

**GUIDELINES FOR NURSE MANAGERS TO PROMOTE THE COMPETENCE
LEVELS OF PROFESSIONAL NURSES IN UTILISING THE ELECTRONIC
SYSTEM FOR STAFFING OF AGENCY NURSES, IN PUBLIC HOSPITALS IN
THE WESTERN CAPE**

by

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ABSTRACT

In 2011, a structured electronic system for the staffing of agency nurses was implemented in the Western Cape as part of the Nursing Information Management System (NIMS). This electronic system was developed to ensure a fair tendering process for the procurement of agency staff, providing information on agency expenditure, maximum wage rates and adherence to principles and rules of supply chain management. Although technology is used more and more in healthcare services within the Western Cape, some professional nurses could lack the skills needed to implement the electronic system appropriately. A descriptive and quantitative design was followed to determine the competence levels of professional nurses in utilising the electronic staffing system for agency nurses in public hospitals in the Metropole, Western Cape.

The aim of the study was to develop guidelines for nurse managers according to which they can train professional nurses in hospitals to utilise the electronic system for staffing of agency nurses. Assumptions were adapted from the theoretical framework of Benner (1984) on different levels of competencies and used as theoretical departure of the study.

The accessible population for this study was all the professional nurses in hospitals within the Metropole of the Western Cape Government Health registered as users on the database, called the Nursing Information Management System (NIMS) (N=278). This population served as the total inclusive sample for the study. The method of data collection was a self-administered structured questionnaire. The data was analysed by using the SPSS Version 24 software program and descriptive and inferential statistics were conducted.

The findings indicated that, despite the training that has been provided to the professional nurses on the electronic system for staffing of agency nurses over the past seven years since 2011, most of the professional nurses have not reached an expert level of competence in (i) resources management; (ii) effective decision-making; (iii) a collaborative approach; and (iv) quality assurance. Professional nurses' years of experience in NIMS only showed a significant difference in competence for collaborative approach, that is staff with 4-6 years of experience, were more competent than those with less experience. However, it did not present the same for decision-making and resources planning assisted by NIMS reports, there were no significant difference in competence, with regards to years of experience in NIMS. Previous research supports these results, in that despite years of experience, staff may reach a ceiling effect of competence, the researcher has addressed various interventions in the guidelines to assist the nurse manager in promoting the competence level of professional nurses. There was a significant difference between the professional nurses in general hospitals (being more competent) and those in speciality hospitals for effective decision-making and resources management, but not for a collaborative approach to nursing, it varied between the items. Respondents indicated that with regard to certain items related to quality assurance, they were aware of what is expected and adhered to these items. The respondents were however not compliant for certain items such as monitoring the system on a daily basis with regards to quality assurance.

It is recommended in the guidelines that the nurse manager focuses on establishing a collaborative relationship with the NIMS team and stakeholders, attending meetings and share best practice. Continuous training is important and the nurse manager needs to create an environment in which staff can also learn from one another. The nurse manager

needs to understand control measures that needs to be in place for an electronic system that is used for the procurement of agency nurses and ensure implementation of such control measures whilst managing the system.

The researcher ensured validity and reliability during the research and adhered to ethics throughout the research.

KEYWORDS:

Health information system, competence, agency nurses, professional nurses, nurse managers, decision-making, electronic staffing, quality assurance, collaborative approach, workforce planning, nurse budget.



DECLARATION

I, Martha Maria van As declare that the study, *Guidelines for nurse managers to promote the competence levels of professional nurses in utilising the electronic system for staffing of agency nurses, in public hospitals in the Western Cape*, is my original work and that it has not been submitted, or part of it, for any degree of examinations in any other university. All the resources I have used or quoted have been indicated and acknowledge by means of complete references.



Martha Maria van As

Date: APRIL 2018



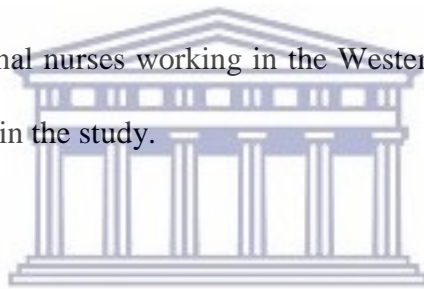
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To God the glory, to my husband, son and family who have encouraged and supported me during the course of this study, a special thank you.

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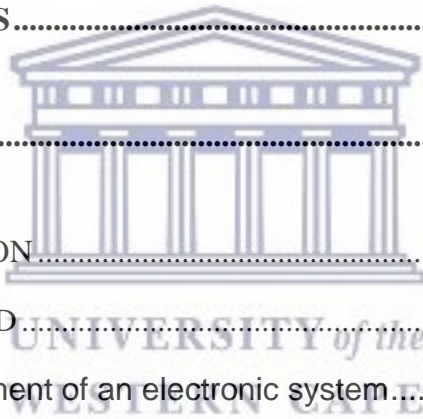
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DEDICATION

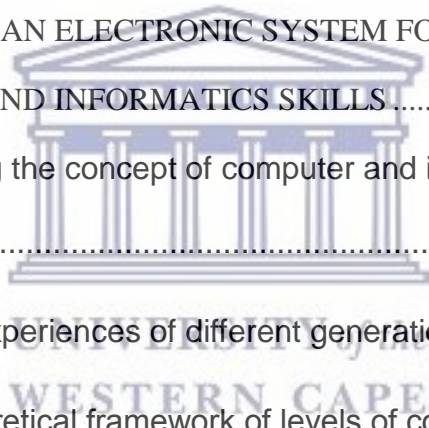
This dissertation is dedicated to my parents (Martha and JP Engelbrecht) who supported and encouraged me throughout my journey.

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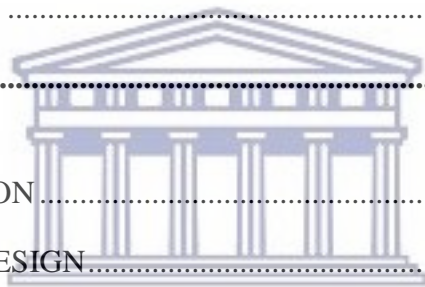
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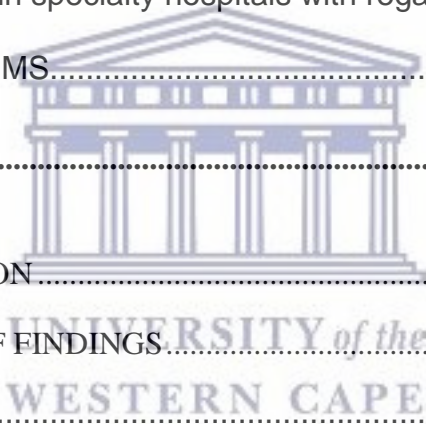
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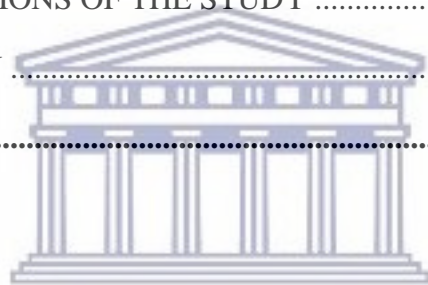
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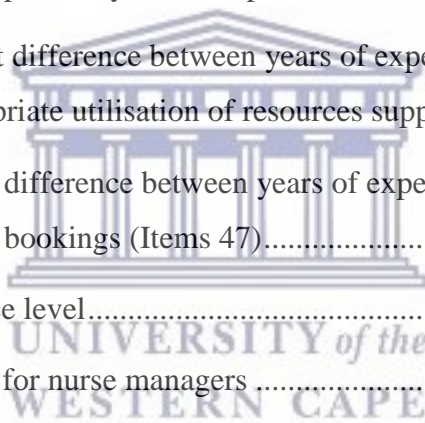
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CHAPTER 1

ORIENTATION TO THE STUDY

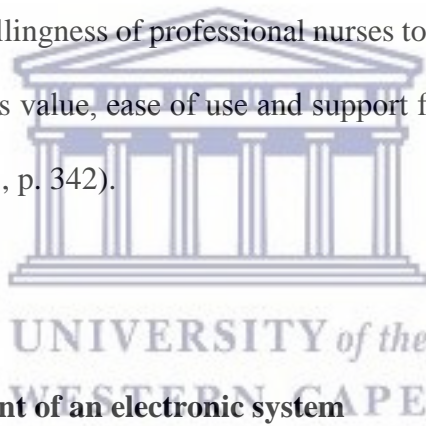
1.1 INTRODUCTION

Nurse managers are expected to ensure safe and quality nursing care to consumers of healthcare and must constantly balance the financial management of nurse staffing against the needs of the patient (Pruinelli, Delaney, Garcia, Caspers & Westra, 2016, p. 67). Optimal staffing is essential for delivering high-quality, cost-effective nursing care (American Nurses Association, 2015, p. 18; Gildemeister, 2015, p. 5). Staff planning refers to the number of direct patient care providers scheduled to be on duty during a shift with the correct skills mix and patient-to-nurse ratio (Pruinelli, et al., 2016, p. 69). Nurse managers have to focus on evidence-based staffing and be proactive in predicting and budgeting of staffing resources (Pruinelli, et al., 2016, p. 66). Technology, such as an electronic system for staffing, can ease the administration burden of managers (Olajubu, Irinoye & Olowokere, 2014, p. 30). In this study, the focus is on NIMS (Nursing Information Management System), an electronic system for staffing in the Western Cape Government Health. It is used for staff scheduling and also as an information system for the procurement of agency and permanent nurses when there are staff shortages. This study targeted the competence levels of professional nurses using the electronic system for specifically the procurement of agency nurses.

Nurse managers use agency nursing staff as a way to quickly fill critical gaps and to ensure that nursing care continues when they don't have enough permanent staff to

address the units' needs (Rispel & Moorman, 2015, p. 8). Globally, agency nurses are employed by independent staffing organisations and these health-care professionals have the opportunity to work in any health facility on a daily, weekly or monthly basis according to the required health-care needs at a certain time (Seo & Spetz, 2013, p. 218). Nurse agencies provide flexible, qualified nursing staff during peak times and at times of staff shortages to continue the nursing care service (Rispel & Moorman, 2015, p. 6).

Nurse managers need to be competent in using electronic information systems; that is, they should be able to process and store data or retrieve information in order to procure agency staff to deliver efficient healthcare (Kerfoot, 2015, p. 342). Attitudes towards an electronic system and willingness of professional nurses to use the system, are influenced by their perceptions of its value, ease of use and support from the health facility's nurse managers (Kerfoot, 2015, p. 342).




1.2 BACKGROUND

1.2.1 The establishment of an electronic system

The Western Cape Government Health: Head office's supply chain management was instructed by the Auditor General in 2010 to develop a computerised system to standardise the procurement and booking of agency nurses (Circular H74/2011, Western Cape Government Health). The need was for an information management system for staffing. NIMS was originally developed to facilitate the management of permanent staff scheduling, added was then the agency staff (two models). Agency staffing entails procuring agency nursing staff, processing data, generating reports, and various other functions. NIMS (agency model) standardise and streamline the procurement of agency staff across all health facilities (Western Cape Government) and provides an electronic

record of procurement to verify finances and expenditure, thereby assisting in budget control. It also provides reference information for invoicing purposes. Standard fixed rates for all categories are set as part of the tendering process and can be used to estimate the cost of the request for agency staff. NIMS ensures compliance with the fair tendering process by enabling the recording of online nominations against requests, as well as the recording of attendance and absenteeism of agency nursing staff. NIMS assists the nurse managers by producing operational and management reports and providing data on agency staff. In the context in which this study was done, NIMS refers to the electronic system for the staffing of nurses. This study focused on the competence levels of professional nurses in using this system for the staffing of agency nurses.



NIMS improves the agency nursing staff procurement process by introducing electronic record-keeping of agency nurses in terms of staff detail, agency requisitions, monitoring quality of agency staff, management reporting and cost analysis (Figure 1.1). It provides a solution to record-keeping suitable for auditing, provides control over the nursing agency acquisition process and introduces improvements to the current agency nursing staff procurement process (Figure 1.2). Permission to use these screenshots in Figures 1.2 – 1.3 formed part of the permission provided for the research by the Western Cape Government Health, Strategy and Health Support: Health Research: WC_2017RP39_522 (Annexure B).

This electronic system accessibility extends from the Internet to the Intranet or any smart mobile device that has Internet/3G/4G access, as displayed in Figure 1.3.

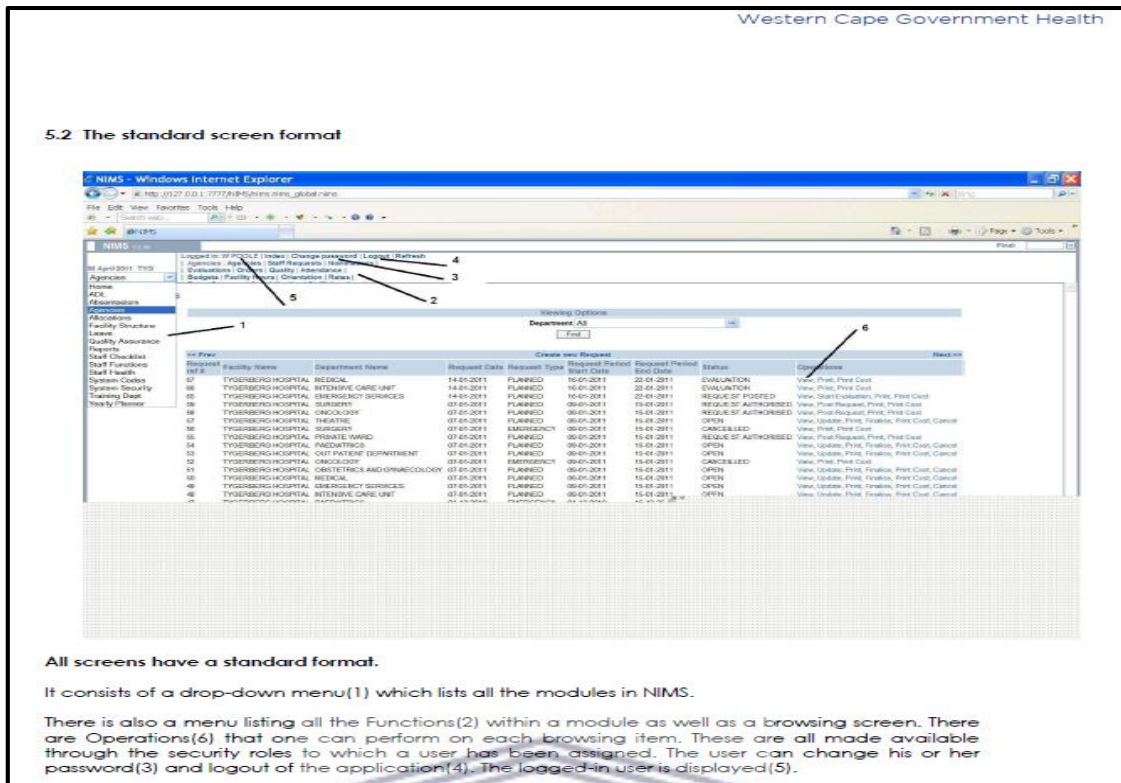


Figure 1.1: The standard screen on NIMS (Western Cape Government Health, Directorate Nursing Services, 2013)

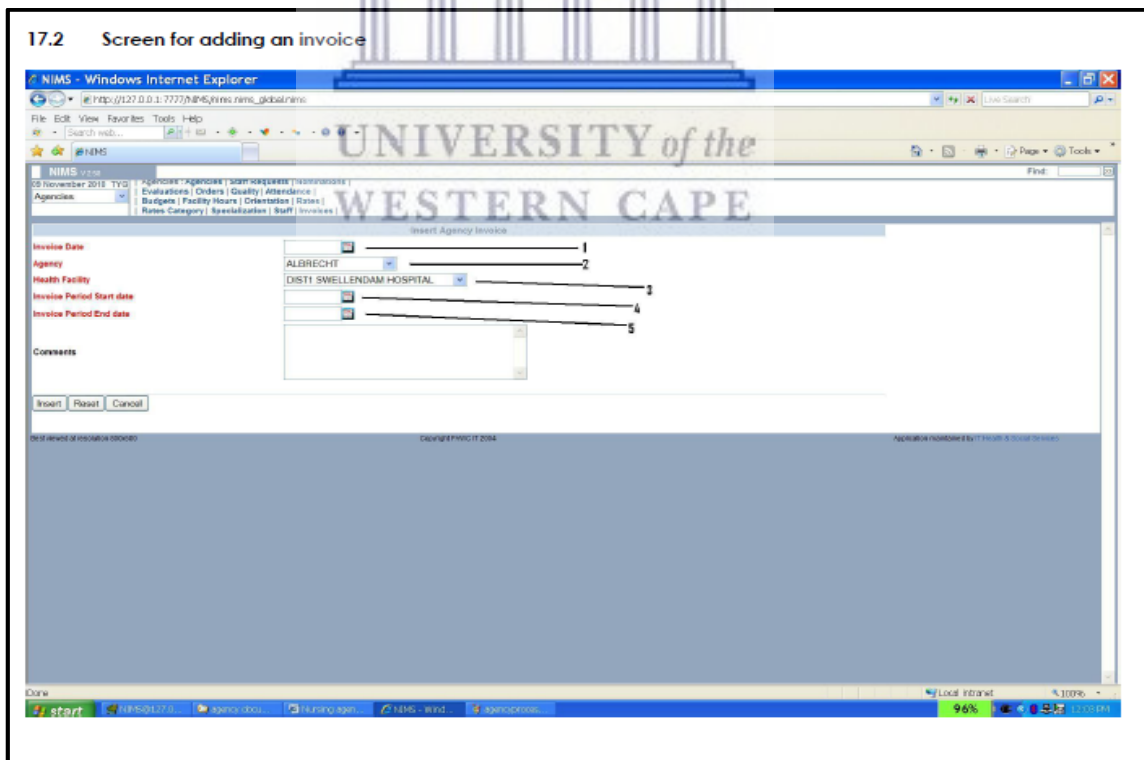


Figure 1.2: The standard screen for invoicing on NIMS (Western Cape Government Health, Directorate Nursing Services, 2013)

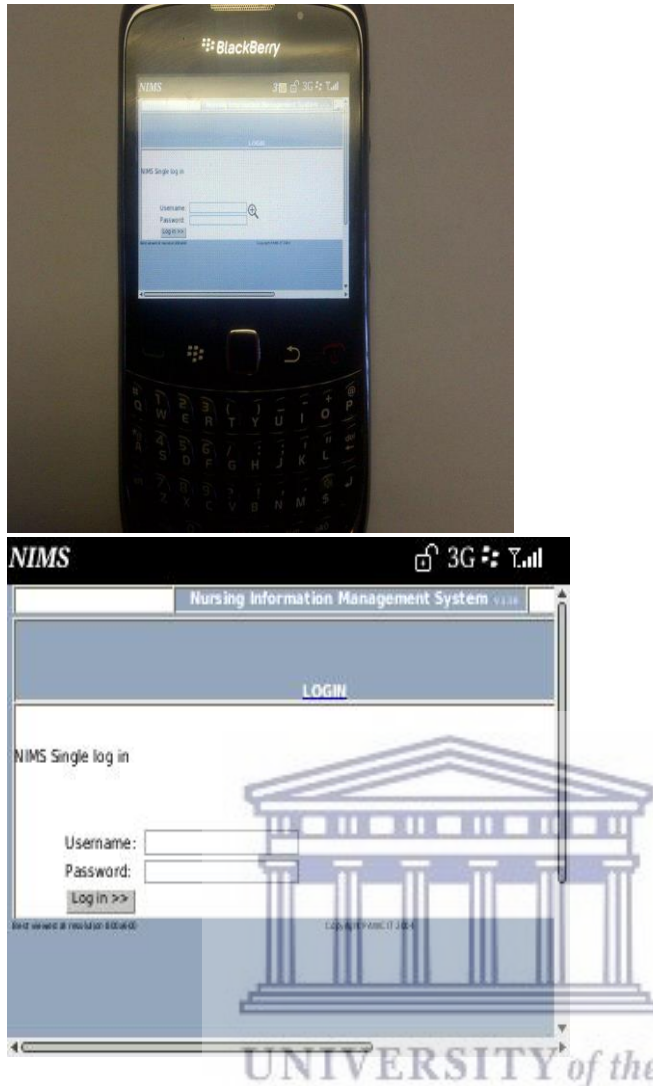


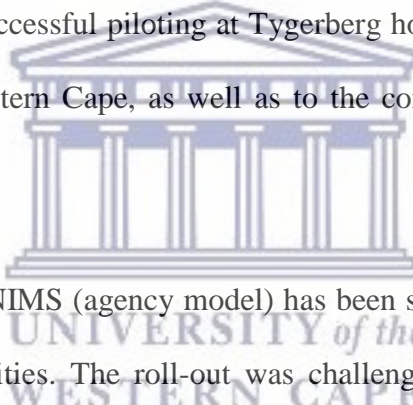
Figure 1.3: Access to this automated electronic staffing system (Western Cape Government Health, Directorate Nursing Services, 2013)

The system has a built-in transparency control, which ensures the confidentiality of information. Data can only be altered by the application developer. The built-in transparency control ensures that staff and transaction information remain confidential within each nursing agency and the Western Cape Government health facilities. When a user is registered at a facility, e.g. Tygerberg Hospital, he or she can only see that particular hospital's application information. Likewise, when a user registers at a nursing agency, he or she can only see that nursing agency's information. The system

administrator manages the security. The Electronic, Communication and Transaction Act of 2002 (ECT, 2002) had a significant impact on the health sector as all departments are encouraged to implement electronic systems characterised by security, integrity and authenticity (ECT, 2002).

1.2.2 Roll-out of Nursing Information Management System (NIMS)

On the week of the 23rd May 2011, Tygerberg Hospital implemented the pilot of NIMS (agency model), approved by the Western Cape Department of Health. The Chief Financial Officer of the Western Cape Department of Health, endorsed the agency model as per Circular H148/2013. Implementation and roll out of NIMS (agency model) commenced, after the successful piloting at Tygerberg hospital, to the rest of the health facilities across the Western Cape, as well as to the contract nursing agencies in this province.



The implementation of NIMS (agency model) has been slow, particularly in rural areas and smaller health facilities. The roll-out was challenged by several factors such as technical infrastructure, lack of computer skills, and a lack of buy-in from the nurse managers, as well as high staff turnover (staff are trained and then exit the services shortly thereafter). It has been found that there are negative consequences when people are forced to use an electronic system without proper motivation and support (Carayon, Cartmill, Blosky, Brown, Hackenberg, Hoonakker, Hundt, Norfolk, Wetterneck & Walker, 2011, p. 812).

The NIMS team is responsible for the promotion, roll-out, training, desktop support, as well as maintenance and upgrade of NIMS. The NIMS team is situated at the head office

of the Western Cape Government Health and the developer, who is part of the NIMS team is situated at the Department of Premier: Health Systems.

1.2.3 Stakeholders

Nurse managers, professional nurses, human resources (People Management/HR) and nurse agency managers all have to work closely together using the electronic staffing system (NIMS) to procure permanent nurses and agency nurses for different disciplines in the health facilities to address the staffing shortages. The stakeholders involved in the electronic system for staffing is the nurse manager, the nursing agency/HR and the professional nurse (Figure 1.4).

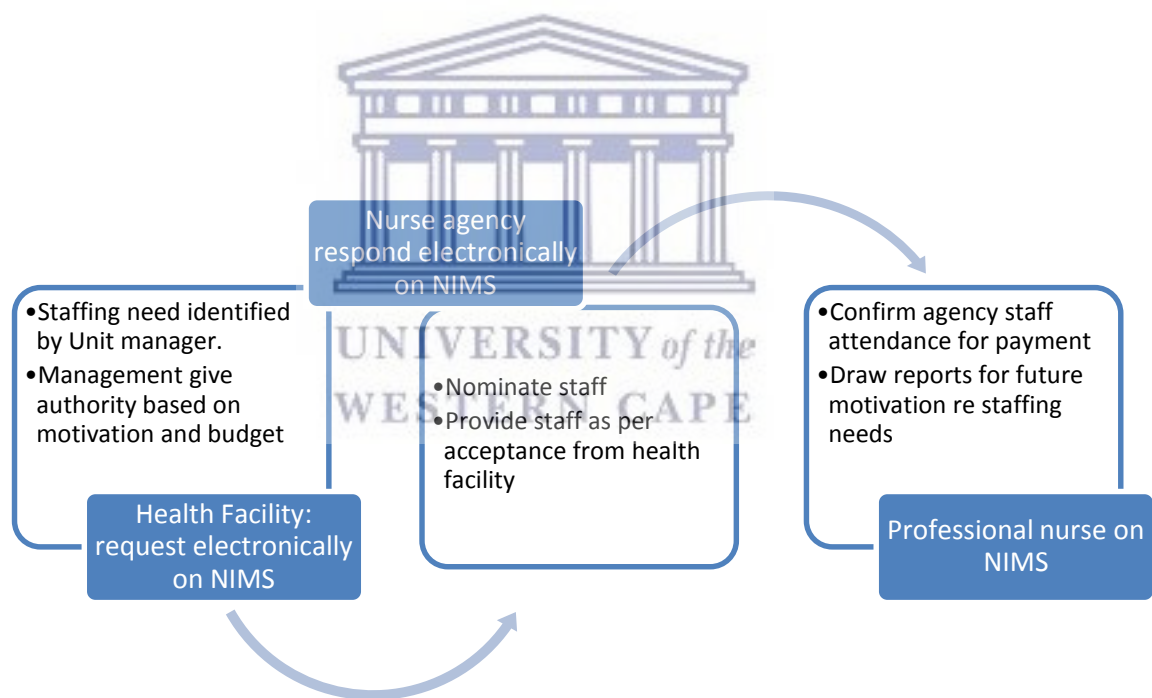


Figure 1.4: Stakeholders in the electronic staffing system (Western Cape Government Health, Directorate Nursing Services, 2013)

As outlined in Figure 1.4, there are various stakeholders involved in the staffing system. In this study, the focus was on the use of the electronic system by professional nurses

regarding agency nurses. The competence levels of professional nurses in using NIMS in the workplace play an important role in the effectiveness of the roll-out of the electronic system for the staffing of agency nurses. Professional nurses, nominated by the nurse manager, attend training for NIMS, but sometimes end up never utilising the system or only using the basic features of the system. The nurse managers tend to nominate the support/administrative staff to be trained in the system, since the professional nurses are already coping with a high workload.

Reports from the NIMS team (training and developer) have noted that not all health facilities that were initialised request agency staff electronically; some still use the traditional system. Some of the sites that are using NIMS do not use the system in full; that is, they do not draw the reports that can be generated from the system and that can assist in translating data into workforce planning and budget control. Nurse managers only use limited functions of the system (if any) and are shying away from using the system – some have delegated this task to administrative staff. This comes despite on-site technical training and software user-support by the NIMS team to enable users to access all the features of the electronic system.

1.3 THEORETICAL DEPARTURE

1.3.1 Overview on key components of information systems in health

Literature indicates that the main components to be addressed in an information management system, in this study called an electronic staffing system for agency nurses, should focus on (i) resources management; (ii) effective decision-making; (iii) a collaborative approach; and (iv) quality assurance (Darvish, Bahramnezhad, Keyhanian & Navidhamidi, 2014, p. 11). In this study, the competence levels of professional nurses

with regards to using the electronic system for staffing in these four areas are important, while adapted assumptions of the theoretical model of Benner (1984) are considered.

Professional nurses need adequate computer skills to be able to adopt a positive attitude towards computer technology (Gurdas Topkaya & Kaya, 2014, p. 8), e.g. the electronic system for the staffing of agency nurses. Nurse managers must establish positive, collaborative relationships with others (the developer, training team and information technology team involved with the nursing information system) to create the support necessary to address the challenges of nursing informatics (Daniels & Oyetunde, 2013, p. 96). In order for a nursing information system to be fully implemented, all health professionals, as part of a team, have to be accepting of such a system (Tsoromokos, Harami, Dermatis & Lazkidou, 2015, p. 30).

The use of computer technology and nurses' decision-making has both been described as important to good healthcare information management, with the potential to transform the current healthcare systems to the benefit of both the provider and consumer (Adeleke, Salami, Achinbee, Anamah, Zakari & Wasabi, 2015, p. 48). In the electronic system for staffing, nurse managers serve as the liaison between nurses and executive management, representing and advocating for their staff during decision-making (Chase, 2010, p. 7). Nurse managers promote shared decision-making and professional autonomy by providing input – their own ideas and those of their staff – on the procurement of e.g. agency nurses, to contribute to informed executive-level decisions, and keeping staff informed of executive-level activities (Chase, 2010, p. 9). To be successful with decision-making during the implementation of new technology, the advantages of using the system, the user-friendliness of it, and flexibility in decision-making are important for the

users (Fagerstrom, 2014, p. 35). Computer technology has made it possible for nurses to quicken activities, and to access a digitally stored pool of literature, statistics and research data that can aid decision-making (Yang, Cui, Zhu, Zhao, Xiao & Shen, 2014, p. 1).

The changes in healthcare delivery and the need to ensure cost-effective and quality care in re-engineered hospital environments have led to the recognition that the nurse manager plays a pivotal role in the effectiveness of staffing in the healthcare system (Chase, 2010, p. 30). Managing resources is defined as ensuring the effective and appropriate utilisation of human and fiscal resources (Drake, 2013, p. 95). The nurse manager's role includes implementing the unit's strategic plan to ensure sufficient staff, endorsing and adapting the plan in response to changing internal and external factors (Chase, 2010, p. 37). Linking patient-classification data, staffing requirements and evidence-based practice data to a budget can help justify the nursing department's annual operating budget and expedite budget preparation (Chubbs, 2013, p. 13). Nurse managers who utilise an electronic system can gain control over costs, as the system assists with decisions in financial management, resource allocation and activity planning (Pruinelli, et al., 2016, p. 70). Health information systems aid in analysing the relationships between patient activity, staffing and costs of nursing care (Harper, 2012, p. 267). Information management systems can provide nurse managers with day-to-day information on patient flow and acuity, resource use, staffing levels, costs and budgetary balance and can therefore help them to improve the management of costs and resources in their units (Liljamo, Lavander & Kejonen, 2016, p. 6).

Quality assurance of the electronic system includes performance assessment of staff using the electronic system, clear guidelines and orientation to the system and support in using

it (Ruxwana, Herselman & Pottas, 2013, p. 32). There is a relationship between the electronic system's features and the nurses' satisfaction (McBride, Tietze, Hanley & Thomas, 2017, p. 19). The acceptance of an electronic system, such as NIMS, can be hampered by various factors such as fear of and or resistance to new technology, lack of understanding of the significance and benefits, inadequate technical support and lack of training (Tsoromokos, et al., 2015, p. 30). Nurses' attitudes towards computer-use were found to be less favourable if they experienced problems related to passwords, accessing the equipment, navigability, technical support, printing, slow systems or downtime of systems (Holden, Asan, Wozniak, Flynn & Scanlon, 2016, p. 1). Workload and the number of computers (resources) are principal barriers to the use of an electronic system (Ahani, Nilashi & Ahmadi, 2016, p. 31).

1.3.2 Theoretical framework

The theoretical framework of Benner (1984) on different levels of competence was used as departure of the study, as it aids in understanding how individuals progress, develop and master skills (Benner, 1984). The five levels of development from *novice to an expert* refer to knowledge, skills, perceptions, intuition, wisdom and, most important of all, experience in a given field of practice, such as the use of an electronic information management system (Kaminski, 2010). Each of these five levels of skill acquisition has unique and different characteristics, supported by studies of Means (2015) and Myers (2014). In this study, the following was assumed as adapted from the theoretical framework of Benner (1984):

- A novice nurse has minimal knowledge about the electronic system for staffing (NIMS) of agency nurses and its application in nursing practice.

- An advanced beginner nurse in an electronic system for staffing is still dependent on the training manual of NIMS to operate the electronic system for staffing of agency nurses. At this level, the professional nurse will still not be able to make individual decisions and will need guidelines. The advanced beginner will realise that there are different applications of NIMS but will not be able to differentiate between the importance of tasks. They will recognise the knowledge of peers and begin to trust those peers.
- The competent nurse has at least 2–3 years of experience with NIMS and therefore grasps all the relevant rules and facts of the field of the electronic system for staffing of agency nurses and is able to bring his/her own judgment to each case. However, even with increased experience, the competent nurse will have difficulty with all applications and concepts involved in NIMS and may not always be able to operate it well.
- In the proficient stage, the nurse demonstrates a step-by-step analysis and solving of the situation, and provides appropriate guidance to other members of the team. The proficient nurse is more involved and active in decision-making and interpretation of reports from NIMS of agency nurses and understands how to guide others.
- A NIMS expert has a vast range of experience, to the extent that each specific situation immediately dictates an intuitive, appropriate action. The expert nurse does not need the training manual and guidelines to make decisions due to years of acquired experience and skills in using NIMS. This expert level is generally reached after five years of experience and is developed with dedicated focus and practice.

Professional nurses need to use information on the electronic system appropriately and act responsibly, especially since this system, with the use of agency nurses, has financial

implications. Benner's framework (1984) was utilised to guide the study in determining the levels of competence of professional nurses on NIMS within the four aspects, namely a collaborative approach, taking decisions, resources management, and ensuring quality assurance. This was to procure agency nurses through NIMS. The findings could indicate in which aspects professional nurse could be supported to reach an expert level of competence. This study therefore developed guidelines for nurse managers to promote the competence level of professional nurses using the electronic system for the staffing of agency nurses.

1.4 PROBLEM STATEMENT

The implementation of an electronic system for the staffing of agency nurses, NIMS (agency model), has raised many questions at stakeholders' meetings of the Directorate Nursing Services about the competence levels of the professional nurses who use the system. Adequate computer skills are needed to be able to adopt a positive attitude towards computer technology (Gurdas Topkaya & Kaya, 2014, p. 8). It is important to understand end-user perceptions of the technology.

The NIMS team (trainers and developer) has raised the concerns that professional nurses do not have the needed competence level in using the electronic system for the staffing of agency nurses, as:

- some professional nurses have not yet managed to draw the reports from the system with regards to agency utilisation;
- the capturing of attendance is not always done timeously, which then affects the Chief Financial Officer's Bass expenditure report (due to missing information);

- even though some facilities have had more than one training session, the NIMS team is still receiving several phone calls from professional nurses who need assistance with for example retrospective bookings;
- agency nurses at times do not report for duty as all the steps were not followed by the professional nurse to confirm bookings; and
- nurse managers as professional nurses only use limited functions of the system (if any) and have delegated the operation of it to the administrative staff.

Should the professional nurses have developed a negative perception to the usefulness of NIMS, it may be difficult to continue to engage them in using the full features of it (Carayon, et al., 2011, p. 812).

1.5 AIM OF THE STUDY

The aim of the study was to develop guidelines for nurse managers, which they can use to promote the competence levels of professional nurses in utilising the electronic staffing system for agency nurses in public hospitals in the Western Cape.

1.6 OBJECTIVES OF THE STUDY

The objectives of this study were to:

- determine the competence levels of professional nurses in utilising the electronic staffing system for agency nurses in public hospitals in the Western Cape; and
- develop guidelines for nurse managers, which can be used to promote the competence levels of professional nurses in utilising the electronic staffing system for agency nurses in public hospitals in the Western Cape.

1.7 DEFINITIONS OF CONCEPTS

- **Professional nurse**

According to Nursing Act no. 33 of 2005, the definition of a registered or professional nurse is a person registered as a nurse under section 31. “A professional nurse is a person who is qualified and competent to independently practice comprehensive nursing in the manner and to the level prescribed and who is capable of assuming responsibility and accountability for such practice.”

- **Agency**

Nurse staff agency in this study, is any company that is legally registered and have a contract with the Western Cape Government Health to provide temporary nursing personnel to the health care facilities of the Western Cape Government Health.

- **Agency nurse**

Agency nurses may be regarded as nurses who are hired as independent contractors for a shift, a week, or a longer period (Yoder-Wise, 2003, p. 286). In this study, an agency nurse is also a professional nurse registered with the South African Nursing Council under Act no. 33 of 2005.

- **Nurse manager**

The nurse manager, also a professional nurse, is central to all activities in a ward and carries out certain fundamental unit functions such as planning, organising, leading and controlling of the agency and permanent nursing staff (Jooste, 2010, p. 77).

- **Staff planning or staffing**

Jooste, Prinsloo and De Wet (2018, p. 193) describe staffing as a process from post recruitment, selection and appointment, placement and supervision. In this study the focus is placed on appointing, scheduling and supervision of agency nurses utilising the NIMS. A specific focus is placed in this study on the knowledge of professional

nurses of the system, their appropriate utilisation of resources, decision-making during scheduling, collaboration in respect of utilising the system and quality assurance during the use of the system.

- **Health facility**

For the purpose of this study, health facilities are places that provide healthcare and will include district, regional/secondary, specialised and academic/tertiary hospitals.

- **Health informatics**

Health informatics is the connection of information science, computer science and healthcare (Means, 2015, p. 11). Nursing informatics is a sub-discipline that informs health informatics. Nursing informatics incorporates information technology with the skills of nurses and it involves systems such as electronic health records, medical records and staff schedules (Wong, 2013, p. 141).

- **Information management**

Information management is the practice where data is generated, managed and processed to provide useful information (Means, 2015, p. 11).

- **Nursing information management system (NIMS)**

In the context of this study, NIMS is an electronic information management system utilised by professional nurses within the Western Cape as an electronic system for the staffing of nurses, i.e. to procure and manage e.g. agency nurses to compliment current staffing.

- **Information technology (IT)**

IT refers to hardware, software, data capturing and other information-related sources used for storing, retrieving, protecting, sharing and transmitting data, and making it available in a format that will support organisational decision-making and communication (Means, 2015, p. 11). Health information technology therefore

represents computers and communication features that can be networked to build systems for health information and informatics (Means, 2015, p. 11). Computers are used to procure agency nurses on NIMS.

- **Computer literacy**

Being computer literate means that one has the knowledge and skill to utilise computers and related technology competently, with skills from basic use to programming and advanced problem-solving (Gurdas Topkaya & Kaya, 2014, p. 1). Computer literacy includes the use of basic hardware and software and the understanding of key information technology concepts and mechanisms (Nelson & Carter-Templeton, 2016, p. 238). Basic skills with regards to maintenance of a computer, or use of products like the Microsoft Office suite, is part of computer literacy (Gurdas Topkaya & Kaya, 2014, p. 1).

