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Examining the factors affecting the adoption of telemedicine in the Maldives

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Abstract: In the age of growing integration of technology in service provision, countries facing challenges due to diseconomies of scale and unique geographical topographies require a thorough understanding of how technology can enhance service delivery. This study examines the factors affecting the adoption of telemedicine services in the Maldives, tracing the evolution from a community-based healthcare system to a modern allopathic system, now with regional healthcare providers supporting peripheral service providers. The study employed a mixed-methods approach, utilizing secondary data from regional healthcare providers, carrying out in-depth interviews with hospital management, and conducting a comprehensive literature review to gather systemic insights. Leveraging the Hospital Telehealth Maturity Model, the research specifically examined platform and program factors affecting the adoption of telemedicine. The study on telemedicine adoption in the Maldives reveals a basic level of readiness characterized by fragmented technological implementation, deficient workflow, and inadequate infrastructure in regional hospitals. There is a need for significant improvement in human resources and supportive functions, alongside inconsistent policies influenced by shifting political landscapes. Limited awareness and coordination among stakeholders further constrain adoption capacity. However, there is potential for progress through enhanced leadership, technological innovation, resource efficiency, and strengthened adoption capacity to better cater to changing demographics and patient preferences, ultimately delivering affordable, equitable, and quality healthcare services.

Keywords: accessibility, digitization, equity, health, healthcare, Maldives, SIDS, telehealth, telemedicine

Introduction

In today's era, various services are increasingly accessible online. Healthcare services through digital platforms, while not yet widespread, are present in both developed and developing regions. The telemedicine services initially focused on communication of required medical assistance and informing of medical status. Evidence from Robert H. Eikelboom's book 'The Telegraph and the Beginnings of Telemedicine in Australia' suggests that the telegraph was employed in Australia as early as 1874 to aid in the medical care of a wounded soldier. The advent of the telephone by Alexander Graham Bell in 1876 further expanded connectivity. Since then, telemedicine has evolved to encompass patient-physician consultations, prescription services, and coordination with other healthcare facilities for medical examinations, referrals, and follow-up appointments. The imperative for telemedicine became even more pronounced during the recent COVID-19 pandemic. Consequently, the global telehealth market size reached US$ 19 billion in 2023. The

IMARC Group expects the market to reach US$97.3 billion by 2032, exhibiting a growth rate of 19.7% during 2024-2032 (IMARC Group, 2023). Discussions surrounding telemedicine have now broadened to include the integration of artificial intelligence. Furthermore, digital health has become a crucial step in attaining universal health coverage which is also under the Sustainable Development Goals (SDG) of the United Nations.

In 2019, the World Health Organization (WHO) issued its inaugural guideline on digital health. According to WHO, telemedicine is defined as 'the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies, for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation and continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities'. With this definition in mind, prioritizing Small Island Developing States (SIDS) becomes paramount.

WHO data reveals that more than half of individuals in SIDS are experiencing premature mortality due to non-communicable diseases (NCDs) with hypertension rates exceeding 30% in nearly all countries. Additionally, ten of the countries with the highest obesity rates globally are situated in SIDS. It is projected that SIDS will have the highest prevalence of diabetes among adults worldwide. Mental health conditions are also prevalent, with rates reaching as high as 15% in the Caribbean and the Pacific regions. 'These countries are facing multiple overlapping crises. The climate crisis and the COVID-19 pandemic, combined with poverty, unemployment, inequality and the marginalization of minority communities are fuelling an increase in noncommunicable diseases and mental health conditions' said Dr Tedros Adhanom Ghebreyesus, Director-General of World Health Organization (WHO), in 2023 (WHO, 2023).

Even within the SIDS, the Maldives stands as the world's lowest-lying country, with just 1.8 meters above sea level. With a population of 500,000 spread across 186 inhabited islands spanning over 90,000 km^2, the nation faces significant challenges in healthcare accessibility and quality. Since the establishment of the first health centre, Daktaruge, in the Maldives in 1948, and even earlier through the roles of community health workers and individuals with healthcare knowledge acquired mainly through their experience, trial and error, and to a lesser extent, education and training, the country has struggled to provide affordable, equitable and quality healthcare services due to inadequate resources and systemic barriers.

The country's development, marked by its transition from a Least Developed Country (LDC) in 2011 to a Middle-income Country has seen improvements in health outcomes, particularly in reducing infant and maternal mortality rates and increasing average life expectancy (World Bank, 2022). In the Maldives, 85% of deaths are linked to NCDs. Among these, 36% are attributed to cardiovascular diseases, 18% to cancers, 9% to chronic respiratory diseases, and 6% to diabetes. Additionally, 8% are due to communicable, maternal, perinatal, and nutritional conditions, while injuries account for 7%, and other NCDs make up 16% (WHO, 2024). Despite these statistics highlighting the significant challenges facing the nation, the system faces even greater strain due to the rapid migration from rural to urban areas with one-third of the population residing in the capital city of Male'.

Moreover, while telemedicine has attracted global attention, relatively little empirical work has focused on its adoption in Small Island Developing States (SIDS). Most studies emphasize high-income or large landmass contexts, overlooking the complex interplay of geographic dispersion, small populations, and political volatility that characterize SIDS. The Maldives, in particular, remains underrepresented in digital health literature. This study addresses this gap by examining how structural and institutional factors influence telemedicine uptake in the country, using original data from healthcare providers and stakeholders to provide grounded, policy-relevant insights.

