






# Exploring Healthcare Workers' Perceptions of Digital Healthcare Support Platforms: The Case of NurseConnect

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**Abstract.** The provision of professional and psycho-social support for healthcare workers (HCWs) is integral to the delivery of high-quality care worldwide. New digital health platforms (DHPs) are being developed to support healthcare workers in delivering patient care during stressful times. However, as these new support technologies become more widely available, healthcare workers may need clarification about how to integrate them effectively into daily practice. This qualitative study explores the perceptions of nurses and midwives towards a nationally rolled out DHP called NurseConnect, which is aimed at improving maternal and newborn clinical knowledge of HCWs to understand better how digital healthcare support platform tools might be integrated into daily patient care. In-depth semi-structured interviews of purposively sampled three accoucheurs (male midwives), three midwives, and three public hospital nurses were conducted. An inductive thematic analysis approach highlighted overall pessimism, manual workarounds, and abandonment of the digital platform due to negative perceptions of lack of awareness, low usefulness, and poor usability. The study proposes the need for integrating the NurseConnect platform into the employee work practice policies, targeted promotion of platform benefits, and the digitization of guidelines and textbooks that workers use to improve the current healthcare process. A longitudinal nationwide mixed-methods study should be undertaken to probe further the value and impact of digital healthcare support platforms.

**Keywords:** Digital health platforms · Non-adoption · Healthcare workers · Nurseconnect

## 1 Introduction

There has been a rise of digital health platforms (DHPs) in the past few years due to their usefulness to healthcare workers and patients worldwide [1]. The broad digital health platforms category encompasses mobile health (mHealth), telehealth, telemedicine, and wearable devices [24]. The goal of these platforms varies widely. In South Africa, two national digital healthcare platforms are intended to support patients; the MomConnect messaging service and the NurseConnect support platform to help nurses and midwives [3, 21]. Generally, digital health platforms are an example of healthcare innovation, as

they provide a platform in which digital technologies facilitate patients' and healthcare workers' participation in the healthcare delivery process [14]. However, there is a small number of DHPs in general in low and middle-income countries (LMICs) [9]. Among the reasons is the lack of funding, digital skills, and technological capabilities amongst healthcare workers (HCWs), despite DHPs having the potential to improve the quality of their work [3]. The lack of healthcare workers' involvement on the development phase of the platform ensures that the platform is fit-for-purpose to increase their digital capability [11]. The lack of digital health policy and strategy plays a significant role in non-adoption, resistance, and negative attitude towards DHPs [6, 30].

This paper aims to qualitatively explore the perceptions of HCWs, specifically nurses and midwives, towards the nationally rolled-out digital healthcare support platform, NurseConnect, which aims to improve maternal and newborn clinical knowledge through the provision of professional and psycho-social support for healthcare workers in South Africa. The rest of the paper is structured as follows: Sect. 2 is the literature review, Sect. 3 will cover the research design, Sect. 4 will present findings for this study, and the last section will be the conclusion and recommendations for future work.

## 2 Literature Review

### 2.1 Digital Health Platforms

The implementation of DHPs needs to be integrated into the daily routines of healthcare workers to eradicate the manual work they are expected to perform to succeed [26]. DHPs intended for patients should be educational, enable independence, and ease patients' frustrations in public and private healthcare facilities during processes such as appointment booking [11, 28]. DHPs for patients and healthcare workers should be based on the actual access criteria evaluation, which must be integrated into the patient or healthcare worker's day-to-day activities [8]. The criteria for access evaluation include, but are not limited to, a) physical access to the app to evaluate whether the initiative is accessible to the users and highlights barriers that may hinder their accessibility, b) appropriateness of the app to evaluate whether the app is suitable for the needs of the intended users [28], c) integration to daily activities to evaluate whether DHPs have any disturbances on the daily activities of the users and d) relevant content to evaluate the content of the app [9]. Further research, education, and evidence-based tools are required to support nurses in helping patients select, initiate, and sustain the use of digital health platforms to improve health outcomes [11].

Even though DHPs have an advantage in the overall healthcare practice, healthcare workers in LMICs need to receive the necessary support [5]. DHPs are helpful as they add value to healthcare facilities, healthcare workers and patients with educational content that empowers them to overcome challenges that they encounter on a day-to-day basis [29]. The benefits encompasses; improvement of healthcare process since majority of the processes are manual, seamless sharing of electronic healthcare records to eradicate paper-based, sharing of healthcare information through the utilization of telehealth, easy access to medical records for patients, patient-to-patient online portals for communication, support for healthcare workers who practice in areas with inadequate resources with important health information to raise awareness to patients and citizens, as well as

support for patients who need remote treatment to alleviate healthcare facility visitation to patients with limited transportation.

