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FACTORSINFLUENCINGEFFECTIVETELEHEALTHMANAGEMENT: PERSPECTIVES OF QUALITY COMPETENCY AND ORGANIZATIONAL CHANGE

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Abstract

This study investigates key factors influencing effective telehealth management in healthcare organizations in Saudi Arabia, particularly within primary health centers in Riyadh Saudi Arabia. Present study focuses on five primary areas: technology infrastructure, provider training and competency,patientengagement,regulatorycomplianceandqualityassurance,andorganizational culture and change management. A comprehensive survey questionnaire was conducted among healthcare staff, including directors, physicians, head nurses, and administrative personnel, to assess these factors' impact on telehealth effectiveness. SPSS was utilized for data analysis. Analysis of data revealed significant positive relationships between all suggested constructs which leads consequently to effective telehealth management. Specifically, technology infrastructure and organizational culture emerged as the strongest predictors. Further, findings emphasize the necessity of investing in robust technology systems, enhancingprovidertraining,,ensuringregulatorycompliance,promotingpatientengagement,and fostering a supportive organizational culture for the successful implementation of telehealth services.
Study further provides practical implications for healthcare organizations and policymakers, offeringinsightsintooptimizingtelehealthservicestoimprovehealthcaredeliveryinSaudiArabia.

Keywords: Saudi Arabia, telehealth, virtual healthcare, healthcare management, technology infrastructure, provider training

1- INTRODUCTION

Telehealth and virtual healthcare have emerged as transformative approaches to healthcare delivery,leveragingtechnologytoprovideremoteclinicalservices.Whiletheconceptoftelehealth isnotnew,withearlyexperimentsintelemedicinedatingbacktothe1960s(Bashshur&Shannon, 2009), recent technological advancements and the global COVID-19 pandemic have dramatically acceleratedtheadoptionandexpansionofteleheal thservicesacrossthehealthcareindustry(Wosik et al., 2020). Telehealth encompasses a broad range of remote healthcare services, including live videoconsultations,remotepatientmonitoring,mobilehealthapplications,andstore-and-forward transmission of medical data (American Telemedicine Association, 2020). These virtual care modalities offer numerous potential benefits, such as improved access to care, reduced healthcare costs,enhancedpatientengagement,andbettermanagementofchronicconditions(Tucksonetal., 2017).
TheCOVID-19pandemichasservedasacatalystforteleh ealthadoption,withmanyhealthcare providers rapidly implementing virtual care platforms to ensure continuity of care while minimizing in-person interactions (Mehrotra et al., 2020). This sudden shift has highlighted both the potential of telehealth and the challenges associated with its widespread implementation and management. As telehealth becomes an integral part of the healthcare ecosystem, effective management of these services is crucial to ensure quality, accessibility, and efficiency.

Healthcare organizations face numerous challenges in implementing and optimizing telehealth programs, including technology infrastructureand integration, provider training and adaptation to virtual care delivery, patient engagement and acceptance of telehealth services, regulatory compliance and reimbursement issues, and quality assurance and performance measurement. Addressing these challenges requires a comprehensive approach to telehealth management that considers both technical and human factors (Kruse et al., 2018). However, many healthcare organizations lack the knowledge and experience necessary to effectively manage and scale their telehealth initiatives.

The primary objective of this research is to investigate best practices for managing telehealth and virtual healthcare services. This study aims to identify key factors that contribute to successful telehealthmanagement,examinethechallengesfacedbyhealthcareorganizationsinimplementing and optimizing telehealth programs, explore strategies for overcoming obstacles to effective telehealth management, and develop a framework for comprehensive telehealth management that addresses technology, clinical, and operational aspects.
Toachievetheseobjectives,thestudywilladdressseveralkeyresearchquestions.Thesequestions focusonidentifyingcriticalsuccessfactorsfor effectivetelehealthmanagement,understandingthe impact of technology infrastructure, provider training, patient engagement, and regulatory compliance on telehealth initiatives, exploring strategies to overcome common challenges in telehealth implementation and management, and examining ways healthcare providers can optimize their telehealth services to improve patient

outcomes and satisfaction.

Thesignificanceof thisresearchlies initspotential toinform healthcareproviders,policymakers, and technology developers on how to enhance the delivery of virtual care services. As telehealth continues to evolve and expand, understanding the critical success factors for telehealth management will be essential for improving patient outcomes and experiences with virtual care, increasing healthcare access (particularly for under-served populations, enhancing the efficiency and cost-effectiveness of healthcare delivery, promoting the long-term sustainability of telehealth programs, and guiding policy development and regulatory frameworks for virtual care. Astelehealthandvirtualhealthcareservicesc ontinuetoreshapethehealthcarelandscape ,effective managementof theseinitiativesiscrucialforrealizing theirfullpotential.Additionallythisresearch aimstocontributetothegrowingbodyofknow ledgeontelehealthmanagementbyidentifyi ngkey success factors,examining challenges,andproposing strategies foroptimizingvirtualcaredelivery. Thefindingsofthisstudywillhaveimportantimp licationsforhealthcareproviders,policymake rs, andtechnologydevelopersastheyworktoim provethequality,accessibility,andefficiency of

healthcareservicesthroughtelehealth.
Study considered several hypotheses and constructs that includes, quality of technology infrastructure, patient engagement, level of provider training and telehealth competency, regular complainceandqualityassurance,strengthoforganizationalcultureandchangemanagement,and effective telehealth management.