Healthcare system of the Maldives

Before the introduction of modern healthcare in the Maldives, traditional medicine and healing referred to as 'Dhivehi Beys' or 'Hakeemee Beys' were practised using both spiritual and herbal medicine methods (World Bank, 2022) and this was mostly based on treatment than prevention. Since the establishment of the first health centre in 1948, the health sector of the Maldives has undergone rapid transformations. The government opened a well-equipped hospital in 1967 with doctors and nurses who had regular training in medicine and nursing. Modern allopathic medicine was established in the 1950s, and there were initial overtures in this direction since the 1930s with the opening of the very first dispensary by the government of Maldives. The Maldives formulated its first primary health care plans in the early 1980s in a dynamic manner, where the broad commitment to the principles of Primary Health Care was launched by an equal commitment to delivery in which those principles are applied (Sulaiman, Bakar, & Wahab, 2014).

In recent years, the healthcare system of the Maldives has undergone significant development, evolving into an integrated framework comprising both private and public healthcare providers. The healthcare structure in the Maldives operates on a four-tier system, consisting of island-level primary healthcare centres, six regional hospitals, and thirteen atoll hospitals offering a variety of specialities and diagnostic facilities and tertiary care at the central level. Private healthcare delivery predominantly occurs in Male', catering to tertiary care and speciality outpatient services. Administratively, each regional or atoll hospital, except in Kaafu atoll, serves as the main coordinating entity for providing primary and curative healthcare services within its respective atoll.

The 189 government health facilities across the country are categorized based on their capacity and the complexity of services they offer. Island-level health centres are graded into four levels – grades 1, 2, 3, and 4 – providing basic medical services, public health promotion, and preventive services. Atoll hospitals are designated as higher-level health facilities and are classified into grades 1, 2, and 3, with grade 3 hospitals serving as regional hospitals responsible for specialized care and services across clusters of 2-4 atolls. These secondary-level hospitals located in peripheral areas support the provision of curative services, with major specialities in surgical, radiological, and laboratory investigation services. Furthermore, tertiary-level care hospitals are situated at the central level. In the periphery, the Addu Equatorial Hospital in Seenu Atoll and Kulhudhufusi Regional Hospital in Haa Dhaalu Atoll also offer some tertiary-level care services (Ministry of Health, 2022).

The evolution of the healthcare system of the Maldives has seen moving from a community-based treatment approach to an increase in demand for specialists and super-specialist services, which has stretched the overburdened system. The findings from the first Health Forum of the Maldives also highlighted the need to address issues related to mistrust in the system, inadequate human resource capacity, rigidity in the legal framework, lack of affordability and existing inequalities in healthcare (Maldives Research, 2020).

This transition, while indicative of progress, has also contributed to widening disparities between urban and peripheral healthcare access. The concentration of specialized care in Male' has increased dependence on medical travel, while rigid budget structures and limited autonomy at the regional level constrain innovation. Furthermore, a shortage of managerial capacity and weak health information infrastructure undermine service integration. In this context, telemedicine represents a strategic opportunity to overcome geographic barriers, redistribute specialist expertise, and enhance service equity, particularly if supported by long-term planning and regulatory alignment.

Telemedicine practices worldwide

With the definition of telemedicine, it is important to factor in 'distance' as a critical element in delivery of healthcare services. As countries started adopting telemedicine, it has been localized in approaches to ensure its pertinence.

In India, some 72.2% of the population live in rural areas; while 75% of doctors are based in cities. Recognizing the need, India enacted a Telemedicine Act (2003) and a National Telemedicine Network in 2015, facilitating the setting up of telemedicine services to remote areas from surrounding district hospitals. To complement the need to provide affordable healthcare service, India also has the cheapest telemedicine consultation service 'Hello Doctor 555' with less than 25 cents in Uttarakhand (The Better India, 2019).

On the contrary, the situation in Pakistan presents a different scenario. Among 182 million residents in Pakistan, 51% of people lack basic healthcare services as Pakistan spends a mere 0.9% of its GDP on health. It is also evident that 70% of medical students in Pakistan are women, of more than half of these graduates never practice in the field largely due to sociocultural belief that women- 'doctor wives' should stay at home to serve their husbands and kids once married and to a smaller extent due to lack of professional maid service and child care centres at/near workplaces (Quartz, 2017). To overcome this barrier, a project 'Sehat Kahani' was initiated, aiming to empower female doctors who are unable to leave their homes to provide e-consultations which has resulted in a network of 500 females serving 40,000 patients (Sehat Kahani, 2024).

China boasts three primary telemedicine networks: the Golden Health Network, International MedioNet of China, and the People's Liberation Army. With a strategic investment of 26.5 million RMB (equivalent to US$3.9 million) by the Xiamen government, medical services have been significantly enhanced. This investment has facilitated the integration of information systems across various levels, streamlining the retrieval of citizens' health records. Out of Xiamen's 3 million residents, records for over 1 million individuals are now accessible from birth, fostering improved collaborations with third-party companies regarding medical material distribution and delivery, enabling routine monitoring of disease prevention, and decision support for the national government. Notably, an analysis conducted in 2008 revealed a cost savings of 21 million CNY

(around US$3.1 million) attributed to a decrease in redundant medical examinations at healthcare facilities (Zhao, Zhang, Guo, Ren, & Chen, 2010).