- **NIMS team**

The NIMS team is responsible for the promotion, roll-out, training, desktop support as well as maintenance and upgrade of NIMS (electronic information management system). The NIMS team is situated at the head office of the Western Cape Government Health and the developer that is part of the NIMS team is situated at the Department of the Premier: Health Systems.

- **Competence**

Competence is a multifaceted and dynamic concept that refers to knowledge, clinical skills, attitudes, interpersonal skills, problem-solving ability, clinical judgment, and technical skills (Chase, 2010, p. 28; Yang, et al., 2014, p. 1) on a continuum (from novice to an expert). In this study, competence levels will refer to the knowledge and skills needed by the professional nurses to operate NIMS software efficiently. The knowledge and skills relate to resources management, effective decision-making, a

collaborative approach and quality assurance to procure agency nurses using the electronic system.

- **Guideline**

In the context of this study, a guideline is a specific type of guidance that provides additional details, rules and recommendations and describes best practices and different approaches for doing work (Kredo, Bernhardsson, Machingaidze, Young, Louw, Ochodo & Grimmer, 2016, p. 122).

1.8 RESEARCH DESIGN

This study is based on a quantitative, exploratory and descriptive design. *Quantitative research* is a formal, objective, systemic process in which numerical data is used to obtain information about the phenomenon (Grové, Burns & Gray, 2015, p. 23). Terre Blanche, Durrheim & Painter (2006) indicate that exploratory, descriptive studies collect detailed descriptions of existing variables and use the data collected to justify and to assess current conditions and practices or to make plans for improving existing practices (Grové, et al., 2015, p. 323).

Population and sampling

A population refers to the aggregate or totality of all objects, subjects or members that conform to a set of specifications (Grové, et al., 2015, p. 263). In this study, the population was identified as all professional nurses, registered as users, who have been trained in NIMS or who knew how to use NIMS in the health facilities of the Western Cape, Metropole, to procure agency nurses (N= 278). The population served as the total sample to be included in the study.

Data collection (Objective 1)

Polit and Beck (2012) indicate that a survey study represents the broadest category of all non-experimental research designs. Survey studies may be further classified as descriptive, exploratory or comparative (Grové, et al., 2015, p. 224). In this study, a survey was conducted in which the data collection technique comprised of questionnaires, which were used to gather data about the competence levels of professional nurses regarding their use of NIMS, an electronic system for staffing of agency nurses. A survey is the best method for collecting data in respect of a population that is too large to observe directly (Grové, et al., 2015, p. 267).

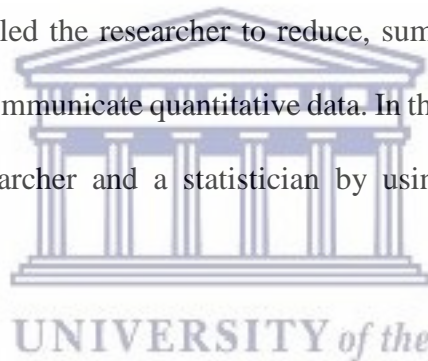
Based on the literature, a structured questionnaire, with closed-ended questions that cover the content of an electronic system for the staffing of agency nurses, was developed. Closed-ended questions comprise questions to which the response alternatives are pre-specified by the researcher. Polit and Beck (2017) are of the opinion that closed-ended questions ensure comparability of responses and facilitate the analysis of the data. In this study, the closed-ended questions comprised 5-point Likert scale statements. A Likert scale consists of several declarative items that express a viewpoint on a topic (Polit & Beck, 2017, p. 273). Respondents needed to indicate the extent to which they agree or disagree on an item (Polit & Beck, 2012, p. 380), and thus the ordinal level of measurement was applicable.

The 5-point Likert scale corresponded with Benner's (1984) theory and responses ranged from totally unproficient to totally proficient. The questionnaire included a cover letter that provided details of the research, as well as instructions on how to complete the

questionnaire. The questionnaire was divided into two sections and took less than 20 minutes to complete. Section 1 required the respondents to furnish their biographic and biographic information, e.g. age. Section 2 described the scope of the staffing process and contains four headings. An envelope was provided in which completed questionnaires were to be sealed.

Data analysis

Statistics is the most powerful tool available to the researcher for analysing quantitative data (Brink, Van der Walt & Van Rensburgh., 2012, p. 171). Without the aid of statistics, quantitative data would simply be a chaotic mass of numbers (Grové, et al., 2015, p. 315). Statistical methods enabled the researcher to reduce, summarise, organise, manipulate, evaluate, interpret and communicate quantitative data. In this study, the data was analysed statistically by the researcher and a statistician by using descriptive and inferential statistics.



Data collected was described and summarised in descriptive statistics in the form of number of responses (n), mean (\bar{x}) and standard deviations (SD). These statistics converted and condensed the collected data into an organised, visual representation so that the data will have meaning to the readers of this research report (Polit & Beck, 2012, p. 383).

Non-parametric inferential statistics were also conducted as it relies on data belonging to any particular distribution (Polit & Beck, 2017, p. 383). Pearson's chi-square (χ^2) test was applied to determine whether there were significant differences in the competence levels of professional nurses using the electronic system for staffing (NIMS), that is between

the type of hospitals that they were working in and the years of experience in using NIMS. The cross-tabulation matrix output was discussed and illustrated to present tabulations (counts) for each group of one variable separated across the groups of the second variable where there were significant differences.

Development of guidelines

Objective 2 was to develop guidelines which nurse managers could use to improve the competence levels of professional nurses who utilise the electronic system for the staffing of agency nurses in public hospitals in the Western Cape. The method by Muller (2006, p. 204) was used to develop these guidelines. The steps that were followed are outlined in Point 3.6 in Chapter 3.

1.9 VALIDITY AND RELIABILITY

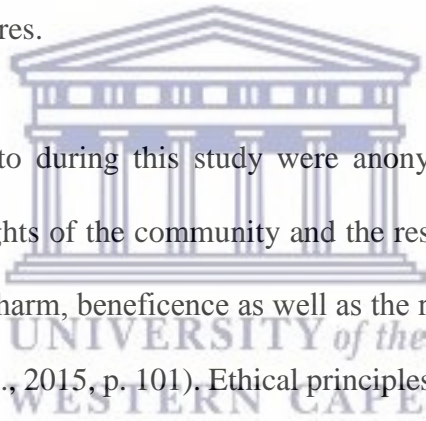
Validity refers to accuracy and truthfulness of the scientific findings, while *reliability* means consistency and dependability of the instrument of a researcher to measure a variable (Polit & Beck, 2017, p. 309). Reliability and validity were adhered to and described under Point 3.6 in Chapter 3. Face and content validity were established by ten staff members with extensive experience in working on NIMS and supervisors. Accuracy was ensured by pre-testing the instrument on six (n=6) professional nurses with extensive experience in working on the electronic system for staffing of agency nurses. This process served to establish face and content validity, and assisted the researcher to reformulate some items as effectively as possible (Jasper, 2011, p. 1051). Validity and reliability are discussed under Point 3.7 in Chapter 3.

1.10 ETHICS

Researchers and reviewers of research have an ethical responsibility to recognise and protect the rights of human research subjects. The researcher submitted the proposal to the ethics committee of the University of the Western Cape to ensure that the respondents' rights and safety were protected. The ethical principles of Sim and Wright (2000, p. 39) and Terre Blanche, et al. (2006) were adhered to. The research project, inclusive of questionnaire, cover letter and consent form, was presented for approval to the Ethics Research Committee at the University of the Western Cape (BM17/2/11). Upon receiving ethical approval from the University of the Western Cape at the end of March 2017, permission was requested from the Western Cape Government: Department of Health, WC_2017RP39_522 (Annexure B), to conduct the research within the health facilities of the Metropole. Separate letters were sent to the Red Cross War Memorial Children's Hospital (RXH: RCC68), Groote Schuur Hospital/UCT (HREC REF: 252/2017) and Tygerberg Hospital (BM17/2/11). Permission letters are attached as annexures.

A presentation by the researcher was done at Khayelitsha Hospital to secure research approval from the specific health facility. The first approval was granted on the last week of April and the last letter was received 23rd August 2017. Once approval was granted, the intent of conducting a study was communicated to the nurse managers by email and appointments were made with the nursing managers at the various hospitals. A copy of the document granting permission to conduct the study, the questionnaire and a consent form were attached. Telephone calls were made to those who did not respond to the email or who had questions.

The various health facilities were visited by the researcher on the dates provided by the nurse managers. The researcher addressed the professional nurses, provided them with the questionnaire and the consent form and explained the research and the process to complete the questionnaires. Information was provided to the professional nurses to allow them to make an informed decision. This included identification of the researcher, the purpose of the study, benefits of participating, notification of risks, assurance that they can withdraw at any time, the use of the data obtained, the maintenance of anonymity and confidentiality throughout the study and the publication date of the results. The researcher had to visit the hospitals more than once, to either collect questionnaires and consent forms or to address another group of staff that was not present during the first session, to complete the questionnaires.



The principles adhered to during this study were anonymity, confidentiality, justice, equality, information, rights of the community and the research community, respect for person, prevention from harm, beneficence as well as the respondent's rights to data and publications (Grové, et al., 2015, p. 101). Ethical principles are described under Point 3.8 in Chapter 3.

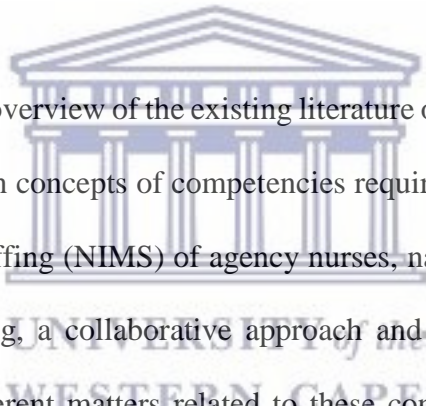
1.11 SIGNIFICANCE OF THE STUDY

The researcher believes that this study is valuable to organisations (government hospitals, finance and human resource management) within the Western Cape Department of Health, as no studies of this nature have been carried out in the Western Cape Government Health. The study informed the development of guidelines for nurse managers to promote the competence levels of professional nurses operating the electronic system for the

staffing of agency nurses within the health facilities of the Western Cape Government Health.

1.12 STRUCTURE OF THESIS

Chapter 1: Provided an introduction to the study on competence levels of professional nurses using a structured electronic system for staffing of agency nurses, NIMS (agency model). It provided an overview of the full thesis, described the aims and objectives, stated the problem and provided a background to the study. The chapter furthermore briefly introduced the theory on which the study is formulated, the research methods applied and the significance of the study.



Chapter 2: Provides an overview of the existing literature on the different concepts being studied and the four main concepts of competencies required to engage expertly with an electronic system for staffing (NIMS) of agency nurses, namely resources management, effective decision-making, a collaborative approach and quality assurance to procure agency nurses. The different matters related to these concepts will also be discussed, including possible challenges in reaching an expert competence level in an electronic system for staffing, focusing on quality challenges that can prevent reaching an expert level. The assumptions based on the theoretical framework of Benner (1984) pertaining to the different levels of competencies in the use of an electronic system were also outlined.

Chapter 3: Outlines the research methodology that framed the design of the study. An in-depth description of the quantitative methods which were used is provided, alongside the data collection procedures, sampling, validity and reliability of the instrument used,

feedback on the pilot study, procedures of the main study and the data analyses. This chapter also addresses the ethical considerations of this study.

Chapter 4: Presents the findings from the quantitative method used in this research study. These findings aim to establish the competence level of professional nurses in NIMS and possible factors that may hinder expert competence.

Chapter 5: Presents conclusions that were drawn from the analyses, guidelines for nurse managers to promote the competence levels of professional nurses in utilising NIMS, limitations and recommendations.

1.13 SUMMARY

This chapter has introduced the study and provided the background to it. The research aim, the research problem, theoretical framework, objectives, as well as the introductory to this study were outline. The methodology outlined was appropriate to address the research problem within the theoretical framework of Benner (1984)

Chapter Two provides a detailed discussion of the literature that was reviewed as part of this study. It informs the framework of the study and is used to support the results of the study.

CHAPTER 2

LITERATURE REVIEW

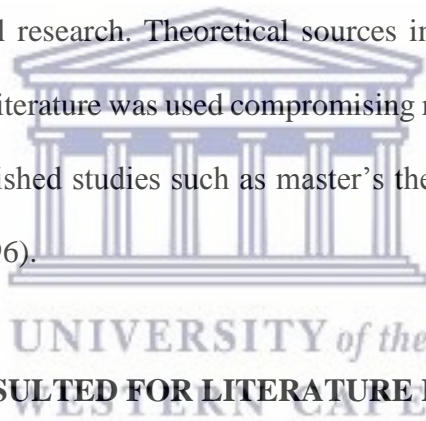
2.1 INTRODUCTION

The literature review of the existing available body of knowledge was conducted to understand how other researchers investigated the problem of competence in using an electronic system for staffing and for agency nurses, and how they theorised and conceptualised the challenges (Grové, et al., 2015, p. 162). The difference between the literature reviews of quantitative and qualitative research is that, in the case of quantitative research, the literature review is always completed before the research is started. Qualitative literature reviews vary, depending on the type of study. Some phenomenologists believe that conducting the literature review before doing the research will influence the researcher's openness and will affect the way in which the researcher will view the phenomenon during data collection and analysis. Therefore, in qualitative research, the researcher primarily uses the literature to explain and support the research done (Polit & Beck, 2012, p. 94). The literature review in this study was conducted prior to the research, as it is a quantitative study and the focus was on the most recent, credible and relevant work, that could assist in developing instruments. A literature review was important in developing the framework for the research, which in this study included Benner's (1984) competence levels applied to nurses utilising an electronic staffing system.

Health information management might not be a new concept in the literature; however, in the government health facilities, of South Africa it is still a developing technology in

nursing practice. Using the Nursing Information Management System (NIMS) for the procurement of agency nurses, in particular, is still new as it is only used in the Western Cape Province.

As explained by Polit and Beck (2012), the literature review should be organised into sections that represent themes or identify trends. Theoretical literature reviews focus more on theory whilst empirical literature review deals with original research such as scientific experiments, surveys and research studies (Polit & Beck, 2012, p. 14). Empirical studies are the collection and analysis of primary data based on direct observation or experiences in the field. Furthermore, different types of literature are cited in the literature reviews of theoretical and empirical research. Theoretical sources include serials, periodicals and monographs. Empirical literature was used comprising relevant studies in journals and books as well as unpublished studies such as master's theses and doctoral dissertations (Polit & Beck, 2012, p. 96).



2.2 DATA BASE CONSULTED FOR LITERATURE REVIEW

The literature review is an organised, written presentation of anything that is published or currently known about the topic of interest (Polit & Beck, 2012, p. 96). A systematic and explicit approach was used to examine independent, published studies of full-text articles available in CINAHL, MEDLINE, Health Source (nursing/academic and consumer edition) and Google scholar databases. Citations were selected based on the subject headings of indexes and abstracts, and included the paragraph and full-text citations. Also, using the citation search directories on the basis of the references at the end of the article ensured that the most current and applicable sources were selected (Polit & Beck, 2012, p. 101). A full-text database catalogue of journal articles was accessed

electronically at the university library and was read online, or printed or saved electronically to read and critique. Most of the selected material was published during the past five years.

The process of reviewing the literature was undertaken to search for and identify literature that would add value to the topic and illuminate the field of research. Nurse managers need more sophisticated technology-related competencies and expertise in order to demonstrate the quality and financial benefits nursing brings to patient care (Simpson, 2013, p. 279). Using computers for planning and policy development can lead to effective financial management, communication, administration and support in education and research (Singh & Senthil, 2015, p. 665).

2.3 CONTEXT OF AN ELECTRONIC SYSTEM FOR STAFFING

Information management is the practice where data are generated, managed and processed to provide useful information (Wong, 2013, p. 141). Nursing informatics incorporates information technology with the skills of nurses and it involves systems such as electronic health records, medical records and staff schedules (Wong, 2013, p. 141). *For purposes of this study NIMS (Nursing Information Management System) is the electronic system in the Western Cape government health, being utilised as an electronic system to assist in staffing agency nurses to fill the service gap.* This entails introducing electronic record-keeping of agency nurses in terms of staff detail, agency requisitions, monitoring quality of agency staff, management reporting, and cost analysis. This system can be used for agency and permanent staff; in this study the population was professional nurses using the system for procurement of agency nurses on the electronic system for staffing. The theoretical framework of Benner (1984) on different levels of competencies

was used as theoretical departure for this study. The main components applied in this study were (i) different levels of competence in utilising an electronic system; (ii) resources management of a workforce utilising an electronic staffing system; (iii) the use of the electronic staffing system for decision-making; (iv) a collaborative approach in using an electronic staffing system; (v) quality assurance with regards to using an electronic system; and (v) computer and informatics skills.

The literature review provides an overview on:

- Computer and informatics skills
 - o Understanding the concept of computer and informatics skills for nurses
 - o Technology experience of different generations
 - o Benner's theoretical framework of levels of competence to use an electronic staffing system
- Resources management of nursing workforce utilising an electronic staffing system
 - o Financial management
 - o Agency nurses
 - o Resources management
- The use of an electronic staffing system for decision-making
 - o Traditional thinking pertaining to data-driven decision support
 - o The organisational culture and technology
- Collaborative team approach to using an electronic staffing system
 - o Nurse managers facilitating collaboration
 - o Peers and super users
- Quality assurance with regards to using an electronic system
 - o Quality assurance

- Human factors can lead to workarounds/ bending the rules
- Training can influence acceptance

2.4 COMPUTER AND INFORMATICS SKILLS

2.4.1 Understanding the concept of computer and informatics skills for nurses

Information management is the practice where data are generated, managed and processed to provide useful information (Wong, 2013, p. 141). Nursing informatics incorporates information technology with the skills of nurses and it involves systems such as electronic health records, medical records and staff schedules (Wong, 2013, p. 141). Information technology allows for the development of knowledge that supports nurses in multiple practice areas such as administration, clinical practice, education and research (Wong, 2013, p. 141).

Research shows that nurse managers' computer and informatics skills (use of methods, tools, and techniques) are worse than their informatics knowledge (theoretical and conceptual basis for the specialty) (Yang, et al., 2014, p. 5). Computer skills include the use of computer hardware and software, e.g. the use of email and the Internet, conducting online literature searches and using applications such as word processors (Yang, et al., 2014, p. 5). Nursing informatics, no longer only comprise skills to manage data and databases. It requires much more advanced skills from healthcare providers and organisational leaders (Sipes, 2016, p. 256). Abilities in data management, the use of systems for decision support and communication resources, are important skills (Jensen, Guedes & Leite, 2016, p. 115).

Not all nurse managers necessarily have expert competencies in healthcare information technology as it is not universally seen as a key job requirement, resulting in a wide discrepancy in the ability to make informed decisions regarding information technology (Kerfoot, 2015, p. 342). Nurse managers need to be committed to continuous training in electronic information management systems content, since rapid technological innovation and adaption are creating a complex environment in which the nurse managers have to lead (Kerfoot, 2015, p. 243). It is important that nurse managers' computer and informatics skills should be improved through education and training (Yang, et al., 2014, p. 5). Also, when the nurse manager does not have the necessary skills in advanced technology, it often prevents effective collaboration and limit the nurse managers' collection and analysis of nursing data (Simpson, 2013, p. 280). Traditional paper-based information documents cannot ensure efficient service any longer (Lundgren-Laine, Kontio, Kauko, Korvenranta, Forsstrom & Salanterä, 2013, p. 10).

Electronic information management systems have an impact on workflow, communication patterns and the broader healthcare team, all of which may have consequences that may not have been anticipated when the electronic system was introduced (Dowding, Turley & Garrido, 2015, p. 346). It is therefore important to understand the informatics competence levels of the professional nurses, as explained by Benner's theoretical framework, to allow a better understanding of how much and or what training is needed.

2.4.2 Technology experiences of different generations

When implementing electronic information management systems, there is also the challenge of the varying needs of nurses from different generations (Wong, 2013, p. 144).

Experienced nurses are better equipped to incorporate technology into practice as compared to less experienced nurses, most probably because they have more refined decision-making skills that develop with experience. The technological age is relatively new, therefore the experienced nurses in terms of years may have little to no experience with technology and not be positive towards technology (Wong, 2013, p. 144).

Many nurses may not have had the opportunity to become well versed in using technology nor had the time to become comfortable using it, as they grow up without using digital technology (Goldsmidt, 2016, p. 225). There is often the assumption that students entering nursing programs have advanced technological skills, while these students' computer skills actually vary greatly (Goldsmidt, 2016, p. 225). The newer and younger nurses who have grown up with technology and who are more comfortable with it want to develop their knowledge-base (Wong, 2013, p. 144). According to McBride, et al. (2017, p. 24), age is a factor in overall satisfaction. Nurses aged 50 to 60 years are 36% less likely to be satisfied with an electronic system, while nurses older than 61 years are 68% less likely to be satisfied with an electronic system (McBride, et al., 2017, p. 24). Nurses from the age group 26 and up should be exposed to computer assisted training and encourage the older nurses to use computers more frequently for administrative-related activities (Singh & Senthil, 2015, p. 665).

Communication from top-down must clearly explain strategies to reach optimal utilisation of the information system (Collins, Alexander & Moss, 2015, p. 702). Participation allows for expertise among users who can guide other colleagues in the enhanced use of the system (Hirsch, 2014, p. 44). It is important that there should be inclusive and cross-disciplinary representation to promote the cross-population of ideas

and alignment of efforts to improve implementation of electronic information management systems (Collins, et al., 2015, p. 703).

2.4.3 Benner's theoretical framework of levels of competence to use an electronic staffing system

The five levels of development, ranging from novice to an expert, refer to knowledge, skills, perceptions, intuition, wisdom and most important of all, experience in a given field of practice such as the use of an electronic system (Kaminski, 2010). These levels were briefly described in Chapter 1.

According to Kaminski (2010), the Novice to Expert Theory is “a construct theory first proposed by Hubert Dreyfus and Stuart Dreyfus (1980) as the Dreyfus Model of Skill Acquisition, and later applied and modified to nursing by Patricia Benner (1984)” and it provides a very useful and important theory that clearly applies to nursing informatics (Kaminski, 2010). Kaminski (2010) further explains that the Dreyfus brothers developed the model while working with scholars interested in comparing artificial intelligence development and expert computer system programming to the human mind and the development of expertise. Both Dreyfus and Dreyfus (1980) and Benner (1984) estimate that it takes approximately five years to move through the five stages (from novice to expert) but also elaborated that not all novices become experts. Some people get “stuck” at the competent or proficient stages (Kaminski, 2010).

Benner's (1984) theoretical framework is further elaborated on by Kaminski (2010), Means (2015) and Myers (2014) on the different levels of skill acquisition with unique and different characteristics. These levels link with the assumptions made for this study (See Point 1.3.2), as described below.

→ The novice has been exposed to a computer and basic computer skills such as word processing, spreadsheets and emails but has minimal experience on NIMS (Means, 2015, p. 49). A professional nurse learning to use a new electronic system, in this study NIMS, needs very clear instructions and guidelines to learn how to use the electronic system. The professional nurse memorises the features and works within the rules and guidelines, the professional nurse will need a mentor present most of the time whilst working on NIMS (Myers, 2014, p. 48). The novice needs constant feedback for him/her to improve and move to the next level of competence (Kaminski, 2010, p. 967). Initial training will need to be followed up and it is important to monitor the level of expertise and have continuing workshops to reach expert level (Kaminski, 2010, p. 967).

- An advanced beginner nurse in nursing informatics is still dependent on rules, to operate NIMS but she/he is more aware of additional features that can be used within the system (Kaminski, 2010, p. 967). The professional nurse practising her/his skills on NIMS in real situations begins to understand and notice more applications to the system, that is except for procurement of agency nurses, various reports can be drawn from the system to assist in agency nurse staffing (Means, 2015, p. 49).

- The competent nurse grasps all the relevant rules and facts of the field of NIMS and is able to bring his/her own judgment to each case; she/he will be able to do problem-solving if she/he is confronted with technical difficulties (Kaminski, 2010, p. 967). The professional nurse has used NIMS enough to learn other ways to work in the system and has developed the necessary skills through experience to use NIMS appropriately and efficiently (Means, 2015, p. 49). The competent nurse is at ease with NIMS and able to extract various reports from the system to be used for decision-making and management of agency nurse staffing and budget (Kaminski, 2010, p.

967). It takes approximately 3 years for the professional nurse to reach competence level if actually using NIMS full time (Myers, 2014, p. 48).

- In the proficient stage, the nurse demonstrates step-by-step analysis and solving of the difficulties and will be able to guide other members on the team (Kaminski, 2010, p. 967). She/he will be able to interpret all the data provided by the system (Kaminski, 2010, p. 967). The proficient nurse effectively uses decision-support capabilities of NIMS and understand the entirety of the system (Means, 2015, p. 49). She/he will be able to interpret all the data provided by NIMS and be able to procure agency nurses, do attendance, retrospective bookings, auditing of attendance, drawing of reports and interpret reports.
- A professional nurse that is an expert in NIMS, has experienced a vast range of situations to the extent that each specific situation immediately dictates an automatic correct action (Means, 2015, p. 49). The expert nurse with about 5 years of experience in actually using NIMS all the time does not need any rules or guidelines, she/he understands what to do and how to do all actions required on the system (Myers, 2014, p. 48). Even though the professional nurse has reached the level of expertise it is important to maintain the skills and competence acquired and still attend workshops and training sessions (Kaminski, 2010, p. 967).

Nurses have different information needs, depending on their work experience, and it is explained by Benner's previous studies that nurses with 5–10 years of work experience can reflect on and adapt their decision-making to rapidly changing situations, whilst the less experienced ones will follow the rules more closely and are less flexible (Lundgren-Laine, et al., 2013, p. 9). The experienced nurse has instinctive ways of working (Lundgren-Laine, et al., 2013, p. 9). Nurses with 5–10 years of work experience are more

likely to be confident in articulating their immediate and necessary information needs (Lundgren-Laine, et al., 2013, p. 9).

Nurse managers are not always fully supportive of nursing informatics, and do not involve themselves with content development, workflow redesign, and innovation explorations and leave this to others (Hirsch, 2014, p. 41). This could leave the nurse manager at a disadvantage as nursing is a multi-generational workforce and leaders need to understand and embrace technology to attract and retain nurses who have experienced advanced technological solutions throughout their lives (Hirsch, 2014, p. 41).

In this study the four main concepts of competencies required to engage expertly with an electronic system for staffing (NIMS) of agency nurses, are resources management, effective decision-making, a collaborative approach and quality assurance to procure agency nurses.



2.5 RESOURCES MANAGEMENT OF NURSING WORKFORCE UTILISING AN ELECTRONIC STAFFING SYSTEM

2.5.1 Financial management

The workforce planning process involves three factors: the staff budget; the number of staff required to achieve quality nursing care; and the actual number of staff employed (Drake, 2013, p. 95). Nursing managers are constantly challenged to do more with less, they need to provide an excellent service with less finance and resources for an increased number of patients. Therefore, they need to be equipped to manage these changing and growing demands and develop the knowledge necessary to ensure that the services and team they oversee meet the strategic goals (Chubbs, 2013, p. 13). There is a difference in

acceptance between nurse managers with predominantly clinical backgrounds and those with administrative backgrounds (Kivinen & Lammintakanen, 2013, p. 93). The nurse managers with clinical backgrounds focus more on non-financial information and prefer a more interactive management style of using electronic information management systems, whilst the nurse managers with backgrounds in administration will be using the system more for economic decision-making (Kivinen & Lammintakanen, 2013, p. 93).

Nurse managers are expected to have comprehensive knowledge of their budgets and spending and are accountable for variances in them. Funding decisions are often based on evidence and data; therefore, they need to make time to gather data, look at the data once compiled or know how to use it to influence decision-making (Chubbs, 2013, p. 13). Budgetary planning promotes the use of the best methods to achieve financial objectives while ensuring patients receive high-quality, cost-effective services (Sherman, 2012, p. 33). Healthcare facilities use various types of budgets, including operating and capital budgets. The operating budget is important to the nurse manager as it concerns day-to-day activities, resources, personnel and supplies (Sherman, 2012, p. 33). Part of the operating budget, as explained, is the employment cost, the largest part of the unit budget, which includes salaries and wages of nursing staff. Staffing not only has a quality and cost implication for the nursing service, but it is also important in terms of its contribution to job satisfaction and the retention of personnel in the nursing service (Jooste & Prinsloo, 2013, p. 2). The budget needs to be monitored continuously to ensure that expenses stay within the projected budgetary limits. Nurse managers need to submit reports explaining the utilisation of their budgets. They can make a difference in their budget by not overstaffing and preventing excessive use of unscheduled leave, which could lead to the need for agency nurses (Sherman, 2012, p. 34).

Healthcare is constantly challenged to do more with less, to increase output with a smaller budget and to deliver better-quality patient care to an increasing population. This responsibility for managing resources has become a large component of the nurse manager's role (Chubbs, 2013, p. 13). Financial constraints and shortage of skilled nurses mean that nurse managers need to manage their resources under difficult conditions (Drake, 2013, p. 99). Shortages of nurses place a burden on a health facility. The shortage of nurses in healthcare facilities is not limited to the Western Cape, but is an international problem. The nurse manager needs to address shortages of staff and therefore some hospitals are using nursing agencies in order to augment and enhance the efficiency, productivity and cost-effectiveness of their nursing resources. The use of agency nurses is an attempt by the nurse manager to meet the acute staffing needs that are caused by fluctuating patient numbers (Jooste & Prinsloo, 2013, p. 3).

2.5.2 Agency nurses

The use of nursing agencies has become an international trend and benefits health organisations. A nursing agency service identifies, screens and provides qualified nurses to healthcare facilities. The advantages of using agency nurses includes operational and numerical flexibility, as well as savings in costs (Branine, 2003, p. 53). In South Africa it seems that the nursing agencies are growing and that nurse managers can choose who will provide them with the nurses they need. The employment of agency nurses is characterised by a triangular relationship involving the nursing agency who hires the nurses to work for the specific hospital, the hospital that pays a fee to the nursing agency for services provided and the agency nurse who is then paid by the nursing agency for the services delivered to the hospital (Biggs & Swailes, 2006, p. 130). Nursing agencies are required to provide large numbers of nurses to different hospitals (Jooste & Prinsloo,

2013, p. 4). The agencies also manage the recruitment and selection of nurses, as well as the payment of their annual practising licence to the South African Nursing Council and the verification of their qualifications.

An agreement with preferred nursing agencies across the country ensures that minimum standards and fixed rates are established for all categories when agency tenders are accepted. These rates remain in place for a predetermined period as per the government tender contract. An important feature of these agreements is that only agencies that signed the tender contract are allowed to supply staff to the specified hospitals (Jooste & Prinsloo, 2013, p. 4). Many organisations use new technology to solve the problem of procuring agency nurses by investing in software that allows them to offer open shifts to staff. Nurse managers' workloads are thereby lightened and flexible options for nurses are provided. Different systems are available from a variety of companies, for example there is a management program called ShiftSelect, developed by Concerro Inc., at six of Eastern Carolina's University Health Systems' eight hospitals (Hendren, 2010, p. 1). The electronic system allows the nurse managers to view the nurses who requested the shift, their experience level and whether they have the necessary orientation for that unit, and then to pick the nurse who is the best fit for patient care on that unit. The software connects all the hospitals in the system with the tendered agency nurse providers (Hendren, 2010, p. 1). The nurse managers no longer have to spend time on the phone begging, cajoling, and pleading for nurses to fill the gap. They can fill the openings in their schedule with just a few clicks of the mouse (Hendren, 2010, p. 2).

Appropriate staffing involves more than just numbers. Staff, including agency nurses, with the appropriate skills and competencies should be selected. The increase in workload along with a decline in the number of nurses impacts on the quality of patient care, as

well as on patients' safety. Accordingly, the management of a health organisation's human resources department should include an anticipation of the labour shortages and surpluses (Sherman, 2012, p. 33).

2.5.3 Resources management

Nurse managers need the knowledge and skills to use electronic information systems for the collection and interpretation of statistical data on staff rosters, budgets and resource ordering, therefore information competence is essential (Yang, et al., 2014, p. 5). Information competence for nurse managers includes being competent in processing data and storing or retrieving information (Kerfoot, 2015, p. 342). The introduction of computers into the nursing environment has significantly affected the actual and perceived methods for managing patient care in a nursing environment. The more knowledge the nurse manager has of the electronic system, the more positive perceptions of the implemented technologies are (Kaye, 2017, p. 244).

Historically, the primary focus of nursing was patient care, which is still the focus (Walker-Czyz, 2014, p. 3). However, it is imperative for the modern nursing practice to consider the effect of the explosion of information technology on the practice of the professional nurse. The secondary focus should thus be on the adoption of technology. The professional nurse and nurse manager need to develop creative strategies for using technology in this environment. Computer information and communication technologies can contribute towards the reduction of healthcare costs and improve the efficiency and quality of care and patient safety, as it provides data sets that support analysis and decision-making (Harper, 2012, p. 267; Pruinelli, et al., 2016, p. 66). Nursing data sets can assist nurse managers with effective staff recruitment and retention strategies, and the

integration of data from multiple sources helps nurse managers to balance workloads (Pruinelli, et al., 2016, p. 70). Nurse managers will be recognised at executive level if they can produce evidence (data) that can justify funding requests and identify shortage areas within the workforce (Fraher, 2017, p. 160). The most critical information needs of nurse managers are linked to the organisation and management of work and allocation of staff resources (Lundgren-Laine, et al., 2013, p. 7).

Nurse managers must find a balance between financial viability and quality of patient care (Harper, 2012, p. 262). Workforce planning involves balancing the supply and demand of nursing staff to ensure that a sufficient number of suitably skilled nursing staff is available in the right place and at the right time to ensure quality nursing care (Drake, 2013, p. 95). Staffing, overtime and the use of agency staff often result in high costs, especially if there is a lack of reliable forecast of staffing needs (Harper, 2012, p. 262). According to Lundgren-Laine, et al. (2013, p. 9) nurse managers spent 75% of their round time exchanging information and communicating with other professionals about the number of nursing staff per patient and staff skills. Round time being the process where the nurse manager walks through the wards to directly communicate with patients and staff as part of quality assurance and engaging with staff personally. One of the most important information needs of nurse managers is the allocation of staff resources (Lundgren-Laine, et al., 2013, p. 10). By using an electronic system for nurse staffing, transparent and comparable information for planning, follow-up and evaluation is allowed, which can also be used for managerial purposes (Liljamo, et al., 2016, p. 6).

2.6 THE USE OF AN ELECTRONIC STAFFING SYSTEM FOR DECISION- MAKING

2.6.1 Traditional thinking to data-driven decision support

Information management is the ability to use information in support of decision-making by collecting, processing, presenting and applying data. In the past, nursing care of patients were managed by decisions made on the spot, based on memory or experience (Kerfoot, 2015, p. 342). Information management forces a difficult transition from traditional thinking to data-driven decision support (Kerfoot, 2015, p. 342). The electronic health systems, provide many management reports regarding clinical efficiency and timeliness and nurse managers should understand these reports and learn how to create custom reports focusing on key quality improvement areas (Hirsch, 2014, p. 45). Nurse managers are encouraged to examine nursing workflow to enable more cost-effective care (Walker-Czyz, 2014, p. 10). Nurse managers need reliable, affordable and easy-to-use systems to improve their evidence-based human resource management (Fagerstrom, 2014, p. 35). Computer-use that is not part of ongoing nurse workflow, can have implications for patient care safety and effectiveness (Walker-Czyz, 2014, p. 10). It is essential that nurse managers receive continuous feedback on the utilisation of the system, as well as constructive and relevant advice, in order to utilise the data for the improvement of service delivery (Shiferaw, Zegeye, Assefa & Yenit, 2017, p. 7). Health decision-making is dependent on timeously available, reliable data, and substantial resources are invested to facilitate electronic information management systems (Shiferaw, et al., 2017, p. 2). It seems that the demand for data and use of information for decision-making are still being seen as insignificant despite the improvement of electronic information management systems (Shiferaw, et al., 2017, p. 2). It is believed that if the

technology is easy to use and assist in providing the necessary information for decision-making purposes, nurse managers will be more willing to use the system (McBride, et al., 2017, p. 19).

Nurse managers still tend to revert to the traditional system, that is for example paper-based reporting that they are familiar with, when they need to respond quickly. The traditional way also allows them to personalise the information they record, fitting to their way of working, helping them with time management, as they are experienced in doing it the “old way” (Dowding, et al., 2015, p. 357). This results in quite a few health systems failing to link evidence to decisions and therefore inadequately responding to priority health needs at all levels of the health system (Shiferaw, et al., 2017, p. 2). The fact that supporting staff is responsible for working with electronic information management systems may initially be seen as a solution, but can be problematic as strategic decisions are made at higher levels (Collins, et al., 2015, p. 703). Supporting/administrative staff can only provide what the nurse manager ask for, they are not part of management and do not have the insight in what is needed to provide evidence for strategic management decisions. On the other hand, nurse managers are in an excellent position to access information that is vital to the improvement of health facility processes and patient outcomes (Yang, et al., 2014, p. 1).

There is a higher likelihood of successful adoption of an electronic system if end-users believe that the technology is easy to use and can supply the information they need for decision-making. When there is no perceived advantage of an electronic system compared to a traditional system, it is reasonable to assume that adoption will be resisted (McBride, et al., 2017, p. 19).

The use of computer technology and nurses' decision-making have been described as important to good electronic information management systems, with the potential to transform the current healthcare systems to benefit both the provider and consumer (Adeleke, et al., 2015, p. 48; Gurdas Topkaya & Kaya, 2014). Nurse managers serve as the liaison between nurses and executive management, representing and advocating for their staff during decision-making (Chase, 2010, p. 7). Nurse managers who are informatics illiterate may be less influential and disadvantaged in leading new systems implementation, which may result in others in the multidisciplinary team making decisions on behalf of nursing, where the new systems are concerned (Remus, 2016, p. 412). Information literacy is the ability to decipher relevant and irrelevant information by using critical skills and retrieving, evaluating and using information. Nurse managers who are highly competent in using information technology and who ensures the development of informatics in nursing personnel (allowing for a strong nurse-centric role), can in the process avoid physician-led decisions that exclude nursing (Kerfoot, 2015, p. 342). Nurse managers who are skilled in informatics are acknowledged as leaders who deliver high-quality care through evidence-based practices and demonstrate nurses' unique contributions to fiscal health (Remus, 2016, p. 413). An information culture (as a part of an organisational culture) is created when the value and utility of information in realising operational and strategic success is recognised by the nurse managers. In such a culture, information forms the core of the organisational decision-making and information technology acts as an enabler for effective information management (Kivinen & Lammintakanen, 2013, p. 94).

