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Telemedicine options to address identified health needs in Botswana

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Abstract

Objective: Global efforts to implement national ehealth strategies have occurred, yet specific telemedicine implementations have fallen behind. A weakness inherent within many, perhaps most, national ehealth strategies, including Botswana's – is a lack of telemedicine focus. This is despite its potential to address many current healthcare system needs. The development of a telemedicine-specific strategy, to complement the existing ehealth strategy, has been proposed. This paper reports on an emulated process to determine prioritised health needs, identify broad solutions, consider ehealth and then telemedicine solutions, and prioritise these as insight for telemedicine-specific strategy development.

Methods: The eHealth Strategy Development Framework (eHSDF) was adopted and steps 5–7 were emulated. Key informants participated in telephone-based semi-structured interviews in November 2020, using a key informant interview guide. Participants were asked specific questions related to national health needs, proposed solutions, and prioritisation. The interviews were recorded and transcribed for analysis.

Results: Eleven key informants identified the top five perceived health issues as human resource shortages, congestion and overcrowding, prevalence of diseases, poor referral system, and lack of diagnostic and case management skills. Solutions were proposed, some of which included: Telehealth (including telemedicine), health informatics, and elearning. Telemedicine solutions included: a health professional help desk, teleconsultations, and apps for specialist referral. eLearning solutions were training, mentoring, and continuing professional development.

Conclusion: A telemedicine-specific strategy, addressing the identified health issues and aligned to the existing national ehealth strategy, would provide the required focus to enable the development and deployment of telemedicine activities in the country.

Keywords

eHealth strategy, health needs, telemedicine, telehealth, elearning

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Introduction

eHealth (the use of information and communication technologies (ICT) for health[1]) is broadly seen as a facilitator of health, and the importance of an ehealth strategy has been emphasised as a prerequisite for national and even local ehealth implementation.[2–4] However, many countries, perhaps more so developing countries, still have discrete and uncoordinated ehealth activities, experience policy barriers, suffer from 'pilotitis', or have experienced failed implementations.[5–7] Botswana has encountered each, but

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Table 1. Identification and summary description of sequential steps for the eHealth strategy development Framework.[4]

Step	Title	Description[a]
1	Evidence gathering and situational assessment	This Step identifies from scientific and grey literature the specific health issues of most importance to the jurisdiction, including their size and scope. It creates a solid, evidence-based and defensible foundation for the strategy.
2	Holistic review	Non-health-related factors may indirectly impact (facilitate or impede) resolution of health needs. This Step captures socioeconomic, political and environmental context of relevance.
3	Differential diagnosis	For different circumstances (geographic or facility-based) health *issues* and *settings* may at first seem similar, but a detailed examination of data from Steps 1 and 2 may reveal the real health needs are different, which may in turn alter the appropriate ehealth solutions ultimately considered. This Step identifies such circumstances.
4	Preliminary prioritisation	'Given resource limitations, not every option can be pursued; trade-offs are essential and enforcing choice purposefully limits the options'. This Step further characterises the previously identified health needs and resolves their priority ready for further review.
5	Identifying solutions	Knowing the identified health needs and understanding their relative priority, this Step seeks optimal and innovative solutions (not necessarily technological solutions) to the top 20% of the prioritised health needs from Step 4.
6	Considering ehealth solutions	This Step only now invokes ehealth solutions and identifies one or more 'technologically appropriate, culturally sensitive, or financially feasible' ehealth options for each of the prioritised health needs.
7	Secondary prioritisation	Where more than one option is identified for any single health need it is necessary to again prioritise which will be considered further. In addition, there may be several ehealth options overall for the top 20% Of prioritised health needs, and it is necessary to again prioritise which will be pursued. This crucial Step 'sets direction for allocation of resources and commits to a certain path of ICT infrastructure development and policy need'.