Mongolia, characterized by sparse population density and historically high maternal mortality rates, exemplifies the impact of telemedicine interventions. Through collaboration between the United Nations Population Fund and the government of Luxembourg, a telemedicine system was deployed, focusing on maternal care. This system connected local healthcare providers with experts, provincial hospitals, and the National Center for Maternal and Child Health (NCMCH). The results were significant, with pregnancy complications decreasing from 25.7% in 2007 to 9% in 2009. Furthermore, maternal mortality rates dropped from 199 deaths per 100,000 live births in 1990 to 26 deaths per 100,000 live births in 2015 (Ati, 2015).

Established to offer telemedicine services on a broader scale, the Apollo Telemedicine Networking Foundation (ATNF) is a non-profit organization that has more than 125 telemedicine centres across several countries, including India, Pakistan, Afghanistan, Iraq, Sri Lanka, Bangladesh, Nepal, Kazakhstan, Lagos, Sudan, Yemen, and the Middle East. The ATNF collaborates with various entities, ranging from large corporate hospitals to government hospitals and small clinics, as well as information centres in remote and inaccessible areas. Covering the Himalayas- an elevation of 13,000 feet above sea level, it holds the distinction of being the highest telemedicine centre (Apollo Telemedicine Network Foundation, 2024).

Although countries blessed with ample landmasses and resources have their own set of challenges, the SIDS face unique obstacles due to their geographic dispersion and the difficulty in achieving economies of scale as a result of their limited population size. In this regard, Latin American countries have exemplified innovative multi-country initiatives to overcome the issues of legal barriers which restrict patients from being treated by doctors from another country or state. The 'SickKids' Caribbean initiative was started in 2013 to facilitate access to healthcare services for children with cancer and blood disorders, maintain local databases for cancer patients, and connect Caribbean doctors with Canadian specialists. During 2017–2018 and in Jamaica alone, 57,790 newborns were screen-tested for sickle-cell disease (Gupta & Sao, 2011).

A study done in Dominica has highlighted the advantages of the use of telemedicine associated with the management of diabetes and hypertension, making healthcare accessible and affordable. Furthermore, digitization of healthcare has also proven to aid early diagnosis and disease monitoring and management during and post-COVID-19 pandemic in Dominica. Although there is a need to improve connectivity, increase e-health medical devices, technological apparatus, and advocacy and education of telemedicine services in SIDS, there is no denying ease of service and improvement in satisfaction levels of telemedicine services (ITU, 2022).

The Federated States of Micronesia (FSM) have also started utilizing telemedicine to overcome the geographical challenges faced by SIDS. The Department of Health and Social Affairs Family Planning Programme (FSM FPP) has prompted to launch Telehealth Access Project, which brings telehealth to the residents of eight outer island sites of the FSM. The FSM FPP built its telehealth model around the unique constraints and assets of the outer islands. Most outer island residents live a subsistence lifestyle; many don't have smartphones or computers, which are essential ingredients for telehealth. But every inhabited island has a small local clinic, called a dispensary, staffed by a community health worker and stocked with a computer. Residents can go to their local dispensary and use telehealth to connect with medical professionals at Pohnpei State Hospital (Reproductive Health National Training Center, 2023).

In the process of implementing telemedicine, countries have also started to amend their existing legal frameworks to facilitate and regulate telemedicine services. In this regard, Norway became the first country to reimburse telemedicine services in 1996 through its national health system, recognizing that 2.4% of expenditure on specialist health services was on travel costs (Alami, Gagnon, Wootton, Fortin, & Zanaboni, 2017). Similarly, France has also amended their Social Security Bill in 2018 to reimburse teleconsultations (Gupta, et al., 2019).

Cuba, a country which boasts of excellence in primary healthcare, established the Centre of Cybernetics Applied to Medicine (CECAM) as early as the 1970s, and since then has established a national telediagnosis system that incorporates all primary healthcare information centres located in 498 polyclinics, computer rooms, 76 laboratories, and has a system of Virtual University of Health Care and Virtual Library of Healthcare (Gupta, et al., 2019). The Ministry of Health, Singapore came up with a Licensing Experimentation and Adaptation Programme (LEAP). In this regulatory sandbox, interested telemedicine companies can pilot their programmes under a safe and controlled setting to help finalize telemedicine policy and be licensed afterwards.

The telemedicine practices worldwide show that telemedicine is generally less progressed in upper-middle, lower-middle and low-income countries than in high-income countries. A series of factors including policy, technology, finance, human resources, culture, infrastructure and data are all factors enabling the environment to promote capacity building for the sustainable development of telemedicine (APEC, 2022).

Several of the models discussed offer instructive parallels to the Maldivian context. Sehat Kahani's engagement of female physicians working remotely suggests that underutilized clinical capacity such as recently retired professionals could be similarly mobilized in the Maldives. The FSM's dispensary-based telehealth network is also highly adaptable, as each inhabited Maldivian island maintains a health post or centre with basic IT infrastructure. Additionally, the Apollo network's success in high-altitude, low-resource settings shows that geographically challenging environments are not prohibitive to scale-up. These comparative insights highlights the feasibility of tailored telemedicine models for SIDS contexts, including archipelagic states like the Maldives.

Methods

The primary objective of this study is to examine the factors affecting the adoption of telemedicine services in the Maldives. By means of a thorough literature review, in-depth interviews and secondary data, both platform and programme factors about telemedicine adoption are presented. The specific aims of this study encompass: (1) What are the challenges within the healthcare system of the Maldives that hinders widespread adoption of telemedicine? (2) What are the platform factors affecting the adoption of telemedicine in the Maldives? (3) What are the programme factors affecting the adoption of telemedicine in the Maldives?