2.6.2 The organisational culture and technology

Nurse managers need information when making decisions regarding their daily work pertaining to planning, organising, staffing, coordinating, reporting and budgeting as well as clinical management. Electronic information management systems ensure that nurse managers make better decisions and are proactive planners due to the more comprehensive use of information (Kivinen & Lammintakanen, 2013, p. 93). Nurse managers need to adopt informatics competencies and behaviors inclusive of facilitation, collaboration, transdisciplinary teamwork and point-of-care experience excellence that are in line with the digital environment in which healthcare occurs (Remus, 2016, p. 414). The transformative nurse manager need to lead the eHealth discussions and advocate electronic information management systems that will address patient quality initiatives, nursing practice and funding needs (Remus, 2016, p. 415).

Nurse managers need to indicate what impact the budget shortfalls will have on levels of care. To do this and ensure sufficient staff supply, they need accurate data, the time to analyse that data and negotiation skills (Drake, 2013, p. 99). Patient care is complex and necessitates instantaneous availability of information to allow for effective decision-making (Simpson, 2013, p. 277). The nurse manager still has a responsibility to converse, debate and champion specific technologies and clinical information systems personally, even if she has back-up from support staff (Simpson, 2013, p. 278). Nursing informatics, using information constructs, methods and practices, supports decisions in all positions, functions and settings (Sipes, 2016, p. 253). Nurse managers who are not skilled in informatics will have to rely on others for making decisions regarding an electronic system and that may lead to wrong choices (Remus, 2016, p. 412). Nurses who are trained

in information technology can enhance communication and help to improve operational efficiency (Singh & Senthil, 2015, p. 665).

Health organisations need resources, sufficient knowledge and experience to adopt and implement information technology (Ahmadi, Nilashi, Shahmoradi & Ibrahim, 2017, p. 10). The size of the organisation can also have an impact on implementation, as bigger organisations have more resources and better infrastructure (Ahmadi, et al., 2017, p. 10). Nurse managers must facilitate positive, collaborative relationships to create the support necessary to address the difficulties in information technology (Daniels & Oyetunde, 2013, p. 96).



2.7 COLLABORATIVE TEAM APPROACH TO USING AN ELECTRONIC STAFFING SYSTEM

2.7.1 Nurse managers facilitating collaboration

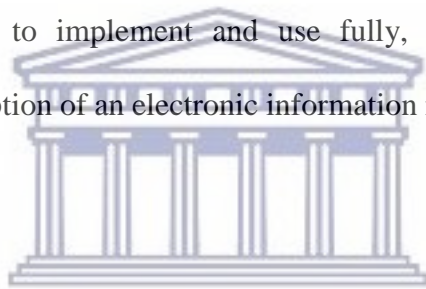
Nurse managers' role in the design, implementation and use of electronic information management systems and in developing a collaborative working environment is important (Kivinen & Lammintakanen, 2013, p. 99). The nurse manager can explain the needs of the department to the information technology team and facilitate the understanding and interpretation of the information received from the electronic system (Kivinen & Lammintakanen, 2013, p. 99). The information and technology (IT) team refers to the administrators and other technical staff deploy to manage the health facilities IT infrastructure and assets, the NIMS team augment the IT team. Information ethos highlights communication flow, cross-organisational partnerships and a collaborative, open and trusting working environment (Kivinen & Lammintakanen, 2013, p. 94). Nurses' input into the design and improvement of the system is important, as a lack of

involvement of nurses can lead to negative perceptions and dismissal of the system (Scott, 2017, p. 242). Nurse managers need to participate in advisory groups and IT governance structures so that they can gain an understanding of available analytics and become familiar with the electronic system (Hirsch, 2014, p. 44). IT governance is defined as leadership and organisational structures and processes that regulates, manage and keep accountability of IT. By being involved in technology governance, the nurse manager can get the opportunity to evaluate the development of content, workflow and quality measures to ensure that these aspects represent key clinical, regulatory and strategic priorities (Hirsch, 2014, p. 44).

It has been shown that strong leadership and a culture of improvement, focusing on quality issues, are important for the successful implementation of technology (Dowding, et al., 2015, p. 348). Organisational commitment is a key factor that leads to a positive attitude towards an electronic system (Scott, 2017, p. 243). It will not be possible to fully implement an electronic system if all the healthcare professionals in a team do not accept the utilisation of the system (Tsoromokos, et al., 2015, p. 30). Healthcare teams need to have the necessary skills to be able to adopt a positive attitude towards computer technology (Gurdas Topkaya & Kaya, 2014, p. 8). Implementing electronic information management systems does not necessarily mean actual use – it will only happen if nurses accept and intend to fully use it (Holden, et al., 2016, p. 6).

To ensure successful implementation, nurse managers need to facilitate a supportive climate for innovative change (Yuan, Bradley & Nembhard, 2015, p. 8). A study done in Finland shows that nurse managers lack uniform competencies and information literacy necessary to use electronic information management systems (Liljamo, et al., 2016, p. 6).

Implementation of the system should be supported by health facility leaders, otherwise nurses will not be committed and motivated to engage with the system (Fagerstrom, 2014, p. 35). A central motivating factor for nurses, as seen in Finland, Iceland, Norway and other countries, is that they need to understand that their managers support the system and use the data (Fagerstrom, 2014, p. 35). Therefore, nurse managers' interests and competence in using the different reports and data can directly impact the successful implementation of the system (NIMS) (Fagerstrom, 2014, p. 36). Nurse managers must see advanced technologies from a strategic and operational perspective that motivate them to perfect the systems' design, workflow and implementation processes (Simpson, 2013, p. 286). The perceived complexity of an electronic system can cause resistance from the nursing staff to implement and use fully, therefore it is an important consideration in the adoption of an electronic information management system (Ahmadi, et al., 2017, p. 10).



Obstacles in the full implementation of electronic information management systems are negative attitudes of peers towards the system and decreased communication with colleagues (Ahani, et al., 2016, p. 31).

2.7.2 Peers and super-users

The organisational hierarchical structure determines who can access the system and not necessarily who needs to utilise the health information in daily practice (Kivinen & Lammintakanen, 2013, p. 99). Nurse managers should carefully select the staff that will be working and utilising the system, reason being that those that are actually willing to be trained and use the system may be more successful in use of the system than those that were chosen purely on their technological savvy (Yuan, et al., 2015, p. 8). Super-users

have training and knowledge of the electronic system more than the regular end-user. They are important for implementation, challenge reporting and problem-solving with regards to the electronic system. It is not a given that previous experience with an electronic information management system will allow for a positive attitude, nurses who have the choice have a more positive attitude (Yuan, et al., 2015, p. 8).

However, successful implementation of information technology can be facilitated by enlisting super-users or individuals already working within the organisation who received extra training so that they can provide frontline technical support to their peers (Yuan, et al., 2015, p. 1). Health facilities that have staff with sufficient knowledge of electronic information management systems have a greater tendency to adopt a system (Ahmadi, et al., 2017, p. 12). Staff, both experienced and new, young and old, can become resources to one another, teaching each other in real-time (Wong, 2013, p. 145). Peer support (fellow nurses helping and encouraging one another as explained above) has a significant positive effect on perceived ease of use, perceived usefulness and intention to use technologies (Kaye, 2017, p. 242). Peer support also involves super-users and system trainers being available, which will most likely increase the meaningful use of technology (Kaye, 2017, p. 243).

It is important that various methods are implemented to improve the perception of the meaningful use of technology, including but not limited to continuous training sessions, peer support in the form of expert peer users, an increase in organisational commitment and constant communication (Scott, 2017, p. 242). Nurses and end-users need to be part of the development of the system, since they may not want to use the technology if they

are not consulted (Goldsmidt, 2016, p. 226). System and information quality influence use and user satisfaction.

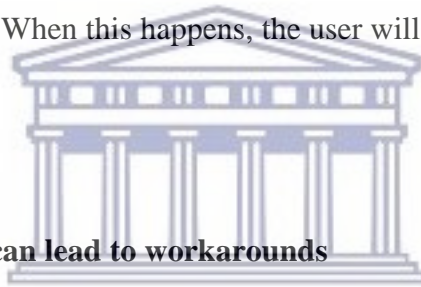
2.8 QUALITY ASSURANCE WITH REGARDS TO USING AN ELECTRONIC SYSTEM

2.8.1 Quality assurance

Quality assurance of the system includes assessing the performance of staff who uses the electronic system, clear guidelines and support, and orientation to the system (Ruxwana, et al., 2013, p. 32). The aspects of the electronic information management system pertaining to quality include the features of the system itself as well as flexibility, accuracy, response time, ease of use, convenience of access and integration of systems (Kivinen & Lammintakanen, 2013, p. 92). Information quality measures the system output with regards to information accuracy, usefulness, reliability, currency, format and timelines (Kivinen & Lammintakanen, 2013, p. 92). System quality and information quality influence use and user satisfaction (Kivinen & Lammintakanen, 2013, p. 92). Professional nurses' attitudes towards the use of an electronic system have a direct influence on the quality, frequency and extent of the use of these systems. Various factors can influence acceptance of technology, such as ease of use, time required to complete tasks and whether the system is prone to errors (Kaye, 2017, p. 243). An electronic system can be complex, since there are so many different possibilities for obtaining and storing data, also the volume of data that needs to be managed, has increased the level of complexity in the development of systems capable of sharing and exchanging information. Even if data is of high quality, the human element in using the system cannot be avoided, which increases the likelihood of system errors. For example, data accuracy is dependent on the correct data input (Kaye, 2017, p. 243).

The system features that lead to challenges are: technical problems related to the design, system task incompatibility, difficulty in using the systems, no evidence regarding the usefulness of system, user dissatisfaction about content of the system, non-compliance with quality standards and error in data entry (Ahani, et al., 2016, p. 31). These issues are classified as the technical and non-technical aspects that influence nurses' perspectives of the advantage of using the system (Ayatollahi, Langarizadeh & Chenani, 2016, p. 326).

The expectation is that technology should make tasks easier but unfortunately there are instances where new technology is perceived as being difficult to learn and use, requiring increased effort, and reducing efficiency and the ability to extract useful information (Salinero, 2016, p. 170). When this happens, the user will seek ways to work-around the system.



2.8.2 Human factors can lead to workarounds

As mentioned, end-users who are not always completely satisfied with implemented systems and who do not accept them, can only use a small number of the available features and actively resist or even abandon them (Holden, et al., 2016, p. 1). The implementation of electronic information management systems is negatively influenced by the following factors: human factors (such as users' limited knowledge, their experience of a lack of freedom when working with the system, having no incentive to use the system and perceiving it as time consuming), systematic characteristics, the organisational environment and hardware factors (Ahani, et al., 2016, p. 31). Systematic characteristics can include but are not limited to technical problems related to the system design, and difficulty in using the system and error in data entry. Hardware factors refer to not having

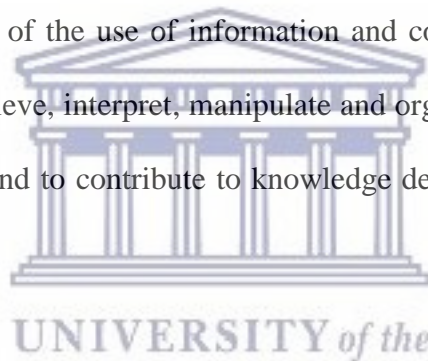
enough computers and the network not having enough capacity to carry the system (Ahani, et al., 2016, p. 31).

The user will therefore in these circumstances seek ways to work around the system (Salinero, 2016, p. 170), when they feel the system is incompatible with their current workflow and that they are controlled by the system (Goldsmidt, 2016, p. 224). When nurses start working around the system, it creates challenges for the health facilities culture, processes, data collection/analysis, budget and ultimately patient safety (Goldsmidt, 2016, p. 224). Dowding, et al. (2015, p. 346) found that features inherent in information technology implementation can lead to unintended outcomes of the technology or that it can produce workarounds to allow for the technology to fit in with the traditional work processes. Nurses will engage in a number of workarounds to deal with the limitations of the system if they are not satisfied (Dowding, et al., 2015, p. 357).

Although there are growing investments in electronic information management systems, there are still many challenges in the implementation, use and usability of healthcare systems (Kivinen & Lammintakanen, 2013, p. 91). Challenges identified that prevents full implementation of a system and using the system to its full advanced capacity are inertia and reaching a ceiling in usage. Inertia in electronic information management systems has been defined as the organisation's attachment to and persistence in staying with the status-quo, irrespective of the existence of better alternatives or motivation to change (Trudel, Marsan, Pare, Raymond, De Guinea, Mallet & Micheneau, 2017, p. 11). Organisational inertia can be seen when users are not motivated and able to use the system once it has been installed (Trudel, et al., 2017, p. 11). In this situation, users are able to do the basics but rely heavily on the administrative staff, have little interest in continuous

learning and/or knowledge-sharing and this prevents the users from understanding the more advanced uses of the system (Trudel, et al., 2017, p. 11).

A ceiling effect is seen as stagnation in the assimilation of the electronic system with no growth and utilisation of the benefits of the system (Trudel, et al., 2017, p. 2). Overcoming the ceiling effect is important as an electronic system have many administrative benefits and more importantly enhance inter-professional collaboration (Trudel, et al., 2017, p. 4). When specific past experience of acceptance and usage are known, they can guide the design, redesign, implementation strategies and policies according to which acceptance and use of the system can be facilitated (Holden, et al., 2016, p. 6). Nurses need to have skills in and knowledge of the use of information and communication technologies to allow them to enter, retrieve, interpret, manipulate and organise data into information to affect nursing practice and to contribute to knowledge development in nursing (Wong, 2013, p. 141).



It is important that staff receive on-site training and continuous support from the vendors, as this will lower the perceived complexity of the system and ensure continuous adoption (Ahmadi, et al., 2017, p. 12).

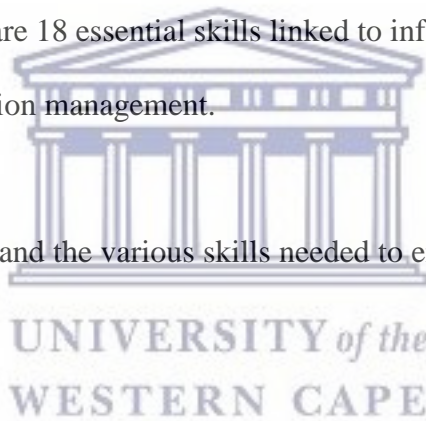
2.8.3 Training can influence acceptance

Acceptance of the system is dependent on the training methods. Hands-on/face-to-face training in an electronic system was found to positively impact on nurses' usage confidence, ability to quickly learn and adapt, and perceptions about the ease of learning, ease of use, and efficiency gained (Salinero, 2016, p. 156). Highlighting the benefits of the electronic system leads to greater acceptance (Ehteshami, 2017, p. 7; Salinero, 2016,

p. 156). When training takes place, it is important to not only focus on teaching positive behaviors, but also to warn against negative attitudes (Yuan, et al., 2015, p. 8). The size of the organisational environment, facility, high workload as well as the organisational culture and absence of organisation training can act as obstacles (Ahani, et al., 2016, p. 31).

The focus should be placed on the ease of use of the system, proper computer training and familiarisation with the electronic system. The integration of an electronic system should be supported by integrating information technology into the continuing professional development programs (Gagnon, Ghandour, Talla, Simonyan, Labrecque, Ouimet & Rousseau, 2013, p. 25). Nurse managers need to support commitment to continuous training in electronic information management systems, since technological innovation and adoption happen fast and create a complex environment in which the nurse managers have to lead (Kerfoot, 2015, p. 342). A tiered ceiling effect develops when the learner is not yet an expert in a given topic, and barriers are preventing him or her to engage further in learning of the subject (Trudel, et al., 2017, p. 4). Integration stops when there are constraining conditions on the users, even if higher levels of assimilation could be reached (Trudel, et al., 2017, p. 4). The differences in age and experience between nurses and nurse managers highlight the need for strategies that incorporate all generations. Differences in age and experience can result in very different needs with regards to knowledge of computer technology as well as the desire to learn and educate using technology (Wong, 2013, p. 144). Having no incentives to use the system can be a barrier to the use of the system and strong leadership is needed when adopting and implementing technology (Ahani, et al., 2016, p. 34).

Nurses perspective on the advantages of using a system may be influenced by age, work experience and educational level (Ayatollahi, et al., 2016, p. 326). A study done by Singh and Senthil (2015, p. 665) shows that nurses with bachelor degrees are better at using computer hardware and communication-related activities than nurses with a diploma in nursing. Educational level has a significant impact on informatics competencies. A possible reason for this can be that those with higher education levels have learned information retrieval and evidence-based nursing systematically, for example, the preparation of a master's thesis requires proficiency in technological skills, including keyboarding, word processing, multimedia presentations, online literature searches, email correspondence, and use of the Internet (Yang, et al., 2014, p. 5). According to Jensen, et al. (2016, p. 115), there are 18 essential skills linked to information literacy and 38 skills associated with information management.



It is important to understand the various skills needed to ensure that all training gaps are identified.

2.9 CONCLUSION

This chapter addressed the literature, it indicates that investment in information technology, especially in technology that can enhance the working environment of nursing care, is needed. However, there are still many challenges in the implementation, use and usability of electronic information management systems. Overcoming these difficulties that prevent full implementation and optimal use of the system is important as the system has many administrative benefits and, more importantly, can enhance inter-professional collaboration.

The competence level of the user of the system, specific experience of the user, acceptance and use should be determined to guide the design and redesign of the system as well as implementation and policies to facilitate acceptance and use of the system.

Chapter 3, is an overview of the research methodology which framed the design of the study. An in-depth description of the quantitative methods which were used is discussed, alongside the data collection procedures, sampling, validity and reliability of the instrument used, feedback on the pilot study, questionnaire administration and the data analyses which were used. This chapter also addressed the ethical considerations for this study.



CHAPTER 3

RESEARCH METHODOLOGY

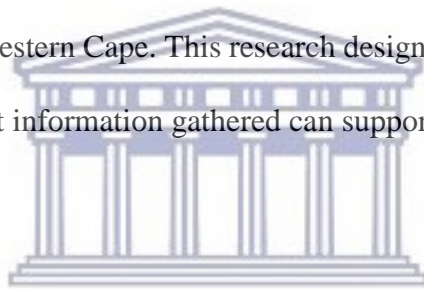
3.1 INTRODUCTION

This chapter describes the research methodology used in this quantitative study to achieve the research objectives. Quantitative research is a formal, objective, systematic process in which numerical data is used to obtain information about the phenomenon (Grové, et al., 2015, p. 23). This includes an explanation of the research design, the population, the instrument for collecting data, validity and reliability as well as ethical considerations. In a quantitative study, the researcher describes Benner's theory being tested and also describe and compare the variables and the relationships between them (Creswell, 2014, p. 181). In this study, the researcher endeavoured to minimise the possibility that the results will be influenced by errors in the methodology by, for example, using appropriate statistics and following reliability and validity measures such as pre-testing the questionnaire to minimise reading errors. A research process is a systematic way of applying a scientific method in an orderly and logical manner (Polit & Beck, 2017, p. 76). The methodology of this study was conducted in a diligent and systematic way, which means that the researcher developed a plan to progress in an orderly manner according to a predetermined framework (Creswell, 2014, p. 43), as described in this chapter.

The choice of the research methodology was determined by the research objectives. The first research objective for this study was to determine the competence levels of professional nurses in utilising the electronic system for staffing agency nurses.

3.2 RESEARCH DESIGN

A research design is the plan, outline or blueprint for the research processes and ensures maximum control over factors that may interfere with the validity of the results (Creswell, 2014, p. 118). It provides the guidelines, planning and implementation that describes how to select a data collection method that is the most appropriate to achieve the goals and to suit the selected design (Polit & Beck, 2017, p. 58). In this study, a quantitative and descriptive design was selected since it was the most appropriate for the purpose of the research, which was to determine the competence level of the professional nurses and then to create guidelines for nurse managers to promote the competence levels of professional nurses in utilising the electronic system for staffing of agency nurses in public hospitals in the Western Cape. This research design was used because the purpose was to gather data so that information gathered can support or refute knowledge (Polit & Beck, 2017, p. 54).



There is a distinct difference between quantitative and qualitative research in terms of using words (qualitative) rather than numbers (quantitative), or using closed-ended questions (quantitative hypotheses) rather than open-ended questions (qualitative interview questions) (Creswell, 2014, p. 32). A researcher keeps a distance by not interacting with the respondents directly in quantitative research, upholding objectivity rather than being subjective as is the case in a qualitative research (McNabb, 2010, p. 226). The specific method used to conduct this research was to collect data with instruments (quantitative), while data is collected through observation in qualitative research (Creswell, 2014, p. 32). The researcher chose quantitative research since large numbers of respondents were needed for the study to be representative of a bigger

population. In qualitative research, the number of participants is smaller, thereby making it difficult to generalise the findings of the study to a larger population (Creswell, 2014, p. 32).

Quantitative research involves gathering data that is absolute, such as statistics, and as far as possible, allows data to be studied in an objective manner. In this study, both the profiles of the respondents – professional nurses (biographic data) – and the competence levels of these respondents in respect of their use of an electronic system for staffing of agency nurses within the health facilities of the Western Cape were collected by using a self-administered, structured questionnaire.

3.2.1 Descriptive survey design

The knowledge gained from this study is based on the collection, analyses and interpretation of the data. A descriptive study design was followed to collect more information about characteristics within this particular field of study, and about the relationship among the variables (Polit & Beck, 2012, p. 226). The purpose of a descriptive design was to provide more information on the competence levels of professional nurses (Polit & Beck, 2012, p. 232). A descriptive survey design is a scientific method, which means that it is a formal, objective, systematic process, which requires the use of numerical data to obtain information about the research phenomenon (Polit & Beck, 2012, p. 50). The emphasis was on the collection of data via a structured questionnaire, completed by the professional nurses (the respondents). In this study, the existing competence levels of the professional nurses using an electronic system in the procurement of agency nurses within the health facilities of the Western Cape were

investigated in order to develop guidelines which nurse managers can use to promote these competence levels.

3.3 POPULATION AND SAMPLE

3.3.1 Population

A **target population** refers to those who are in possession of specific characteristics that are of interest to a researcher and whose responses will enable the researcher to make generalisations (Polit & Beck, 2012, p. 274). In this study, the population was identified as all professional nurses who have been trained in NIMS or who are knowledgeable about NIMS in the health facilities of the Western Cape, Metropole (Figure 3.2) to procure agency nurses (Western Cape Provincial Nursing Strategy: 2016-2030).

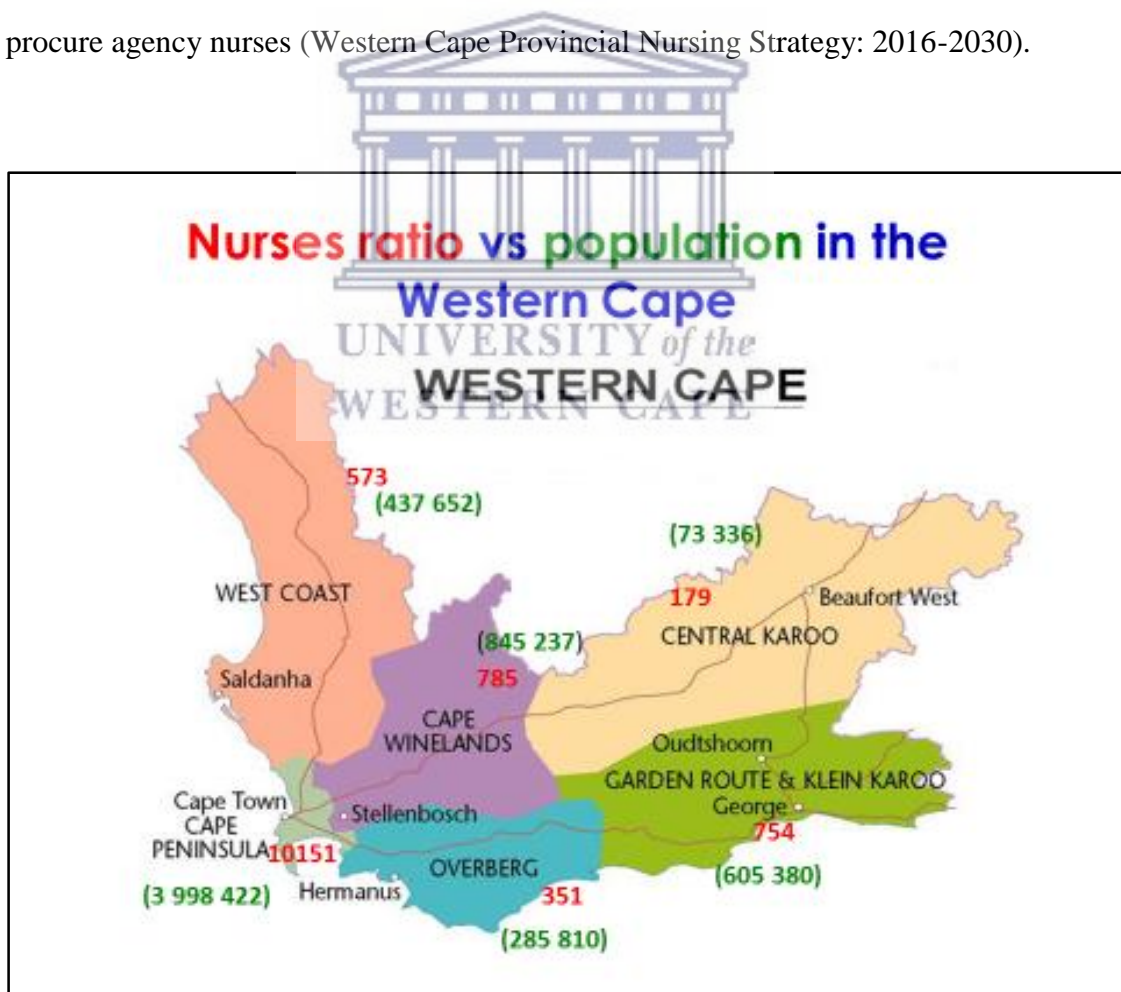


Figure 3.1: Health districts of the Western Cape Government Health (2016)



Figure 3.2: Health sub-districts of the Metropole in the Western Cape

Often, when it is impossible to study an entire population (Polit & Beck, 2012, p. 274), an accessible population could be used. An **accessible population** refers to all members of a population who match the selected criteria and who are accessible as respondents (Polit & Beck, 2012, p. 274). For the purpose of this study, the respondents included all professional nurses who have been trained in the electronic system for the procurement of agency nurses (NIMS) or those who are knowledgeable about the electronic system (NIMS) and work in the hospitals of the Western Cape Metropole (N=278). The Western Cape Metropole's health facilities (Figure 3.2) included in the study were eight district hospitals, two regional hospitals, three specialised hospitals, three psychiatric hospitals and three academic hospitals (Table 3.1) (Provincial Nursing Strategy: 2016-2030).

Table 3.1: Accessible NIMS trained population as total sample of professional nurses in the Metropole hospitals

Population	Total sample
District Hospitals (N=121)	
Hospital 1	7
Hospital 2	2
Hospital 3	5
Hospital 4	12
Hospital 5	21
Hospital 6	48
Hospital 7	6
Hospital 8	20
Regional hospitals (N=29)	
Hospital 1	8
Hospital 2	21
Psychiatric hospitals (N=24)	
Hospital 1	7
Hospital 2	12
Hospital 3	5
Central (N=75)	
Hospital 1	40
Hospital 2	5
Hospital 3	30
Specialised hospitals (N=29)	
Hospital 1	8
Hospital 2	17
Hospital 3	4
Total	n= 278

In the Department of Health, and the Western Cape in particular (Regulation 185 of 2012, National Health Act), hospitals of various levels include district, regional/secondary,

specialised and academic/tertiary hospitals. A district hospital serves a defined population within the health district and supports primary health care with 50 to 600 beds. A regional/secondary hospital provides services in internal medicine, paediatrics, obstetrics, gynaecology and general services, with 200 to 800 beds. The tertiary/academic hospital provides specialist services and can have up to 1200 beds, while the specialised hospitals provide a specific specialised service such as maternity, psychiatry, tuberculosis, infectious diseases and rehabilitation, with a maximum of 600 beds (National Department of Health, 2012).

3.3.2 Sampling, sample and sample size

Sampling describes the list of essential characteristics for membership of or eligibility for the target population (Polit & Beck, 2017, p. 249). With probability sampling, all the members of the population have an equal probability of being selected, with the intent that the selected sample would adequately represent the population. Probability sampling results in less bias during the sample selection and is mostly used in quantitative research (Polit & Beck, 2017, p. 250).

Table 3.2: Distribution of questionnaires and feedback per hospital

Type of hospital	Sample (n)	Responses (n)
District hospital	121	60
Secondary hospital	29	13
Specialised hospital	53	27
Tertiary hospital	75	43
TOTAL	278	143

In this study, the researcher used the accessible population (N=278) serve as the total sample. Table 3.1 illustrates the sample size and number of responses per level of health care. The sample comprised professional nurses (n=278) within the Western Cape Metropole hospitals who were registered on the NIMS system as NIMS users, and who were therefore by implication knowledgeable about the system and trained in NIMS. The names of these nurses were obtained from the record of the NIMS team at the Department of Health, Nursing Directorate. An instrument was distributed to the sample on which a response rate of 51.4 percent (n=143) was obtained.

3.4 DATA COLLECTION

3.4.1 Data collection method

Data collection refers to a precise and systematic gathering of information relevant to the research design and measurements methods (Creswell, 2014, p. 45). A survey was used to gather data. A survey is a method for collecting quantitative information in the form of numerical data with the aim of describing or explaining the research phenomenon (Polit & Beck, 2017, p. 243). A survey was the best method for collecting data from an accessible population that was too large to observe directly (Polit & Beck, 2012, p. 274). In this study, a self-administered questionnaire was used to gather data about the competence levels of professional nurses in using NIMS, an electronic procurement system. The questionnaire was used to explore the competence level of professional nurses, for the purpose of statistical analysis (Polit & Beck, 2017, p. 275).

3.4.2 Description of the research instrument

A structured questionnaire with closed-ended questions was developed from a literature review that covered the topic of agency staff procurement on an electronic system. Survey questionnaires offer complete anonymity, and the questionnaires were numbered and coded to facilitate data capturing and auditing of captured data. The term “structured” refers to fixed items that form a series of questions or scales with pre-coded response options from which respondents can choose (Grové, et al., 2015, p. 425). Closed-ended questions comprise questions to which the response alternatives are pre-specified by the researcher. They also ensure comparability of responses and facilitate the analysis of the data (Polit & Beck, 2010, p. 343). Closed-ended questions are more time-efficient than open-ended questions and are therefore more suitable to use within a short timeframe. Respondents may also be more willing to answer closed-ended questions than to compose lengthy responses to open-ended questions (Polit & Beck, 2017, p. 275). Instructions and questions were written in English and were edited to eliminate ambiguous or vague meaning of language in items. All respondents understood English very well, as the official language for communication within the Western Cape Government health and health facilities is English and working in wards entails communication in English.

The questionnaire (Annexure H) was divided into two sections that took the respondents 20 minutes or less to complete. Section 1 contains biographic items that were presented in either a nominal scale (characteristics of respondent were categorised by assigning names to them, e.g. male or female) or ordinal scale (characteristics of respondents were classified in a number of categories that could not be measured, e.g. level of education/qualifications).

Section 2 describes the scope of the staffing process and the content was separated by four headings (see Table 3.3).

Table 3.3: Content of the instrument

	Content of items on the electronic system covered	Items
Section 1	Biographical information	1 to 10
Section 2:	Information systems	
Section 2.1	Collaborative approach to NIMS	11 to 18
Section 2.2	Decision-making supported by NIMS reports	19 to 24
Section 2.3	Effective and appropriate utilisation of resources supported by NIMS	25 to 32
Section 2.4	Quality assurance	33 to 40

Section 2 of the questionnaire comprised statements on a 5-point Likert scale. A Likert scale consists of several declarative items that express a viewpoint on a topic. The scale corresponded with Benner (1984) and Kaminski (2010), with responses ranging from:

1 = Totally unproficient (novice)

2 = Unproficient (advanced beginner)

3 = Neither proficient or unproficient (competent, bare minimum required)

4 = Proficient (a level of expertise that is above the minimum)

5 = Totally proficient (expert)

Ordinal measurement ranks respondents based on their relative standing in respect of a specific attribute. However, ordinal measurement does not indicate how much greater one level was to another (Polit & Beck, 2012, p. 380). Respondents needed to indicate

the extent to which they agreed or disagreed with the opinion expressed by the statement (item) and, thus, the ordinal level of measurement was applicable (Polit & Beck, 2012, p. 380) (see Table 3.4).

Respondents were required to indicate a most appropriate block by marking it with an X.

Table 3.4: Example of Likert-scale statement

Indicate to what extent you are proficient in the utilisation of the NIMS:	Totally unproficient	Unproficient	Neither proficient or unproficient	Proficient	Totally proficient
Section 2.1: Collaboration					
I have established a partnership relationship with the NIMS team to ensure training on NIMS when facing problems with agency nurses.	1	2 X	3	4	5

The questionnaire included a cover letter (Annexure F), which provided details of the proposed research as well as instructions on how to complete the questionnaire. On completion of the questionnaire, respondents were to seal their answers in an envelope (provided) and deposit it in a box at the office of the nurse manager.

3.4.3 Pre-testing of the instrument

The first letter of approval for the research was obtained 03 May 2017 from Tygerberg Hospital (Annexure E). In May 2017, prior to pre-testing the instrument, the researcher approached ten staff members (via email, followed up with a telephone call) with extensive experience in working on the system (experts) to read the questionnaire. These staff members and the supervisors were asked to assess whether the questionnaire contained any vague, leading or duplicate questions or questions that could influence the responses of the respondents; face and content validity were therefore ensured. The

essence of the process was to comment on the structure of the questionnaire, reveal whether respondents understood the instructions, and identify confusing questions that could affect the response rate. The ten staff members confirmed that adequate time was allowed for the completion of the questionnaire. The researcher made sure that the respondents did not feel uncomfortable in answering any of the questions and that all major topics were included (as part of content validity). The ten staff members provided some input that required editorial changes.

The pre-testing of the data-collection instrument ensured that the layout of the questionnaire was of such a nature that it was easy to follow (Polit & Beck, 2012, p. 296). Results of pre-testing a questionnaire could assist the researcher with identifying those items in the questionnaire that were not providing useful information about the topic. The instrument and consent form (Annexure G) was handed to six respondents who were part of the actual study sample at the end of June 2017. The pre-testing took place over a week and the researcher was available to clarify any questions the respondents had.

By ensuring that the questionnaire was easy to use, the possibility that the respondents could misunderstand the questions was reduced. An easy to use questionnaire could promote consistency of answers by all respondents and result in a higher response rate (Polit & Beck, 2012, p. 298). Respondents who had taken part in the pre-testing of the instrument were included in the main study as no more changes were made to the instrument.

Prior to conducting the research, the researcher made sure of the following:

- Ethics approval from the University of the Western Cape (BM17/2/11) (Annexure A);

- Permission to conduct research from the Western Cape Government: Department of Health (WC_2017RP39_522) (Annexure B1-12);
- Separate permission letters from: Red Cross War Memorial Children's Hospital (RXH: RCC68) (Annexure C); Groote Schuur Hospital/UCT (HREC REF: 252/2017) (Annexure D) and Tygerberg Hospital (BM17/2/11) (Annexure E);
- Information sheet/cover letter to explain the research and adherence to ethical principles (Annexure F);
- Consent form to obtain written agreement from the respondents to complete the questionnaire (Annexure G).

3.4.4 Questionnaire administration

The researcher contacted the nurse managers of the health facilities to arrange a suitable time for explaining the scope of the study and administering the questionnaire. The cover letter, which included the purpose of the study, benefits of partaking in the study for the broader community, the name of the researcher, training institutions supporting the study, the approximate amount of time required to complete the questionnaire (20 minutes), the assurance of confidentiality and confirmation that respondents could withdraw from the study at any time, was explained to the respondents. The cover letter also contained the instructions that explained the process after the questionnaires had been completed in their own time. Respondents who agreed to the study were requested to sign a written informed consent form before partaking.

The researcher arrived at the date and time that had been agreed upon by the nurse manager of each specific health facility in order to not inconvenience the nursing care services. As the questionnaires were self-administered and the respondents could

complete it at a place and time that felt comfortable to them, the researcher was not present when the questionnaires were completed (Polit & Beck, 2012, p. 297). Hospitals provide a 24-hour service and were visited more than once to reach all respondents and to maximise the return rate of questionnaires.

Upon completion, respondents placed questionnaires in provided envelopes and sealed them before returning them to the researcher. The envelopes were then handed over to the nurse managers of the health facilities who in turn returned them to the researcher during the subsequent visit, arranged between the nurse managers and the researcher.

The data was gathered during the period of July to September 2017. The total of professional nurses who responded to the study were 143 out of a total of 278. This amounts to a response rate of 51.4 percent (Table 3.2). The possible reasons for the low response rate are outlined in the limitations of the study (Point 5.5).

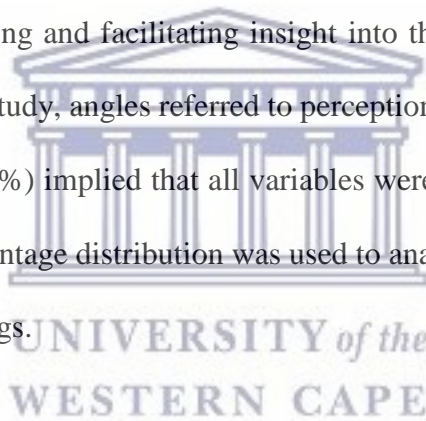
3.5 DATA ANALYSIS

Data analysis is the systematic organisation and synthesis of research data (Polit & Beck, 2012, p. 725). Numbers are organised into rows and columns to make them workable for the statistician (Grové, et al., 2015, p. 45). In this study, the researcher conducted the majority of the statistical analysis. Collected data was captured by using the statistical package for the social sciences (SPSS) Version 24 analysis software, that was programmed to electronically execute mathematical processes. A statistician of the University of the Western Cape was consulted to guide the researcher in the process of analysing the statistics. Statistics are used for reducing, summarising, organising, manipulating, evaluating, interpreting and communicating quantitative data (Polit &

Beck, 2012, p. 379). In the absence of statistics, quantitative data would simply be a chaotic mass of numbers. The incomplete questionnaires in this study were processed as only some information was missing that did not significantly interfere with the analysis process. In this study, data was analysed by using descriptive and inferential statistics.