2- LITERATUREREVIEWANDHYPOTHESESDEVELOPMENT

QUALITYOFTECHNOLOGYINFRASTRUCTUREAND PATIENTENGAGEMENT

Healthcareindustryisincreasinglyreliantonadvancedtechnologyinfrastructuretoenhancepatient care.High-qualitytechnologyinfrastructure,includingelectronichealthrecords(EHRs),telehealth platforms, and mobile health applications, plays a pivotal role in facilitating patient engagement, which is vital for improving health outcomes (HealthIT.gov, 2020; McAlearney et al., 2019).

High-quality infrastructure ensures that healthcare providers have real-time access to accurate patient information, which improves decision-making, reduces errors, and enhances the coordination of care. It also facilitates the deployment of telemedicine and remote monitoring technologies, making healthcare more accessible and personalized (Kruse et al., 2017).

However,patientengagementreferstotheinvolvementofpatientsintheirhealthcaredecisionsand management, further engaged patients are morelikely to adhere to treatment plans, attend follow- up appointments, and actively participate in their health management, leading to better health outcomes (Powell et al., 2017).

Technology, such as electronic health records (EHRs), patient portals, and mobile health applications, empowers patients by providing them with easy access to their health information, enablingthemtocommunicatewithhealthcareproviders,andallowingthemtomonitortheirhealth conditions (Mammen et al., 2018).

Paststudieshaveshownapositiveassociation betweenthequalityoftechnologyinfrastructureand patientengagement.Suchas,high-qualityEHRsystemswithintuitiveinterfacesandseamlessdata integration have been found to increase patient satisfaction and engagement by providing timely accesstoimprovingcommunicationandhealthinformationwithhealthcareproviders(McAlearney etal.,2019). Further,telehealthservices,supportedbyarobustITinfrastructure,thatsignificantly enhancedpatientengagementbyprovidingconvenientandflexibleaccesstocare.Patientscannow consultwithhealthcareprovidersfromremotelocations,reducingtheneedforin-personvisitsand allowingforcontinuousmonitoringandfollow-up(Zanaboni&Wootton,2012).Thus,basedon

thefollowingabovediscussionandevidences thefollowinghypothesiswasdeveloped.
***H*$_1$**:*Thequalityoftechnologyinfrastructureispositivelyassociatedwithpatientengagement*.

QUALITY OF TECHNOLOGYINFRASTRUCTURE AND LEVEL OF PROVIDER TRAINING AND TELEHEALTH COMPETENCY

Generally in healthcare delivery telehealth has become an increasingly important component, specificallyinthepandemicofCOVID-19.Thequalityofinnovativetechnologyandinfrastructure andthelevelofprovidertrainingandcompetencyintelehealthareimportantfactorsthatdetermine the effectiveness of telehealth services.

Quality technology infrastructure in telehealth includes reliable internet connectivity, capabilities of high-quality audio and video, must having the capacity to secure data transmission, that allow seamlessintegrationwithelectronichealthrecords(EHRs)andotherhealthcareITsystems.These elements are important for ensuring that telehealth services are delivered effectively and securely (Kruse et al., 2017). The effectiveness of telehealth is heavily dependent on the quality of the underlying technology infrastructure. High-quality infrastructure ensures that telehealth sessions are conducted without technical interruptions, such as poor video quality, dropped calls, or data breaches. Studies have shown that telehealth encounters conducted with high-quality technology infrastructure are associated with higher patient satisfaction, better clinical outcomes, and improved continuity of care (Zanaboni & Wootton, 2012).

Despite the potential benefits, many healthcare providers face challenges in establishing and maintaining high-quality telehealth infrastructure. Issues such as limited broadband access, especiallyinruralareas,canhindertheeffectiveness oftelehealth services.Additionally,thehigh costof implementing and maintainingadvanced telehealth technology can beabarrier forsmaller healthcare providers (Reed et al., 2020).

Providertrainingintelehealthisimportantforensuringthathealthcareprofessionalscaneffectively use telehealth technology and provide high-quality care remotely. Competency in telehealth requires not only technical skills but also the ability to engage patients, conduct virtual examinations, and manage telehealth-specific workflows (Shaw et al., 2018).

Past studies indicated that providers who receive comprehensive training in telehealth are more likely to conduct successful telehealth sessions. These training providers are better equipped to manage the technical aspects of telehealth, troubleshoot issues, and ensure positive patient experience. Additionally, well-trained providers can more effectively use telehealth to diagnose and treat patients, leading to better health outcomes (Smith et al., 2020).