This research relies mainly on secondary data, including publications by the Government of the Maldives and development partners. Additionally, unpublished data such as consultancy reports and informal discussions were incorporated to elucidate the current state of the healthcare system and telemedicine practices, particularly in the outer islands. Furthermore, to collect insights into prevailing practices and determinant factors, the Hospital Telehealth Maturity Model by Manatt (2019) was utilized, and data was collected from six regional hospitals, with one Northern regional hospital chosen to focus more closely on studying the dynamics of telemedicine,

supplemented by health service statistics from the hospital, and interviews with representatives from hospital's management.

A significant limitation encountered during the study pertains to the lack of statistical data, reliable information, and comprehensive studies available on the subject matter, thus constraining further elaboration of the research findings.

Conceptual framework

The study utilizes the model developed by Manatt Health-Hospital Telehealth Maturity Model (2019) (recently recognized by the American Health Association) to understand the criteria for competency, capability and level of sophistication. The model provides a framework that can be used to measure and develop existing and prospective telehealth services by program and platform within prescribed best-practice parameters. According to the American Health Association, this model may also be useful for self-assessment and benchmarking to guide telehealth programs toward the adoption of best practices. In this study, the Hospital Telehealth Maturity Model will be applied to current hospital data, existing literature and interview findings on telehealth adoption and uses.

Figure 1: Hospital Telehealth Maturity Model

		Basic	Foundational	Advanced
PLATFORM	Telehealth platforms/ technology	• Rely on fragmented technology solutions • Limited integration with EHR • Inefficient workflows • Unreliable technology	• Established technology platform standards • Mostly integrated with EHR • Good reliability	• Scaled platforms that enable capabilities across the enterprise • Fully integrated with EHR and related systems • Highly reliable and easy to access
PROGRAM	Resources	• Limited resource commitment • No or limited centralized telehealth team or support model; programs individually managed by pilot leaders	• Moderate resource commitment • Centralized team that provides limited support for core services (technology rollout and general support)	• Significant resource commitment • Full range of support services (customized design and implementation, training, 24/7 support, optimization, etc.)
	Leadership and governance	• No or limited success criteria or value metrics • No consistent policies or standards • Limited ownership in the organization	• Emerging vision and strategy • Alignment of enterprise priorities and telehealth investments • Established success criteria and process for measuring and tracking • Formalized telehealth policies and standards • Established leader providing direction	• Value tracked, measured and used to inform investment decisions • Program accountability managed across technology and operations leadership • Telehealth policies and standards deployed consistently across the institution • Direct involvement from Executive leadership and formal governance structure
	Adoption	• Moderate levels of adoption among small subset of interested providers	• High level of adoption within narrow domains	• High level of adoption across all program and platform areas

Source: Manatt Health: Hospital Telehealth Maturity Model (American Hospital Association, 2019).

The model takes into account programme and platform readiness in the adoption of telehealth. Platform readiness is based on existing telehealth platforms and technological situations. The programme readiness depends on resources, leadership and governance and adoption. There are three levels of adoption characterized by basic, foundational and advanced. The analysis presented below is in line with these factors.

Results

Factors affecting the adoption of telemedicine in the Maldives: Telehealth platforms and technology

Maldives has a high usage of the internet with around 63% of the population, or 60% of households using the internet. There is also an established submarine cable network of 850km running from north to south of the entire country with full connectivity, with eight land points. 3G and 4G services are provided to 100% of the country, with 75% of households with access to fiber connections.

A District Health Information Software Version 2 (DHIS2) was introduced as a statistical software in 2017 envisaging better data management, analysis, monitoring & evaluation of key health indicators for informed and evidence-based decision-making. However, currently, only limited routine information is collected through the system. Each hospital has its own health information system (HIS), and clinical notes and workflow are primarily electronic. Small clinics purchase off-the-shelf HIS from vendors, and large hospitals often build their systems in-house.

A study done by the World Bank in early 2023 showed that 70% of health centres and 68% of hospitals stated that they do not have the necessary infrastructure to provide telemedicine (World Bank, 2022). It was reported in June 2023 that 608 computer systems, 44 laptops, 500 tablets, 14 video conferencing systems, and 551 printers were distributed to 6 regional hospitals, 13 atoll hospitals and 164 health centres during the month (Ministry of Health, 2023).

Conversations with the hospital's management underscored the necessity of an integrated electronic medical record (EMR) system for the successful implementation of telemedicine. Patients are currently required to carry physical copies of their medical records when seeking healthcare services, a practice that is inconvenient and can result in disruptions to administrative and clinical processes. The discussions also revealed that consultations rarely take place in a home environment; instead, patients typically visit a healthcare centre near them. In cases where the consultant is a foreigner, which is common in Maldives, patients rely on interpreters for assistance. Additionally, technical support is occasionally required, which patients receive from family members. It was also identified that the lack of technical capacity of the user and unstable internet connection also impacted telemedicine usage. Moreover, the discussions highlighted that inexperienced managers appointed to health centres lack the requisite knowledge and experience to instigate management and organizational change, resulting in the perpetuation of habitual operations within these centres.

Discussions with the hospital's management revealed the absence of a comprehensive framework for telemedicine implementation. Its inception was primarily driven by the need to provide specialist consultations to outer islands, which would otherwise rely on outreach programs involving specialists travelling to the islands for consultations. Initially conducted through Viber/WhatsApp, telemedicine has now evolved to include platforms such as Zoom and Google.