[a]Taken from reference.[4]

has also been proactive in strategy development. Three components of ehealth exist or have existed in the country; health informatics, telemedicine and elearning. The health informatics implementations are incomplete and only a few of the available modules for an Integrated Patient Management System (IPMS) have been installed. mHealth initiatives in telemedicine and elearning (mHealth being defined as 'the use of mobile wireless technologies for public health'[8] have been limited and funder dependent, and most have stopped,[9] although future growth is expected.[10]

Botswana is a land-locked country located in southern Africa. It has a relatively young population of ~2.35 million (2020), median age of 24 years, who are concentrated in and around the two major cities Gaborone and Francistown with an overall population density of only 4 people per km^2.[11,12] The country provides universal healthcare via a public healthcare system, delivered using a decentralised model focussed on primary care through a network of health facilities (hospitals, clinics, health posts and mobile stops) in 27 health districts (some private healthcare is also available).[13] Similar to many countries in sub-Saharan Africa, the healthcare workforce is limited: Physicians and nurses/midwives per 10,000 population were 3.4 and 28.4 in 2006,[12] and 4.0 and 42 (rural – 3 and 26; urban 9 and 77) in 2014;[14] physicians were 2.9 in 2018.[15] The WHO has identified countries with fewer than 10 doctors and 40 nurses/midwives per 10,000 as having 'insufficient healthcare professionals',[16] and projected that in the African region the needs-based shortage of health workers will worsen by 45% between 2013 and 2030.[17] Botswana appears well connected, with mobile cellular telephone subscriptions at 3.8 million and Internet subscriptions at 2.1 million in 2020.[18] Distribution and ownership of mobile phones (including smartphones) in Botswana is uncertain, but it is important to note that the above numbers represent active mobile SIM cards for all mobile devices, not unique cellphone owners.

The country's national ehealth strategy has developed over time. In 2004, Botswana's ehealth policy was incorporated as an addendum to the country's national ICT Policy. In 2015, Botswana developed a draft ehealth strategy premised on the WHO/ITU eHealth Strategy Toolkit,[19] which was approved for implementation in March 2020.

However, this strategy lacks a clear focus on telemedicine which could address some of the current health system's shortcomings and deficiencies in healthcare provision and delivery. This shortcoming has been identified resulting in a recommendation for a related telemedicine-specific strategy aligned with the existing National eHealth Strategy.[9] Telemedicine is described as 'The delivery of health care services, where distance is a critical factor, by all health care 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 for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities'.[20]

A scan of the grey literature by the authors found inconsistent strategy-related documentation across sub-Saharan African countries (health strategies, ICT strategies, ehealth strategies), but no telemedicine-specific strategy. Many documents were stale-dated. Even within the available English language ehealth strategy documents reviewed, telemedicine was often mentioned only in passing or not at all. To the authors' knowledge, there is no approved telemedicine-specific strategy for any country in the sub-Saharan Africa region.

While there is an absence of published national telemedicine strategies for comparison and guidance, as well as limited telemedicine strategy development guidance,[21,22] the literature does provide guidance on ehealth strategy development with perhaps four practical and detailed documents describing generic ehealth strategy development.[4,23–25] Of these, the 'eHealth Strategy Development Framework' (eHSDF)[4] was selected as the most suitable tool due to its theory-driven, evidence-based, and clear stepwise approach to strategy development, capable of being applied in local, regional, or national levels. The spirit and intent of the eHSDF are to develop an overall ehealth strategy that identifies specific ehealth solutions (telehealth, health informatics, elearning and ecommerce) for the specific evidence-based health needs of any particular jurisdiction. Because telemedicine is a subset of ehealth, the eHSDF should allow for the development of a telemedicine-specific strategy.

In the absence of the ability to fully implement the eHSDF process nationally, as is intended, it was emulated as an academic exercise. Seven fundamental principles serve to provide a foundation for the eHSDF, with the process having nine steps, of which seven are described in detail.[4] These are summarised in Table 1. The eHSDF has three basic constituent elements. The first series of steps (Steps 1 to 4) focus on identifying the specific health needs of the jurisdiction; the second series of steps (Steps 5 to 7) focus on identifying solutions and then specific ehealth solutions to the identified needs; and the final steps (Steps 8 to 9) collate the findings into a cohesive strategy (Step 8) and policy direction (Step 9). Thereafter further undertakings must occur, such as the development of the required enterprise architecture, as well as distinct business, readiness assessment, implementation, change management, operational and evaluation plans as required. Steps 1 and 2 and part of Step 4 have been previously reported.[9,26] Step 3 (Differential Diagnosis) relates to differing needs of distinct locales or populations within a jurisdiction, and given the focus on national strategy, this step was not emulated.

