section of the population is suitable to represent the research proposition and add value to the study.

For this study purposes, a population of South African medical doctors was used. Furthermore, the population included medical doctors practicing in state, private or both facilities; male or female; and all age groups.

The categories were taken into consideration in order to determine if telemedicine usage is common in males or females, which age category finds it most useful and to ensure that the participants were based in the region and profession as per the objective of this study. Factors such as income level served least importance.

The initial sampling strategy was to focus on the Johannesburg region, however, due to a low response rate, the survey was expanded to the rest of South Africa.

3.3.2.2 **Sampling or selecting respondents from the target population**

Sample is usually drawn from a population and data gathered from the sample will lead to assumptions about the population (Bryman & Bell, 2014). A sample of medical doctors specialising as Family Physicians was used in this study. Family Physicians focus on primary healthcare by diagnosing and treating acute or chronic illnesses, hence its relevance to the study.

According to Bryman and Bell (2014), there are a number of methods used to formulate a sample such as bias, sampling error, probability sample (simple random sample, systematic sample, stratified random sampling, multi-stage cluster sampling), non-probability sampling (convenience sampling, snowball sampling, quota sampling).

In a research conducted by Prinsloo (2017) the sampling method used was convenience sampling where the researcher conducted face to face briefing sessions with staff at seven hospitals in Kwa-Zulu Natal and obtained email addresses. Thereafter, the researcher approached participants individually via email. Each email contained an information sheet explaining the purpose of the study, an invitation to participate and informing the recipient that participation is voluntary and anonymous. Through this method, a large number of people took part in the research.

For this study, a non-probability convenience sampling was used so that the accuracy of data obtained is high. Initially, face-to-face briefing sessions with family physician was going to be conducted. However, due to Covid-19 pandemic and restrictions imposed at healthcare facilities, online communication was instrumented. Hence, doctors' (that specialised as family physicians) names and email address were sourced from the websites of hospital groups namely Netcare, Life Healthcare and Mediclinic.

Thereafter, an email containing the research information, link to the online survey and ethics certificate was sent to each medical doctor, inviting them to participate in the research and informing them that participation is voluntary and that all information shared remained confidential by encrypting documents with a password. Contact details was also included in the email. Here, 50 Family Physicians based in Johannesburg was approached.

Additionally, an organisation that collects and maintains the contact information of South African healthcare providers and complies with the Protection of Personal Information Act (POPIA), was approached to assist with accessing the contact information of Family Physicians, in both public and private practices. However, due to privacy concerns, the organisation preferred to share the invitation to 580 Family Physicians practicing in various parts of South Africa to participate in the research via email using their resources.

Amidst the Covid-19 and medical doctors working longer than normal shifts, a challenge experienced during data collection was doctors' unavailability to answer the survey shared, hence low response received. To try and alleviate the problem and improve the response rate, telephone conversations with medical doctors was conducted.

3.3.3 Ethical considerations when collecting research data

The role of ethics is to ensure sustainability and transparency of a study. Ethics or morals is a standard of conduct. When conducting research, participants are likely to share their personal information and experiences and would prefer that the researcher keeps all information shared confidential and not be shared externally by the data collector (Merriam & Tisdell, 2016).

A researcher should seek consent from respondents prior to collecting data. Consent is defined as giving permission for something to happen. For research purposes, consent is willingness to participate in the interview/survey/focus group and should include the following characteristics for building trust: honesty, openness, carefulness, accountability and fairness (Merriam & Tisdell, 2016).

In this study, an email (appendix 2) containing the following information was sent to each Family Physician - the title and aim of the research undertaken; link to the online survey should the medical doctor be interested to participate with a claim that no personal costs is associated by participating; option to withdraw at any time; noting that information shared will remain confidential; all information that is obtained will be stored and protected; a summary of the research will be sent upon request; and contact details of the researcher, supervisor and University Human Research Ethics Committee.

Prior to data collection, approval from School of Graduate School of Business Administration Ethics Committee was obtained. For authenticity, a signed ethics certificate (appendix 3) was shared with medical doctors who wished to participate.

3.3.4 Research data and information collection process

When collecting data, various elements should be taken into consideration to gain as much information as possible. These include: what data sources are most valued; what data collection methods is highly effective; what data collection methods will provide valid and reliable results; and any parameters that need to be considered (Merriam & Tisdell, 2016).

Family Physicians who agreed to participate had to simply click on a link supplied on the email which took them to the survey. The survey was built on a user-friendly online platform called Survey Monkey. Each survey took an average of 5 minutes to complete.

Data collected from participants was then automatically stored in an Excel spreadsheet which could easily be downloaded from Survey Monkey.

In order to meet the objectives of the study and present a quality quantitative research, data captured on the Excel spreadsheet was then cleaned whereby respondents who did not specialise as family physicians was deleted and those who did not complete the survey was deleted.

3.3.5 Research data and information processing and analysis

3.3.5.1 **Research data and information processing**

Research data processing is the steps used to filter information acquired to make it more meaningful and comprehensive. The benefits of data processing is that it becomes easy to handle large amounts of data and to reorder great quantities of information quickly. In quantitative research, data processing becomes much simpler and variability is reduced because interviewees are provided with answers to choose from (Merriam & Tisdell, 2016).

For the current research, data was coded as per the code number on each completed questionnaire and imported to JMP software for analysis. Data was analysed by the researcher with the assistance of a statistician using both descriptive and analytic statistics.

3.3.5.2 **Research data and information analysis**

Data analysis is defined as interpreting data collected and how it relates to the study. It is about making meaning about the data collected by consolidating, reducing, and interpreting what people have said and what the researcher has seen and read. This is done using statistical models such as descriptive statistics, regressions analysis, cluster analysis, content analysis, Pearson's correlation coefficient, t-test, statistical significance, univariate analysis and bivariate analysis (Merriam & Tisdell, 2016).

The data collected from the study population was analysed using descriptive and analytic statistics.

Descriptive statistics was used to summarise data collected from the sample for questions on demographics of the respondents, engaging platform, informed consent, resources and storage of patient information. Measures of central tendency (mean, median or mode) was used to understand common patterns in the use of telemedicine. While, measures of variability, was used to analyse how spread out the distribution of the data was.

The types of analytic statistics used was:

1. A Mosaic Plot to summarize the relationship between ease of use and gender (male & female) among several categorical variables
2. A Oneway Analysis of engaging platform & age and engaging platform & gender was done to determine which age group (21-40; 41-60; 61+) and gender (male/female) agrees the most that telemedicine is an engaging platform
3. A Pearson Correlation of family physicians & written informed consent and family physicians & verbal informed consent to determine its association

3.4 Research strengthens—reliability measures applied

Reliability

Reliability is the degree to which findings are consistent when researchers repeat the process. An assessment cannot be valid unless it is reliable. Factors which stimulate reliability include stability, internal reliability and inter-observer consistency (Bryman, 2014).

For this study, a Cronbach's alpha was used to measure internal reliability. The measurement was done using question 1 in appendix 1 on engaging platform as the Likert scale was consistent for all the sub-questions and the score was 0.83.

The calculation of the alpha correlation coefficient varies between 0 (no correlation and therefore no internal consistency) and 1 (perfect correlation and therefore complete internal consistency). A result of 0.8 and above usually implies an acceptable level of internal reliability (Bryman, 2014).

Validity

Validity is an important research criterion that describes the integrity of research findings and consists of four main types namely, internal, external, measurement, and ecological (Bryman, 2014). This section discusses three categories of validity for the current research study.

Internal validity refers to whether the current research findings are aligned to the theoretical ideas proposed (Bryman, 2014). Bryman (2014) argued that internal validity tends to strengthen a qualitative research design strategy because of the consistency between concepts and observations through an experimental design. In the current research study, a survey as utilised, making internal reliability difficult to achieve because the research design strategy is quantitative and the outcome variable cannot be controlled by the researcher.

External validity is if the research finding can be applied more broadly in external environments such as different location or population (Bryman, 2014). In the current research study, a non-probability convenience sampling was used and respondents were family physicians. Thus, the results may not represent other medical specialities.

Ecological validity is described when the research findings can be applied to natural setting such as people's everyday lives (Bryman, 2014). Hence, the findings in the current research study will help determine the socio-economic conditions influencing daily life conditions and contribute towards future research studies and models to improve the usage of telemedicine in various geographical locations.

3.5 Research weaknesses—technical and administrative limitations

Limitations in a research is broad and certain environmental or social factors may hinder achieving the expected results.

The targeted number of responses for this study was 120, but 80 responses was acquired. The acquisition of the targeted number was a challenge to achieve because between December 2020 and January 2021, South Africa experienced the second wave of the Covid-19 pandemic, putting doctors especially those that focus on primary healthcare under immense pressure. Also, the aim of the present study was to collect data from a sample based in Johannesburg, however, due to the above mentioned challenge, the sample was stretched to family physicians practicing in other metropolitan areas in of South Africa.

A difficulty in the research was extracting a sample that had some sort of telemedicine experience. When the study population was approached to participate in the research, it was assumed that they were potential users of telemedicine and could be considered a volunteer sample.

The initial strategy for the research was to use the entire UTAUT model, including the set of questions developed for this specific model. However, the questionnaire and research propositions developed for this research study does not strongly correlate with the requirements of the UTAUT model and statistical analysis required. In a UTAUT model, all questions based on the four constructs has a consistent Likert scale of strongly agree, agree, disagree and strongly disagree. Hence the usage of some parts of the model was omitted in the present study.

4 PRESENTATION OF RESEARCH RESULTS

The purpose of this study was to determine if the following attributes namely engagement, written and verbal informed consent, method used to store patient information, and availability of resources - make access to telemedicine consultation less feasible. Five questions were drafted and researched to meet the objectives of the study. In this chapter, an analysis was done on the demographics of the sample approached and research questions portrayed as in section 1.2.3.

In the study, a Cronbach's alpha was used to measure internal reliability and the score was 0.83. The measurement was done using question 1 on engaging platform as the Likert scale was consistent for all the sub-questions.

The calculation of the alpha correlation coefficient varies between 0 (no correlation and therefore no internal consistency) and 1 (perfect correlation and therefore complete internal consistency). A result of 0.8 and above usually implies an acceptable level of internal reliability.

4.1 Socio-Demographic Characteristics of Participants

The study population included mixed genders with 65% males and 35% females (Table 1). The age group of participants was ranked into four groups and ranged from 21 – 61+ with majority been between 51+. In terms of practice of work, the study population practiced as family physicians in either a private facility, state facility or both.

Table 1: Socio-demographic representation of the study population

	N	Percentage
Gender		
Female	28	35%
Male	51	65%
Age		
21 – 30	4	5%
31 – 40	10	13%
41 – 50	18	22%
51 – 60	30	38%
61+	18	22%

Place of work		
Private	47	59%
State	23	29%
Both	8	10%
Other	2	2%

4.2 Telemedicine usage

Study population reported that 35% used telemedicine daily, 29% weekly, 15% monthly and 21% never used it (Table 2 and Figure 3). For those that made use of telemedicine, 5% used it for diagnosis, 12% used it for treatment, 71% used it for both while 12% reported for other purposes with reasons being following up, consultation and scripts, referral letters and feedback (Table 2)

Table 2: Telemedicine usage of the study population

	N	Percentage
How often telemedicine is used		
Daily	28	35%
Weekly	23	29%
Monthly	12	15%
Never	17	21%
What purpose is telemedicine used		
Diagnosis	3	5%
Treatment	8	12%
Both	46	71%
Other	8	12%

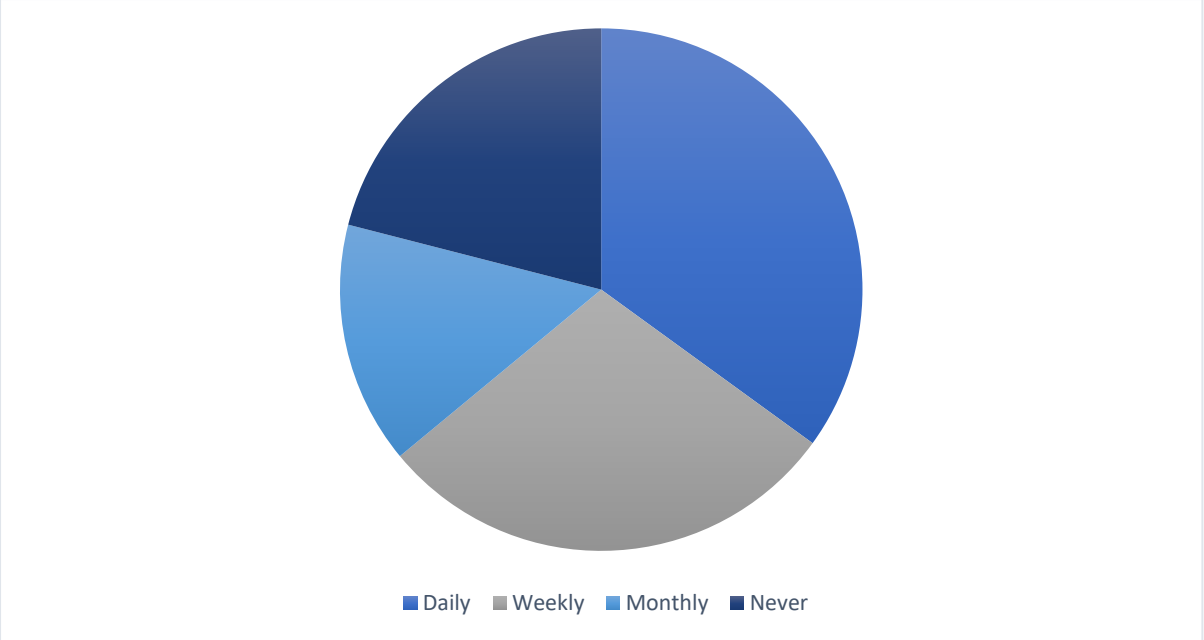


Figure 3 How often telemedicine is used

The study population also reported on the types of telemedicine modalities used from the options that were provided – SMS, telephonic conversation, video call, instant messaging and other with reasons being email. Even though participants could choose from more than one option, telephonic conversation was rated the highest telemedicine modality used by family physicians, followed by instant messaging (Figure 4).