Management has identified that the initial technological setup cost is comparatively lower than the expenses incurred in organizing outreach programs. However, challenges such as the lack of systematic organization, limited awareness and understanding of telemedicine among implementers, and insufficient coordination between implementing agencies and regulatory support persist.

Comparable SIDS such as Samoa and Fiji have also faced challenges stemming from fragmented health information systems. Fiji's Health Information System Enhancement Project highlighted how siloed data systems impede coordination and result in duplication of records. For the Maldives, interoperability should extend beyond EMR consolidation to include referral tracking, real-time diagnostics sharing, and remote consultation scheduling across islands. This will require technical protocols for cross-platform communication, as well as governance mechanisms to manage data quality, confidentiality, and accountability, particularly in facilities where human resources for ICT remain limited.

Factors affecting the adoption of telemedicine in the Maldives: Leadership and governance

The vision for socioeconomic development of the country undergoes significant changes every five years, influenced by the political will and direction of the incumbent government. Unlike in many parts of the world, the Maldives lacks a long-term national development plan, relying instead on sectoral plans that rarely span exceeding five years. Consequently, this approach results in a shift in the direction of sector development plans every five years, limiting the time available for the effective implementation of new policies. The Ministry of Health's 'Health Master Plan 2016-2025' recognizes telemedicine as a potential solution for remote diagnosis, sample transport and image transfer.

Maldives has been slow in adopting information technology to enhance healthcare services. The first telemedicine project in the Maldives was recorded in 2002; the Health Telematics Project funded by the WHO. However, the project did not materialize as planned due to administrative and logistical issues. A project named 'Telemedicine Project' was initiated in 2004 with assistance from the World Bank under its Integrated Human Development Project (IHDP). Similarly, this project also did not succeed due to financial constraints, limitations of technological infrastructure, limitation of human resource capacity in the rural areas, lack of public awareness and community sensitization on telemedicine, limitation of trust within the health system, lack of commitment from politicians and other stakeholders, and limitations on the legislative support for telemedicine (Nazviya & Kodukula, 2011). It was also recognized that a lack of regulatory framework about telemedicine such as the Health Act or Patient Confidentiality hinders such efforts.

In 2010, the Ministry of Health implemented the Medical Kiosk Project which was better planned and organized compared to earlier projects. The project aimed to deliver telemedicine kiosk carts and additional equipment at 35 locations, including 32 remote islands, funded by the Khalifa Bin Zayed Al Nahyan Foundation. The project included healthcare human resource development through overseas training as well as procurement of the Medical Kiosk hardware. However, the project eventually came to a standstill after only managing to train the specialists and procurement of the hardware, due to political and administrative changes (Maldives Financial Review, 2021).

Efforts by the private sector to introduce telemedicine in the Maldives also faced setbacks due to shifts in political commitment. In 2011, Dhiraagu, the leading telecommunications company, collaborated with the government to establish a telemedicine kiosk at Thinadhoo Regional Hospital in Gaafu Dhaalu Atoll. Inspired by a visit to Panama where telemedicine was successfully implemented, the CEO of Dhiraagu sought to replicate the model in the Maldives after discussions with the government. The telemedicine kiosk, donated to the government, allowed for remote consultations between a consultant doctor located at Indhira Gandhi Memorial Hospital (IGMH), based in the capital city of Male', and patients in Thinadhoo. Plans were underway to extend similar setups to 36 more islands, staffed by trained nurses. However, following changes in government in 2011, interest in the initiative waned.

In the recent past, the government had a Strategic Action Plan 2019-2023 which had specific activities on telemedicine implementation, including developing a legal and regulatory framework for the practice of telemedicine, building IT expertise to run telemedicine services, building infrastructure in health facilities to provide telemedicine services, developing IT infrastructure for health network, developing a health data repository including backup system, and building IT capacity at all levels to support digitalization initiatives (Office of the President of the Maldives, 2019). By the end of 2023, there was no enactment of a legal and regulatory framework for telemedicine and establishment of a digital repository, however, significant progress was seen in other areas including equipping healthcare centres in outer islands with basic IT equipment and initiating telemedicine service in some of the regions. The new government was sworn in on 11 November 2023. The ruling party's Presidential manifesto did not include any commitments regarding the digitization of healthcare or the provision of telemedicine. However, since the government has not yet formulated a longer-term Strategic Action Plan, the necessity for such initiatives may arise from broader consultations.

Implementing innovative digital health solutions requires a willingness from the management. It was identified that 63.2% of hospitals and 49.6% of health centres indicated that they had identified, at least partially the vision, priorities and goals related to telemedicine. However, it was also identified that 36.8% of hospitals and 48% of health centres do not have a formal strategic planning process. When analyzing the readiness of the systems, assessments done show that 79% of hospitals and 75.6% of health centres indicated that they have no experience in the area of telemedicine.

The first law of public health in the Maldives was passed in 1978. At present, a total of 15 laws are in effect directly related to health, and 18 laws in other areas have reference to health (World Bank, 2022). However, interviews conducted as part of this study highlight the lack of relevant regulations such as digital development, privacy, data protection and cybercrime which hinder innovation in the field. Furthermore, it is also identified that the Maldives lacks key legislation for digital government, digital commerce, consumer protection and cybercrime. However, the Consumer Protection Law enacted in August 2020, for the first time, applies to both tangible and intangible goods, including those made in digital forms, as well as online businesses. Moreover, the Electronic Transaction Bill (2/2022) was also passed by the Parliament of Maldives on April 11, 2022, and in force since April 27, 2022, which covers the use of electronic signatures, contracts, records and use of electronic material (World Bank, 2022). Regardless, the instability within the political landscape and shifts in policy direction impede both accountability and consistency in the implementation of new policy initiatives.