As its starting point, this study used findings from prior research that had surveyed 142 healthcare workers and patients, and identified 14 health issues of concern for Botswana.[26] The paper reports on the emulation of a component of Step 4, and Steps 5 through 7 of the eHSDF which focus on identifying overarching solutions and then specific ehealth solutions to the health needs previously identified. The study lays the groundwork for the final development of a telemedicine-specific strategy to align with, complement, and strengthen Botswana's formally adopted National eHealth Strategy.

Methods

Key informant selection and recruitment

A non-probability sampling approach was adopted. Key informants (KIs) were identified and were selected on the

Table 2. Key informant characteristics.

Designation	Sex	Position	Location	Role
KI-01	M	Doctor	Clinic	General practitioner
KI-02	M	Lecturer	University	eHealth expert
KI-03	M	Doctor	Hospital	General practitioner
KI-04	M	Lecturer	University	eHealth expert
KI-05	M	Professor	Research centre	eHealth expert
KI-06	F	Doctor	Hospital	Administrator/ manager
KI-07	F	Nurse	Clinic	Nurse
KI-08	M	Nurse	Clinic	General nurse
KI-09	F	Nurse	Clinic	ARV prescriber
KI-10	F	Nurse	Hospital	Ophthalmic nurse
KI-11	M	Information officer	Ministry	eHealth expert

basis of being experts, knowledgeable and involved in ehealth activities in Botswana. Sixteen KIs were approached; five did not respond. The remaining 11 (69%) were recruited; seven healthcare professionals and four ehealth experts (Table 2). According to Malterud et al.,[27] an adequate sample size for interview studies requires sufficient 'information power': 'Information power indicates that the more information the sample holds, relevant for the actual study, the lower number of participants is needed'.[27] Consideration of the five factors impacting 'information power' indicated eleven participants of diverse role and location (Table 2) was satisfactory. Healthcare professionals were participants of a prior survey who had consented to further contact. They were purposively selected as follows: three from hospitals and four from clinics (Table 2). Four ehealth experts were also purposively selected from academia (public–private sector health–related) and government (Table 2). They participated in a preliminary needs assessment and subsequent interviews.

KI interview process

KIs were e-mailed an information package, consent form, and a list of 14 previously identified health issues in Botswana. These health issues were identified in prior research based upon survey responses from 142 healthcare workers and patients.[26] Each KI was requested to review the information package and to read and sign the consent form. Once consented, their tasks were to: select the top five health issues ranking them according to their perceived priority; return the signed consent form, their list of selected and prioritised health issues; and indicate when they should be contacted for the Key Informant Interview (KII). Those without printing or scanning facilities could complete the process online (Google Forms). Upon receipt, a telephone-based KII was scheduled (in accordance with COVID-19 protocols and procedures prevailing at the time).

A KII guide was developed by the authors to conduct the semi-structured interviews in a consistent manner (Supplementary File 1). Participants consented to the interviews being recorded.

These KIIs were used to emulate Steps 4 to 7 in the eHSDF process as follows.

Step 4. Termed 'Preliminary Prioritisation' this step is intended to determine the priority health needs (and their associated characteristics).[4] Prior research had listed 14 perceived health issues.[26] Using this list, and prior to their interviews, each KI identified and prioritised their top 5 perceived health issues to be resolved within Botswana, listing them in order of priority. These results were collated and analysed using the Excel ranking function to create a ranked list of the health needs in Botswana requiring resolution The top five items from this list were subsequently presented to each KI during their interview.

