Research Report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in Partial fulfilment of the requirements for the Degree of Master of Public Health.

ASSESSING THE LEVEL OF READINESS IN TSHWANE AND DR KENNETH KAUNDA DISTRICTS FOR IMPLEMENTING A NATIONAL PATIENT BASED INFORMATION SYSTEM

Name: Gaurang Tanna

Student: 511133

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DECLARATION

I, Gaurang Tanna, declare that this Research Report is my own, unaided work. It is being submitted for the Degree of Master of Public Health at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

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Signature

__2nd_____day of____November_____2017____________

ABSTRACT

PURPOSE: The National Health Insurance programme has been identified as a priority to achieve Universal Health Coverage in South Africa. The development and implementation of a health information system (HIS) that is underpinned by a master population index (ability to uniquely identify a person), and operates on the electronic health records (EHR) model is critical for the implementation of the NHI. This study assesses the level of readiness in Tshwane and Dr Kenneth Kaunda districts for implementing a national patient based health information system.

METHODS: This study design was a descriptive cross-sectional design. The study used a structured questionnaire to measure the level of readiness in two NHI districts, namely, Tshwane and Dr Kenneth Kaunda, for implementing a patient based National Health Information System in South Africa.

RESULTS: The assessment has revealed that PHC facilities are at varying levels of readiness for implementing a national patient based information system. Tshwane scored better than Dr Kenneth Kaunda district on all four readiness criteria, with non-significant differences between them for core readiness, engagement readiness, and societal readiness and significantly higher levels in Tshwane for technological readiness. The readiness results varied across all four domains, ranging from 13% and 16% for core readiness to 59% and 68% for engagement readiness for Dr Kenneth Kaunda and Tshwane districts respectively.

CONCLUSION: PHC facilities in Tshwane and Dr Kenneth Kaunda districts were capacitated with respect to ICT infrastructure. There were weaknesses with respect to business processes and IT support. The business process for the filing system needs to be defined, optimised and implemented in PHC facilities. The turnaround time for IT support was unacceptably high in both districts and needs to be improved prior to implementation of a patient based information system.

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ACRONYMS

CHCs	Community Health Centres
DHIS	District Health Information Software
DHMIS	District Health Management Information System
EHR	Electronic Health Record
EMR	Electronic Medical Record
FIO	Facility Information Officer
HIE	Health Information Exchange
HIS	Health Information System
HPRS	Health Patient Registration System
ICT	Information Communication Technology
IT	Information Technology
NDP	National Development Plan
NHA	National Health Act
NHI	National Health Insurance
NHIS/SA	National Health Information Systems South Africa
NHNSF	National Health Normative Standards Framework
PCEHR	Personally Controlled Electronic Health Record
PHC	Primary Health Care
PMR	Personal Medical Record
SAIMD	South African Index of Multiple Deprivation
UHC	Universal Health Coverage

1. INTRODUCTION

1.1. Background

The United Nations has described Universal Coverage as "access to health care without discrimination, to nationally determined sets of the needed promotive, preventive, curative and rehabilitative basic health services and essential, safe, affordable, effective and quality medicines, while ensuring that the use of these services does not expose the users to financial hardship, with a special emphasis on the poor, vulnerable and marginalized segments of the population" (1).

The South African Government's adopted a National Development Plan (NDP) in 2013. The NDP envisages that by 2030, South Africa will have a life expectancy rate of at least 70 years, and that there is a significant shift in equity, efficiency, effectiveness and quality of health care and Universal Health Coverage (UHC) is achieved (2). The implementation of the National Health Insurance (NHI) Programme is a strategy by the South African Government to achieve UHC to deal with the challenges faced in South Africa of the quadruple burden of disease, inequitable health service delivery between its rich and poor, as well as rural and urban populations, among other social group strata (3) (4) (5).

The South African health system is regulated by the National Health Act (NHA) of 2003. The Act prescribes that public Primary Health Care (PHC) facilities are to be managed by the provincial government, and that facilities belonging to municipalities must be transferred to provincial Department of Health. Health care in South Africa have been provincialized, with an exception of those in the four largest metropolitan municipalities.

Minister of Health announced that 10 districts would be piloting NHI over the next 5 years (6). Administering and managing NHI requires an understanding of the number of patients being treated, the providers and services being accessed, and the cost thereof, as well as managing referrals between levels of care across the country. There are also a number of other important benefits for implementation of such systems. Health providers require timeous access to health records and medical history at the point of care to improve effectiveness of clinical care (7).

Access to a complete, up-to-date and timeous access to medical history of patients help health providers better manage care in several ways. It improves accuracy of diagnosis, better care continuum, reduced medical errors, and better adherence, all resulting in better effectiveness. Timeous access to health records can also improve efficiencies to render care due to improved productivity, reducing costs, seamless communication between providers and between providers and patients. Lastly, implementation of patient information systems strengthens surveillance of diseases and monitoring implementation of health programmes.

The development and implementation of a Health Information System (HIS) operating on an Electronic Health Records (EHR) model is required to improve service delivery, and strengthen surveillance. The NHI also requires such a system that is underpinned by a master population index, with an ability to link patients, providers and funders to services. It is therefore a pre-requisite for the implementation of the NHI (8).

We know from experience that HIS implementation is complex and expensive therefore requires a huge investment as well as long term and sustainable commitment. The development and implementation needs to be very carefully planned and thought through because failure can result in very significant losses.

To ensure a successful and sustainable implementation, it is critical to understand the current situation to determine the level of readiness of public health institutions to reduce the failure rate and manage risks associated with implementation. This includes understanding the extent to which users of the health system (population), the health system itself and institutions providing health care are ready for the transition from pure paper based systems to use of IT systems.

This study therefore aims to assess the level of readiness of PHC facilities in Tshwane and Dr Kenneth Kaunda districts for implementing a national electronic patient based health information system. Tshwane and Dr Kenneth Kaunda districts are two of the ten NHI Pilot districts with the former being predominantly urban (metropolitan municipality) and the latter peri-urban (category C municipality) with a strong presence of mining communities.

Tshwane's main economic sectors are community services and finance, while Dr Kenneth Kaunda survives mainly on the mining sector. This is consistent with the socio economic status differences between the districts. (9).

There are several other notable key differences between the two districts with respect to the socio-economic status of households in these districts. The South African Index of Multiple Deprivation (SAIMD) method, used by district Health Barometer, includes indicators from four domains: income and material deprivation, employment deprivation, education deprivation and living environment deprivation, ranks Tshwane district at 4, while Dr Kenneth Kaunda is ranked at 18. Therefore a larger proportion of the population is dependent on public Health services in Dr Kenneth Kaunda district compared to Tshwane district (10) .

The public health care per uninsured capita spending in both districts are however very similar. During 2014/15 financial year, Tshwane district spent R 1382 per uninsured capita compared to R 1339 per uninsured capita in Dr Kenneth Kaunda district on district Health Services. The expenditure on district Health Services is made up of expenditure for district Hospitals and PHC. The PHC spending was also similar, with Tshwane and Dr Kenneth Kaunda districts spending R932, and R965 per capita respectively in both districts. These expenditure figures are controlled for insured population in both districts. It can therefore be deduced that both districts have equal budgets for operating their Primary Health Care facilities.

1.2. Justification for the study

Over the years, a variety of reviews, assessments and evaluations have been carried out to date on HIS in South Africa, and have found several weaknesses. (11-14) These assessments are dated and therefore do not take in account the latest developments and change in context.

There are several prerequisites for the development and implementation of EHR in South Africa. These include leadership, local vision, strengthened governance, change management and infrastructure. The implementation is therefore not purely technological but rather “socio-technological” (15). It requires technology to support the workflow implemented by people, and people to adopt technology.

The development of EHR therefore requires understanding of the current situation in health facilities, with respect to people, processes (or organisational), hardware, software and telecommunications, hence the need to assess the level of readiness for implementation of EHR in South Africa.

This study aims to assess the level of readiness for the implementation of EHR in two NHI pilot districts, namely, Tshwane and Dr Kenneth Kaunda districts.

1.3. Problem Statement

South Africa has not been able to successfully implement patient based HIS that is centralised and patient based, a "critical factor for improving quality of care and implementation of NHI" (8). This scenario prevents sharing of information among health facilities and health providers at all levels of the health care continuum. The challenge is further exacerbated by the fact that most public health facilities use manual data collection systems with inconsistent workflows. This combined with high demand for care leads to slow access to patient data, long queues and poor data quality that impact negatively on the quality of health care. The Government of South Africa has shown commitment and developed solutions to leverage IT capabilities for improving service delivery. (16) However, eHealth systems may not be successfully implemented without knowledge of the readiness of the South African public health system. This study therefore seeks to determine the level of readiness for implementing a National patient based information system at PHC facilities in two of ten NHI Pilot districts.

1.4. Literature Review

1.4.1. Global Electronic Health Record Implementations

The development and convergence of Information and Communication Technologies (ICTs) has provided the means to improve quality of care, efficiencies of operations in health facilities and surveillance to guide health policy. There are several terms used to describe the transition from paper to electronic. Some of the known terms used locally include: Electronic Medical Record (EMR), Electronic health Record (EHR) and Personal Health Record (PMR).

There are overlaps of functionalities and capabilities, however, there are significant differences to their meaning. The EMRs are digital versions of paper records in one health facility. They contain and are used for diagnosis and treatment within a health facility. These are usually not accessible to other health facilities or even patients themselves. The EHRs are designed to reach out to other health facilities and institutions, and patients themselves. It therefore contains information from all health providers that interacted with the patient. These are largely developed to improve clinician's decision making, and therefore best understood by medical professionals. (17) One other big difference is that the term 'health' in general is used more broadly than 'medical' (or clinical).

PMRs are EHRs that are designed for patients use. They are setup to be accessible to patients. They also cater for self-reporting by patients using their personal health monitoring devices. The PMRs therefore consists of EHRs that are sourced from information reported by clinicians and information self-reported by the patient.

There are many documented benefits for transitioning from an information system that collect statistical health data, such as the DHIS, to an EHR platform. Improved adherence (18), better care (19), enhanced surveillance and monitoring, decreased medication errors (20) and transformation of health delivery (21). It has already been acknowledged that EHRs represent "the single-most important revolution in healthcare since the advent of modern medicine, vaccines, or even public health measures like sanitation and clean water" (22). EHRs have the potential to revolutionise the delivery of health services (23).

1.4.2. Global relationship between Electronic Health Records and National Health Insurance

A number of countries around the world have developed EHR systems to support NHI schemes. Since 2005, the National Health Service (NHS) in England started the move towards a single, centrally-mandated electronic care record for patients. The goal of the NHS was to connect 30,000 General Practitioners and 300 hospitals, and have 60m patients registered on the centralized electronic health record system by 2010. However, the plan was greatly delayed and frequently criticised (24). A recent mixed-method case study concluded that "Complex interdependencies, inherent tensions, and high implementation workload should be expected when EHRs are introduced on a national scale"(25).

In Australia, HealthConnect was the major national EHR initiative (26). There was a strong belief among providers and consumers that HealthConnect would provide major benefits in the delivery of coordinated health care across the Territory. Consumers and Providers embraced the concept of HealthConnect and readily committed to register to participate (27). The 5-year HealthConnect project ended in 2009. An evaluation on HealthConnect in 2009 concluded that the "HealthConnect program has significantly contributed to the establishment of infrastructure that will enable the ongoing development of eHealth initiatives" (28). During 2008, the Australian government published an eHealth strategy to guide incremental and agile development of eHealth by leveraging existing gains (29). It recognises many challenges including disparate information repositories many of which are paper based; manual information flows that are both inefficient and not effective and growing number of disparate eHealth initiatives. A Personally Controlled Electronic Health Record (PCEHR) initiative was launched subsequently, leveraging off the investments from the HealthConnect programme (30).

The PCEHR is made available to Australians based on an opt in system. It is implemented in two phases, firstly by strengthening co-ordination of initiatives at a national level, and secondly by collaborating and integrating with eHealth initiatives at regional and institution levels. During 2011, the Government released a document detailing ECEHR system, describing the functionality, the type of information, and how it will be gathered. The first phase targeted general providers, and the next was enrolling specialists, pharmacies and hospitals (31) .

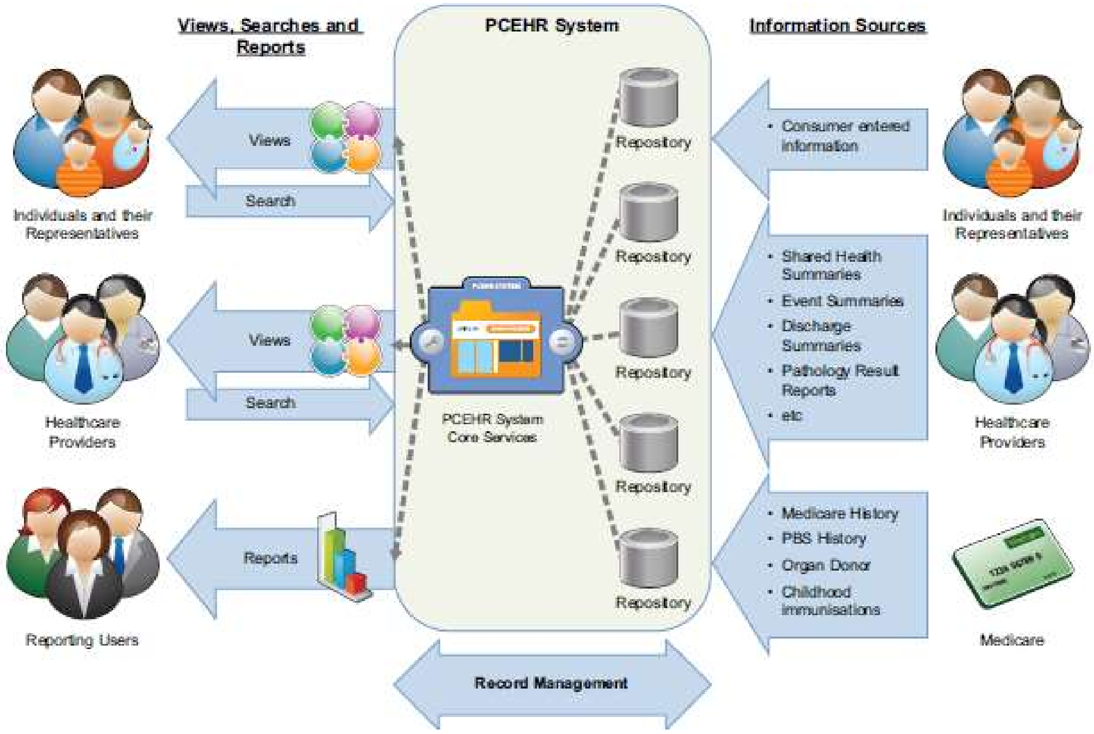


Figure 1.1 PCEHR System its interfaces with various stakeholders and Information sources

Source: Department of Health and Ageing. PCEHR Draft Concept of Operations Consultation 2011

During late 2013, a review of the PCEHR was conducted, which found a number of challenges including: unreliable and incomplete data sets; system integration not aligned to standard workflow of events; change management; poor test environment for developers; overly bureaucratic and ineffective governance structures resulting in ineffective consultation and lack of buy in from critical stakeholder groups (software vendors, private hospitals, and medical specialists, among others); and privacy and security of users (32).

The review made 38 recommendations. These can be broadly categorised into governance (review governance structures, clarify mandates of government departments and agencies, establish focussed various advisory committees), consultation with key stakeholders (consumers, software vendors, private providers, pharmacists, medical insurance companies), technological and support (improve management and support; make one government department responsible for end-to-end support for the shared infrastructure), business model and communication.

1.4.3. eHealth in South Africa

In South Africa, “there has been considerable but uncoordinated investment in eHealth, with limited tangible benefits” (8). South Africa has made remarkable progress in terms of its development of its HIS, however, there has been criticism relating to the quality and integrity of the data produced (33).

