Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Primary Care Physicians' Perspectives on Video Consultation Services for acute medical conditions in public primary care clinics in Singapore: A Qualitative Study

Jambay Dorji
jambay.dorji@singhealth.com.sg
SingHealth Duke-NUS Academic Medical Centre
Stella Xiao Jun Poh
SingHealth Duke-NUS Academic Medical Centre
Emily Pui-Yan Lee
SingHealth Duke-NUS Academic Medical Centre
Gary Chun-Yun Kang
SingHealth Duke-NUS Academic Medical Centre
Aminath Shiwaza Moosa
SingHealth Duke-NUS Academic Medical Centre
Ngiap Chuan Tan
SingHealth Duke-NUS Academic Medical Centre

Research Article

Keywords: Video consultation, telehealth, primary care, TAM, digital health

Posted Date: June 28th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9935362/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Acute on-demand telehealth (AODTH) service was initiated in a Singapore public primary care cluster for acute medical conditions in January 2023. The challenges primary care physicians (PCPs) face in providing video consultations (VCs) for this service remain unclear. This study explored PCPs' perspectives on the utility, usability, enablers, barriers, and safety of tech-enabled VC for managing acute medical conditions in primary care.

Method

PCPs who had conducted VC for AODTH in the polyclinics were recruited using purposive sampling. They were interviewed via focus group discussions (FGD) and in-depth interviews (IDI). A topic guide with questions arising from the Technology Acceptance Model (TAM) was used to gather qualitative data. The audio-recorded interviews were audited for accuracy, transcribed verbatim, coded and analysed to identify emerging themes.

Result

16 PCPs were interviewed over 4 FGDs and 2 IDIs. PCPs were confident to manage simple, acute and non-urgent conditions using VC. They perceived it to be convenient for patients in terms of accessibility, saving travel and waiting time in the clinic. However, PCPs raised usability concerns, including difficulties navigating the VC digital platform and the potential risks of managing elderly patients and atypical cases without physical examinations. They found the current onboarding training module sufficient but highlighted an increased administrative burden.

Conclusion

PCPs accepted the current technological infrastructure and system to provide VC for AODTH. However, they reported limitations of the digital platform and potential risks for selected patients who used the service.

Background

Video consultation (VC) has rapidly evolved in recent years, mainly during the COVID-19 pandemic, when it became a standard practice for general practitioners and specialists worldwide. Such consultations cover chronic disease management [(1)], to dermatology [(2)], mental health [(3)] and palliative care [(4)]. VCs have also been increasingly used in acute and urgent care settings [(5–7)]. Numerous studies have demonstrated its effectiveness in improving access to care, ensuring continuity of care, maintaining quality, increasing patient satisfaction, and reducing costs and wait times [(1, 8, 9)].

Primary care physicians (PCPs) serve as the first point of contact for patients presenting with acute, non-urgent conditions. Offering VC for such cases improves timely care access and management, avoids gathering of infective patients at the clinic and potential spread of diseases, and reduces travel or wait time at the clinics[(10, 11)]. The availability of telehealth services for acute medical care can strengthen front-line responsiveness, optimise resource use, and deliver care that is both patient-centered and sustainable [(10, 12)].

In Singapore, the local Ministry of Health had launched a regulatory sandbox to support Telehealth in April 2018, even before the COVID-19 pandemic [(13)]. In the local public primary care clinics (polyclinics), VC services for patients with stable chronic diseases, such as type 2 diabetes mellitus, hypertension and hyperlipidaemia, have been implemented as routine services since 2020 [(14, 15, 16)]. A number of private PCPs have adopted VC using different tech-enabled platforms to manage their patients with both acute and chronic medical conditions [(17–19)].

Since January 2023, a public primary care institution began an acute-on-demand telehealth (AODTH) service for acute medical conditions [(20)] such as upper respiratory tract infections, gastroenteritis and other non-urgent acute conditions [(16)]. The service was accessible to adults (age 18 years old and above) in Singapore. It adopted a centralised model whereby the appointment registration and medication dispensing operated through 1 of their 10 polyclinics. Doctors from 3 polyclinics supported the service and conducted the VC from dedicated workstations at their polyclinics. By November 2023, up to 3 virtual doctor rooms were available for booking during working hours on Monday to Friday.

Appointment slots were open to booking the night prior. Patients self-booked their appointment online using the national public healthcare mobile applications, whereby the patient had to input a medication delivery address and confirm contact details. Information about the service, including eligibility criteria, was accessible during the booking process. The VC link was sent to the patient via SMS upon booking confirmation, and from 2024, direct access button was available in the mobile applications. In 2023, each virtual doctor room had its own VC link, and the doctor would admit patients in from the waiting room. From 2024, the Video Consultation Platform (VCP) was enhanced whereby patients had unique virtual rooms. A telephone number was shared to patients via mobile application and SMS if they required technical assistance. The patient entered the VC room at their appointed time and consulted the doctor. If medications were required, the doctors would explain the items to the patient. If medication counselling by a pharmacist was required, the doctor would inform the pharmacist and phone tele-dispensing and counselling would be performed. Medications were delivered to the patient within 4 hours or patients could opt for self-collection from 24-hour access medication lockers available only at selected polyclinics. Any documents such as medical certificate, referrals or memos were sent to patients digitally by the doctors through the Electronic Medical Records system. Appointments were booked by administrative staff. Patient would make payment after receiving the bill on the same day or next working day.

