

Lessons Learnt from Initial Deployments of Rocket Health Telemedicine Service to Deliver Last Mile Medical Services in Uganda

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Abstract: Achieving the World Health Organization target for universal healthcare coverage requires innovations that deliver health services using models that overcome barriers to access, affordability, knowledge and the low health worker to population ratio. Innovations like telemedicine have gained traction in the delivery of healthcare globally. Rocket Health is operated by The Medical Concierge Group (TMCG) in Uganda, leveraging telemedicine to deliver last mile medical services within a private health insurance setting. Analysis of electronic medical records and key informant interviews revealed that telemedicine was used for almost the full range of out-patient care including acute medical conditions, home emergencies, and chronic care refills. Combining last mile medicine delivery and lab sample pick up increased uptake and adoption as it provided an end-to-end solution. Telemedicine models offered savings of 30-40% compared to traditional healthcare models which adds more user satisfaction and saves time for patients.

Keywords: Telehealth, Telemedicine, Tele-pharmacy, Digital Health, Health insurance.

1. Introduction

As Uganda progresses towards achieving the World Health Organization (WHO) universal healthcare coverage [1], a number of challenges remain evident in the path towards attaining this health-for-all strategy. Structural barriers including distant health facilities, counterfeit medical products, low health worker to population ratio and individual attributes like the lack of access to health information and service cost disrupt the delivery of health services across the entire chain from demand creation to service uptake [2, 3].

With the country's health expenditure standing at 7.2% of the gross domestic product (GDP), Uganda still performs below the Abuja declaration that advocates for at least 15% total government expenditure on health [4]. The Ministry of Health 2019/20 annual sector report showed that up to 43% of Uganda's healthcare financing came from private funding of which 40% was paid out-of-pocket [5]. The role of the private sector in ensuring that people have access to the healthcare they need, at the right time and in the right place cannot be underscored. The private sector in Uganda continued to be a critical partner to the government in achieving universal healthcare coverage through innovativeness, increased access and strengthened healthcare systems [6].

Uganda's private healthcare insurance penetration has remained very low with less than 1% coverage of the country's population [7]. Factors contributing to this low penetration included public mistrust, low public awareness and a narrow insurance product range

targeting low-income earners. [8, 9]. Therefore, innovations that address these bottlenecks will go further in building popular demand for private healthcare insurance within the population as well as increasing overall health care coverage.

WHO defines telemedicine as a broad term that encompasses the use of digital health technologies to remotely deliver clinical and non-clinical services [10]. The integration of digital technologies in healthcare delivery has gained momentum globally in recent years with use cases in tele-consultations, tele-pharmacy, tele-psychiatry and others being documented [11]. The potential telemedicine presents in bridging the gaps in private health insurance uptake and hence achieving universal healthcare coverage (UHC) lies with its ability in covering the low health worker force, provision of emergency services especially for remote/rural settings, increasing availability of specialist and other mandated services [12].

This paper explores how a digital health company has modelled a telemedicine centred medical services delivery for private health insurance companies in Uganda. The lessons, digital technologies applied, and challenges met could be useful for other private players as well as public entities implementing the same elsewhere and for scale in other similar settings.

The paper is structured to first provide a background context, followed with a detailed description of the telemedicine services offered and the technological applications that support these. A discussion section of the key findings from key informant interviews and analysis of the electronic medical records from the company is followed with a conclusion section.

2. Background

The Rocket Health medical services are provided by The Medical Concierge Group (TMCG) a digital health company with headquarters in Kampala, Uganda. The operations of the company are regulated by different authorities including the Uganda Medical and Dental Practitioners' Council (UMDPC), Allied Health Professionals Council and the National Drug authority which are responsible for health professionals' licensure and regulate the operations of the tele-clinic, tele-pharmacy and mobile laboratory services.

The delivery of telecommunication services is supported by third party mobile network operators (MNO) that offer text and voice platforms used for teleconsultation. Rocket Health purchased its mobile short messaging service (SMS) short code and voice line from the MNO with an annual subscription fee. The private health insurers are clients of the telehealth services whose beneficiaries accessed medical services from Rocket Health. The insurers receive monthly reports that are referenced when executing on the financial reconciliations.