Interviews with hospital management revealed that implementing necessary strategic actions faces challenges due to the frequent appointment of healthcare centre managers based on political affiliations rather than technical expertise. Consequently, consensus between management and technical staff becomes difficult to achieve.

Factors affecting the adoption of telemedicine in the Maldives: Resources

The healthcare system of the Maldives is an integrated system of both private and public sector service providers. According to the Ministry of Finance, 7459.4 Million Rufiyaa (equivalent to USD 483,748) is budgeted in 2024 to enhance and extend healthcare services for the public, which is 11% of the country's GDP (Ministry of Finance, 2024). In the Maldives, universal healthcare access is guaranteed by the Social Health Insurance Act (15/2011), which started its implementation through the Aasandha Scheme in 2012. This tax-funded health insurance initiative serves as a financing mechanism linking both public and private healthcare providers to ensure comprehensive coverage of healthcare expenses, including inpatient and outpatient treatments, medications, and diagnostic services, for all Maldivians. Services are fully covered in public facilities and partially covered in private facilities. Additionally, the scheme provides coverage for transportation costs during emergencies and facilitates treatment abroad for services unavailable within the country. However, while medications are included in the health financing scheme, private healthcare services are not fully covered.

The healthcare system of the Maldives has always been heavily dependent on Medical Treatment Overseas (MTO). A study done in the context of the Maldives saw that the median per capita total cost of a medical travel episode amounted to USD 1470 and that 48% of the cost was spent on travel, 26% spent on direct medical costs, which were markedly higher among patients subsidized by the government than self-funded patients. Medical treatment overseas imposed a considerable burden on households as 43% of the households of medical travellers suffered from catastrophic health spending. Annually, an estimated $68.9 million was spent to obtain treatment for Maldivians in overseas health facilities ($204 per capita), representing 4.8% of the country's GDP (Suzana, Mills, Tangcharoensathien, & Chongsuvivatwong, 2015).

A high percentage of healthcare professionals (around 80%) in the Maldives are expatriates, leading to high turnover (UNICEF, 2024). According to Health Statistics of the Ministry of Health, the health professionals distribution consists of 27% nurses, 20% allied health professionals, 1% medical and dental professionals and 43% non-medical staff. There are 134 registered pharmacies in the Greater Male' region and 287 registered pharmacies in the outer islands, with 990 registered pharmacy professionals (Ministry of Health, 2020). The study done by the World Bank on telemedicine readiness in the country showed that 94.7% of hospitals and 87.8% of health centres in the Maldives reported that their staff were not trained explicitly in providing telemedicine services.

The COVID-19 pandemic shook healthcare systems around the world, exacerbating the already existing bottlenecks in the systems that forced service providers to act quickly to respond. According to Dr Nazla Musthafa (a member of the Technical Advisory Group of the Health Emergency Operations Centre of Maldives established during the peak of the COVID-19 crises), the healthcare system in the Maldives faced great difficulties since the pandemic started, and due to difficulties in travelling to Male' for treatment, local health centres in the islands have just been barely able to treat patients. The health centres and hospitals she mentioned have performed many previously untried procedures successfully, that otherwise would have been performed in Male' or

at a hospital overseas. Some examples of these are; the submandibular sialoadenectomy surgery at Shaviyani Atoll Hospital, the first maxillofacial surgery performed in Addu at Addu Equatorial Hospital (AEH), a neurosurgery, hip replacement surgery and joint replacement surgeries have also been successfully performed at AEH (Times of Addu, 2021). A study done by the World Bank in 2023 showed that despite the increase in interest in telemedicine accelerated by the COVID-19 pandemic in Maldives, 57.9% of hospitals and 81.3% of health centres still lacked operational telemedicine programmes. The study also showed that there were 10.5% of hospitals and 4.9% of health centres in the planning or development stage (World Bank, 2022).

The interview with the hospital's management also highlighted that effective implementation of telemedicine requires more than just policy direction and equipping health centres with the necessary infrastructure and technological equipment. Often, there is a tendency for politicians and like-minded individuals to prioritize physical infrastructure. However, the greater challenge lies in ensuring adequate technical capacity and human resources to run healthcare centres. Additionally, it was emphasized that a significant portion of the health centre budget is allocated to recurrent expenses, primarily staff salaries, which limits opportunities for innovation and development. Only recently has Maldives begun training medical doctors and allied health professionals, with training for nurses and pharmacists having been established slightly earlier. The interviewees identified that it is crucial to integrate telemedicine knowledge into training programs so that healthcare professionals understand the essential online etiquette necessary for providing telemedicine services.

Conversations with hospital management underscored that certain managers have sought to introduce innovative practices to address human resource barriers. Specialists who are employed in the Maldives have expressed dissatisfaction with the insufficient number of consultations, which hampers their career progression, leading some to depart early. To mitigate this issue, certain hospitals have attempted to establish connections with telemedicine centres in neighbouring countries, with initial setups arranged within the local hospitals. Nevertheless, bureaucratic obstacles and the absence of facilitating regulations have impeded progress in this regard.