An in-house review of the service roll-out is needed due to overseas reports of challenges facing PCPs serving on-demand VCs. In North America, PCPs noted difficulties in making accurate diagnosis without a physical examination and expressed concerns about patient safety and the potential for medical errors [21]. They also highlighted barriers to building doctor-patient rapport remotely, particularly with new patients [21].

PCPs' acceptance and effectiveness in managing chronic conditions through teleconsultation have been well established [22, 23]. However, their concern on the capacity and capability in using a tech-enabled telehealth platform to manage VCs for acute medical conditions have yet to be fully elucidated.

Exploring PCPs’ perspectives is essential for service improvement, sustainability and scaling up without compromising on patients' safety and wellbeing [24]. Hence, this study aimed to explore the perceived utility, usability, enablers, barriers and safety of tech-enabled VC to manage acute medical conditions in primary care.

Methods

Study Design

A descriptive-interpretive qualitative approach [25] was used to explore PCPs' perspectives, focusing on their perceived usefulness, ease of use, and safety, as well as the potential enablers and barriers to its implementation in primary care. This study report adheres to the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist [26].

Theoretical framework

The Technology Acceptance Model (TAM) framework guided the conduct and analysis of the study. TAM utilises perceived usefulness (PU) and perceived ease of use (PEU) as the fundamental factors which affect a user's intention to use any form of service involving information technology (Fig. 1) [27]. Known for its functionality and ease of application, TAM has been widely used in studies to explore physicians' perspectives on technological acceptance [28.29].

Setting and timeline

The interviews were conducted between April 2024 and February 2025 across 3 polyclinics in Singapore, where AODTH was provided. As of October 2024, 35,000 VCs have been conducted [30].

Study Population

PCPs involved in AODTH within the last 12 months were eligible for the study. Purposive sampling was conducted to include PCPs of varying ages and professional qualifications. Eligible PCPs were invited via email, followed by a face-to-face explanation about the study. Recruitment continued until data saturation was reached, which was confirmed by two additional interviews [31].

Research Team

The primary research team consisted of family physicians (JD, SP, SM, TNC) who are trained in qualitative research. SP provides video consultations. JD and SP interviewed the participants and coded the transcripts. All team members analysed the data, discuss and finalize the results and manuscript.

Research Instruments

Interview guide

An interview guide was developed based on a literature review, the TAM framework and discussion among the research team. Refer to supplementary 1.

Data Collection and Coding

All PCPs completed the sociodemographic data collection forms before the FGDs. All FGDs were conducted in person at each clinic. Separate IDIs were conducted with 2 PCPs who had prior AODTH participation but declined to continue the service, ensuring gathering of balanced perspectives whilst providing a safe space for open dialogue.

All interviews were conducted by a researcher (JD) trained in qualitative research using a semi-structured interview guide, under the guidance of an experienced researcher (TNC). All interviews were audio recorded. A study team member (SP) took field notes. The participants were compensated with vouchers worth SGD 30 (~ USD 22) each. All interviews were transcribed verbatim and checked for accuracy before data analysis. NVivo version 1.5.1, was used to facilitate the data coding.

Data Analysis

The data were analysed via Braun and Clarke's thematic analysis, using a mixed deductive and inductive approach [(32)]. Two researchers (JD and SP) independently familiarised themselves with the transcripts and conducted thematic analysis; verbatim quotes were coded to identify relevant features of the data, which were then grouped into distinct themes reflecting broader patterns of meaning. Coding was done iteratively; codes and themes from the first two coded transcripts formed the initial coding framework, which was then used to code the remaining transcripts, adding new codes and themes where necessary. The two researchers met regularly to discuss similarities and differences in their analysis, and any discrepancies were resolved through consensus with a third researcher (TNC).

Rigour

The lead investigator maintained a reflexive journal and field notes throughout data collection, documenting emerging insights and contextual observations. The researchers actively reflected on how their professional roles and assumptions might shape the interview process and interpretation of data. Regular deliberations with an experienced researcher and iterative team discussions that supported reflexive analysis of the data.

Results

4 FGDs and 2 IDIs were conducted. Of the 21 PCPs invited, 16 participated in the interviews, while 1 was unable to attend. The interview ranged from 45 to 60 minutes with no repeat.

The median age of PCPs was 35.5 yrs. (range) with a median 9 years of experience. Most had higher qualification in family medicine (n = 13, 81%) and are currently working full time (94%).

Table 1: Demographic characteristics of the PCPs (N=16)

Characteristics	Number of primary care physicians (n, %)
Age (Median age- 35.5 years)	
20-30 years old	3, (19%)
31-40 years old	11, (69%)
41-50 years old	2, (12%)
Above 50 years old	0, (0%)
Employment status	
Part time	1, (6%)
Full time	15, (94%)
Retiree	0, (0%)
Locum	Nil
Highest Qualifications	
FCFP	Nil
MMed (FM)	9, (56%)
GDFM	4, (25%)
Medical Officer (MO) / Resident Physician (RP)	3, (19%)
Years of Service	
1-5 yrs.	2, (12%)
6-10 yrs.	10, (63%)
>10 years	4, (25%)
Abbreviations: FCFP: Fellowship of the College of Family Physician; MMed (FM): Masters in Family Medicine; GDFM: Graduate Diploma in Family Medicine, RP: Family Physician, MO: Medical Officer	

Five themes emerged from the thematic analysis and were presented according to the TAM framework: perceived usefulness, perceived ease of use, enablers which influence attitude towards using AODTH, perceived risks which hinder behavioural intention to use and stakeholder barriers which may impede actual system use. The themes and subthemes are summarised in Fig. 2.