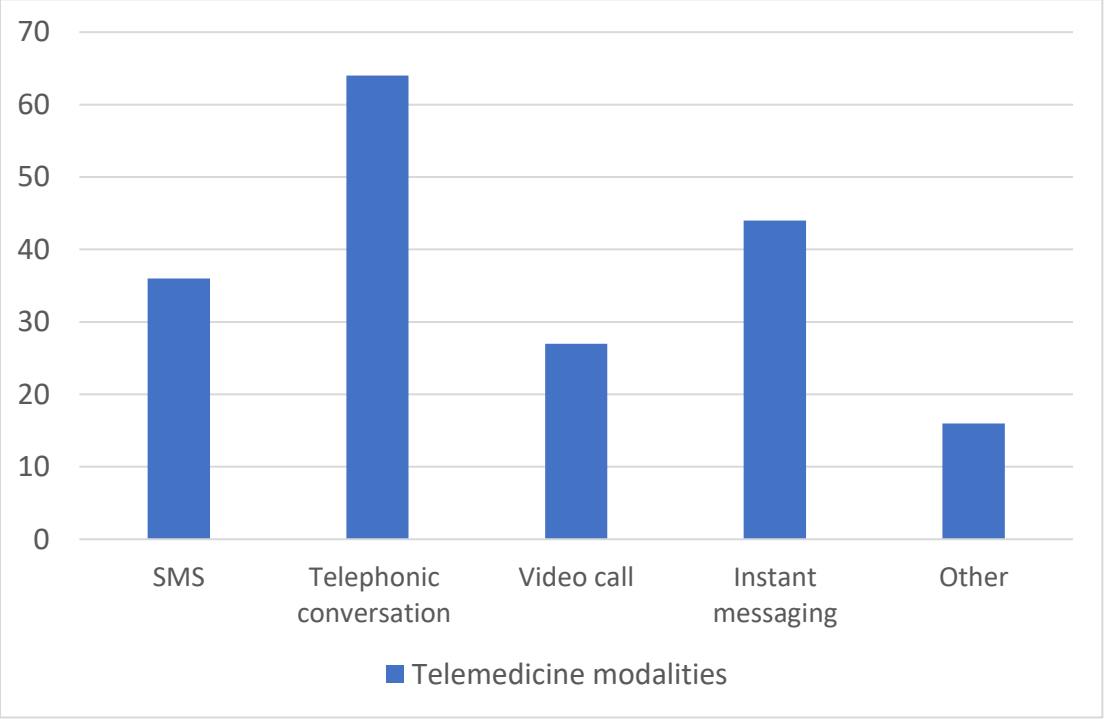


Figure 4: Modalities used by study population

More than 40% of the population study find telemedicine to be somewhat useful followed by 30% who find it to be extremely useful (Figure 5).

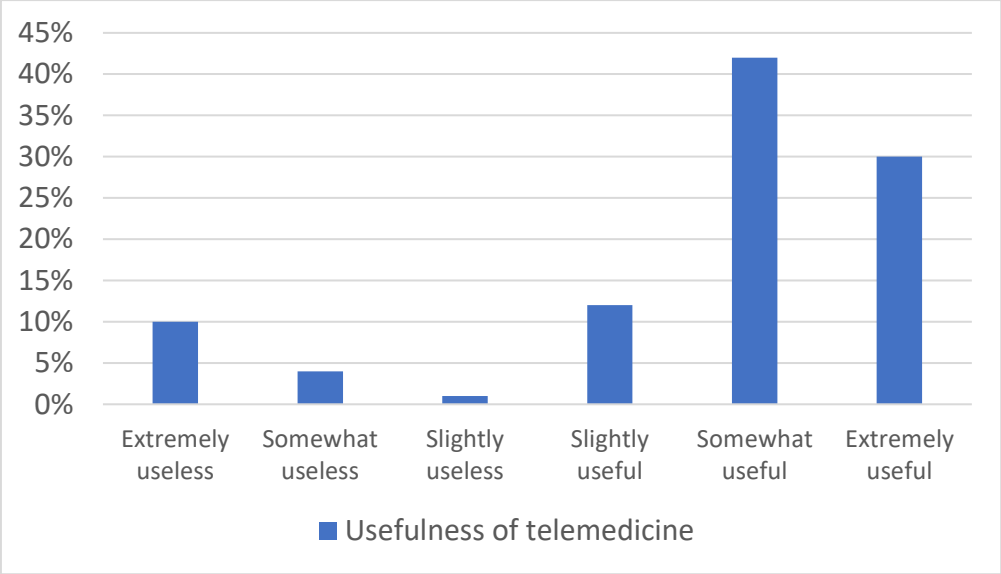


Figure 5: Usefulness of telemedicine as per the study population

Nearly half (47.5%) of the participants are somewhat knowledgeable about telemedicine while 37.5% indicated that they are knowledgeable, while only 7.5% very knowledgeable and 7.5% are not knowledgeable about telemedicine (Figure 6).

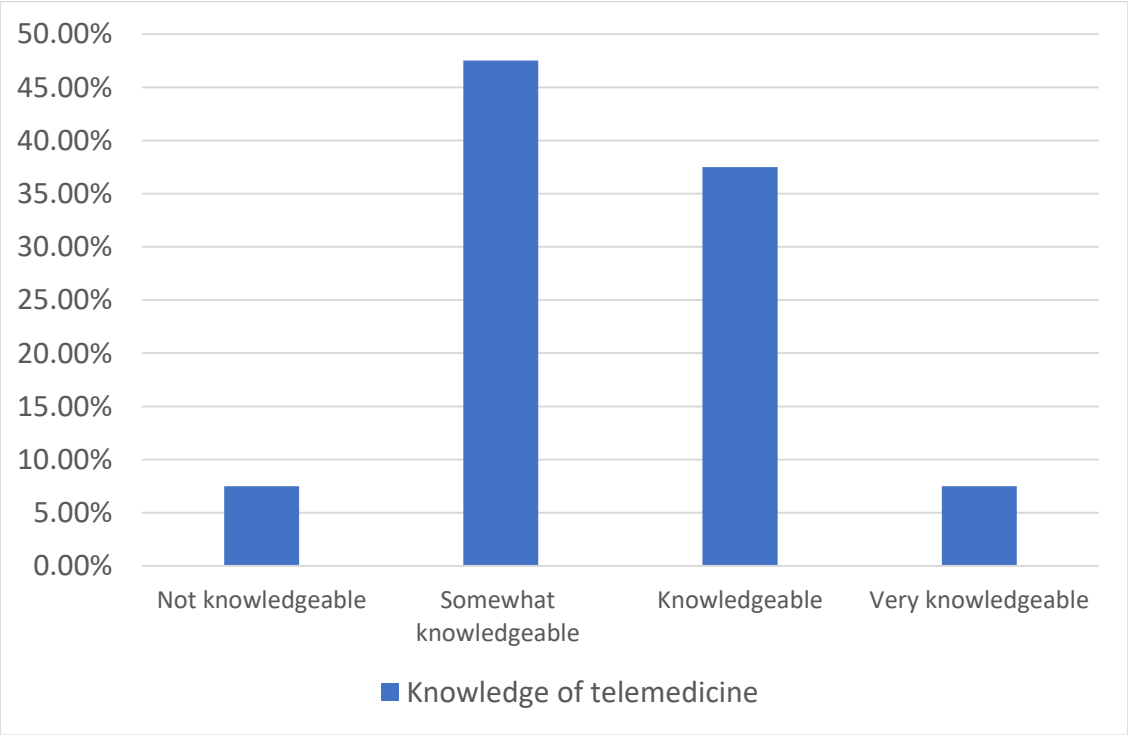


Figure 6: Study population knowledge about telemedicine

4.3 Telemedicine as an engaging platform

Respondents were assigned scores (strongly disagree= 1; strongly agree= 4) and mean scores for the individual indicators and mean total scores as a whole was computed (Table 3). The mean total score was 10.7 out of 16 with individual means ranging from 2.56 to 2.85.

Table 3: Telemedicine as an engaging platform

	Min	Max	Mean	Std Deviation
1. Do you agree that telemedicine enables a doctor to be more productive?	1	4	2.85	0.74
2. Do you agree that telemedicine results in increased confidence in a doctor/patient relationship?	1	4	2.61	0.77
3. Do you agree that as a doctor, satisfaction is usually gained post telemedicine consultation?	1	4	2.56	0.67
4. Are questions answered profusely during a telemedicine consultation?	1	4	2.68	0.65

Overall, more than 50% of respondents agreed that telemedicine is an engaging platform with 52.5% agreeing that telemedicine enables a doctor to be more productive (Q1), 55% agreeing that satisfaction is usually gained post telemedicine consultation (Q3); and 55% agreeing that questions answered profusely during a telemedicine consultation (Q4). However, the same percentage of respondents (41.25%) agreed and disagreed that telemedicine results in increased confidence in a doctor/patient relationship (Q2). A relatively low percentage of respondents strongly disagreed that telemedicine is an engaging platform (Figure 7).

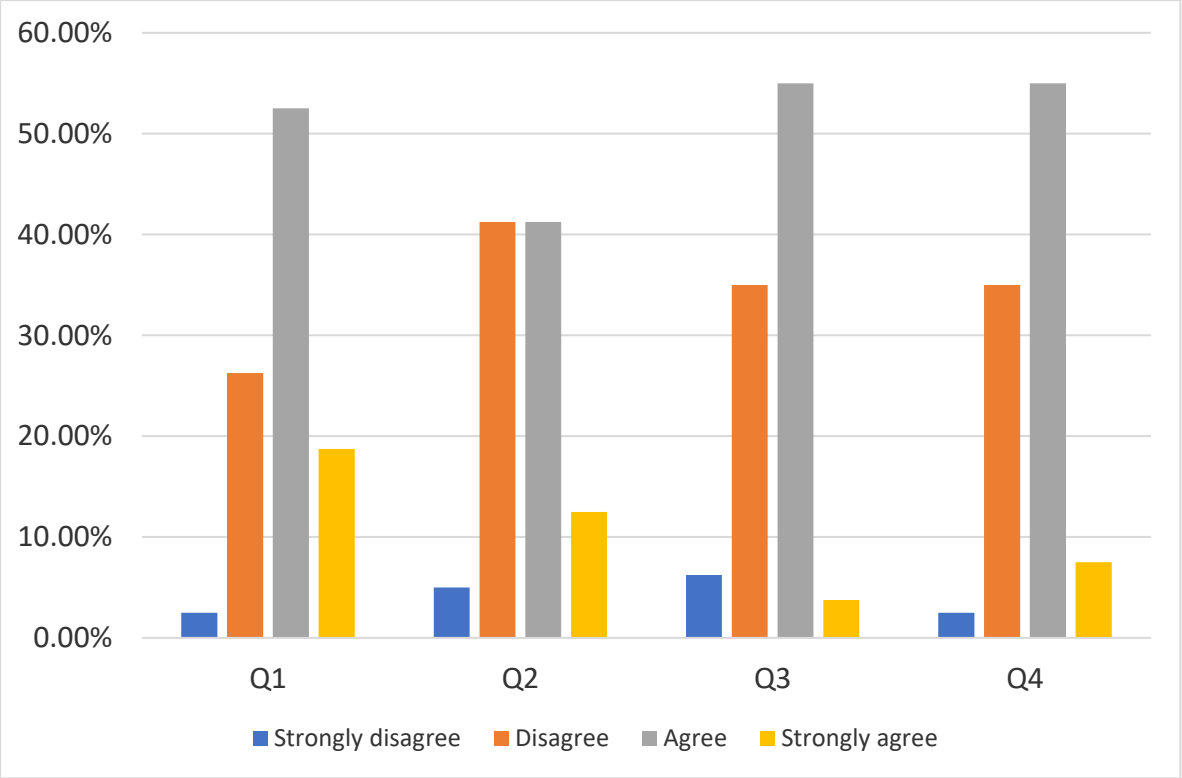


Figure 7: Percentage of respondents that find telemedicine to be an engaging platform

In terms of information exchange during a telemedicine consultation more than half the respondents said that the explanation concerning the disease or treatment is not better (Table 4).

Table 4: Information exchange during a telemedicine consultation

	Yes	No	Sometimes
1. In your experience, was the explanation concerning the disease better in telemedicine?	2.5%	58.75%	38.75%
2. In your experience, was the explanation concerning the treatment better in telemedicine?	6.25%	50%	43.75%

4.4 Informed consent preference (written or verbal) to perform a clinical examination or when using ICT

For this category, the study population scored according to elements from a list - take patient history, examine a patient, email patient information, refer patient, prescription, virtual consultation, none of the above, and other - for both written informed consent and verbal informed consent. Respondents were allowed to choose more than one option (Figure 8). Overall, more respondents (40%) took verbal consent to conduct virtual consultation compared to 14% that took written consent.

Family physicians take an average of 2.61 (Figure 9 and Table 5) procedures relating to clinical examination or when using ICT using verbal format and an average of 1.08 (Figure 10 and Table 6) procedures relating to clinical examination or when using ICT using a written format.