Step 5. Termed 'Identifying Solutions' this step requires that *all* reasonable solutions to address an identified health issue are considered at the practice, process, or policy levels.[4] These are 'generic solutions' and are not only technical (ehealth) solutions. To emulate this step, KIs were asked to think of the best ways to address each issue on the consensus list

Step 6. Termed 'Considering eHealth Solutions' the eHSDF gives focus to the top 20% of identified health issues, and technologically appropriate, culturally sensitive, and financially feasible ehealth options are identified for each, whether telehealth, health informatics, elearning, or ecommerce related.[4] Having identified optimal approaches to address each identified health issue (Step 5), KIs were asked to identify which of these approaches might involve the use of ehealth? Informants were reminded that an 'eHealth Solution' could include health informatics (e.g. erecords; esurveillance), telehealth (teleconsultation; health-related apps), elearning (education of healthcare professionals and/or patients), or ecommerce (health professional reimbursement), or a combination. Participants were encouraged to brainstorm, focusing on concepts and not details.

Step 7. Termed 'Secondary Prioritisation' this step identifies priority ehealth solutions, based upon differentiation between potential options that would be considered *essential* to have, versus those either *good* or *nice* to have.[4] To correspond to this step, and having previously identified a variety of possible ehealth solutions to address each identified health issue (Step 6), KIs were asked to determine which of the identified solutions were most important, listing them in their own perceived order of priority.

Data analysis

This was guided by the qualitative data reduction process described by Adu[28] (raw data to relevant data to codes to categories to themes) and the thematic analysis process described by Braun and Clark[29] (familiarise to initial coding to themes to thematic review to defining and naming themes to reporting findings). Immediately after each interview, the recorded file was transcribed (Microsoft Word, Microsoft Corporation**,** Mountain View, California, USA) and confirmed and clarified using interview summary notes. Files were uploaded to NVivo 12 (QSR International, Melbourne, Australia) and the findings were systematically examined (visualised, reorganised, explored, and reduced) until codes or themes addressed all of the survey responses. Related sub-themes and duplicates were merged and recategorised. A code book was

generated and collaboratively reviewed, critically evaluated, and verified by all authors, before summarising the findings (Supplementary File 2).

Ethical approval

Ethical approval for this study was granted by the ethics committee in the Ministry of Health and Wellness of Botswana, and the Humanities and Human Sciences' Ethics Committee of the University of KwaZulu-Natal, South Africa.

Results

A ranked list of health needs in Botswana requiring resolution, created collectively by KIs prior to their interview, was created (Table 3).

Analysis of KII transcripts from Step 5 identified nine themes. These were: health human resource (HHR) shortages, congestion and overcrowding, prevalence of disease, poor referral system, lack of diagnostic and case management skills, medication shortages, reporting laboratory test results, transport shortages, and lack of medical equipment. The most prevalent related to HHR shortages. Results for each are described below.

Table 3. Summary and ranking of priority health issues (top 5 issues italicised).

Identified health issue	Rank
Shortage of doctors, specialists, and nurses	1
*Prevalence of diseases (TB, blood pressure, cancer, HIV/AIDS, malaria, CVD)**	2
Inefficient/poor referral system	3
Lack of medical and drug supplies	4
Congestion/overcrowding at healthcare facilities	4
Lack of diagnostic and case management skills	6
Transport shortages	7
Delayed reporting of laboratory results	7
Lack of medical equipment	9
Costs of accessing healthcare facilities and services	9
Lack of ICT knowledge	9
Poor quality of healthcare	9
Increased patient workloads	9
Loss of patients to follow-up or monitoring	9

*TB: tuberculosis; CVD: cardiovascular disease.

For 'HHR shortages', KIs noted the need for government intervention to establish policy and provide financing that addressed the pervasive shortages. '*I think the biggest problem in Botswana with, with why they have such a shortages is that they can't retain healthcare workers'*. (KI-06) with this and other KIs identifying issues such as poor wages and a difficult work setting. Proposed solutions included recruitment and retention strategies, improved working conditions and remuneration, cross-sector employment (private and public sectors), and greater use of family nurse practitioners. These shortages also impacted the referral system (below) prompting suggestions of the need for a proper HHR allocation plan, more equitable distribution of healthcare providers (specialists, nurses and doctors), task shifting, creation of community health educators, and policy changes that permit village nurses to refer directly to specialists.