## 2.2 mHealth Adoption in South Africa

Mobile health technology is significant to healthcare workers who practice in areas where patients have inadequate access to quality healthcare and substantial health information to raise awareness [1]. The purpose of mHealth applications is to assist healthcare workers with educational content, create awareness about various health topics, support diagnostic treatment and provide telemedicine to patients who reside in areas with inadequate access to healthcare services [11]. mHealth technologies must emphasize the type of communication and the level of interaction, as shown in Table 1.

**Table 1.** Types of mHealth Applications [3].

Type of communication	Level of Interaction (with the user)
Text Messaging	<ul style="list-style-type: none"> <li>• Appointment reminders</li> <li>• Health Education &amp; Awareness notifications</li> <li>• Emergency button connected to a health facility</li> </ul>
Mobile-site services	<ul style="list-style-type: none"> <li>• Read the full educational article on the site</li> <li>• Complete patient surveys</li> <li>• View patient medical records</li> </ul>
Voice messages	<ul style="list-style-type: none"> <li>• Staffed information lines</li> <li>• Read messages to visually impaired patients</li> </ul>
A mix of voice & video messages	<ul style="list-style-type: none"> <li>• Instruction videos, for example to expecting mothers or patients with chronic illness</li> <li>• Mobile telemedicine</li> </ul>
Text messaging	<ul style="list-style-type: none"> <li>• Appointment reminders</li> <li>• Health Education &amp; Awareness notifications</li> <li>• Emergency button connected to a health facility</li> </ul>
Mobile-site services	<ul style="list-style-type: none"> <li>• Read the full educational article on the site</li> <li>• Complete patient surveys</li> <li>• View patient medical records</li> </ul>
Voice messages	<ul style="list-style-type: none"> <li>• Staffed information lines</li> <li>• Read messages to visually impaired patients</li> </ul>

mHealth initiatives lack value and innovation for the targeted population, which hinders the advantages of mHealth utilization to individuals who reside in low and middle-income countries (LMICs) [7]. The possibility of the patient data breach to malicious attacks [20] indicated that health facilities do not have technologies that protect patient data due to the non-existence of response from the security, risk, and compliance. Scholars also discovered that “more experienced healthcare workers seem to be less digitally capable compared with their younger counterparts” thus non-adoption of these

[1, 28]. The non-adoption of digital health platforms is problematic since healthcare workers are expected to perform manual work for capturing, accessing, and storing patient data. This replicated effort triggers frustration to healthcare workers, which has an impact on quality health delivery to patients [12]. Finally, DHPs have the potential to improve the lives of patients who reside in areas with inadequate access to healthcare [10]. Thus, it is imperative for LMICs to adopt DHP strategies that are currently implemented in HICs, to improve the digital capability of healthcare workers and patients [11].

### 2.3 Digital Applications in Health

Real Access to technology is put into effective use to analyze all issues for lack of access to technology [17, 18, 25]. This centers on several elements that ICT developers must incorporate for users, to eradicate non-adoption of DHPs. The first elements are physical access to technology which aims to understand whether the initiative is available to the users, by highlighting the barriers that may hinder accessibility e.g., network coverage and access to smartphones. Appropriateness of technology aims to understand whether the mHealth initiative is suitable for the needs of the intended users. Suitability can be assessed through capacity, user friendly and language use. Language use aims to understand whether the messages sent are clearly understood by users. Affordability of technology aims to understand whether the users can afford DHPs in the context of mobile data since South Africa is experiencing a challenge of high data prices. Integration into daily routines aims to evaluate whether the new DHP will not have any disruption to the daily life of the user.

High income countries (HICs) such as Canada, the United States of America, the United Kingdom, and Australia have shown success in DHP adoption, through the application of the above-mentioned elements [27]. In 2015 Canada launched the Omama Project which assists expecting and existing mothers with maternal and child health information [1]. In 2017 United Kingdom introduced the peanut app to help new and existing mothers with peer-to-peer education where they converse about antenatal and postnatal care [13]. The center of perinatal excellence (COPE) supports mothers and fathers with emotional support of being a parent and was launched in Australia. The app supports parents until the child is one year old, which has similar features with the MomConnect messaging service [6].