2.1 Telehealth Medical Service

Rocket Health operates a telehealth centred model for delivering medical services that hinge around a 24/7 medical call centre manned by health professionals including medical doctors, pharmacists, nurses and psychotherapists. Users interact with the health professionals via tele-platforms including voice, text and video and are able to have their pharmaceutical and or laboratory needs addressed at their convenience through medicine delivery and mobile laboratory sample pick-up services. An online self-service medical eShop is also available.

Figure 1 illustrates the telehealth centred medical service delivery workflow.

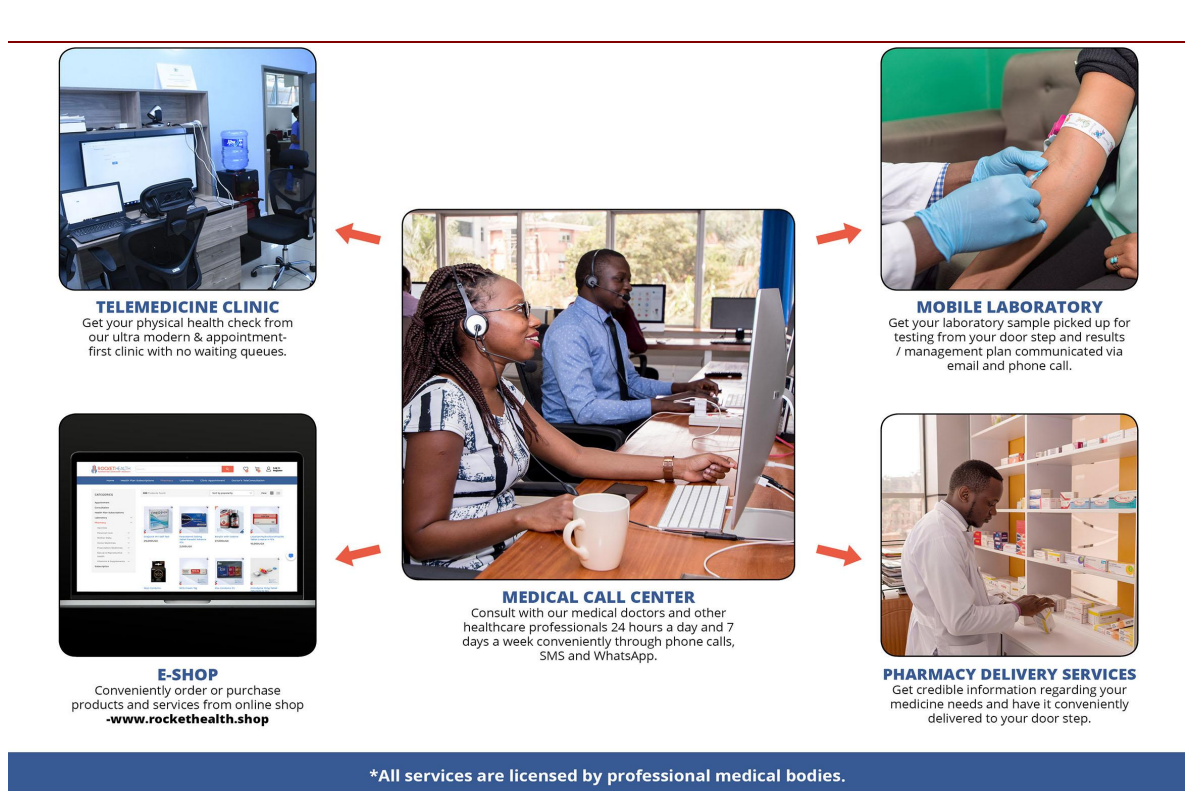


Figure 1: Rocket Health TeleHealth Medical Service Delivery Workflow

i. **Teleconsultations:** Deployed in 2013 with voice and text platforms to support remote resolutions of clients' health inquiries. Users have countrywide representation with a range of platforms being utilized including mobile short messaging services (SMS), WhatsApp and other third-party social chat spaces such as Facebook messenger. End users are able to access health professionals by calling in or having a video interaction leveraging platforms such as 'Agnes' (see description under technology section), Zoom and Google team. Teleconsultation interactions are documented in an electronic medical record (EMR) system for future reference that could have involved patients' follow-up.