The South African Minister of Health acknowledged that “health information systems in South Africa have been characterised by fragmentation and lack of coordination, prevalence of manual systems and lack of automation, and where automation existed, there was a lack of interoperability between different systems. Considerable resources were also invested in these systems that, in the final analysis, did not generate the expected returns on investment” (8). During 2009, the National Health Council chaired by the Minister of Health placed a moratorium for the procurement of new software solutions in an effort to prevent proliferation of information systems used in public health facilities that either do not meet the needs, or are not interoperable (8).

Since 1994, the Department of Health has established a National Health Information System South Africa (NHIS/SA) committee, a sub-committee of the National Health Council chaired by the Minister of Health, mandated by the NHA to make health policy decisions in South Africa. The NHIS/SA committee involves nine provinces, private sector, local authority, military health services and the Medical Research Council (MRC) that has the mandate to design a national health information system for South Africa (8).

The DHIS is a key element of the South African health information system since 1997. The DHIS software allows clinics and hospitals to enter data relating to their services. The data is usually captured into a computer system in the Health district or Sub-district offices and then submitted electronically to Provincial Department’s head office. The Provincial health office collates the data from all the districts and transmits it electronically to National Department of Health.

The DHIS was adopted by NHIS/SA as a National Health Information System for South Africa (34). It is designed to collect anonymised aggregated health-service data from each public health facility, that gets collated and cascaded upwards in the administrative hierarchy to district, provincial and national levels. DHIS is also able to collect semi-permanent data such as staffing, equipment, infrastructure, population estimates and survey data. DHIS data is used for planning, and monitoring of all strategic health programmes implemented in South Africa. The District Health Management Information System (DHMIS) policy strengthened standardisation and created uniformity of data management (including Data security, Data flow, Data analysis, and Data dissemination) across all nine provincial Department of Health. (12)

It has been the intention of NHIS/SA since 1997 to develop a HIS that will be developed on the EHR model,which can operate nationally. To date such has not materialised (35).

In 2010, the Department of Health implemented a 3-tiered monitoring system to monitor performance of the HIV Treatment programme. Tier 1 is using paper based registers while Tier 2 is an offline electronic register. Both Tier 1 and Tier 2 were implemented as immediate solution(s) to track patient care for HIV patients as both solutions were pragmatic and cost effective and scalable. Tier 3 is a networked electronic health record solution that can collect a much larger dataset and offers management functions that could cut across all health programmes (36). Almost all PHC facilities are at Tier 2 stage, Tier.net software as an electronic HIV register. It was implemented as a stop gap solution as South Africa evolves towards an enterprise level EHR system.

During 2012, the Department of Health published an eHealth strategy to guide the health sector for developing and implementing a functional patient-based information system (8). Subsequently, during 2014, the National DoH also published National Health Normative Standards Framework (NHNSF) for interoperability in eHealth, which prescribes standards that eHealth systems must use in the health sector (37), and shortly thereafter commenced with a reference implementation of these eHealth standards in 10 NHI Pilot districts (16).

1.4.4. Transition to Electronic Health Records in South Africa

The Department of Health adopted the an eHealth strategy during 2012, that "provides with a clear roadmap that guides us from the current status to an integrated and well-functioning national patient-based information system, based on agreed upon scientific standards for interoperability, which improves the efficiency of clinical care, produces the indicators required by management, and facilitates patient mobility" (8).

The NHNSF for interoperability in eHealth provides scientific standards to achieve interoperability from four perspectives, namely, technical, syntactical, semantic, and organisational across technology and business process domains. Technical and syntactical are largely technological, while semantic and organisational are to a great degree associated with business processes (37).

The NHNSF also defines the required eHealth architecture, its components and inter-relationships among them. The eHealth standards and proposed architecture collectively can achieve the overall goal of linking patient based information systems at health facilities where health care is provided to a national electronic health record system.

The Health Information Exchange (HIE) together with shared patient, provider and health facility registries; terminology services and analytic services making up the shared info-structure for the proposed eHealth architecture (16, 37, 38). The access to info-structure is centrally setup and hosted on shared IT infrastructure. This makes it possible for all health providers to securely share and access a patient's vital health information electronically.

This method of integration is beneficial to South Africa because it promotes re-use of existing systems to achieve integration and standardisation, and it aligns well with the decentralised health system of South Africa. It also guides development of existing and new systems in a transparent and collaborative manner in partnership with private health and ICT sectors.

The eHealth Programme being implemented in PHC facilities of NHI Pilot Districts is a reference implementation of the NHNSF from workflow, infrastructure and technology aspects. This initiative aims to optimize work flow for both patients and facility management. The optimized business processes are automated using Health Patient Registration System (HPRS) to reduce administration burden on PHC facilities and improve patient experience.

The HPRS maintains a patient index and offers capabilities to store and maintain a set of identifiers used by the users of health services, so that it is possible to minimizes duplicate records, as essential capability for implementing EHRs. (16) The "Operation Phakisa Ideal Clinic Realisation and Maintenance Programme" of government has been identified as the "breakthrough" initiative, and proposed that the programme be implemented in PHC facilities of South Africa. (39)

The HIS Audit of 2006 found that over one third of all HIS staff had not attended formal training on DHIS. (11) An evaluation of DHIS in rural South Africa amongst other things also identified that training and support is required for the DHIS to function optimally. (14) In South Africa, large number of the information systems either fail, or fail to be utilized to their full capacity. The challenges in South Africa include inadequate infrastructure, poor functioning systems and most importantly lack of software interoperability. (40) There are also concerns of acceptance of technology by health care professionals (41).

1.4.5. Readiness Assessment for Successful Implementation

Lack of readiness has been a major contributor to the overwhelmingly high failure rate of EHR adoptions (40). Information systems researchers have recognised the problem of sustainability in HIS implementations especially in developing countries such as South Africa (42). The challenges of computer literacy and ICT requirements were identified as barriers. Clinicians also reported concerns about negative impact on workflow and the interim need to duplicate efforts during the transition phase when migrating from paper to electronic systems (43).

Both International and local lessons learned caution about the barriers and challenges facing country wide EHR implementation projects. Healthcare organisations are complex (15) and therefore successful transition from paper-based records and charts to an EHR system requires organizational support and commitment, significant process change and sufficient human and financial resources (44).

A move to an EHR will not be successful unless these deficiencies are addressed (45). EHR implementation will also not improve fundamental process deficiencies. The EHR implementation experience depends on a variety of factors including the availability of technology, training and leadership (46). A qualitative study by Yoon-Flannery et al (2008) found that clear communication, system migration, technical support and training, patient privacy and, most important, efficiency have been identified as critical factors for successful implementation (47).

In the South African context, prerequisites include the availability of local vision, standards, information management, implementation committees, investment strategies, infrastructure, human resources, and stakeholder involvement. Some of the predetermined barriers are lack of broadband connectivity, inconsistent levels of maturity amongst provinces and poor adherence to standards recently published by the Ministry of Health. (8).

The reference implementation of the eHealth Programme defined the outcomes for various maturity levels that PHC facilities may achieve over time for the eHealth Programme. The maturity level zero simply entailed securing legitimacy of implementation and local vision because it is imperative that the management hierarchy (provincial management, district technical support and facility staff) is responsive and supportive of the changes. The next maturity level was ICT provisioning, followed by site preparation and business process optimization, which are key requirements before automation can be embraced. Maturity level 3 was about implementing the adapted workflow and business processes with HPRS and webDHIS which reduces patient waiting time through efficient patient file management and routine data collection. The final maturity level was the facility in real-time being able to access patient visits from other PHC facilities (16).

The readiness assessment tool must incorporate potential barriers and identified prerequisites for a successful implementation. Several readiness tools and frameworks have been developed internationally and locally. Almost all assessment toolkits site the importance of change management, support systems, infrastructure and information management, and aim to measure organisational and healthcare provider factors (15, 48).

A need exists to develop a tool that responds to the current context and needs of clinics. A review of eHealth readiness frameworks was conducted by Li J, et al, 2008. They propose that a number of components should be included in readiness assessments, namely, core readiness, engagement, technological and societal readiness (48). They also propose a number of variables, that should be constructed within these components. The variables proposed by Li J, et al, 2008 were corroborated with the requirements defined by the maturity model of eHealth implementation of South Africa, and those identified by as weaknesses by prior assessment studies. (11, 14, 16, 49) The corroborated variables were used by the researcher to develop a tool for the four components proposed by Li J, et al, 2008 to contextualise it to the South African environment. The newly developed tool has not been validated prior to use in the study.

Core readiness pertains to patient records generation, storage and retrieval with paper-based health record systems. It aimed to measure documentation efficiency concerning patient records, patient privacy and the degree of clinicians' satisfaction with completeness and accuracy of patient files and with sharing of patient records between health facilities.

The engagement component aimed to measure the facility staff (including clinicians') exposure to HIS and recognition of its benefits.

No modern-day information systems can be implemented without IT infrastructure and support. The technological component of the study instrument measured the availability of hardware, software, connectivity and support.

Lastly, it was important to understand communication links within the health facility, but also with other health facilities and administrative centres, namely, sub-district, district and provincial offices.

1.5. Study Aim and Objectives

The aim of this study is to determine the level of readiness of Primary Health Care facilities in the two NHI Pilot districts for implementing a basic patient based National Health Information System to commence implementation of a HIS based on an EHR model in South Africa. The study has been carried out in Tshwane district (Gauteng Province), and Dr Kenneth Kaunda district (North-West Province).

The specific objectives for this study are to:

- Describe the level of readiness in Tshwane and Dr Kenneth Kaunda district for implementing first phase of the national patient based information system
- Compare the level of readiness between Tshwane and Dr Kenneth Kaunda districts
- Identify strengths and weaknesses in Tshwane and Dr Kenneth Kaunda districts.

2. METHODOLOGY

2.1 Study setting

This study is being carried out in two of the ten NHI Pilot districts, namely, Tshwane and Dr Kenneth Kaunda districts. Dr Kenneth Kaunda district municipality in the North West province is located south-west of Johannesburg. It consists of four sub-distircts, namely, Tlokwe, Ventersdorp, Matlosana and Maquassi Hills. Tshwane is a metropolitan municipality located in Gauteng province, that is divided in regions. The Tshwane district is predominantly urban, while Dr Kenneth Kaunda district is peri-urban with mostly mining communities.

In Tshwane district, 24 of its 75 PHC facilities are operated and managed by the Tshwane Metropolitan Municipality. While in Dr Kenneth Kaunda district all public PHC facilities are managed by North-West provincial government.

2.2 Study Design

This analytical cross-sectional survey was conducted using a structured survey instrument to measure the level of readiness in two NHI districts, namely, Tshwane and Dr Kenneth Kaunda, for implementing a patient based national HIS in South Africa.

2.3 Study Population

The Minister of Health announced in 2012 a list ten districts that would be piloting NHI over the next 5 years (6). However, KwaZulu-Natal Department of Health requested Amajuba district be added to form part of the NHI pilot districts. Therefore, 11 districts have been identified by Department of Health to pilot NHI. For convenience, as the researcher is currently working in two of the 11 pilot districts, only public primary health care (PHC) facilities within these two districts, Tshwane and Dr Kenneth Kaunda districts, are included in the study population.

2.4 Inclusion and Exclusion Criteria

This study is limited to all provincial PHC clinics and Community Health Centres (CHCs) in both districts. The clinics in both districts generally operate for 8-hours on weekdays, while Community Health Centres (CHCs) operate 24 hours and 7 days a week in Tshwane and Dr Kenneth Kaunda districts.

The 24 PHC facilities that are operated by City of Tshwane Metro in Tshwane district, were excluded in the study for the reasons due to operational and organisational differences between local government PHC facilities and provincial PHC facilities. This was also done to ensure comparability between the two districts. Hospitals were also excluded in both districts because the selected basic tool may not be able to gather an adequate level of information to determine readiness in complex hospital settings.

In total, 51 PHC facilities in Tshwane and 42 PHC facilities in Dr Kenneth Kaunda district were selected to participate in the study.

2.5 Sampling

The total population (all provincial clinics) were selected in both Tshwane and Dr Kenneth Kaunda districts, based on the selection criteria outlined in the above section.

Purposive sampling was then used to select two participants, namely, Facility Information Officer (FIO), and facility manager from every PHC facility as key respondents. The researcher selected acting official(s) that fulfilled these responsibilities in cases where such posts were vacant.

2.6 Data collection tool and measurement variables

A review of eHealth readiness frameworks was conducted by Li J, et al, 2008. This study proposes four dimensions should be considered for readiness assessments of eHealth. These are core readiness, engagement readiness, technological readiness and societal readiness (48). This study further further proposes sevral variables, that should be constructed within these dimentions. This framework has been applied by several countries internationally including South Africa (50, 51). The variables proposed by Li J, et al, 2008 were filtered to those that apply for assess readiness of the health institutions in the study, and corroborated with the requirements defined by the maturity model of eHealth implementation of South Africa, and those identified by as weaknesses by prior assessment studies. (11, 14, 16, 49). The corroborated variables were used by the researcher to develop a tool for the four components proposed by Li J, et al, 2008.

Whilst the developed tool has not been used in South Africa, the variables it measures are pertinent to eHealth implementation in South Africa. Therefore, a number of variables measured by this study were sourced from the prior assessments conducted in South Africa. The tool developed by the researcher has not been validated prior to use in this study. The data collection tool was however pre-tested on 5 colleagues working at the National Department of Health that have knowledge and prior experience of clinic operations to ensure there were no problems with interpretation of the questions.

The questionnaire was self-administered. There were 37 questions in total. The first 7 general (demographic) questions are about the health facility for assessing specific groups within the study population (e.g. specific district, sub-district, etc). The four components, namely, core readiness, engagement, technological and societal readiness make up 30 questions. The questions are divided up into 19 questions that require dichotomous answers (i.e. yes/no), 10 multiple choice questions, and 1 question with a detailed response.

Each of the components were constructed as a key performance indicator of the current state in the clinics. The researcher reduced the overlap between the different components to limit ambiguity. The assessment tool (questionnaire) used in this study is attached as Annexure C.

2.7 Data Collection

One pre-planned field visit was conducted in each district to inform the district Management Team of this study and agree on a data collection process.

The Tshwane district Management requested that sub-districts be contacted to present the study in their respective sub-district meetings. A package was distributed containing the information sheet, consent form, questionnaire and an envelope to all PHC facility managers (study participants). The study participants completed their portion of the tool in presence of the researcher when the study was presented, and thereafter requested their facility information officer to complete their portion. The researcher arranged for collection of the responses from PHC facilities which was kept in sealed envelopes.

The PHC facilities in Dr Kenneth Kaunda also received the same package containing information sheet, questionnaire, consent form and an envelope to sub-district managers However, in the case of Dr Kenneth Kaunda district, the district management team preferred that the researcher or his assistant visit PHC facilities to present the study, and obtain their responses. PHC facilities were provided an opportunity to submit their responses later to their respective sub-district managers if they were unable to complete the questionnaire during the visit.

2.8 Limitations

The level of information obtained might be superficial because special conditions within different Primary Health Care facilities cannot adequately be studied using a cross sectional study design.

The researcher aimed to obtain mostly generic information, rather than a detailed understanding of specific problems in each facility. The measurement tool has not been validated with real data from Primary Health Care facilities. The data collection tool was therefore not tested for reliability.

The researcher explained that the study will not result in any punitive measures for the respondent and clinic, however, there may still be some response bias.

2.9 Data Processing Methods

The researcher captured the data using Excel 2016. The data was cleaned using standard Microsoft Excel functions. A sample of questionnaires were selected to test the accuracy of data capture. Outliers were detected and corrected. Data consistency checks were also performed by grouping information from mutually compatible variables.

All the missing data were identified, and PHC facilities were followed up to obtain their responses. Once the data was captured, cleaned and complete, a backup was made and stored securely.

2.10 Data Analysis

The responses from both key informants, namely, the PHC manager, and the Facility Information Officer were combined because the unit of analysis was health facility and not individual participants.

Frequency distributions were used for the Likert scale and yes/no questions. Frequency distributions were also used for all categorical variables. An average score was obtained for all likert scale questions.