Perceived Usefulness of AODTH

Safe and useful for managing simple and non-urgent conditions

PCPs were confident to manage patients with upper respiratory tract infections and gastroenteritis.

"I would say most of the patients are actually simple, straightforward cases like URTI [upper respiratory tract infection], GE [gastroenteritis]. I have no problem with that". (PCP 16, RP, < 5 years in service)

Improved access, convenience and time saving for patients

PCPs perceived the service as useful to patients in saving traveling and waiting time, as well as improving accessibility.

"Saves the travel and waiting time for patients. And sometimes they just need some medicine and some medical advice." (PCP 15, RP, < 12 years in service)

"You don't have to make your way to the clinic just to get some medicines. You can do it from the convenience of your home" (PCP 05, MMed FM)

Perceived Ease (and Challenges) in the Use of the Tech-enabled System

Gaps in the system

PCPs reported system limitations, and navigating the interface added significant time to the consultation. PCPs were unable to view patients who logged in late on the platform's waiting list, and attending to them based on appointment time sequence became an issue.

"The platform that we are currently using, the VCP (Video Consultation Platform) is not very user friendly. There are a lot of inefficiencies like having to click a lot of things just to see one page and it significantly adds time to our consults". (PCP 05, MMed FM, < 9 years in service)

"It's bit difficult to keep track of the patients who come late because we have to continue seeing patients. Previously we had only one fixed Zoom waiting room and all the patients used that same video link. Whereas now with VCP, every patient has their own unique link and a unique Zoom session. For those who don't show at their appointment time, we have to keep checking their Zoom link to see whether they are [logged in]. This is a hassle when you are trying to clear the queue as the slots can be tightly packed." (PCP 06, RP, < 12 years in service).

Constraints due to limited consultation time

Due to varying face time per consult and the interval between consults, PCPs highlighted the mental burden of ensuring the VC is on time, as patients could have waited beyond their initial appointment time.

"There were instances where it was 5-minute slot [between consults which] I find it a bit challenging although majority of the cases are straightforward …. but sometimes it so happens that the person with the five-minute slot is bit more complicated and you need to spend more time. This becomes very stressful (PCP 14, GDFM, < 13 years in service).

Enablers which Influence Attitude Towards Using AODTH

Adequate onboarding training

PCPs felt the training provided was sufficient, but they expected to learn to deliver the service on the job.

"I had one session where I sat in with another doctor who was running the session. And then, towards the end of the session, I started seeing cases [under the supervision of] more senior doctors. After that, I was running on my own." (PCP 07, MMed FM, < 3 years in service)

"I think the training is sufficient. It can only bring us that far in terms of sitting in and getting used to the technical process. But clinical knowledge and skills are just like being in medical school. You learn more when you start working and learning things on the ground and seeing many patients." (PCP 08, MMed FM, < 7 years in service)

Advantage of prior clinical experience

To better manage the various clinical presentations on the platform, PCPs felt having prior clinical experience was helpful.

"I think you definitely need a certain level of seniority. You need to have had encountered all these conditions during face-to-face consultation and managed it and seen the different nuances- patients with same diagnosis can present in various ways." (PCP 08, MMed FM, < 7 years in service)

Ready access to clinical and technical support

The availability of formal and informal support helped to troubleshoot any technical issues. For clinical issues, the PCPs had access to support via chat groups and online references.

"The advantage we had was that the admin staff were located right next to us when we first started. So, it was very easy for us to just pop over and ask them any questions." (PCP 05, MMed FM, < 12 years in service)

Perceived risks which affect behavioural intention to use AODTH

Safety concerns due to lack of physical examination

PCPs voiced safety concerns about managing patients without physical examination, noting reduced diagnostic confidence and increased risk, particularly among older adults.

"If I am unable to examine, I can't know for sure it's nothing serious" (PCP 12, MMed FM, < 6 years in service)

"Cases are more straightforward when they are 20-30s age group. We do have 80-year-olds who use [VC] with [the help of] their children but it may not be appropriate in terms of management and there are safety concerns because you are limited by the lack of physical examination. Even for a normal URTI [upper respiratory tract infection] case in those who are more than 65 years, you might be more wary." (PCP 02, RP, < 12 years in service)

Medicolegal liabilities when unknowingly serving overseas patients

PCPs described liability risks when patients accessed VC from overseas, raising concerns about lack of understanding of legal regulations.

"*There are more people calling in from overseas when they are not supposed to. And we wouldn't know. I just wonder whether it might affect our medical practice in terms of medicolegal liability. (PCP 06, RP, < 12 years in service)*

Stakeholder Barriers which Impede Actual System Use

Patient-related technological issues

PCPs highlighted user technical barriers that affected the quality of VC, often disrupting communication and hindering clinical assessment.

"The other challenges are more technical. Sometimes the patient's connection is poor, or they don't have good broadband connection. Then, we are unable to see the patient or sometimes we cannot hear them" (PCP 06, RP, < 12 years in service)

Increased administrative burden

PCPs reported increased administrative workload, leading to reduced focus on clinical care. Tasks such as verifying patient contact details were seen as time-consuming and better suited for admin staff.