ii. **Mobile Laboratory Sample Pick Up and testing:** Launched in December 2018 as client numbers and demands grew to warrant an end-to-end medical service from teleconsultation to laboratory testing. End users with laboratory requests get their samples picked-up from their place of convenience via Rocket health's mobile laboratory sample pick-up service. Samples are processed and tested at the central laboratory and clients' results are delivered electronically by email with a follow-up call from the doctors explaining results and offering the next plan of management.

iii. **Tele-Pharmacy and Prescription Delivery:** Launched in December 2018 informed by the growing need for pharmaceutical or medicine prescription filling among clients. The products are delivered to their convenient location through Rocket Health's pharmacy delivery service. Prescriptions come through teleconsultations from doctors or are direct purchases through the online eShop platform of Rocket Health.

iv. **Outpatient Clinic Appointment Referral and Scheduling:** Rocket Health telemedicine clinic was launched in December 2019 with the aim of offering physical assessment in the virtual medical delivery model. The clinic operated via Agnes software to support remote video interactions between the patient and medical professional [13].

v. **Healthcare eShop:** Rocket Health eShop was launched in September 2019 as a self-service online platform. This e-commerce platform allows users to purchase medical services including tele-consultations, laboratory tests and pharmacy prescriptions. The e-

commerce platform is accessed via a website with users required to set up an account for the purpose of tracking utilization trends [14].

2.2 Team

The team at Rocket Health is diverse with varying professional backgrounds including medical professionals (doctors, nurses, pharmacists and psychotherapists) that directly interact with the end users while offering medical services. The quality assurance team is in charge of providing checks and balance and ensuring delivery of health services met the set quality and minimum standards. The information and technology team designed and delivered the software and digital tools that support the telemedicine services including teleconsultation, mobile laboratory sample pick-ups and testing and medicine delivery. The marketing and communications and the finance teams play a central role in business continuity through promoting brand visibility, awareness and ensuring availability of sufficient resources for maximum output. The diversity in team composition offers complementary support and allows knowledge and experience sharing which was an important aspect to excellent service performance.

2.3 Use Case

A typical use case of Rocket Health's telehealth services starts with a tele-consultation with a doctor stationed at their medical call centre that operates 24/7. The tele-communication channels include video, voice call and text platforms with clients' inquiries either resolved remotely and where there is a need for additional medical services such laboratory investigations or prescribing medications, these are delivered at the client's convenient location i.e., home, work, school etc.

Tele-consultation encounters are documented within a custom-built electronic medical records (EMR) system that is integrated with the laboratory and pharmacy information systems. When an encounter is registered within the EMR it could be marked for follow-up if additional medical services are recommended. In cases where a laboratory test is advised by the doctor for a client, the encounter registered at the laboratory information system (LIS) upon notification a laboratory technician is dispatched to the field to collect the client's sample for processing. Tele-consultations that end in a prescription have a pharmacy technician dispatched to deliver medicines or other pharmaceutical products to the client's location. The average turnaround time for a telehealth supported medical consultation to service acquisition averages from 1 to 3 hours depending on the encounter reasons.

3. Objectives

The overall objective is to share lessons from an indigenous digital health and telemedicine company that applies telemedicine in delivering last mile medical services within a private health insurance setting.

The specific paper objectives are:

1. To describe telehealth medical services delivered by Rocket Health
2. To describe the digital technologies Rocket Health deployed in delivering medical services in Uganda.
3. To share potential facilitators and barriers to the adoption of telehealth services in private healthcare.