There are more than a few DHPs that have been implemented in LMICs with an intent of assisting healthcare workers and patients [13]. While the majority of these DHPs were in the pilot phase, a minuscule number of them have not been enhanced ever since [9]. MomConnect messaging service was launched in South Africa in 2014 to assist pregnant women and first-time mothers with antenatal and postnatal care information [28]. The messages are sent via SMS and WhatsApp three times a week, the initiative is implemented in line with the principles of mobile alliance for maternal action (MAMA) [2]. Integrated healthcare information service through mobile telephony (IHISM) is a mobile phone-based patient record and assists citizens with general health queries via text messages [3]. Free AIDS Test was launched in Ethiopia to educate, raise awareness, and encourage citizens using text messages to test for HIV/AIDS [15]. The author further elaborated about CellPhones4HIV, which was launched in South Africa to send

HIV/AIDS text messages to patients and raise awareness about mother-to-child HIV transmission.

## 2.4 The Nurseconnect Support Platform

The South African National Department of Health (NDoH) implemented a national health digital strategy to support patients, citizens, and healthcare workers for quality healthcare delivery [19]. The Nurseconnect support platform is an association of the MomConnect messaging service that was officially presented to the public by NDoH in 2016. The platform aims to support nurses and midwives in their everyday routines with clinical knowledge and professional and social support [21]. Users subscribe by following unstructured supplementary service data (USSD) or Mobile-sites guidelines. On successful registration, a short messaging service (SMS) is sent to the user to confirm the registration. A clinical code is mandatory for all midwives and nurses who anticipate registering to the platform. As shown in the below illustration derived from the mobile platform site (Fig. 1).

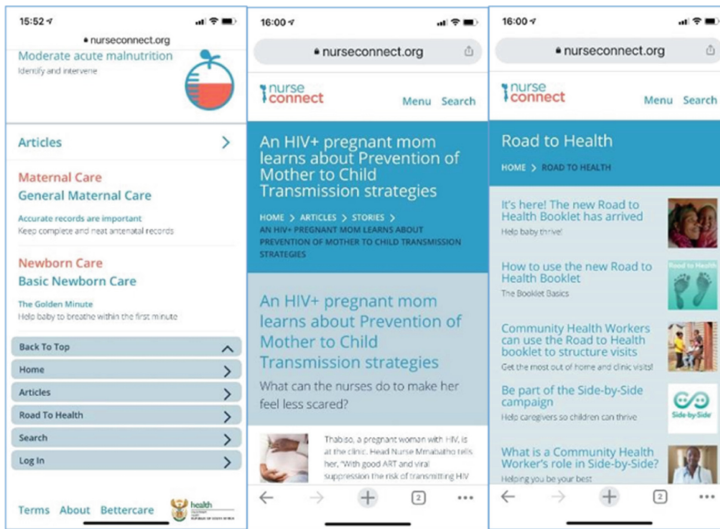


Fig. 1. The nurseconnect support platform – mobile site [21].

The Nurseconnect support platform messages are sent two times a week via SMS. Each educational or motivational message entails a link to redirect users to read the complete article on the Nurseconnect mobile site. The mobile site has the following features on the homepage; daily topic, search, road to health, back to the top, login, terms, about and better-care.

## 3 Research Design

### 3.1 Methodology

This study is exploratory and follows a qualitative research methodology [22]. The qualitative, inductive, interpretive research methodology was deemed suitable for this study as it enhances a deeper understanding of the perceptions and experiences of healthcare workers regarding digital health platforms [16].

### 3.2 Participants

This study was conducted with nurses, and midwives in maternal and child healthcare or family planning in South Africa. A semi-structured interview instrument was employed, and a mobile phone was utilized to collect data from the participants. A purposive sampling technique was used to purposefully choose nurses and midwives within the healthcare fraternity since Nurseconnect is intended for them. The audio data gathered from the interviews was transcribed from audio to text, and no automated voice transcribing tools were used. A total of 9 participants were interviewed (see Table 2). All personal information of the participants was removed from the data using audio editing software. The illustration below depicts the summary of the participants.

### 3.3 Data Collection

Face-to-face interviews were conducted over three months in 2019. The duration for each interview was between 30–60 min on average; each interview transcript was three to seven pages long. Participants were allowed to use their home languages thus four South African languages and English was used by participants. Figure 2 illustrates an example of an interview transcript from NVivo for Midwife four and five with a combination of English & isiZulu.