In relation to 'congestion and overcrowding at healthcare facilities' the majority of KIs ($n = 8$) believed scheduling and queuing, healthcare worker collaboration, local service provisioning and specialist deployment, and establishment of Centres of Excellence were the most appropriate solutions. One ehealth expert noted the need for '*a module like an appointment module or a scheduling module'* (KI-04) that could be used for booking purposes. It was noted that good primary healthcare and health education of the public could help prevent the contraction or development of some diseases and reduce the numbers that fall ill. It was further noted that there is a relationship between HHR shortages and congestion, recruitment, and training. Thus KI-01 noted '… *tackling some of these [issues] we have highlighted up there will remedy a bit in congestion. For example, if you have no shortage of doctors and specialists, it means people are seen early and treated early when they need specialist services. They don't congest and then, then if you prevent disease, well, you have a good primary health care that stops people from getting sick'*. Alternatively KI-10 focused on patient education as a means of reducing congestion and overcrowding; '*if we can emphasise more on primary health care, that is education. People can know how they can prevent themselves from contracting certain diseases. And if they can prevent themselves from contracting certain diseases, it means that not many will go to the facilities because they won't contract diseases'*.

To directly address the 'prevalence of diseases' nearly all KIs ($n = 10$) indicated the government should focus more on preventative care than curative care, emphasising primary healthcare and education, including school health. One participant (KI-07) suggested greater use of

family nurse practitioners empowered to assist physicians; *'[FNP] … is an assistant to the doctor, they can do more as compared to just nurses who are, some of them are just certified nurses, …'*. Overall there was again support for refocusing on primary healthcare and extensive education. Thus KI-06 stated '*… so to reduce the prevalence of diseases, I think the really big thing that needs to be done is focusing on prevention, which I don't think is done. Usually it's wait; people wait until they're very sick until they they get cancer, they get diabetes, they get heart disease, until they do something about it'*. Similarly KI-10 reflected: '*During those years back, there were community Family Welfare educators who just go into the community to do the education. But nowadays it [has] ceased, we just wait at the facility for the patient to come when they're sick. That's the first point that we have to do. Even the other things we have to teach. Like in schools, things like school health, we no longer emphasise on school health, we no longer do it timely. It has just collapsed. If we can do those things, we can treat most of the conditions*'.

Regarding the 'poor referral system', most KIs ($n = 9$) believed technology could be used to address the needs by, for example, avoiding unnecessary referrals and making the process more direct and swifter. It was stated that more effective communication and coordination amongst healthcare providers could improve feedback to the referring provider; KI-07 lamented the loss of experiential learning that could be gained through effective consultation '*The referral system which you are talking about, we never get the feedback so that next time we know how to take care of this patient at the end of the day. We used to have, but now we are not having the feedback*'. Also, the creation of Centres of Excellence could more clearly profile specialist services to better inform patients. Importantly, other needs were noted to affect the referral system, including HHR shortages, equitable distribution of skilled HHR, and adequate medications and other supplies. Another KI lamented the lack of feedback which would allow ongoing learning, thereby enhancing future healthcare delivery: '*The telemedicine like I've already said when you talk to a specialist, he will direct you on which, which specialist to book that patient. Instead of just booking a patient waiting for three, four months to be seen, only to find out that he doesn't belong to that specialist You need to also to rebook again. So it's faster'* (KI-09).