4. Methodology

This case study of Rocket Health as a telemedicine service was conducted from March to October 2020. The telemedicine model has been running since December 2018. A focus group was undertaken with a director to gather insight on the operations of the company

and their relationship with private health insurers, 2 medical doctors to understand how telemedicine services are delivered and 2 software engineers to gain insights into the technology and software tools leveraged to deliver telemedicine. Data was collected using a researcher-administered, open-ended questionnaire that incorporated details about the telehealth platforms deployed, how they were used and the kinds of health services they facilitated. Demographic information of the end users including age and gender was collected in the electronic databases of the different telehealth platforms assessed. Additionally, we analysed anonymised user data of medical encounters specifically on the diagnoses made that we categorized within 8 groups i.e., allergic conditions, Upper respiratory tract infections, fungal infestations, tumours, non-sexually transmitted Genito-Urinary diseases, Gastro-intestinal tract infections, bleeding disorders and burns. This was part of the routinely collected data from tele-consultations documented within the electronic medical records system. Exported data was made available in the form of Excel spreadsheets for analysis within Microsoft Excel 2018.

5. Technology Description

Rocket Health customized open-source software to run its telehealth platforms that includes voice call-in, video, online eShop, and the messaging platforms.

5.1 Voice call-in platform

The Asterisk software was customized to meet data collection needs for voice call-in services [12]. The voice calling platform allowed immediate and real-time interactions between health workers and beneficiaries. Asterisk is an open source software that converts an ordinary computer into a feature-rich voice communications server. The software was used to create and deploy a wide range of telephony applications and services, including Internet Protocol private branch exchange (IP PBXs), Voice over Internet Protocol (VoIP) gateways, call centre automatic call distributions (ACDs) and Interactive Voice Recording (IVR) systems [15].

Figure 2 illustrates how the voice calling platform for tele-consultations works.

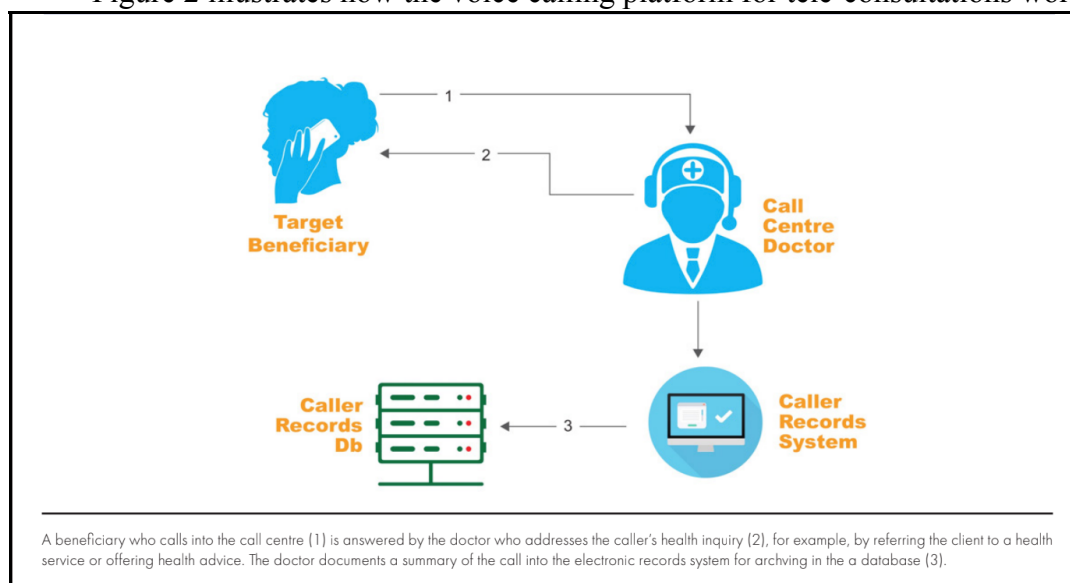


Figure 2: Voice Calling Platform Workflow

5.2 Messaging Service

Rocket Health's messaging service involves both pushes and pulls. With 'push' interactions, private health insurance beneficiaries' consented to receive health information via mobile messages. For the 'pull' messaging services, individuals subscribed to mobile

health content by sending a keyword to a short code. For the push system, the messaging platform was integrated into Rapid-Pro an open-source messaging software application that is used for health campaigns, wherein content including reminders can be sent to beneficiaries [16]. In addition to being used for health information dissemination, the SMS platform was used for individualised case management based on client enquiries, allowing personalised interactions between health workers and end users.