Core readiness predominantly measures existence of filing system and effective patient administration workflow. This indicator is made up of four items (questions 10, 12, 13 and 15). Question 10 and 12 were coded as (1) for yes, and (0) for no, while for question 13 and 15 were conversely coded. A sum of responses for questions 10, 12, 13 and 15 was calculated to determine core readiness. A facility can only be classified as core ready if it scores 4. The variety of filing systems used by PHC facilities was determined by question 11, and challenges with the established filing system was described by question 14. Question 8 was used to determine if an electronic catalogue of patient files already existed so that these data may be pre-populated into the patient information system. Frequency distribution was conducted for questions 8, 10 and 11 to describe the above characteristics of the study population.

Engagement readiness is a measure of the IT skills of the facility information officer, and willingness to migrate to an electronic environment. Frequency distribution was used to determine the level of IT knowledge of the facility information officer (Question 16). A score was calculated to determine if the facility was willing to migrate to an electronic environment. Responses to Questions 17, 18, 19, and 20 were coded as (1) for a options 1 and 2, and (0) for 3, 4 and 5. The facility must score at least 4 to be classified as ready The responses were also summed to calculate a measure of acceptance. The greater the score the better the acceptance for migration to electronic data capture. A mean measure of acceptance will be calculated to determine the level of engagement readiness across all participating clinics for each district.

Technological readiness is made up of two key measures, availability of IT infrastructure and IT support. PHC facilities should be able to register patients electronically at the front desk. A facility can be therefore only be considered to be technologically ready from the IT infrastructure availability perspective if it has at least 2 functional computers (Question 21), 1 printer(s) (Question 23 and 24), Local Area Network (Question 22), and Wide Area Network (question 31).

Question 21 is coded as 1 if the response is equal to or greater than 2 computers. Questions 22, 23, and 31 were coded as 1 for all yes responses, and 0 for all no responses. The response to Question 28 was also coded as 1 if the response was A, B, C, or D. Responses to Questions 21, 22, 23, 28 and 31 were summed to determine availability of IT infrastructure. A score of 5 could therefore be interpreted as IT infrastructure and support available at the facility. Source of IT support was measured by Question 28. Frequency distribution was used to determine if IT support was available, and if available who was responsible for such support. A facility could only be technologically ready if it scored 5 for availability of IT infrastructure support. Question 25, 26, 30 and 32 were categorical variables to obtain a more detailed understanding of the available IT infrastructure and support system. Frequency distributions were used to describe the quality of IT infrastructure and IT support.

Societal Readiness measures if email would be an acceptable way of communicating with patients, other clinics, clinic supervisor, district office and provincial office. Responses to Questions 33, 35 and 36 will be coded with a (1) for a yes response and (0) for a no response. Responses to Questions 33 to 36 were summed to determine the extent of societal readiness.

The two districts were statistically compared using two sample t-Test for Core Readiness, engagement readiness, societal readiness and technological readiness. F-Test was used for each of the above to determine if the two samples contained equal or unequal variances. The results from the F-Test were used in the T-Test to determine if the differences between the two districts are statistically significant or insignificant.

2.11 Ethics

The researcher received approval from Tshwane districts research committee. The researcher also received approval from Dr Kenneth Kaunda district Management, and North-West Provincial head office to conduct the research. The ethics approval was received from the Human Research Ethics Committee on 31 October 2014. The ethics clearance certificate number is M141042.

The original instruments were coded with a sequence numbers. The original instruments were locked away after all the data was captured, and will be destroyed later to comply with confidentiality. The facility names were removed from the data set to anonymise the data. The anonymised data will only be accessible to the researcher and his supervisor. The final research report will be shared with the district management of both Tshwane and Dr Kenneth Kaunda district, and National Department of Health that has funded the MPH degree.

3. RESULTS

The results chapter describes and compares the level of readiness by component in both Tshwane and Kenneth Kaunda districts. The Discussion chapter explored in more detail on the the strengths and weaknesses in both districts.

In Tshwane district 31 of their 51 provincial PHC facilities participated in the study. The remaining 19 PHC facilities did not participate in the study. All 12 facilities in Sub-district 2 (Hammanskraal region) could not participate due to ongoing violent protests during the data collection period during June and July 2016. This period was just before local government elections. The remaining 7 (of 19) PHC facilities either chose to not participate in the study or didn't supply their responses after multiple attempts to obtain them from key respondents.

In Dr Kenneth Kaunda district, 32 of their 41 PHC facilities participated in the study. Two facilities could not participate as their facilities were closed for extended period as they were being refurbished. The balance of 7 PHC facilities either chose to not participate in the study or didn't supply their responses after multiple attempts to obtain them from key respondents. It is worth noting that 5 of these clinics were from Ventersdorp. Therefore, the study is representing results from 3 of the 4 sub-distrticts in Dr Kenneth Kaunda District.

3.1. Data Completeness

There were a few questions which were unanswered by key respondents. The researcher contacted key respondents to obtain missing responses. The following table described the number missing responses after key respondents were followed up.

Table 3.1 Data Completeness in Tshwane and Dr Kenneth Kaunda districts

Question[1]	key respondent	Tshwane district			Dr Kenneth Kaunda district		
		Responses	Expected responses	No Responses	Responses	Expected responses	No Responses
4	Manager	26	31	16.1%	30	32	6%
5	Manager	24	31	22.6%	18	32	44%
6	Manager	27	31	12.9%	24	32	25%
7.1	Manager	31	31	0.0%	31	32	3%
7.2	Manager	31	31	0.0%	31	32	3%

Question[1]	key respondent	Tshwane district			Dr Kenneth Kaunda district		
		Responses	Expected responses	No Responses	Responses	Expected responses	No Responses
8	Manager	31	31	0.0%	32	32	0%
10	Information Officer	31	31	0.0%	32	32	0%
11	Information Officer	31	31	0.0%	32	32	0%
12	Manager	31	31	0.0%	31	32	3%
13	Information Officer	31	31	0.0%	32	32	0%
14*	Information Officer	22	22	0.0%	21	21	0%
15	Information Officer	30	31	3.2%	32	32	0%
16	Information Officer	31	31	0.0%	32	32	0%
17	Information Officer	31	31	0.0%	32	32	0%
18	Manager	31	31	0.0%	32	32	0%
19	Manager	31	31	0.0%	32	32	0%
20	Manager	31	31	0.0%	32	32	0%
21	Information Officer	31	31	0.0%	32	32	0%
22	Information Officer	31	31	0.0%	32	32	0%
23	Information Officer	31	31	0.0%	32	32	0%
24	Information Officer	31	31	0.0%	32	32	0%
25*	Information Officer	12	12	0.0%	7	7	0%
26*	Information Officer	12	12	0.0%	7	7	0%
27	Information Officer	31	31	0.0%	32	32	0%
28	Information Officer	31	31	0.0%	32	32	0%
30	Information Officer	31	31	0.0%	31	32	3%
31	Information Officer	31	31	0.0%	32	32	0%
32*	Information Officer	28	29	3.4%	25	26	4%
33	Manager	31	31	0.0%	32	32	0%
34	Manager	31	31	0.0%	32	32	0%
35	Manager	31	31	0.0%	32	32	0%
36	Information Officer	31	31	0.0%	32	32	0%
37	Information Officer	31	31	0.0%	32	32	0%

Notes:

1. Question numbers correspond with the data collection tool provided as Annexure A.

* The number of expected responses was adjusted as they are dependant questions / variables.

There were only three questions (4, 5 and 6) that were poorly responded. These questions were not significant for the study because they are mainly related to demographics and management experience of the facilities. These questions were not followed up with facilities where there were missing responses.

3.2. Demographics of districts

The mean age of facilities in Tshwane and Dr Kenneth Kaunda districts respectively is just under 24 years, and 15 years. These figures commensurate with the management experience of the facility managers. The facility managers in Tshwane were managing their facilities on average for 6 years, while those in Dr Kenneth Kaunda had just under 4 years' experience. Most of the facilities in Tshwane are in urban and peri-urban settings, while there is a split between urban and rural in Dr Kenneth Kaunda districts.

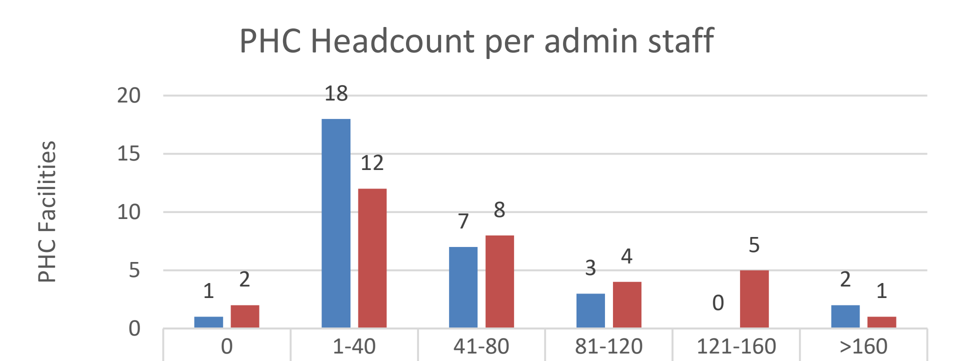
Table 3.2 Administration Capacity in Tshwane and Dr Kenneth Kaunda districts

	Mean Administration Personnel [2]	**Median Administration Personnel [2]**	**Range**	**Percentage of Facilities with no administration personnel**	**Percentage of Facilities with No permanent administration capacity**
Tshwane district	7	6	0-20	3% (1/31)	12.5% (4/31)
Dr Kenneth Kaunda district	4	2	0-38	9.7% (3/31[1])	54.8% (17/31[1])

Notes:

1. Denominator excludes facilities that did not respond to the question
2. Permanent and Temporary aggregated

There is a normal distribution of administration capacity in Tshwane district, with mean and median being 7 administration clerks at PHC facilities, reflecting a normal distribution across their facilities. While the PHC facilities in Dr Kenneth Kaunda district had an average of 4 administration personnel, with a median of just 2, representing a skewed distribution. 17 (of 31) PHC facilities in that responded to this question indicated that they have no permanent administration personnel.



	0	1-40	41-80	81-120	121-160	>160
Tshwane	1	18	7	3	0	2
Dr KK	2	12	8	4	5	1

Figure 3.1 – Histogram of PHC Headcount per day to admin staff

PHC headcount is a good measure to determine workload and crudely measure size of PHC facility. Number of patients serviced per day per admin staff was calculated to understand admin capacity in relation to its workload. The analysis reflects unequitable distribution of admin staff in both districts across their PHC facilities. This analysis further affirms that PHC facilities in Tshwane are better staffed than those in Dr Kenneth Kaunda District.

3.3. Core Readiness

The core readiness measures the existence, effectiveness and satisfaction of the filing system in PHC facilities. This question also crudely measures if PHC facilities are implementing a standardised work flow.

The facility must have a defined filing system, that doesn't require creation of multiple patient files, and one with which clinicians are satisfied. The other pre-requisite is for facilities to have one central repository of all patient files because experience has shown that facilities with multiple filing stations increases the chances of duplicate files.

The Facility Information Officers were asked (a) if the facility had a defined filing system; (b) if a need existed to open a new file for existing patients, and (c) if there were multiple demarcated areas where patients could obtain their patient files to measure standardised work flow. The facility managers were asked if the clinical staff were satisfied with the filing system at the health facility. These responses were aggregated to determine core readiness.

The Facility Information Officers were further asked to the indexing method used by the health facility, where they had a method, and reason for them needing to creating a new file for existing patients.

3.3.1. Indexing method of patient files

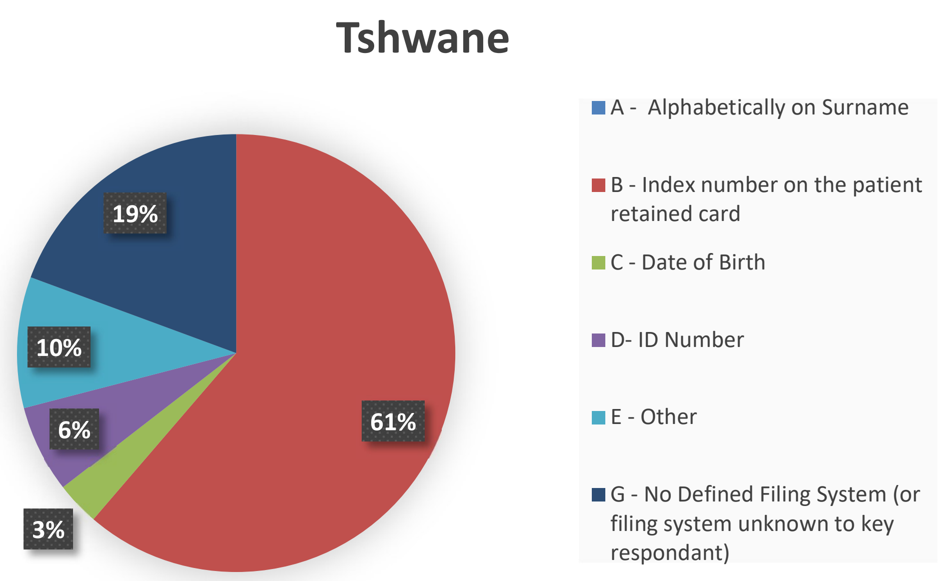


Figure 3.2 Sorting system of patient files in PHC facilities of Tshwane district

In Tshwane district, 81% PHC facilities had a known standardised filing system. More than half of these PHC Facilities (61%) used the index number on Patient retained card to sort and index their files, with rest of the remaining using ID number and Date of Birth for this purpose.

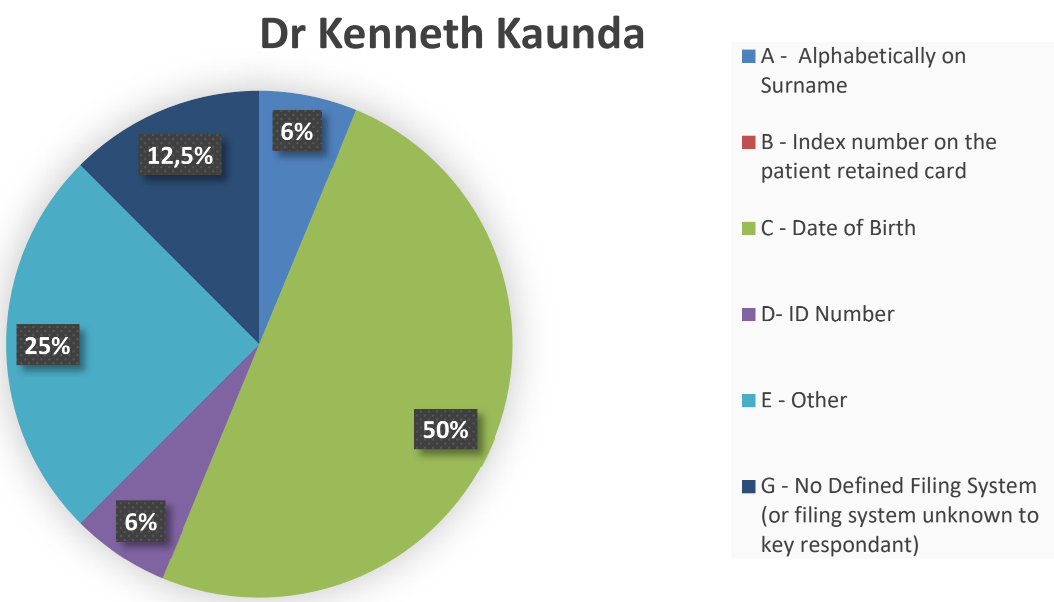


Figure 3.3 Sorting system of patient files in PHC facilities of Dr Kenneth Kaunda district

In Dr Kenneth Kaunda district, 87.5% of PHC facilities had a defined filing system. The indexing method however varied between facilities. Half (50%) of the facilities in Dr Kenneth Kaunda made use of Date of Birth to index their patient files, followed by 29% that make use of a combination of Date of Birth and First 3 letters of surname, with the remaining facilities choosing between surname and ID number.