3.5.1 Descriptive statistics

In this study descriptive statistics, i.e. number of responses (n), percentage distributions (%), mean values (\bar{x}) and standard deviations (SD), were used for describing and summarising data meaningfully. These statistics converted and condensed a collection of data in a variety of ways into an organised, visual representation or picture with the purpose of giving meaning and facilitating insight into the research phenomenon from different angles. In this study, angles referred to perception (Polit & Beck, 2017, p. 357). Percentage distribution (%) implied that all variables were listed and counted each time they occurred. The percentage distribution was used to analyse the data with the purpose of interpreting the findings.



The measuring of central tendencies (the most concise statement of the location of the data, often referred to as an average), i.e. the mean (\bar{x}) and standard deviation (SD), was used to describe and to summarise data (Polit & Beck, 2012, p. 382). The mean (\bar{x}) was the sum of the scores divided by the number of scores being added and is the most commonly used measurement of central tendency for an approximately normal distribution (Polit & Beck, 2012, p. 386). A standard deviation is a statistical measure of accuracy for a sequence of repetitive measurements (Polit & Beck, 2012, p. 387). SD expresses the distribution (percentile) of values within a set of observations (Polit & Beck, 2012, p. 387). The lower the value of SD, the higher the precision, since data is more

densely concentrated around the mean. A higher value of SD indicate that the data points are spread out over a large range of values and is said to have a low level of precision (Polit & Beck, 2012, p. 388).

3.5.2 Inferential statistics

Inferential statistics provide a means for drawing conclusions about the population based on the data from the sample (Polit & Beck, 2012, p. 404). Non-parametric statistics were calculated as it does not make assumptions about the underlying population distribution (Polit & Beck, 2012, p. 411). Non-parametric techniques are used when data is measured on nominal (categorical) and ordinal (ranked) scales. Measures of central tendency (mode, mean and median) were calculated for each item to identify systematic variations among the sample population, and to identify central characteristics of the data. Non-parametric statistics were included to establish whether or not the competence levels with which professional nurses (of varying ages and with different levels of NIMS training) operate the electronic system (items on collaboration/decision-making/ and resources management and quality) differ.

Pearson's chi-square (χ^2) test was applied to evaluate whether there are significant differences (they were marked in colour in Chapter 4) between the competence levels of nurse users of the electronic system for staffing (NIMS) between:

- the type of hospitals that they were working in; and
- the years of experience of respondents in NIMS.

The cross-tabulation matrix outputs (Tables 4.8–4.11, 4.13, 4.15, 4.17, 4.20) illustrate the tabulations (counts) for each group of one variable separated across the groups of the

second variable, where there were significant differences. A p-value of $p < 0.05$ represented a statistically significant difference between variables.

For purposes of the analysis and therefore the description of the findings the responses were combined:

1 and 2: novice to advanced beginner;

3: competent;

4 and 5: proficient to an expert.

3.6 DEVELOPMENT OF GUIDELINES

Objective 2 was to develop guidelines for nurse managers to promote the competence levels of professional nurses' to utilise the electronic system for staffing of agency nurses in public hospitals in the Western Cape. The method used by Muller (2006, p. 204) to develop guidelines was applied. The steps followed were:

- Overall interpretation of the data analysis, that identified the headings for the guidelines as a collaborative approach, decision-making, resources management, and quality assurance to procure agency nurses. They served as departure point to formulate the overall broad guidelines to procure agency nurses.
- Writing a rationale, with supporting literature for each broad guideline, was written with reference to the context of the Western Cape, where needed.
- The items in each of the four guidelines that received mere negative responses to being competent were identified as challenges that needed actions. Based on the findings of the study, specific *actions* required to meet each guideline was thus described.

- Each action was outlined with reference to appropriate literature to support the recommended actions where needed.

Guidelines are addressed in Chapter 5.

3.7 VALIDITY AND RELIABILITY

3.7.1 Validity

Validity is about the control of the research design and the instrument that will be used to gather the information (Grové, et al., 2015, p. 393). Both the internal and external validity of a research design are measured. External validity refers to the degree to which the findings of the research can be generalised and whether the sample was representative of the whole study population (Brink, et al., 2012, p. 111). The findings of this study can be generalised to all the health facilities within the Western Cape utilising NIMS to manage the nursing staff shortage. The questionnaire used in this study was structured, which meant that it was less prone to different interpretations and changes in emphasis. The questionnaire was scrutinised by the researcher, supervisors and ten experts in NIMS for face and content validity.

Face validity means that an instrument appears to measure what is intended to be measured, as determined by the researcher and the experts who have been consulted (Polit & Beck, 2012, p. 336). The results of the pre-testing of the instrument by six respondents confirmed that all items in the questionnaire were relevant and no editorial corrections were required. Respondents who had taken part in the pre-testing of the instrument were thus included in the main study. The instrument appeared to measure what it was intending to measure, as it covered all the main aspects.

Content validity refers to the degree to which an instrument comprehensively includes the range of meanings inherent to the concept and measures all the various components of the variables in question (Polit & Beck, 2012, p. 336). The researcher designed the questionnaire based on a thorough literature review. Prior to pre-testing the instrument, the researcher approached ten staff members with extensive experience (experts) in working on the electronic system for procurement of agency nurses (NIMS) to read the questionnaire. These staff members and the supervisors were asked to assess whether the questionnaire contained any vague, leading or duplicate questions or questions that could influence the responses of the respondents; face and content validity were therefore determined. The instrument and consent form was handed to six respondents who were part of the actual study sample for pre-testing of the instrument.

Internal validity is threatened by the degree to which the independent variable can affect the dependant variable (Polit & Beck, 2012, p. 236). The identified threats to internal validity include, but are not limited to, testing, instrumentation and selection bias (Polit & Beck, 2012, p. 255). This research design is a non-experimental design and no variables were manipulated. Objectivity was ensured by using the same structured, self-administered questionnaire during data collection.

Measures undertaken during data analysis and interpretation phases to ensure internal validity included:

- pre-testing of the instrument;
- the use of an appropriate method of data analysis, which was a statistical package of the social sciences (SPSS) Version 24;
- adherence to ethical standards during the data collection e.g. allowing the respondents to withdraw from the study at any stage;

- maintenance of accuracy during data analysis; and
- the support of interpretation with true and relevant data.

Measures undertaken during the selection of the population and sample to ensure internal validity and a representative sample included the total sampling of respondents.

External validity refers to the degree to which findings can be generalised from the sample to the population of the sample (Polit & Beck, 2012, p. 250; Grové, et al., 2015, p. 202). In this study, external validity was ensured by a total sampling method to validate the generalisation of the findings to the accessible population. The representativeness of the sample determined that the findings could be generalised to the target population who are professional nurses working in all hospitals (district, regional, academic and specialised) that were part of the study. Potential threats to external validity included the reaction of the respondents to the questions being asked and the researcher's ability to control the setting or influence the responses given (Brink, et al., 2012, p. 158). These threats were addressed by using a self-administered questionnaire that the respondents could complete in their own time without the presence of the researcher.

3.7.2 Reliability

Reliability refers to the extent to which the particular instrument can reproduce the same results if used by more than one researcher (Polit & Beck, 2012, p. 331). Therefore, if the same instrument is used by more than one researcher and the same results are obtained, the instrument is very reliable (Polit & Beck, 2012, p. 175). The reliability of this study was established by using the Cronbach's Alpha coefficient. The reliability of any given measurement refers to the extent to which it is a consistent measure of a concept, and

Cronbach's Alpha (α) test is one way of measuring the strength of that consistency (Polit & Beck, 2017, p. 352). The same instrument was given to all the respondents who partook in the study. Reliable instruments enhance the study and assist in identifying important differences or relationships that occur in the study population (Polit & Beck, 2012, p. 331). In this study, reliability referred to the degree of accuracy with which the instrument was capable of measuring the phenomenon; that is to determine the competence levels of professional nurses in utilising the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

The internal consistency aspect of reliability is the extent to which all the instrument's items are measuring the same attribute, this is mostly assessed by Cronbach's Alpha (Polit & Beck, 2012, p. 348). The higher the value of the Cronbach alpha, the more confident the researcher may feel that the test is internally consistent. Cronbach's Alpha (α) reliability coefficient usually ranges between 0 and 1, and values of > 0.7 is deemed acceptable (Polit & Beck, 2017, p. 352).

Table 3.5: Reliability statistics (section 2.1, 2.2, and 2.3)

Section	Cronbach's Alpha (α)	No. of items
2.1 Collaborative approach to NIMS	0.938	8
2.2 Decision-making supported by NIMS reports	0.924	6
2.3 Effective and appropriate utilisation of resources supported by NIMS	0.941	8

In this study, all the items had a Cronbach's Alpha coefficient of .924 and higher (Table 3.6). The items of Sections 2.1, 2.2 and 2.3 were tested for reliability as they contained items that tested the propositions presented. These sections refer to a collaborative approach to NIMS (2.1), decision-making supported by the NIMS reports (2.2) and effective and appropriate utilisation of resources supported by NIMS (2.3). Sections 1 and 2.4 contain biographic information, ability, availability and barriers to computer-use. The instrument was thus indicated as being reliable.

3.8 ETHICAL CONSIDERATIONS

Ethical approval/consent for the study was obtained from the Biomedical Science Research Ethics Committee of the University of the Western Cape, the relevant authorities of the Department of Health and health facilities. The ethical principles of Sim and Wright, as well as Terre Blanche, et al. (Sim & Wright, 2000, p. 39; Terre Blanche, et al., 2006, p. 67) were adhered to as follows:

- **Permission to conduct a research project:** A research proposal, accompanied by a cover letter, was submitted to the Biomedical Science Research Ethics Committee of the University of the Western Cape for approval (Ethics reference number: BM 17/2/11 and Provisional Ref. number: -130416-050). Copies of the proposal and the letter requesting permission to undertake the study at the health facilities had been submitted to the relevant authorities of the Department of Health and health facilities, after which they all granted permission to do so. The intent of conducting a study had been communicated via email to the managers of the institutions where the study was going to be conducted, and a copy of the document in which written permission to conduct the study was granted was forwarded to the nurse managers.

- **Informed consent:** Written informed consent was obtained from the respondents before data collection (Polit & Beck, 2012, p. 159). Respondents were requested to sign the consent forms after they had read the information about the purpose of the study, time needed to answer the questionnaire, the benefits and risks of the study and the measures taken to ensure confidentiality. Respondents were also informed that participation in the study was voluntary and that there would be no negative consequences if they decided against the completion of the questionnaire. Respondents were requested to place consent forms, whether signed or not, inside the envelopes that were provided. Informative letters and consent forms were written in English, since all professional nurses understand English.

- **The right to freedom of choice and withdrawal:** Written informed consent was obtained before questionnaires were completed. Respondents who decided against participation were not coerced or harassed in any way. The researcher respected the human dignity of the respondents and she obtained *voluntary, informed consent* from each respondent (Polit & Beck, 2012, p. 158). This informed consent was obtained in writing from each of the respondents who had voluntarily agreed to participate in the research study. Appropriate information about the nature, purpose and implications (benefits) of the research study was explained to all the respondents. The researcher outlined the ways in which respondents' confidentiality and privacy would be safeguarded. The concept of informed consent serves to enhance the ethical norms of voluntary participation. Voluntary participation in a research project implies that the respondents fully understand the possible risks involved. The right of the respondents to withdraw or to terminate their participation in the study at any time was both

acknowledged and respected by the researcher. The researcher furthermore informed the respondents about who she was, and what her affiliation and qualifications are.

- **Protecting the research respondents and honouring trust:** Respondents were given a leaflet that informed them about the study and the time it will take them to complete the questionnaire (20 minutes at most).
- **The right to privacy:** The privacy of the respondents was ensured at all times during the research proceedings. A consent form, whether signed or not, was placed into a different envelop than the one used for the questionnaire to ensure that these two documents could not be associated with each other. Invasion of privacy was prevented by making sure that no identifying information would be required during the completion of questionnaires (Polit & Beck, 2012, p. 158). The method of data collection was a self-administered, structured questionnaire that was scrutinised by the researcher and research expert from the university to ensure that there were no questions that would compromise the privacy of the respondents. Gathered data will be kept under lock and key for two years after the results in this report had been published in for example an article. Thereafter, it will be destroyed.
- **The respondents' right to confidentiality and anonymity** was ensured by making it impossible to link specific data to either a particular institution or person (Polit & Beck, 2012, p. 160). Respondents could be assured of anonymity because their personal details would not be published. The researcher's report was written in such a way that neither individuals nor groups would be identified by their responses. Any personal details that could identify individuals were omitted from the study and each instrument was given an identifying number for control purposes. The completed

questionnaires did not reveal the names of either an institution or respondents since it was completed anonymously. After completion, it was inserted into a sealed envelope before it was handed back to the researcher.

- **The right to justice and equality:** The researcher treated all the respondents fairly (Polit & Beck, 2012, p. 155). Total sampling was used to ensure a fair selection of respondents. Total sampling gave everyone in the accessible population an equal chance of participating in the research. Contact details of the researcher were provided in the event that her support during the study was needed.
- **Access to information and communication:** Sufficient information was supplied to the respondents in an informative letter that indicated the purpose of the study, the study procedure, expected duration of the study and the goal of the study. The researcher offered to answer any questions the respondents might have (Polit & Beck, 2012, p. 158). Respondents were assured that the gathered data would only be shared with the relevant researchers or supervisors who were consulted during the study and other relevant persons who were assisting with the analysis of the data and the compilation of the research findings.
- **The rights of the community and the research community:** The researcher maintained the highest standards of research planning, implementation and reporting; was committed to be honest, unbiased and conduct neutral research; made the constraints of the study known; did not participate in any unethical manipulation of the gathered research data; made use of acceptable, scientific methods and procedures during the research process; did not engage in plagiarism; and acknowledged contributions from other researchers.

- **Respect for person:** Informed written consent was obtained from the respondents who voluntarily agreed to participate in the study.
- **Prevention of harm:** The principle of non-maleficence was ensured. In quantitative studies, most details of the study are spelled out in advance, so a reasonable accurate risk/benefit ratio assessment can be developed (Polit & Beck, 2012, p. 156). The purpose of the ethical consideration of nonmaleficence is to avoid intentional harm or the risk of inflicting harm on any individual (Polit & Beck, 2012, p. 156). The study did not present any anticipated risks. Only those items which were considered necessary for the study were included in the questionnaire and any words or phrases in the items that could offend any of the respondents were avoided. Respondents were made aware of the research project in an informative letter. Data collection took place at a time that was convenient to the respondents. The completion of the questionnaire took about 20 minutes and therefore did not take up much of the respondents' time. The research proposal was submitted to Biomedical Science Research Ethics Committee of the University of the Western Cape for evaluation and was approved. The relevant authorities of the Department of Health and health facilities also granted permission to the researcher for conducting the study.
- **Beneficence** (benefit to the research respondents): The researcher needs to disclose any benefits that may reasonably be expected from the research to the respondents or to others (Polit & Beck, 2012, p. 152). The study can benefit the respondents as well as their colleagues within the health facilities. The newly gained knowledge will inform the development of guidelines for nurse managers to promote the competence levels of professional nurses utilising the electronic system, NIMS, to procure agency

nurses. The research findings might therefore lead to improved utilisation and further roll out of NIMS.

- **Respondents' rights with regard to data and publications:** Research results will be shared with respondents on request once completed. Publications will not refer to the identity of respondents or the site. The researcher's report will be written in such a way that neither individuals nor groups could be identified by their responses.

3.9 CONCLUSION

A quantitative design was followed in order to explore and describe the competence levels of professional nurses in utilising the electronic system for staffing of agency nurses. A further goal was to develop guidelines for nurse managers to promote the competence levels of professional nurses in utilising the electronic system for staffing of agency nurses in public hospitals in the Western Cape. A pre-test of the instrument was conducted in order to determine the validity of the questionnaire. The total number of the population served as the sample (n=143). The self-administered questionnaire was completed by the respondents. Descriptive data analysis followed. The principle of validity and reliability were taken into consideration during the research processes, while the researcher was also adhering to ethical principles. The findings of the research were used to realise the first objective and provide substance for the fulfilling the purpose of the study.

Chapter 4 focuses on the results.

CHAPTER 4

ANALYSIS, PRESENTATION AND DISCUSSION OF THE FINDINGS

4.1 INTRODUCTION

In this chapter, the results of descriptive and inferential analysis are presented. In order to answer the research questions, a researcher needs to analyse the data in an orderly and coherent fashion (Polit & Beck, 2010, p. 76). The research design was quantitative in nature, therefore a statistical analysis (with the assistance of a statistician of the University of Western Cape) was conducted. Data was captured onto a spreadsheet after completion of the survey with the finalised questionnaire, counting the number of responses of each question. SPSS software, Version 24, was used for analysis of the data. As explained in Point 3.5 descriptive statistics, that is number of responses (n), percentages distributions (%), mean values (\bar{x}) and standard deviations (SD), were used for describing and summarising data meaningfully. Non-parametric statistics were calculated as it does not make assumptions about the underlying population distribution. Chi-square (χ^2) test was applied to evaluate whether there were significant differences between the competence levels of nurse users of the electronic system for staffing (NIMS), that is between the type of hospitals that they were working in; and the years of experience of respondents in NIMS. The cross-tabulation matrix output (Tables 4.8–4.11, 4.13, 4.15, 4.17, 4.20) is discussed and illustrated to present tabulations (counts) for each group of one variable separated across the groups of the second variable where there are significant differences.

The first objective was to:

- Determine the competence levels of professional nurses utilising the electronic system for staffing of agency nurses in public hospitals in the Western Cape.

4.2 PRESENTATION OF THE RESULTS

A self-administered, structured questionnaire was distributed to 278 professional nurses working in hospitals within the Metropole of the Western Cape. The total of professional nurses who responded to the study were 143 out of a total of 278. This amounts to a response rate of 51.4%. The possible reasons for the low response rate are outlined in the limitations of the study (Point 5.5). For the purpose of this study, the research results are discussed according to the competence of the professional nurses, with reference to adapted assumptions of the theoretical framework of Benner (1984) and the sequence of the headings in the questionnaire:

Section 1:


- Biographic characteristics of the respondents

Section 2:

- Collaborative approach to NIMS (Nursing Information Management System)
- Decision-making supported by NIMS reports
- Effective and appropriate utilisation of resources supported by NIMS
- Quality assurance




The results of the responses to the questionnaire are discussed as follows:

- **Descriptive statistics** of 143 (100.0%) respondents: The results are presented in the format of number of responses (n), mean values (\bar{x}) and standard deviations (SD) for the purpose of interpreting the responses of the respondents.

→ Highest mean value (\bar{x}) 


→ Lowest mean value (\bar{x}) 


For the purpose of discussion, the responses (Items 27–48) will be grouped and presented with reference to:

-  • *novice to advanced beginner* – rating values 1–2;
-  • *competent* – rating value 3;
-  • *proficient to an expert* – rating values 4–5.

Item no.	Items	Responses on competence level										Highest \bar{x}	Lowest \bar{x}	Skewness		
		Novice		Advanced beginner		Competent		Proficient		Expert		Total	Mean		Std. deviation	
	Computer literacy of respondents	n	%	n	%	n	%	n	%	n	%	n	%	(\bar{x})	(SD)	

- Items 12 to 18 and 49 to 56 were Yes/No questions and Items 20–26 were presented on a 3-point scale (1=Never, 2=Sometimes, 3=Always). Respondents were requested to answer all items and to score them accordingly. **Pearson’s chi-square (χ^2) test** was applied to evaluate whether there were significant differences in the competence of respondents using the electronic system for staffing (NIMS), with regards to the type of hospitals and years of experience of respondents.

→ Significant difference, colour coded 

Item no.	Items	Degrees of freedom	Total of respondents	Pearson chi-Square value	Pearson chi-square significance
		df	n	χ^2	 p

- The cross-tabulation matrix output presents tabulations (counts) for each group of one variable, separated across the groups of the second variable where there are significant differences.

I know how to access NIMS any time to be of assistance to my colleagues						
Item no.	Item	Type of hospitals/ years of experience of respondents	Novice to advanced beginner	Competent	Proficient to an expert	Total

The completed questionnaires were checked for missing values and or omissions. They were also examined carefully to identify any misinterpretations of inconsistencies in the responses. **The number of the responses on the items varied**, since a few of the items in the questionnaire were not answered. The missing data did not significantly interfere with the analysis process.

4.3 BIOGRAPHIC PROFILE

Information about the respondents' age, the health facility they were currently working in, their current position at work, clinical experience, highest qualifications, level of computer literacy, formal computer training received, NIMS training received, number of years of NIMS experience, computer access, network connections, time to work on computer, confidence in using the computer, barriers relating to age, computer literacy and actual interest in utilising the computer was obtained from the responses to the items in Section 1 of the questionnaire. Gender was not included in the biographics questions, as the researcher was informed by the NIMS team that there were less than 10 males in the total professional nurses (N=278) trained on NIMS and therefore would not have any statistical value. Nursing is a profession dominated by females and the statistics of the South African Nursing Council confirms this, it also seems to be a pattern internationally (SANC distribution stats 2107).

4.3.1 Respondents' current position at the health facility (Item 1)

The majority (n=134, 93.7%) of the (100.0%) respondents indicated that they were professional nurses acting as unit managers and nine (6.3%) respondents indicated that they were only working in the unit on operational level as professional nurses (Figure 4.1).

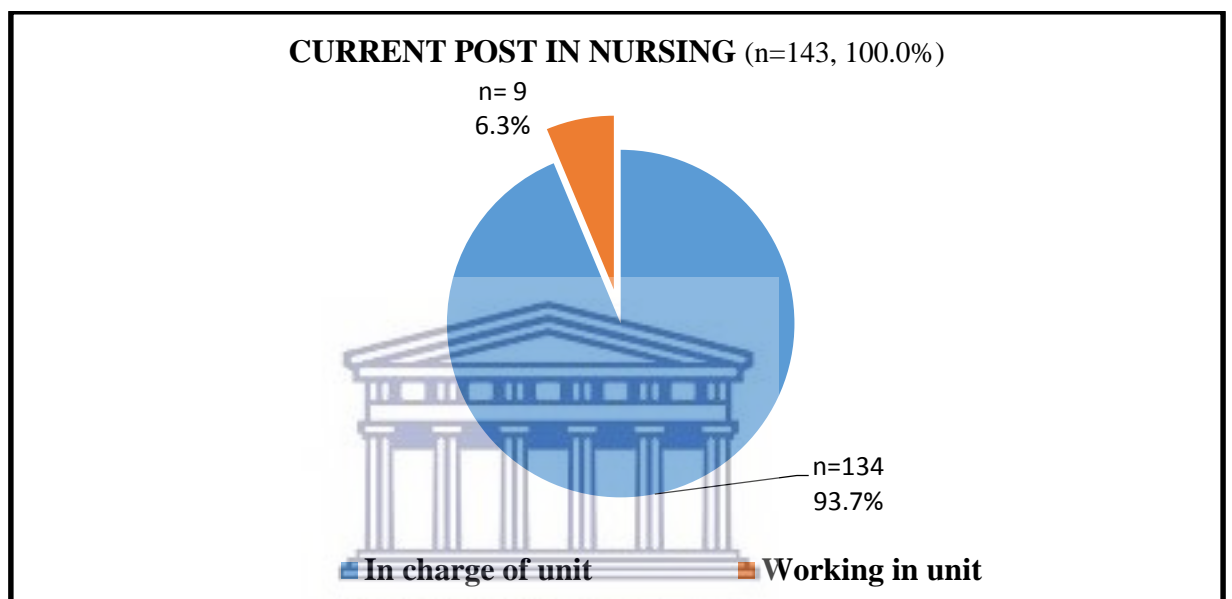


Figure 4.1: Respondents' current positions

The findings indicated that professional nurses in the position of being in charge of a unit (unit managers) have the responsibility to procure agency nurses on NIMS. As explained by Harper (2012, p. 262), unit nurse managers are responsible for staffing, overtime and the use of agency staff. Nurse managers need information for the allocation of staff resources (Lundgren-Laine, et al., 2013, p. 10).

4.3.2 The age of the respondents (Item 2)

Figure 4.2 illustrates that the minority (n=26, 21.1%) of 123 (100.0%) respondents were younger than 46 years of age, and the majority (n= 97, 78.9%) were older than 46 years.

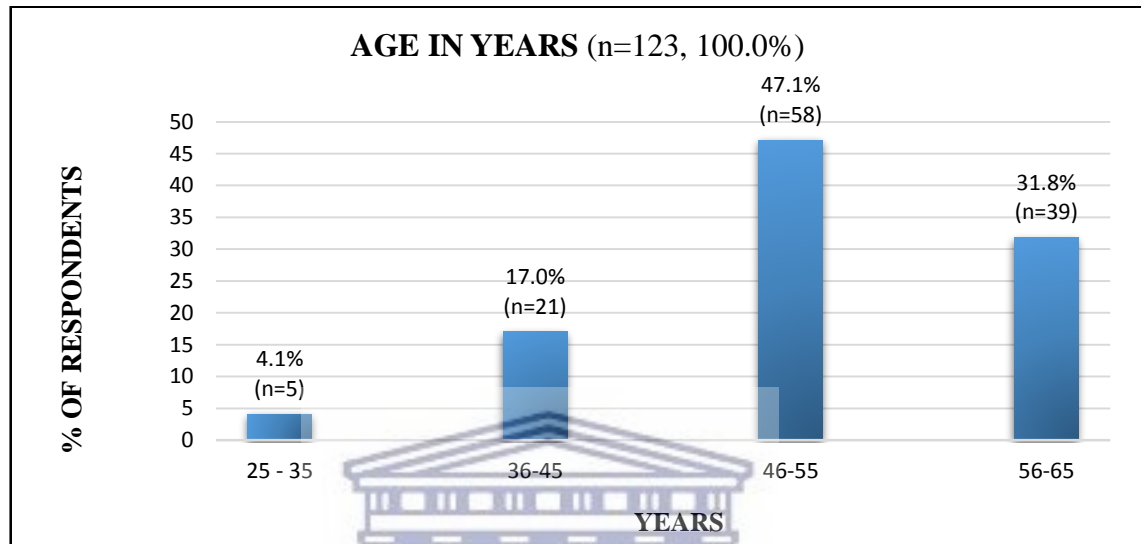


Figure 4.2: Age group of the respondents

The mean age of the respondents in this study was 51.1 years, with a narrow standard deviation (SD) of 7.38 around the mean value. The youngest in the group (n=123, 100.0%) of respondents was 29, while the eldest was 63 (Table 4.1).

Table 4.1: Age of respondents

n	%	Median	Mean (\bar{x})	SD	Min	Max
123	100.0	52.0	51.1	7.38	29	63

A requirement for the position of a nursing manager (Operational Nurse Manager), in the South African government health facilities, could be required to be a minimum of seven

years' experience after registration as a professional nurse of 4 years training. Therefore, most professional nurses that are nursing managers, are 30 years and older. The literature mentions an aging population of nurses, and the Strategic Plan for Nurse Education, Training and Practice 2012/13–2016/17 (2013) indicates that approximately 47% of the workforce is over 50 years of age, while 16% has reached the age of 60. The South African Nursing Council's statistics of 31 December 2016, concur that only 25% of South Africa's professional nurses are 39 years and younger, while 29% are at the age of 50-59 years, 16% are between 60-69 years of age and 3% of nurses are older than 69 years (SANC, 2017, p. 1).

4.3.3 Highest nursing qualification (Item 3)

The results on nursing qualifications show that a few (n=13, 9.2%) of 141 (100.0%) respondents had a basic two-year Diploma in Nursing, nearly a fifth (n=27, 19.1%) had a basic four-year Diploma in Nursing and six (4.3%) had a Degree in Nursing (Figure 4.3).

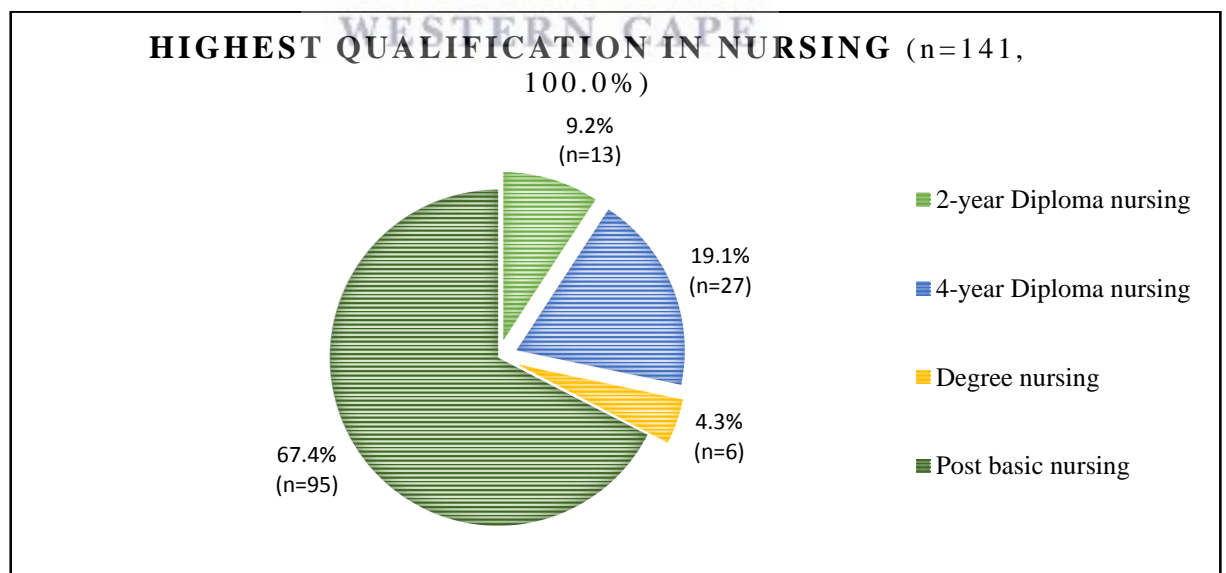


Figure 4.3: Respondents' highest nursing qualification

Two-thirds (n=95, 67.4%) of 141 (100.0%) respondents had a post basic qualification (Figure 4.3), which indicates a large number of nursing experts that were trained to use NIMS. Previous research indicates that a post basic qualification is necessary for supervising and or administrative positions, as well as for conducting research, consulting and teaching (Dehghani, Nasiriani & Salimi, 2016, p. 63). As per Point 4.3.1, the majority (n=134, 93.7%) of 143 (100.0%) respondents indicated that they were professional nurses acting as unit managers. Qualified persons are needed for service delivery, advancing a co-ordinated effort to improve health care service and to reduce errors in health care (Duma, Dippenaar, Bhengu, Oosthuizen, Middleton, Phillips & Uys, 2012, p. 2012). The more experienced and qualified professional nurses should be the resource managers. Nurse managers must be equipped (specialised qualifications) to manage changing and growing demands and must obtain the necessary knowledge to ensure that the services and team they oversee meet the established goals (Chubbs, 2013, p. 13).

4.3.4 Clinical experience of the respondents (Item 4)

Figure 4.4 illustrates the clinical experience of 124 (100.0%) respondents, showing that close to one-third (n=40, 32.3%) of the respondents had less than 20 years of clinical experience as professional nurses. Two-thirds of 82 (66.1%) respondents had 21 to 40 years of clinical experience and two (1.6%) had more than 40 years' experience. The mean number of experience was 25 years, with a minimum of 4 and a maximum 45 years of experience.

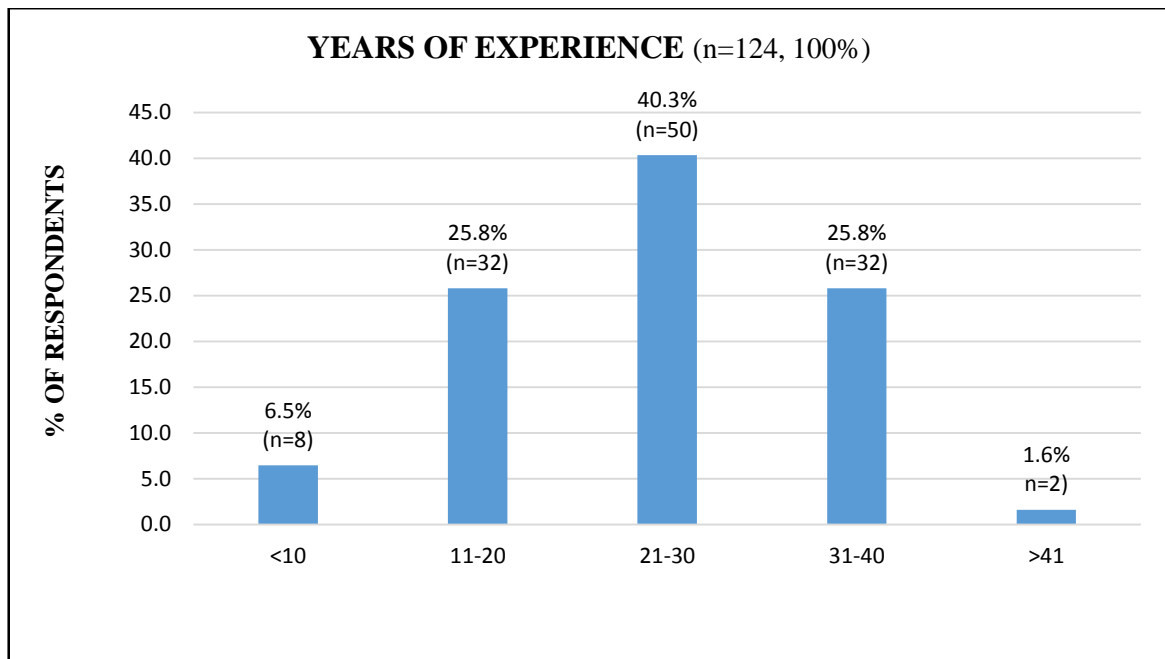


Figure 4.4: Respondents' clinical experience

The two-thirds of respondents with 21 to 40 years of clinical experience can be related to the age (Item 2) and the more senior positions of most of the respondents, as indicated in Item 1. This is also in line with Item 3, which indicated that the majority of the respondents had a post basic qualification.

Research shows that there is a negative correlation between age and the acceptance of electronic information management systems; however, acceptance can be facilitated by continuous training and peer support (Kaye, 2017, p. 7).

4.3.5 Health facility in which respondents were working (Item 5)

Nearly half of 143 (100.0%) respondents worked in general hospitals (Figure 4.5). There were 60 (42.0%) respondents in district hospitals, and 13 (9.1%) in secondary hospitals.

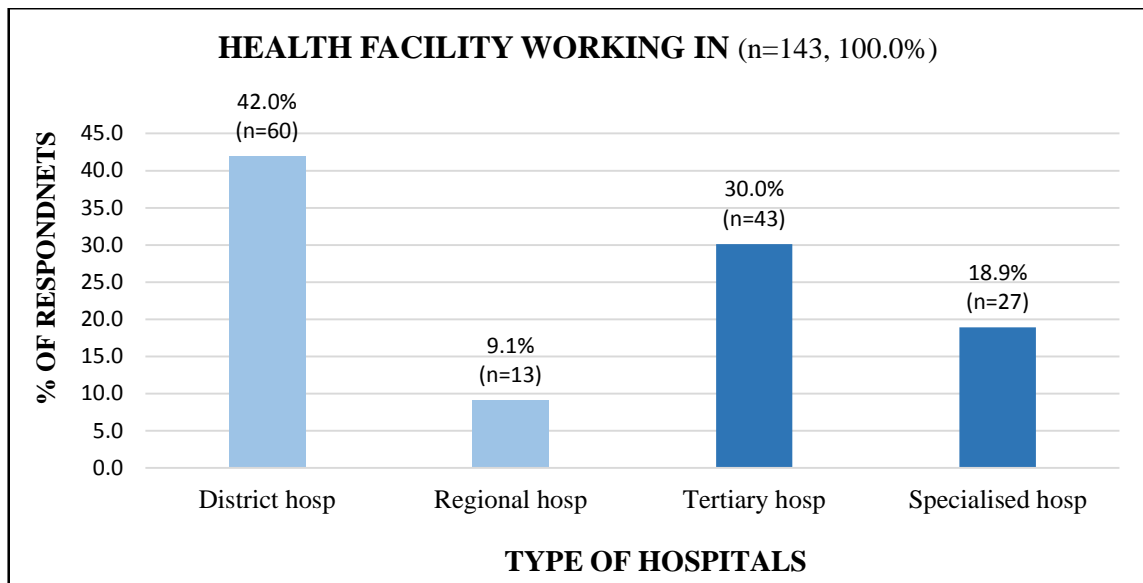


Figure 4.5: Health facility in which respondents were working

The other half of respondents were working in more specialised hospitals, of which 43 (30.0%) respondents were in tertiary and 27 (18.9%) in specialised hospitals within the Metropole of the Western Cape (Figure 4.5). The four types of hospitals for purposes of this study, were divided into two groups that were used in the discussion of inferential statistics, that is, general hospitals being district and secondary hospitals, and specialised hospitals being tertiary and specialised hospitals.

Previous research done with regards to electronic information management system utilisation showed that there was significant difference in competence of staff working in different health care settings (Shiferaw, et al., 2017, p. 7). It was found by Shiferaw, et al. (2017) that the healthcare staff at primary health care level were using the electronic system more, than those in hospitals, and the assumption was made that it was due to providing supervision and regular feedback to the staff at primary health care level compared to those in hospitals.

4.3.6 Computer literacy of the respondents (Item 6)

Table 4.2 illustrates the computer literacy of the respondents and Figure 4.6 depicts the respondents' mean values (\bar{x}) for computer literacy. The responses to literacy in the various programmes and systems showed that the mean value varied between 2.6 and 3.6. The mean values were: Word (\bar{x} =3.3), spreadsheets (\bar{x} =2.6), databases (\bar{x} =2.7), email (\bar{x} =3.6), Internet (\bar{x} =3.0) and Intranet (\bar{x} =3.2), as per Figure 4.6.

The results indicate that very few respondents perceive themselves as experts in computer literacy. This speaks to the results of Item 7, where the responses showed an unequal focus with regards to receiving formal training in computer programmes and systems. Research studies support the findings of this study that nurses have basic knowledge and skills in computer literacy, mostly gained through self-taught-efforts. It is proven that to have a successful rollout of an electronic information management system, it is important to improve the computer literacy of the nursing staff (Adeleke, et al., 2015, p. 51).