Figure 3 illustrates how the messaging platform works

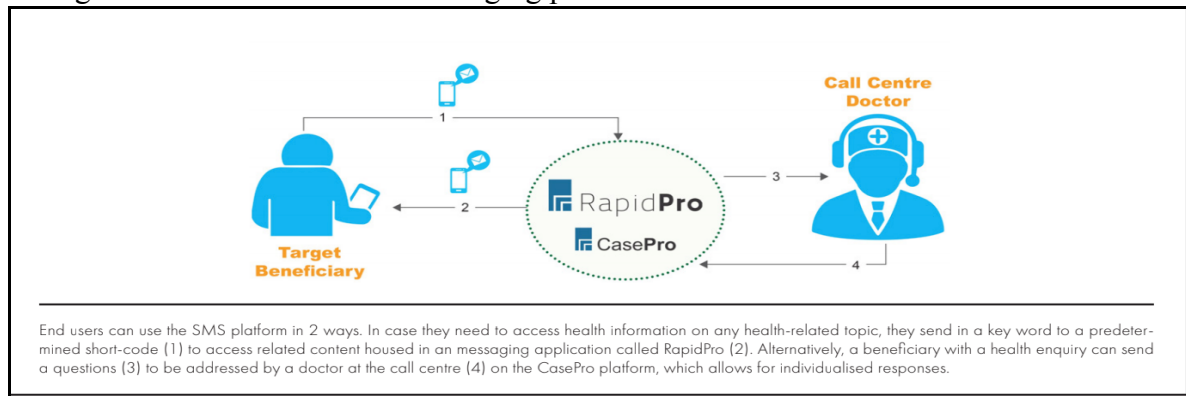


Figure 3: Messaging Platform Workflow

5.3 Agnes Interactive Video Platform

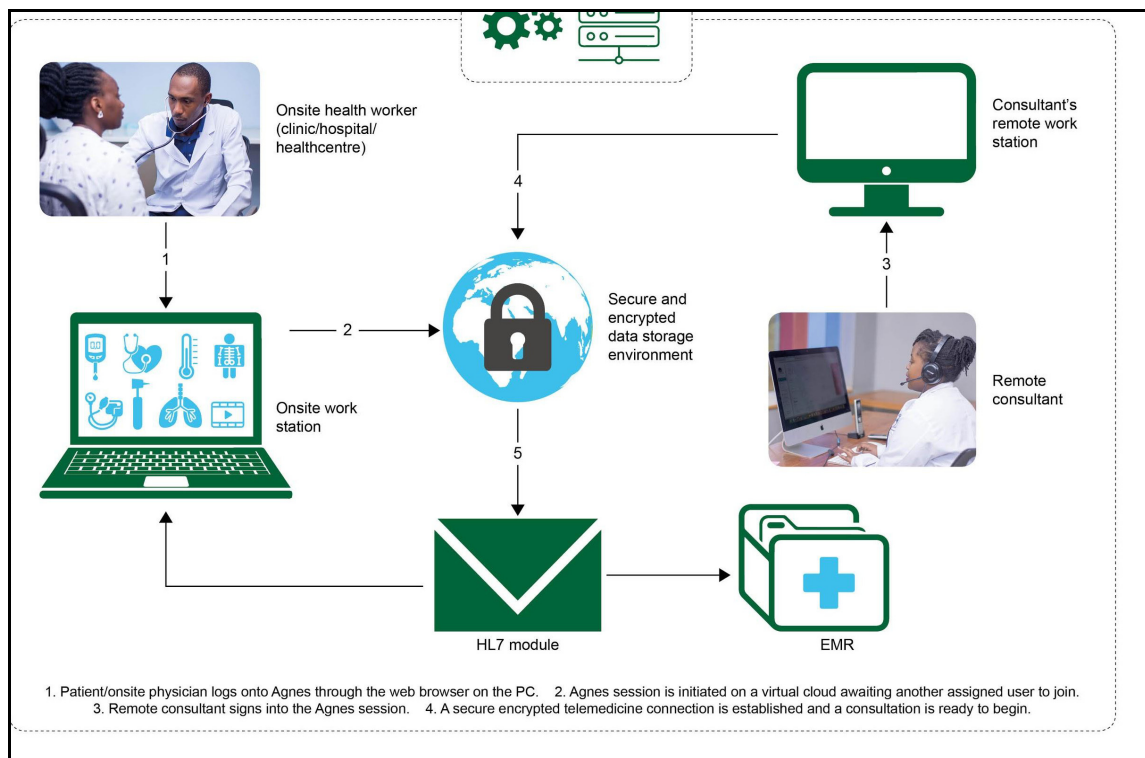


Figure 4: Agnes Video Platform Workflow

Rocket Health partnered with AMD global, a telemedicine company headquartered in the USA, to deploy Agnes a web-based software used for clinical tele-medicine assessment and video consults. The Agnes software aggregates medical device data and delivers it to remote specialists in real time allowing effective interaction with the patient and or onsite health worker as if it were an in-person examination [17]. During the tele-consultation, Agnes aggregates all data coming from the connected medical devices such as heartbeat, blood pressure, medical images etc. In addition, remote healthcare providers have real time access to patients' which includes HD video conferencing, Pan-tilt-zoom (PTZ) camera

control, live streaming of medical images and data such as electrocardiogram (ECG) reports, X-rays and patient consent forms. At the end of the telemedicine consultation, all medical information collected is saved into the electronic medical records (EMR) or other secure location of choice using the Health Level-7 (HL) & EMR integrated module.

5.4 Online eShop

The online eShop¹ is a platform that offers self-service to clients where they are able to log onto the web link and purchase any medical services including doctor consultations, order medicines or laboratory tests. The eShop was built using WooCommerce, a WordPress based content management system for eCommerce, that allows installation of different plugins that facilitates several functionalities. WooCommerce is an