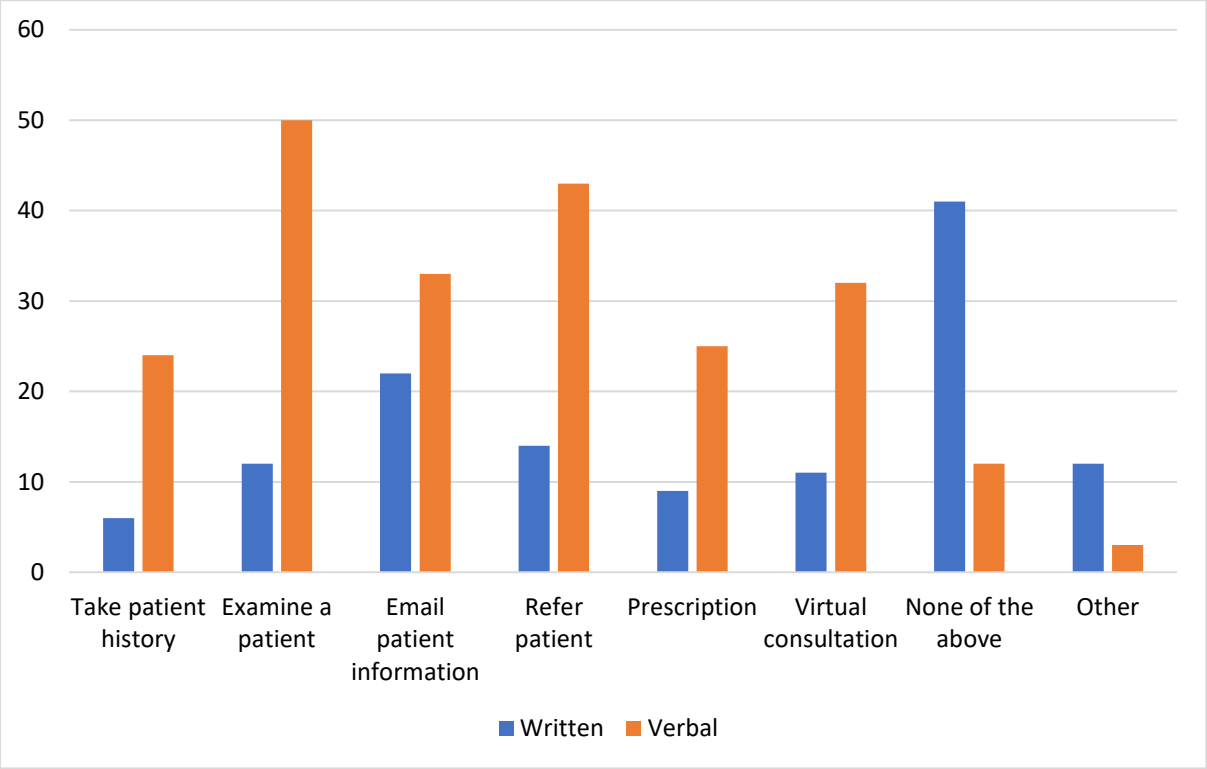


Figure 8: Study population preference on informed consent

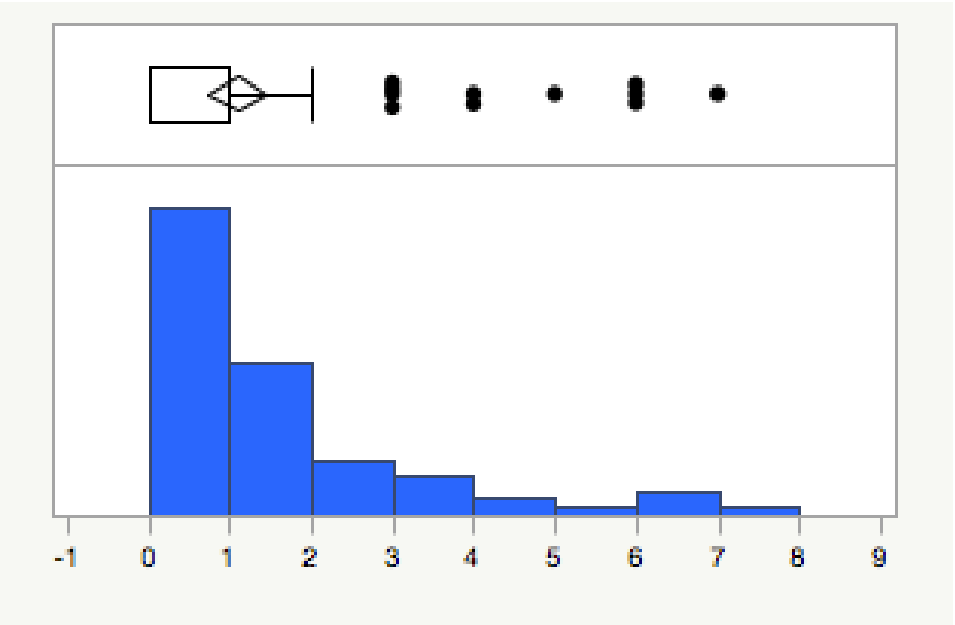


Figure 9: Written number of Procedures

Table 5: Summary Statistics on written number of procedure

Mean	1.0875
Std Dev	1.6396492
Std Err Mean	0.1833183
Upper 95% Mean	1.452386
Lower 95% Mean	0.722614
N	80
Skewness	1.9414634
Kurtosis	3.4516841

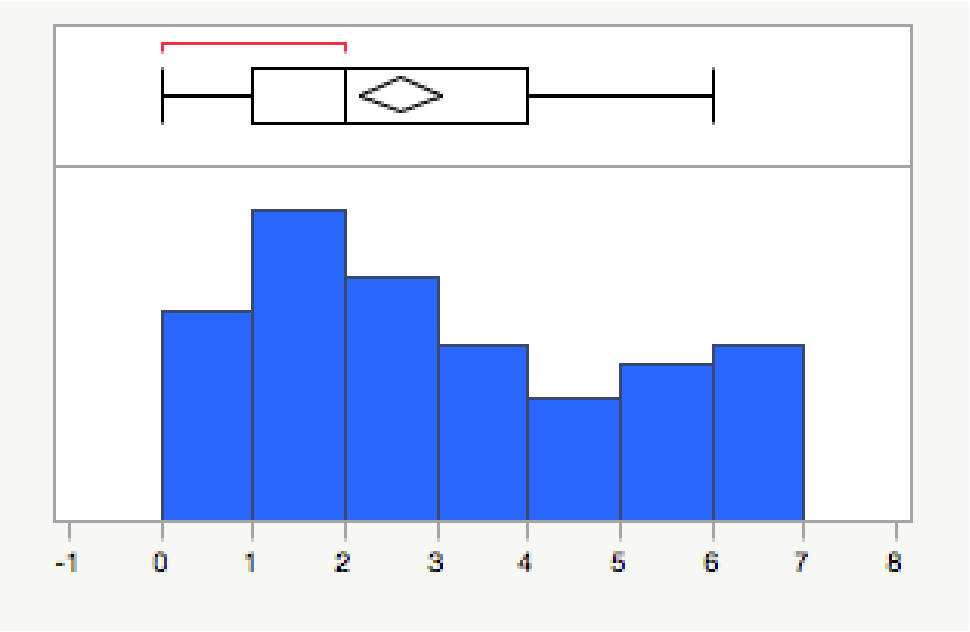


Figure 10: Verbal number of Procedures

Table 6: Summary Statistics on verbal number of procedure

Mean	2.6125
Std Dev	1.9967933
Std Err Mean	0.2232483
Upper 95% Mean	3.0568646
Lower 95% Mean	2.1681354
N	80
Skewness	0.3878212
Kurtosis	-1.126012

A Pearson Correlation of family physicians and written informed consent was higher at 0.1174 compared to the correlation of 0.0329 of family physicians and verbal informed consent, showing no real evidence of association.

4.5 Availability and quality of essential resources to conduct telemedicine

As with the facilitating condition, the responses in this category was significant with 72 of the respondents indicating that they do have an electronic device to implement telemedicine consultation followed by 42 who also had access to quality broadband (Figure 11). On average family physicians had access to 1.61 resources to conduct telemedicine consultation.

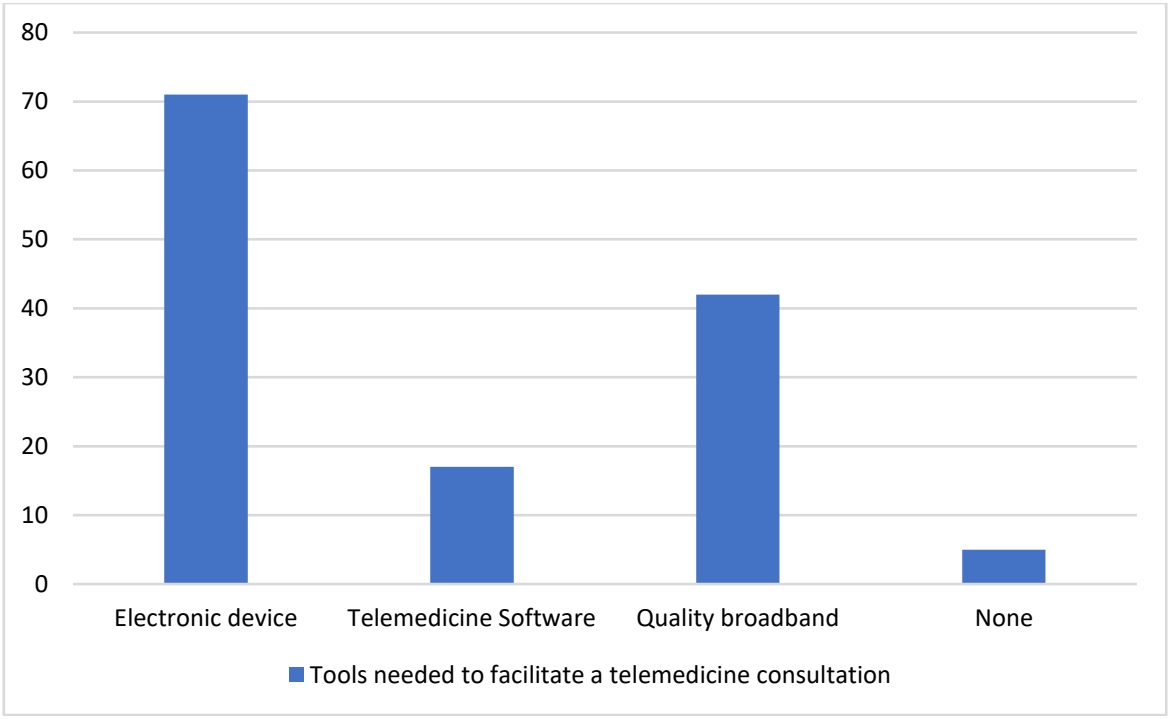


Figure 11: Study population representation on tools used by doctors for telemedicine

Of the 17 respondents that use a telemedicine software, 76% said that the software is user friendly. Respondents also reported that 71% of their patients found the telemedicine software to be user friendly (Table 7).

Table 7: The efficiency of telemedicine software

	Yes	No
1. **If you do use a telemedicine software, is it user friendly for you?**	76%	24%
2. **If you do use a telemedicine software, is it user friendly for your patient?**	71%	29%

The study population also reported that 59 of the medical doctor's patients do have access to an electronic device, 20 have access to quality network while 18 have access to none (Figure 12).

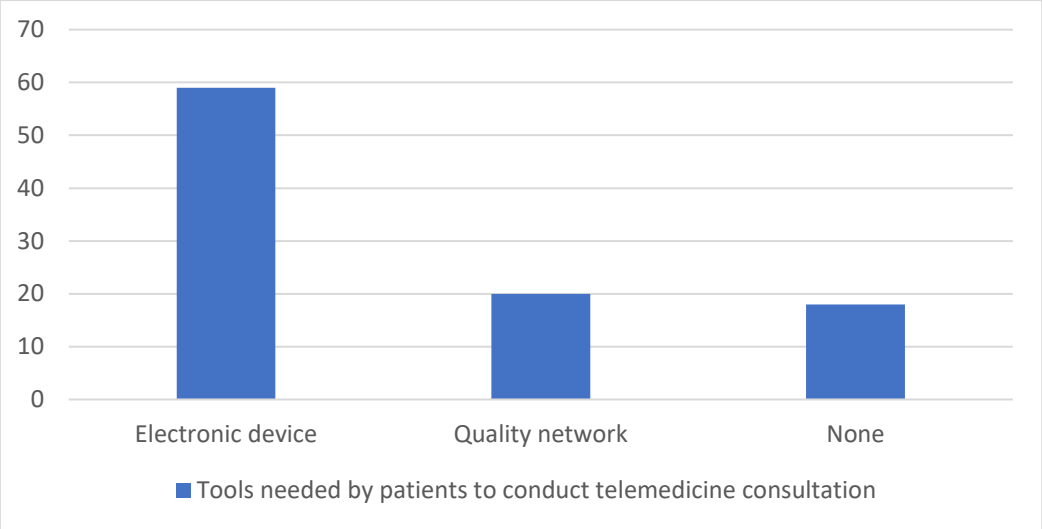


Figure 12: Study population representation on tools used by patients for telemedicine

For those respondents that use telemedicine, preference for ease of using telemedicine, learning to operate and usefulness was measured (Table 8).

On a scale of 1 = Never and 4= Always, the mean for telemedicine is easy to use was 2.65, which lies between rare and usually.

On a scale of 1 = very difficult and 4 = very easy, the mean for learning to operate telemedicine systems was 2.81, leaning more towards easy.

On a scale of 1 = never and 4 = always, the mean for telemedicine useful in your job was 2.73, leaning more towards usually.

Table 8: Preference for ease of using telemedicine, learning to operate and usefulness

	Min	Max	Mean	Std Deviation
1. Easy to use (1 = Never; 4= Always)	1	4	2.65	0.70
2. Learning to operate (1= Very difficult; 4= very easy)	1	4	2.81	0.69
3. Useful in your job (1= Never, 4= Always)	1	4	2.73	0.72

4.6 Modalities used to store patient information

The study population reported on how patient information was stored and if that method was efficient. Majority of the respondents, 64%, actually store patient information manually. Of the respondents (19) that store patient information electronically, 68% reported to protect patient information through encryption (Table 9).

Table 9: Storage of patient information

	N	Percentage
How patient information is stored?		
Electronically	19	24%
Manually	51	64%
Other	10	12%
Patient information protected through encryption		
Yes	13	68%
No	5	26%
Other	1	5%

On a scale of 1= always and 4= never, a mean of 3.17 was found where respondents usually find storing patient information electronically efficient (Table 10).