"I have to confirm the patient's home address and phone number. They [admin staff] should [have done that] before even registering or after the consult. If I add up all the admin [work], there [is] really no time [to] provide the medical part of the consult" (PCP 11, MMed FM, < 10 years in service)

Discussion

This study explored PCPs' perspectives on AODTH using the TAM framework. Participants were confident managing simple, acute, and non-urgent conditions via VC for AODTH. They perceived VC as convenient for patients, improving accessibility and reducing travel and waiting time. While PCP onboarding was deemed sufficient, usability challenges, workflow constraints, additional administrative burdens, and safety concerns related to atypical cases without physical examination were among the limitations.

PCPs perceived AODTH to be useful and effective for clearly defined clinical scope such as managing simple, low risk clinical conditions particularly acute respiratory infections and gastroenteritis. A Swedish study, similarly reported that PCPs could use VC for simple acute prescriptions, including prescription refills, sick leave assessments, and preventive health [(33)]. They had well-defined acute disease management pathways covering history-taking and symptom assessment alone, which required limited physical examination, enabling them to use VC as first-contact modality of consultation in primary care, thereby alleviating capacity and infrastructure constraints.

The study participants' perception of usefulness were centred on improved access, convenience and time saving for patients. Systematic reviews by Ekeland, Bowes, & Flottorp (2010); Kruse et al. (2018), revealed that VC enhanced accessibility, improve the patient experience,' reduced travel and waiting time [(34, 24)]. They highlighted that incorporating VC into existing workflows optimised manpower resources and reduced patient workload in primary care clinics[(34–35)].

Participants reported usability challenges in navigating the VC platform, difficulty tracking patients who arrived late, and perceived limited time for each consultation. Suboptimal interface design could lead to increased cognitive load and reduced overall efficiency [(34–35)]. They experienced stress from the fixed and limited consultation time due to perceived insufficiency to address the diverse clinical encounters. Greenhalgh (2020) and Vodička, S., & Zelko, E. (2022) have highlighted that remote consultation often requires flexible rather than rigid scheduling, as encounters can be unpredictable [(36, 37)].

Participants also raised safety concerns managing certain conditions without physical examinations, particularly among older adults where subtle symptoms may mask serious illness. A systematic review likewise found physicians' preference for face-to-face consultations as the absence of physical examination reduced diagnostic confidence and increased perceived risk [(38)]. Nonetheless, physician-guided patient self-examination during VC was a method to support clinical decision-making [(38)].

Patient-related technological challenges, including unstable internet connections, poor video quality, and limited digital literacy, hamper effective VC [(24)]. Disruptions caused by unreliable connectivity and low-resolution audio-visual feeds can delay care, reduce consultation quality, and frustrate patients, particularly in rural or economically disadvantaged settings where network instability is common [(39)]. In

addition, limited digital literacy, particularly among older adults and those from lower socioeconomic backgrounds, leads to a low adoption rate, which deprives them from alternative options for healthcare [40].

Onboarding training, prior clinical experience and ready access to technical support were perceived as enablers. Participants in a study emphasised experiential learning and clinical exposure as essential onboarding process to boost confidence, and motivation needed for teleconsultation [41]. Tailored technical, clinical, and communication training significantly improves staff readiness, reduces resistance, and increases adoption rates, especially when combined with ongoing support and practical simulations [42, 43]. Such training upskills physicians to deliver safe and efficient virtual care, and promotes smoother integration of VC into routine practice [44]. Strengthening provider competence and confidence during onboarding training enhances patient safety, service quality, and long-term sustainability of teleconsultation services [45].

Nonetheless, increased administrative burden deters implementation and sustained use of the telehealth service [46]. Physicians and administrative staff reported that digital platforms often introduce more complex workflows, requiring additional steps for scheduling, documentation, technology setup, and patient preparation, which contribute to workload and cognitive strain [47] .The absence of standardised protocols for processes such as check-in and documentation further adds to inefficiency and necessitate extra effort in managing patient data, referrals, and follow-up [48].

Strengths and Limitations:

To the authors' knowledge this is the first institution-based study to use TAM to systematically frame the perspectives of PCPs currently or with prior experience in delivering AODTH service. However, it was limited to PCPs practising within a single public primary care institution and had excluded other stakeholders such as local private general practitioners who also offered similar AODTH services. At the time of data collection, no other public primary care clinic in Singapore offered AODTH. Future research should explore perspectives from both public and private PCPs to capture a wider range of experiences and enhance the applicability of findings across diverse practice settings.

Conclusion

PCPs perceived usefulness and ease of use of the existing technological infrastructure and system to support VC, recognising its potential to enhance accessibility and timely management of acute medical conditions. However, they also highlighted factors which affected their attitude and behavioural intention to use it. Regular engagement of AODTH providers, supported by collection of relevant service quality data are strategies to improve service delivery, refine digital tools, triage protocol, clinical scope to enhance patient safety when they use the service.