open-source ecommerce software that provides a flexible, extensible and secure way for clients to do online shopping. WooCommerce brings an assortment of different services and functionality that permit integration with different payment gateways such as cash on delivery, mobile money and Credit/Debit Card (e.g., Mastercard, Visa) payments, the plugin also blends smoothly with different themes which has greatly improved the look and feel of the eShop. In addition, WooCommerce provided a well-crafted checkout process which enabled users to easily purchase the different services and products. Moreover, WooCommerce also comes with a shop manager dashboard out of the box that facilitates inventory management, order management and provides comprehensive reports on the eShop performance.

6. Findings

A key informant interview with one of the Rocket Health directors in May revealed that 5 private health insurance companies had been onboarded onto the telemedicine model of medical services delivery. Over a 6 month performance review period from March to October 2020, a total of 3,432 clients had been served with a majority 2,012 (59%) being females. Table 1 summarizes the demographics characteristics of Rocket Health private telehealth insurance utilizers.

Table 1: Demographics characteristics of Rocket Health telehealth insurance utilizers

Characteristic	N (%)
Number of utilizers	3,432
Sex:	
Male	1,420 (41%)
Female	2,012 (59%)
Age (years):	
Below 18	957 (28%)
18-34	1,236 (36%)
35-50	1,003 (29%)
Above 50	234 (7%)

Tele-consultations remained the most popular telemedicine service product at 57% utilization rate among private health insurance beneficiaries. Figure 5 shows proportions of telemedicine services uptake by beneficiaries.