Past empirical studies have shown that healthcare organizations with innovative and unique technologyinfrastructurearemorelikelytosucceedinimplementingtelehealthprograms.For

instance,astudyfoundthathospitals withadvanced telehealthinfrastructurereportedhigherrates oftelehealthadoptionandpatientsatisfactio ncomparedtothosewithlimitedinfrastructure (Smith et al., 2020; Zanaboni & Wootton, 2012).

The past studies and literature consistently indicates that both the quality of technology infrastructureandthelevelofprovidertraining arecriticalandimportantfactorsindeterminin gthe success of telehealth services. The high-quality infrastructure supports secure and reliable telehealthinteractions,whilecomprehensive providertrainingensuresthathealthcareprof essionals are competent in using telehealth technologies. Furthermore, this interdependency between the factors suggests that a coordinated approach, integrating advanced infrastructure with ongoing training, is essential for maximizing the benefits of telehealth. Thus, based on the following discussion the following study suggested the following hypothesis.

***H_2**:Thequalityoftechnologyinfrastructureisp ositivelyassociatedwithlevelofprovidertraini ng and telehealth competency.*

QUALITY OF TECHNOLOGY INFRASTRUCTUREAND REGULATORY COMPLIANCE AND QUALITY ASSURANCE

Averygeneralconceptisinthehealthcaresec tor,thatthequalityoftechnologyinfrastructur eplays a crucial role in maintaining regulatory compliance and ensuring quality assurance. Additionally, the healthcare systems increasingly rely on digital technologies for managing patients data, that deliver care, and coordinating services, and reliable technology infrastructure becomes essential. Present literature aims is to review and examines the interconnections between the quality of technology infrastructure, regulatory compliance, and quality assurance in healthcare in Saudi Arabia.

This quality IT infrastructure in healthcare includes reliable hardware, secure and interoperable software systems, good speed internet connectivity, and effective data storage solutions. These components support various healthcare functions, from clinical care to administrative operations, and are critical for ensuring that healthcare providers can deliver safe and effective care (HealthIT.gov, 2020). Additionally, good and high-quality technology infrastructure enables healthcare organizations to manage vast amounts of patient data securely and efficiently, facilitating better decision-making and enhancing patient outcomes. Furthermore, it supports the integration of different healthcare systems, enabling seamless communication and data sharing across various departments and institutions (Adler-Milstein & Jha, 2017).

Another perspective if this study is because healthcare organizations often face challenges in maintaining complianceduetо thecomplexityofregulationsand theevolvingnatureof technology. For instance, inadequate or outdated technology infrastructure can lead to compliance breaches, whichcan resultinlegalpenaltiesanddamageto theorganization'sreputation.Therefore, regular updates and monitoring, and audits of technology systems are necessary to ensure ongoing compliance (Bowman, 2013). Additionally, quality assurance (QA) in healthcare involves systematic processes to ensure that healthcare services are meeting toestablish standards and providesafe,effective,andpatient-centeredcare.Further,itencompassesarang eofactivities,

including regular audits, performance monitoring, and adherence to clinical guidelines e.g. (Institute of Medicine, 2001).

Past studies have shown that healthcare organizations with robust technology infrastructure are betterequippedtomeetregulatoryrequirements andmaintainhighstandardsofcare.Forinstance, organizations with advanced systems are more likely to achieve compliance with data protection regulations and have more effective quality assurance programs (McCarthy & Eastman, 2010).

One of the core barriers to effective integration of technology infrastructure with regulatory compliance and quality assurance is the cost of implementation and maintenance. These organizations, particularly smaller ones, may struggle to invest in the necessary technology. whereas,adoptingcloud-basedsolutions,partneringwithtechnologyvendors,andparticipatingin health information exchanges can help mitigate these challenges (Kruse et al., 2017).

Past several empirical studies highlight the positive impact of high-quality technology infrastructure on regulatory compliance. Such as, healthcare organizations that implemented comprehensive systems reported fewer compliance issues and enhanced data security (Adler- Milstein & Jha, 2017). Thus, due to some flaws and challenges the contemporary study however then suggested the below hypothesis for more investigation.

H_3: *The quality of technology infrastructure is positively associated with regulatory compliance and quality assurance.*

QUALITY OF TECHNOLOGY INFRASTRUCTURE AND STRENGTH OF ORGANIZATIONAL CULTURE AND CHANGE MANAGEMENT

Studies in the past shows that many healthcare organizations struggle with implementing and maintaininghigh-qualitytechnology infrastructure. Thesecommonchallenges includehighcosts, the need for continuous updates, and issues related to system interoperability (Kruse et al., 2016; McCarthy & Eastman, 2010).

In addition, organizational culture refers to the shared values, beliefs, and norms that shape the behavior and practices within an organization. A strong organizational culture promotes collaboration, innovation, and a commitment to patient-centered care. Key components include leadership, communication, teamwork, and a focus on continuous improvement (Schein, 2010).

Thestrength oforganizationalcultureisacriticaldeterminantof thesuccessoftechnologyadoption in healthcare. A positive and adaptive culture encourages staff to embrace new and innovative technologies and processes, fostering innovation and improving patient outcomes. Conversely, a weakorresistantculturecanleadtoresistancetochange,hinderingthesuccessfulimplementation of new technologies (HealthIT.gov, 2020; Weiner, 2009).