Abbreviations

AODTH- Acute on-Demand Telehealth

PCP- Primary care Physicians

VC- Video Consultations

FGD- Focused Group Discussions

IDI- In-depth Interviews

TAM- Technology Acceptance Model

COREQ- Consolidated Criteria for Reporting Qualitative Research

PU- Perceived Usefulness

PEU- Perceived Ease of Use

FCFP: Fellowship of the College of Family Physician

MMed (FM): Masters in Family Medicine

GDFM: Graduate Diploma in Family Medicine

RP: Family Physician

MO: Medical Officer

URTI- Upper respiratory Tract Infection

GE- Gastroenteritis

Declarations

Ethical Approval and Informed Consent

Ethical approval was obtained from the SingHealth Centralised Institutional Review Board (CIRB), Reference No: 2024/2118. All participants provided written informed consent prior to participation. The study procedures were conducted in accordance with relevant guidelines and regulations, including the Declaration of Helsinki.

Consent for Publication- Not applicable

Availability of data and materials

Due to the qualitative nature of this study and to protect confidentiality of participants, the datasets generated and analysed are not publicly available. De-identified excerpts may be made available upon reasonable request to the corresponding author.

Competing Interests

The authors declare they have no competing interests

Acknowledgments

The authors would like to thank the research department of SingHealth polyclinics, Family Medicine Academic Clinical Program Secretariat and staffs and physicians of Punggol, Eunos and Marine Parade polyclinics for their help and participation in this study.

Funding

This study was funded by the Family Medicine Academic Clinical Program seed grant no 202406.

Authors' Contribution

JD conceived and designed the study, developed the interview guide/study protocol, conducted interviews, analysed data and contributed in manuscript writing. Author was responsible for overall project management and manuscript submission.

SP co-coded transcripts, participated in data interpretation and reflexive discussions. Author was involved in manuscript revision.

EL contributed in study conceptualisation and interpretation of findings. Critically reviewed and revised the manuscript. Provided insight of current service details and delivery on the ground.

GK contributed in initial study conceptualisation, provided critical intellectual input and manuscript refinement. Provided insight to current service from policy and implementation aspect.

MA contributed to study design, interpretations of findings, revisions of themes and extensive revision of manuscript revision. Participated in analytical discussion of the study findings

TNC provided senior methodological and academic oversight. Guided on qualitative methodology, selection of framework, analysis and results interpretation. Author supervised the whole project and critically revised manuscript.

References

1. Powell RE, Henstenburg J, Cooper G, Hollander JE, Rising KL. Patient perceptions of telehealth primary care video visits. Annals of Family Medicine [Internet]. 2017;15(3):225–9. Available from: https://doi.org/10.1370/afm.2095
2. Elsner P. Teledermatology in the times of COVID-19 – a systematic review. Journal Der Deutschen Dermatologischen Gesellschaft [Internet]. 2020;18(8):841–5. Available from: https://doi.org/10.1111/ddg.14180