Almost two-thirds of the participants ($n = 7$) discussed potential solutions to the perceived 'lack of diagnostic and case management skills'. To raise these skills suggestions included remote learning, and videoconferenced in-servicing training, case sharing, case discussion, and case investigation. For example, KI-08 stated '*the best way is to go to the root of the problem, which is to teach about health issues'*. Use of mobile diagnostic apps was proposed as a means to provide access to up-to-date case management guidelines and treatment algorithms, facilitate triage and referral of urgent cases, and (enabled with Artificial Intelligence and physician support for diagnosis and management) assist nurses to treat patients directly (e.g. teledermatology). KI-06 spoke quite futuristically about the potential of ehealth: '*So ehealth tools, like I mentioned, diagnostics, support tools, are directly made to help with these types of problems. And also, artificial intelligence, which can be built into applications, has a huge potential to improve diagnosis and treatment, especially for medical specialties that just aren't present as much, in Botswana. For example, I'm a dermatologist and there just aren't that many dermatologists and most of the people with skin diseases are making it to local healthcare facilities and they're treated by nurses and if nurses were armed with a mobile diagnostic support tool that had artificial intelligence, they would be able to significantly improve their ability to to take care of patients and to like actually have quality patient care'*.

Overall, KIs believed such approaches would result in better patient outcomes and improve the quality of future service delivery as experience in the field is gained. Mandatory continuing professional development (CPD) for physicians, similar to nurses, was noted, as was the inclusion of evidence-based medicine and clinical practice guidelines by training institutes for CPD. KI-01 was quite vociferous in this regard: '*This one has to come with issues of continuous medical education where it should be mandatory for all health workers to be at par with the common trends which are happening. And the training institutes should come in here I'm talking about University of Botswana, the medical school, and all nursing departments where training is happening. It shouldn't be only in terms of training, but it should be also in evidence based medicine, where you come up with recent ah proven ways of dealing with each case and coming out with protocols of management'*.

Participants noted the problem of 'medication shortages' to be associated with poor resource management rather than financing (procuring incorrect medications; allocating nearly expired medications; provision of incorrect alternatives). KIs indicated these required policy changes not only the use of medication management/inventory management systems with collaboration and effective communications between healthcare facilities and central medical stores. One KI implied redistribution of medications through '*monitoring the usage in other facilities to streamline and efficiently distribute drugs in time*' (KI-08).

To permit prompt reporting of 'laboratory test results' the introduction of laboratory information systems, fully automated and integrated to SMS platforms, was the only recommended solution, and this by only one KI. Although a laboratory module exists in the IPMS, installed in all government hospitals and some clinics, most

Table 4. Summary of key informants' ehealth solutions to identified health issues.

Identified issue	Telehealth	Health informatics	eLearning
Human resource shortages	mHealth, voice calls, video calls; teleradiology	-	eLearning; eTraining
Congestion and overcrowding	Apps for specialist referral and teleconsultation	EMR, EHR, HIMS	Surgical mentoring
Prevalence of disease	Surveillance telehealth virtual remote support	Surveillance EMR	-
Inefficient/poor referral system	Telehealth (telemedicine specialties)	EMR	eTraining
Lack of diagnostic and case management skills	Telehealth, telemedicine specialties, apps, professional helpdesk	EMR	eLearning
Medication shortages	-	EMR, Medication management software	-
Delayed laboratory results	LIS and automated SMS	EMR, LIS and automated SMS	-
Transport shortages	Drones	HIMS	-

EMR: electronic medical record; EHR: electronic health record; HIMS: health information management system; LIS: laboratory information system; SMS: short message service.

participants indicated that IPMS (the most widespread ehealth solution in Botswana) was a failing system. Generally, clinicians rarely use it, being perceived as not user friendly and unavailable when needed. Responses varied, but all indicated issues with the IPMS: '*But I think from the assessments that we have done in the audits that have already been done, it's quite clear that IPMS is not as user friendly as one would like*' (KI-11); '*… it works but it needs a lot of implements. In the sense that once you input a patient national ID, it should give you all the details about them. Their demographic information, next of kin, such things - then there's options for the labs, the medications and the other procedures that were done. But only a few patients here and there can actually find such a detailed record*' (KI-08); '*Well, with [the] little experience that I have with interacting with people using the system is that even though IPMS might have all these modules, it also has its own shortfalls that may be has resulted in people not fully utilising its capabilities*' (KI-02). Two KIs specifically noted a lack of interoperability with and between existing erecord systems: '*I am talking like this because I'm in the process of actually designing one [IPMS], but there are a few [10] systems that are isolated, which is not the best, the best state'*. (KI-05); '*I think that is a huge priority to have a better system than there is now because currently, the system isn't really being used to its full potential and has a lot of; it's very outdated and doesn't communicate well between different centres'* (KI-06).