Relationshipbetweentechnologyinfrastructure,organizationalculture,andchangemanagementis

highlyinterdependent.Goodandhighquality technologyinfrastructureprovidesthefound ationfor effective change management by enabling seamless communication, training, and monitoring. However,astrongorganizationalculturesupp ortstheadoptionofnewtechnologiesbystimu lating a positive attitude towards change and encouraging innovation (Weiner, 2009).

Past empirical studies have shown that healthcare organizations with robust technology infrastructure and strong organizational cultures are more successful in implementing new technologies and achieving positive patient outcomes. For instance, hospitals with a culture of innovation and collaboration are more likely to effectively use EHR systems to improve care quality (Weiner, 2009).
Discussion above shows the importance of the constructs for each other, and thus suggest the following hypothesis.
H4*: The quality of technology infrastructure is positively associated with strength of organizational culture and change management.*

PATIENTENGAGEMENTANDEFFECTIVETELE HEALTHMANAGEMENT

Achieving high levels of patient engagement can be challenging, specifically among populations with low health literacy, limited access to technology, and or cultural and language barriers. Furthermore, healthcare providers may face difficulties in sustaining engagement over time, especially when patients are managing chronic conditions that require ongoing care and attention (Barello et al., 2016).

Effective telehealth management involves the delivery of healthcare services through telecommunication technologies, such as video conferencing, mobile health apps, remote monitoring, and electronic health records (EHRs). Effective telehealth management requires a robust technological infrastructure, trained healthcare providers, and clear protocols to ensure quality care(Totten et al., 2016). Further telehealth offers numerous benefits, including increased access to care, particularly for patients in remote or under served areas, convenience for both patientsandproviders,andthepotentialforre al-timemonitoringofchronicconditions.Telehe alth can also reduce healthcare costs by minimizing the need for in-person visits and enabling early intervention in health problems and issues (Dorsey & Topol, 2020; Kruse et al., 2017).

Pastliteraturesuchas(Graffignaetal.,2015;Tot tenetal.,2016),indicatesthatpatientengage ment is a critical factor in the success of telehealth management. Telehealth offers numerous opportunitiestoenhancepatientengageme ntbyprovidingaccessible,personalized,and convenient healthcare services. However, to maximize the effectiveness of telehealth, healthcare providers must address the challenges related to technology access, digital literacy, and provider training. Based on the discussion above and evidences the association between patient engagement and effective health management can be acknowledged and thus the following hypothesis were developed.
H5*:Patientengagementispositivelyassociat edwitheffectivetelehealth management.*

LEVELOFPROVIDERTRAINING&TELEHEALTH COMPETENCYAND EFFECTIVE TELEHEALTH MANAGEMENT

Successfulimplementationandmanagemento ftelehealthservicesdependsignificantlyonthelevel of provider training and their competency in using telehealth system and technologies. Present literaturereview examines therelationship between provider training, telehealth competency, and the effectiveness of telehealth management, drawing on major studies and best practices.

Properandformaltrainingensures thatproviders arefamiliarwiththetechnology,understandthe key needs of telehealth encounters, and can effectively communicate and deliver care through digital platforms. Conversely, without proper training, providers may struggle with the technical aspects of telehealth or fail to engage patients effectively, leading to suboptimal outcomes (Coon & Wiegand, 2021; Donnelly et al., 2021; Wosik et al., 2020).

Telehealthcompetencyreferstotheknowledge,skills,andattitudesthathealthcareproviders must possess to effectively deliver care through telehealth platforms. This further includes technical proficiencywithtelehealthtools,clinicalskillsadapted tothetelehealthcontext,andtheabilityto buildrapportandcommunicateeffectivelywithpatientsremotely(Gajarawala&Pelkowski, 2021). Telehealthcompetency can beassessedthroughvariousmethods, includingself-assessmenttools, peer evaluations, patient feedback etc.. Regular assessment and measurement of telehealth competencies can help identify areas where providers need additional training or support (Wosik et al., 2020).

Effective telehealth management involves major key components, a well-trained and competent provider workforce, clear clinical protocols, technological infrastructure, and a patient-centered approach.Goodandeffectivemanagementensuresthattelehealthservicesaredelivered efficiently, safely, and in a manner that meets service user needs and expectations (Totten et al., 2016).

Literature has witnessed that the level of provider training and competency directly impacts the effectiveness of telehealth management. The providers who are well-trained and competent in telehealth are more likely to deliver high-quality care, maintain patient engagement, and directed the challenges of remote care delivery. Contrary, providers who lack telehealth competency may facedifficulties in managing patientcare, leading to reduced patientpleased and potentialclinical errors (Kruse et al., 2017).

Providers with high levels of telehealth competency contribute to well managed outcomes, that includes higher patient satisfaction, improved clinical outcomes, and more efficient use of telehealth technologies (Coon & Wiegand, 2021; Wosik et al., 2020).