The results show that on spreadsheet and database literacy, respondents perceived themselves as *novices to advanced beginners* (Table 4.2). Nearly half (n=64, 46.8%) of 137 (100.0%) respondents indicated being a *novice to advanced beginner* in spreadsheets, close to a third (n=41, 29.9%) indicated they were *competent* and less than a quarter (n=32, 23.3%) regarded themselves as *proficient to an expert*. More than a third (n=54, 39.7%) of the respondents indicated that they were *novices to advanced beginners* in databases, 51 (37.5%) indicated that they were *competent*, and just more than a fifth (n=31, 22.8%) indicated that they were on a *proficient to an expert* level.

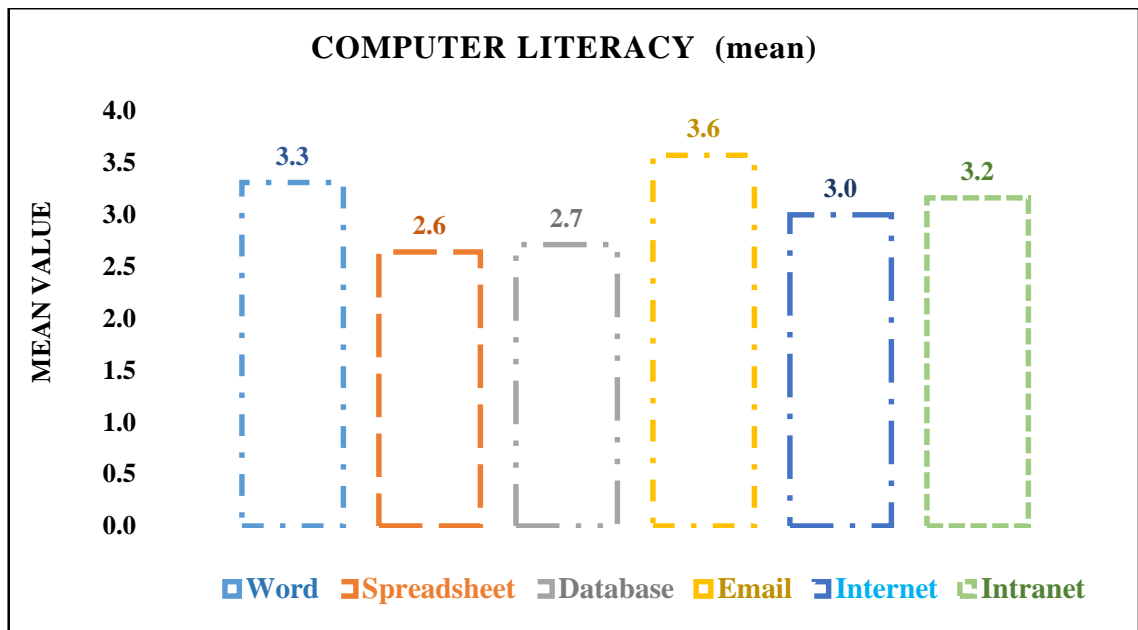


Figure 4.6: Computer literacy of respondents

Responses to Word, email, Intranet and Internet showed mean values (\bar{x}) between 3.0 and 3.6, indicating that even though the majority of respondents did not see themselves as a *novice to advanced beginner*, few were on an *expert* level (Figure 4.6).

Of 141 (100.0%) responses on Word, less than one-fifth ($n=25$, 17.8%) were a *novice to advanced beginner*, 54 (38.3%) *competent* and nearly a half ($n=62$, 43.9%) indicated being *proficient to an expert*. The responses to email literacy ($n=139$, 100.0%) showed that a few ($n=15$, 10.8%) perceived themselves as being a *novice to advanced beginner*, a third ($n=49$, 35.3%) as *competent* and just more than a half ($n=75$, 53.9%) as *proficient to an expert* (Table 4.2). The responses to Internet literacy ($n=136$, 100.0%) were similar, with 44 (32.3%) indicating that they were a *novice to advanced beginner*, 42 (30.9%) regarded themselves as *competent*, and 50 (36.8%) saw themselves as *proficient to an expert*. The responses on the use of the Intranet ($n=141$, 100.0%) showed that more regarded themselves as *proficient to an expert* ($n=59$, 41.8%) than the quarter ($n=36$,

25.6%) who perceived themselves as *a novice to advanced beginner*, and the third 46 (32.6%) who indicated that they were *competent*.

The skewness value on computer literacy varied between -0.3 (lowest) and 0.2 (being highest), thus data was normally distributed. All mean values (\bar{x}) of Items 6.1 to 6.6 were between 2.6 and 3.3, with a reasonably normal distribution of SD=1.20 and less around the mean value. Therefore, few respondents perceived themselves as experts in computer literacy.

Research by Yang, et al. (2014) highlights the lack of competencies of nurse managers in computer and informatics systems. This author is also of the opinion that their competencies should be upskilled through education or training (Yang, et al., 2014, p. 5). The results of Item 6 (computer literacy) also speak to Item 2 (age of nurses) and Item 4 (years of experience of nurses). Other studies furthermore support the finding that nursing experience in years can be unfavorable where computer literacy is concerned, as the technological age is relatively new and experienced nurses may have little to no experience with technology (Wong, 2013, p. 144). Looking at the average age of nurses, it is clear that many may not have had the opportunity to become well-versed in using technology nor had the time to become comfortable with using it, as they grew up without using digital technology (Goldsmidt, 2016, p. 225).

Table 4.2: Computer literacy of the respondents

Item no.	Items	Responses on competence level												Highest \bar{x} ■ Lowest \bar{x} ■		
		Novice		Advanced beginner		Competent		Proficient		Expert		Total		Mean	Std. deviation	Skewness
		n	%	n	%	n	%	n	%	n	%	n	%	(\bar{x})	(SD)	
6.1	Word processing (e.g. using Word in Microsoft office)	7	5.0	18	12.8	54	38.3	48	34.0	14	9.9	141	100.0	3.3	0.99	-0.35
6.2	Spreadsheet (e.g. Excel in Microsoft office)	22	16.1	42	30.7	41	29.9	27	19.7	5	3.6	137	100.0	2.6	1.08	0.16
6.3	Database (e.g. Access in Microsoft office)	22	16.2	32	23.5	51	37.5	25	18.4	6	4.4	136	100.0	2.7	1.08	0.02
6.4	Email (e.g. Outlook, GroupWise)	1	0.7	14	10.1	49	35.3	54	38.8	21	15.1	139	100.0	3.6	0.89	-0.17
6.5	Internet (use for access to World Wide Web/ www)	20	14.7	24	17.6	42	30.9	36	26.5	14	10.3	136	100.0	3.0	1.20	-0.15
6.6	Intranet (networking within the Department of Health)	15	10.6	21	15.0	46	32.6	44	31.2	15	10.6	141	100.0	3.2	1.14	-0.33

4.3.7 Respondents who received formal training in various computer programmes and systems (Item 7)

Figure 4.7 illustrates the responses of 142 (100.0%) respondents to whether they received formal training in the various computer programmes and systems. The majority (n=115, 81.7%) were formally trained in Word, while 26 (18.3%) were not trained. Of 138 (100.0%) responses to formal training in Excel, two thirds (n=87, 63.0%) of the respondents did receive formal training in Excel, while a third (n=51, 37.0%) did not.

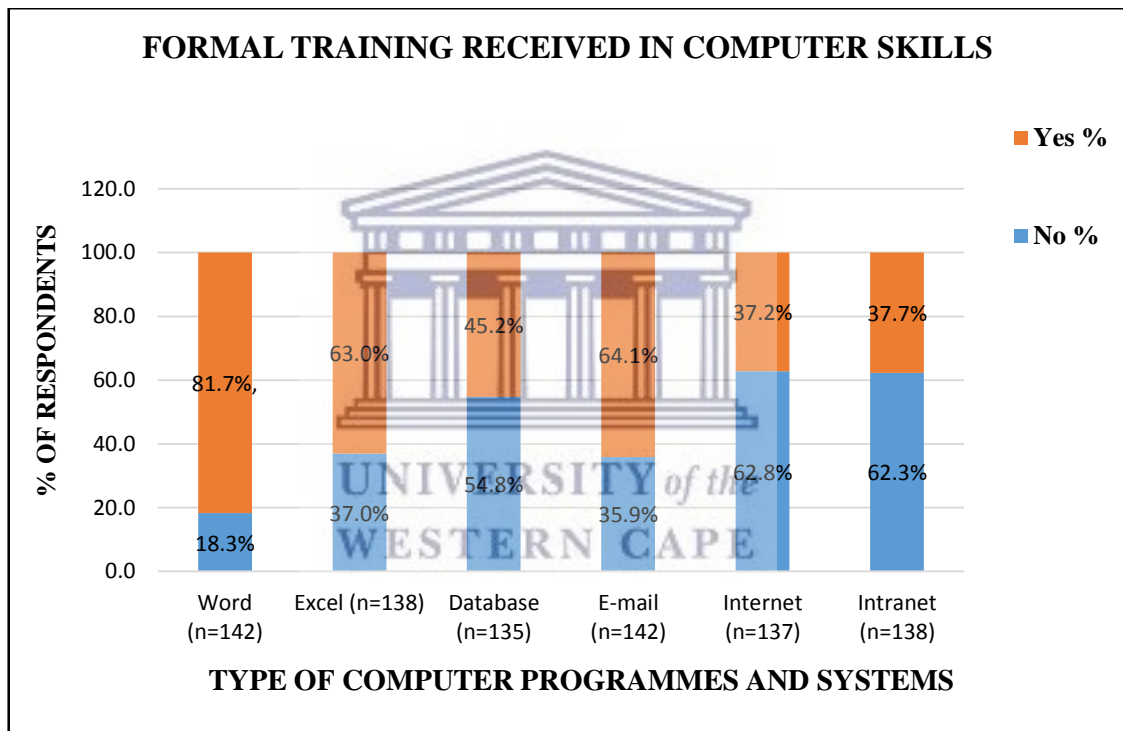


Figure 4.7: Respondents who received formal training in various computer programmes and systems

Responses to training in databases show that less (n=61, 45.2%) respondents received formal training compared to more than half (n=74, 54.8%) of 142 (100.0%) respondents who did not. Of 142 (100.0%) responses to formal training in email, more than two-thirds

(n=91, 64.1%) did receive formal training in email, and just more than a third (n=51, 35.9%) did not (Figure 4.7).

Training received in Internet and Intranet showed similar results. A third, 51 (37.2%) of 137 (100.0%) respondents, had formal training in using the Internet and nearly two-thirds (n=86, 62.8%) did not attend formal training. Of 138 (100.0%) responses on Intranet training, more than a third (n=52, 37.7%) of respondents indicated receiving formal training in Intranet versus two-thirds, 86 (62.3%), who did not.

The findings display an unequal focus on the importance of attending all available formal training opportunities on computer programmes and systems. The responses to Item 6 showed that few respondents were *experts* in computer literacy. Research corroborates this study's finding that nursing staff may be skilled in the use of electronic mail and Internet through self-taught-efforts but have poor competence in database design and statistical analysis and therefore need training to improve their computer-use (Adeleke, et al., 2015, p. 51). This is further supported by a study done in Finland, where it was indicated that nurse managers lacked uniform competencies and information literacy necessary to use management information systems (Liljamo, et al., 2016, p. 6). It is therefore necessary that professional nurses' limited computer and informatics skills are improved through education or training (Yang, et al., 2014, p. 5).

4.3.8 Number of respondents trained in NIMS (Item 8)

Figure 4.8 illustrates the number of respondents who were trained in NIMS. The majority (n=115, 81.6%) of 141 (100.0%) respondents were trained in NIMS, while less than one-

fifth (n=26, 18.4%) were not formally trained. This implies that the majority of respondents should be able to use NIMS to its full capacity.

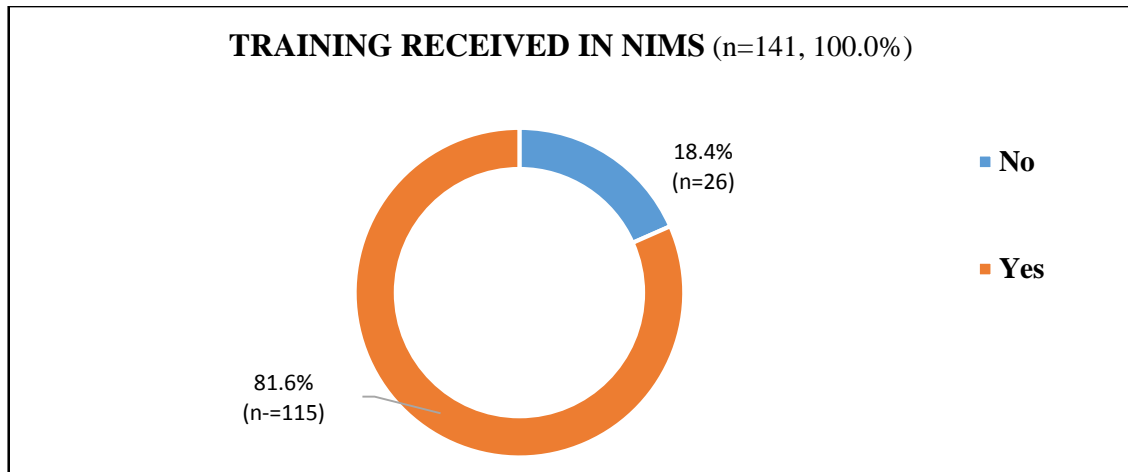


Figure 4.8: Respondents who were trained in NIMS

4.3.9 Respondents years of experience in NIMS (Item 9)

Figure 4.9 illustrates the respondents' years of experience in NIMS. Almost a half of 126 (100.0%) respondents had four to six years of experience in NIMS. This half referred to less than a third (n=33, 26.2%) who had six years of NIMS experience, 22 (17.5%) who had five years' experience, and eight (6.3%) who had four years' experience. The other half of the respondents indicated that they had three years and less experience. Twenty (15.9%) had three years of experience, 12 (9.5%) had two years' experience, 29 (23.0%) one year's experience and two (1.6%) had less than one year's experience in NIMS (Figure 4.9). The mean number of years of NIMS experience for the group of respondents was 3.6 years.

There is a clear variation in years of experience in NIMS that can speak to the competence level of the professional nurses, as explained by Benner (1984).

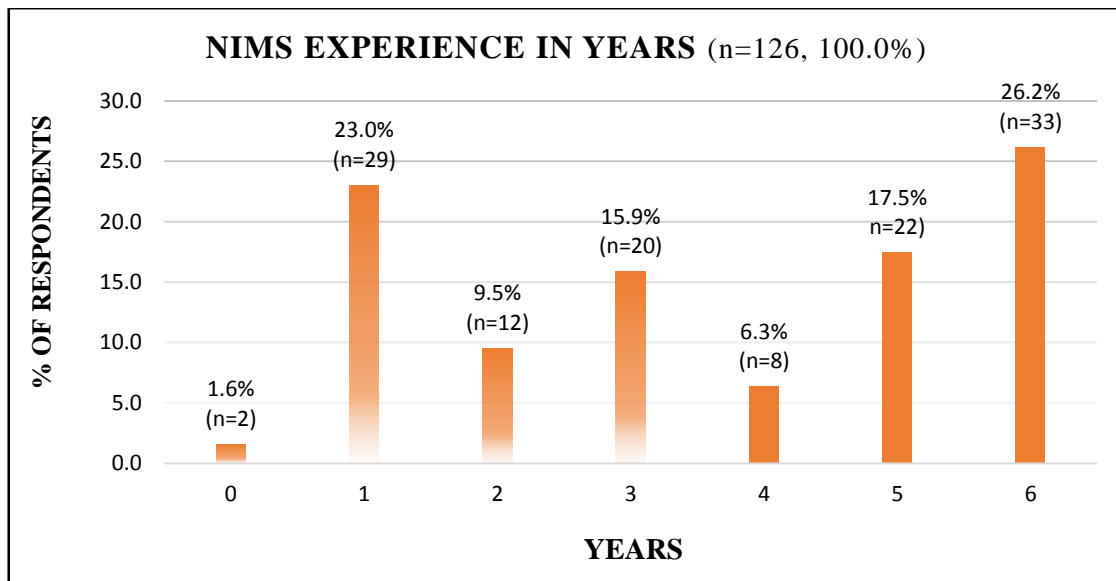
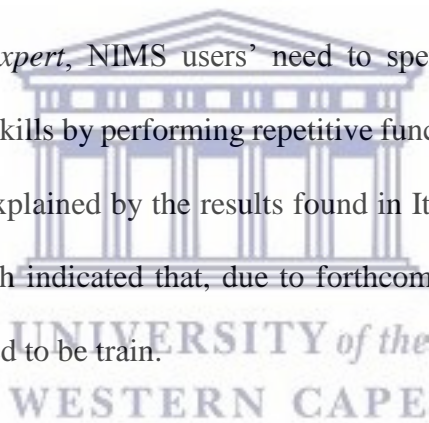


Figure 4.9: Respondents’ years of experience in NIMS

To reach the level of *expert*, NIMS users’ need to spend a minimum of five years acquiring the necessary skills by performing repetitive functions on NIMS. The results in Figure 4.9 can also be explained by the results found in Item 2 regarding the age of the professional nurse, which indicated that, due to forthcoming retirements, a continuous intake of new people need to be train.



4.3.10 Factors that might be barriers to NIMS use in the work place (Item 10)

Research shows that various factors could influence the implementation of systems, e.g. human aspects that include lack of users’ knowledge, lack of freedom when working with the system and limited time (Ahani, et al., 2016, p. 31). Table 4.3 indicates the number of responses (n) and the percentages (%) of the distribution of responses on a 3-point scale (1=Never, 2=Sometimes, 3=Always). It also shows the mean values (\bar{x}) and the standard deviations (SD) of the responses to Item 10 (Items 10.1–10.7), with regards to factors that

could be barriers to respondents' use of the electronic information management system (NIMS) and becoming experts.

Results as per Table 4.3 show that limited time and unreliable connections are possible hindrances to the respondents' use of the system, with time (Item 10.3) having the **highest mean value** ($\bar{x} = 1.75$), followed by unreliable network conditions ($\bar{x} = 1.64$) (Item 10.2).

The standard deviations for both time and unreliable connections respectively showed a narrow distribution of 0.63 and 0.60 around the mean values. Item 10.3 ($\bar{x} = 1.75$; SD = 0.633) on time to work on the computer shows that few (n=14, 10.5%) of 134 (100.0%) respondents indicated that they *always* lacked time, while just more than half (n=72, 53.7%) indicated that they *sometimes* and at a third (n=48, 35.8%) indicated that they *never* perceived limited time as a barrier. The responses to time management is consistent with findings of a study done by Dowding, et al. (2015, p. 357), which indicated that nurse managers still tend to revert back to the traditional system when they need to respond quickly.

In Item 10.2, Table 4.3, relating to unreliable network connections, only a few (n=9, 6.6%) of 135 (100.0%) respondents indicated that they *always* perceived it as a barrier, with respectively more and less than a half (n=68, 50.4%; n=58, 43.0%) indicating *sometimes* and *never* perceiving network connections as a barrier. Poor information networks are corroborated by previous research to be one of the most important obstacles to nurse satisfaction and full acceptance of an electronic information management system (Ahani, et al., 2016, p. 34).

Table 4.3: Descriptive statistics – Barriers to NIMS use in the work place (Item 10)

Item no.	Barriers	Never		Sometimes		Always		Total		Mean Highest \bar{x} Lowest \bar{x}	Std. deviation
		n	%	n	%	n	%	n	%	(\bar{x})	
10.1	Location of the computer	92	68.1	27	20.0	16	11.9	135	100.0	1.44	0.698
10.2	Unreliable connection to the network	58	43.0	68	50.4	9	6.6	135	100.0	1.64	0.606
10.3	Time to work on the computer	48	35.8	72	53.7	14	10.5	134	100.0	1.75	0.633
10.4	My age	111	86.0	17	13.2	1	0.8	129	100.0	1.15	0.377
10.5	My computer/IT knowledge	78	59.1	47	35.6	7	5.3	132	100.0	1.46	0.598
10.6	My confidence in use	91	69.0	37	28.0	4	3.0	132	100.0	1.34	0.536
10.7	I don't have any interest in using the computer	107	81.1	21	15.9	4	3.0	132	100.0	1.22	0.484

The lowest mean value ($\bar{x} = 1.15$; $SD = 0.377$) on barriers to using NIMS was found in Item 10.4, relating to the age of respondents, where the majority ($n=111$, 86.0%) of 129 (100.0%) respondents indicated that their age was *never* a barrier, 17 (13.2%) indicated that their age was *sometimes* a barrier and one (0.8%) indicated that their age was *always* a barrier. This result is supported (Odom, 2016, p. 86), although others found that many professional nurses may not have had the opportunity to become well versed in technology nor had the time to become comfortable using it (Goldsmidt, 2016, p. 225).

Figure 4.10 displays the responses to possible factors that might hinder the use of NIMS to its full capacity, indicating that the majority of respondents did not perceive these items described as possible barriers (*never*). Responses to Item 10.1, relating to the location of the computer, showed that two-thirds ($n=92$, 68.1%) of 135 (100.0%) respondents perceived it *never* to be a barrier to NIMS use, 27 (20.0%) indicated that it is *sometimes* a barrier, while only a few ($n=16$, 11.9%) indicated that it is *always* a barrier.

Previous studies confirm that barriers to the successful implementation of an electronic information management system are the absence of IT hardware and software (Ahani, et al., 2016, p. 35). Nurses who do not have easy access to a computer will be reluctant to use the system as time away from patient care impedes effective and efficient job performance (Kaye, 2017, p. 243).

On computer knowledge (Item 10.5), more than half ($n=78$, 59.1%) of 132 (100.0%) respondents indicated that their computer knowledge *never* hinders them to use NIMS, while a third ($n=47$, 35.6%) indicated that it *sometimes* does, and a few ($n=7$, 5.3%) indicated that their computer knowledge *always* hinders their use of NIMS.

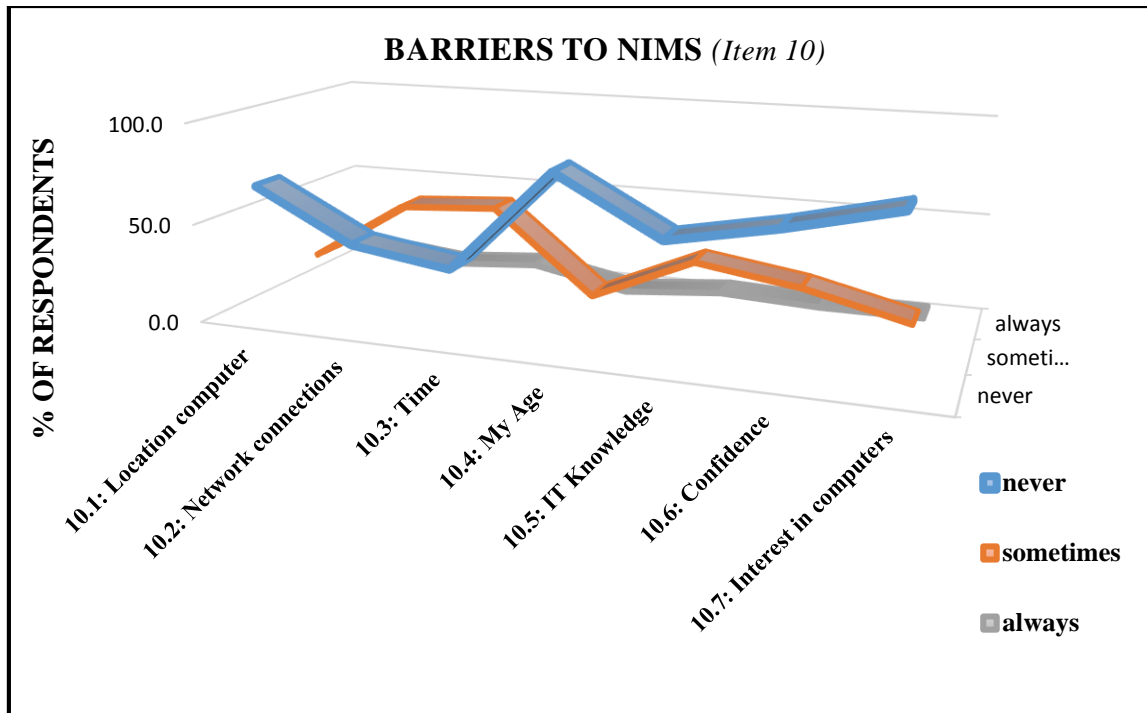


Figure 4.10: Factors that might be barriers to NIMS use

Differences in age and experience can result in very different needs with regards to computer technology and the desire to learn and educate using technology (Wong, 2013, p. 144). There is consistent evidence in research that the more competent a person is in using computers, the more likely he or she will be to accept an electronic information management system (Ingebrigtsen, Georgiou, Clay-Williams, Magrabi, Horden, Prgomet & Braithwaite, 2014, p. 398).

Item 10.6 addressed the confidence in using the system. More than two-thirds (n=91, 69,0%) of 132 (100.0%) respondents indicated that their confidence to use NIMS was *never* a barrier. On the other hand, just over a quarter (n=37, 28.0%) indicated that it is *sometimes* a barrier, while a few (n=4, 3.0%) indicated that their confidence was *always* a barrier. Results of Item 6 (Figure 4.6) relating to computer literacy showed that, with the exception of database and spreadsheets, respondents perceive themselves as

competent, which may explain the response to their confidence level in using the electronic information management system (NIMS).

Interest in using the computer was addressed in Item 10.7. The majority (n=107, 81.1%) of 132 (100.0%) respondents indicated that it is *never* a barrier to their NIMS use, 21 (15.9%) indicated that it is *sometimes* a barrier, while only a few (n=4, 3.0%) indicated that it is *always* a barrier.

Table 4.3 shows the mean values of responses to Item 10.1 to 10.7, indicating that there is a narrow standard deviation of 0.7 and less around the mean values. Therefore, it could be interpreted that respondents did not perceive these factors as barriers to using NIMS to its full capacity.

4.4 COMPETENCE IN NIMS, AGENCY MODEL

In this section, the collaborative approach to NIMS, decision-making supported by NIMS reports, effective and appropriate utilisation of resources supported by NIMS, and quality assurance are addressed.

4.4.1 Collaborative approach to NIMS

Table 4.4 illustrates how the professional nurses work together as a team and have a collaborative approach to using NIMS (Items 27 to 34). The lowest mean value ($\bar{x} = 2.6$; SD = 1.301) for collaboration was found on relating to motivating colleagues to better their knowledge in NIMS through training (Item 28), where close to a half (n=64, 47.1%) of 136 (100.0%) respondents indicated that they were *a novice to advanced beginner*, 30 (22.1%) *competent* and a third (n=42, 30.9%) *proficient to an expert*.

Table 4.4: Descriptive statistics – collaborative approach to NIMS

Item no.	Items	Responses on competence level												Highest \bar{x}	Lowest \bar{x}	Skewness
		Novice		Advanced beginner		Competent		Proficient		Expert		Total		Mean	Std. deviation	
		n	%	n	%	n	%	n	%	n	%	n	%	\bar{x}	SD	
27	I established a collaborative relationship with the NIMS team to ensure guidance on NIMS when facing challenges with agencies and/or agency nurses.	19	13.7	22	15.8	40	28.8	46	33.1	12	8.6	139	100.0	3.1	1.177	-0.3
28	I organise NIMS training sessions with the NIMS team and participate in the training sessions to motivate my colleagues to better their knowledge of the system.	40	29.4	24	17.6	30	22.1	34	25.0	8	5.9	136	100.0	2.6	1.301	0.1
29	I participate in fine-tuning discussions with my colleagues and the NIMS team to improve the rollout of NIMS.	33	24.3	19	14.0	34	25.0	42	30.9	8	5.9	136	100.0	2.8	1.276	-0.2
30	I can continue with a request for agency staff on NIMS where my colleague has left off.	23	16.3	18	12.8	19	13.5	47	33.3	34	24.1	141	100.0	3.4	1.400	-0.5

Item no.	Items	Responses on competence level												Highest \bar{x}	Lowest \bar{x}	Mean	Std. deviation	Skewness
		Novice		Advanced beginner		Competent		Proficient		Expert		Total		\bar{x}	SD			
		n	%	n	%	n	%	n	%	n	%	n	%	\bar{x}	SD			
31	I understand the role and functions of the other person/s e.g. administrative staff and colleagues in NIMS.	14	9.9	13	9.2	32	22.7	59	41.8	23	16.3	141	100.0	3.5	1.168	-0.7		
32	I know how to obtain support via desktop/telephone from the NIMS team should it be necessary.	13	9.3	15	10.7	31	22.1	56	40.0	25	17.9	140	100.0	3.5	1.178	-0.7		
33	I know how to access NIMS any time to be of assistance to my colleagues.	15	10.6	18	12.7	24	16.9	57	40.1	28	19.7	142	100.0	3.5	1.241	-0.6		
34	I can assist staff of other units in the health facility to e.g. do an emergency booking.	23	16.4	16	11.4	28	20.0	43	30.7	30	21.4	140	100.0	3.3	1.365	-0.4		

The highest similar mean value of 3.5 was respectively found in Items 31, 32 and 33 on collaboration, with a broad distribution around the mean values (SD=1.168, 1.178 and 1.241 respectively). Item 31, relating to understanding the role and functions of others, showed that a fifth (n=27, 19.1%) of 141(100.0%) respondents indicated that they were *a novice to advanced beginner*, 32 (22.7%) *competent* and more than half (n=82, 58.2%) indicated being *proficient to an expert* (Table 4.4). On obtaining support via desktop or telephonically (Item 32), the minority 28 (20.0%) of 140 (100.0%) respondents were *a novice to advanced beginner*, 31 (22.1%) *competent* and more than half (n=81, 57.9%) *proficient to an expert*. Close to a quarter (n=33, 23.2%) of a 142 (100.0%) respondents were *a novice to advanced beginner*, 24 (16.9%) were *competent* and more than half (n=85, 59.9%) were *proficient to an expert*, on understanding how to access NIMS any time to be of assistance to colleagues (Item 33).

Collaboration varies across organisations and various factors influence collaboration, these need to be explored and address (Chase, Ash, Cohen, Hall, Olson & Dorr, 2014, p. 1725).

Within collaboration and team work, Items 27, 28, 29 and 32 reflect on working closely with the NIMS team to utilise the system to its full capacity (Table 4.4). The competence level for establishing a collaborative relationship with the NIMS team (Item 27), showed a slight inclination of expert competence level, nearly one-third (n=41, 29.5%) of 139 (100.0%) respondents indicated being *a novice to advanced beginner*, 40 (28.8%) indicated they were *competent*. Less than half (n=58, 41.7%) regarded themselves as being *proficient to an expert* (Table 4.4). Item 28 had the lowest mean value for collaboration. On discussions with colleagues and the NIMS team to facilitate the rollout

of NIMS (Item 29), more than a third (n=52, 38.2%) of 136 (100.0%) respondents indicated being *a novice to advanced beginner*. A quarter (n=34, 25.0%) indicated they were *competent* and a third (n=50, 36.8%) regarded themselves as being at a competence level of *proficient to an expert*. Items 31, 32 and 33 had the highest mean value of 3.5 for collaboration (Table 4.4).

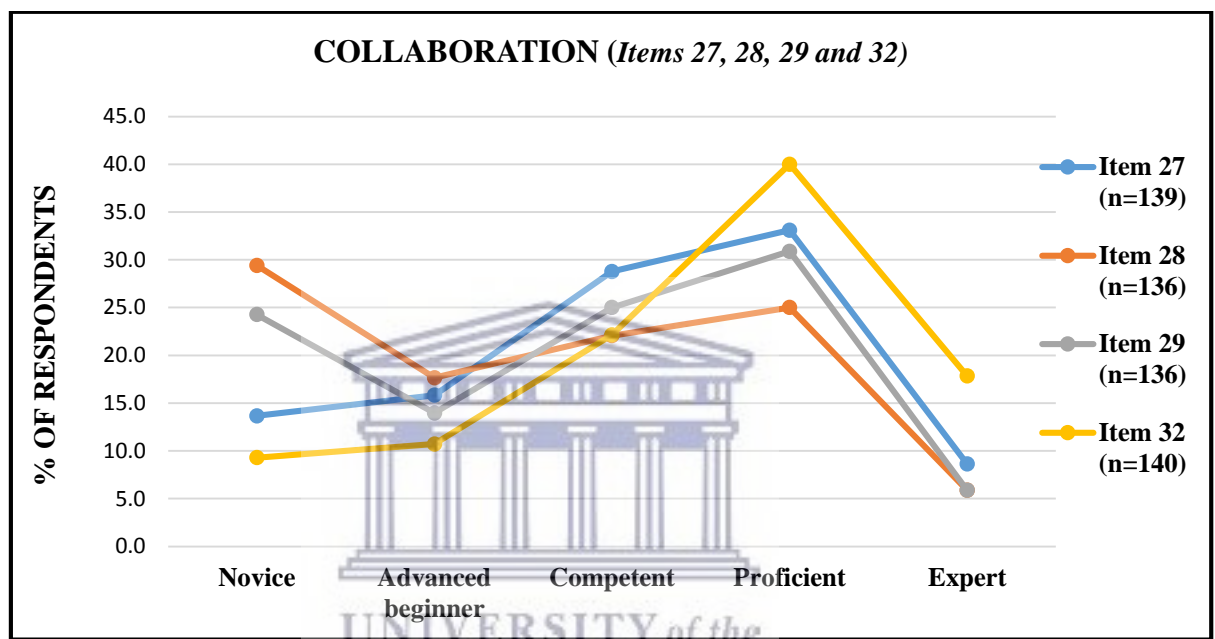


Figure 4.11: Collaboration, working closely with the NIMS team

Figure 4.11 displays the competence level of the professional nurses with regards to working closely with the NIMS team, that is for Items 27, 28, 29 and 32. It is clear that for working closely with the NIMS team, establish a collaborative relationship (Items 27), organise NIMS training sessions (Item 28), participate in fine-tuning discussions with colleagues (Item 29) and obtaining support via desktop/telephone (Item 32), very few respondents perceive their competence level as being *experts* (Figure 4.11). The majority indicated that they were at *competent to proficient* competence level and lower.

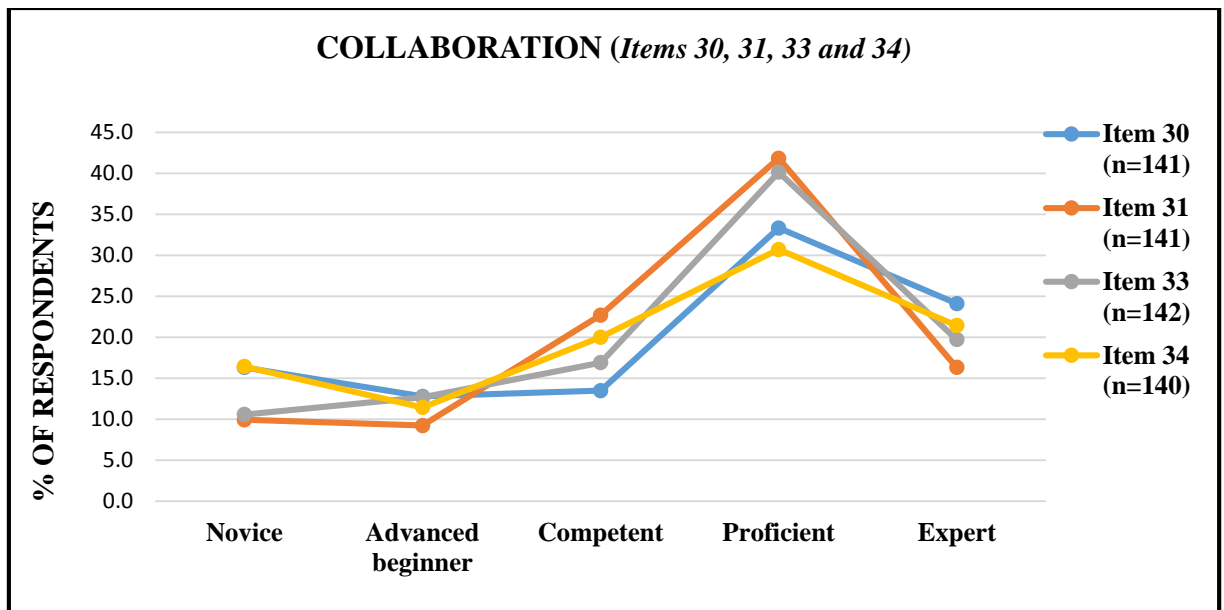


Figure 4.12: Collaboration, understanding each other's role and function within NIMS

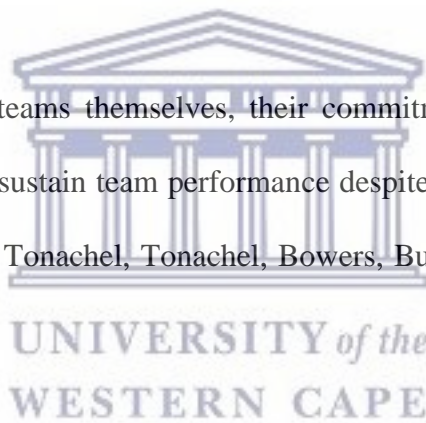
Figure 4.12 relates to Items 30, 31, 33 and 34 that addressed working together as a team, understanding each other's role and function within NIMS and being able to support and relieve one-another. The items were about being able to continue with a request on NIMS where a colleague has left off (Item 30), understanding the role and functions of the others in NIMS (Item 31), access NIMS any time to be of assistance (Item 33) and assisting other units to do a booking (Item 34). Most of the respondents were at a competence level of *proficient to an expert* and few were *a novice to advanced beginner* competence level.

For Item 30, to continue on NIMS where a colleague has left off, one-third (n=41, 29.1%) of 141 (100.0%) respondents indicated being *a novice to advanced beginner*, 19 (13.5%) regarded themselves as *competent*. More than half (n=81, 57.4%) of the respondents thought they were at a *proficient to an expert* competence level. Item 31 and 33 had the **highest mean value** for collaboration. Responses relating to assisting staff of other units to do a booking (Item 34), showed less than one-third (n=39, 27.9%) of 140 (100.0%)

respondents indicated they were *a novice to advanced beginner*. One-fifth (n=28, 20.0%) regarded themselves as *competent*, while the more than half (n=73, 52.1%) thought they were at a *proficient to an expert* competence level (Figure 4.12).

The skewness value for the professional nurses working together as a team and having a collaborative approach to utilise NIMS lies between -0.7 (lowest) and 0.1 (highest), thus data was normally distributed. All mean values (\bar{x}) in Items 27 to 34 were between 2.6 and 3.5, with a narrow distribution of SD=1.40 and less around the mean value. Few respondents perceived themselves as *experts* in working together as a team and having a collaborative approach in utilising NIMS (Table 4.4)

Research supports that teams themselves, their commitment to team behaviours and attitudes strengthen and sustain team performance despite the type of electronic system to be used (Gross, Leib, Tonachel, Tonachel, Bowers, Burnard, Rhinehart, Valentim & Bunnel, 2016, p. 1075).