As a resolution to 'transport shortages' some KIs ($n = 3$) recommended investment to ensure adequate ambulances and auxiliary transport, noting at one time each clinic had had its own vehicle to facilitate referral; KI-07 reminisced '*… I think we used to have a good system whereby each and every clinic had a vehicle. If it has a maternity, the maternity will be having its own vehicle, the OPD will be having its own vehicle. There would be a drivers and that was good because each and every clinic, when you have a patient you just load the patient to the nearest referral hospital'*. Drone technology was proposed for medication deliveries (with government regulation). The final issue related to the 'lack of medical equipment', with informants indicating the government should invest in modern equipment and fully equip both healthcare workers and healthcare facilities.

Subsequently, as part of Step 6, informants were asked to refocus and identify possible ehealth solutions (telehealth, health informatics, elearning or ecommerce) to address the above-perceived health issues and potential solutions. There was a clear belief that ehealth could help in diverse ways: '*ehealth decentralises the need for health services where you can get everything anywhere through its means*' (KI-01); '*… certain management, like the apps [ehealth] for algorithm, when somebody come[s] in complaining with [something], following the algorithm; and assist also patients who are in the periphery especially where there are no specialists. I think they can be of necessity in terms of early diagnosis and proper management of conditions'* (KI-10). Possible ehealth solutions were identified for all but 'lack of medical equipment', and no solution involved ecommerce (Table 4).

Step 7 (Secondary Prioritisation) identified three dominant ehealth solutions that were endorsed by key informants: telehealth, e.g. adoption of telemedicine specialties and surveillance tools; health informatics, e.g. electronic medical records and associated software tools such as decision support software; and eLearning, e.g. mandatory CPD for clinicians. Policy changes would facilitate such initiatives.

Discussion

Building on prior research that identified health issues of concern to Botswana,[26] and through emulating several steps of the eHSDF, this study has collected evidence regarding potential ehealth solutions to these issues supporting the need for the development of an effective telemedicine-specific strategy. KI interaction and interviews identified priority health issues, proposed solutions to each identified health issue, identified which proposed solutions could benefit from ehealth applications, and ultimately distinguished priority ehealth solutions. Three dominant ehealth categories were endorsed by key informants: telehealth, health informatics, and elearning. Possible telemedicine solutions could address several of the identified health needs for Botswana identified in Table 3. HHR shortages (including 'ehealth' HHR shortages) were found to be central to most of the identified issues. This provides a clear area of focus, since tackling this problem would also positively impact related but peripheral problems. For example, CPD and videoconsultation could enhance local skills and clinical abilities, improving patient outcomes, healthcare worker satisfaction, and easing upstream (referral facility) overcrowding. Other identified challenges included the prevalence of diseases, poor referral system, lack of diagnostic and case management skills and medication shortages.

For the process in Botswana, the following health needs were identified: a critical shortage of healthcare workers, the prevalence of diseases, poor referral system, congestion and overcrowding at health facilities, lack of diagnosis and case management skills of healthcare workers, as well as medication shortages. These findings are not unexpected, as they reflect the reality of many developing countries.[30–32] Significantly, telemedicine (as defined) can aid in addressing some of these issues at the practice and process levels and can be enabled at the policy level. Indeed, creating a conducive setting for some ehealth solutions may require policy changes to support investment and aid integration into healthcare systems, recognising the economic, social, and organisational factors that affect sustainable implementation.[7,33]