¹ <https://www.rockethealth.shop/>

Proportions of Telemedicine services uptake among beneficiaries

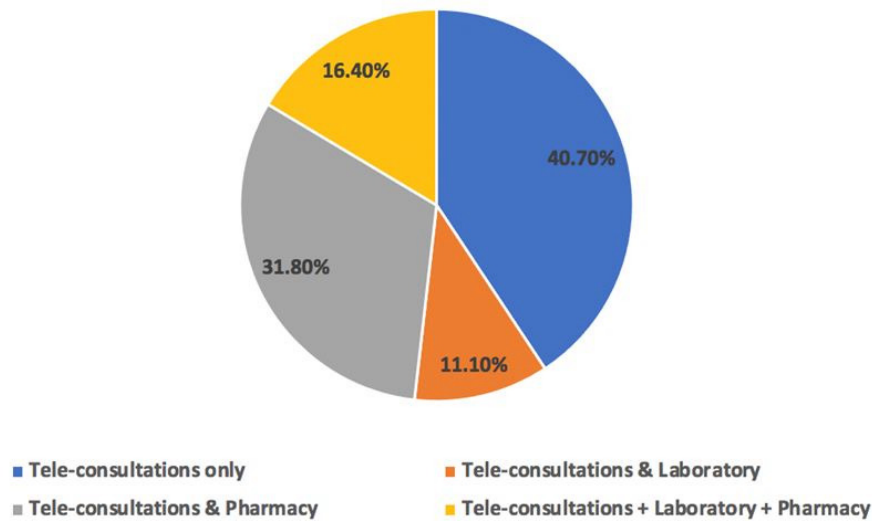


Figure 5: Uptake of Telemedicine Services (March - October 2020)

Categorization of medical conditions handled through the telemedicine platforms showed that non sexually transmitted Genito-urinary diseases (e.g., candidiasis, urinary tract infections etc) accounted for the largest proportion of inquiries at 28%. Figure 6 shows categorization of top 5 common diagnoses handled through the telemedicine platforms.

Proportion of Top 5 common diagnoses via Telemedicine Platforms

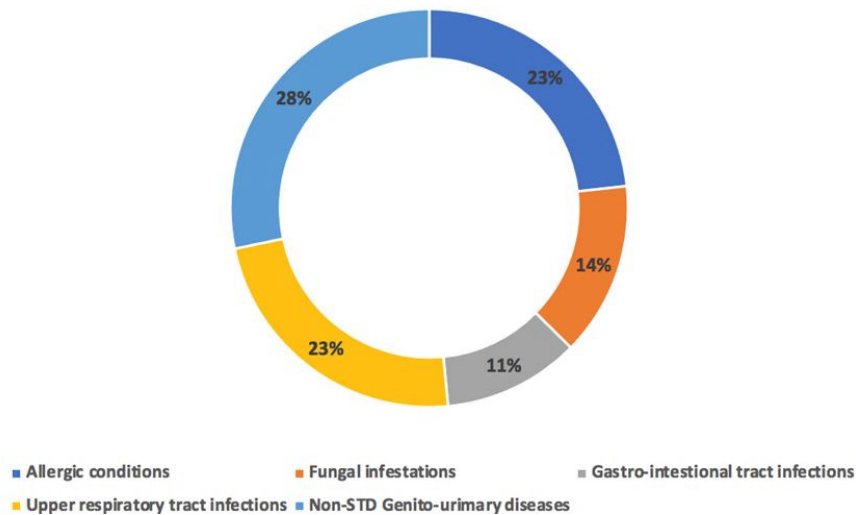


Figure 6: Common Diagnosis via Telemedicine Platform (March - October 2020)

6.1 Facilitators to telemedicine adoption among beneficiaries

A Focus Group discussion with medical doctors and the software engineering team generated insights some of the possible facilitators and barriers to the adoption of telemedicine among target beneficiaries. Facilitators highlighted included:

1. **Education and Sensitization** through workplace activations and remote webinars that increased awareness and knowledge about the availability and usage of telemedicine medical services.
2. **Ease of use:** Easy to use tele-medicine platforms were noted to be easily taken up, for example voice calling and SMS as they require a less steep learning curve. This is

consistent with other studies on telehealth adoption where tools with fewer buttons and required low-tech were highly adopted [18].