3. Gullslett MK, Kristiansen E, Nilsen ER. Therapists' experience of video consultation in specialised mental health services during the COVID-19 Pandemic: Qualitative interview study. JMIR Human Factors [Internet]. 2021;8(3):e23150. Available from: https://doi.org/10.2196/23150
4. Van Gurp J, Van Selm M, Vissers K, Van Leeuwen E, Hasselaar J. How Outpatient Palliative Care teleconsultation Facilitates Empathic Patient-Professional Relationships: A Qualitative study. PLOS ONE [Internet]. 2015;10(4):e0124387. Available from: https://doi.org/10.1371/journal.pone.0124387
5. Payne R, Clarke A. How and why are video consultations used in urgent primary care settings in the UK? A focus group study. BJGP Open [Internet]. 2023;7(3):BJGPO.2023.0025. Available from: https://doi.org/10.3399/bjgpo.2023.0025
6. Morgenstern-Kaplan D, Rocha-Haro A, Canales-Albarrán SJ, Núñez-García E, León-Mayorga Y. An App-Based telemedicine program for primary care and specialist video consultations during the COVID-19 pandemic in Mexico. Telemedicine Journal and E-health [Internet]. 2022;28(1):60–5. Available from: https://doi.org/10.1089/tmj.2021.0055
7. Jury SC, Walker A, Kornberg AJ. The introduction of web-based video-consultation in a paediatric acute care setting. Journal of Telemedicine and Telecare [Internet]. 2013;19(7):383–7. Available from: https://doi.org/10.1177/1357633x13506530
8. Sevean P, Dampier S, Spadoni M, Strickland S, Pilatzke S. Patients and families experiences with video telehealth in rural/remote communities in Northern Canada. Journal of Clinical Nursing [Internet]. 2009;18(18):2573–9. Available from: https://doi.org/10.1111/j.1365-2702.2008.02427.x
9. Viers BR, Lightner DJ, Rivera M, Tollefson MK, Boorjian SA, Karnes RJ et al. Efficiency, satisfaction, and costs for remote video visits following radical prostatectomy: a randomised controlled trial. European Urology [Internet]. 2015;68(4):729–35. Available from: https://doi.org/10.1016/j.eururo.2015.04.002
10. Campbell K, Greenfield G, Li E, O'Brien N, Hayhoe B, Beaney T, Majeed A, Neves AL. The Impact of Virtual Consultations on the Quality of Primary Care: Systematic Review. J Med Internet Res. 2023;25:e48920. https://doi.org/10.2196/48920.
11. de Carrillo S, Sia KL, Harris A. The effectiveness of teleconsultations in primary care: systematic review. Fam Pract. 2022;39(1):168–82. https://doi.org/10.1093/fampra/cmab077.
12. Lunova T, Hurndall K, Kirk UB et al. Patient safety measures for virtual consultations in primary care: a systematic review BMJ Quality & Safety Published Online First: 30 July 2025. 10.1136/bmjqs-2025-018712
13. Licensing Experimentation and Adaptation Programme (LEAP). - A MOH regulatory sandbox. Ministry of Health Singapore. [accessed 2023-11-13]. Available from: https://www.moh.gov.sg/home/our-healthcare-system/licensing-experimentation-and-adaptation-programme-(leap)---a-moh-regulatory-sandbox
14. How Singapore is using telehealth to care beyond hospitals. Gov insider Asia. 10 May 2021. [accessed 2023-11-12]. Available from: https://govinsider.asia/intl-en/article/how-singapore-is-using-telehealth-to-extend-care-beyond-hospitals-nhg-thomas-lew
15. Wong SH. (2021). Video consultation in SingHealth polyclinics [Poster]. SingHealth Polyclinics. [accessed 2023-11-13]. Available from: https://www.singaporehealthcaremanagement.sg/Documents/Poster%20Competition%202021/Patient%20Experience/SHM_PE002%20-%20Wong%20Siew%20Hui_SHP%20-%20Video%20Consultation%20in%20SingHealth%20Polyclinics.pdf
16. SingHealth polyclinics video consultation services. Video Consultation Services. [accessed 2023-11-12] Available from: https://polyclinic.singhealth.com.sg/Pages/shp-vc.aspx
17. Lim C, Doctor Anywhere WC, Doctor World… Can Telemedicine Apps Save Us Money? MoneySmart. 2020 Mar 1. [accessed 2023-11-13]. Available from: https://blog3.moneysmart.sg/healthcare/doctor-anywhere-telemedicine-apps/
18. Health care providers need to foster culture of trust amid digital revolution. Channel News Asia. 31 October 2023. [accessed 2023-11-20]. Available from: https://www.channelnewsasia.com/singapore/healthcare-providers-foster-culture-trust-amid-digital-revolution-artificial-intelligence-telemedicine-3886006
19. Telemedicine in Singapore. - A useful adjunct in a pandemic. Singapore Medical Association. [accessed 2023-11-20]. Available from: https://www.sma.org.sg/news/2020/September/telemedicine-in-singapore-a-useful-adjunct-in-a-pandemic
20. SingHealth to introduce telemedicine hub at Eunos polyclinic. The Straights times. 3 October 2023. [accessed 2023-11-12]. Available from: https://www.straitstimes.com/singapore/health/singhealth-to-introduce-telemedicine-hub-launches-new-polyclinic-in-tampines-north
21. Bréton M, Sullivan EE, Deville-Stoetzel N, McKinstry D, DePuccio MJ, Sriharan A et al. Telehealth challenges during COVID-19 as reported by primary healthcare physicians in Quebec and Massachusetts. BMC Family Practice [Internet]. 2021;22(1). Available from: https://doi.org/10.1186/s12875-021-01543-4
22. Vargo D, Zhu L, Benwell B, Yan Z. Digital technology use during COVID – 19 pandemic: A rapid review. Hum Behav Emerg Tech. 2021;3(1):13–24.