The data gathered from the interviews was safely stored in the UCT OneDrive Cloud Storage. The data gathered was first analyzed manually using Microsoft excel packages and the second round of analysis was done in NVivo. The reason for analyzing data in two steps was to have an overall understanding of the data collected by going through each line of the transcript iteratively, so that no code words or phrases are omitted if the researcher used a computer-assisted qualitative data analysis software (CAQDAS) like NVivo, ATLAS.ti, HyperRESEARCH, MAXqda2 and QDA Miner [23].

### 3.4 Data Analysis

Thematic analysis is an approach used in qualitative research to analyze data to categorize themes after data has been gathered from the sample [16]. Hence thematic analysis was used to analyze the collected data from the nurses and midwives. This approach follows six phases to identify themes which emerged during data analysis for this study, namely, familiarize yourself with the gathered data, generate initial codes, search for themes, review themes, define and name themes, and produce a report [4].

**Table 2.** Semi-structured interviews participants

Unique name	Occupation	Language	Municipality	Analysis tools
NUR001	Nurse	English & isiXhosa	City of Cape Town Metropolitan Municipality	Microsoft Excel & NVivo
NUR002	Nurse	English & Tswana	Ngaka Modiri Molema District Municipality	Microsoft Excel & NVivo
MID001	Accoucheur ( <i>Male Midwife</i> )	English	City of Cape Town Metropolitan Municipality	Microsoft Excel & NVivo
MID002	Midwife	English & isiXhosa	City of Tshwane Metropolitan Municipality	Microsoft Excel & NVivo
MID003	<i>Midwife</i>	English & isiXhosa	Inxuba Yethemba Local Municipality	Microsoft Excel & NVivo
NUR003	<i>Nurse</i>	English	Sedibeng District Municipality	Microsoft Excel & NVivo
MID004	Accoucheur ( <i>Male Midwife</i> )	English & isiZulu English & isiXhosa	Cape Winelands District Municipality	Microsoft Excel & NVivo
NUR004	<i>Nurse</i>	English & isiXhosa	Inxuba Yethemba Local Municipality	Microsoft Excel & NVivo
MID005	Accoucheur ( <i>Male Midwife</i> )	English & isiXhosa	City of Cape Town Metropolitan Municipality	Microsoft Excel & NVivo

### 3.5 Ethical Considerations

The researcher had a duty to safeguard consent and confidentiality for all participants, therefore a letter of consent was circulated amongst all participants to voluntarily participate in this study [23]. The researcher utilized five components with all nurses and

What do Nurses and Midwives understand about mHealth technologies in maternal healthcare?	What do Nurses and Midwives understand about mHealth technologies in maternal healthcare?
<p><b>Interviewer:</b> Are there any mobile applications or sites you use to source maternal and family planning information?</p>	<p><b>Interviewer:</b> Are there any mobile applications or sites you use to source maternal and family planning information?</p>
<p><b>Interviewee:</b> No my brother we don't have any mobile applications, but here is the thing we have what we call Perinatal Problem Identification Programme (PPIP), <i>yha</i>. So in those meeting we are talking about mistakes done by nurses/ patients or discuss maternal deaths if there's any so <i>yha</i>, we conduct these meetings once a month. If there is a doctor or nurse or advanced midwife would present on a specific topic. So we don't have an app specifically to that, I only use these meetings with my colleagues. I use a dictionary called nurses dictionary but there is another called midwifery dictionary so there are two. A lot of terms I don't know I refer to it, if I left the dictionary at home I use my own data then and search on the internet.</p>	<p><b>Interviewee:</b> Yes, you know we have now a recent App <i>konje</i> what is that App <i>errr</i>... I have it here in my phone, we have a <i>mack wheel</i>, it's an app that is integrated with all baby maternal and women's health. For an example if someone comes to do family planning and you want to see which is the suitable method you can use. You can just take their age, weight and align them, the wheel will give you some of the possibilities that you can use. For now we have <i>ama</i>-guidelines which have been turned into app, your maternal guideline you can access it in a way of an App. Other than going to page in a book.</p>
<p>Another thing I downloaded an app called 'Obstetric Wheel', so it predicts the expected delivery date and we assess the information for pre-term labour reasons (giving birth to a premature baby). One of the reasons for pre-term labour is infection, factual union, home-made herbal medications, alcohol and tobacco on the first trimester (forty divide by three).</p>	<p><b>Interviewer:</b> Is this App funded by NDoH?  <b>Interviewee:</b> Yes, you know because <i>ukuthi manje</i> I cannot see the app in my phone I have not been using it for long. I remember installing it, <i>yhaaaa its Impilo Healthcare</i>. Do you know <i>Impilo healthcare</i>?</p>