The COVID pandemic remains unresolved. Many examples have been described of the use of ehealth to address and resolve aspects of the provision of medical services during the COVID-19 pandemic and it is speculated that its use will be ongoing post-pandemic.[34–37] However, of note is that despite the KIIs taking place early in the COVID-19 pandemic (prior to a clear understanding of its severity and longevity) it was not raised as a priority healthcare issue in any KII, although noted by two KIs. The key issue identified was the shortage and maldistribution (urbanisation) of HHR impacting healthcare delivery, particularly in rural areas, which has been described in five categories: provider shortages, maldistribution, quality deficiencies, access limitations and the inefficient utilisation of health care services.[38] Whilst telemedicine cannot immediately increase the number of qualified healthcare workers, it can impact access to and effectiveness of the existing workforce. Thus mHealth, one component of telehealth, has been successfully used to address many purposes including chronic diseases, infectious diseases, health monitoring and surveillance, behaviour change, and mental health.[39–42] Similarly, telemedicine can ease referrals[39] and improve the referral process,[43] having knock-on effects that decrease congestion at referral centres.[44] In addition, telemedicine can improve local clinical care and skill levels through consultation and formal (online elearning programmes) and informal (experiential learning) education, enhancing diagnostic and case management skills.[45,46] The issue of medication shortages often has more to do with maldistribution and poor supply chain management leading to wastage,[47] and ehealth solutions may crossover between health informatics and telemedicine through national and facility focused software programs to monitor the process.[48]

Despite the above, telemedicine can also impact the number of qualified healthcare workers. Indeed, the use of Technology Enabled and Enhanced Training (TEET)[49] has had to be rapidly employed and expanded due to the COVID-19 pandemic.

The development of a complementary approach distinct from an existing ehealth strategy is not entirely new, with Ethiopia and South Africa having developed parallel mHealth strategies to supplement their existing ehealth strategies.[50,51] Although it is generally believed that most

sub-Saharan African countries have ehealth strategies, the authors' knowledge suggests the contrary. Many are not true national ehealth strategies (lacking the orderly, systematic, and progressively derived detail developed through following the eHSDF), but instead are often national 'ICT' strategies, or national ehealth 'policies', 'roadmaps', or 'frameworks'. In the absence of widely accepted definitions in the context of ehealth, these can be characterised as: statements of a desired course of action to adopt ehealth (policy), more perfunctory descriptions of a plan to embark on the widespread use of ehealth (roadmaps), or basic ideas for a structure to support ehealth use (frameworks). More importantly, many such documents are often not current, having lapsed, and not been revised, updated, or re-instated. No sub-Saharan African country has a telemedicine-specific strategy, and other countries have no evidence of any form of ehealth or telemedicine-specific strategy documents. This may be an indication that several countries could be struggling to use the available ehealth strategy development guidance. For example, Bhaskar et al.[52] noted the need for 'Increased strategization' for development in 'countries with limited access to current telehealth'. These authors concluded that 'government support of telemedicine partnerships are required to set the groundwork in many countries'.

There is a belief that telemedicine could positively impact health delivery system performance in a developing country, when deployed in a strategic way. It was proposed that a telemedicine-specific strategy for Botswana, premised on a sound evidence base, be developed to enhance the country's current ehealth strategy document.[26] Therefore, this current study adopted a novel stepwise approach to enhance the development and deployment of ehealth services in Botswana and elsewhere by focusing on telemedicine.

Limitations

The absence of the ability to fully implement the eHSDF process nationally, as is intended, led to the emulation of the process as an academic exercise. While of value, this experience has confirmed the need for a national and more granular approach. It is recommended that governments lead and fully implement the eHSDF process nationally. Performing an emulation with larger numbers of KIs from geographically dispersed locations nationally may prove satisfactory as a preliminary step.

Conclusion

This study has provided the additional insight needed to develop an evidence-based telemedicine-specific strategy, complementary to Botswana's existing national ehealth strategy, enhancing its ability to address identified health needs. Despite limitations, the emulation approach described could be adopted and adapted by other developing countries to swiftly and inexpensively identify their own national health issues and determine which are amenable to telemedicine interventions.

Ethics approval: The ethics board of the University of KwaZulu-Natal (HSSREC/00001506/2020) and the ethics committee of the Republic of Botswana Ministry of Health and Wellness (HPDME 13/18/1) approved this study.

Guarantor: MM

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