Past empirical studies such as (Coon & Wiegand, 2021; Wosik et al., 2020), have shown that targetedtelehealthtrainingprogramscansignificantlyimproveprovidercompetency.For example, astudyinvolvingprimarycareprovidersdemonstratedthatthosewhoparticipatedinastructured

telehealth training program reported higher confidence and competence in delivering telehealth services compared to those who did not receive such training (Donnelly et al., 2021). Henceforth, based on the past studies evidences and importance the present study postulated the following hypothesis.

***H_6**: Level of provider training and telehealth competency is positively associated with effective telehealth management.*

REGULATORYCOMPLIANCE&QUALITYASSURANCEANDEFFECTIVETELEHEALTH MANAGEMENT

Regulatory compliance and quality assurance in telehealth involves adhering to a range of laws, regulations, and guidelines that govern the delivery of healthcare services through electronic platforms. These regulations cover areas such as privacy of patient, securing the data, reimbursement of license , and all the standards of care (O'Doherty et al., 2020).

Compliancewiththeseregulationsisimportantinordertoensurethelegalandethicaldeliveryof telehealthservicesandcare.Non-compliancecanresultinginlegalpenalties,otherfinanciallosses, and damage to the reputation of healthcare centers and organizations. Furthermore, regulatory complianceiscriticaltomaintainpatienttrust, asitensuresthattheirdataisprotectedandthatthey receive care that meets established standards (Cohen et al., 2020; Deloitte, 2020).

Quality assurance in telehealth refers to the systematic processes used to ensure that telehealth services meet established standards of care. Further it includes monitoring the quality of patient provider interactions, the effectiveness of telehealth technologies, and the outcomes of telehealth interventions.QualityAssuranceprocessesareimportantforidentifyingareasofimprovementand ensuring that telehealth services are effective, safe, and patient-centered (Totten et al., 2016).

Additionally,effectivetelehealthmanagementrequirestheseamlessmixofregulatorycompliance and quality assurance processes. Further, it involves developing protocols and guidelines that address both regulatory requirements and quality standards, ensuring that telehealth services are legally compliant while also providing high quality care. For instance, healthcare organizations mayimplementcomprehensivetrainingprogramsforprovidersonbothregulatorycomplianceand quality assurance practices, helping them to navigate the complexities of telehealth management (Deloitte, 2020).

Quality assuranceisimportantto thesuccessof telehealth management, asitensures thatservices aredeliveredataconsistentlyhighstandard.Effectivequalityassuranceprocessescanidentifyand address issues before they impact patient care, thereby improving clinical outcomes and patient satisfaction. Additionally, this assurance contributes to continuous improvement in telehealth services by providing valuable feedback on performance and areas for enhancement (Kruse et al., 2017).

Patliteraturehassuggestedastrongsynergybetweenregulatorycomplianceandqualityassurance intelehealthmanagement.Regulatoryframeworksoftenincludequalitystandards,andcompliance with these standards naturally leads to improved quality of care. Contrary, a robust quality assurance practices help ensure that telehealth services meet or exceed regulatory requirements, thereby reducing the risk of non-compliance (Cohen et al., 2020).

Strategies for effective telehealth management include developing clear procedures and policies that address both regulatory and quality requirements, investing in training and resources for healthcare providers, and using technology solutions that support compliance and quality assurance.Regular andcontinuous monitoringand improvement,supported bydataanalytics,can helphealthcareorganizationsstayaheadofregulatorychangesandmaintainhighstandardsofcare (Deloitte, 2020). Henceforth, the discussion shows the hypothetical relationship between the suggested constructs and thus developed the below hypothesis.

H7:*Regulatorycomplianceandqualityassuranceispositivelyassociatedwitheffectivetelehealth management.*

STRENGTHOFORGANIZATIONALCULTURE& CHANGEMANAGEMENT AND EFFECTIVE TELEHEALTH MANAGEMENT

Adoption and effective management of telehealth services within the healthcare organizations depend significantly on the strength of organizational culture and the approach to change management (Gagnon et al., 2020). Additionally, organizational culture shapes how telehealth is perceivedandintegratedintohealthcarepractices,whilechangemanagementstrategies arecritical in ensuring smooth transitions and the successful implementation of telehealth technologies.

Afterward, in the context of healthcare, a strong organizational culture supports the adoption of innovative practices, such as telehealth, by fostering an environment that values patient-centered care, continuous improvement, and adaptability (Schein, 2017).

Studies suggested that strength of an organization's culture can significantly affect the adoption and effectiveness of telehealth services (Gagnon et al., 2020). A culture that encourages collaboration, innovation, and open communication is more likely to embrace telehealth as a valuable tool for delivering care.

Change management refers to the structured approach used to transition teams, individuals and organizationsfroma currentstate toadesiredfutureformandstate.However,frommtheperspectives of telehealth, effective change management is essential for addressing the challenges associated with shifting from traditional in-person care to remote care models. Further, it includes managing the technical, operational, and human aspects of telehealth implementation (Kotter, 1996).