More than three quarters of PHC facilities in Tshwane district used Index number on patient cards to index patient files, compared to, date of birth used by facilities in Dr Kenneth Kaunda district. It can be therefore assumed that these are the standard methods adopted by their district Management Teams for use in their PHC Facilities.

3.3.2. Satisfaction with Filing System

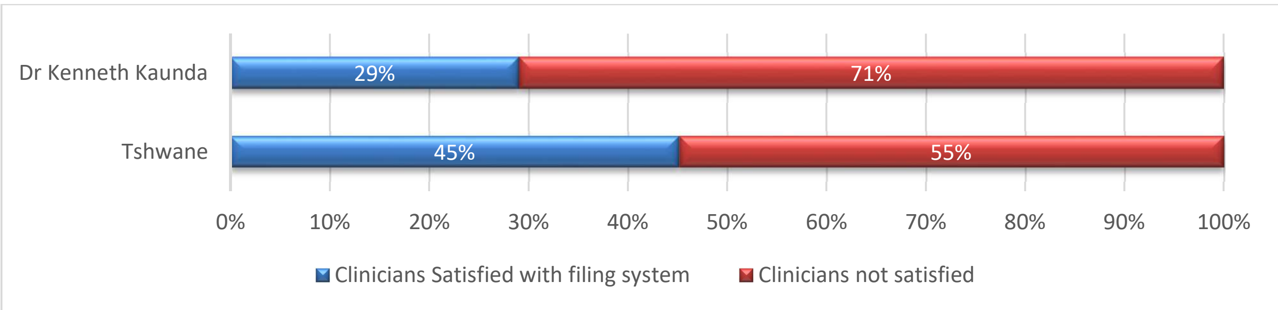


Figure 3.4 Satisfaction with the filing system among clinicians in Tshwane and Dr Kenneth Kaunda districts

The facility managers were asked to make an opinion on the satisfaction of clinicians in their clinics. This was used as a proxy to understand perception of clinicians of their filing systems in their clinics. This was appropriate in light of the fact that all facility managers also consult patients. They perceived that clinicians in majority of PHC facilities in both districts are not satisfied with their current filing system. More than half (55%) of PHC facilities in Tshwane district, compared to more than two thirds (71%) in Dr Kenneth Kaunda district are not satisfied with their current filing system.

3.3.3. Duplicate files

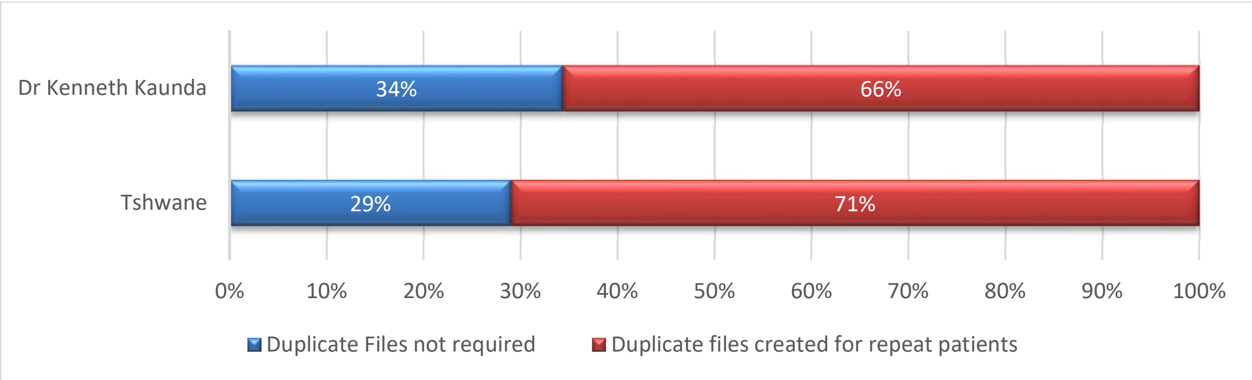


Figure 3.5 Prevalence of duplicate files among PHC facilities in Dr Kenneth Kaunda and Tshwane districts

The prevalence of facilities creating duplicate files correlates with the satisfaction levels among clinicians for filing systems. In both districts, majority of PHC facilities (71% in Tshwane district, and 66% in Dr Kenneth Kaunda district) find the need to create duplicate files for repeat patients for a variety of reasons. A significant limitation to interpret responses to this question is that, it was not possible to understand the frequency with which duplicate files are created, or number of duplicate files are created in a specific time frame, so it is not possible to measure the extent of challenge.

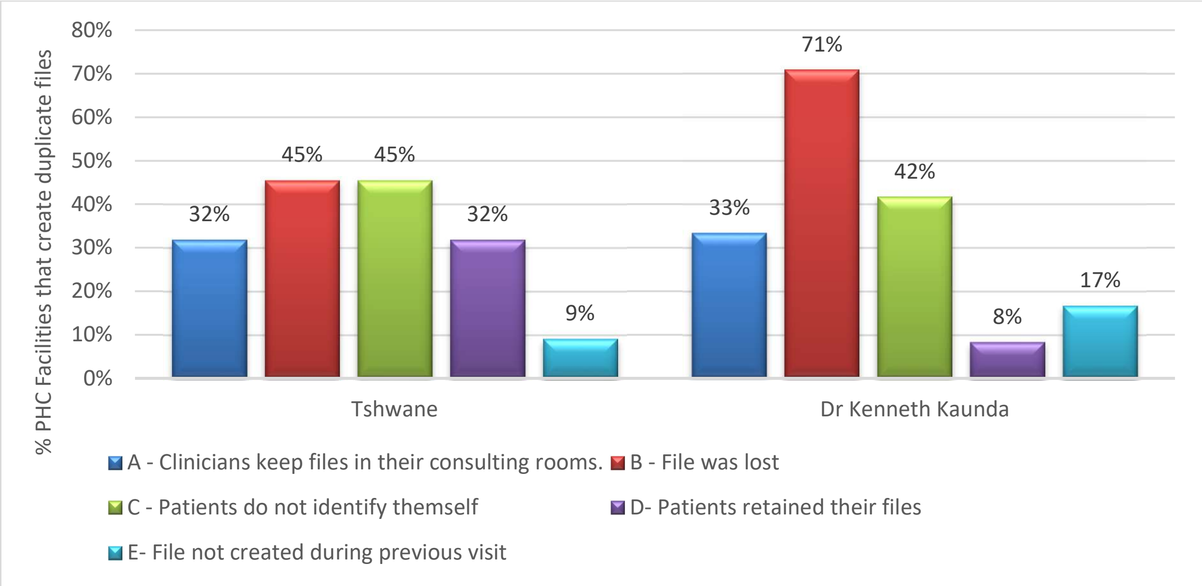


Figure 3.6 Reasons reported by PHC facilities for creating duplicate files for each district

The challenges cited by facilities that necessitate a duplicate file for a repeat patient varied in both districts. The most common cause reported by PHC facilities in Dr Kenneth Kaunda district was a lost or misplaced file (71%), followed by patients not identifying themselves (42%), and clinicians retaining files (33%). The ranking was much the same in Tshwane district.

The key difference is that most of the PHC facilities in Dr Kenneth Kaunda district (71%), compared to 45% in Tshwane reported that they had to create a new file for repeat patients because files were lost. Conversely, 32% of PHC facilities in Tshwane district (compared to just 8% in Dr Kenneth Kaunda) found that patients retaining their health records was the cause of duplicate patient files.

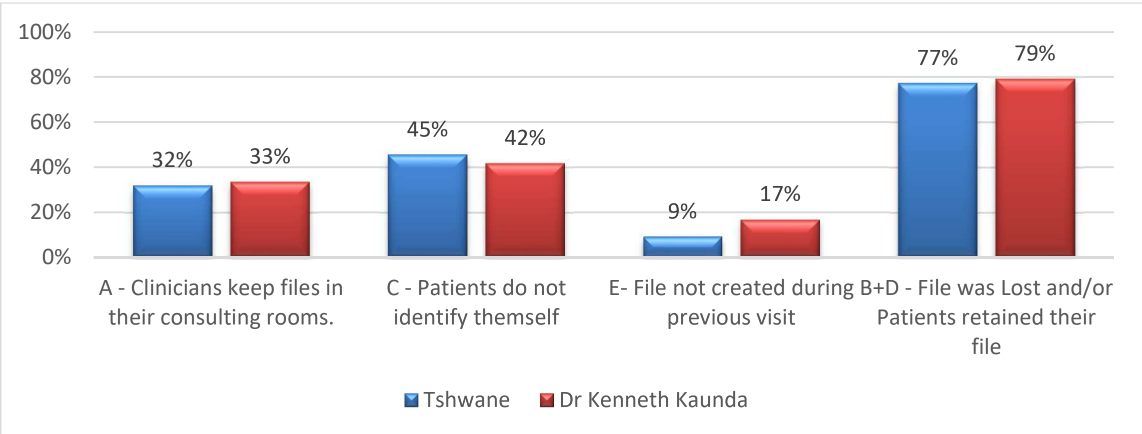


Figure 3.7 Compare Reasons reported by PHC facilities for creating duplicate files between districts

The patients retaining their file may also constitute a lost file because legislation requires the health provider to retain the patient file. It may have been difficult for information officers to distinguish whether files were lost or retained by patients, therefore in the analyses below they were combined. The researcher collated facilities that reported lost file, with those that reported patients retaining their file. The combined cause after aggregating these two shows that causes of duplicate files in Tshwane and Dr Kenneth Kaunda show no significant differences.

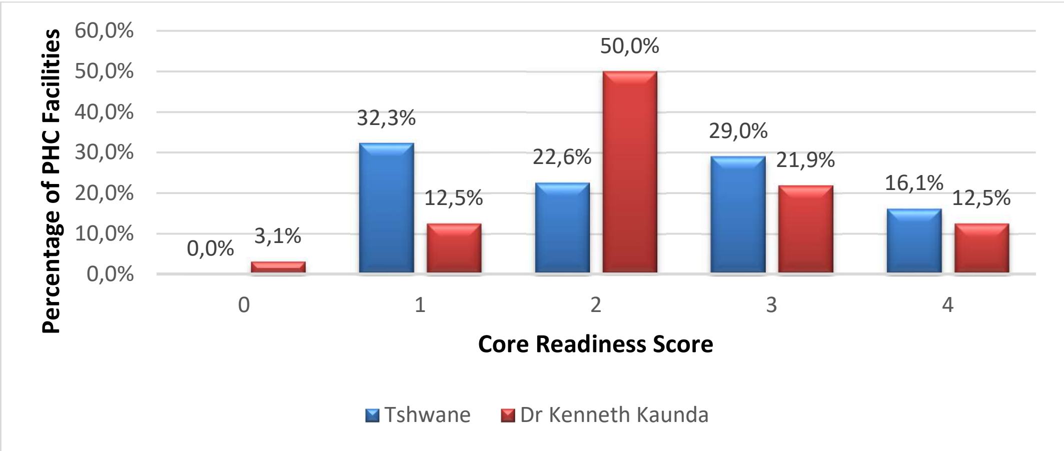


Figure 3.8 Core readiness Score by district

Overall, just 12.5% of facilities met all four core readiness criteria (ie. PHC facilities with a score of 4) in Dr Kenneth Kaunda district compared to 16% in Tshwane district. Just under one third of facilities in Tshwane only met 1 criteria, while half of the facilities met at least two criteria in Dr Kenneth Kaunda district.

3.4. Engagement Readiness

The level of engagement readiness was derived from responses to 5 questions that were asked from both the management and administration perspectives. The questions tested facility management and operational staff’s willingness to migrate to an electronic environment, and if the administration staff had acceptable level of knowledge to use IT systems.

The facility managers were asked to respond on a likert scale of 1 (strongly agreed) to 5 (strongly disagreed) for the following: (a) if they would place an extra effort to implement an electronic system to improve patient administration; (b) if their nurses will use an electronic system to document patient care during consultations; and lastly (c) if they would support creation of a system to facilitate exchange of records between PHC facilities.

3.4.1. Support from facility Managers for Migration to Electronic Systems

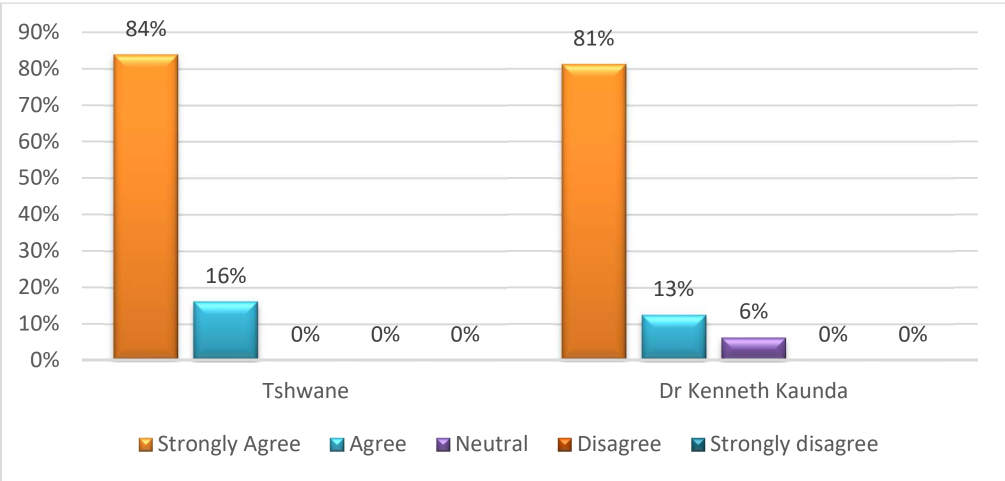


Figure 3.9 Support from Facility managers to support implementation of electronic systems

In Tshwane district, 100%, and Dr Kenneth Kaunda 94% of PHC facilities strongly agreed or agreed to offer additional effort for implementing a system that will improve administration.. In both districts, majority of the facilities strongly agreeing to use of technology.

3.4.2. Nursing staff's willingness to use Electronic Systems

The facilities in both districts were not as convinced of their nurses using an electronic system to document patient care during consultations. In Tshwane 77% of facilities anticipated nurses to support the use electronic systems, while in Dr Kenneth Kaunda 81% of facilities agreed that nurses would use an electronic system to document patient care.

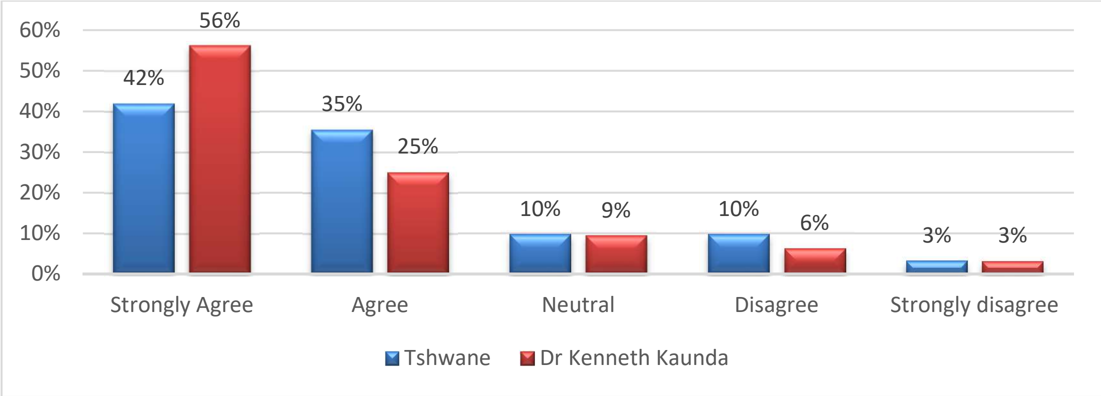


Figure 3.10 Perception of facility managers on nursing staff's willingness to use electronic systems during consultations

3.4.3. Support for Exchanging Health Records Electronically

The majority of the facilities were supportive and comfortable to share electronic patient records across their facilities. Both districts reported that 97% of their PHC facilities agreed to creating a unified registry of patients to facilitate sharing of patient records.