Table 10: Efficiency of storing patient information

	Min	Max	Mean	Std Deviation
Is patient information stored electronically more efficient?	2	4	3.17	0.72

4.7 Associations - one way Analysis of Variance (ANOVA)

4.7.1 Differences of engagement means between age groups

In appendix 4, Figure 1A, 1B and 1C are histograms representing skewness for distribution for engagement and ages 21 – 40, 41 – 60 and 61+. From the Figures 1A, 1B & 1C, it is depicted that there is normal distribution supported by skewness for each graph ranging between 1 and negative 1. Hence the use of ANOVA.

To test for equal variance, Levene and Bartlett test was done (Table 11 & 12). Here, the assumption of homogeneity of variance was not violated – P-value for Levene and Bartlett > 0.01.

Based on equal variances and normality, a one way Analysis of Variance (ANOVA) F test was done to test if the results are significantly different between means (Table 12, 13, 14, 15). F-test resulted in no statistically significant difference in engaging platform between the different age groups, $F_{2,79}=1.16$, $p=0.3194$.

The connecting letters report (Table 16) shows that the levels are connected by same letter, hence no statistical difference.

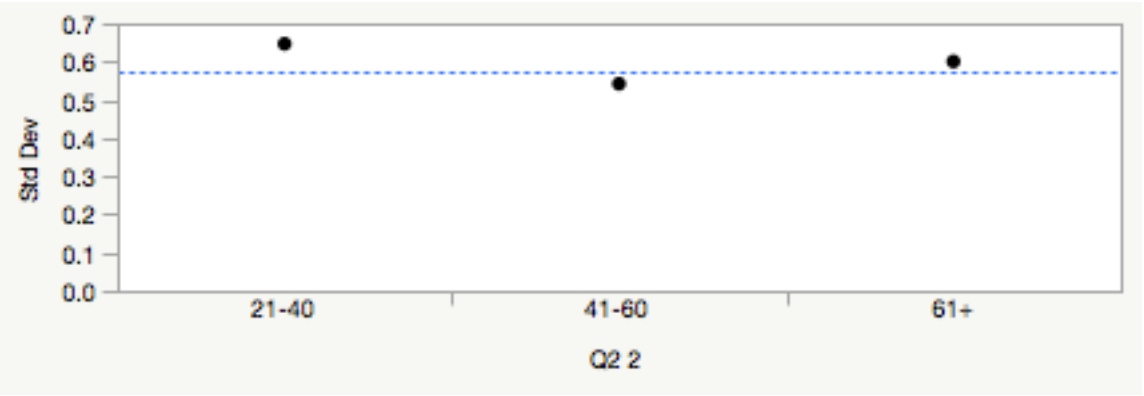


Figure 13: Test to determine if variances are Equal

Table 11: Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
21-40	14	0.6464718	0.5178571	0.5178571
41-60	48	0.5418797	0.3977865	0.3906250
61+	18	0.6002450	0.4444444	0.4444444

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.4218	2	77	0.6573
Brown-Forsythe	0.6509	2	77	0.5244

Test	F Ratio	DFNum	DFDen	Prob > F
Levene	0.5951	2	77	0.5540
Bartlett	0.3753	2	.	0.6871

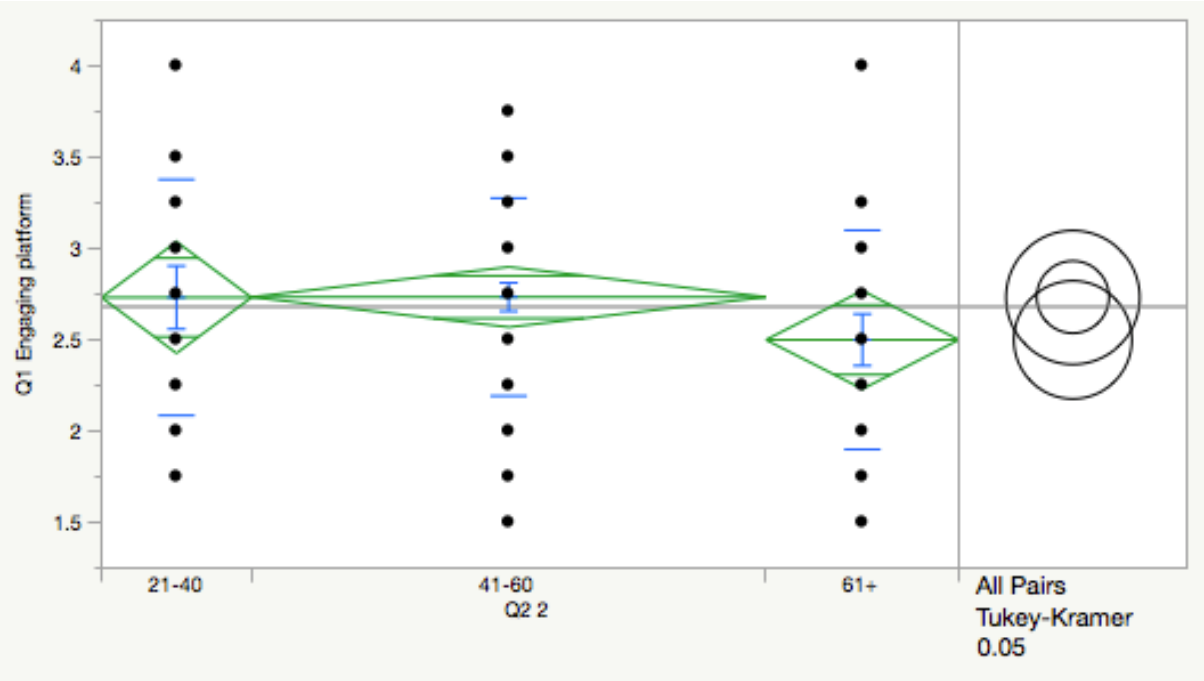


Figure 14: Oneway Analysis of Engaging platform by Age

Table 12: Oneway Anova Summary of Fit for Engaging platform and age

Rsquare	0.029211
Adj Rsquare	0.003996
Root Mean Square Error	0.573877
Mean of Response	2.68125
Observations (or Sum Wgts)	80

Table 13: Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
21-40	14	2.73214	0.15338	2.4267	3.0376
41-60	48	2.73438	0.08283	2.5694	2.8993
61+	18	2.50000	0.13526	2.2307	2.7693

Table 14: Means and Standard Deviation

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
21-40	14	2.7321429	0.6464718	0.1727769	2.3588811	3.1054046
41-60	48	2.734375	0.5418797	0.0782136	2.5770295	2.8917205
61+	18	2.5	0.600245	0.1414791	2.2015052	2.7984948

Table 15: Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Q2 2	2	0.763058	0.381529	1.1585	0.3194
Error	77	25.358817	0.329335		

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
C. Total	79	26.121875			

Table 16: Connecting Letters Report

Level		Mean
41-60	A	2.7343750
21-40	A	2.7321429
61+	A	2.5000000

4.7.2 Differences of engagement means between gender groups

In appendix 5, Figure 1A and 1B are histograms representing skewness for distribution for engagement and genders namely females and males. From the Figures 11A & 11B, it is depicted that there is normal distribution supported by skewness for each graph ranging between 1 and negative 1. To test for equal variance, Levene and Bartlett (Table 17) test was done. Here, the assumption of homogeneity of variance was not violated – P-value for Levene and Bartlett > 0.01.

Based on normality and equal variances, an independent t-test (Table 18) was used to determine if there was a significant difference between males and females. From the findings, there is no significant difference between the males and females - t(77)=0.03, p=0.98.

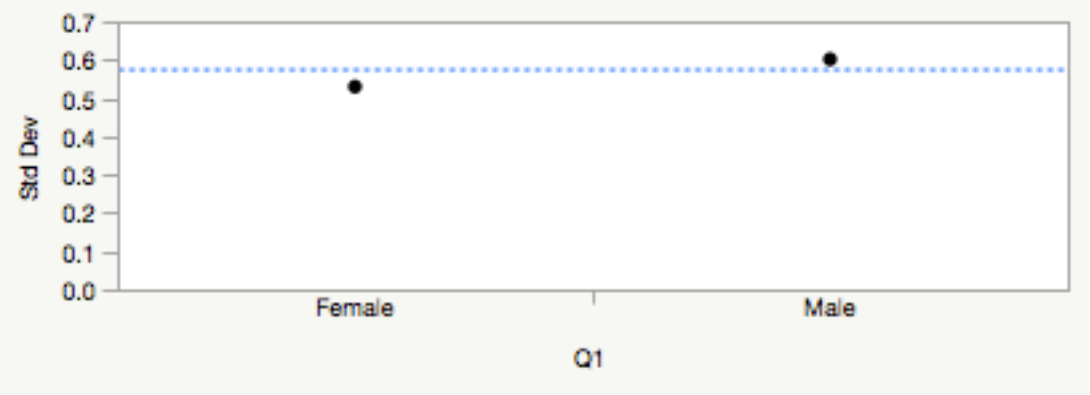


Figure 15: Test to determine if variances are equal

Table 17: Tests that the Variances are equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Female	28	0.5297842	0.4285714	0.4196429
Male	51	0.6012242	0.4584775	0.4411765

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.6024	1	77	0.4400

Test	F Ratio	DFNum	DFDen	p-Value
Brown-Forsythe	0.0582	1	77	0.8099
Levene	0.1272	1	77	0.7224
Bartlett	0.5381	1	.	0.4632
F Test 2-sided	1.2879	50	27	0.4838

Table 18: Pooled t Test
Male-Female
Assuming equal variances

Difference	0.00368	t Ratio	0.027081
Std Err Dif	0.13576	DF	77
Upper CL Dif	0.27400	Prob > |t|	0.9785
Lower CL Dif	-0.26665	Prob > t	0.4892
Confidence	0.95	Prob < t	0.5108



4.7.3 Contingency Analysis of gender by ease of use

A Mosaic Plot (Figure 16) representing the difference in proportion of ease of use and gender (male & female). From the mosaic plot, more males usually/always find telemedicine system easy to use (Table 19). A Person correlation (Table 20) of 0.31 indicates that there is no significant association between ease of use and gender.

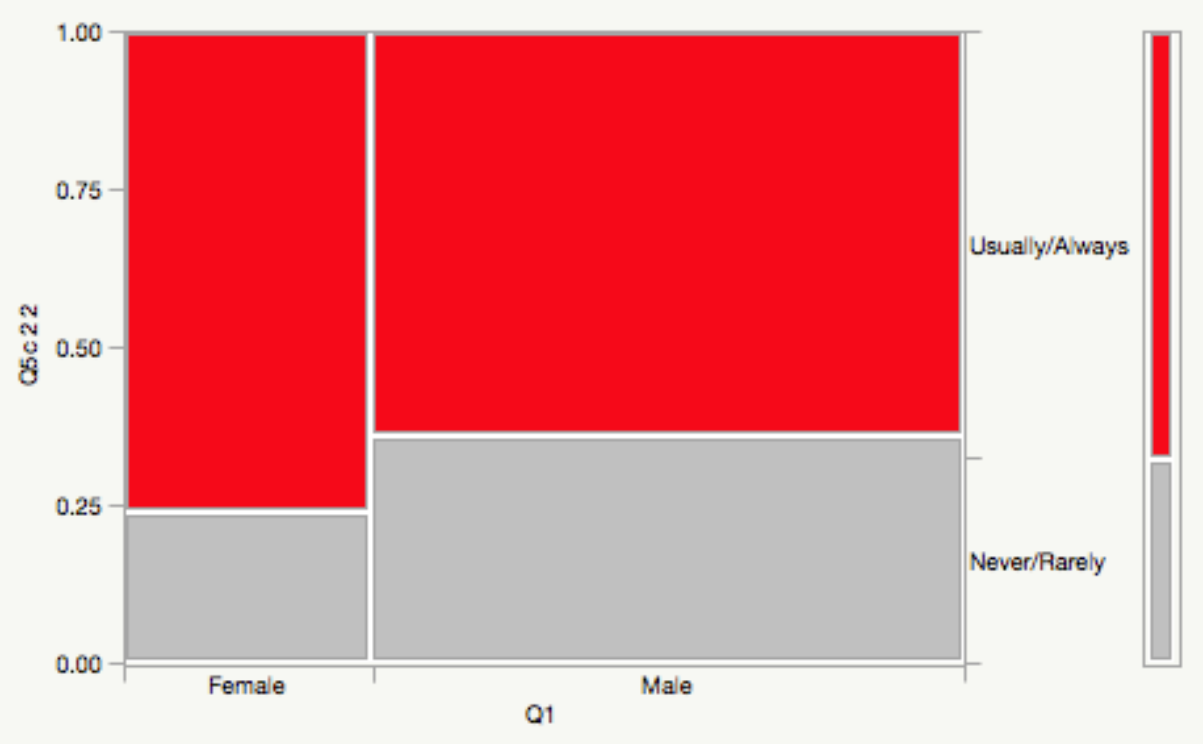


Figure 16: Mosaic Plot measuring ease of use and gender

Table 19: Contingency Table measuring ease of use and gender

Count Total % Col % Row %	Never/Rarely	Usually/Always	Total
Female	5	16	21
Male	18	32	50
Total	23	48	71

Table 20: Pearson correlation test

N	DF	-LogLike	RSquare (U)
71	1	0.51898397	0.0116

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	1.038	0.3083
Pearson	1.004	0.3165

Test	ChiSquare	Prob>ChiSq
Fisher's Exact Test	**Prob**	**Alternative Hypothesis**
Left	0.2370	Prob (Q5c 2 2=Usually/Always) is greater for Q1=Female than Male
Right	0.9016	Prob (Q5c 2 2=Usually/Always) is greater for Q1=Male than Female
2-Tail	0.4095	Prob (Q5c 2 2=Usually/Always) is different across Q1

4.7.4 Contingency Analysis of age by ease of use

A Mosaic Plot (Figure 17) representing the difference in proportions of ease of use and age (21-40; 41-60; 61+). From the mosaic plot, age range of 41-60 usually/always find telemedicine system easy to use (Table 21). A Pearson correlation (Table 22) of 0.09 indicates that there is no significant association between age and ease of use.