The discussions with the hospital's management also identified that by investing in resources, they have been able to achieve significant progress in reducing referrals to the greater Male' region, or even abroad. There is an undeniable need to develop human resources for the effective implementation of telemedicine in the country, not only to deliver direct medical services but also to bolster technical capacity and supportive functions. Despite the substantial expenditures on the healthcare sector by the government, the significant outflow of medical needs underscores the necessity for improving sector financing to enhance equity and efficiency.

Factors affecting the adoption of telemedicine in the Maldives: Adoption

Due to geographical limitations, a basic phone call between a healthcare provider and a patient can offer access to services that would otherwise require costly travel expenses. The COVID-19 pandemic and associated travel restrictions prompted many healthcare providers and patients in the Maldives to embrace telemedicine for the first time. However, telemedicine is not entirely novel in the Maldives today. Studies reveal that some 42% of hospitals and 17% of health centres have some level of telemedicine programs in place (World Bank, 2022).

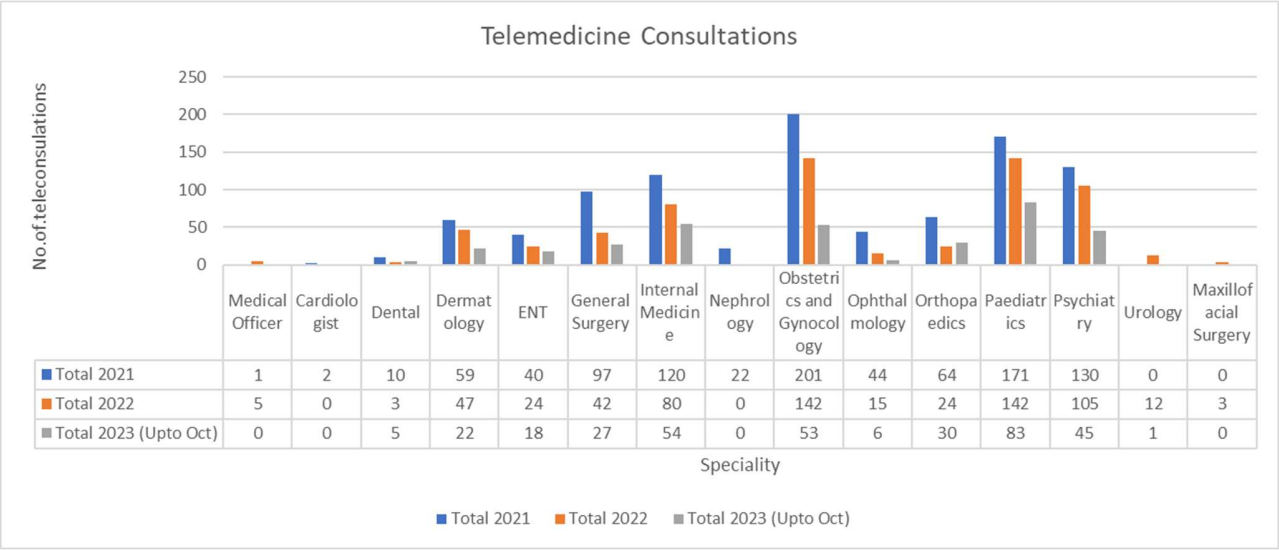
At present, Maldives has six regional hospitals. The study analysed data from six regional hospitals between the years 2021 and 2023 to understand the use of telemedicine. The Mulee Regional Hospital and Addu Equatorial Hospital does not conduct telemedicine post-COVID-19. The Gan Regional Hospital (GRH) started its regular telemedicine services in the year 2022, specific to the speciality of Psychiatry. The periphery covered by the GRH includes 9 islands. 32 consultations were done between October and December 2022; while 103 consultations were undertaken between January and October 2023.

The Ungoofaaru Regional Hospital (URH) started its regular telemedicine services in December 2022 for which they did 1 General Surgery consultation and 7 Psychiatry consultations. In the year 2023, URH did 1 General consultation, 1 Cardiac consultation, 1 ENT consultation, 1 Orthopedics consultation and 47 Psychiatry consultations. On average, 5 consultations were done daily between January and October of 2023. The periphery of URH includes 14 islands.

Regular telemedicine consultations in the Abdul Samad Memorial Hospital (ASMH) were initiated in 2023. 1 General consultation, 1 ENT consultation, 1 Obstetrics and gynaecology consultation and 2 Psychiatry consultation was done between January and October 2023. The ASMH has 8 islands under its periphery, however, services were obtained from only two islands within the period. Although the teleconsultation data from the regional hospitals gives an account of services and frequency of services obtained post-COVID-19, it lacks the required longevity and magnitude to understand patterns.

The Kulhudufushi Regional Hospital (KRH) has 12 islands under its periphery. The KRH had a total of 961 teleconsultations in the year 2021, 644 teleconsultations in the year 2022 and 344 teleconsultations in the year 2023 (until October 2023). Table 1 gives a summary of teleconsultations by specialities between the period of 2021-2023.

Table 1: Telemedicine consultations in KRH



	Medical Officer	Cardiologist	Dental	Dermatology	ENT	General Surgery	Internal Medicine	Nephrology	Obstetrics and Gynocology	Ophthalmology	Orthopaedics	Paediatrics	Psychiatry	Urology	Maxillofacial Surgery
Total 2021	1	2	10	59	40	97	120	22	201	44	64	171	130	0	0
Total 2022	5	0	3	47	24	42	80	0	142	15	24	142	105	12	3
Total 2023 (Upto Oct)	0	0	5	22	18	27	54	0	53	6	30	83	45	1	0

Source: Kulhudhuffushi Regional Hospital (2024).