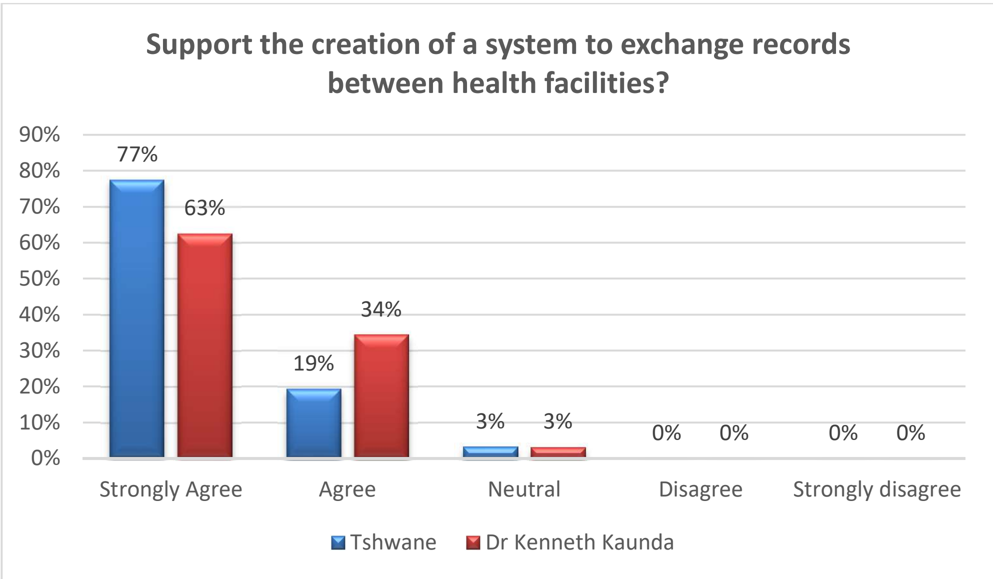


Figure 3.11 Support the creation of a system to exchange records between health facilities

3.4.4. Perceptions and Skill levels of Facility Information Officers

The facility Information Officers were asked two questions, namely, (a) if a need exists for introducing an electronic system for reducing administration burden, and (b) rate their skill level.

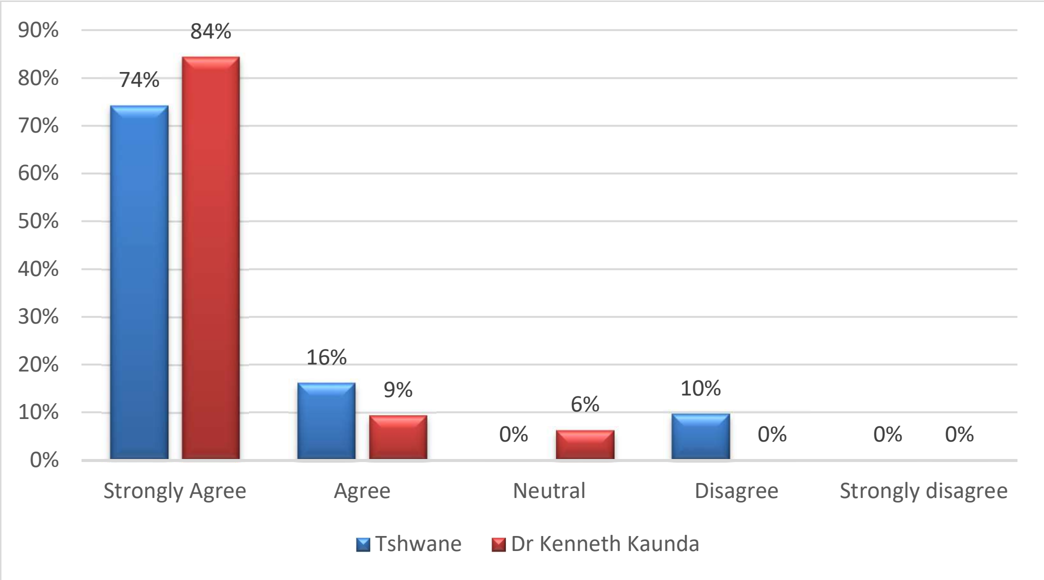


Figure 3.12 Support from Facility Information Officers for introducing technology

Majority of facility Information Officers in Tshwane (90%), and Dr Kenneth Kaunda districts (94%) agreed to a need for introducing technology for reducing administration burden. This was supported by facility managers who indicated their willingness to put in an extra effort to implement the system that will improve the administration. This improvement can potentially lead to reduced administration in their facilities.

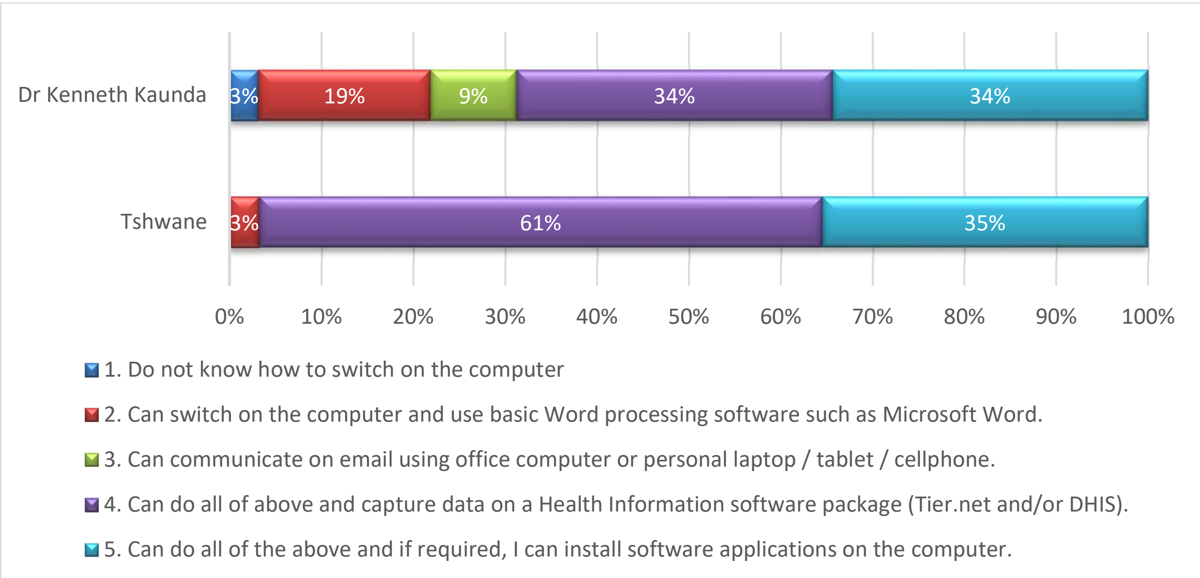


Figure 3.13 IT Skills of Facility Information Officers in by district

In terms of access to IT skills at PHC health facilities, Facility Information Officers are required to at least be able to capture data and use existing information systems. The researcher used the highest option from responses where more than one response was provided for the above question. Nearly all (97%) of PHC facilities in Tshwane were adequately skilled to implement the system, against 69% in Dr Kenneth Kaunda district.

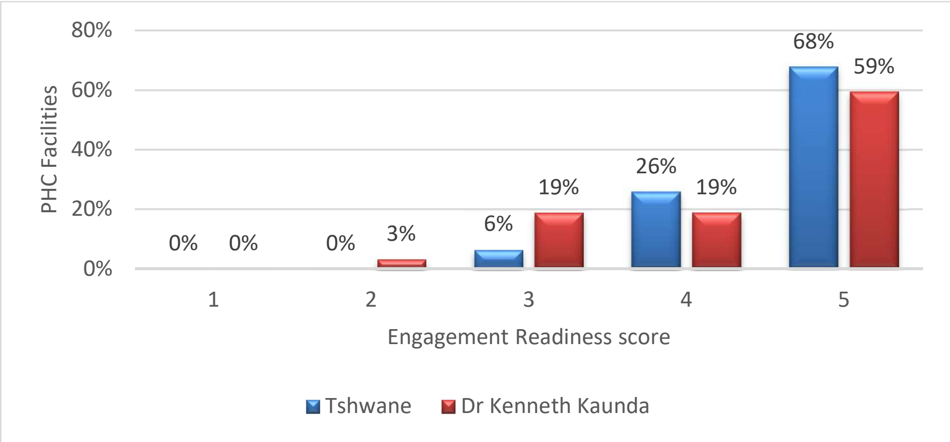


Figure 3.14 Percentage of PHC facilities that met the engagement readiness criteria by district

Overall, 68% of facilities in Tshwane and 59% of facilities in Dr Kenneth Kaunda district were ready to engage (ie. PHC facilties with a score of 5) with a new electronic system to strengthen administration system, and document patient care. The slightly lower rate of engagement readiness in Dr Kenneth Kaunda district is largely attributed to their weak level of IT knowledge.

3.5. Technological Readiness

The technological readiness is made up of access to ICT infrastructure, and quality of ICT support. All the questions in the technological readiness were answered by Facility Information Officers due to their expertise and experience.

The health facility must have access to at least two computers, that are on a Local Area Network, with a functional printer. The facility must also have access to intranet/internet and/or email. The facilities were questioned on availability and source of IT support, and the average resolution time after the fault was reported.

3.5.1. Access to Computers and Printers

Table 3.3 Availability of computers in PHC facilities by district

Number of Computers	Tshwane	Dr Kenneth Kaunda district
Mean	8	5
Median	5	5
Range	2-31	2-15

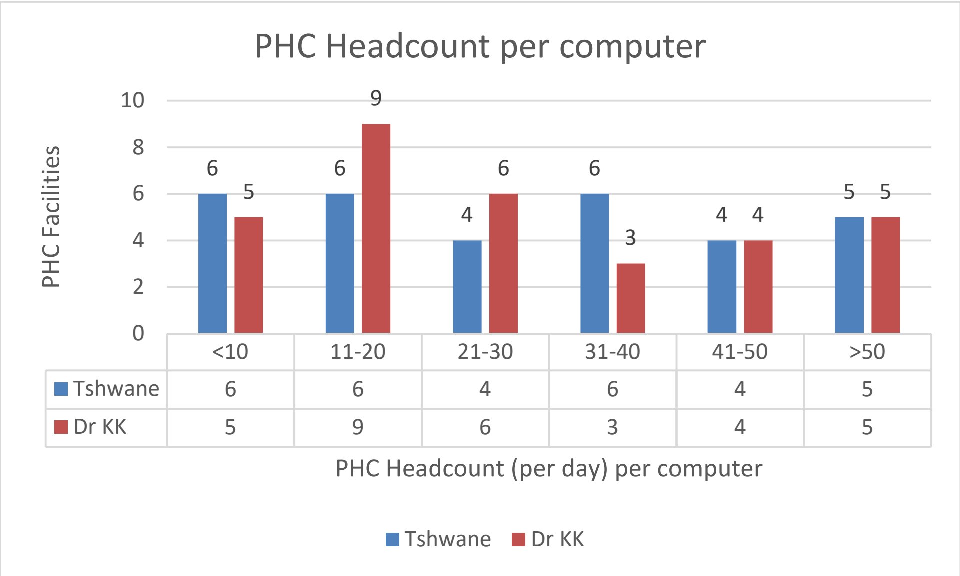


Figure 3.15 Histogram for PHC headcount per day to number of computers

All the facilities in Tshwane and Dr Kenneth Kaunda districts had at least 2 computers, with a mean of 8 and 5 computers respectively in both districts. The number of computers ranged between 2 and 31 in Tshwane, and 2 and 15 in Dr Kenneth Kaunda districts. Both districts had a mode of 5 computers among their facilities.

PHC headcount is a good proxy measure to determine workload of the PHC facility and crudely measure the need. Number of patients serviced per day per computer was calculated to understand adequacy of IT equipment in relation to workload. The analysis reflects inequitable distribution of admin staff in both districts across their PHC facilities.

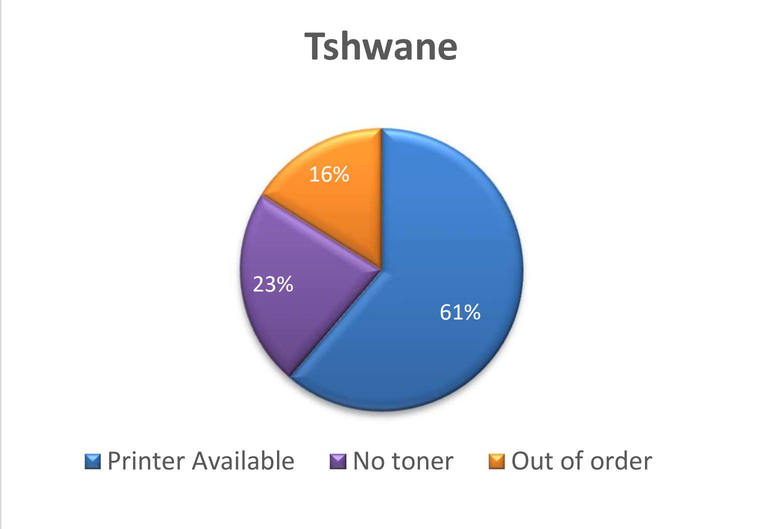


Figure 3.16 Access to a printer at PHC facilities in Tshwane district

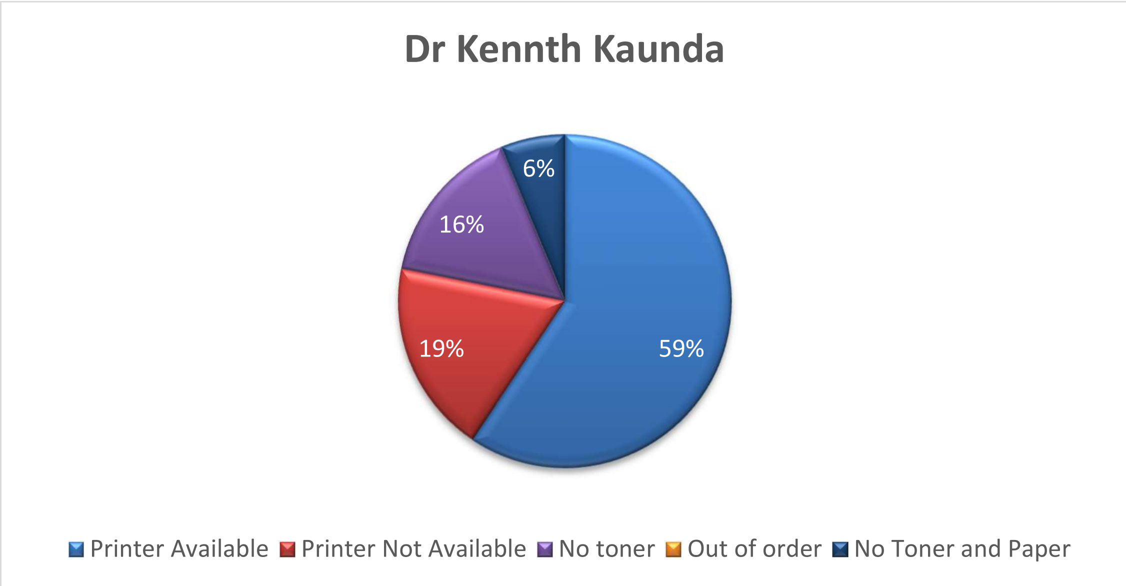


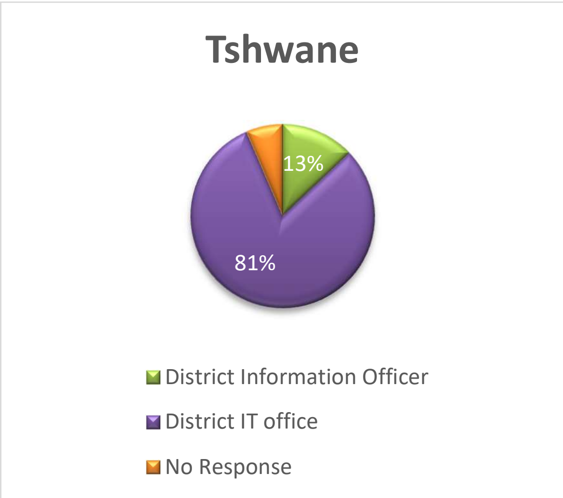
Figure 3.17 Access to a printer at PHC facilities in De Kenneth Kaunda district

The vast majority of facilities in both districts (100% of facilities in Tshwane and 81% of facilities in Dr Kenneth Kaunda district) have access to a printer. However, only 61% of facilities in Tshwane district, and 59% Dr Kenneth Kaunda district reported that their printer was functional at most times. Most facilities in both districts attributed non-functionality due to lack of toner. This challenge was experienced by most of the facilities (with non-functional printers) for more than a month.