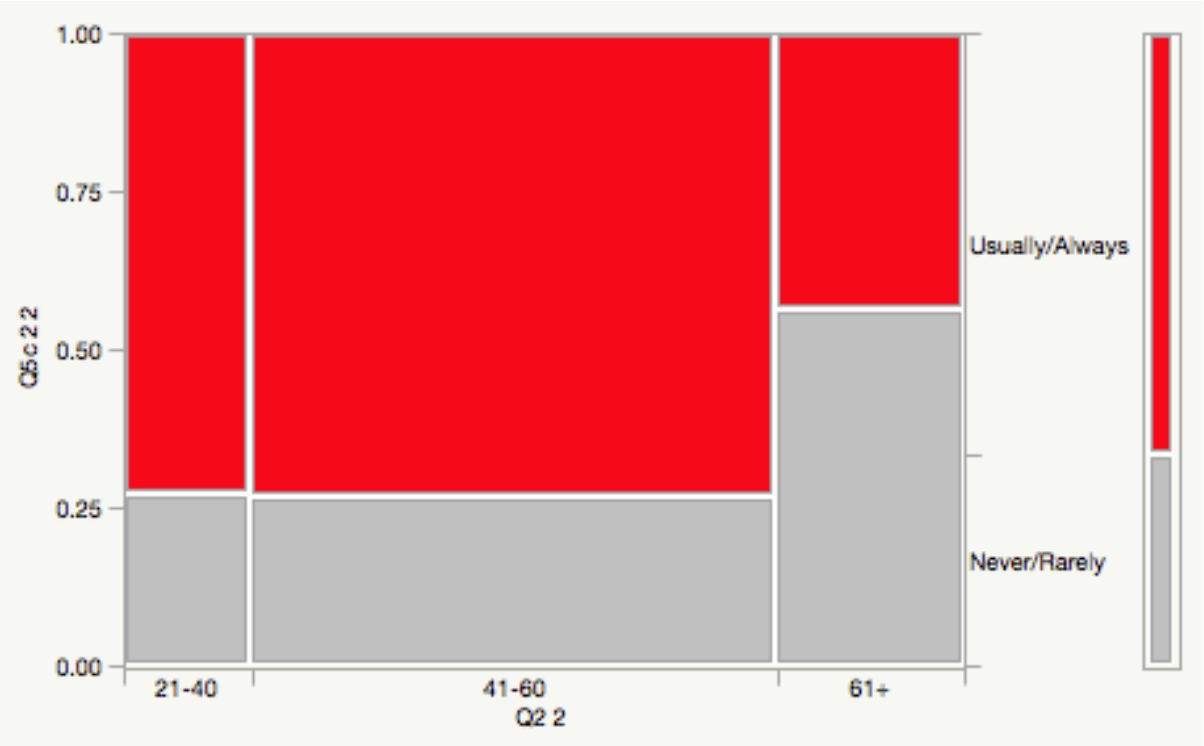


Figure 17: Mosaic Plot measuring ease of use and age

Table 21: Contingency Table measuring ease of use and age

Count Total % Col % Row %	Never/Rarely	Usually/Always	Total
21-40	3	8	11
41-60	12	33	45
61+	9	7	16
Total	24	48	72

Table 22: Pearson Correlation Tests

N	DF	-LogLike	RSquare (U)
72	2	2.3223313	0.0507

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	4.645	0.0980
Pearson	4.863	0.0879

5 DISCUSSION OF RESERCH FINDINGS

5.1 Introduction

Leading to the purpose of this paper in investigating the factors influencing the accessibility and low use of telemedicine, this chapter discusses the findings and key learnings based on the topics in Chapter four namely: socio-demographic characteristics of participants; telemedicine as an engaging platform; informed consent preference (written or verbal) to perform a clinical examination or when using ICT; availability and quality of essential resources to conduct telemedicine; and methods used to store patient information.

5.2 Socio-Demographic Characteristics of Participants

The research project investigated the factors that influence the use of telemedicine amongst medical doctors specialising as Family Physicians in South Africa. In Section 5.2, the demographics of family physicians practicing in either state, private or both facilities were analysed. The factors included the response rate, age and the influence it may have on telemedicine, and usage of telemedicine.

The study achieved a response rate of 14%, which is low compared to previous studies that produced a higher (on average 70% or more) response rate. It was predicted that the study sample had some form of experience with telemedicine, especially since the Covid-19 pandemic enforced medical professionals to use technological resources to treat patients. As per the demographics of the present study, more than half of the study population practice in a private facility while a third practice in a state facility.

Age can have an influence on the usage of telemedicine because older consumers tend to face difficulty in processing new or complex information. This can be acknowledged from literature by Venkatesh et al (2012) reporting that compared to younger consumers, older consumers may tend to rely on old traditional methods such as using paper and pen instead of typing.

Findings from this study disputes with Venkatesh, Thong and Xin (2012) because it was found that from the participants (appendix 6) aged 51 and above, only 10% was not knowledgeable about telemedicine while, 42% was somewhat knowledgeable, 40% was knowledgeable and 8% was very knowledgeable about telemedicine. From a Covid-19 perspective, could it be that medical doctors were compelled to learn, unlearn, relearn technological platforms in order to attend to patients.

Therefore, examining the user acceptance of telemedicine for the age group 51 and above to further analyse if Venkatesh et al (2012) literature that age can have an influence on the usage of telemedicine is applicable.

Four fifths of the participants reported to have used some form of telemedicine, with only one third using it daily. A fifth of the sample never made use of telemedicine. In comparison to Prinsloo (2017), the finding was slightly lower than the current study as it was reported that two thirds of the study population made use of telehealth with about two fifths indicating to use it daily and a tenth never used it. Data from the World Economic Forum (WEF) reported a significant increase in virtual consultations during the Covid-19 pandemic. According to the WEF report, 11% of the US population used telemedicine in 2019 and 76% are now interested in using telemedicine going forward. The findings in this study does not reflect WEF results.

From the findings in the present study, a surge in the use of telemedicine as result of the Covid-19 pandemic was expected, whereby doctors were forced to harness technology to attend to patients virtually while simultaneously protecting these vulnerable patients from contracting the deadly virus. In addition, this setting could be a turning point in which a greater efficiency and flexibility in diagnosing and treating patients pursued, but further examination is required on the reasons that prevailed limited use of telemedicine.

According to the study by Cilliers and Flowerday (2013), a lack of understanding in implementing telemedicine leads to decrease in daily use and an increase in apprehension and fear. Hence, the realisation of telemedicine will be achieved if greater awareness about its benefits is created (Cilliers & Flowerday, Health information systems to improve health care: A telemedicine case study, 2013).

About two thirds of the participants indicated that telemedicine is used for both diagnosis and treatment, while a small portion indicated using telemedicine for only diagnosis or treatment purposes. Also, two thirds of the study population reported to find telemedicine somewhat useful or extremely useful, while a tenth found telemedicine to be extremely useless. Cilliers and Flowerday (2013), reported that more than two-thirds of participants found that telemedicine would be useful in their job. In the current context, is it that medical doctors' responsibility to diagnose and treat patients was not lacking, because an alternative form of face-to-face meetings called telemedicine, enabled them to see to patients.

Telemedicine can be implemented in various ICT formalities such SMS, email, instant messaging or video call, that will ultimately support healthcare needs at a distance. Telephonic conversation was the most common modality used as it is a convenient and easily accessible method of communication. This was followed by instant messaging and SMS as a cost-effective method of communication. The study by Prinsloo (2017) also found that the most common modality of communication was telephone, a small percentage reported use of the real-time video conferencing. In the present study, it can be noted that video calls were not frequently used by Family Physicians which may be due to various factors such as poor connectivity, unavailability of device or that other platforms are suffice to treat patients. Hence, an opportunity for future research exists to examine the preferred methods to conduct a telemedicine consultation and factors that contribute to the low usage of video call.

Participants were also given an opportunity to specify other platforms used to communicate with patients and this included email, health ID, video messaging and faxing of lab/ radiological results and a telemedicine platform called teledok and another one called Vula Mobile which is a referral and chat app. This study noted that there is more than one platform available to conduct telemedicine, therefore the expectation to increase the use of telemedicine, especially to populations with limited access to quality health.

5.3 Telemedicine as an engaging platform

Based on the research question if telemedicine results in an engaging platform, section 5.3 provides an interpretation of the findings on satisfaction, productivity, confidence and level of explanation concerning the disease or treatment.

It was reported in the present study, that a high percentage of respondents generally agreed that telemedicine is an engaging platform because questions are answered profusely during a telemedicine consultation and satisfaction is gained post telemedicine consultation. This finding is consistent with literature by Tates et al (2017) and Mirzaei and Kashian (2020) that revealed that there was no significant difference between face-to-face and virtual consultation in terms of information exchange.

Literature by Opperman (2020) reported that due to the Covid-19 pandemic and lockdown in South Africa, the HPCSA was forced to change its guidelines for the safety of patients and doctors,

giving permission to doctors to see a new patient without having seen the patient or examining them physically previously. This change created a realisation of telemedicine as an alternate platform that allowed doctors to be in contact with new or pre-existing patients, no matter where these patients may be, increasing their productivity and potential to provide quality healthcare to the entire population.

The study population showed support that telemedicine increased their productivity as this may reduce the patients waiting time to see a medical doctor. This can be supported by literature from Cilliers and Flowerday (2013) who reported that telemedicine shortens the waiting times for diagnoses and treatment and fewer patients from rural areas being referred incorrectly to urban centres. Furthermore, Ateriya et al (2018) reported that telemedicine forms an alternative solution for patients who have mobility issues and for those who do not want to waste their time in the waiting room of the doctor's clinic.

Less than fifty percent of the sample agreed that telemedicine results in increased confidence in a doctor/patient relationship. Whereas, half the number of respondents indicated that the explanation concerning the disease or treatment is not better in telemedicine. This could be due to poor internet connection, language barrier, information provided is very high-level and not in detail, the preference of patients to provide minimal information to doctors due to a feeling of discomfort and embarrassment or the lack of hand-on examination.

Literature by Mars and Odhiambo (2018) reported that a barrier to telemedicine as an engaging platform is the patient's understanding of telemedicine and its associated terms. A lack of understanding can have an implication on the doctor-patient relationship and may lead to other consequences such as missing of appointments. Mars and Odhiambo (2018) literature reported further that terminology such as internet, email, videoconferencing, store and forward, and real-time, were all poorly understood.

Hence, it should be noted that as the doctor/patient consultation method evolves from the emergence of new technologies, a healthcare practitioner is still responsible for maintaining high standards and ensuring that they abide to the fundamental ethical, professional and legal responsibilities. This can be approached by defining the responsibility of the patient and the roles and responsibilities of the healthcare professional. For example, according to a World Medical Association (WMA) [9] 2009 statement: 'The physician needs to give clear and explicit direction

to the patient during the telehealth encounter as to who has ongoing responsibility for any required follow-up and ongoing healthcare.'

Moreover, from an innovation perspective, there is opportunity for healthcare professionals to use the telemedicine platform to engage with their patients more frequently, in a convenient way, which may result in a better doctor–patient relationship (Ateriya, Saraf, Meshram, & Setia, 2018). Parallel to conducting telemedicine consultations, there is an opportunity for healthcare practitioners to collect patient data instantaneously using electronic devices that will help monitor patients with chronic conditions.

Although the field of telemedicine is growing and making healthcare more accessible, affordable and convenient, there still remains a lack of a standardized format to a virtual interaction. Also, telemedicine reduces direct interaction of patients with doctors, creating an inadequate development of a doctor-patient relationship because the interactions are impersonal (Ateriya, Saraf, Meshram, & Setia, 2018).

5.4 Informed consent preference (written or verbal) to perform a clinical examination or when using ICT

What are the implication of the nature and form of informed consent for practice and tele-medicine? Seeking informed consent is an important medicolegal requirement in order to ensure that both the doctor and patient adhere to medical procedures, no party is held responsible in an unprecedented event and that a medical practitioner remains compliant with their professional indemnity cover. Also, failure to seek informed consent can be a tort and crime.

Hence, Section 5.4 will cover the findings in the acquisition of written and verbal informed consent for clinical examination or when using ICT, before and during Covid-19 and in compliance with the HPCSA guidelines.

In the present study, more than ninety percent of the participants obtained consent for a medical interaction and the study population utilized the verbal consent more than written informed consent, which may be part of the culture of routine clinical practice. The findings in the present study aligns with literature by Jack and Mars (2013), that found that during a clinical examination between a patient and healthcare practitioner or when using ICT for the transfer of patient

information, written informed consent is not obtained frequently. In addition, acquiring written consent for telemedicine will be low in relation to low use of telemedicine (Jack & Mars, 2013).

The paper further states that since telemedicine uses different platforms for communication, each specific issue, clinical protocol and needs will require its own guideline on how consent is acquired (Jack & Mars, 2013). A future research opportunity is to evaluate informed consent in different geographic areas, requirement per speciality and how is it obtained in a private verses state healthcare systems.

Of the respondents for this study, that did make use of written informed consent, majority chose the 'none of the above' option. While patient examination accounted the most for verbal consent. Additionally, twenty-five percent of the doctors took written consent for at least one activity and fifty-one percent took no consent. This is relatively high in comparison to Jack and Mars (2013), ten percent doctors took written consent for at least one activity and twelve percent took no consent.

A new learning gained from this study is that the higher use of verbal consent could most likely be influenced by the relaxation of the HPCSA guideline during Covid-19 pandemic. Another factor could be time management. Seeking verbal consent accelerates consultation times and reduces waiting period as doctors don't need to prepare documents for patients to acknowledge. Hence an opportunity for future research is to evaluate the opportunities of seeking verbal consent and which is the preferred method used.