3. **User empowerment:** tools like SMS reminders and routine follow-up voice calls to beneficiaries helped improve health outcomes. Many insurers looked at this as a cost saving opportunity through patient health empowerment that helped reduce re-occurrences of illnesses.
4. **Versatility of tele-platforms:** tele-platforms that supported more than one channel for example text and video or image sharing like Agnes, social chats spaces like WhatsApp or Facebook messenger were preferred for tele-consultation. This was also noted by another study on telehealth adoption by community nurses who preferred platforms that were flexible and supported more than one channel [19].
5. **Partnerships:** Strategic partnerships with different stakeholders included regulatory authorities like the Ministry of Health, software developing companies and private health insurance companies were important in the uptake and utilization of telemedicine. In addition, these partnerships assisted in fostering a favourable policy and regulatory environment for conducting telemedicine services in Uganda.

6.2 Barriers to telemedicine adoption among beneficiaries

The key informant interviews with Rocket Health senior management and medical service providers revealed the following as barriers to the adoption of telehealth by private health care providers:

1. **High cost** of airtime, internet, purchase of mobile phones among other digital tools was critical in determining access and usage of telemedicine.
2. **Lack of connectivity:** internet and network connectivity were poor especially in remote/rural areas. This affected delivery on services like tele-consultation which is important for efficient running of telemedicine centred medical services in regard to communication and services delivery like for Lab results among others.
3. **Legacy senior management** that lacked the appreciation of novel ways of service delivery often preferring to stay to traditional methods of healthcare delivery making integration and adoption of telemedicine models a challenge.

7. Health Insurance Cost-Benefit Impact

With the advent of coronavirus (COVID-19) pandemic and the Uganda Ministry of Health guidelines to curb its spread through prevention measures such as social distancing and avoiding congregations/crowding, a number of private health insurers took on the Rocket Health telemedicine centred medical services. This helped in continuity of medical service provision and for Rocket health, an increase in client traffic and income. Up to 4 private health insurance companies have incorporated telemedicine in their health service packages. This offered Rocket health a clientele base of over 1 million users at its disposal to interest in utilizing the convenience of telemedicine.

Electronic documentation of medical encounters from consultation to laboratory testing and pharmacy prescriptions improved financial audit transparency, a challenge private health insurers have had with medical service providers. This reduced fraud instances and saved the insurer exorbitant costs which increased trust and loyalty to Rocket Health as a preferred medical service provider.

The average cost of a medical tele-consultation was USD 3 compared to the traditional physical consultation that averaged USD 7. However, the cost of the entire medical journey from tele-consultation through accessing a laboratory and or pharmacy delivery services was averagely the same as that for traditional physical encounters at USD 22.

Partnerships with private health insurance companies contributed to Rocket Health's brand growth and awareness in the country. This fostered new businesses with entities like

small and medium scale enterprises (SMEs) that often-lacked financial muscle to cover the high costs of private healthcare insurance through designing affordable healthcare packages in form subscriptions premiums. In addition, global recognition of Rocket Health as a player in the telemedicine/telecare arena with accolades like the Commonwealth digital awards.

8. Conclusions

The adoption of telemedicine for medical services delivery by private health insurance providers is new in Uganda but the traction it has gained with 5 insurers adopting this model is a demonstration of its potential. This is further supported by Rocket Health's current monthly utilization numbers of 1,500 users as of October representing a 30% increment from the average 450 in previous months.

The popularity and lower cost of teleconsultation services in a setting where medical human resource challenges exist offers an opportunity to leverage digital technologies to overcome the low doctor to patient ratio in Uganda especially for remote and rural geographies. In addition, the tele-supported mobile medical service delivery for laboratory and medicine services helps to overcome barriers of access especially for persons living with disabilities and those with chronic conditions.

The preference for platforms that support more than one communication channels i.e., visual and text should be considered when developing or adopting telehealth faceted delivery especially if expectations and experience of both the provider and patient are to be met. More research is needed to understand the nuances to adoption and impact telemedicine has as a cost effective preventive approach to chronic care management in Uganda.

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