Effective telehealth management requires the integration of a strong organizational culture with robust change management practices. Additionally, a supportive culture provides the foundation for change, while change management strategies ensure that the adoption of telehealth is systematic, smooth, and sustainable. All these elements help to optimize telehealth management, which are leading to better patient outcomes and higher levels of provider and patient satisfaction (Greenhalgh et al., 2017; Hartmann et al., 2020).

The synergy between a strong organizational culture and effective change management is key to the success of telehealth initiatives. When these elements are aligned, organizations are better equipped to navigate the complexities of telehealth implementation, ensuring that services are delivered effectively and meet the needs of both providers and patients (Gagnon et al., 2020; Greenhalgh et al., 2017).

Past literature (Gagnon et al., 2020; Hartmann et al., 2020) indicates that the strength of organizational culture and the effectiveness of change management are important factors in the successful management of telehealth services. A strong culture that supports innovation and adaptability, combined with structured change management strategies, can significantly enhance theeffectivenessoftelehealthmanagement. Henceforth,Inlightof thediscussionabove thestudy then postulated the following hypothesis.

2.1 Introducti

H8*: Strength of organizational culture and change management is positively associated with effective telehealth management.*

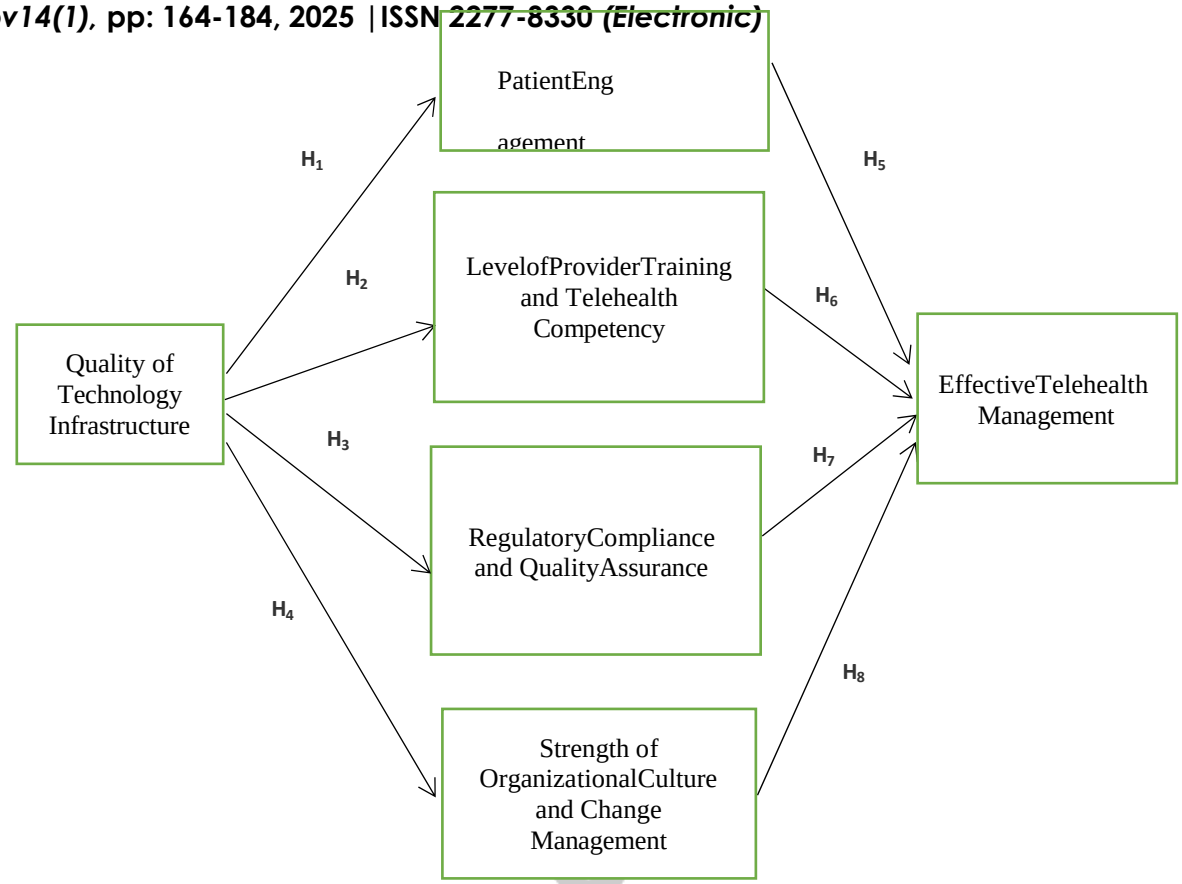

Figure1:A conceptualStudyFramework

3- RESEARCHMETHODOLOGY

PROCEDUREANDDATACOLLECTION PROCESS

Data for the contemporary research were collected from Saudi Arabia, particularly capital city Riyadh were chosen due to its wide outskirts and diversifying characteristics. Additionally, study has chosen randomly Thirty One (31) PHC's (Govt. & Non-Govt.) situated in different region of Riyadh Saudi Arabia. Reason for targeting the primary health centers were due to convenient and easytoaccesstotherespondents.Thetargetrespondentswerethestaffof PHC's.Severalpositions holders were targeted for instance, directors, general physician, Head Nurses and some other administrative staff. The designed survey questionnaire has been handed over after the approval and agreement of the respondents. A briefly introduction was a part of the survey.