Literature by Jack and Mars (2013) reported that telemedicine use in developed countries, namely Canada and Australia, have a high frequency in the use of telemedicine; in consequent, digital healthcare is integrated into routine healthcare. Thus, the requirement of written informed consent is not compulsory (Jack & Mars, 2013). Eventually, as telemedicine use becomes routinely, the trend to use verbal consent will become more common. Therefore, an opportunity that could be evaluated further is the digitisation of written informed consent, such as agreeing to a list of terms & conditions, or recording and storing consent so that medical interaction can happen in real time should the HPCSA reintroduce its guidelines.

In the present research study, those participants that reported to use telemedicine, forty eighty percent obtained verbal informed consent and seventeen percent obtained written informed

consent for the use of virtual consultation. The finding would conflict with the pre-Covid-19 HPCSA guidelines that "Healthcare practitioners should not give medical advice or provide treatment using telemedicine without obtaining proper informed consent from the patient for both the treatment to be given and the use of telemedicine technology."

Mars and Odhiambo (2018) reported that requiring informed consent for telemedicine has been debated because some practitioners argue that there is no difference between face to face consultation or existing methods of seeking a second opinion. While others argue that obtaining consent is a challenge due to language barrier, hence the need to consider obtaining it in the patient's mother tongue language. Interestingly, the study by Mars and Odhiambo (2018) found that majority of their respondents could not fully interpret the following sentence: "I consent to a telemedicine consultation."

The American Telemedicine Association recommends informed consent as best practice and it is a requirement for many Telemedicine programs (Odhiambo & Mars, 2018). The World Medical Association's Statement on Guiding Principles for the Use of Telehealth for the Provision of Health Care states that "relevant legislation and regulation that relate to patient decision making and consent, be it verbal, written, or recorded should be applied," and, "to the extent possible, informed consent shall be obtained by the physician before starting any service or intervention" and "consent for telehealth should follow similar principles and processes as those used for other health services" (WMA statement on guiding principles for the use of telehealth for the provision of health care, 2009).

An aspect of future research is whether the medicolegal value of informed consent in telemedicine is the same or different with respect to traditional face-to-face interaction (Ateriya, Saraf, Meshram, & Setia, 2018).

5.5 Availability and quality of essential resources to conduct telemedicine

The study by Venkatesh (2003) stated that resource availability is an important factor in the use and acceptance of telemedicine. Chifamba (2018) research study reported a low utilization of real-time modes of telemedicine due to technological challenges that needs to be addressed to ensure the success of future telemedicine implementations. The challenges outlined in the research by Chifamba (2018) included poor connectivity and low bandwidth issues which is still a relevant

issue as per the findings in this research, and the lack of integration of the solutions with existing and future infrastructures due to lack of interoperability.

Section 5.5 will evaluate resource availability, preference for using telemedicine, learning to operate and usefulness. In the present study, majority of the respondents and their patients reported to have an electronic device to conduct a telemedicine consultation which is a positive sign because healthcare is increasingly moving towards digital systems in order to align with the Department of Health's National Digital Strategy to provide universal health care. Additionally, this finding demonstrates that majority of the participants had no fear of electronic devices and may disagree that ICT applications might have an influence with their working style.

This finding differs from literature by Cilliers and Flowerday (2013) that reported a lower figure, that half of the number of participants indicated that they thought they did have the resources necessary to make use of telemedicine, insofar progression to digitisation and some electronic devices are been manufactured to target lower income bands.

The internet is a useful technological tool used to connect millions of people around the world and provide the platform to access medical information faster and more efficiently. The internet is a required component for one to maximise the opportunities of e-health. Ami-Narh and Williams (2012) reports that e-health is a strategic tool that encompasses a range of healthcare services, including telemedicine, to provide quality health care and overcome challenges faced in the healthcare sector.

In this study, internet connection was measured to determine if this could be a barrier to the use of telemedicine. About fifty percent of the study population and twenty-five percent of the respondent's patients indicated having access to quality broadband network. This is low in comparison to the number of South Africans that have access to internet. According to Statista, fifty-six percent of the South African population were internet users in 2020. Overall, South Africa still lacks adequate internet infrastructure giving users access to an inconsistent internet connection either at their residence, place of work or in reasonable proximity to their homes.

The high cost of data is another factor that restricts one to use the internet to a few days per month. Even though an individual may have the device to connect to the internet, due to financial constraints, they cannot afford to purchase data to operate applications that consume a large

amount of data (Petersen, Brown, Pather, & William, 2019). Hence, elements, such as airtime, data costs and internet, associated with electronic devices should be further evaluated to determine its severity to limit the use of telemedicine.

A small number of respondents reported to use a telemedicine software and more than two thirds indicated that it is user friendly for themselves and their patients. A gap in this research was identifying the types of telemedicine softwares available and its efficiency.

The study also measured the preference for using telemedicine, learning to operate and usefulness. On average, the respondents usually found telemedicine easy to use and useful in their job. For learning to operate the technology, overall respondents found it easy. This aligns with the study by Cilliers and Flowerday (2013) who reported that majority of healthcare workers in both the urban and rural areas indicated that it was easy to learn how to make use of the telemedicine system.

Venkatesh (2003) reported that technology is generally considered not to be well accepted by the older generation. In this study, age group 41 and above found telemedicine easy to operate. Hence, this study results contradicts with literature by Venkatesh (2003) that younger adults are considered to be more knowledgeable about navigating electronic devices such as computers and mobile phones as they have grown up with new technology developments.

As the way consultations are conducted evolves, those that find telemedicine easy to learn to operate will find it much easier to learn new programmes.

Hence, for telemedicine to gain prominence, the educational aspect of the technology needs to be introduced at tertiary education level (Cilliers & Flowerday, 2011). The curriculum should include the benefits and why the system exists rather than how to use it (Cilliers & Flowerday, 2011). The educational aspect would assure confidence and satisfaction in user acceptance of telemedicine.

Cilliers and Flowerday (2011) state in their research that if a healthcare practitioner is not confident about how safe the technology is, it is less likely that they will use the technology. Additionally, literature by Kifle et al (2008), and a factor that should be studied in future, reports that for telemedicine technology to be user-friendly and function effectively, users must be well trained and supported.

All things considered, with the continuous advancement in ICT and the growth of internet users, there is a likelihood in the increase in demand for ICT by healthcare organisations. Also, in the future, core services in the health industry would be determined by ICT (Ami-Narh & Williams, 2012).

Covid-19 pandemic created a realisation that health visits can be done virtually. Suppose the socio-economic inequality gap narrowed and the entire population has resources to access telemedicine, there is certainty for improved convenience and access to care, better patient outcomes, and a more efficient healthcare system. Hence, more research is required to find out about the user acceptance of the essential resources using the UTAUT model post Covid-19 pandemic based on a larger sample size.

5.6 Modalities used to store patient information

Electronic record keeping, especially for telemedicine consultations, will become beneficial to both medical practitioner and patient. There are two categories of electronic record keeping systems namely electronic health record (EHR) and personal electronic health record (PEHR). EHR is a method whereby patient's health history is maintained and controlled by healthcare personnel and accessible in real time. Information includes diagnoses, immunisation dates, treatment plans and laboratory results (Els & Cilliers, 2017).

Section 5.5 provides an interpretation on EHR. More than two thirds of the study population reported using the traditional method of storing patient information manually. Two tenths of the population stored patient information electronically while a small percentage used both methods.

This finding proves that it will be challenging to shift to the implementation of EHR, which aims to centralise a system to assist doctors share patient information between private and government hospitals and to improve the quality and continuity of care (Katurura & Cillier, 2018). Additionally, events related to poor record keeping, such as incorrect diagnosis and medical history of the patient is lost, will not subside the challenge of maximising the value of telemedicine (Maphumulo & Bhengu, 2019).

A recommended approach for the storage of medical records efficiently is through a cloud storage. In their research study, Mvelase, Dlamini and Dludla (2015) stated that cloud storage is a model where data is stored digitally and can be accessed anywhere and anytime by authorised healthcare

practitioners and patients. Other benefits of storing medical records electronically include reduced costs and increase in productivity (Mvelase, Dlamini, & Dludla, 2015).

In the absence of a system to perform remote real-time collection, dissemination and analysis of medical data, and in the context of telemedicine, it is likely that patient information will not be available to more than one specialist instantly, but rather on a 'store-and-forward' basis. The "store and forward" basis may result in delays in detecting health emergencies, diagnosing and treating patients. Moreover, storing patient information manually and in the event sharing papers with doctors, this will have a negative consequence that gives way for viruses to be easily transmittable, posing health risks.

The benefit of storing patient information manually is that may prevent any alteration or elimination of patient data and information cannot easily be leaked as data is secured in a room and accessible to limited number of people. However, the risk is that patient information can be lost through accidental damage. However, the disadvantage is that the patient information can only be accessed in one place or one hospital, and if a patient needs to access treatment in another healthcare facility, tests will need to be redone costing time, resources and money. From the respondents that indicated storing patient information electronically, two thirds ensured that the patient information is protected through encryption which follows the HPCSA guidelines that every registered healthcare professional is responsible for keeping patient information secure, confidential and safe. Furthermore, the HPCSA states that computers should be accessed by authorised personnel only through the use of a login password, if healthcare practitioners use it to conduct telemedicine consultation.

Patient information not only includes medical records but also digital images, video and audio files that is often personal and highly sensitive. Information protection plays a critical role especially if telemedicine is used because personal health data freely navigates and can easily be shared across various digital networks within a largely borderless setting which allows for information to be easily transmitted to other healthcare professional, but there is a risk to unauthorised access to confidential information (Townsend, R E Scott, & Mars). This research study could have further explored factors on security of information namely who has authority to access patient data; who sends the information; and has the information been altered during its transmission through the public networks.

An implication of telemedicine is the PEHR which is an innovative tool that gives patients the platform to take more ownership and improve their health and wellbeing by setting personal health goals. Moreover, PEHR becomes more valuable in an emergency as patient data is available instantaneously and reduces medical errors. (Els & Cilliers, 2017).

A subset of PEHR, provider-based PEHR, enables patients to manage their medical appointments, conduct virtual consultation with healthcare practitioners and view their medical records at their convenience (Els & Cilliers, 2017).

In this study, over ninety percent of respondents indicated that they do have an electronic device to implement telemedicine consultation. This is concurrent with a study by Els and Cilliers (2017), who identified that ninety percent of South African adults own a cell phone. This finding reassures that telemedicine consultation (be in synchronous or asynchronous) and PEHR is accessible.

A future research opportunity is to evaluate the accessibility, usefulness and security information controls of PEHR in the current healthcare system in South Africa.

6 SUMMARY, CONCLUSIONS, LIMITATIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to evaluate a combination of key factors that limit the ease of accessing and using telemedicine by medical doctors specialising as Family Physicians in Johannesburg, in the context of Covid-19. The four factors examined in this research study included:

- if telemedicine results in an engaging platform in a doctor-patient relationship, especially as technology and telemedicine practice evolve;
- if written or verbal informed consent is routinely obtained from patients during clinical examination or when using ICT, before and during Covid-19;
- if electronic resources and digital literacy is still an implication of low use of telemedicine;
- additionally, the method used to store patient information was evaluated and the impact it may have on the interoperability amongst stakeholders in the healthcare sector.

The following section provides a conclusion about the research study in Section 6.1, limitations of the research in Section 6.2 and recommendations for future research opportunities in Section 6.3.

6.1 Conclusions

Overall, more attention is required to make the functionality of telemedicine more noticeable. Telemedicine may not be valued so much when there is good health infrastructure, however, when health infrastructure is poor, telemedicine is unable to stand on its own. In the context of this study, over eighty percent of the study population reported to use telemedicine and found telemedicine to be either somewhat useful or extremely useful because they had access to an electronic device to consult with patients virtually, which evidently shows the value gained. However, about fifty percent of the study population reported to have access to quality broadband network causing inefficiencies in transmission of messages regarding diagnosis and treatment.

A reduction in technical and infrastructure barriers would have a ripple effect to enhancing telemedicine where there is an improvement in technology literacy, higher level of interaction, ease of use, and more frequent use, thereby minimizing the effect of shortages of healthcare professionals and accessibility. For example, according to the WEF report, 11% of the US

population used telemedicine in 2019 and 76% are now interested in using telemedicine going forward.

Acknowledging and respecting that participants modelled their responses according to their current experiences of telemedicine resulting from the Covid-19 pandemic. The Covid-19 pandemic became a public health emergency that increased the risk for practitioners, patients and others (Opperman, 2020). Thus, the HPCSA was required to relax telemedicine regulations to incorporate government intervention to curb the spread of Covid-19 (Opperman, 2020). However, Opperman (2020) reported the guideline by the HPCSA for Covid-19 pandemic is short lived. It further states that after the Covid-19 pandemic, the new guidelines will fall away and be replaced by previous ones.

Based on a qualitative research study on HPCSA telemedicine guidelines by Townsend, Mars and Scott (2020), the authors of the research recommend that the HPCSA should evaluate the value gained in using telemedicine against its risk of harm to healthcare professional and patients (Townsend, Mars, & Scott, The HPCSA's telemedicine guidance during COVID-19: A Review, 2020).

Townsend, Mars and Scott (2020), supported the use of telemedicine because many South Africans have a direct or indirect access to digital devices, which will address the South African public healthcare needs, namely human and infrastructure resource constraints. The authors of the study further recommend for the HPCSA to seek appropriate and necessary guidance on telemedicine guidelines post Covid-19 pandemic (Townsend, Mars, & Scott, The HPCSA's telemedicine guidance during COVID-19: A Review, 2020).

Nevertheless, South Africa has the potential to draw on its experiences of health inequalities to build a health system that will benefit all citizens.

6.2 Limitations

As discussed in Chapter 3, limitations to this study was acquiring a low response rate, hence the sample size was broadened to other metropolitan areas in of South Africa. Additionally, the UTAUT model was not maximized in the present study.

The sample was not self-weighted by age and gender, resulting in imbalance amongst gender and age groups.
A limitation posed in the study was not actually defining telemedicine in the letter to participants. Hence, each person answered the questions with a certain image of what "telemedicine" means to him/her/them.