23. Ma Y, Zhao C, Zhao Y, et al. Telemedicine application in patients with chronic disease: a systematic review and meta-analysis. BMC Med Inf Decis Mak. 2022;22:105. https://doi.org/10.1186/s12911-022-01845-2.
24. Kruse CS, Karem P, Shifflett K, Vegi L, Ravi K, Brooks M. Evaluating barriers to adopting telemedicine worldwide: A systematic review. J Telemed Telecare. 2018;24(1):4–12.
25. Elliott R, Timulak L. Descriptive and interpretive approaches to qualitative research. A handbook of research methods for clinical and health psychology. 2005;1(7):147 – 59.
26. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349–57. https://doi.org/10.1093/intqhc/mzm042.
27. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989;13(3):319–40.
28. Gagnon M-P, Orruño E, Asua J, Abdeljelil AB, Emparanza JI. Using a modified Technology Acceptance Model to evaluate healthcare professionals' adoption of telemedicine: A systematic review. J Telemed Telecare. 2012;18(1):54–9. https://doi.org/10.1258/jtt.2011.110418.
29. Garavand A, Samadbeik M, Nadri H, Rahimi B, Asadi H. Factors influencing the adoption of health information technologies: A systematic review. Digit Health. 2022;8:20552076221086310. https://doi.org/10.1177/20552076221086.
30. Loh R. (2024, November 16). Despite the bad rap, telemedicine is the future of healthcare. Channel NewsAsia. https://www.channelnewsasia.com/today/big-read/telemedicine-future-healthcare-doctors-patients-4747776
31. Fusch P, Ness L. Are we there yet? Data saturation in qualitative research. Qualitative Rep. 2015. https://doi.org/10.46743/2160-3715/2015.2281.
32. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Res Psychol. 2006;3(2):77–101. https://doi.org/10.1191/1478088706qp063oa.
33. Kujansivu K, Tolvanen E, Kautto M, Koskela TH. Primary care physicians' experiences of video and online chat consultations: a qualitative descriptive study. Scand J Prim Health Care. 2024;1–12. https://doi.org/10.1080/02813432.2024.2391406.
34. Ekeland AG, Bowes A, Flottorp S. Effectiveness of telemedicine: A systematic review of reviews. Int J Med Informatics. 2010;79(11):736–71. https://doi.org/10.1016/j.ijmedinf.2010.08.006.
35. Rush KL, Howlett L, Munro A, Burton L. (2018). Videoconference compared to telephone in healthcare delivery: A systematic review. International Journal of Medical Informatics, 118, 44–53. https://doi.org/10.1016/j.ijmedinf.2018.07.007
36. Greenhalgh T. Will COVID-19 be evidence-based medicine's nemesis? PLoS Med. 2020;17(6):e1003266. https://doi.org/10.1371/journal.pmed.1003266.
37. Vodička S, Zelko E. Remote Consultations in General Practice - A Systematic Review. Zdravstveno varstvo. 2022;61(4):224–30. https://doi.org/10.2478/sjph-2022-0030.
38. Thiyagarajan A, Grant C, Griffiths F, Atherton H. (2020). Exploring patients' and clinicians' experiences of video consultations in primary care: a systematic scoping review. BJGP Open. 4. bjgpopen20X101020 . 10.3399/bjgpopen20X101020.
39. Leclercq V, Vandervliet L, Schmitt T, Van Den Bulcke M, Delnord M. Inequities to the access to and use of telemedicine among cancer patients in Europe: a scoping review. Front Public Health. 2025;13:1483706. https://doi.org/10.3389/fpubh.2025.1483706.
40. Alfarwan N, Panagioti M, Panagioti M, Hassan L, Zghebi S, Kontopantelis E. Demographic and Socioeconomic Disparities in Telemedicine Use among Individuals with Type 2 Diabetes in Primary Care: Systematic Review and Meta-Analysis. J Med Internet Res. 2025;27:e73113. https://doi.org/10.2196/73113.
41. Jiménez-Rodríguez D, García AS, Robles JM, Del Mar Rodríguez Salvador M, Ronda FJM, Arrogante O. Increase in Video Consultations During the COVID-19 Pandemic: Healthcare Professionals' Perceptions about Their Implementation and Adequate Management. Int J Environ Res Public Health. 2020;17(14):5112. https://doi.org/10.3390/ijerph17145112.
42. De Albornoz SC, Sia K, Harris A. The effectiveness of teleconsultations in primary care: systematic review. Fam Pract. 2021;39(1):168–82. https://doi.org/10.1093/fampra/cmab077.
43. Cruz-Panesso I, Tanoubi I, Drolet P. Telehealth Competencies: Training physicians for a new reality? Healthcare. 2023;12(1):93. https://doi.org/10.3390/healthcare12010093.
44. Bajra R, Srinivasan M, Torres EC, Rydel T, Schillinger E. Training future clinicians in telehealth competencies: outcomes of a telehealth curriculum and teleOSCEs at an academic medical center. Front Med. 2023;10. https://doi.org/10.3389/fmed.2023.1222181.
45. Galpin K, Sikka N, King SL, Horvath KA, Shipman SA, Evans N, Henderson K, Kitts AB, Krupinski E, Kvedar JC, Lin C, ., Lowery C, Marcin JP, Rheuban K. Expert consensus: Telehealth skills for health care professionals. Telemedicine J e-Health. 2020;27(7):820–4.

https://doi.org/10.1089/tmj.2020.0420.

46. Nabelsi V, Plouffe V, Leclerc MC. Barriers to and facilitators of implementing overnight nursing teleconsultation in small, rural Long-Term Care Facilities: Qualitative Interview study. JMIR Aging. 2025;8:e71950. https://doi.org/10.2196/71950.
47. Meng G, McAiney C, Perlman CM, McKillop I, Tisseverasinghe T, Chen HH. Service process factors affecting patients' and clinicians' experiences on rapid teleconsultation implementation in out-patient neurology services during COVID-19 pandemic: a scoping review. BMC Health Serv Res. 2022;22(1):534. https://doi.org/10.1186/s12913-022-07908-4.
48. Galpin K, Sikka N, King SL, Horvath KA, Shipman SA, Evans N, Henderson K, Kitts AB, Krupinski E, Kvedar JC, Lin C, ., Lowery C, Marcin JP, Rheuban K. Expert consensus: Telehealth skills for health care professionals. Telemedicine J e-Health. 2020;27(7):820–4. https://doi.org/10.1089/tmj.2020.0420.