Fig. 2. Interview transcript for MID004 & MID005

midwives who participated on this study; (I) any personal information like name, a surname of the participants was kept confidential therefore each participant was given a unique name MID/NUR with a number (all indicators that could suggest the identity of the participants were deleted from the data, using an audio editing software), (II) the questions for the interviews were not sensitive or instigated any harm to participants (III) participants were informed prior to the commencement of the interview that they will be recorded and a letter of consent was issued to obtain their signature (IV) participants had a right to withdraw after the interview and their answers were removed by researcher from this study and, for example NUR005, was removed as per her request.

## 4 Findings and Analysis

The selected participants were interviewed through a semi-structured interview research instrument via WhatsApp, Microsoft teams, Google Hangout and Zoom. The interviews were conducted on participant convenience to ensure that the researcher acquired more in-depth information until no further significant insight was yielded by the analysis. Five themes emerged from the data that was collected, the following sections present the themes and findings.

### 4.1 Perceived Usefulness

Participants stated that the Nurseconnect support platform is unresponsive, particularly when nurses and midwives require clarity on the information that is sent to them, "... They take very long to respond sometimes, and it made me wonder – because sometimes I would need an answer now-now(immediately)" (MID005). NUR003 stated that it is essential for National Department of Health (NDoH) to recruit more employees on the helpdesk to assist with all related queries "...delegated personnel who will act as point of contact to assist nurses / midwives with emotional and psychological support" (NUR003). The current communication process is one-way, and this created a barrier for users who want more details on the messages they receive, "...I send this you send this, if I don't understand anything I send you an SMS you reply to me, so it was a one-way thing, they would send us SMS's, but we couldn't have communication *wa bona*"



(NUR002). Thus, most users opted to use their guidelines and textbooks to access maternal and family planning information. “... *I don't have an App; I use my textbooks and the guidelines*” (NUR002; MID001; MID002; MID003). Healthcare workers cannot distinguish between the Nurseconnect support platform and the MomConnect messaging service, thus, they cannot realize the usefulness of the platform.

#### 4.2 Willingness to Make Use of the Platform

Restricted accessibility to hospital or clinical resources such as Wi-Fi to acquire information is another factor that discourages users from willingly utilize the Nurseconnect, “...*we do not have free Wi-Fi that is one of the things that need to be improved, if you put free Wi-Fi for us*” (NUR001; NUR002; NUR003; MID002; MID005; NUR004). The healthcare workers who are most impacted by the challenge are those who practice in rural areas with inadequate access to maternal healthcare resources “... *we are living in these poor areas there's no internet access, the landlines are not working, you use your own phone to get an ambulance or 'ntho eo' other personnel's there's nothing, literally nothing*” (NUR002; NUR004). As a result, if the platform was zero-rated like the COVID-19 portal, a small number of participants exhibited high-level of willingness to put into effective use the mobi-site, “... *Having to walk from this block to another to ask my colleagues about something I am not sure about, if NDoH can provide us with Wi-Fi I think a lot can improve*” (MID004). Majority of participants exhibited willingness to utilize the platform if there was provision of free Wi-Fi in public healthcare facilities, the platform was zero-rated, and the management was fully involved in encouraging healthcare workers to make use of the platform.

#### 4.3 Nurseconnect Usability Challenges

Users stated that the platform has one way communication “...*it was a one-way thing, they would send us SMS's, but we couldn't have communication 'wa bona'*” (NUR002). Communication is supposed to be two-way until there is an alignment between the sender and the receiver. Thus, the continuation of a way one communication from the platform with the users might have a negative impact on the NDoH vision and strategy, particularly when users necessitate emergency assistance, “...*they too very long sometimes to answer*” (NUR004; MID005). However, MID005 stated that the content on the mobile site needs to be expanded and include other key topics that are discussed in the guidelines and textbooks, “...*I stopped using it, I am now using my guideline for information purposes actually*”. Due to the complexities of this platform, one participant opted to use a similar platform to the Nurseconnect to source maternal information, “... *It was kind of helping, but I am now using Mpilo Healthcare App, it has all the guidelines you know, you can actually see how many people are reporting cases, it has complaints and requests*” (MID004). While other participants specified that the NurseConnect is time-consuming and they work under immense pressure, “...*if you introduce this new process this will be time-consuming because this might need more hands we need to deal with patients*” (NUR004).