4.4.2 Decision-making supported by NIMS reports

Items 35 to 40 (Table 4.5) related to professional nurses' decision-making supported by NIMS reports. The **lowest mean value** ($\bar{x} = 2.2$; SD = 1.118) for decision-making was on using NIMS to determine trends (Item 38). Two-thirds (n=87, 62.6%) of 139 (100.0%) respondents indicated being *a novice to advanced beginner*, 31 (22.3%) indicated they were *competent* and 21 (15.1%) regarded themselves as *proficient to an expert*.

Table 4.5: Descriptive statistics - Decision-making supported by NIMS reports

Item no.	Items	Responses on competence level												Highest \bar{x}		
		Novice		Advanced beginner		Competent		Proficient		Expert		Total		Mean	Std. deviation	Skewness
		n	%	n	%	n	%	n	%	n	%	n	%	\bar{x}	SD	
35	I can compile different reports for management from NIMS to e.g. assist me in motivating the need for more staff or an increased agency budget.	42	30.2	31	22.3	41	29.5	21	15.1	4	2.9	139	100.0	2.38	1.151	0.281
36	I can generate a report from NIMS to determine expenditure in order to request agency nurses within available/remaining.	41	29.3	38	27.1	42	30.0	16	11.4	3	2.1	140	100.0	2.30	1.078	0.356
37	I draw reports from NIMS to establish the trend of different categories of agency staff used in the different disciplines.	44	31.6	35	25.2	38	27.3	19	13.7	3	2.2	139	100.0	2.29	1.119	0.369
38	I can use NIMS to determine trends e.g. which months my health facility/unit used the most agency staff.	48	34.5	39	28.1	31	22.3	18	12.9	3	2.2	139	100.0	2.20	1.118	0.541

	Items	Responses on competence level												Highest \bar{x}	Std. deviation	Skewness
Item no.	Computer literacy of respondents	Novice		Advanced beginner		Competent		Proficient		Expert		Total		Mean	Std. deviation	Skewness
		n	%	n	%	n	%	n	%	n	%	n	%	\bar{x}	SD	
39	I am confident in writing a motivation to management to approve the booking of agency staff on NIMS.	33	23.6	25	17.9	31	22.1	42	30.0	9	6.4	140	100.0	2.78	1.281	-0.076
40	I know how to choose the best skilled agency nurse for service needed from the list provided (PDF) in NIMS.	26	18.3	34	23.9	23	16.2	42	29.5	17	12.0	142	100.0	2.93	1.324	-0.036



It is found that despite the fact that data monitoring and evaluation has been improved with an electronic system, data demand and information use for decision-making is still negligible (Shiferaw, et al., 2017, p. 2). Utilisation of the electronic system for evidence decision-making is low and managerial decisions are made without supporting evidence (Shiferaw, et al., 2017, p. 2). The possible cause being that there may not be regular supervision and feedback to encourage professional nurses to use the system optimally (Shiferaw, et al., 2017, p. 2).

The highest mean value ($\bar{x} = 2.9$; $SD = 1.324$) with regards to decision-making was on knowing how to choose the best skilled agency nurse in NIMS (Item 40). Less than half ($n=60$, 42.2%) of 142 (100.0%) respondents indicated that they were *a novice to advanced beginner*, 23 (16.2%) indicated they were *competent* and 59 (41.6%) regarded themselves as *proficient to an expert*.

Within decision-making supported by NIMS reports, Items 35, 39 and 40 reflected on the competence of professional nurses in utilising NIMS reports to motivate agency budgets, agency staff and choosing correct skills mix (Table 4.5).

Responses on using reports from NIMS to motivating for more staff (Item 35), showed that more than half ($n=73$, 52.5%) of 139 (100.0%) respondents were *a novice to advanced beginner*. A third ($n=41$, 29.5%) indicated they were *competent* and 25 (18.0%) regarded themselves as *proficient to an expert*. Regarding being confident to write a motivation to management to approve the booking of agency staff on NIMS (Item 39). Less than half ($n=58$, 41.4%) of 140 (100.0%) respondents indicated being *a novice to advanced beginner*, 51 (36.4%) indicated they were *proficient to an expert* and just more than a fifth ($n=31$, 22.1%) regarded themselves as *competent*. Item 40, choosing the best

skilled agency nurse from the list in NIMS, had the highest mean value ($\bar{x} = 2.9$; SD = 1.324) with regards to decision-making (Table 4.5).

The successful implementation of the system depends to a great extent on the professional nurses' interest and competence in using the different reports and data (Fagerstrom, 2014, p. 36). Supporting research concur that the implementation of an electronic system is challenging because it causes changes and can lead to resistance (De Lima Silva, Evora & Cintra, 2015, p. 930). Therefore, an information flow must be developed to facilitate the use of the electronic system, understanding and team communication (De Lima Silva, et al., 2015, p. 230).

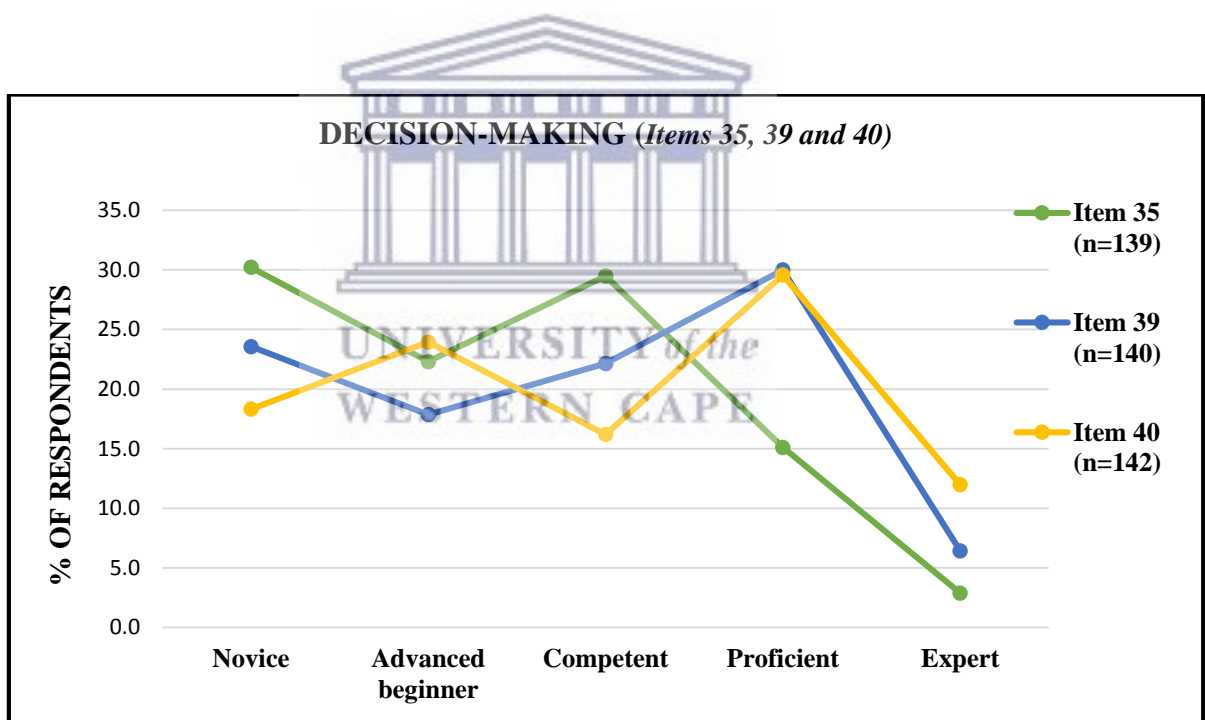


Figure 4.13: Decision-making, utilising NIMS reports to motivate for agency budgets, agency staff and the choice of correct skills mix

Figure 4.13 depicts decision-making supported by NIMS reports. In response to Items 35, 39 and 40, which reflected on the competence of professional nurses in utilising NIMS reports (Item 35) to motivate agency budgets (Item 39), agency staff and the choice of

correct skills mix (Item 40), very few respondents indicated they were *experts*. Most respondents indicated that they were on the competence level of *proficiency*. Items in Figure 4.13 are: Item 35 (compiling different reports for management from NIMS to assist in motivation for more staff or increased agency budget), Item 39 (being confident to write a motivation to management to approve the booking of agency staff on NIMS) and Item 40 (to choose the best skilled agency nurse for the service needed from the list provided (PDF) in NIMS).

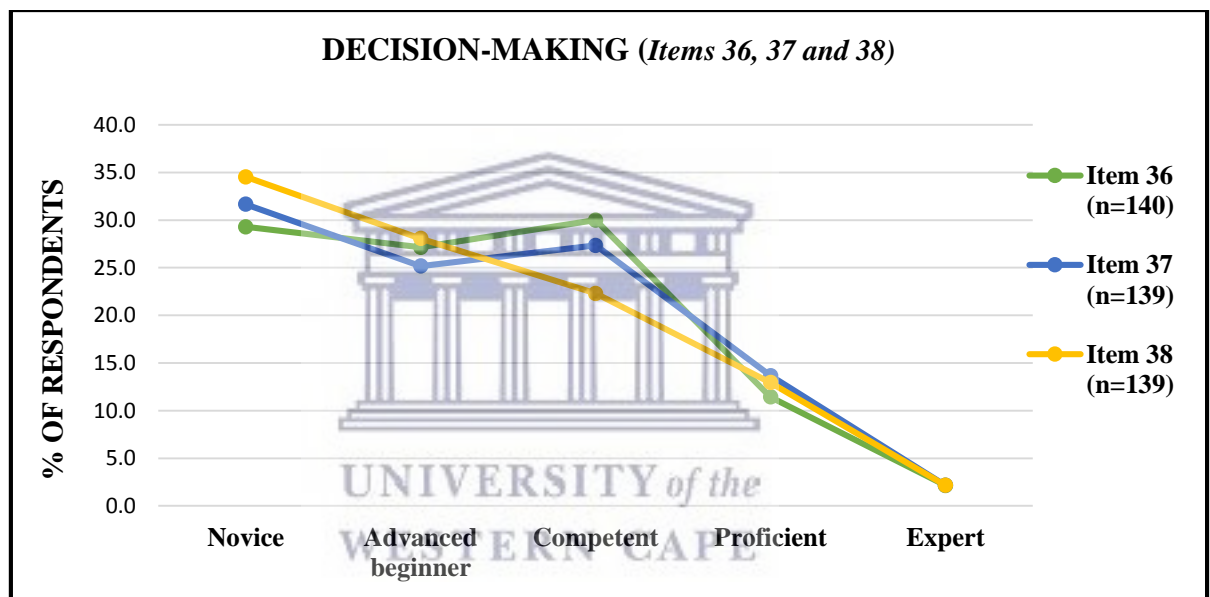


Figure 4.14: Decision-making, utilising NIMS reports to determine agency budgets and trends in utilising agency staff

Items 36, 37 and 38 in Table 4.5, related to decision-making supported by NIMS reports, reflect on the competence of professional nurses in utilising NIMS reports to determine agency budgets and trends in utilising agency staff. In reaction to generating a report from NIMS to establish expenditure to request agency nurses within an available/remaining budget (Item 36), more than half (n=79, 56.4%) of 140 (100.0%) respondents indicated being *a novice to advanced beginner*. One-third (n=42, 30.0%) indicated they were

competent and few (n=19, 13.6%) regarded themselves as *proficient to an expert*. Regarding proficiency to draw reports from NIMS to establish the trend (Item 37), of different categories of agency staff used in the different disciplines (allowing strategic planning) more than half (n=79, 56.8%) of 139 (100.0%) respondents indicated being *a novice to advanced beginner*. Less than a third (n=38, 27.3%) indicated they were *competent* and a few (n=22, 15.9%) regarded themselves as *proficient to an expert*. Item 38 scored the **lowest mean value** ($\bar{x} = 1.53$; SD = 0.745) for decision-making.

Figure 4.14 depicts decision-making supported by NIMS reports and reflected on the competence of professional nurses in utilising NIMS reports to determine agency budgets and trends in utilising agency staff. Very similar results were obtained for all three items with very few respondents being *experts* in any of the three items. Respondents mostly indicated being at a competency level of *a novice to advanced beginner* on generating a report from NIMS to establish expenditure (Item 36), proficiency in drawing reports from NIMS (Item 37) and using NIMS to determine trends (Item 38).

Evidence supports that professional nurses who are responsible for critical patient decisions and interpretations often lack the skills to use an electronic system's reports to identify and articulate nursing care needs (Beckham, Schaar & Riedford, 2015, p. 130).

The skewness value for professional nurses' decision-making supported by NIMS reports lies between -0.1 (lowest) and 0.5 (highest), thus data is normally distributed. All mean values (\bar{x}) of Items 35 to 40 lies between 2.2 and 2.9, with a narrow distribution of SD=1.32 and less around the mean value. Therefore, few respondents perceived themselves as experts in decision-making supported by NIMS reports.

4.4.3 Effective and appropriate utilisation of resources supported by NIMS

Items 41 to 48 (Table 4.6) relate to the professional nurses' effective and appropriate utilisation of resources, supported by NIMS. The lowest mean value ($\bar{x} = 2.4$; SD = 1.641) for effective and appropriate utilisation of resources was for validating agency staffing to management (Item 41). More than half (n=75, 54.3%) of 138 (100.0%) respondents indicated being *a novice to advanced beginner*. A quarter (n=35, 25.4%) indicated they were *competent* and a fifth (n=28, 20.3%) regarded themselves as *proficient to an expert*.

Liljamo, et al. (2016) confirms that professional nurses lack uniform competencies and information literacy required to use an electronic system to positively manage staffing challenges (Liljamo, et al., 2016, p. 6).

A similar high mean value ($\bar{x} = 3.1$) was found in Items 42, 47 and 48, with SDs of respectively 1.441 (Item 42), 1.414 (Item 47) and 1.429 (Item 48), with regards to effective and appropriate utilisation of resources. Responses on capturing attendance on NIMS (Item 42), showed that one-third (n=53, 37.3%) of 142 (100.0%) respondents are *a novice to advanced beginner*. A few (n=25, 17.6%) indicated they were *competent* and less than half (n=64, 45.1%) regarded themselves as *proficient to an expert*. Requesting an emergency booking on NIMS (Item 47), more than a third (n=52, 36.6%) of 142 (100.0%) respondents indicated being *a novice to advanced beginner*. A few (n=19, 13.4%) indicated they were *competent* and half (n=71, 50.0%) perceived themselves as *proficient to an expert*.

Table 4.6: Descriptive statistics – Effective and appropriate utilisation of resources supported by NIMS

		Responses on competence level												Highest \bar{x} ■ Lowest \bar{x} ■		
Item no.	Items	Novice		Advanced beginner		Competent		Proficient		Expert		Total		Mean	Std. deviation	Skewness
		n	%	n	%	n	%	n	%	n	%	n	%	\bar{x}	SD	
41	I validate my decisions regarding staffing of my health facility/unit by using electronic reports on NIMS when reporting to management.	38	27.5	37	26.8	35	25.4	23	16.7	5	3.6	138	100.0	2.4	1.164	0.3
42	I can capture the attendance of agency staff on NIMS including absenteeism.	28	19.7	25	17.6	25	17.6	33	23.2	31	21.9	142	100.0	3.1	1.441	-0.1
43	I can obtain information from NIMS regarding category of staff per discipline that worked to report to management on staffing needs.	33	26.2	30	21.3	34	25.5	31	20.6	13	6.4	141	100.0	2.7	1.293	0.1

Item no.	Items	Responses on competence level												Highest \bar{x} ■ Lowest \bar{x} ■		
		Novice		Advanced beginner		Competent		Proficient		Expert		Total		Mean	Std. deviation	Skewness
		n	%	n	%	n	%	n	%	n	%	n	%	\bar{x}	SD	
44	I can monitor the total of hours/shifts worked by agency nurses on NIMS.	35	25.0	30	21.4	29	20.8	30	21.4	16	11.4	140	100.0	2.7	1.351	0.2
45	I can audit agency nurses' attendance time sheets with control sheets on NIMS to monitor expenditure.	37	26.2	30	21.3	36	25.5	29	20.6	9	6.4	141	100.0	2.6	1.253	0.2
46	I can capture retrospective bookings of agency nurses on NIMS.	39	28.2	32	23.2	23	16.7	25	18.1	19	13.8	138	100.0	2.7	1.412	0.3
47	I can do emergency bookings of agency nurses' on NIMS, i.e. emergency bookings on short notice due to increased bed occupancy, patient acuity, and staff being absent.	26	18.3	26	18.3	19	13.4	43	30.3	28	19.7	142	100.0	3.1	1.414	-0.2

Items		Responses on competence level										Highest \bar{x} ■ Lowest \bar{x} ■				
Item no.	Computer literacy of respondents	Novice		Advanced beginner		Competent		Proficient		Expert		Total		Mean	Std. deviation	Skewness
		n	%	n	%	n	%	n	%	n	%	n	%	\bar{x}	SD	
48	I can book in advance up to one (1) month on NIMS to secure agency staff for annual, maternity, study and long-term sick leave.	29	20.4	24	16.9	21	14.8	41	28.9	27	19.0	142	100.0	3.1	1.429	-0.2



Responses to booking in advance on NIMS to ensure that agency staff replace staff on leave (Item 48) showed that 53 (37.3%) of 142 (100.0%) respondents were *a novice to advanced beginner*, 21 (14.8%) were *competent* and 68 (47.9%) regarded themselves as *proficient to an expert*.

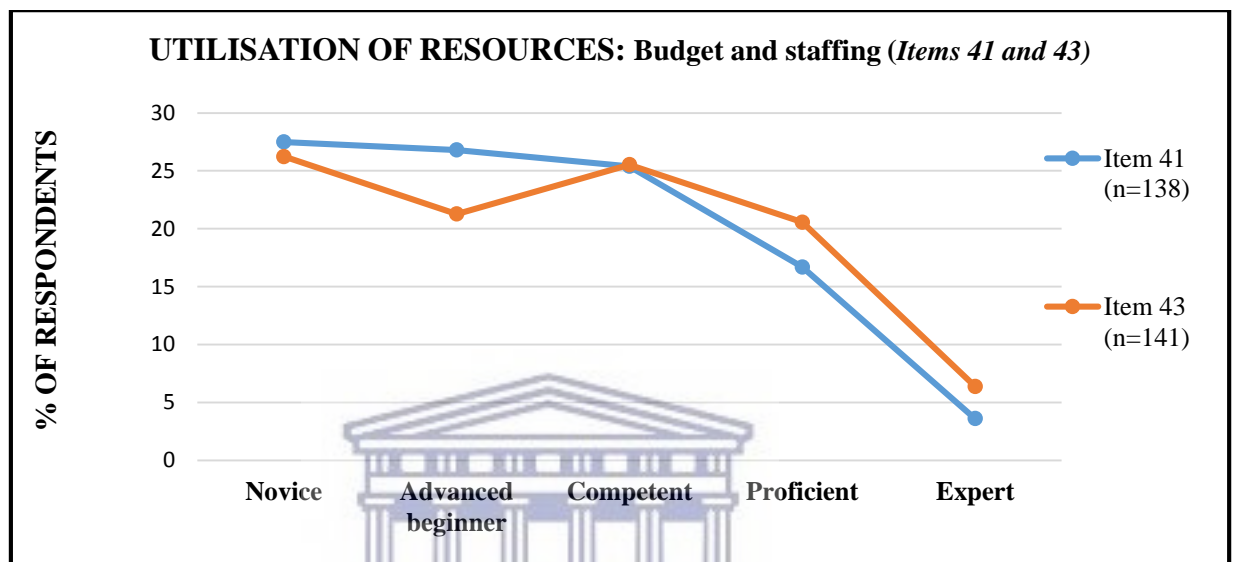


Figure 4.15: Utilisation of resources (Items 41 and 43)

Figure 4.15 shows that the competence level for Items 41 and 43 was mostly *novice to competent*, while there were no *expert* responses as there were a small number for each of items 41 and 43. Within effective and appropriate utilisation of resources (agency nurses and budget), Items 41 and 43 (Table 4.6) relate to the competence with which professional nurses utilise information obtained from NIMS to manage and motivate the allocation of resources (agency budget and agency staff). Item 41, had the **lowest mean value** for effective and appropriate utilisation of resources, i.e. agency nurses and budget. In reaction to Item 43 (obtaining information from NIMS regarding the category of staff per discipline that worked), less than half (n=63, 47.5%) of 141 (100.0%) respondents

indicated being *a novice to advanced beginner*. A quarter (n=34, 25.5%) indicated they were *competent* and 44 (27.0%) regarded themselves as *proficient to an expert*.

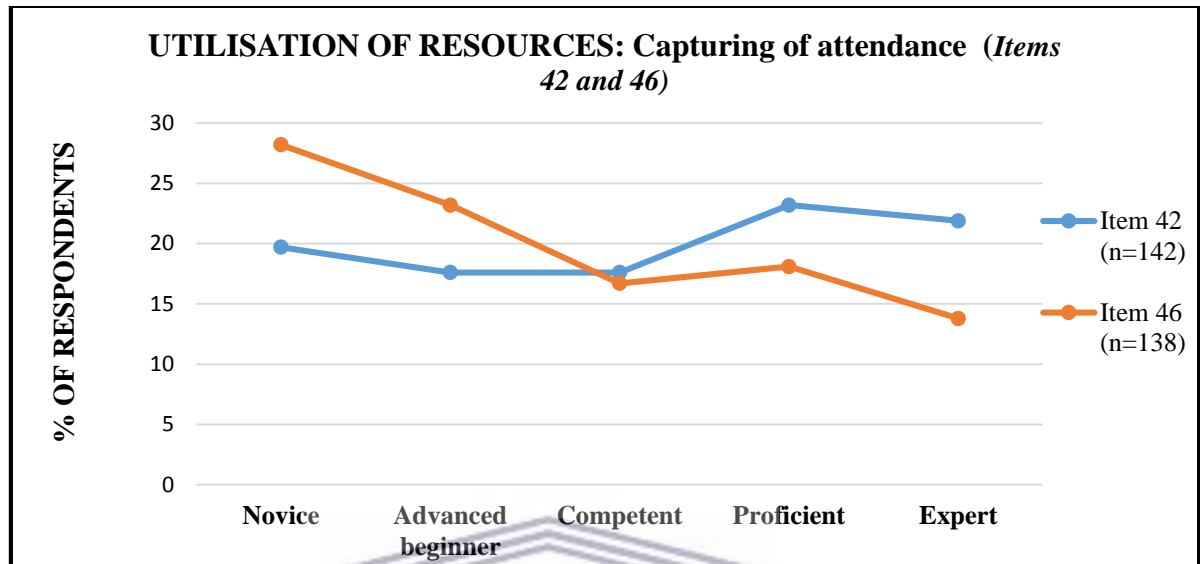


Figure 4.16: Utilisation of resources (Items 42 and 46)

Figure 4.16 shows that the competence level of the respondents for Items 42 and 46 (utilisation of resources) is evenly distributed across all five competence levels, with a slight inclination towards *novice to advanced beginner*. Items 42 and 46 reflected on the competence of professional nurses with which they use the NIMS system to effectively and appropriately manage the resources (agency budget and agency staff) (Table 4.6 and Figure 4.16). Competence level for capturing attendance of agency staff on NIMS (Item 42), showed that more than a third (n=53, 37.3%) of 142 (100.0%) respondents indicated being *a novice to advanced beginner*. Only 25 (17.6%) indicated they were *competent* and less than half (n=64, 45.1%) regarded themselves as *proficient to an expert*. Competence to capture retrospective bookings (Item 46), presented with half (n=71, 51.4%) of 138 (100.0%) respondents being *a novice to advanced beginner*. Less than one-

fifth (n=23, 16.7%) indicated they were *competent* and almost a third (n=44, 31.9%) regarded themselves as *proficient to an expert* competence level.

Evidence substantiate that it is short-sighted to expect a professional nurse that is clinically orientated to be nurse informatics experts that can inform decision-making and policy development to determine workforce needs and safe staffing (Lloyd & Ferguson, 2017, p. 211).

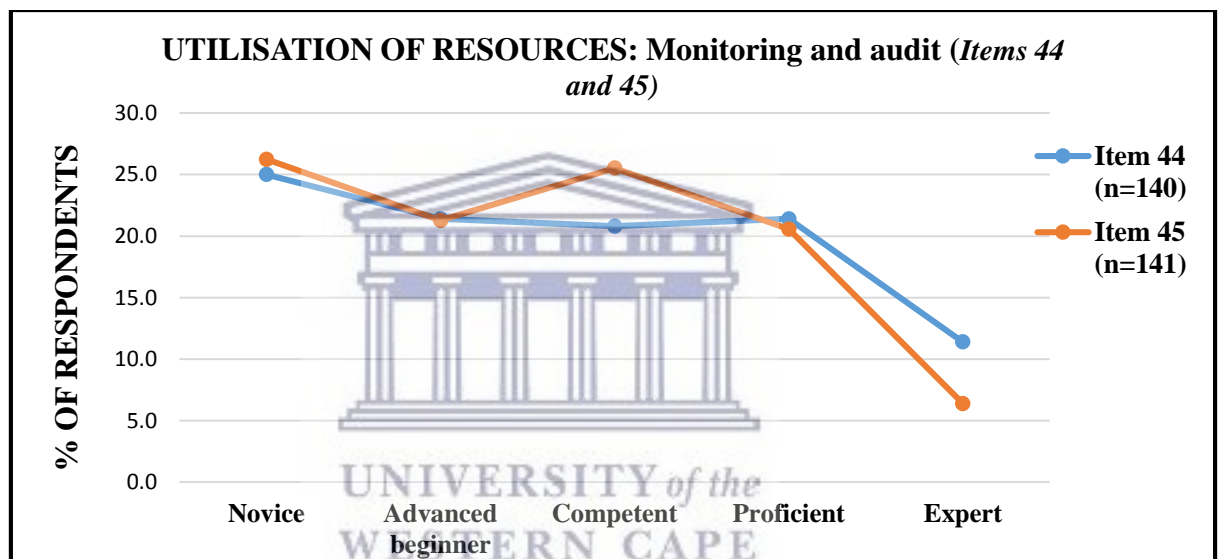


Figure 4.17: Utilisation of resources (Items 44 and 45)

Figure 4.17 showed that a few respondents were *experts* in relation to Items 44 and 45 (utilisation of resources). The competence level of the respondents was more or less evenly spread between *proficient*, *competent* and *advanced beginner*, with slightly more respondents at the *novice* competence level. Items 44 and 45 related to the competence with which professional nurses utilise the different features of NIMS to monitor and verify agency staff (Table 4.6, Figure 4.17). Respondents indicated that for monitoring that agency nurses worked on NIMS (Item 44), less than half (n=65, 46.4%) of 140

(100.0%) were a *novice to advanced beginner*. A fifth (n=29, 20.8%) indicated they were *competent*, and a third (n=46, 32.8%) regarded themselves as *proficient to an expert*.

Auditing of attendance time sheets (Item 45) showed that less than half (n=67, 47.5%) of 141 (100.0%) respondents indicated being a *novice to advanced beginner*. A quarter (n=36, 25.5%) of the respondents indicated they were *competent* and 38 (27.0%) regarded themselves as *proficient to an expert*.

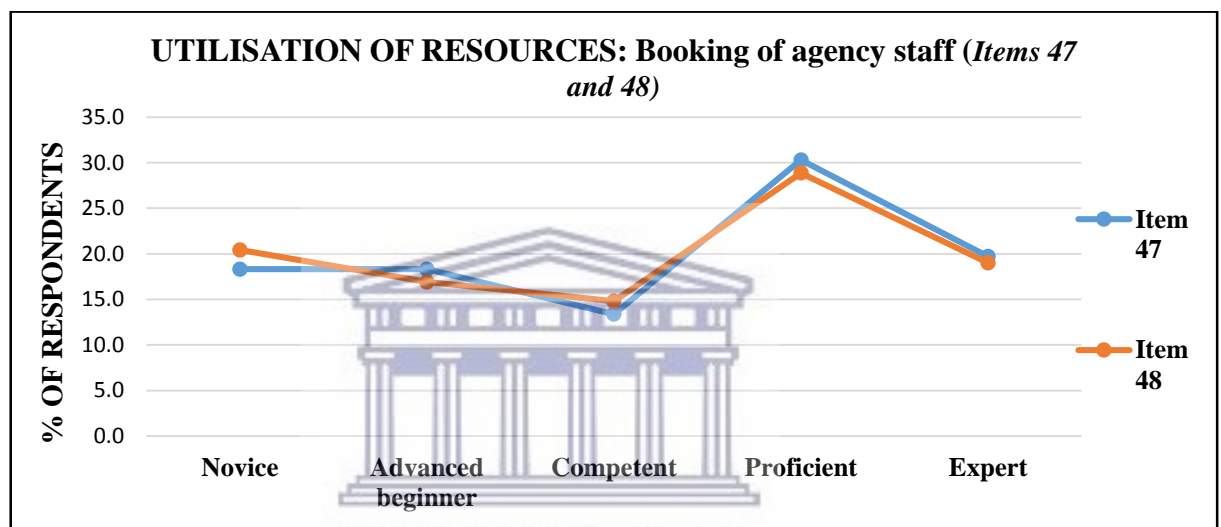


Figure 4.18: Utilisation of resources (Items 47 and 48)

Figure 4.18 provides a visual display of the respondents' competence with which an emergency booking of agency nurses' on NIMS is made (Item 47), and responses to booking in advance on NIMS to ensure agency staff replacing staff on leave (Item 48). An equal distribution of responses for *novice*, *advanced beginner* and *expert*, slightly less for *competent*, with a larger total of respondents being at *proficient* level, was found. Items 47 and 48 indicated the competence level of professional nurses to do bookings on NIMS (Table 4.6, Figure 4.18). As previously mentioned, Item 47 and 48 have the **highest mean value** ($\bar{x} = 3.1$) to book in advance on NIMS to ensure that agency staff replace staff on leave.

Results of studies done in South Africa showed that professional nurses had the lowest competence ratings for financial management competencies compared to other categories (Munyewende, Levin & Rispel, 2016, p. 8). Studies also confirmed that professional nurses need training in staff management to steer complex health system changes in facing staff shortages (Munyewende, et al., 2016, p. 8).

4.4.4 Quality assurance

There are system features that can lead to challenges e.g. technical problems related to the design, system task incompatibility, difficulty in using the systems, no evidence regarding the usefulness of system, user dissatisfaction about the content of a system, non-compliance with quality standards and errors in data entry (Ahani, et al., 2016, p. 31). These challenges are classified as the technical and non-technical aspects that influence nurses' perspectives on the advantage of using the system and influence the use of the system to full capacity (Ayatollahi, et al., 2016, p. 326).

Figure 4.19 depicts respondents' responses to administrative factors that might influence their competence on NIMS (Item 49–56). Items 49–53 showed that the respondents were aware of all the administrative tasks needed to ensure quality assurance; however, most respondents were not participating in meetings and did not do daily monitoring, which can influence quality assurance (Items 54 and 55). The majority (n=126, 88.7%) of 142 (100.0%) respondents used an established link, while only a few (n=16, 11.3%) indicated they did not (Item 49). The ability of 142 (100.0%) respondents to recognise that agency staff is working a double shift on NIMS (Item 50), showed a majority (n=102, 71.8%) indicating they can, while 40 (28.2%) responded negatively.

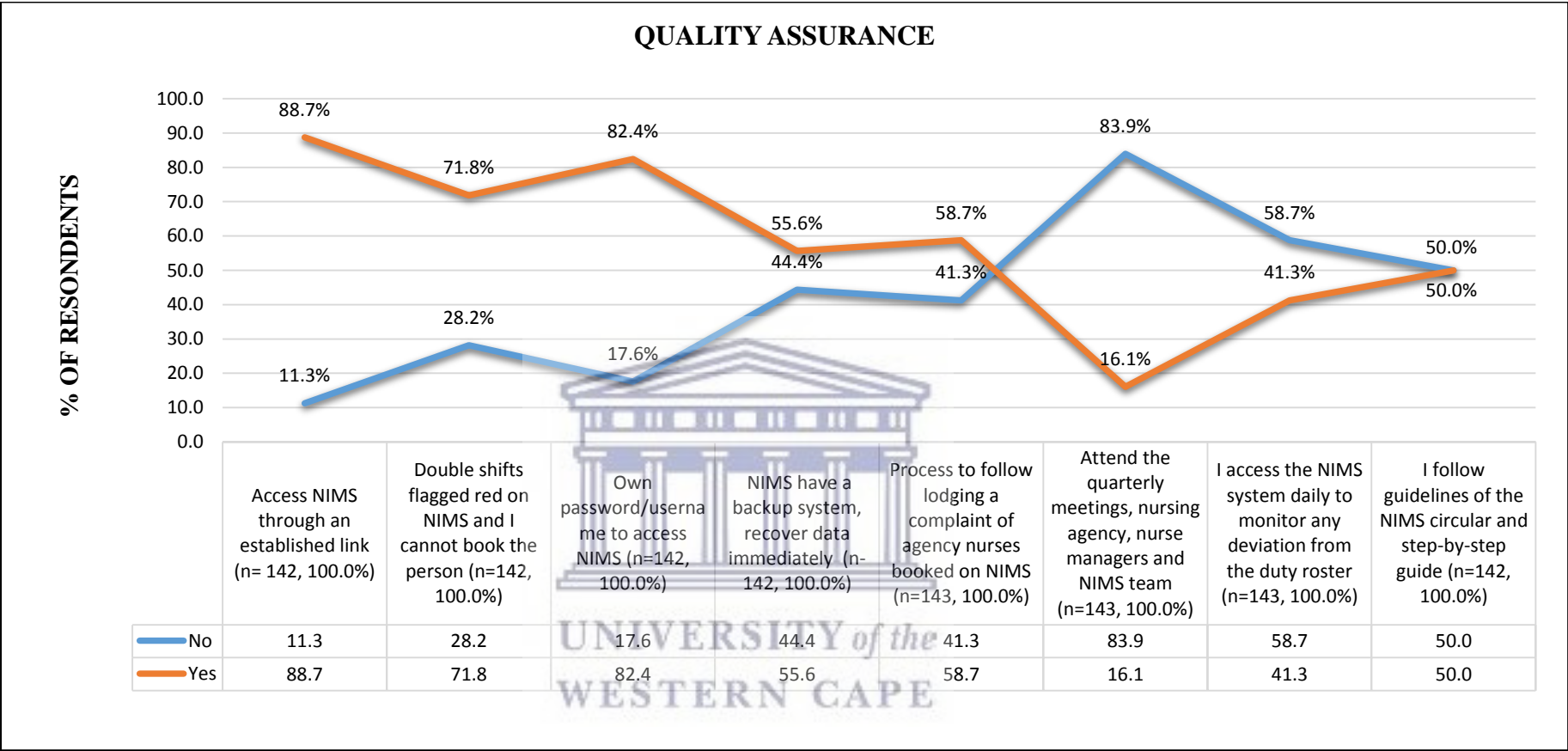


Figure 4.19: Quality assurance in NIMS system


On having an own password and username (Item 51), the majority (n=117, 82.4%) of 142 (100.0%) respondents had, and 25 (17.6%) respondents did not. Item 52 related to understanding that NIMS have a backup system, slightly more than half, 79 (55.6%) of 142 (100.0%) respondents, knew this, while 63 (44.4%) was unaware of it (Figure 4.19).

Slightly more than half (n=84, 58.7%) of 143 (100.0%) respondents indicated that they understood the process to follow to lodge a complaint on NIMS, while 59 (41.3%) did not (Item 53). In reaction to Item 54, only 23 (16.1%) of 143 (100.0%) respondents, indicated attendance of quarterly meetings between the nursing agencies and NIMS team to discuss and address challenges and problems experienced with NIMS. The majority (n=120, 83.9%) of respondents did not attend the meetings. Of 143 (100.0%) respondents, nearly half (n=59, 41.3%) accessed NIMS daily to monitor any deviation of the agency nurses from the duty roster, while just more than half (n=84, 58.7%) did not (Item 55). In Item 56, on the guidelines of the NIMS circular and step-by-step guide to prevent non-attendance of agency staff, exactly half (n=71, 50,0%) of 142 (100.0%) respondents did not need the step-by-step guide, whilst the other half (n=71, 50,0%) still need the circular and guideline.

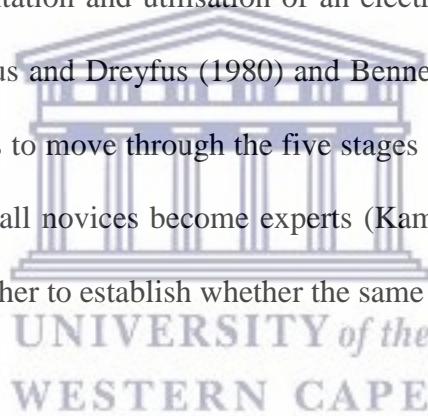
The results showed that attending quarterly meetings between the nursing agencies and NIMS team to discuss and address challenges and problems experienced with NIMS (Item 54), there was a very low positive response (Figure 4.19). The fact that half of the respondents still need the guidelines and step by step guide (Item 56) is an indication of not being at an *expert* competence level. Ahani, et al. (2016) confirms that if there are no incentives and support, when faced with challenges, staff will not utilise the system to its full capacity.

4.5 SIGNIFICANT DIFFERENCE IN RESPONSES

Pearson's chi-square (χ^2) test was applied to evaluate whether there are significant differences between the competence with which respondents from different hospitals and of different ages use the electronic information management system for staffing (NIMS).

- Significant difference, colour coded 
- The cross-tabulation matrix output presents tabulations (counts) for each group of one variable, separated across the groups of the second variable where there are significant differences.

Studies showed that there is a significant difference between types of hospitals with regards to the implementation and utilisation of an electronic system (Shiferaw, et al., 2017, p. 7). Both Dreyfus and Dreyfus (1980) and Benner (1984) estimate that it takes approximately five years to move through the five stages (from novice to an expert) but also elaborated that not all novices become experts (Kaminski, 2010). It was therefore important for the researcher to establish whether the same applies to her study.