Figures

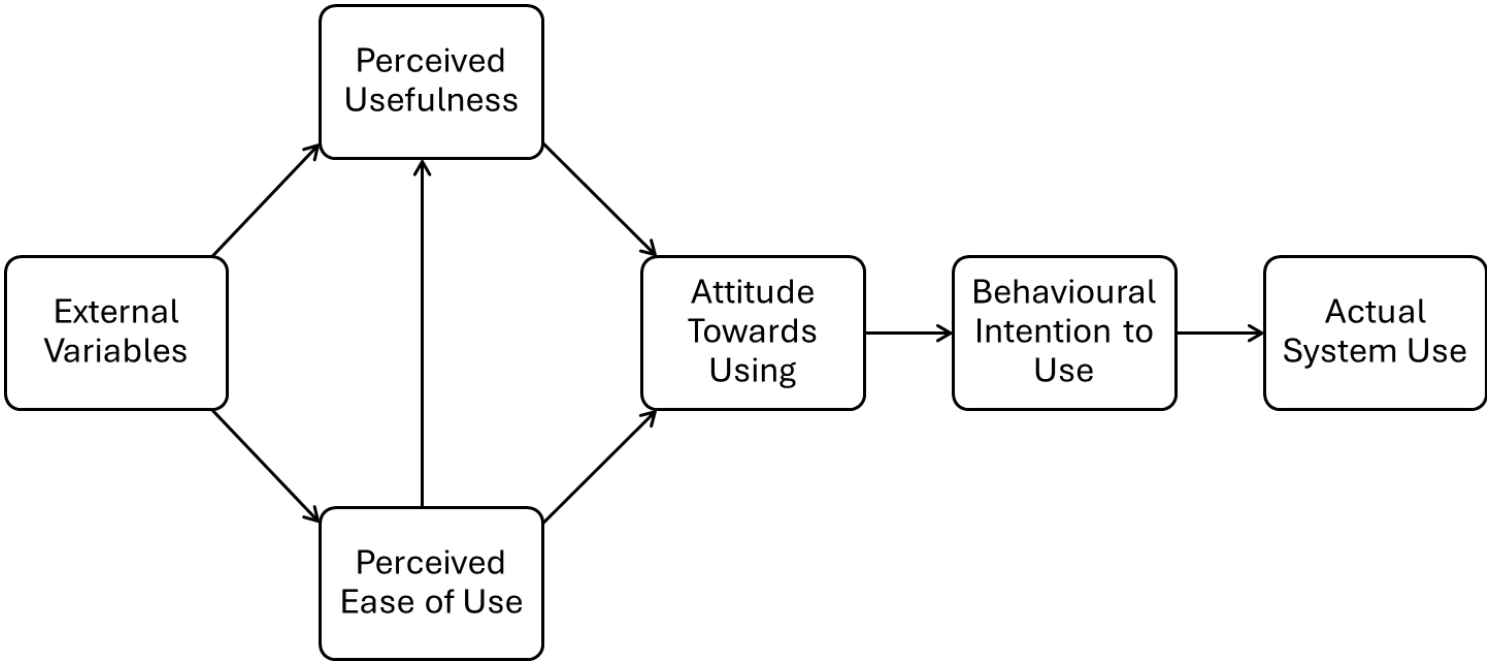


Figure 1

Technological Acceptance Model (adapted from Davis et al. 1989) [27].

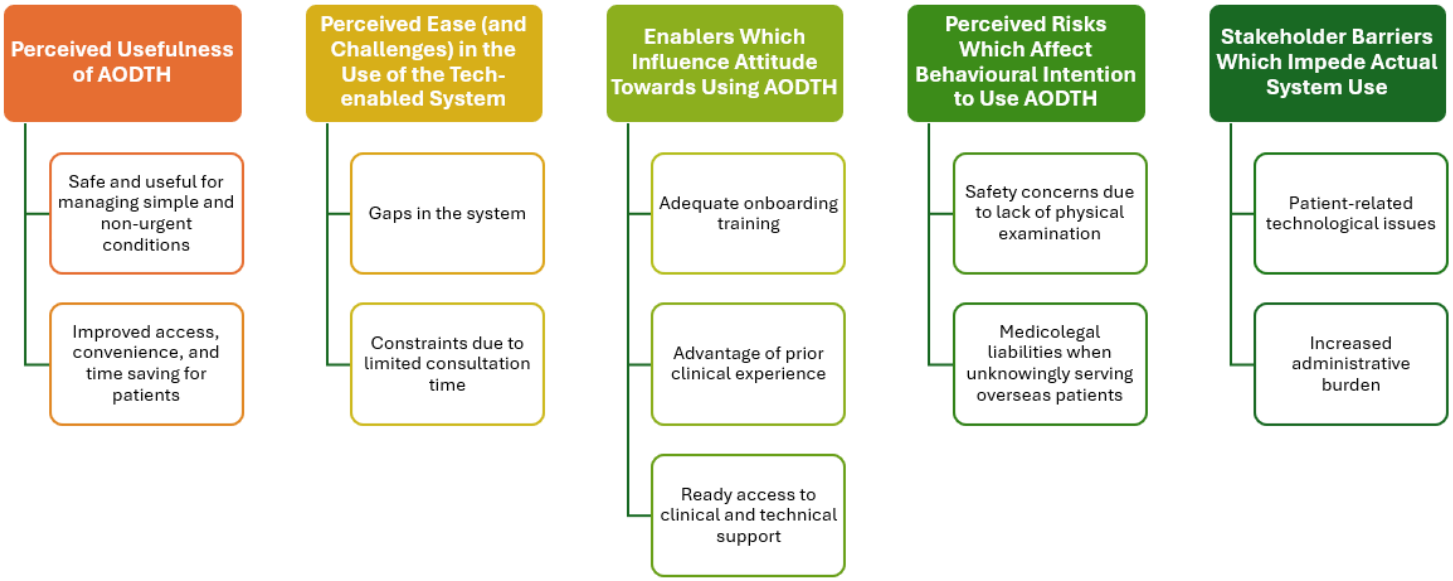


Figure 2

Technology Acceptance Model frames primary care physicians' perspectives on acute-on-demand video consultations (AODTH)

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- supplementaryAppendix1Interviewguide.docx