#### 4.4 Status of mHealth Adoption in Maternal Healthcare and Family Planning

Healthcare workers will still be dependent on their guidelines and textbooks, whereas there is a gap to digitize these materials to improve the current ways of working. Therefore, NDoH needs to implement initiatives and in-service training with an aim of educating healthcare workers about DHPS as an enabler to their day-to-day activities. The majority of the participants have little or no knowledge about mHealth applications, *"...I don't have an App at all, and I just use the internet. There is no specific App that speaks to the information that I might need as an Accoucheur"* (MID005). Resistance to change is another factor for lack of mHealth adoption amongst nurses and midwives. Users are at ease in following the current ways of working than adopting new, *".... I don't have an App; I use my textbooks and the guidelines at work"* (MID003). On the other hand, one participant had a perception regarding the use of mHealth applications, the user highlighted that patients might perceive nurses and midwives as bad-mannered if they are constantly on their mobile phones, *".... Because now if I am always on my phone is regarded as rude, patient might not know I am trying to access information they might think I am on WhatsApp or Facebook"* (MID001). Furthermore, MID005 cannot distinguish between a mobile app and a maternal healthcare initiative, *".... No my brother we don't have any mobile applications, but here is the thing we have what we call Perinatal Problem Identification Programme (PPIP)"*.

#### 4.5 Improvement of Manual Processes in Maternal Healthcare and Family Planning

There is a lot of manual work that is expected to be performed by nurses and midwives, this is time consuming and might lead to incorrect reporting if the clinical data is captured incorrectly on the NDoH system SINJANI. Therefore, there is a need to move away from the use of paper-based records. *"...We do everything manually and only when you are submitting a statistics then you handover to our clerk to capture on our system"* (NUR003; NUR004; MID001). Manual record capturing is seen as a dual work which is another factor that contributes to behavioral change amongst nurses and midwives, *"...We basically do 'double job' in Excel when you do calculations to capture the data"* (MID004). In addition, MID002 further explains her pain points on the current manual process at the healthcare facility she practices in, *"...the issue of records also comes to the issue of us keeping records for a certain period of time and throwing others away"*. The participants further emphasized that the current process is also taking a lot of their time, *"...we must document everything that is time-consuming. Let's say you do a reproductive treatment, and they have STI symptoms. If they want family planning, then you must do the documentation for all that. Then you make sure you put your stats on the system"* (NUR002) As a result, participants expressed the benefits of digitizing maternal and family planning records, *"...when they are in a software method you can't easily disport, you can save, don't use a lot of space we can minimize"* (MID001; MID002; MID003; NUR002). The continuance of manual capturing, storing and processing of maternal and family planning data is a serious problem that needs to be eradicated by NDoH. Thus, there is a need to develop a Nurseconnect App to integrate some of the activities that healthcare workers perform, for instance patient record and appointment bookings.

## 5 Recommendations and Future Work

### 5.1 Recommendations

It is recommended that the National Department of Health (NDoH) must; delegate trained representatives from the department of health who will perform as a point of contact at different provincial and national healthcare facilities to support healthcare workers to subscribe to the Nurseconnect platform. The NDoH must organize an international day for midwives and nurses, to raise awareness about the Nurseconnect support platform. Improve the current communication process by allowing users to send enquiries about the messages they receive from the platform every morning or afternoon. The platform needs to be consistent in terms of the time it sends messages to the users. NDoH must introduce other mediums of communication like WhatsApp, where users can forward messages on various WhatsApp groups like 'Nurses Who Care'. Nurseconnect content needs to be updated to cater for nursing and midwifery information needs. The current content was last updated in 2016/17, the content can include eclampsia, anaemia during pregnancy and ophthalmia neonatorum information. NDoH must implement a zero-rated Nurseconnect App for nurses and midwives. In order to integrate the guidelines, textbooks and dictionaries that the nurses and midwives utilize when they refresh their memories on key terms in practice.

### 5.2 Future Work

The Nurseconnect support platform is a decent initiative especially in a developing country like South Africa, where there are little or no mHealth initiatives for the maternal, child healthcare and family planning practice. Therefore, there is possibility for future research to investigate various topics in practice, the research area that can be conducted by scholars is as follows; development of mHealth application to support healthcare workers in maternal, child healthcare and family planning practice: a case of the Nurseconnect support platform. The researcher can visit several public healthcare facilities in different provinces of the country to collect data from all workers of these practices, to produce better results.

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