3.5.2. IT Network Infrastructure

Facility Information Officers were asked if all their computers are connected to a common area network, as a proxy to ascertain if their PHC facilities had a Local Area Network (LAN). Both districts reported a low coverage of facilities with a Local Area Network that had all its computers on the LAN, with 39% in Tshwane and 17% in Dr Kenneth Kaunda district, with surprisingly a high percentage of facilities reporting access to internet. 94% of facilities in Tshwane and 81% in Dr Kenneth Kaunda district could connect to internet. This implies that majority of the facilities in both districts with internet access would not be able to access internet on all of their computers due to limited coverage of LAN.

3.5.3. IT Support



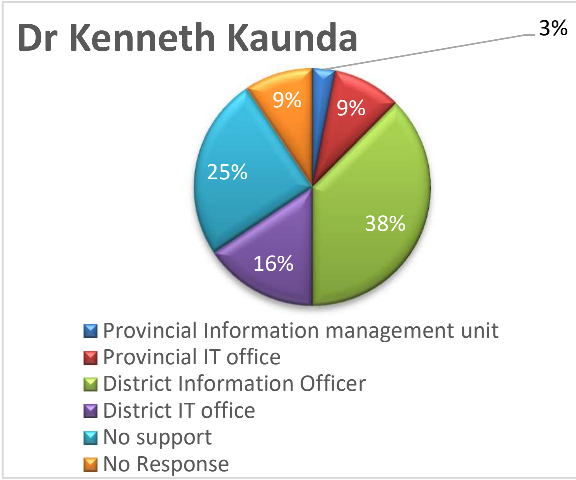


Figure 3.18 Provision of IT Support in Tshwane and Dr Kenneth Kaunda district

In terms of support, all facilities in Tshwane district had access to IT support, while 25% of facilities in Dr Kenneth Kaunda district reported no IT support. Both districts received IT support from their district offices, with facilities in Tshwane district mostly receiving support from district IT officer (86%), and facilities in Dr Kenneth Kaunda district receiving IT support from district Information Officer (41%).

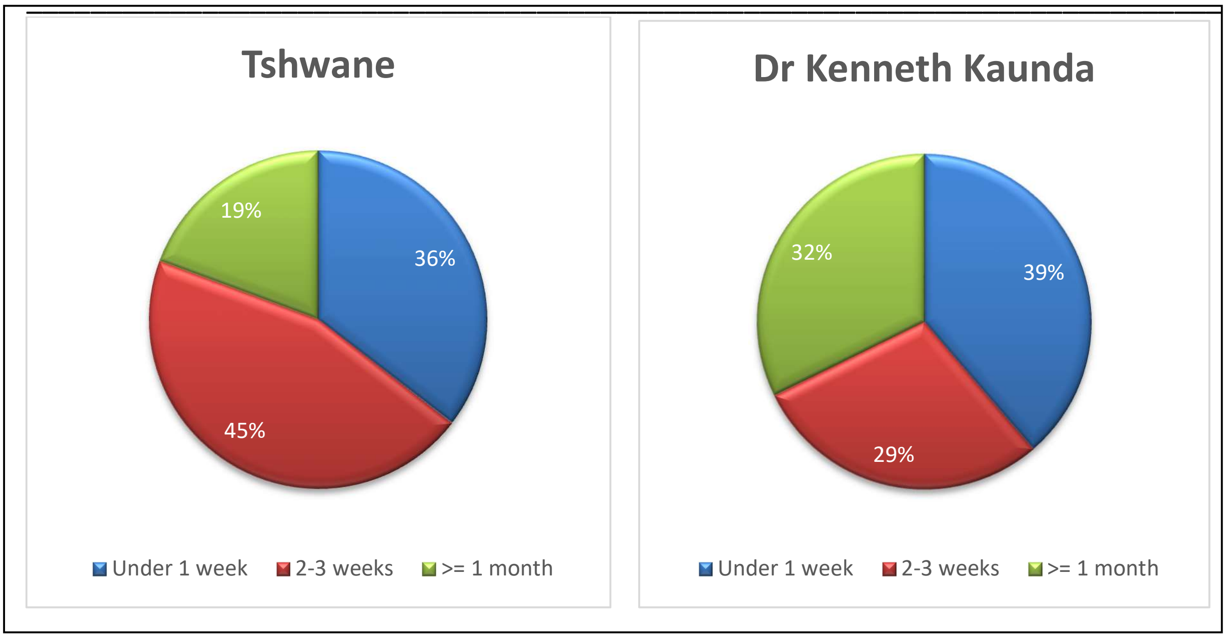


Figure 3.19 IT Support response time by district

The response times for IT support were poor in both districts with just more than one third (35% of facilities in Tshwane district and 39% of facilities in Dr Kenneth Kaunda district) of PHC facilities received support in under a week.

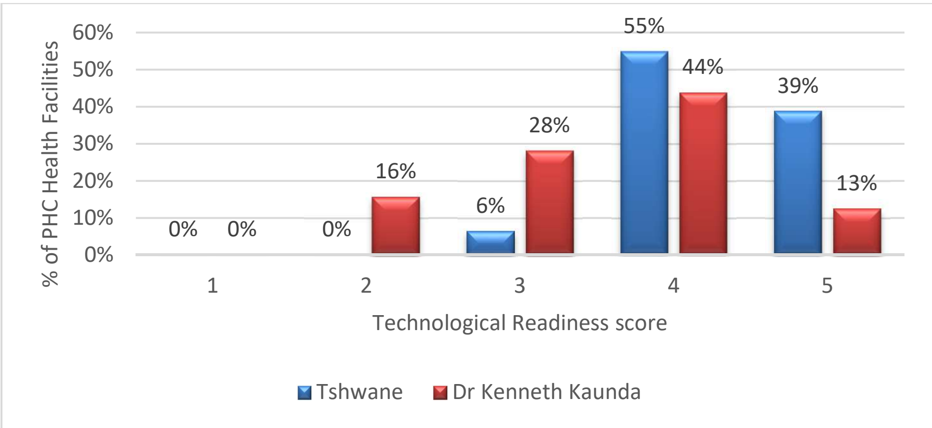


Figure 3.20 Percentage of PHC facilities that met the technological readiness criteria by district

Overall, 39% of PHC facilities in Tshwane district met all 5 criteria to be technologically ready, compared to just 12.5% in Dr Kenneth Kaunda district.

3.6. Societal Readiness

The societal readiness measured if the health facility has access to email, and perceptions on the use of email communication for both internal and external communication, as a proxy measure for general openness to technology.

The key respondents were asked five questions. The facility managers were asked if they would be comfortable to use email for receiving laboratory results, and that they would prefer to communicate using email with patients and with their supervisor as well as other clinics and district/provincial offices.

The facility information officers were asked if they had access to an email address, and if it was a person email account or that provided by their employer. They were also asked to rate the intensity of use of email to determine how frequent and familiar they are with the use of email.

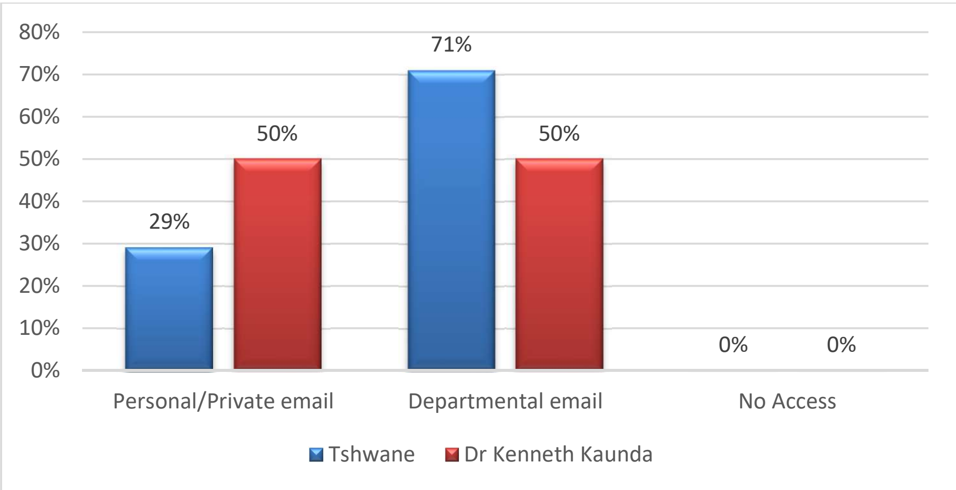


Figure 3.21 Access to email in PHC Facilities by district

All the facilities in Tshwane and Dr Kenneth Kaunda had access to email. However, staff at just 29% of facilities in Tshwane and 50% of facilities in Dr Kenneth Kaunda only had access to their private email system(s).

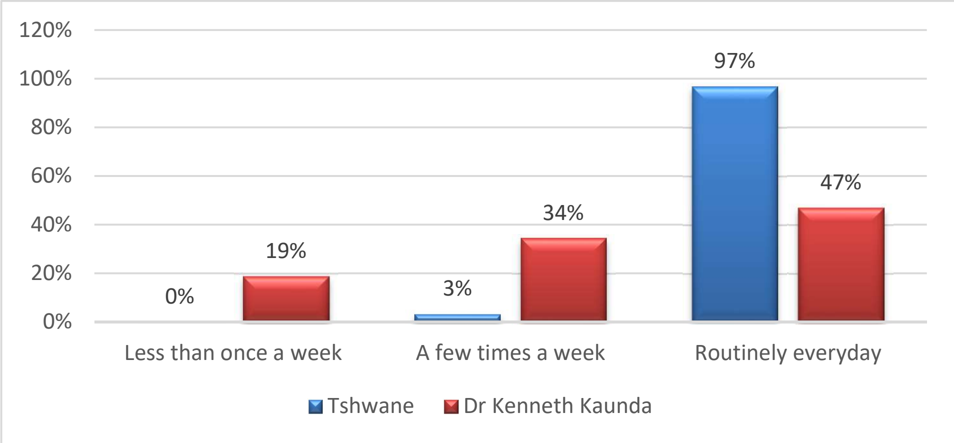


Figure 3.22 Frequency of email use by staff at PHC facilities

There are relatively high levels of email use in PHC facilities in Both districts. Staff at Majority of PHC health facilities in both districts reported routine use of email on a daily basis. The proportions however differed significantly between districts. Almost all (97%) of facilities in Tshwane were making use of email routinely on a daily basis, compared to just 47% in Dr Kenneth Kaunda district, while 34% used it a few times per week.

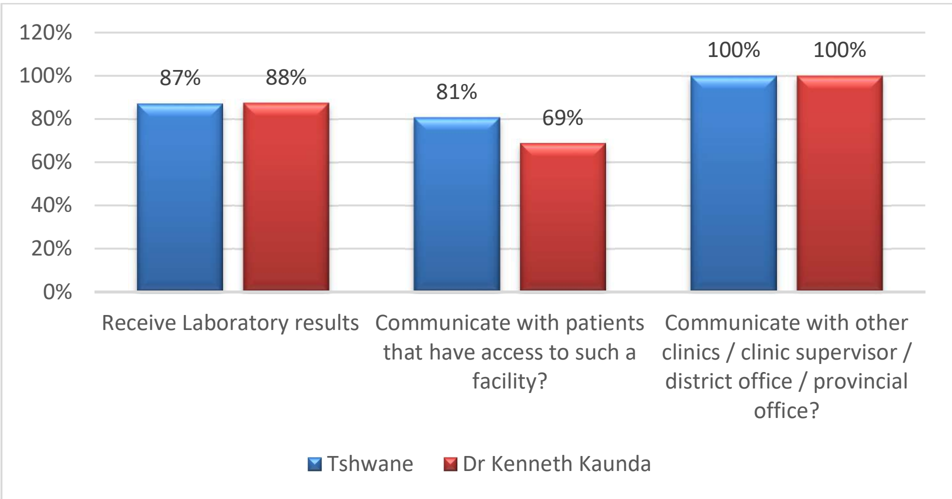


Figure 3.23 Preferences of email use by district

All clinics in both Tshwane and Dr Kenneth Kaunda preferred the use of email to communicate with other clinics, their clinic supervisors and district Office, however, only a subset preferred using it for receiving Lab results and/or communicating with their patients. 87% in Tshwane and 88% in Dr Kenneth Kaunda of facilities would use an email system to receive laboratory results. Similarly, 81% and 69% of facilities in Tshwane and Dr Kenneth Kaunda districts respectively preferred to use email to communicate with patients.

The societal readiness measure requires the facility to have access to a secure email facility provided by the Department of Health and acceptability of email use both for laboratory results and internal communication. Overall there is a high prevalence of societal readiness with, 65% of facilities in Tshwane and 44% in Dr Kenneth Kaunda districts that meeting societal readiness criteria.

3.7. Compare level of readiness between Tshwane and Dr Kenneth Kaunda districts

A F-Test was done for each of the four readiness domains to test if there are equal or unequal variances between the samples of both districts. The results from the F Test for each of the four domains are provided below.

Table 4 F-Test results for Core Readiness, Engagement Readiness, Technological Readiness and Societal Readiness

α = 0.05

F-Test Two-Sample for Variances

	Core Readiness		Engagement Readiness		Technological Readiness		Societal Readiness	
	Tshwane district	***Dr KK district***	***Tshwane district***	***Dr KK district***	***Tshwane district***	***Dr KK district***	***Tshwane district***	***Dr KK district***
Mean	2.2903	2.281	4.6129	4.3437	4.3225	3.53125	2.5806	2.40625
Variance	1.2129	0.9183	0.3784	0.8135	0.3591	0.837702	0.3849	0.378024
Observations	31	32	31	32	31	32	31	32
P Value	0.222		0.0194		0.0113		0.4793	

H_0 : The variances between Tshwane and Dr Kenneth Kaunda district are equal
H_1 : The variances between Tshwane and Dr Kenneth Kaunda district are unequal

$P > 0.05$ for core readiness and societal readiness therefore cannot reject null hypothesis (H_0). The variances between Tshwane and Dr Kenneth Kaunda district are therefore equal. Conversely $P < 0.05$ for Engagement and Technological readiness, therefore the null hypothesis may not be rejected and variances between the two samples are unequal.

A two-sample t-Test was therefore conducted assuming equal variances was conducted for core readiness and societal readiness, while the same test was conducted assuming unequal variances for Engagement and Technological Readiness.

Table 5 – Two-sample t-Test results for core readiness and societal readiness assuming

t-Test: Two-Sample Assuming Equal Variances $\alpha = 0.05$

	Core Readiness		Societal Readiness	
	Tshwane district	***Dr KK district***	***Tshwane district***	***Dr KK district***
Mean	2.290323	2.28125	2.580645	2.40625
Variance	1.212903	0.918347	0.384946	0.378024
Observations	31	32	31	32
P Value	0.972262		0.266891	

H_0: Levels of readiness in Tshwane and Dr Kenneth Kaunda districts are not significantly different

H_1: Levels of readiness in Tshwane and Dr Kenneth Kaunda districts are significantly different

The t-Test confirmed that levels of core readiness in Tshwane and Dr Kenneth Kaunda districts are not significantly different because P>0.05 and null hypothesis can not be rejected.