Furthermore, respondents based their answers in the context of Covid-19 whilst the HPCSA was forced to ease guidelines on the use of telemedicine. Thus, the scenario prior and post Covid-19, still requires further examination.

The uses of telemedicine were limited for the purpose of this study to clinical care and educational purposes. And further factors confining the use of telemedicine such as economic (cost barriers), educational (level of literacy), and sociocultural contexts (language barriers and persuasion from colleagues) was limited to the present study. The factors that limit the use of telemedicine from a patient perspective was excluded in the study.

Although this study had some limitations, findings do shed light on the factors that influence the low use of telemedicine and future use of telemedicine. It can also help to inform future research in this area.

6.3 Recommendations (action plan)

The following section provides a description of recommendations for education and policy, rules and regulations for consideration to improve the frequency of telemedicine.

Education

As health care is increasingly moving towards digital platforms and computerized systems in order to provide universal access, it is important that health care workers are well trained and supported to maximise the use of telemedicine. Perhaps, training should be introduced into undergraduate training of health care workers in order to prepare them for its use when they are qualified.

Policies, rules and regulations for telemedicine

Policies, rules and regulations for telemedicine, and most importantly guidelines developed by HPCSA needs to be relooked so that behavioural barriers are reduced and telemedicine platform is easily accessible to all. For example, as presented in the current study that ninety percent of the

participants obtained consent for a medical interaction, and verbal consent was acquired more than written consent, this finding illustrates the preference of verbal consent over written consent. In the research findings, the study population agreed that telemedicine is an engaging platform, during a time when majority of medical doctors/patient consultation occurred virtually.

Furthermore, Townsend, Mars, & Scott (2020) specified in their research study that telemedicine delivered a valuable service during the pandemic and is a recommended platform to use post the pandemic. Hence, the authors of the study indicated that the HPCSA needs to acknowledge global experience, and use the learnings from Covid-19 pandemic to restructure telemedicine guidelines so that it is clear and prudent for all stakeholders in the healthcare industry (Townsend, Mars, & Scott, The HPCSA's telemedicine guidance during COVID-19: A Review, 2020).

There is also an opportunity to introduce alternative methods to obtain consent such as agreeing to a list of terms & conditions digitally, or recording and storing consent so that medical interaction can happen in real time.

6.4 Areas for future research

The current research study presents other areas that could be further explored in relation to telemedicine. Whilst the Covid-19 pandemic enforced the HPCSA to relook at guidelines to accommodate for virtual consultations, further research on the impact the HPCSA guidelines has on telemedicine before and after the pandemic will be resourceful. Results may persuade the HPCSA to develop guidelines that ease the use of telemedicine.

With the changing technology environment and the introduction of Protection of Personal Information Act (POPIA), security and privacy of patient information is important. Hence, further research is needed on security information controls of patient information.

Although the present study provided an overview of the usage telemedicine in the context of Covid-19, there is opportunity for future research to examine the user acceptance of telemedicine amongst larger populations, gender, age groups and medical specialities post Covid-19 using the UTAUT model with its four constructs namely performance expectancy, effort expectancy, social influence and facilitating conditions.

Furthermore, opportunity for further research regarding the efficacy and influencing socio-economic factors of telemedicine from a patient perspective. Here factors such as availability of resources (electronic device, internet, and data), education and communication can be investigated.

Finally, opportunities for research can focus on examining the efficacy of telemedicine in rural areas, especially at primary care level and chronic conditions as well as the preferred methods to conduct a telemedicine consultation and factors that contribute to the low use of video calls.

REFERENCES

Agwa-Ejon, J. F., & Pradhan, A. (2014). The impact of technology on the health care services in Gauteng Province South Africa. *International Association for Management of Technology (IAMOT) Annual Conference*.

Alan Bryman, A., & Bell, E. (2014). *Research Methodology: : Business and Management Contexts*. Oxford University Press Southern Africa.

Ami-Narh, J. T., & Williams, P. A. (2012). A revised UTAUT model to investigate E-health acceptance of health professionals in Africa. *Journal of Emerging Trends in Computing and Information Sciences, 3*(10).

Ateriya, N., Saraf, A., Meshram, V., & Setia, P. (2018). Telemedicine and virtual consultation: The Indian perspective. *The Indian perspective. Natl Med J India , 31*(4), 215-218. doi:10.4103/0970-258X.258220

Bryman, B. (2014). *Research Methodology: Business and Management Contexts*. Oxford University Press Southern Africa (Pty) Ltd.

Chang, I., Hwang, H. G., Hung, F. W., & Li, Y. C. (2007). Physicians' acceptance of pharmacokinetics-based clinical decision support systems. *Expert Systems with Applications, 33*(2), 296-303.

Chifamba, N. (2018, December). A scoping review on the challenges of Telemedicine implementation the Southern Africa. doi:10.13140/RG.2.2.32011.23842

Cilliers, L., & Flowerday, S. (2011). Will Computer Literacy Affect Telemedicine Acceptance Among Health Care Workers? *ReSNES 2011*. doi:978-0-620-51804-8

Cilliers, L., & Flowerday, S. (2013). Health information systems to improve health care: A telemedicine case study. *SA Journal of Information Management , 15*(1), 1-5.

Cohen, J., Bancilhon, J.-M., & Jones, M. (2013, July). South African physicians' acceptance of e-prescribing technology: an empirical test of a modified UTAUT model. *SACJ*, 43-54.

Coleman, A. (2013). An Integrated Model to Share Patient Health Records in Public and Private Hospitals in South Africa. *Studies on Ethno-Medicine, 7*(3), 87-93.

Delobelle, P. (2013). *South Africa in Focus: Economic, Political and Social Issues*. (C. Wolhuter, Ed.) Belgium: Nova Science Publishers.

Els, F., & Cilliers, L. (2017). Improving the information security of personal electronic health records to protect a patient's health information. *IST-Africa Week Conference (IST-Africa)*, 1-8.

Goertzen, M. (2017). *Applying Quantitative Methods to E-book Collections*. Library Technology Reports.

Guidelines on telemedicine in South Africa. (2020, March 9). Retrieved from HPCSA: https://www.hpcsa.co.za/Uploads/Press%20Realeses/2020/Guidelines_to_telemedicine_in_South_Africa.pdf

Hennington, A. H., & Janz, B. D. (2007). Information System and healthcare XVI: physician adoption of electronic medical records: applying the UTAUT model in a healthcare context. *Communications of the Association for Information Systems, 19*(5), 60-80.

Human Rights, E. a. (2014). *General Ethical Guidelines for Good Practice in Telemedicine*. Health Professions Council of South Africa.

Jack, C., & Mars, M. (2013, November). Informed consent for telemedicine in South Africa: A survey of consent practices among healthcare professionals in Durban, KwaZulu-Natal. *SAJBL, 6*(2), 55-59.

Katurura, M. C., & Cillier, L. (2018). Electronic health record system in the public health care sector of South Africa: A systematic literature review. *African Journal of Primary Health Care & Family Medicine, 1*(10), 2071-2928. doi:10.4102/phcfm.v10i1.1746

Kifle, M., Mbarika, V. W., Tsuma, C., Wilkerson, D., & Tan, J. (2008). A TeleMedicine Transfer Model for Sub-Saharan Africa. *Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008), 1*, 244. doi:10.1109/HICSS.2008.41

Maphumulo, W., & Bhengu, B. (2019). Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review. *Curationis, 42*(1). doi:https://doi.org/10.4102/curationis.v42i1.1901

Merriam, S., & Tisdell, E. (2016). *Qualitative Research : A Guide to Design and Implementation.* San Francisco: Jossey-Bass.

Mvelase, P., Dlamini, Z., & Dludla, A. (2015). Integration of Smart Wearable Mobile Devices and Cloud Computing in South African Healthcare. *eChallenges e-2015 Conference*, 1-10. doi:10.1109/eCHALLENGES.2015.7441084

(2019). *National Digital Health Strategy for South Africa 2019 - 2024.* National Department of Health Repubic of South Africa.

Nordal, E. J., D, M., Kvammen, B., & Løchen, M. L. (2001). A comparative study of teleconsultations versus face-to-face consultations. *Journal of Telemedicine and Telecare*, 257-265.

Odhiambo, R., & Mars, M. (2018). Patients' understanding of telemedicine terms required for informed consent when translated into Kiswahili. *BMC Public Health, 18*(588). doi:https://doi.org/10.1186/s12889-018-5499-1

Petersen, F., Brown, A., Pather, S., & William, T. D. (2019). Challenges for the adoption of ICT for diabetes selfmanagement in South Africa. *John Wiley & Sons Ltd, 86*(e12113). doi:10.1002/isd2.12113

Prinsloo, C. J. (2017). *Factors affecting health care workers' acceptance and use of telehealth in hospitals in Kwa Zulu Natal.* Cape Town.

Research methodology: Research Starters Topic. (2018).

Tates, K., Antheunis, M. L., Kanters, S., Nieboer, T. E., & Gerritse, M. B. (2017). The Effect of Screen-to-Screen Versus Face-to-Face Consultation on Doctor-Patient Communication: An Experimental Study with Simulated Patients. *J Med Internet Res, 19*(12), e421. doi:10.2196/jmir.8033

Tope Samuel Adeyelure, T. S., & Kalema, M. B. (2019). An exploratory study on telemedicine in the South African public health sector: A case of Gauteng Province. *Kalpa Publications in Computing, 12*, 13-19.

Townsend, B. A., Mars, M., & Scott, R. E. (2020). The HPCSA's telemedicine guidance during COVID-19: A Review. *S Afr J Bioethics Law, 13*(2), 97-102.

Townsend, B. A., R E Scott, R. E., & Mars, M. (n.d.). The development of ethical guidelines for telemedicine in South Africa. *SAJBL, 12*(1), 19-26.

van Dyk, L. (2014, January 23). AReviewofTelehealthServiceImplementationFrameworks. *International Journal of Environmental Research and Public Health , 11*, 1279-1298. doi:10.3390/ijerph110201279

Venkatesh, V. M. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*, 425-47.

Venkatesh, V., Thong, J. Y., & Xin, X. (2012, March). Consumer Acceptance and Use Of Information Technology: Extending The Unified Theory of Acceptance And Use Of Technology. *MIS Quarterly , 36*(1), 157-178.

WMA statement on guiding principles for the use of telehealth for the provision of health care. (2009, October). Retrieved from World Medical Association: https://www.wma.net/policies-post/wma-statement-on-guiding-principles-for-the-use-of-telehealth-for-the-provision-of-health-care/

APPENDIX 1: QUESTIONNAIRE

University of the Witwatersrand
Faculty of Commerce, Law and Management
1 Jan Smuts Ave, Johannesburg, 2000
011 717 3544

Survey

Title of research: An evaluative study of telemedicine consultation in primary healthcare sector

Protocol number: WBS/BA451825/960

Geographic area of practice:

- Ekurhuleni
- Johannesburg
- Sedibeng
- Tshwane & Metsweding
- West Rand
- Other (please specify)

Demographics

1. Indicate your gender	
Male	Female

2. Indicate your age				
21 - 30	31 – 40	41 - 50	51 - 60	61+

3. What is your specialisation?

- Cardiologist
- Dermatologist
- Emergency Medicine Specialists
- Family Physician
- Other (please specify)

4. Which of the following describes your place of work?			
State practice	Private practice	Both	Other

5. How often do you use telemedicine?

Never	Monthly	Weekly	Daily

6. If you do use telemedicine, for what purposes do you use it			
Treatment	Diagnosis	Both	Other (please specify)

7. Please indicate which of the following telemedicine modalities you have made use of in the past:				
SMS	Telephonic conversation	Video call	Instant messaging	Other (please specify)

8. How useful do you find telemedicine to be?					
Extremely useless	Somewhat useless	Slightly useless	Slightly useful	Somewhat useful	Extremely useful

9. How would you describe your knowledge of telemedicine in general?			
Not knowledgeable	Somewhat knowledgeable	Knowledgeable	Very knowledgeable

1. Telemedicine is an engaging platform for doctor/patient relationship

From your experience, do you believe that telemedicine is an engaging platform for doctor/patient relationship?	Yes	No

a. Do you agree that telemedicine results in increased confidence in a doctor/patient relationship?	Strongly agree	Agree	Disagree	Strongly disagree
b. Do you agree that as a doctor, satisfaction is usually gained post telemedicine consultation?	Strongly agree	Agree	Disagree	Strongly disagree
c. Are questions answered profusely during a telemedicine consultation?	Strongly agree	Agree	Disagree	Strongly disagree
d. Do you agree that telemedicine enables a	Strongly agree	Agree	Disagree	Strongly disagree

doctor to be more productive?				