4.5.1 Significance difference between staff working in general hospitals and those working in specialty hospitals with regards to a collaborative approach to NIMS

There was no significant difference for Items 27, 28, 29 and 32 (Table 4.7) between the general hospitals and the specialty hospitals with regards to competence in a collaborative approach to NIMS ($p=0.151$ to $p=0.472$). As previously indicated under Point. 4.4.1, within collaboration and team work, Items 27, 28, 29 and 32 reflected on working closely with the NIMS team to utilise the system to its full capacity. Items 30, 31, 33 and 34

(Point 4.4.1), related to the ability to work together as a team, understanding each other's role and function within NIMS and being able to support and relieve one-another.

Table 4.7: Significant difference between hospitals and collaborative approach to NIMS

Item no	Collaboration: General and specialty hospitals	Degrees of freedom	Total of respondents	Pearson's chi-square value	Pearson's chi-square significance
		df	n	χ^2	p
27	I establish a collaborative relationship with the NIMS team to ensure guidance on NIMS when facing challenges with agencies and or agency nurses.	2	139	1.72	0.424
28	I organise NIMS training sessions with the NIMS team and participate in the training sessions to motivate my colleagues to better their knowledge of the system.	2	136	2.79	0.248
29	I participate in fine-tuning discussions with my colleagues and the NIMS team to improve the rollout of NIMS.	2	136	1.50	0.472
30	I can continue with a request for agency staff on NIMS where my colleague has left off.	2	141	13.69	0.001
31	I understand the role and functions of the other person/s e.g. administrative staff and colleagues in NIMS.	2	141	7.71	0.021
32	I know how to obtain support via desktop/telephone from the NIMS team should it be necessary.	2	140	3.78	0.151
33	I know how to access NIMS any time to be of assistance to my colleagues.	2	142	6.21	0.045
34	I can assist staff of other units in the health facility to e.g. do an emergency booking.	2	140	7.61	0.022

According to Baxter and Warshawsky (2014) nurse managers may have some slight differences in competence among different facilities but overall the professional nurses were equal by six to nine years of experience (Baxter & Warshawsky, 2014, p. 50).

Table 4.8: Significant difference between hospitals for ability to continue with a request (Item 30)

I can continue with a request for agency staff on NIMS where my colleague has left off (Item 30)						
		Health facility you are currently working in	Novice to advanced beginner	Competent	Proficient to an expert	Total
Health facility you are currently working in	General hospitals	n	15	5	52	72
		%	20.8%	6.9%	72.2%	100.0%
	Specialty hospitals	n	26	14	29	69
		%	37.7%	20.3%	42.0%	100.0%

The majority (n=52, 72.2%) of 141 (100.0%) respondents working in the general hospitals were on a *proficient to an expert* competence level, versus only 29 (42.0%) of the respondents in the specialty hospitals that indicated being *proficient to an expert* (Table 4.8). Respondents ability to being able to continue with a request for agency staff (Item 30) indicates a significant difference as the *p* value was below 0.05, the chi-square test, $\chi^2(2, n=141) = 13.69, p=0.001$.

Gross, et al. (2016) explains that it is important to evaluate health facilities' team performance and abilities to respond to change before implementing a system, to stabilise and preserve team functioning (Gross, et al., 2016, p. 1082).

Table 4.9: Significant difference between hospitals for understanding the role and function of others (Item 31)

I understand the role and functions of the other person/s e.g. administrative staff and colleagues in NIMS (Item 31)						
		Health facility you are currently working in	Novice to advanced beginner	Competent	Proficient to an expert	Total
Health facility you are currently working in	General hospitals	n	10	12	50	72
		%	13.9%	16.7%	69.4%	100.0%
	Specialty hospitals	n	17	20	32	69
		%	24.6%	29.0%	46.4%	100.0%

Item 31, on being able to understand the role and functions of the other person/s in NIMS (Table 4.7), a significant difference was found between the two groups of hospitals, the chi-square test being $\chi^2 (2, n=141) = 7.71, p=0.021$. The *proficient to an expert* competent levels of respondents for general hospitals were higher (n=50, 69.4%), than the 32 (46.4%) of 141 (100.0%) respondents in specialty hospitals for competence in Item 31 (Table 4.9).

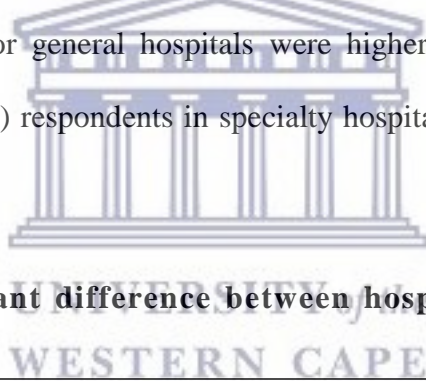


Table 4.10: Significant difference between hospitals in ability to access NIMS (Item 33)

I know how to access NIMS any time to be of assistance to my colleagues (Item 33)						
		Health facility you are currently working in	Novice to advanced beginner	Competent	Proficient to an expert	Total
Health facility you are currently working in	General hospitals	n	11	12	50	73
		%	15.1%	16.4%	68.5%	100.0%
	Specialty hospitals	n	22	12	35	69
		%	31.9%	17.4%	50.7%	100.0%

The chi-square test on the ability to access NIMS any time (Item 33) to be of assistance to my colleagues, was $\chi^2 (2, n=142) = 6.21, p=0.021$ (Table 4.7). There were more

respondents at *proficient to expert* competence level in general hospitals (n=50, 68.5%), than in the specialty hospitals (n=35, 50.7%) of 142 (100.0%), Table 4.10.

Table 4.11: Significant difference between hospitals for assisting others (Item 34)

I can assist staff of other units in the health facility to e.g. do an emergency booking (Item 34)						
		Health facility you are currently working in	Novice to advanced beginner	Competent	Proficient to expert	Total
Health facility you are currently working in	General hospitals	n	14	12	45	71
		%	19.7%	16.9%	63.4%	100.0%
	Specialty hospitals	n	25	16	28	69
		%	36.2%	23.2%	40.6%	100.0%

Responses on knowing how to access NIMS (Table 4.7) any time to be of assistance to my colleagues (Item 34) shows a chi-square result of $\chi^2(2, n=140) = 7.61, p=0.022$. Table 4.11 illustrates that the majority (n=45, 63.4%) of 140 (100.0%) respondents of the general hospitals were at *proficient to an expert* competence level compared to the 28 (40.6%) working in specialty hospitals.

4.1.1 Significance difference between staff working in general hospitals and those working in speciality hospitals with regards to decision-making supported by NIMS reports

Items 35, 36, 37, 38 and 40 showed no significant differences ($p=0.082$ to $p=0.442$) between the general hospitals and specialty hospitals with regards to competence in decision-making supported by NIMS reports (Table 4.12). It seems that data demand and information use for decisions are still being seen as insignificant despite the improvement of information systems (Shiferaw, et al., 2017, p. 2). Nurse managers tend to still revert

to the traditional system when they need to respond quickly. It allows them to personalise the information they record, fitting to their way of working and helping with time management (Dowding, et al., 2015, p. 357). This causes quite a few health systems to fail in linking evidence to decisions and therefore result in an inadequate ability to respond to priority health needs at all levels of the health system (Shiferaw, et al., 2017, p. 2).

Table 4.12: Significant difference between hospitals and decision-making supported by NIMS reports

Item no	Collaboration: General and specialty hospitals	Degrees of freedom	Total of respondents	Pearson's chi-square value	Pearson's chi-square significance
		df	n	χ^2	<i>p</i>
35	I can compile different reports for management from NIMS to e.g. assist my motivation for more staff or increased agency budget.	2	139	1.63	0.442
36	I can generate a report from NIMS to determine expenditure in order to request agency nurses within available/remaining budget.	2	140	5.01	0.082
37	I draw reports from NIMS to establish the trend of different categories of agency staff used in the different disciplines, allowing me to plan strategically.	2	139	3.93	0.140
38	I can use NIMS to determine trends e.g. which months my health facility/unit used the most agency staff.	2	139	4.71	0.095
39	I am confident to write a motivation to management to approve the booking of agency staff on NIMS.	2	140	16.22	0.000

Item no	Collaboration: General and specialty hospitals	Degrees of freedom	Total of respondents	Pearson's chi-square value	Pearson's chi-square significance
		df	n	χ^2	<i>p</i>
40	I know how to choose the best-skilled agency nurse for the service needed from the list provided (PDF) in NIMS.	2	142	2.46	0.293

Under Point 4.4.2 it is explained that within decision-making supported by NIMS reports, Items 35, 39 and 40 reflected on the competence of professional nurses in utilising NIMS reports to motivate agency budget, agency staff and the choice of correct skills mix. Items 36, 37 and 38 related to decision-making supported by NIMS reports and reflect on the competence of professional nurses in utilising NIMS reports to determine agency budget and trends in utilising agency staff.

Table 4.13: Significant difference between hospitals for writing motivations (Item 39)

I am confident in writing a motivation to management to approve the booking of agency staff on NIMS (Item 39)						
		Health facility you are currently working in	Novice to advanced beginner	Competent	Proficient to an expert	Total
Health facility you are currently working in	General hospitals	n	20	14	37	71
		%	28.2%	19.7%	52.1%	100.0%
	Specialty hospitals	n	38	17	14	69
		%	55.1%	24.6%	20.3%	100.0%

A significant difference (Table 4.12) was found for writing a motivation to management (Item 39) between the general hospitals and the speciality hospitals with regards to competence in decision-making supported by NIMS reports, chi-square test: χ^2 (2, n=140)

= 16.22, $p=0.000$. Responses ($n=140$, 100.0%) to being confident to write a motivation to management (Item 39, Table 4.13) indicated a significant difference on the *proficient to an expert* competence level between general hospitals ($n=37$, 52.1%) and specialty hospitals ($n=14$, 20.3%).

4.1.2 Significant difference between staff working in general hospitals and those working in speciality hospitals with regards to effective and appropriate utilisation of resources supported by NIMS

Table 4.14 and 4.15 illustrates the significant difference between the general hospitals and the speciality hospitals with regards to effective and appropriate utilisation of resources supported by NIMS.

Table 4.14: Significant difference between hospitals and effective and appropriate utilisation of resources supported by NIMS

Item no.	Utilisation of resources supported by NIMS: General and specialty hospitals	Degrees of freedom	Total of respondents	Pearson's chi-square value	Pearson's chi-square significance
		df	n	χ^2	p
41	I validate my decisions regarding staffing of my health facility/unit by using electronic reports on NIMS when reporting to management.	2	138	5.91	0.052
42	I can capture the attendance of agency staff on NIMS including absenteeism.	2	142	32.09	0.000
43	I can obtain information from NIMS regarding category of staff per discipline that worked to report to management on staffing needs.	2	141	19.16	0.000
44	I can monitor on NIMS the total of hours/shifts worked by agency nurses.	2	140	18.70	0.000

Item no.	Utilisation of resources supported by NIMS: General and specialty hospitals	Degrees of freedom	Total of respondents	Pearson's chi-square value	Pearson's chi-square significance
		df	n	χ^2	<i>p</i>
45	I can audit agency nurses' attendance time sheets with control sheets on NIMS to monitor expenditure.	2	141	25.85	0.000
46	I can capture retrospective bookings of agency nurses on NIMS.	2	138	9.91	0.007
47	I can do emergency booking of agency nurses' on NIMS, i.e. emergency bookings on short notice due to increased bed occupancy, patient acuity, and staff being absent.	2	142	13.23	0.001
48	I can book in advance up to one (1) month on NIMS to secure agency staff during annual, maternity, study and long-term sick leave.	2	142	12.97	0.002

All of the items (Items 41 to 48) showed a significant difference ($p=0.000$ to $p=0.052$) between the general hospitals and the speciality hospitals with regards to effective and appropriate utilisation of resources supported by NIMS.

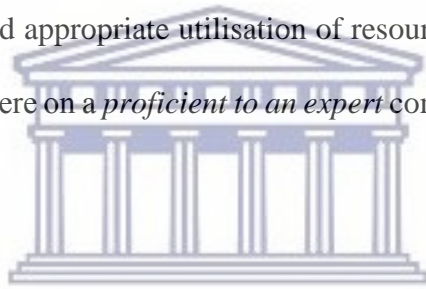
It is found that an electronic system can be at various stages of maturity due to territorial strategies and priorities although implementation across all provinces and territories were in the same time line (Gheorghiu & Hagens, 2016, p. 4). It is proposed that their need to be comprehensive and sustained change management approach, to include evaluation and continuous improvement, to bring users on board, improve competency and use the system to its full potential (Gheorghiu & Hagens, 2016, p. 6).

Table 4.15: Significant difference between hospitals for utilisation of resources (Items 41–48)

Effective and appropriate utilisation of resources supported by NIMS (Items 41–48)						
Item no.	Utilisation of resources supported by NIMS: General and Specialty hospitals		Total Respondents	Novice to advanced beginner	Competent	Proficient to an expert
41	I validate my decisions regarding staffing of my health facility/unit by using electronic reports on NIMS when reporting to management.	General hospitals	138	31	21	18
			100.0%	44.3%	30.0%	25.7%
		Specialty hospitals		44	14	10
				64.7%	20.6%	14.7%
42	I can capture the attendance of agency staff on NIMS, including absenteeism.	General hospitals	142	13	11	49
			100.0%	17.8%	15.1%	67.1%
		Specialty hospitals		40	14	15
				58.0%	20.3%	21.7%
43	I can obtain information from NIMS regarding category of staff per discipline that worked to report to management on staffing needs.	General hospitals	141	19	21	31
			100.0%	26.8%	29.6%	43.6%
		Specialty hospitals		44	13	13
				62.8%	18.6%	18.6%
44	I can monitor on NIMS the total of hours/shifts worked by agency nurses.	General hospitals	140	21	15	34
			100.0%	30.0%	21.4%	48.6%
		Specialty hospitals		44	14	12
				62.9%	20.0%	17.1%
45	I can audit agency nurses' attendance time sheets with control sheets on NIMS to monitor expenditure.	General hospitals	141	19	23	29
			100.0%	26.8%	32.4%	40.8%
		Specialty hospitals		48	13	9
				68.6%	18.6%	12.8%

Effective and appropriate utilisation of resources supported by NIMS (Items 41–48)						
Item no.	Utilisation of resources supported by NIMS: General and Specialty hospitals		Total Respondents	Novice to advanced beginner	Competent	Proficient to an expert
46	I can capture retrospective bookings of agency nurses on NIMS.	General hospitals	138	27	11	30
			100.0%	39.7%	16.2%	44.1%
		Specialty hospitals		44	12	14
				62.9%	17.1%	20.0%
47	I can do emergency booking of agency nurses' on NIMS, i.e. emergency bookings on short notice due to increased bed occupancy, patient acuity, and staff being absent.	General hospitals	142	16	11	45
			100.0%	22.2%	15.3%	62.5%
		Specialty hospitals		36	8	26
				51.4%	11.4%	37.2%
48	I can book in advance up to one (1) month on NIMS to secure agency staff during annual, maternity, study and long-term sick leave.	General hospitals	142	18	9	45
			100.00%	25.0%	12.5%	62.5%
		Specialty hospitals		35	12	23
				50.0%	17.1%	32.9%

The competence of professional nurses was previously discussed (Point 4.4.3), regarding effective and appropriate utilisation of resources (agency nurses and budget). The items concerned were Items 41 ($p=0.052$) and 43 ($p=0.000$) in utilising information obtained from NIMS to manage and motivate the acquisition of resources (Table 4.14 and 4.15). Respondents using the various features of NIMS to effectively and appropriately manage the resources for agency budgets and agency staff, Items 42 ($p=0.000$) and 46 ($p=0.007$). Items 44 ($p=0.000$) and 45 ($p=0.000$) in utilising the different features of NIMS to monitor and verify agency staff. The last two items were, Items 47 ($p=0.001$) and 48 ($p=0.002$) on the competence with which professional nurses use the different booking features of NIMS to procure agency staff and ensure an adequate workforce. The responses to effective and appropriate utilisation of resources indicated that more of the general hospitals' staff were on a *proficient to an expert* competence level than those from the specialty hospitals.



Previous studies confirm and support that there are differences between health facilities in the implementation of an electronic system and that this can be due to various factors and challenges that needs to be explored (Ahani, et al., 2016, p. 33).

4.1.3 Significant difference between staff with 0–3 years' experience in NIMS and those with 4–6 years' experience with regards to a collaborative approach to NIMS

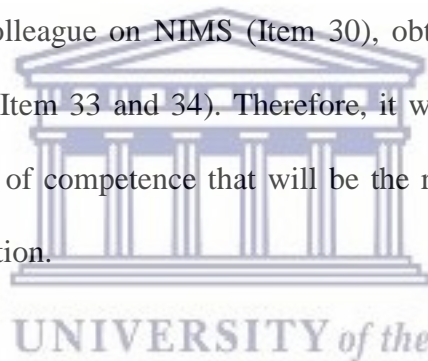
Both Dreyfus and Dreyfus (1980) and Benner (1984) found that it takes approximately five years to move through the five stages from novice to an expert.

Table 4.16: Significant difference between years of experience in NIMS and collaborative approach to NIMS

Item no.	Collaboration 0–3 and 4–6 years' experience in NIMS	Degrees of freedom	Total of respondents	Pearson's chi-square value	Pearson's chi-square significance
		df	n	χ^2	<i>p</i>
27	I established a collaborative relationship with the NIMS team to ensure guidance on NIMS when facing challenges with agencies and/or agency nurses.	2	123	10.95	0.004
28	I organise NIMS training sessions with the NIMS team and participate in the training sessions to motivate my colleagues to better their knowledge of the system.	2	120	6.70	0.035
29	I participate in fine-tuning discussions with my colleagues and the NIMS team to improve the rollout of NIMS.	2	120	5.47	0.065
30	I can continue with a request for agency staff on NIMS where my colleague has left off.	2	125	9.33	0.009
31	I understand the role and functions of the other person/s e.g. administrative staff and colleagues in NIMS.	2	124	2.97	0.227
32	I know how to obtain support via desktop/telephone from the NIMS team should it be necessary.	2	124	6.67	0.036
33	I know how to access NIMS any time to be of assistance to my colleagues.	2	125	15.21	0.000
34	I can assist staff of other units in the health facility to e.g. do an emergency booking.	2	123	8.22	0.016

Table 4.16 indicates a significant difference between staff with 0–3 years' experience in NIMS and those with 4–6 years' experience with regards to a collaborative approach to NIMS. All of the Items (27 to 32), with the exception of Item 31, showed a significant difference ($p=0.000$ to $p=0.065$) between staff with 0–3 years' experience in NIMS and those with 4–6 years' experience with regards to a collaborative approach to NIMS.

As per Point 2.4.3, a professional nurse that is an expert in NIMS, has experienced a vast range of situations to the extent that each specific situation immediately dictates an automatic correct action (Means, 2015, p. 49). The expert nurse with about 5 years of experience in actually using NIMS all the time does not need any rules or guidelines, she/he understands what to do and how to do all actions required on the system (Myers, 2014, p. 48). Even though the professional nurse has reached the level of expertise it is important to maintain the skills and competence acquired and still attend workshops and training sessions (Kaminski, 2010, p. 967). Collaboration as per Items 27-34 entails communication with NIMS team re challenges (Item 27), organizing training and motivating colleagues (Item 28), discussion to improve rollout of NIMS (Item 29), to continue instead of a colleague on NIMS (Item 30), obtaining support (Item 32) and assisting of colleagues (Item 33 and 34). Therefore, it will mostly be the professional nurse at an *expert* level of competence that will be the responsible person to take the leading role in collaboration.



There was however no significant difference, $\chi^2(2, n=124) = 2.97, p=0.227$, between staff with 0–3 years' experience in NIMS and those with 4–6 years' experience relating to understanding the role and functions of the other person (Item 31, Table 4.16). This result can be explained, as that within orientation to the system, it is already explained to the professional nurse the roles and function of the various members within NIMS and therefore does not take years to understand or process.

Table 4.17: Significant difference between years of experience in collaboration (Items 27–34)

Collaborative approach to using an electronic system for staffing (Items 27 to 34)						
Item no.	Collaboration 0–3 and 4–6 years' experience in NIMS	How long in years have you been using NIMS?	Novice to advanced beginner	Competent	Proficient to an expert	Total
27	I established a collaborative relationship with the NIMS team to ensure guidance on NIMS when facing challenges with agencies and/or agency nurses.	0–3	24	17	19	60
			40.0%	28.3%	31.7%	100.0%
		4–6	10	17	36	63
			15.9%	27.0%	57.1%	100.0%
28	I organise NIMS training sessions with the NIMS team and participate in the training sessions to motivate my colleagues to better their knowledge of the system.	0–3	34	10	16	60
			56.7%	16.6%	26.7%	100.0%
		4–6	20	17	23	60
			33.3%	28.3%	38.4%	100.0%
29	I participate in fine-tuning discussions with my colleagues and the NIMS team to improve the rollout of NIMS.	0–3	28	13	20	61
			45.9%	21.3%	32.8%	100.0%
		4–6	15	17	27	59
			25.4%	28.8%	45.8%	100.0%
30	I can continue with a request for agency staff on NIMS where my colleague has left off.	0–3	22	11	30	63
			34.9%	17.5%	47.6%	100.0%
		4–6	10	6	46	62
			16.1%	9.7%	74.2%	100.0%
31	I understand the role and functions of the other person/s e.g. administrative staff and colleagues in NIMS.	0-3	14	13	35	62
			22.6%	21.0%	56.4%	100.0%
		4-6	7	13	42	62
			11.3%	21.0%	67.7%	100.0%

Collaborative approach to using an electronic system for staffing (Items 27 to 34)						
Item no.	Collaboration 0–3 and 4–6 years' experience in NIMS	How long in years have you been using NIMS?	Novice to advanced beginner	Competent	Proficient to an expert	Total
32	I know how to obtain support via desktop/telephone from the NIMS team should it be necessary.	0-3	15	15	33	63
			23.8%	23.8%	52.4%	100.0%
		4-6	6	10	45	61
			9.8%	16.4%	73.8%	100.0%
33	I know how to access NIMS any time to be of assistance to my colleagues.	0-3	21	12	30	63
			33.3%	19.1%	47.6%	100.0%
		4-6	5	8	49	62
			8.1%	12.9%	79.0%	100.0%
34	I can assist staff of other units in the health facility to e.g. do an emergency booking.	0-3	22	12	29	63
			34.9%	19.1%	46.0%	100.0%
		4-6	8	12	40	60
			13.3%	20.0%	66.7%	100.0%

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4.1.4 Significant difference between staff with 0–3 years’ experience in NIMS and those with 4–6 years’ experience with regards to decision-making supported by NIMS reports

Items 35 to 40 (Table 4.18) showed no significant difference ($p=0.245$ to $p=0.891$) between staff with 0–3 years’ experience in NIMS and those with 4–6 years’ experience with regards to decision-making supported by NIMS reports.

Table 4.18: Significant difference between years of experience in NIMS and decision-making supported by NIMS reports

Item no.	Decision-making supported by NIMS reports: 0–3 and 4–6 years’ experience in NIMS	Degrees of freedom	Total of respondents	Pearson’s chi-square value	Pearson’s chi-square significance
		df	n	χ^2	<i>p</i>
35	I can compile different reports for management from NIMS to e.g. assist me in motivation for more staff or agency budget.	2	123	2.27	0.322
36	I can generate a report from NIMS to determine expenditure in order to request agency nurses within available/remaining budget.	2	124	.23	0.891
37	I draw reports from NIMS to establish the trend of different categories of agency staff used in the different disciplines, allowing me to plan strategically.	2	123	.53	0.766
38	I can use NIMS to determine trends e.g. which months my health facility/unit used the most agency staff.	2	123	.39	0.823
39	I am confident in writing a motivation to management to approve the booking of agency staff on NIMS.	2	124	1.31	0.521
40	I know how to choose the best skilled agency nurse for services needed from the list provided (PDF) in NIMS.	2	126	2.81	0.245

Professional nurses will be trained in the basic use of the electronic system and be satisfied with that, relying greatly on administrative staff for the more advanced use of the electronic system’s functionality (Trudel, et al., 2017, p. 13). It is also found that

habitual use of an electronic system enhances the tendency to use the basics and ignore potential advance use of the system (Trudel, et al., 2017, p. 14).

4.1.5 Significant difference between staff with 0–3 years’ experience in NIMS and those with 4–6 years’ experience with regards to effective and appropriate utilisation of resources supported by NIMS

There was no significant difference ($p=0.133$ to $p=0.995$) for the effective and appropriate utilisation of resources supported by NIMS (Items 41 to 48, Table 4.12), with the exception of Item 47, between staff with 0–3 years’ experience in NIMS and those with 4–6 years’ experience.

Table 4.19: Significant difference between years of experience in NIMS and effective and appropriate utilisation of resources supported by NIMS

Item no.	Utilisation of resources supported by NIMS: 0–3 and 4–6 years’ experience in NIMS	Degrees of freedom	Total of respondents	Pearson’s chi-square value	Pearson’s chi-square significance
		df	n	χ^2	<i>p</i>
41	I validate my decisions regarding staffing of my health facility/unit by using electronic reports on NIMS when reporting to management.	2	123	.67	0.716
42	I can capture the attendance of agency staff on NIMS including absenteeism.	2	125	.59	0.744
43	I can obtain information from NIMS regarding category of staff per discipline that worked to report to management on staffing needs.	2	124	.40	0.819
44	I can monitor on NIMS the total of hours/shifts worked by agency nurses.	2	123	.01	0.995
45	I can audit agency nurses’ attendance time sheets with control sheets on NIMS to monitor expenditure.	2	124	.37	0.831
46	I can capture retrospective bookings of agency nurses on NIMS.	2	122	1.29	0.525

Item no.	Utilisation of resources supported by NIMS: 0–3 and 4–6 years' experience in NIMS	Degrees of freedom	Total of respondents	Pearson's chi-square value	Pearson's chi-square significance
		df	n	χ^2	<i>p</i>
47	I can do emergency booking of agency nurses on NIMS, i.e. emergency bookings on short notice due to increased bed occupancy, patient acuity, and staff being absent.	2	126	7.74	0.021
48	I can book in advance up to one (1) month on NIMS to secure agency staff during annual, maternity, study and long-term sick leave.	2	126	4.03	0.133

The basic knowledge that professional nurses have of NIMS is allowing them to procure the agency staff necessary to address staffing needs. Therefore, if there are no incentive to acquire a higher level competence, they will not do so (Trudel, et al., 2017, p. 12).

Table 4.20: Significant difference between years of experience in the ability to do emergency bookings (Items 47)

I can do emergency booking of agency nurses' on NIMS, i.e. emergency bookings on short notice due to increased bed occupancy, patient acuity, and staff being absent (Item 47)					
	How long in years have you been using NIMS?	Novice to advanced beginner	Competent	Proficient to an expert	Total
How long in years have you been using NIMS?	0-3	24	12	27	63
		38.1%	19.0%	42.9%	100.0%
	4-6	18	4	41	63
		28.6%	6.3%	65.1%	100.0%

Responses (n=126, 100%) on the ability to do emergency bookings of agency nurses' on NIMS (Item 47) showed a significant difference, $\chi^2 (2, n=126) = 16.774, p=0.021$, between staff with 0–3 years' experience in NIMS and those with 4–6 years' experience with regards to decision-making supported by NIMS reports (Table 4.19). Those

respondents with 4–6 years' experience who regarded their competence level as *proficient to an expert* on Item 47, were in the majority (n=41, 65.1%), only 27 (42.9%) indicated they were at *proficient to an expert* competence level with 0–3 years of experience.

Research explains the absence of a significant difference in years of experience according to the term organisational inertia, which occurs when users are able to do the basics but rely heavily on the administrative staff. They have low interest in continuous learning and or knowledge-sharing and this prevents the users from understanding the more advanced uses of the system (Trudel, et al., 2017, p. 11). A ceiling effect is seen as stagnation in the assimilation of the electronic system with no growth and no utilisation of the benefits of the system (Trudel, et al., 2017, p. 2).

4.2 CONCLUSION

This study found the mean years of experience in NIMS as 3.6 years and 43.7% of 126 (100.0%) respondents had of 5–6 years' experience. They should be at an expert competence level regarding their operation of NIMS (Benner 1984). However, it is evident from this study that the majority of the professional nurses have not reached the expert competence level in working on NIMS.

The findings indicated the competence levels of professional nurses utilising the electronic system for staffing of agency nurses in public hospitals in the Western Cape. To summarise the important aspects from the findings related to each of the four components of the NIMS system:

Collaborative approach to the electronic system

This study showed that for collaboration (Item 27-34), it was only on, motivating training (Item 27) and participating in facilitation discussion to roll out NIMS (Item 29), that the

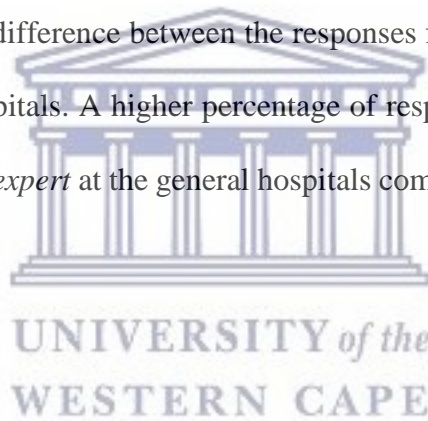
mean value of competence was $\bar{x}=2.6$ and $\bar{x}=2.8$ respectively, which is at the competence level of an *advanced beginner*. The respondents were generally *competent* in a collaborative approach to NIMS, with a mean value of competence ranging from $\bar{x}=3.1$ to $\bar{x}=3.5$, therefore competent but not *experts*. There was a significant difference in response of staff with 0-3 years of experience and those with 4-6 years' experience, with staff having more experience being more at a *proficient to an expert* competence level. The significant differences between staff in general hospitals and specialty hospitals varied between the items with regards to a collaborative approach to NIMS.

Decision-making supported by the electronic system's reports

The respondents' competence for decision-making (Items 35-40) showed mostly around the competence level of an *advanced beginner* as indicated by the lowest ($\bar{x} = 2.2$) and highest ($\bar{x} = 2.9$) mean value. Therefore, there was also no significant difference in the years of experience in NIMS, between the group of staff with 0-3 years' experience in the system and those with 4-6 years' experience with regards to decision-making. There was however a significant difference ($p=0.000$) between responses of respondents in the general and specialty hospitals for writing a motivation for management (Item 39). The percentage of *proficient to an expert* competence level was higher (52.1%) at the general hospital than at the specialty hospitals (20.3%). Decision-making is dependent on the ability to draw reports from NIMS and or have the knowledge of the different reports that can be accessed on NIMS to assist/support decision-making. It seems that the professional nurses do not perceive it as a necessity to know how to draw reports from NIMS.

Effective and appropriate utilisation of resources supported by the electronic system

This study shows that for effective and appropriate utilisation of resources supported by NIMS (Items 41-48), respondents are more inclined to be at a competence level of *advanced beginner* as shown by the lowest ($\bar{x} = 2.4$) and highest ($\bar{x} = 3.1$) mean value. The critical skills for NIMS, that is capturing of attendance and bookings of agency nurses, respondents were mostly *competent* but for validation, auditing and retrospective bookings which is not perceived as critical skills in NIMS, the respondents were at an *advanced beginner* competence level. No significant differences were found between staff with 0–3 years' experience in the system and those with 4–6 years' experience with regards to effective and appropriate utilisation of resources supported by the system. There was a significant difference between the responses from the general hospitals and that of the specialty hospitals. A higher percentage of respondents was at a competence level of *proficient to an expert* at the general hospitals compared to those at the specialist hospitals.



Quality assurance

Respondents' responses to administrative factors that might influence their competence on NIMS (Item 49–56), showed that the respondents are aware of all the administrative tasks needed to ensure quality assurance; however, most respondents are not participating in meetings and do not do daily monitoring, which can influence quality assurance (Items 54 and 55). The results show that for Item 54, attending quarterly meetings, there was a very low positive response. The fact that half of the respondents still followed the guidelines and step by step guide (Item 56) is an indication of not being at *expert* competence level yet, as explained by Benner (1984).

In this chapter, the focus was on analysing and displaying of data with graphs, figures and tables. The data analysed was interpreted and discussed with reference to previous research.

Chapter 5 presents conclusions drawn from the analyses, outlines guidelines for nurse managers to promote the competence levels of professional nurses in utilising NIMS, makes relevant recommendations and points out some limitations of the study. This chapter also concludes the study.



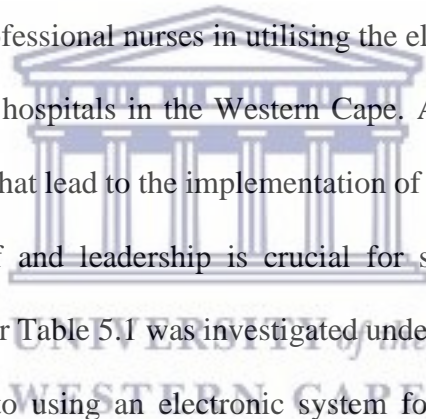
CHAPTER 5

CONCLUSIONS, GUIDELINES, RECOMMENDATIONS AND LIMITATIONS

5.1 INTRODUCTION

This section concludes the entire research study by revisiting the research objectives as identified in Chapter 1, followed by the conclusion, contributions and limitations of the study, the developed guideline and recommendations for future research.

The aim of the study was to develop guidelines for nurse managers to promote the competence levels of professional nurses in utilising the electronic system for staffing of agency nurses in public hospitals in the Western Cape. A literature study showed that there are known factors that lead to the implementation of electronic technology and that the competence of staff and leadership is crucial for success. The competence of professional nurses as per Table 5.1 was investigated under the main components of (i) a collaborative approach to using an electronic system for staffing; (ii) the use of the electronic system for decision-making; (iii) resources management of a workforce utilising an electronic system; and (iv) quality assurance with regards to using an electronic system. The study departed from assumptions based on Benner's (1984) theoretical framework referring to progressing from a novice to an expert user of an electronic system. Each of these five levels of skill acquisition has unique characteristics. Benner's theory with regard to the levels of novice to an expert was evident in the results of the research.



As outlined under Point 2.4.3, the competence levels of professional nurses could be interpreted on different levels.

Table 5.1: Competence level

Competence level	
Novice	<p>Does not know anything about the electronic system:</p> <ul style="list-style-type: none"> • Needs clear instructions and rules to learn how to use electronic system • Needs monitoring and instructional feedback
Advanced beginner	<p>More aware of features within electronic system that can be used:</p> <ul style="list-style-type: none"> • Use appropriate functionality for routine tasks; however, are still dependent on the rules and guidelines
Competent	<p>Able to do problem-solving within electronic system:</p> <ul style="list-style-type: none"> • Is at ease with electronic system and able to extract various reports from the system to be used for decision-making and management of agency nurse staffing and agency budget
Proficient	<p>Able to guide others:</p> <ul style="list-style-type: none"> • Can effectively use decision-support capabilities of electronic system, understand the entirety of the system and provide guidance to other members as well
Expert	<p>Experienced, can automatically correct specific situations:</p> <ul style="list-style-type: none"> • Detect and correct erroneous use of the software, works intuitively on the system

5.2 SUMMARY OF FINDINGS

5.2.1 Biographic

Section 1 of the questionnaire focused on the biographic of the respondents. From the findings it could be concluded that most of the respondents are unit managers (n=134, 93.7%), while 95 (67.4%) of 143 (100.0%) respondents have a post basic qualification. The mean age of the respondents was 51.1 years, while the mean of their years of

experience in nursing was 25 years. Half (51.1%) worked in the district and secondary hospitals and the other half (48.9%) in the specialised and tertiary hospitals.

Responses to computer literacy showed mean values (\bar{x}) between 2.6 and 3.6, indicating that even though the majority of respondents did not see their competence level as a *novice to advanced beginner*, only a few (22.8%) were at *proficient to an expert* level. Training in various computer programmes and systems showed an unequal focus on the attendance of formal training from 81.7% that did have formal training in word to 62.8% that did not have formal training in using the internet. The responses to formal training in NIMS, showed that 81.6% did receive formal training and the mean value for years of experience was $\bar{x}=3.6$ years with 43.7% of the respondents who had 5–6 years of experience.



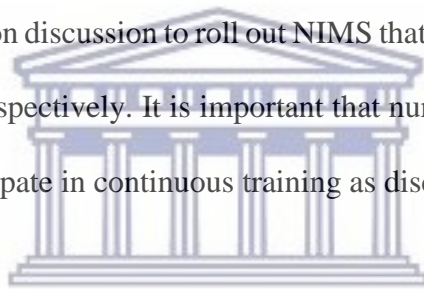
Factors that might be barriers to achieving an *expert level* of competence in the use of NIMS were related to time and unreliable connections. Time had the highest mean value ($\bar{x}=1.75$, $SD=0.633$) followed by unreliable network conditions ($\bar{x}=1.64$, $SD=0.606$). While it was expected that these respondents should be at an expert competence level with regard to their use of the electronic system, the findings showed that their competence level were *competent to proficient* and thus at ease with the system but not yet *totally proficient (expert level)*.

5.2.2 Responses to Section 2 of the questionnaire (establishing competence levels)

5.2.2.1 Collaborative approach to the electronic system

The lowest mean value on collaboration was found in Item 28 ($\bar{x} = 2.6$; $SD = 1.301$), where respondents from both hospital groups indicated being at *advanced beginners'*

competence level in motivating colleagues to better their knowledge of the system through training. A highest similar mean value of 3.5 indicated that respondents' competence level were *competent to proficient* in understanding the role of others (Item 31), obtaining support from the NIMS team (Item 32) and being able to access the system at any time to be of assistance to others (Item 33). Responses on these items were further widely distributed around the mean values (SD=1.168, Item 31; SD=1.178, Item 32; SD=1.241, Item 33). The findings of this research shows that for a collaborative approach to NIMS respondents competence level are generally *competent*, with a mean value of competence ranging from $\bar{x}=3.1$ to $\bar{x}=3.5$. The respondents were therefore not necessarily at *expert* competence level. It was only on Item 27, motivating training and Item 29, participating in facilitation discussion to roll out NIMS that the mean value of competence was $\bar{x}=2.6$ and $\bar{x}= 2.8$ respectively. It is important that nurse managers take the lead and encourage staff to participate in continuous training as discussed under guideline 3.