Table 6 Two-sample t-Test results for engagement readiness and technological readiness assuming unequal variances

t-Test: Two-Sample Assuming Unequal Variances $\alpha = 0.05$

	Engagement Readiness		Technological Readiness	
	Tshwane district	***Dr KK district***	***Tshwane district***	***Dr KK district***
Mean	4.612903	4.34375	4.32258065	3.53125
Variance	0.378495	0.813508	0.35913978	0.837702
Observations	31	32	31	32
P Value	0.170895		0.00015334	

H_0: Levels of readiness in Tshwane and Dr Kenneth Kaunda districts are not significantly different

H_1: Levels of readiness in Tshwane and Dr Kenneth Kaunda districts are significantly different

The two sample t-Test assuming unequal variances for Engagement Readiness revealed that P>0.05, therefore levels of Engagement readiness in Tshwane and Dr Kenneth Kaunda districts are not significantly different. Conversely, P<0.05 for Technological readiness therefore null hypothesis can be rejected, confirming significantly different levels of technological readiness in both districts.

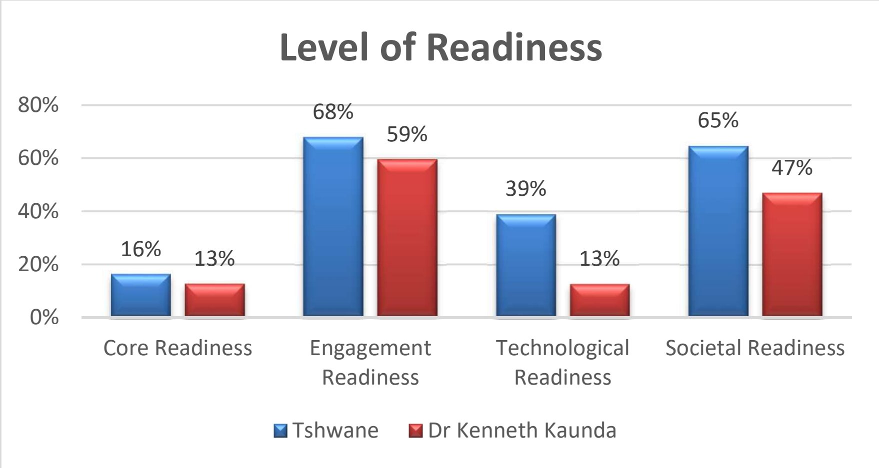


Figure 3.24 Overall Level of Readiness by district

Tshwane district scored better than Dr Kenneth Kaunda district on all four readiness criteria, with small differences between them for core and engagement readiness, and moderately higher levels for the societal readiness. Tshwane district scored three times that to Dr Kenneth Kaunda district for Technological readiness.

However, the two sample t-Test has revealed that levels of readiness in between the two districts is not significantly different for Core Readiness, Engagement Readiness and Societal Readiness. The test confirmed that levels of Technological readiness are significantly different between the two districts.

4. DISCUSSION

The discussion chapter will provide the overall findings, limitations of the study, discuss the strengths and weaknesses in Tshwane and Dr Kenneth Kaunda districts and concludes with recommendations.

This study was carried out in two of the ten NHI Pilot districts, namely, Tshwane and Dr Kenneth Kaunda districts, with the former being predominantly urban and the latter peri-urban with a strong presence of mining communities.

There are three essential aspects that need to be considered for introducing information systems in any environment. These are people, processes and technology. Health care is no different, and therefore it is essential to ensure these components are prepared prior to introduction of information systems. These components are fundamental to the four domains (core readiness, engagement readiness, societal readiness and technological readiness) assessed in Tshwane and Dr Kenneth Kaunda districts.

Tshwane district scored better than Dr Kenneth Kaunda district in all four readiness domains. There were however no statistically significant differences between the two districts with respect to core readiness (12.5% in Tshwane, 16% in Dr Kenneth Kaunda, P-value 0.972262); engagement readiness (68% in Tshwane, 59% in Dr Kenneth Kaunda, P-value 0.170895), and societal readiness (65% in Tshwane, 47% in Dr Kenneth Kaunda, P-value 0.266891). Tshwane district (38%) scored more than three times that of Kenneth Kaunda (12.5%) for technological readiness, making it the only domain with statistically significant differences between the levels of readiness (P-Value 0.00015334). However, both districts have almost equal budgets to fund primary health care in their respective districts (10).

4.1. Limitations

This study has only examined the level of readiness of PHC facilities in two NHI Pilot districts. However, there are several other pre-requisites at community level and at central level (for back office operations) to determine if Department of Health is ready for implementing a patient based health information system at the national scale, that need to be examined.

The special conditions within different Primary Health Care facilities cannot adequately be studied using a cross sectional study design, and therefore the depth of information obtained from the study might be superficial.

The study sampling method selected all PHC facilities in both Tshwane and Dr Kenneth Kaunda Districts. However, 19 PHC facilities in Tshwane and 9 PHC facilities in Dr Kenneth Kaunda District did not participate in the study for the reasons provided in the Results chapter.

The measurement tool has not been validated with real data from Primary Health Care facilities. The data collection tool was therefore not tested for reliability.

The study participants were informed that the study will not result in any punitive meaures for themselves and their clinic, however, there may still have been response bias because the questionnaire was self-administered.

4.2. Strengths and Weaknesses in Tshwane and Dr Kenneth Kaunda districts

4.2.1. Standardised business processes and workflows

Introduction of an information system in any environment requires functional business processes. An effective patient filing system is an essential pre-requisite for introducing an electronic system (16). Both Tshwane and Dr Kenneth Kaunda districts have one or other filing system in place, however, facility managers in majority of PHC facilities of both districts perceived that clinicians are not satisfied with their filing system.

A high proportion of PHC facilities were creating duplicate files for a variety of reasons ranging from clinicians retaining patient files to lost files, and patients not identifying themselves when seeking care. Majority of the PHC facilities in Dr Kenneth Kaunda district (71%), compared to 45% in Tshwane reported that they had to create a new file for repeat patients because files were lost. Almost one third of facilities in both districts reported that duplicate files were created because clinicians retained files after patient care, creating a need for creating a new patient file for the repeat visit. This finding is consistent with challenges identified by the Health System Trust (52). An optimised patient filing system (workflow) is identified as a pre-requisite. It has been identified as one of the seven components that are expected to be implemented within the eHealth Programme. (16)

The other difference between the districts was the filing method. PHC Facilities in Tshwane district mostly made use of the index number on the patient retained card to sort the files, while Dr Kenneth Kaunda district predominantly used patients Date of Birth to sort and store the files.

4.2.2. Local vision and acceptance of technology

The engagement readiness tested if management, clinical and clerical staff were prepared to put in extra effort for migrating to an electronic system for patient administration. The local vision is a primary requirement for a successful and sustainable implementation of the eHealth Programme. (16) Therefore facility staff's willingness to embrace technology is a requirement for a successful implementation of a health information system.

There are at least three factors that influence technology acceptance are performance of the system, effort required to implement and use the system and skills. (11, 41) Almost all facility managers and Facility Information Officers agreed to support introduction of technology in their PHC facility. However, facility managers of some PHC facilities perceived that there will be some resistance from clinical staff (nurses, doctors, etc) to use an electronic system during patient care. This finding was anticipated because previous studies has revealed that nurses already spent undue amount of time to collect data, and that such implementation may come with additional work burden. (52)

Research reveals that significant consideration must be given to development of both computer usability skills, and IT support skills. This study tested IT skill levels of facility information officers. The IT skills of facility Information Officers in both districts were significantly different. Facility Information Officers in 21% of facilities in Dr Kenneth Kaunda district cannot capture data on a Health Information software package, compared to just 3% in Tshwane district. The IT skill levels of FIOs was also much lower in Dr Kenneth Kaunda district with just 68% of FIOs at least being able to capture data on a software package, compared to 97% in Tshwane district. This finding is consistent with the previous assessment that found the need for staff to be taught to capture and install software packages. (49)

The societal readiness measurement assessed if health facilities had access to email facilities, if such a facility to communicate electronically was self-funded or provided by the Department and lastly, if staff would use email communicate internally (with management and other facilities) and externally with patients to receive laboratory results.

Majority of PHC facilities in Tshwane had access to email facilities provided by their Department, with 97% of facilities reporting that they already use email daily. This reflects an improvement to the national assessment carried out during 2012. (49) In Dr Kenneth Kaunda district, the frequency of use of email was much less than Tshwane. Less than half (47%) of PHC facilities reported that they use email daily. This corroborates with the fact that at only half of PHC facilities in Dr Kenneth Kaunda district reported that they had access to email system provided by their Department.

The study revealed that a significant proportion of PHC facilities would embrace technology to receive laboratory results, communicate with patients and internally with management.

4.2.3. ICT Hardware, support and maintenance

PHC facilities must have access required ICT infrastructure and post implementation support to ensure implementation. (41) The technological readiness tested access to ICT infrastructure (both ubiquitous and network infrastructure), as we well as, ICT support. In terms of technological readiness, access to IT Hardware (computers and printers) was not a challenge.

However, more than one third PHC facilities in both districts reported that their printer was not functional at most times. A vast majority attributed non-functionality due to lack of toner. Most of the time it took more than a month to resolve the matter, even though these toners can be procured using transversal tenders. This reflects either a weak supply chain system, poor IT support, or lack of (or inadequate) budgets for IT consumables.

The PHC Facilities in both districts reported IT support to be challenge. There was either no support, or it was not adequate for majority of facilities. Both district reported slow response times. Only about one third of facilities in both districts reported that their IT support would respond within one week of request for support. This finding is consistent with the previous assessment carried out in 2012. (49)

The PHC facilities in Dr Kenneth Kaunda district did not have adequate quality and quantity of IT support. The IT support in Dr Kenneth Kaunda district was largely provided by district Information Officers, who are largely trained for managing data sets rather than providing IT support.

Tshwane district had a much higher administration capacity in their facilities, with a mode of 7 personnel in Tshwane compared to just 1 in Dr Kenneth Kaunda district, albeit both districts have different service volumes. The PHC Headcount in Tshwane were more than three times that of Dr Kenneth Kaunda district during the 2015/16 financial year (53).

4.3. Conclusion and Recommendations

Any eHealth system "is concerned with improving the flow of information, through electronic means, to support the delivery of health services and the management of health systems" (54). ICT can therefore be used to measure progress towards health goals. It can also be used to understand the costs associated with such gains. Successful eHealth implementation is a win-win situation for all stakeholders including Citizens, Professionals in research, practice, healthcare institutions and governments. (54)

South Africa has made strides over the past few years to define, develop and implement the eHealth programme (8, 16, 37, 38). South Africa has made progress to develop and adopt the necessary eHealth standards for the shared info-structure at the central level. The National Department of Health also commenced to do a reference implementation of the eHealth standards through the eHealth programme in all 10 NHI Pilot districts (16). The data collection for this study was conducted after the PHC facilities in both districts were provisioned with some IT equipment, but, prior to the system being implemented, and therefore a number of weaknesses identified by the study may have already been addressed by the districts.

This study looked into levels of readiness for PHC facilities in two NHI pilot districts for implementing a national patient based information system. The study did not go into the level of readiness of this shared info-structure. Nor does it consider existence or functionality of ICT governance mechanisms and structures matters, that are critical to implementing a National Health Information System.

The other area that needs further investigation is the security and privacy aspects of introducing technology in health care. The sharing of patient information among providers raises issues relating to privacy, confidentiality, integrity, availability and security issues.

Equipping employees with technology in rural and/or resource constrained settings poses a number of consequential challenges. The facilities may make them the target of crime or theft, and may encourage misuse. The reliability of their existing network access may also not be sufficient. A deeper understanding of computer literacy levels among clerical and clinical staff is also required before embarking on a full-scale implementation.

The change from provider-centric to patient-centric approaches in the provision of healthcare services requires a paradigm shift for both patients and providers. It is therefore critical for both patients and providers to buy into the introduction of technology in health care to ensure there is adequate level of trust because health providers and patients to share the electronic health records. This study has also not examined patient’s perceptions or obtain an understanding of their context. Such a study will greatly assist to identify other societal challenges that need to be addressed for implementation of National Health Information Systems.

The study has revealed that levels of readiness of both districts vary across the four readiness domains. The study has identified and compared the levels of readiness to understand similarities and differences as well as strengths and weaknesses in both districts. The researcher recommends that the identified weaknesses are addressed in both districts to ensure that implementation is successful and sustainable.

REFERENCES

1. United Nations. United Nations General Assembly Sixty-Seventh Session Global Health And Foreign Policy 2012 [Available from: http://universalhealthcoverageday.org/un-resolution/.
2. National Planning Commission. National Development Plan 2030: Our Future - make it work. In: The Presidency, editor. 2012.
3. Gaza N. Health Sector Roadmap - HASA Conference 2009. 2009.
4. National Department of Health. National Health Insurance in South Africa. Government Gazette2011.
5. National Department of Health. National Health Insurance for South Africa - Towards Universal Health Coverage. Government Gazette2015.
6. Bodibe K. NHI pilot districts announced: Health-e; 2012 [Available from: http://www.health-e.org.za/news/article.php?uid=20033489.
7. Al-Shorbaji N. The World Health Assembly Resolutions on eHealth: eHealth in Support of Universal Health Coverage. Methods Inf Med. 2013(52):463-6.
8. Department of Health. eHealth Strategy South Africa 2012 - 2016. In: National Department of Health, editor. 2012.
9. Main O. The Local Government Handbook: South Africa: Yes Media; 2016. Available from: http://www.localgovernment.co.za.
10. Massyn N, Peer N, Padarath A, Barron P, Day C. District Health Barometer 2014/15: Health Systems Trust; 2015.
11. Karrim N, Mahlatsi M. The Health Information Systems Audit of South Africa. 2006.
12. World Health Organisation. Review of Health Information Systems (HIS) in Selected Countries: South Africa2004.
13. StatisticsSA. Assessment of the Health Information System in South Africa. 2009.
14. Garrib A, Stoops N, McKenzie A, Dlamini L, Govender T, Rohde J, et al. An evaluation of the District Health Information System in rural South Africa. South African Medical Journal. 2008;98(7):549-52.
15. Yogeswarana P, Wright G. EHR Implementation in South Africa: How do we get it right? MEDINFO 2010; South Africa2010.
16. Wolmarans M, Tanna G, Dombo M, Parsons A, Solomon W, Chetty M, et al. eHealth Programme reference implementation in primary health care facilities. South African Health Review. 2015.
17. HealthIT.gov. What are the differences between electronic medical records, electronic health records, and personal health records? 2016 [Available from: https://www.healthit.gov/providers-professionals/faqs/what-are-differences-between-electronic-medical-records-electronic.
18. Fiks A, Grundmeier R, Biggs L, Localio A, Alessandrini E. Impact of clinical alerts within an electronic health record on routine childhood immunization in an urban pediatric population.2007.
19. Middleton B, Hammond W, Brennan P, Cooper G. Accelerating U.S. EHR Adoption: How to Get There From Here. Recommendations Based on the 2004 ACMI Retreat. JAMIA. 2005;12:13-9.
20. Chaudhry B, Wang J, Wu S, Maglione M, Mojica W, Roth E, et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. 2006.