4. DATAANALYSISPROCESS

MEASUREMENTS

Sincestudyparticipant were thestaffofthesePHC's.Henceforth,randomly the questionnairehas beendistributedamongthetargetedrespondents.Onecompletecalenderdaywasdedicatedtovisit one center. Hence, data collection were took almost 31 working days. Ninety Three(93) questionnaireswereredistributedinordertogetheresponsesfromthetargetedrespondents. Among all these Ninety One (91) responses were considered as valid and the rest 2 responses were incompleteandthusdiscarded.Studysampleisjustifiablebasedonthestudyandrecommendations of (Hair et al., 2010). Five point Likert scale used as, (1) = strongly disagree and (5) =strongly agree.

DESCRIPTIVE ANALYSIS

Descriptiveanalysis can beseen in thetablebelow. Tableincluded thegender of therespondents, nationality/race, age marital status, age and holding position were considered as a part of the descriptive analysis. All the

frequencies and percentage can be seen in the table below.

Table1: Demographics

DEMOGRAPHICS	OPTIONS..	FREQUENCY=91	%AGE.
GENDER	MaleF	63.00	69.23
	emale	28.00	30.77
Nationality/Race	Saudi Nationals	67.00	73.63
	OtherNationalities	24.00	26.37
Age	Up to 20 Years	0.00	00.00
	21-30	23.00	25.27
	31-40	37.00	40.66
	41-50	16.00	17.58
	50&aboveMarried	15.00	16.48
MARITALSTATUS		68.00	74.73
	Non-Married	23.00	25.27
EDUCATION	Diploma/Certificate/etc.	16.00	17.58
	Undergraduate	41.00	45.05
	Graduate	34.00	37.36
	PhD	00.00	00.00
POSITION	Manager/Director	28	30.77
	Officeassistant	17	18.68
	Physician	27	29.67
	HEADNURSE	19	20.88

VALIDITYCHECKING

The validity of the construct items can be assessed using Cronbach's alpha and Composite Reliability(CR) tests.However, thisstudy followstherecommendationsof previousresearch and conductstheCronbach'salphatestusingSPSSversion23.Theminimumacceptablevaluefor

Cronbach'salphais0.70orhigher,whichisconsideredacceptableaccordingtoVinzietal.(2010).

Table2:Cronbach'sAlphaValues Results

CONSTRUCTS	CRONBACHALPHAVALUES
QTI	0.831
PE	.0941
LPTTC	0.901
RCQA	0.887
SOCCM	0.776
ETM	0.913

STANDARDDEVIATION AND MEANVALUE

Tablebelowprovidesdescriptivestatisticsfortheconsideredconstructs.Furthershowstheirmean, standard deviations, and corresponding mean levels. All the considered constructs i.e. QTI, PE, LPTTC, RCQA, SOCCM, and ETM that fall within the "Middle" mean level category, and indicating moderatelevelsof agreementorperformance.Meanscoresrange from4.019 (ETM)to 4.978 (RCQA), with standard deviations

ranging from 0.701 to 0.789. Which is the evidentlevel of moderate response among the constructs, with some variation in how tightly the responses are clustered around the mean, as indicated by the standard deviations.

Table3: AnalysisofMeansandStandard Deviation

Constructs	Mean	StandardDeviation	MeanLevel
QTI	4.061	0.722	Middle
PE	4.331	0.719	Middle
LPTTC	4.539	0.774	Middle
RCQA	4.978	0.783	Middle
SOCCM	4.170	0.789	Middle
ETM	4.019	0.701	Middle

HYPOTHESES,CORRELATIONTEST

Pearson test is traditionally used in social sciences to examine the correlation between the consideredconstructsunderthestudy.Thus,SPSSversion23wasemployed toperformthePearson test on the considered constructs, that includes Quality of Technology Infrastructure, Patient Engagement,LevelofProviderTrainingandTelehealthCompetency,RegulatoryComplianceand Quality Assurance, Strength of Organizational Culture and Change Management, and Effective Telehealth Management. It is generally accepted that values of 0.01 or less are considered statistically significant in a two-tailed test.

Table4: HypothesesCorrelationTest

CorrelationofVariables							
		QTI	PE	LPTTC	RCQA	SOCCM	ETM
QTI	PearsonCorrelation	.652**	.324**	.355**	.607**	.462**	.314**
	Sig.(2-tailed)		.000	.000	.000	.000	.000
	N	91	91	91	91	91	91
PE	PearsonCorrelation	.310**	.401**	.303**	.397**	.348**	.322**
	Sig.(2-tailed)	.000		.000	.000	.000	.000
	N	91	91	91	91	91	91
LPTTC	PearsonCorrelation	.427**	.401**	.687**	.597**	.393**	.673**
	Sig.(2-tailed)	.000	.000		.000	.000	.000
	N	91	91	91	91	91	91
RCQA	PearsonCorrelation	.576**	.502**	.583**	.416**	.307**	.547**
	Sig.(2-tailed)	.000	.000	.000		.000	.000
	N	91	91	91	91	91	91
SOCCM	PearsonCorrelation	.582**	.509**	.539**	.992**	.508**	.501**
	Sig.(2-tailed)	.000	.000	.000	.000		.000
	N	91	91	91	91	91	91
ETM	PearsonCorrelation	.527**	.522**	.539**	.902**	.798**	.595**
	Sig.(2-tailed)	.000	.000	.000	.000	.000	
	N	91	91	91	91	91	91