Table 1 shows that the highest demand for teleconsultation was made in the specialities of Obstetrics and gynaecology, paediatrics, psychiatry, internal medicine and general surgery. Upon closer examination of the context, it becomes evident that these specialized medical services were not accessible in the outer islands, thus driving the demand for telemedicine. Additionally, it is noteworthy that telemedicine services were not only extended to islands within the periphery of KRH but also to other regions of the country.

During the COVID-19 pandemic, mobile operator Ooredoo Maldives partnered with Sri Lanka's oDoc telemedicine platform in November 2020 to offer electronic healthcare services. Online consultations became essential for non-COVID patients due to safety concerns during in-person visits.

A telemedicine survey conducted by Medica Hospital in 2020 showed that 63% of respondents were very satisfied with teleconsultations, indicating the viability of telemedicine in the Maldives. However, affordability remains a barrier, particularly for patients without full coverage under Aasandha (Maldives Financial Review, 2021). A 2023 World Bank study affirmed that 79% of hospitals and 59% of health centre managers believed that telemedicine would boost patient engagement. However, the study also found that only 26% of hospitals and 18% of health centres engaged in communication activities to inform and educate the public regarding the recommended use of telemedicine. The study also showed that 47% of hospitals and 38% of health centres reported that patients have asked for telemedicine services or expressed interest in telemedicine for convenience such as remote visits/after-hours medical care. Nevertheless, more than half of the health facilities stated that patients had not requested telemedicine services. From the survey responses completed by the clinical department, 90% of hospitals and 81% of health centres believed patients would accept and feel comfortable with telemedicine (World Bank, 2022).

Discussions with the hospital's management revealed significant challenges in establishing a positive perception of telemedicine within a system marked by widespread mistrust of service providers. Many are unaware that telemedicine is accessible through the Aasandha system. There is also no established medical negligence framework to protect both providers and end-users, which is crucial, especially in telemedicine. In the absence of a referral mechanism and amid difficulties in revitalizing primary healthcare, individuals often bypass these services in favour of seeking opinions from specialists and super-specialists, driven not only by necessity but also by habit and expectation.

Generational dynamics further complicate telemedicine adoption in the Maldives. Younger patients are generally more comfortable navigating digital interfaces and are more accepting of virtual consultations. However, older populations – especially in outer islands – often face technological and cognitive barriers, relying on caregivers or family members to initiate and manage virtual appointments. Interviews with hospital staff revealed that many elderly patients view remote care with scepticism, associating quality healthcare with direct, physical examination. This reluctance is compounded by the absence of clear protocols for follow-up or escalation, and a lack of culturally sensitive community outreach to build trust in digital health solutions.

The interviews also underscored the hurdles in telemedicine implementation. The older generation, to a large extent, emphasizes the importance of physical human-to-human interaction in understanding a patient's condition, even when electronic medical records are available. Moreover, inadequate digital infrastructure and limited access to technological devices, coupled with low levels of health and digital literacy in outer islands, pose significant challenges. Additionally, the lack of systemic community support makes it difficult for individuals lacking the capacity to initiate consultations and communicate for necessary follow-ups. Language barriers, varying levels of education, and a lack of technical and technological support further compound these challenges. From the provider's perspective, there is often a reluctance to implement telemedicine due to a lack of technical and technological skills among providers as well.

Conclusion

This study examined the adoption of telemedicine in the Maldives through a mixed-methods lens, using the Hospital Telehealth Maturity Model to assess platform and programmatic readiness across six regional hospitals. The analysis revealed that the Maldives is currently operating at a basic level of telehealth maturity, characterized by fragmented digital systems, inconsistent leadership commitment, weak regulatory frameworks, and underdeveloped human resource capacity.

Despite high internet penetration and recent investments in digital infrastructure, systemic fragmentation in electronic medical records, absence of interoperability, and limited institutional integration have impeded the sustained uptake of telemedicine. While teleconsultation platforms such as Zoom and Google Meet are occasionally used in clinical settings, their usage remains ad hoc and unsupported by unified protocols or national digital governance.

Programmatically, the implementation of telemedicine is constrained by short-term policy cycles, political appointments to key managerial roles, and weak coordination between central authorities and peripheral health facilities. The lack of telemedicine-specific legislation, medical liability protections, and patient data security laws further undermines institutional confidence and innovation. Additionally, gaps in technical training and digital literacy among providers and patients – especially in remote atolls – continue to restrict service accessibility and patient engagement.

Nevertheless, there are encouraging signs of latent capacity. Select regional hospitals have independently initiated teleconsultations in psychiatry, general medicine, and obstetrics, often as a response to pandemic-induced service disruptions. These early experiences underscore the potential for telemedicine to reduce overreliance on capital-based services, mitigate referral bottlenecks, and extend care to geographically isolated populations.

Ultimately, the findings illustrate that telemedicine in the Maldives remains in a formative phase. Its future success will depend on resolving infrastructural fragmentation, building digital competencies, and fostering a coherent policy and regulatory environment that supports sustained institutional learning and cross-sectoral collaboration. As healthcare systems across Small Island Developing States seek to adapt to demographic pressures and environmental vulnerabilities, the Maldivian case offers valuable insights into both the promises and persistent constraints of digital health in resource-limited island contexts.

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