21. Shekelle P, Morton S, Keeler E. Costs and benefits of health information technology. 2006.
22. Silber D. The case for eHealth. European Commission's first high-level conference on eHealth2003. p. 9.
23. Ritz D, Althauser C, Wilson K. Connecting Health Information Systems for Better Health. 2014.
24. Triggle N. Health e-records 'struggling to fulfil potential' 2010 [Available from: http://www.bbc.co.uk/news/10333432.
25. Greenhalgh T, Stramer K, Bratan T, Byrne E, Russell J, Potts HWW. Adoption and non-adoption of a shared electronic summary record in England: a mixed-method case study British Medical Journal. 2010;340(c3111).
26. Mason MK. What Can We Learn from the Rest of the World? A Look at International Electronic Health Record Best Practices2005.
27. HealthConnect. Shared Electronic Health Record Service 2007 [updated 12 March 2007. Available from: http://www.health.gov.au/internet/hconnect/publishing.nsf/Content/Shared+Electronic+Health+Record+Service+%28SEHR%29#System%20Capability%20%28SEHR%29.
28. Communio. HealthConnect Evaluation. 2009.
29. Department of Human Services. National E-Health Strategy. In: Victorian Department of Human Services, editor. Australian Health Ministers' Advisory Council: Deloitte; 2008.
30. Department of Health and Ageing. PCEHR Draft Concept of Operations Consultation 2011 [Available from: http://www.yourhealth.gov.au/internet/yourhealth/publishing.nsf/Content/pcehr.
31. Jolly R. The e health revolution - easier said than done. In: Parliament of Australia, editor. 2011.
32. Dutton P. Review of Personallly Controlled Electronically Health Record. 2013.
33. National Department of Health. Negotiated Service Delivery Agreement (NSDA) 2010-2014. 2010.
34. National Department of Health. Development of District Health Information System. 2000.
35. National Department of Health. National Health Care Management Information System (NHC/MIS) of South Africa1997.
36. Osler M, Hilderbrand K, Hennessey C, Arendse J, Goemaere E, Ford N, et al. A three-tier framework for monitoring antiretroviral therapy in high HIV burden settings. Journal of the International AIDS Society. 2014;17.
37. National Department of Health, Council for Scientific and Industrial Research. National Health Normative Standards Framework for Interoperability in eHealth. Government Gazette2014.
38. Seebregts C, Barron P, Tanna G, Benjamin P, Fogwill T. MomConnect: an exemplar implementation of the Health Normative Standards Framework in South Africa. 2016.
39. National Department of Health, Department of Planning Monitoring and Evaluation. Operation Phakisa Ideal Clinic Realisation And Maintenance: Final Lab Report 2015.
40. Littlejohns P, Wyatt JC, Garvican L. Evaluating computerised health information systems: hard lessons still to be learnt. BMJ. 2003;326:4.
41. Mammen A, Weeks R, editors. Electronic Medical Record (EMR) technology acceptance by healthcare professionals in South Africa. Proceedings of PICMET '14 Conference: Portland International Center for Management of Engineering and Technology; Infrastructure and Service Integration; 2014 27-31 July 2014.

42. Braa J, Jacucci E, Shaw V. Standardization of Health Information Systems in South Africa: The Challenge of Local Sustainability2004.
43. Trivedi M, Daly E, Kern J, Grannemann B, Sunderajan P, Claassen C. Barriers to implementation of a computerized decision support system for depression: an observational report on lessons learned in "real world" clinical settings2009.
44. Shield RR, Goldman RE, Anthony DA, Wang N, Doyle RJ, Borkan J. Gradual Electronic Health Record Implementation: New Insights on Physician and Patient Adaptation2010.
45. World Health Organisation. Electronic Health Records - Manual for Developing Countries2006.
46. Lorenzi N, Kouroubali A, Detmer D, Bloomrosen M. How to successfully select and implement electronic health records (EHR) in small ambulatory practice settings2009.
47. Yoon-Flannery K, Zandieh SO, Kuperman GJ, Langsam DJ, Hyman D, Kausha R. A qualitative analysis of an electronic health record (EHR) implementation in an academic ambulatory setting. Informatics in Primary Care. 2008;16(4):277-84.
48. Li J, Wee Land L, Chattopadhyay S, Ray P. E-Health readiness framework From Electronic Health Records perspective2008.
49. Enhancing Strategic Information Project South Africa. District Health Information System (DHIS) Rapid Information Needs Assessment. 2012.
50. Rezai-Rad M, Vaezi R, Nattagh F. E-Health Readiness Assessment Framework in Iran. Iranian J Publ Health. 2012;41(10):8.
51. Kgasi M, Kalema B. Assessment E-health Readiness for Rural South African Areas. Journal of Industrial and Intelligent Information. 2014;2(2):5.
52. Health Systems Trust. Rationalisation of Registers 2015 [Available from: http://www.hst.org.za/projects/rationalisation-registers.
53. Massyn N, Peer N, Padarath A, Barron P, Day C. District Health Barometer 2015/16: Health Systems Trust; 2016.
54. World Health Organisation, International Telecommuniccations Union. National eHealth Strategy toolkit 2012.

Annexure A – Information Sheet

INFORMATION SHEET

Study title:

ASSESSING THE LEVEL OF READINESS IN TSHWANE AND DR KENNETH KAUNDA DISTRICTS FOR IMPLEMENTING A NATIONAL PATIENT BASED INFORMATION SYSTEM

Greetings!

Introduction:

My name is Gaurang Tanna , and I am a student at the School of Public Health at University of Witwatersrand.

We are doing research to conduct an assessment at your clinic for the implementation of a first phase of patient based health information system. This research is just the process to learn about the opportunities and challenges that exist for implementing a health information system. This study will help us learn how data collection and patient administration is conducted at your clinic.

Invitation to participate: We are inviting you to take part in a research study, because we wish to understand the facility's level of readiness for the implementation of a patient based information system that is being developed and will be nationally implemented.

What is involved in the study:

This survey will be conducted using a simple questionnaire to measure the level of readiness in two NHI districts, namely, Tshwane and Dr Kenneth Kaunda districts. All Primary Health Care (PHC) facilities operated by provincial government in Tshwane district and Dr Kenneth Kaunda districts are included in this study.

We have selected two participants, namely, Facility Information Officer, and Facility manager from every facility. You are expected to complete a basic questionnaire comprising of 37 questions in total. The facility manager questionnaire contains 14 questions while Facility Information officer questionnaire contains 23 questions. You will notice that questions 1 to 7, 12, 18 to 20, 33 to 35 are in Facility manager questionnaire, and all other questions are in Facility Information Officer's questionnaire. It is done this way because the facility will be the unit of analysis and therefore responses from both key respondents will be combined where data is analyzed.

The questions are simple to answer. It should not take you more than 30 minutes to complete the questionnaire.

The findings from this study will help us and your Department to better understand the level of readiness for deploying a patient based information system in your district.

There are many documented benefits for developing and implementing a patient based patient information systems at National, Provincial and district levels of the health system. At the facility level, health information system implementation can result in improved patient administration, reduction in patient waiting times and better quality of care – all these will positively contribute to satisfaction levels of patients using your services.

You will be given pertinent information on the study while involved in the project and after the results are available.

Contact details:

You may contact the researchers or supervisors regarding queries relating to the study:

Researcher:
Name: Gaurang Tanna
Tel: 083 691 7300
Email: gaurang@tannaonline.com

Supervisor:
Ronel Kelleman
Tel: 011 878 8596
email: ronel.kelleman@gauteng.gov.za

Wits Human Research Ethics Committee administrator Wits (HREC) and chair: –

You may contact Wits REC for reporting of complaints /problems.

Name: Zanele Ndlovu
Tel: 011 717 1252/2700/1234
Email: Zanele.ndlovu@wits.ac.za

Thank you for taking the time to read this information sheet.

Annexure B – Consent Form

CONSENT FORM

Your participation is voluntary, your choice not to participate would not discriminate you in any way. There are no financial implications to you for participating in the study. . If at any time you choose to withdraw your participation and this consent you are free to do so and will not be prejudiced in any way.

Confidentiality: No personal information is collected in this study. The researcher will maintain confidentiality of the data collected in the study.

You may contact the researcher or supervisor or the Wits Human Research Ethics Committee administrator Wits (HREC) regarding any queries or the consent relating to the study:

Researcher:
Name: Gaurang Tanna
Tel: 083 691 7300
Email: gaurang@tannaonline.com

Supervisor:
Ronel Kelleman
Tel: 011 878 8596
email: ronel.kelleman@gauteng.gov.za

Wits Human Research Ethics Committee administrator Wits (HREC) and chair: –

You may contact Wits REC for reporting of complaints /problems.

Name: Zanele Ndlovu
Tel: 011 717 1252/2700/1234
Email: Zanele.ndlovu@wits.ac.za

Consent Given

I____________________________ hereby give consent to participate in the above mentioned study for the purposes of research:

SIGNATURE: ___________________________ DATE: ______________________

Consent Not Given

I____________________________ hereby do not give consent to participate in the above mentioned study for the purposes of research:

SIGNATURE: ___________________________ DATE: ______________________

Annexure C – Questionnaire

Facility Manager Questionnaire

General	
1. Name of Health Facility	
2. Sub-district	
3. district	
4. Location of Health Facility	a) Urban b) Rural c) Peri-Urban
5. Age of facility (years)	
6. Years of working as Facility Manager	
7. How many administration personnel are appointed at your facility?	____________ (Contract) ____________ (Permanent)
Core Readiness	
12. Are clinical staff satisfied with the filing system at the health facility?	Yes – No
Engagement Readiness	
18. You will put in extra effort to implement an electronic system to improve patient administration.	1. Strongly Agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree
19. Nurses in your practice will use electronic system to document patient care during consultations?	1. Strongly Agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree
20. You support the creation of a central registry of patients so that health records that can be accessed by any public health facility?	1. Strongly Agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree
Societal Readiness	
33. Would you use e-mail for receiving of laboratory results for all your patients?	Yes – No
34. Would you prefer to use e-mail to communicate with patients that have access to such a facility?	Yes – No

35. Would you use e-mail to communicate with other clinics / clinic supervisor / district office / provincial office?	Yes – No

Facility Information Officer Questionnaire

Core Readiness	
8. Do you use a computer to record administrative data of the patients	Yes - No
9. If No, skip question If yes, Who captures (or updates) the administrative patient data	a) Doctor b) Nurse c) Doctor and/or Nurse d) Admin clerk or data capturer
10. Does the health facility have a defined filing system method for storing health records?	Yes – No
11. If no, skip If yes, which indexing method is being used by the health facility? (select only one)	a) Alphabetically on Surname b) Index number on the patient retained card c) Date of Birth d) ID Number e) Other (specify) ______________________________
13. In certain circumstances, do you have to open a new file even though there is an existing file?	Yes– No
14. If No, skip question If Yes, what are the reasons for creating a new file? (Multiple options possible)	a) File could not be found because sometimes clinicians keep files in their consulting rooms. b) File was lost c) Patient does not identify himself / herself correctly d) Patients sometime take the files home. e) File not created during previous visit f) Other (specify) ________________________ ______________________________________ ______________________________________ ______________________________________
15. Are there multiple stations where patients can obtain patient files?	Yes – No
Engagement Readiness	

16. Rate your level of IT knowledge. (select only one option)	1. Do not know how to switch on the computer 2. Can switch on the computer and use basic Word processing software such as Microsoft Word. 3. Can communicate on email using office computer or personal laptop / tablet / cellphone. 4. Can do all of the above and capture data on a Health Information software package (Tier.net and/or district Health Information System (DHIS)). 5. Can do all of the above and if required, I can install software applications on the computer.
17. There is a need to introduce technology to reduce administration burden.	1. Strongly Agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree
Technological Readiness	
21. How many computers are functional at the facility?	_______
22. Are all computers connected to a common Local Area Network (LAN)?	Yes – No
23. Is there a printer connected to the computer?	Yes – No
24. If yes, Is the printer functional at most times?	Yes – No
25. If no, why not?	a) No toner b) Out of paper c) Out of order
26. If no, when could it last print?	a) Under a week ago b) More than a week but less than a month c) More than a month
27. Does your facility use Tier.net?	Yes – No
28. Who provides IT support to your facility most frequently?	a) Provincial Information management unit b) Provincial IT office c) district Information Officer d) district IT office e) No support
29. How do you report a fault on your computer(s)?	a) Telephone b) email c) Telephone and/or email d) None of the above

30. If you report a fault for your computer, how long would it take on average to resolve the fault?	a) Under 1 week b) 2-3 weeks c) 1 month d) More than on 1 month
31. Are there any computers in the health facility which are able to connect to the internet/intranet/email?	Yes – No
32. If yes, How are computers connecting to the Internet/intranet/email?	a) modem (PSTN) or ISDN b) Leased Line c) Satellite
Societal Readiness	
36. Do you have an email address?	a) Yes, Personal private email b) Yes, Departmental email c) No
37. If yes, Rate the intensity of use of e-mail in your life and work.	a) Less than once a week b) A few times a week c) Routinely everyday

Annexure D – Ethics Certificate

R14/49 Mr Gaurang Tanna

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M141042

NAME: (Principal Investigator)	Mr Gaurang Tanna
DEPARTMENT:	Public Health Medical School
PROJECT TITLE:	Assessing the level of readiness in Tswane and Dr Kenneth Kaunda districts for implementing a national patient based information system
DATE CONSIDERED:	31/10/2014
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Ronel Kelleman
APPROVED BY:	Professor P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	07/09/2015

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.**

Principal Investigator Signature

Date 25/09/2015

Annexure E – Approvals from Tshwane and Dr Kenneth Kaunda districts

Kuyasheshwa! Gauteng Working Better

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

427 Hilda Street, 4th floor, The Fields Building, Hatfield Pretoria 0001 South Africa. Tel: +27 12 451 9036
Enquiries: Dr. Molapane Chueu-Shabangu
e-mail: Molapane.Shabangu@gauteng.gov.za

TSHWANE RESEARCH COMMITTEE

CLEARANCE CERTIFICATE

Meeting: N/A

PROJECT NUMBER: 64/2015

Title: ASSESSING THE LEVEL OF READINESS IN TSHWANE AND DR KENNETH KAUNDA DISTRICTS FOR IMPLEMENTING ANATIONAL PATIENTBASED INFORMATIONSYSTEM

Researcher: Gaurang Tanna

Supervisor: Ronel Kolleman

Department: University of Witwatersrand

DECISION OF THE COMMITTEE

Approved

NB: THIS OFFICE REQUESTED A FULL REPORT ON THE OUTCOME OF THE RESEARCH DONE

Date: 23/12/2015

....
Dr. Molapane Chueu-Shabangu
Chairperson Tshwane Research Committee
Tshwane Health District

....
Mr. Pitsi Mothompne
Chief Director: Tshwane District Health
Tshwane District

NOTE: Resubmission of the protocol by researcher(s) is required if there is departure from the protocol procedures as approved by the committee.

health
Department of Health
North West Province
REPUBLIC OF SOUTH AFRICA

4TH Floor West End Building
Private Bag A2
Klerksdorp
2570

Tel: (018) 462 5744
Fax: (018) 464 4075
mojanagan@nwpg.gov.za

OFFICE OF THE CHIEF DIRECTOR: DR KENNTH KAUNDA DISTRICT

To: Mr. Gaurang Tanna

From: Ms. K. Wiebe-Randeree
Acting Chief Director: Dr. Kenneth Kaunda District

Date: October 1, 2014

Subject: Approval to Carry Out Research in the Dr. Kenneth Kaunda District

Dear Mr. Tanna,

In reference to your email requesting approval to do research in the Dr. Kenneth Kaunda District on the topic of "Assessing the Level of Readiness in Tshwane and Dr. Kenneth Kaunda Districts for Implementing a National Patient Based Information System."

The District has no objection to your carrying out research on the above mentioned topic in our District, however, there is a Provincial Policy on the process for approval of such research. The Provincial Policy #NWDoH/PPRM&E/13P02, outlines the "method of approval", which I have included verbatim from the policy, below:

8. **METHOD OF APPROVAL**

Two ways to approve the proposal/protocol:

1. Once the proposal/protocol is received by PPRM&E, it will be submitted to a minimum of three research committee members and a relevant directorate within the department for review. Using the internal research evaluation form, the reviewers will scrutinise a proposal and provide their recommendation to the PPRM&E. The directorate will further process the submission until a feedback is submitted to the researcher. This process would take the proposal an average of twelve weeks before approval.

2. In order to fast track the departmental approval, the researcher may opt to present the protocol/proposal to the departmental research committee, receive feedback on the spot and thereafter receive the approval within two weeks after presentation. This is the most effective method as it fast tracks the approvals of the proposals. A presentation should be for 15 minutes thereafter discussions.

1

The Chairperson of the NWDoH Research Committee is Mr. Lesolobe Moalisi, his contact details are: 018-391-5367, Lmoalisi@nwpg.gov.za.

I certainly hope that this information will assist you to fast track approval by the NWDoH for your research.

Kind Regards,

Ms. K. Wiebe-Randeree
Acting Chief Director: Dr. Kenneth Kaunda District

2

Healthy Living for All