2. **Telemedicine results in more information exchange than face-to-face consultations concerning the disease and the treatment. In your experience,**

a. Was explanation concerning the disease better in telemedicine?	Yes	No	Sometimes
b. Was explanation concerning the treatment better in telemedicine?	Yes	No	Sometimes

3. **Written informed consent is not routinely obtained from patients during clinical examination or when using ICT for the transfer of patient information. For which of the following procedures do you seek written informed consent:**

a. Take patient history
b. Examine a patient
c. Email patient information
d. Refer patient
e. Prescription
f. Virtual consultation
g. None of the above
h. Other (please specify)

4. **For which of the following procedures do you seek verbal informed consent:**

a. Take patient history
b. Examine a patient
c. Email patient information
d. Refer patient
e. Prescription
f. Virtual consultation
g. None of the above
h. Other (please specify)

5. **One of the main causes to a low use of telemedicine is limited access to technology needed to conduct virtual consultations.**

a. Which of the following do you have access to implement telemedicine consultation? • Electronic device (computer, mobile, laptop) • Telemedicine Software • Quality broadband network • None If you use a telemedicine software, is it user friendly for you? If you use a telemedicine software, is it user friendly for your patient?				Yes No n/a Yes No n/a
b. Which of the following does your patient have access to implement telemedicine consultation? • Electronic device (computer, mobile, laptop) • Quality broadband network • None				
c. Do you find the telemedicine system easy to use	Always	Usually	Rarely	Never
d. Was learning to operate the telemedicine system is easy for you	Very easy	Easy	Difficult	Very difficult
e. Do you find telemedicine useful in your job	Always	Usually	Rarely	Never

6. Patient information is stored electronically or manually and data is protected through encryption if stored electronically.

a. Is patient information stored electronically or manually?	Electronically	Manually	Other (please specify)
b. If stored electronically, is the patient information	Yes	No	Other

protected through encryption?				
c. Is patient information stored electronically more efficient?	Always	Usually	Rarely	Never

Ends/

APPENDIX 2: LETTER TO PARTICIPATE

Appendix 2: Letter to participate

University of the Witwatersrand
Faculty of Commerce, Law and Management
1 Jan Smuts Ave, Johannesburg, 2000
011 717 3544

Dear Sir / Madam,

My name is Karishma Mistry and I am studying towards a Master of Business Administration at the University of the Witwatersrand, Johannesburg. As part of my studies, I have to undertake a research project and I am evaluating telemedicine consultation in the primary healthcare sector, under the supervision of Mr Patrick Zhuwao. The aim of this research project is to examine the current health system in South Africa, the factors that hinder the ease of accessing and using telemedicine by medical doctors and which method of consultation is preferred.

Thus, the desired outcome of the research is to understand the above-mentioned factors and develop an ideology of how this can be used to strengthen the use of telemedicine and ultimately the current South African health system. This will also assist with the additional Digital health technologies currently being developed by the Department of Health.

As part of this project, I would like to invite you to take part in a self-administered questionnaire which will take about 5 minutes to complete. **Link to survey: https://www.surveymonkey.com/r/9NKHNRT.** Much appreciate if you can complete the survey by Sunday, 24 January 2021.

There will be no personal costs to you if you participate in this project. You will not receive any direct benefits from participation and there are no disadvantages or penalties if you choose not to participate or if you withdraw from the study. You may withdraw at any time or not answer any question if you do not want to.

The survey completed by yourself will remain confidential. However, your gender and age will need to be stated to understand where user acceptance and preference differs. All identifying information, and the information you give to me will be held securely and not be disclosed to anyone else.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report. If you wish to receive a summary of this report, I will be happy to send it to you. Information supplied by yourself will be stored on Microsoft Excel and encrypt with a password for confidentiality. Once the final research has been submitted, most likely in February 2021, all data collected will be destroyed.

If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrec-medical.researchoffice@wits.ac.za

Yours sincerely,
Karishma Mistry

Researcher:
Karishma Mistry
451825@students.wits.ac.za
071 048 9009

Supervisor:
Patrick Zhuwao
331780@students.wits.ac.za
062 306 2312

APPENDIX 3: ETHICS APPROVAL

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF GRADUATE SCHOOL OF BUSINESS ADMINISTRATION ETHICS COMMITTEE
CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER WBS/BA451825/960**
PROJECT TITLE	An evaluative study of telemedicine consultation in the primary healthcare sector in Johannesburg
INVESTIGATOR	Miss Karishma Mistry
SCHOOL/DEPARTMENT OF INVESTIGATOR	MBA (Research Article)
DATE CONSIDERED	24 November 2020
DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	MINIMAL RISK
EXPIRY DATE	30 JUNE 2021

ISSUE DATE OF CERTIFICATE 15 December 2020 **CHAIRPERSON** _____
(Dr MDJ Matshabaphala)

cc: Supervisor: Mr Zhuwao

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am are authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

Signature _____ Date 15 / 12 / 2020

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

APPENDIX 4: HISTOGRAMS: DIFFERENCES OF ENGAGEMENT MEANS BETWEEN AGE GROUPS

Distribution for engagement and age 21 - 40

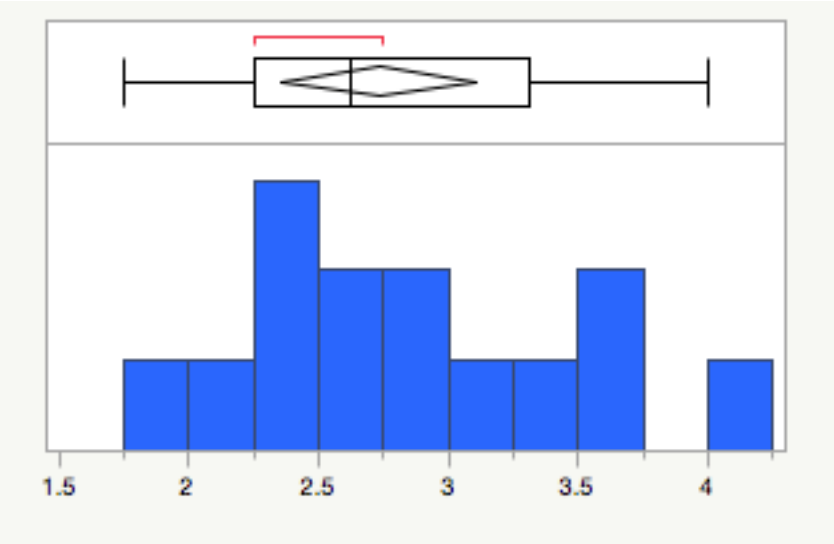


Figure 1A: distribution for engagement and age 21 - 40

Summary Statistics

Mean	2.7321429
Std Dev	0.6464718
Std Err Mean	0.1727769
Upper 95% Mean	3.1054046
Lower 95% Mean	2.3588811
N	14
Skewness	0.4652013
Kurtosis	-0.518419

Distribution for engagement and age 41 – 60

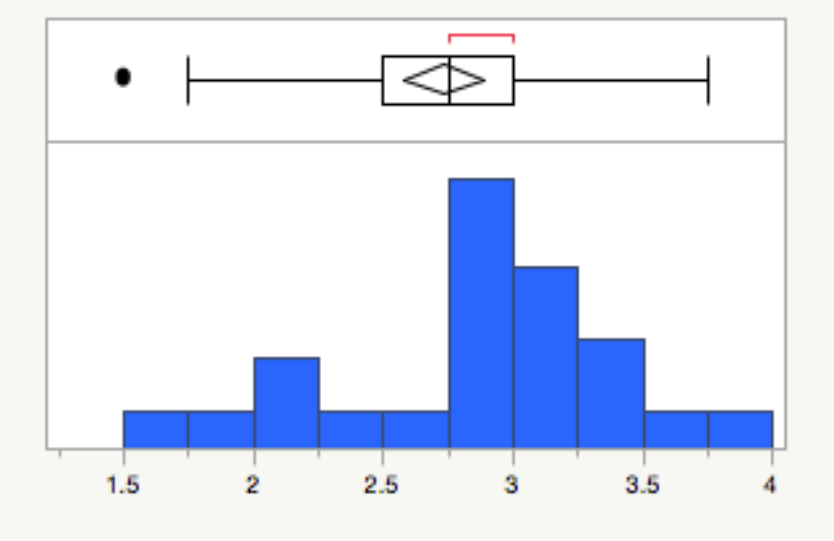


Figure 1B: distribution for engagement and age 41 - 60

Summary Statistics

Mean	2.734375
Std Dev	0.5418797
Std Err Mean	0.0782136
Upper 95% Mean	2.8917205
Lower 95% Mean	2.5770295
N	48
Skewness	-0.544148
Kurtosis	-0.010487

Distribution for engagement and age 61+

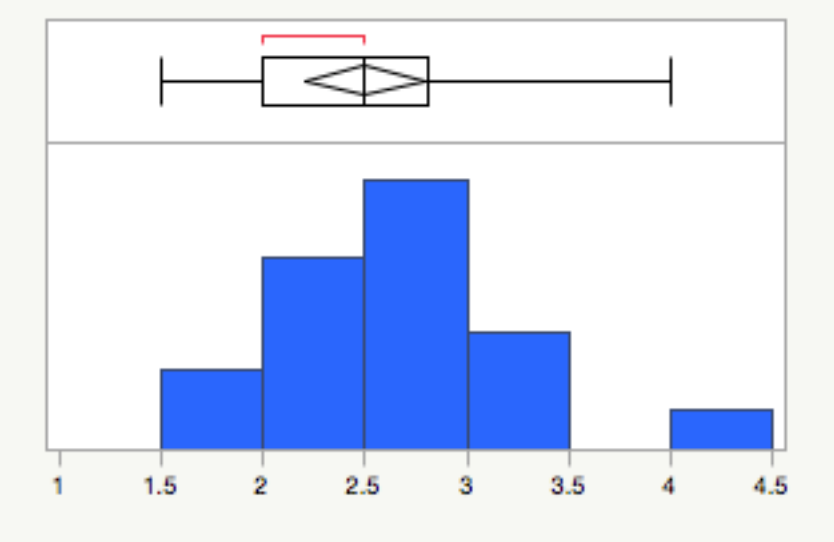


Figure 1C: distribution for engagement and age 61+

Summary Statistics

Mean	2.5
Std Dev	0.600245
Std Err Mean	0.1414791
Upper 95% Mean	2.7984948
Lower 95% Mean	2.2015052
N	18
Skewness	0.6598071
Kurtosis	0.9631091

APPENDIX 5: HISTOGRAMS - DIFFERENCES OF ENGAGEMENT MEANS BETWEEN GENDER GROUPS

Distribution for engagement and females

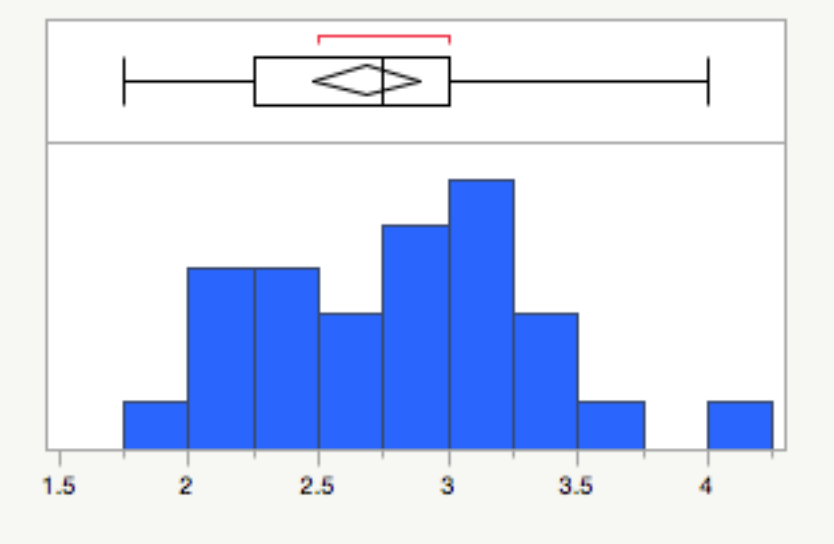


Figure 1A: distribution for engagement and females

Summary Statistics

Mean	2.6875
Std Dev	0.5297842
Std Err Mean	0.1001198
Upper 95% Mean	2.8929289
Lower 95% Mean	2.4820711
N	28
Skewness	0.2781945
Kurtosis	-0.088876

Distribution for engagement and male

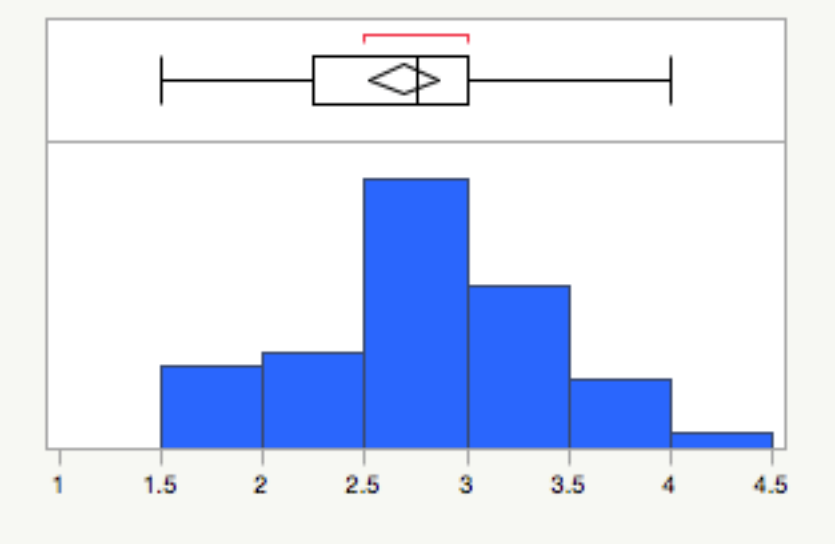


Figure 1B: distribution for engagement and male

Summary Statistics

Mean	2.6911765
Std Dev	0.6012242
Std Err Mean	0.0841882
Upper 95% Mean	2.8602735
Lower 95% Mean	2.5220794
N	51
Skewness	-0.205354
Kurtosis	-0.271808

APPENDIX 6: KNOWLEDGEABILITY OF TELEMEDICINE AMONGST AGE GROUPS

	Not knowledgeable	Somewhat knowledgeable	Knowledgeable	Very knowledgeable
21-30	0	4	0	0
31-40	1	4	4	1
41-50	0	10	7	1
51-60	2	10	15	3
61+	3	10	4	1
TOTAL	6	38	30	6

APPENDIX 7: BIO



Karishma Jivan Mistry has over six years of experience in corporate communication and worked across multiple sectors with local and global clients including financial services, automotive and ICT. She is currently a Reputation Management Consultant at Discovery and specialising in health care.

Her expertise includes strategic & financial communication, media relations, investor relations, stakeholder management and public affairs.

Karishma is an MBA candidate at the Wits Business School. Her passion for the health care industry and to help make a difference in serving communities with limited access to quality health had persuaded her to conduct a research study on the feasibility of telemedicine based consultation in the primary healthcare sector in Johannesburg.

She holds a Bachelor of Science (Anatomy and Physiology) and Postgraduate Diploma in Business Administration from the University of Witwatersrand.