**Correlationsaresignificantat0.01level(2-tailed)

HYPOTHESESRESULTS

Below table contains the values and hypotheses results. For instance, H_1 connects (QTI) and (PE) are significant at (0.000) and calculated the t-value with 8.712, thus the link found positive. Similarly, second hypothesis that

links of (QTI) and (LPTTC) were also found significant at (0.000), whereas, the t-value 9.732, and considered as positive link. Furthermore, the connection between (QTI) and (RCQA) is also found significant at (0.000), and t-value calculated as 6.768, also considered as positive and significant relationship. Similarly, the link between (QTI) and (SOCCM) is also found significant at (0.000), and t-value is calculated as 9.243, hence including this all the values are showing the positive relationship among the constructs. All the values and considered constructs can be seen in the table below.

Table 5: Hypotheses Results

	Constructs	t-value	Significant	Result
H_1	QTI →PE	8.712	0.000	Positive
H_2	QTI → LPTTC	9.732	0.000	Positive
H_3	QTI →RCQA	6.768	0.000	Positive
H_4	QTI →SOCCM	9.243	0.000	Positive
H_5	PE → ETM	9.889	0.000	Positive
H_6	LPTTC→ETM	9.090	0.000	Positive
H_7	RCQA→ETM	7.112	0.000	Positive
H_8	SOCCM→ETM	9.001	0.000	Positive

5- DISCUSSION

Present study provides a comprehensive analysis of the factors that significantly influence the effectiveness of telehealth management within healthcare organizations in Saudi Arabia, with a focus on primary health centers in Riyadh. Findings and results clearly demonstrate that a robust technology infrastructure is important and crucial for theseamless delivery of telehealth services. Additionally, suggested infrastructure supports efficient communication, operational efficiency, and secure data management, that are all critical components of successful telehealth implementation. Positive correlation between technology infrastructure and telehealth outcomes suggeststhathealthcareorganizationsmustprioritizeinvestmentsinadvancedtechnologysystems to improve service quality and patient satisfaction.

Furthermore, thestudyhighlightsthe importanceof providertraining andcompetency inensuring the success of telehealth services. Providers who receive comprehensive training in telehealth technologies and communication techniques are better equipped to manage remote patient interactions effectively. Following the training is essential not only for technical proficiency but also for maintaining high standards of patient care in a virtual environment. Present study further emphasizestheroleofpatientengagementin telehealtheffectiveness.Further,engagedpatientsare activelyinvolvedintheircare,tendtohavebetterhealthoutcomesandaremorelikelytoadhereto treatment plans, thereby enhancing

the overall success of telehealth programs.

Regulatorycomplianceandqualityassuranceemergedascriticalfactorsintelehealthmanagement. Thus, this Adherence to regulatory standards which ensures that telehealth services are delivered within a legal and ethical framework, which is critical for maintaining patient trust and avoiding legalpitfalls.Next,qualityassuranceprocesseshelpmaintainhighstandardsofcare,ensuringthat telehealth services are safe, effective, and patient-centered. Further, the study underscores the significanceoforganizationalcultureandchangemanagement.Supportiveculturewhich embraces innovation and adaptability, coupled with effective change management strategies, facilitates the successful adoption and integration of telehealth services within healthcare organizations.

6- CONCLUSIONANDFUTUREDIRECTIONS

Presentstudycontributesvaluableinsightsintothecriticalsuccessfactorsthatinfluencetelehealth management in Saudi Arabia. Results of study indicates that healthcare organizations must prioritize the development of a strong technology infrastructure, comprehensive training, and strategies to enhance patient engagement. further, ensuring regulatory compliance and fostering a culture that supports innovation and change are essential for the successful implementation and management of telehealth services. Considered elements are not only fundamental for current telehealth practices but also for adapting to future advancements in healthcare technology.

In additiona, healthcare perspectives leaders and policymakers, the study offers them practical guidance on optimizing telehealth services to improve healthcare delivery in Saudi Arabia. The research suggests that a holistic approach, integrating technology, training, patient engagement, and organizational culture, is critical and important to maximize the benefits of telehealth.

Future research could build on these findings by exploring the long-term impacts of these factors and examining how emerging technologies could further enhance telehealth management. By addressingtheidentifiedchallenges andleveragingthestrengths outlined inthis study,healthcare organizations can ensure the effective and sustainable integration of telehealth services into their care delivery models. Study and population were targeted in one city and was limited to Riyadh only, future studies can target other cities and for different outcomes and results.

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