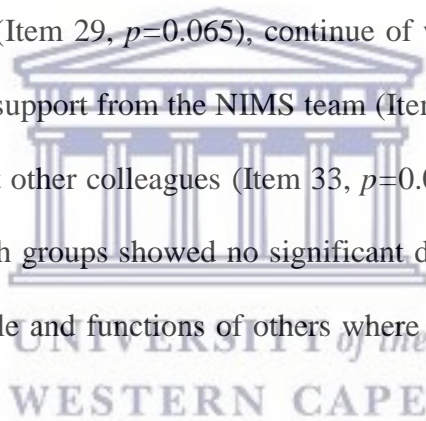


There was not a significant difference between the responses of the staff in general and those of speciality hospitals for establishing a collaborative relationship with the NIMS team (Item 27, $p=0.424$) to organise training (Item 28, $p=0.248$), discuss improvements of the system with colleagues (Item 29, $p=0.472$) and get support from the NIMS team (Item 32, $p=0.151$). However, there were significant differences for continuity of work from where the one has left off and other takeover (Item 30, $p=0.001$), understanding the role and functions of another person (Item 31, $p=0.021$), knowing how to access NIMS to assist other colleagues (Item 33, $p=0.045$) and on emergency bookings (Item 34, $p=0.022$), between respondents of general and specialty hospitals' understanding of the roles of colleagues working on the system. A higher percentage of respondents were at *proficient to an expert* competence level at the general hospitals, compared to respondents

in specialty hospitals, in understanding the role and functions of the other person/s i.e. continuity of work from ones that have left (Item 30, $n=52$, 72.2%), understanding the role and functions of another person (Item 31, $n=50$, 69.4%), knowing how to access NIMS to assist others (Item 33, $n=50$, 68.5%) and being able to support others with emergency bookings (Item 34, $n=45$, 63.4%).

There was a significant difference in responses of staff with 0–3 years' experience in using the electronic system and those with 4–6 years' experience with regards to a collaborative approach to the system, establishing a good relationship with NIMS team (Item 27, $p=0.004$), to organise training (Item 28, $p=0.035$), discuss improvements of the system with colleagues (Item 29, $p=0.065$), continue of work from ones that have left (Item 30, $p=0.009$), get support from the NIMS team (Item 32, $p=0.036$), knowing how to access NIMS to assist other colleagues (Item 33, $p=0.000$) and emergency bookings (Item 34, $p=0.016$). Both groups showed no significant difference in competence level for understanding the role and functions of others where NIMS is concerned (Item 31, $p=0.227$).

There was a higher percentage of respondents who were at a *proficient to an expert* competence level in the group with 4–6 years of experience than in the group of respondents with 0–3 years of experience. These related to establishing a good relationship with NIMS team (Item 27), to organise training (Item 28), discuss improvements of the system with colleagues (Item 29), continue of work from ones that have left (Item 30), understanding the roles of others in NIMS (Item 31) getting support from the NIMS team (Item 32), knowing how to access NIMS to assist other colleagues (Item 33) and emergency bookings (Item 34). Both Dreyfus and Dreyfus (1980) and

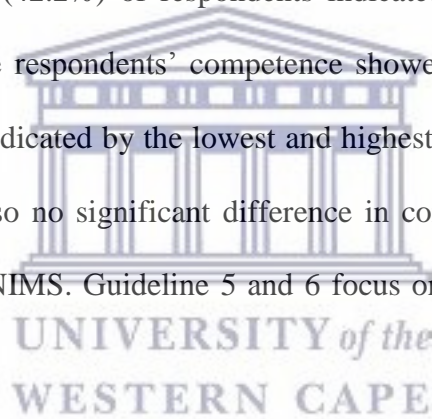


Benner (1984) found that it takes approximately five years to move through the five stages from novice to an expert.

5.2.2.2 *Decision-making supported by the electronic system's reports*

Items 35 to 40, pertained to decision-making. The lowest mean value ($\bar{x} = 2.2$; $SD = 1.118$) for decision-making was using the system to determine trends (Item 38), where two-thirds (62.6%) of respondents indicated that they were *a novice to advanced beginner*. The highest mean value ($\bar{x} = 2.9$; $SD = 1.324$) was on knowing how to choose the best-skilled agency nurse for the service needed from the provided list (PDF) (Item 40), and less than half (42.2%) of respondents indicated that they were *a novice to advanced beginner*. The respondents' competence showed mostly around the level of *advanced beginner* as indicated by the lowest and highest mean value discussed above. Therefore, there was also no significant difference in competence with regards to the years of experience in NIMS. Guideline 5 and 6 focus on addressing this low level of competence.

Items 35 to 40 showed no significant difference between the group of staff with 0–3 years' experience in the system and those with 4–6 years' experience with regards to decision-making. Research done, showed that it seems data demand and information use for decisions are still being seen as insignificant despite the improvement of information systems (Shiferaw, et al., 2017, p. 2). Nurse managers tend to still revert to the traditional system when they need to respond quickly. It also allows them to personalise the information they record, fitting to their way of working and helping with time management (Dowding, et al., 2015, p. 357).



There was a significant difference ($p=0.000$) between responses of respondents in the general and specialty hospitals for Item 39 (writing a motivation for management), and the percentage of *proficient to an expert* respondents was higher (52.1%) at the general hospital than at the specialty hospitals (20.3%).

5.2.2.3 *Effective and appropriate utilisation of resources supported by the electronic system*

The lowest mean value ($\bar{x} = 2.4$; $SD = 1.641$) for effective and appropriate utilisation of resources was found in Item 41, where more than half (54.3%) of respondents indicated being *a novice to advanced beginner*, with the ability to do reports being at a higher competence level than the basic applications of the system. The highest mean value ($\bar{x} = 3.1$) in effective and appropriate utilisation of resources was for capturing of attendance (Item 42) and doing of emergency bookings (Item 47), respondents perceived themselves as *proficient to an expert*. The findings of this research shows that for effective and appropriate utilisation of resources supported by NIMS, respondents are more inclined to be at a competence level of an advanced beginner. Guideline 5 focus on addressing this low level of competence, the mean value of 3.1 being competent.

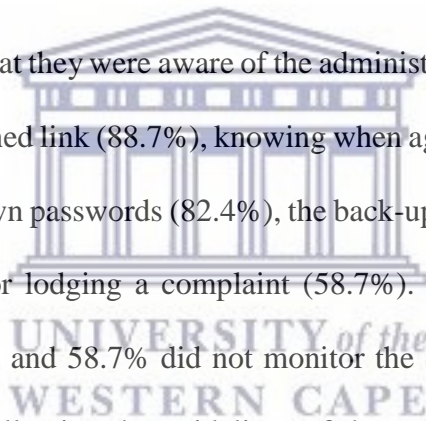
Items 41 to 48 showed a significant difference between the responses from the general hospitals and that of the specialty hospitals with regards to effective and appropriate utilisation of resources. Items 41 to 48 refers to being able to use electronic reports for management (Item 41), to capture attendance (Item 42), to draw reports on category of staff procured (Item 43), to monitor hours and shifts worked (Item 44), to audit nurses' attendance time sheets (Item 45), to capture retrospective bookings (Item 46), to do emergency booking (Item 47) and to do advance bookings (Item 48). A higher percentage

of respondents was at competence level of *proficient to an expert* at the general hospitals compared to those at the specialist hospitals.

No significant differences were found between staff with 0–3 years' experience in the system and those with 4–6 years' experience with regards to effective and appropriate utilisation of resources supported by the system. There is a higher percentage (65.1%) of respondents at *proficient to an expert* competence level for the respondents with 4–6 years' experience in the electronic system compared to those with 0–3 years' experience.

5.2.2.4 *Quality assurance*

Respondents indicated that they were aware of the administrative factors ensuring quality, that is using an established link (88.7%), knowing when agency staff are working double shifts (71.8%), having own passwords (82.4%), the back-up system of NIMS (55.6%) and the process to follow for lodging a complaint (58.7%). However, for participating in meetings, 83.9% did not and 58.7% did not monitor the system daily. Half (50.0%) of respondents were still following the guidelines of the system circular and step-by-step guide, which, according to Benner (1984), is an indication of not being at an *expert* competence level.



5.3 GUIDELINES FOR NURSE MANAGERS TO PROMOTE THE COMPETENCE LEVELS OF PROFESSIONAL NURSES IN UTILISING THE ELECTRONIC SYSTEM FOR STAFFING OF AGENCY NURSES.

Nurse managers play a very important role in supporting staff. They are therefore also the driving force behind the use of the electronic system for staffing of agency nurses and support the professional nurses to adapt to the workflow changes resulting from the implementation of the system. Professional nurses' competence in using email, Internet, word processing, and search engines should not be assumed. Using word processing, email, and search engines may be considered basic computer skills; nonetheless, being incompetent in executing these tasks could increase the time a professional nurse needs to use a NIMS application and the system to its full potential (Adeleke, et al., 2015, p. 51). Eight guidelines emerged from the findings related to collaboration, decision-making, utilisation of resources and quality assurance, as presented below in Table 5.2.

Table 5.2: Guidelines for nurse managers

Key principles	Guideline
Collaboration	Guideline 1: The nurse manager needs to establish a collaborative relationship with the NIMS team to ensure guidance on the electronic system.
	Guideline 2: The nurse manager needs to attend the quarterly meetings with the stakeholders involved with the system to discuss and address challenges/problems experienced.
	Guideline 3: The nurse manager needs to organise training sessions with the NIMS team and participate in the training sessions to motivate colleagues to improve their knowledge of the system.
	Guideline 4: The nurse manager needs to create an environment in which staff learn from one another.

Resource management	Guideline 5: Nurse managers need to understand and manage the information that can be provided by the system to assist in the management of agency staffing.
Decision-making	Guideline 6: Nurse managers should create a cadre of professional nurses who are expert users of the electronic system.
Quality assurance	Guideline 7: The nurse manager needs to implement control measures to prevent unauthorised access.
	Guideline 8: The nurse manager needs to access the system daily to monitor deviations.

5.3.1 Nurse managers need to have a collaborative approach to the electronic system for staffing of agency nurses

Collaboration is needed between all levels and units within the health facility to promote the roll-out of the system (Spetz, Cimiotti & Brunnel, 2016, p. 379). The nurse manager who understands the needs of her/his specific environment and challenges of the professional nurses can work with the NIMS and IT team to resolve and improve system challenges, thereby contributing towards the successful implementation of the system (Hirsch, 2014, p. 44). Working together will help build a strong foundation and staff will have a clearer understanding of the bigger picture. The additional time required for training and initial usage of the system should be balanced with the regular duties of staff. Nurse managers should promote the use of the system to avoid problems and overcome resistance of end-users, that is professional nurses using the electronic system for staffing of agency nurses (Dowding, et al., 2015, p. 348). In order for nurse managers to have a collaborative approach in the electronic system for staffing of agency nurses, they should (i) have a well-established relationship with the NIMS team; (ii) attend stakeholders' meetings; (iii) ensure training; and (iv) create a learning environment.

5.3.1.1 Guideline 1: The nurse manager should establish a collaborative relationship with the NIMS team to ensure guidance on the electronic system

A collaborative approach to NIMS is seen as important, as supported by previous research, that nurses' input into the design and improvement of the system is important, as a lack of involvement of nurses can lead to negative perceptions and dismissal of the system (Scott, 2017, p. 242). Hirsch (2014) states that nurse managers need to participate in advisory groups and IT governance structures so that they can gain an understanding of available analytics and become familiar with the electronic system (Hirsch, 2014, p. 44). Nurses will more readily accept the system if they experience the support of management in the system. Nurses' input into the design and improvement of a nursing information system is important because if nurses are not involved, it can lead to negative perceptions and an unwillingness to accept the system (Scott, 2017, p. 242). The nurse manager can explain the needs of the department to the NIMS team, allow for understanding of the information received from the system and interpret it in practice (Kivinen & Lammintakanen, 2013, p. 97).

Actions to be taken by nurse managers:

- It is important for the nurse manager to create an environment in which the professional nurses feel their opinion about the electronic system is valued.
- The nurse manager needs to have discussions with the professional nurses to ensure that the correct feedback is relayed to the NIMS team for the purposes of the improvement, training and rollout of the system. He/she needs to communicate the professional nurses' expectations and frustrations to the NIMS team.
- The nurse manager must identify and address the professional nurses' expectation with regards to the system to ensure acceptance and successful implementation.

- He/she needs to have a plan for problem-solving and has to keep staff accountable when working on the system.
- The nurse manager must ensure that the professional nurses know how to acquire support via desktop/telephone from the NIMS team should it be necessary, contact numbers for the NIMS team should be easily accessible and known. It is important that staff receive continuous support and on-site training from the NIMS team, as this will diminish the perceived complexity of the system and ensure continuous adoption (Ahmadi, et al., 2017, p. 12).

5.3.1.2 Guideline 2: The nurse manager should attend the quarterly meetings with the stakeholders involved with the system to discuss and address challenges / problems

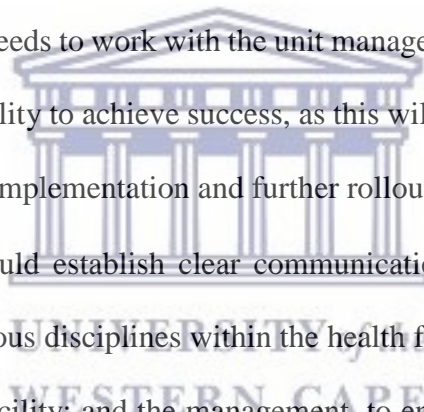
Nurse managers play a very important role in the design, implementation, use of the nursing information management system and in developing a collaborative environment (Kivinen & Lammintakanen, 2013, p. 97). Nurse managers need to participate in advisory groups and IT governance structures, so that they can gain an understanding of available analytics and become familiar with the electronic system (Hirsch, 2014, p. 44). Conducting an evaluation of the system to identify its strengths and weaknesses from the professional nurses' perspective is important (Ayatollahi, et al., 2016, p. 329).

Actions to be taken by nurse managers:

- The nurse manager needs to be involved in technology governance. Information Technology (IT) governance is a framework that ensures that IT infrastructure supports and enables the achievement of the health facilities' corporate strategies and objectives. The nurse manager can, by being involved in technological governance, get the opportunity to evaluate the development of content, workflow and quality

measures of the system to ensure that these represent key clinical, regulatory and strategic priorities.

- He/she needs to evaluate the development of the electronic system's content, workflow, and quality measures and discuss these features with management and the NIMS team.
- It is essential for the nurse manager to identify and address the professional nurses' expectations regarding the use of the system, as these expectations will have a direct impact on the successful use of the information system.
- The nurse manager needs to take cognisance of the influence of the system on the work processes and ensure that the staff understand the benefits of the system.
- The nurse manager needs to work with the unit managers from the various disciplines within the health facility to achieve success, as this will contribute towards a positive attitude towards the implementation and further rollout of the system.
- Nurse managers should establish clear communication channels between the unit managers of the various disciplines within the health facility; the NIMS team; the IT team of the health facility; and the management, to ensure effective communication regarding implementing, maintaining and upgrading the IT infrastructure and the electronic system itself.
- He/she needs to communicate staff expectations to the NIMS team by explaining the needs of the department and allowing for the understanding of the information received from the electronic system and the interpretation of the data/reports in practice.



5.3.1.3 Guideline 3: The nurse manager should organise training session with the NIMS team and participate in the training sessions to motivate colleagues to improve their knowledge of the system

Nurse managers need to support commitment to continuous training in the NIMS content since technological innovation and adoption occurs rapidly and creates a complex environment in which the nurse managers have to lead (Kerfoot, 2015, p. 342). Nurse managers in practice settings (particularly those settings transitioning to an electronic system) need to promote professional nurses' participation in continual education activities in informatics (Kleib, Simpson & Rhodes, 2016, p. 11). It is important to articulate the relevance of NIMS as it applies to agency nurse staffing and provide data for the evaluation of agency staffing. Basic skills in computer literacy should be identified as a key learning area of annual continuing competence development of professional nurses, thus encouraging them to develop computer skills to facilitate training in information management (Kleib, et al., 2016, p. 11). Furthermore, training in computer skills could advance nursing practice roles and increase nurse participation in evidence-based practice. Professional nurses need to understand the value of computer skills for their practice and identify ways to fulfil their educational needs (Yang, et al., 2014, p. 4).

Actions to be taken by nurse managers:

- The nurse manager has to ensure the continuous competence of those professional nurses who have received training in the system. He/she needs to have the staff assessed to determine their ability to utilise all the functions (basic and advance features) of the electronic system. The nurse manager can involve the NIMS team to assist with competence assessment.

- The nurse managers should have a clear strategy according to which professional nurses who will work and be trained on the system are selected. They should ensure that staff who are interested in learning to work on the system are recruited for training. Professional nurses who have no interest in the system may not be able to reach expert competence level of competence and may revert back to the traditional ways of working.
- The nurse manager needs to take into consideration that some professional nurses may take longer to attain competence level and that factors such as their age, qualifications and experience with computers should be accounted for in the training. The training schedule and curriculum should be planned accordingly.
- The professional nurses working on the system need to understand the competencies expected and need to be appropriately trained. The nurse manager needs to make provision for continuous development training, which should be included in the individual performance management plan of the staff member.
- The nurse manager needs to identify those professional nurses who grasp the system quickly and have enthusiasm for the system. He/she needs to ensure that they receive the basic training and then allow them to be exposed to the more complex functionalities and the practical applications e.g. various reports that can be drawn from the system.

5.3.1.4 Guideline 4: The nurse manager should create an environment where staff learn from one another

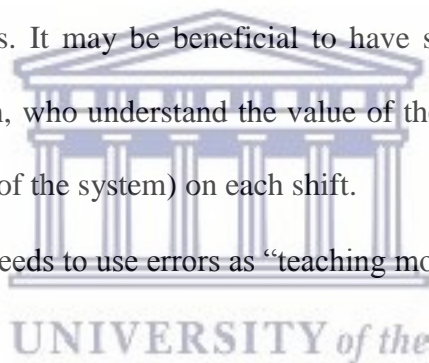
Staff, both experienced and new, young and old, can become resources to one another, teaching each other in real time (Wong, 2013, p. 145). Fellow nurses helping one another and encouraging one another have a significant positive effect on perceived ease of use, perceived usefulness and intention to use technologies (Kaye, 2017, p. 242).

Actions to be taken by nurse managers:

- The nurse manager should ensure that the professional nurses who are trained in the electronic system are available to assist colleagues when needed and are able access the electronic system at any time. These professional nurses should have an understanding of the role and functions of the other person/s (e.g. administrative staff/colleagues) and should be able to continue with a request for agency staff on the system when a colleague has left. They also need to be able to assist others in the health facility to e.g. do an emergency booking on the system.
- It will be beneficial to the health facility and successful rollout of the system if the nurse manager ensures that provision is made for the recruitment of professional nurses as super-users. It may be beneficial to have super-users (being recognised experts in the system, who understand the value of the system and can support and motivate other users of the system) on each shift.
- The nurse manager needs to use errors as “teaching moments”.

5.3.2 Nurse managers should use the data provided by the electronic system for staffing of agency nurses to support management of resources

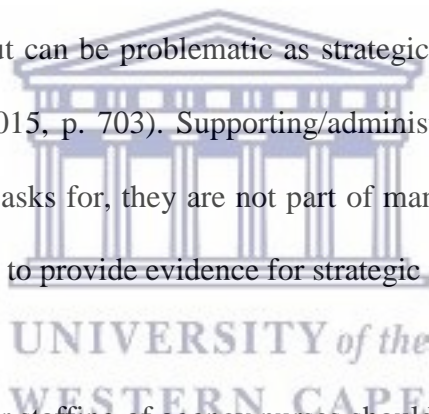
Nurse managers need the knowledge and skills to use electronic information systems for the collection and interpretation of statistical data on staff rosters, budgets and resource ordering (Yang, et al., 2014, p. 5). Nurse managers need to understand and manage the information provided to be able to use the reports from the electronic system to assist in the management of resources.



5.3.2.1 Guideline 5: Nurse managers should understand and manage the information that can be provided by the system to assist in the management of agency staffing

Workforce planning involves balancing the supply and demand of nursing staff to ensure that a sufficient number of suitably skilled nursing staff is available in the right place and at the right time to ensure quality nursing care (Drake, 2013, p. 95). Staffing, overtime and the use of agency staff often result in high costs, especially if there is a lack of reliable forecasting of staffing needs (Harper, 2012, p. 262). Nurse managers need accurate data, the time to analyse that data and negotiation skills (Drake, 2013, p. 99). The fact that due to a lack of time supporting staff is responsible for working on NIMS, which may initially be seen as a solution, but can be problematic as strategic decisions are made at higher levels (Collins, et al., 2015, p. 703). Supporting/administrative staff can only provide what the nurse manager asks for, they are not part of management and do not have the insight in what is needed to provide evidence for strategic management decisions.

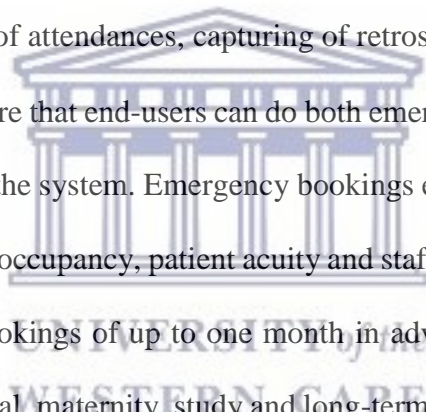
The electronic system for staffing of agency nurses should be used to its full capacity to meet the needs of the nurse manager. When relevant information is not provided accurately, it can result in wrong decisions, improper strategic planning and poor utilisation of agency staff. Nursing data sets can assist nurse managers in supporting effective staff recruitment and retention strategies. The integration of data from multiple sources helps nurse managers to balance workloads (Pruinelli, et al., 2016, p. 70). Nurse managers will be recognised if they can produce data that provide evidence to justify funding requests and identify shortage areas within the workforce (Fraher, 2017, p. 160). The most critical information needs of nurse managers are linked to the organisation,



management of work and allocation of staff resources (Lundgren-Laine, et al., 2013, p. 7).

Actions to be taken by nurse managers:

- The nurse manager needs to participate in fine-tuning discussions with colleagues and the NIMS team to understand the full capacity and features of the electronic system and ensure that it addresses the need of his/her health facility.
- The nurse manager is responsible for the accurate collection, entering and management of data within the system and she/he needs to be able to identify the source of poor data and take appropriate action to remedy the situation. Data being the electronic record-keeping of agency nurses in terms of staff detail, agency bookings, capturing of attendances, capturing of retrospective bookings etc.
- He/she needs to ensure that end-users can do both emergency and advanced bookings of agency nurses on the system. Emergency bookings entail bookings on short notice due to increased bed occupancy, patient acuity and staff absenteeism, while advanced bookings involve bookings of up to one month in advance on the system to ensure agency staff for annual, maternity, study and long-term sick leave. These are the most important basic functions on the system that the professional nurses need to be able to perform.
- The nurse manager has to engage with the NIMS team to ensure that staff understand the build-in quality measures on the electronic system, e.g. the backup system that enables data to be recovered immediately, while agency nurse requests are not affected, as well as the flagging of agency nurses working double shifts (the system would prevent the professional nurse from booking that person).

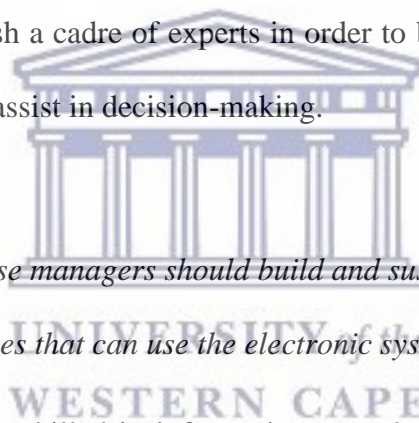


5.3.3 Nurse managers should use the reports from the electronic system to assist in decision-making

Decision-making with regards to agency staff in health institution depends on the availability of quality and accurate data and data timelines. Unit managers and professional nurses must be able to recognise quality data, understand the implications of data for the decision-making process and correctly identify poor quality data and address the cause (Kivinen & Lammintakanen, 2013, p. 94). The use of computer technology and nurses' decision-making have been described as important to good health care information management, with the potential to transform the current healthcare systems to the benefit of both the provider and consumer (Adeleke, et al., 2015, p. 48). Nurse managers should establish a cadre of experts in order to be able to use the reports from the electronic system to assist in decision-making.

5.3.3.1 Guideline 6: Nurse managers should build and sustain a cadre of expert professional nurses that can use the electronic system.

Nurse managers who are skilled in informatics are acknowledged as leaders who can deliver high-quality care through evidence-based practices and demonstrate nurses' unique contributions to resource management (Remus, 2016, p. 413). Information culture, as a part of organisational culture, is established when value and utility of information in the realisation of operational and strategic goals is recognised by the nurse managers. In such a culture, information is the core of organisational decision-making and information technology is an enabler for effective information management (Kivinen & Lammintakanen, 2013, p. 94).



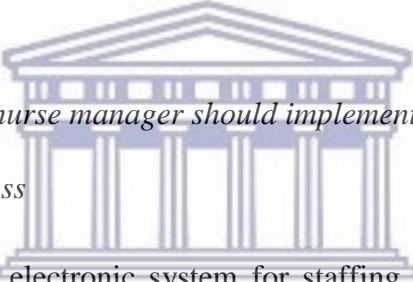
Actions to be taken by nurse managers:

- The nurse manager needs to identify those professional nurses who grasp the system and allow them to be trained in the more complex functionalities and their practical applications, e.g. such as reports on expenditure (to request agency nurses within available/remaining budget), reports to establish the trend of different categories of agency staff used in the different disciplines and reports on which months the health facility/unit used the most agency staff.
- He/she needs to negotiate with the NIMS team to phase in different modules of the training content over several weeks to allow the professional nurses to practice their skills and become experts.
- The professional nurses trained in the system need to engage in continuous professional development and the nurse manager has to ensure that it is adhered to as this will allow the nurses to keep up with the current standards, enhance their knowledge and skills and increase their confidence in the utilisation of the system.
- The nurse manager should determine the factors that differentiate the professional nurse who use the system to its full capacity from those who don't. This can assist in the training and further rollout.
- It is important that the nurse manager arranges for the professional nurses working on the system to meet routinely with the NIMS team to discuss challenges and to learn about better ways to use the system and all its functionalities.

5.3.4 The nurse manager plays an important role in quality assurance as it is one of the deciding factors in the successful adoption of the system.

Monitoring and evaluation is an ongoing process and should be conducted throughout at set intervals. It ensures that implementation and operation of the system is on track and

that standards are adhered to. It also generates lessons learned and best practice to inform further rollout of the electronic system. Data quality is not guaranteed as the human element in using the system cannot be avoided, which increases the likelihood of system errors. For example, data accuracy is dependent on the correct data input (Ahmadi, et al., 2017, p. 31). Knowing the factors that influence the professional nurses' decision to use or not use the system provides the nurse manager with insight into ways in which the nurses can be encouraged to adopt the system (Kaye, 2017, p. 243). Nurse managers need to perform quality assurance on the use of the electronic system for staffing of agency nurses. They should (i) implement control measures to prevent unauthorised access; and (ii) access the system daily to monitor any deviation.



5.3.4.1 *Guideline 7: The nurse manager should implement control measures to prevent unauthorised access*

Quality assurance of the electronic system for staffing of agency nurses includes an evaluation of the performances of staff using the system, and clear guidelines, support and orientation to the system. The electronic system's quality dimension includes the features of the system itself as well as flexibility, accuracy, response time, ease of use, convenience of access and integration of systems (Kivinen & Lammintakanen, 2013, p. 92).

Actions to be taken by nurse managers:

- The nurse manager needs to ensure that the necessary equipment is available and reliable. Professional nurses who are assigned to work on the system must have access to a computer that will be used mainly or exclusively by them.
- He/she needs to have policies in place to avoid computer misuse, e.g. by securing computer programmes and data against unauthorised access or alteration, thereby

ensuring that any person who is updating records on the computer is identifiable. There needs to be an established link on the computer to access the electronic system and all professional nurses should have their own username and password to prevent data tampering.

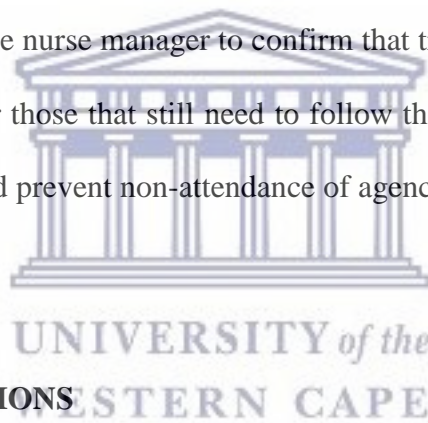
- It is important that the nurse manager ensures that the policies and standard operating procedures are read, understood and signed by staff to ensure that they understand the importance of security and the reasons for usernames (ID) and passwords when logging on to a computer. This needs to include, but is not limited to password policies e.g. not sharing passwords, changing passwords regularly, adequate password length, and an adequate letter and number mix. The professional nurses have to take responsibility for the use of their access codes.
- The nurse manager needs to follow disciplinary processes when the users go beyond what they are permitted to do; this behaviour should be viewed as misconduct.
- He/she needs to ensure that the professional nurses have knowledge about the process to follow when lodging a complaint of agency nurses e.g. agency nurses booked through the system, but not performing well. Standard operating procedures should be readily available to guide the process of lodging a complaint.

5.3.4.2 Guideline 8: The nurse manager should access the system daily to monitor any deviation

The nurse manager needs to audit the various forms of data captured and reports drawn with sufficient frequency to ensure that the system is used correctly and to initiate improvement actions where appropriate.

Actions to be taken by nurse managers:

- He/she needs to have a monitoring and evaluation system in place to ensure that the professional nurses who need to create reports from the system are competent to do so, and that the attendance of agency staff is captured timeously. Daily monitoring of the system is important to ensure that retrospective bookings of agency nurses are captured on the system, that the total of hours/shifts worked by agency nurses are compared to the bookings done, and that agency nurses' attendance time sheets are compared with control sheets on the system to monitor expenditure.
- The nurse manager can make use of the NIMS team to do a quality indicator survey, allowing her/him to be more proactive in responding to quality issues and to follow-up with training where gaps are identified.
- It is important for the nurse manager to confirm that training manuals are freely and readily available for those that still need to follow the step-by-step guide to ensure correct bookings and prevent non-attendance of agency staff.



5.4 RECOMMENDATIONS

5.4.1 Recommendations for practice

Nomination for training

It is important that the nurse manager have the computer literacy of the professional nurses assessed prior to nominating them for training in the system. The nominated professional nurses need to attend computer literacy training to ensure that they meet the minimum requirements in computer literacy, can be successfully trained in the electronic system and can evolve to an expert level of competence.

The nurse manager should ensure that the professional nurses who will be trained will not be subject to any major changes in the near future, such as resigning. Training the staff to use the system as they are preparing to leave can be a waste of time and resources. Results of the study show that the professional nurses who participated in the study are close to or at retirement age.

During orientation of newly appointed nursing staff, the computer literacy of professional nurses and whether they will be working on the electronic system should already have been established. Should the staff member be eligible to work on the system, they need to be paired with a super-user to orientate them to the system.

Professional nurses already trained

Professional nurses may not retain everything they learn in the initial training; however, as they practice their skills, they may benefit from more advanced training to improve their skill level in the various functions of the system. Provision needs to be made for continuous training and assessment of skills to ensure that expert level of competence is reached and maintained. Competence in the electronic system should be a requirement for performance management.

Training on the electronic system

The nurse manager should arrange with the NIMS team to conduct initial and follow-up training. Initial training, inclusive of training in advanced features, should be done by the NIMS team. Training sessions should be grouped into basic or advanced features of the system. Nurse managers should identify and regularly train the super-users who can support other users. Emphasis on supportive training for the professional nurses will help

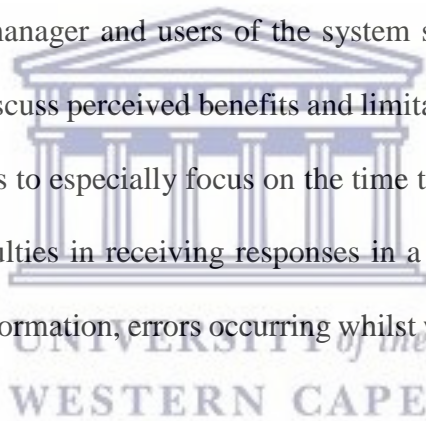
to ensure confidence, proficiency and success of the system. Ongoing training will ensure that the professional nurses use the system appropriately and efficiently. Nurse managers should ensure the availability of sufficient user manuals and quick reference guides for the professional nurses working on the system.

Quality assurance

The nurse manager needs to ensure periodic assessments to determine the extent of utilisation of the different system functionalities and manage improvements accordingly. By analysing all identified problems, the NIMS team can address and or work on solutions to improve the system and acceptance of the system, which will assist in the success of the system. The nurse manager and users of the system should conduct periodic focus groups to identify and discuss perceived benefits and limitations of the electronic system. The nurse manager needs to especially focus on the time taken to procure agency nurses and draw reports, difficulties in receiving responses in a timely manner, difficulties in generating or sending information, errors occurring whilst working on the system and any other obstacles.

Technical support

It is important that the nurse manager ensures that the equipment and Internet is acceptable for use, since inadequacies in this regard can lead to frustration and hamper the full implementation of the system. IT support should be available for the professional nurses working on the electronic system in the hospitals. There needs to be a good relationship between the nurse manager, professional nurses and the IT team of the hospital to ensure that the computer and networking is fully functional and that the professional nurses can use the nursing information system.



5.4.2 Recommendations for educators of the electronic system for staffing of agency nurses

Orientation training should be provided for new nurses, and continuous training should be provided for current nurses. The educators of the electronic system for staffing of agency nurses need to have flexible training methods and training schedules. They also need to, once computer literacy is established, adapt the training to the levels of competence. This may possibly imply different training for different groups, and customising the training to fit specific styles of learning and learning needs and goals.

5.4.3 Recommendations for research

No research has been conducted on the use of NIMS, whether for utilising it as an agency or staff module, and it is important that this system is investigated, taking into consideration resources, time and training of staff to use the system. A better understanding of the professional nurses' and nurse managers' frustrations about and satisfaction with an electronic system for staffing of agency nurses should be created. A possible mixed-method approach should be applied in future studies and should possibly include the support staff.

The following aspects may be considered for future research:

- What is the current situation in relation to the use of an electronic system for staffing of agency nurses in the primary and rural health care settings?
- What are the perceptions of the nursing agency about the use of an electronic system for staffing of agency nurses?

- What are the lived experiences of professional nurses about the use of an electronic system for staffing of agency nurses in the Western Cape?

5.5 THE LIMITATIONS OF THE STUDY

Certain challenges and difficulties were encountered in this study. The first challenge related to the assessment of the professional nurses since they were not always willing to participate in the research studies. Another issue was that some respondents were willing to complete the questionnaire but refused to sign the consent form, even though they were assured that it would remain anonymous, and could not be included in the study.

The low response rate of completing the instrument could be ascribed to various reasons:

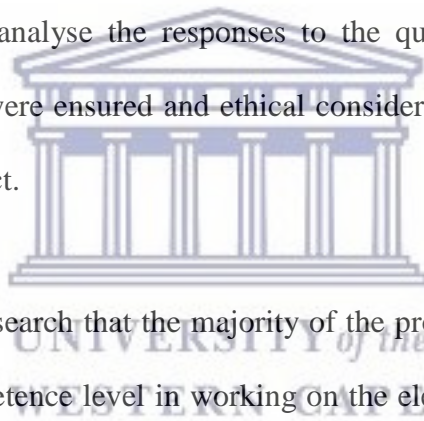
- When the population was established, it was based on the database of NIMS with regards to trained and registered professional nurses on NIMS and not the professional nurses who are actually utilising the system (not known):
 - Quite a large number of nurses who were trained never actually worked on the system after training and was not interested in completing the questionnaire
 - As the procurement of agency nurses have financial implications, nurse managers decided who may work on the system after the training was done and only a small percentage was selected
- Some nurses are heavily burdened with work and could either not complete the questionnaire, or forgot to do so.
- Professional nurses tend to delegate work on the system to support staff as they feel they are overburdened with clinical work.

5.6 CONCLUSION

The purpose of this study was to develop guidelines for nurse managers to promote the competence levels of professional nurses in utilising the electronic system for staffing of agency nurses in public hospitals in the Western Cape.

The study was based on a quantitative descriptive design. Total sampling of all professional nurses who were working at health facilities within the Metropole of the Western Cape was conducted. The 278 professional nurses were requested to complete a questionnaire during the survey in order to establish and describe their competence levels in utilising the electronic system (NIMS) for staffing of agency nurses. Descriptive statistics were used to analyse the responses to the questionnaire. The validity and reliability of the study were ensured and ethical considerations were adhered to during the entire research project.

It is evident from the research that the majority of the professional nurses have not yet reached an expert competence level in working on the electronic system for staffing of agency nurses, NIMS. Years of experience with regards to collaborative approach did show there is a difference in competence, but not for decision-making and resource planning assisted by NIMS reports. This is supported by previous research that despite years of experience staff may reach a ceiling effect of competence due to various reasons, it is therefore important to address the cause of stagnation, which the researcher has done in the guidelines as per above.



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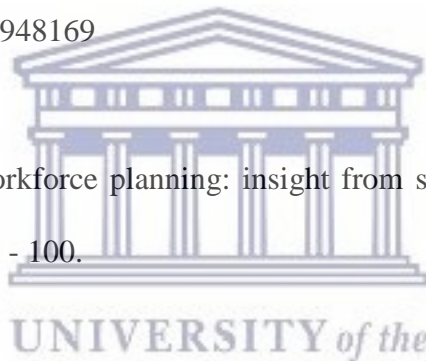


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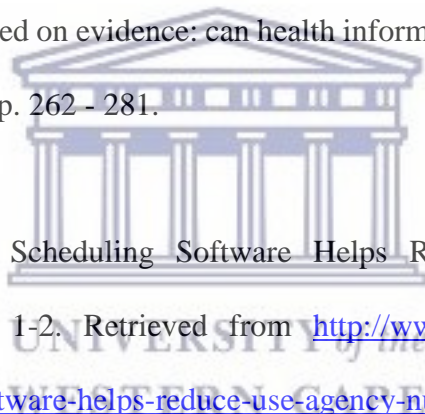
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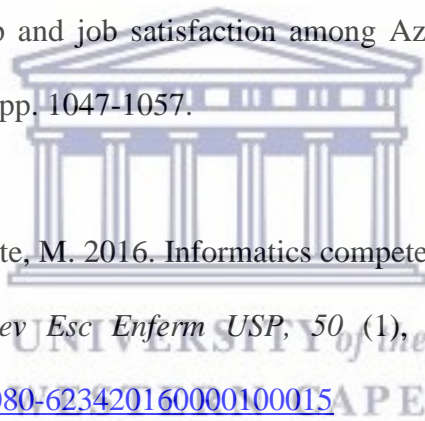
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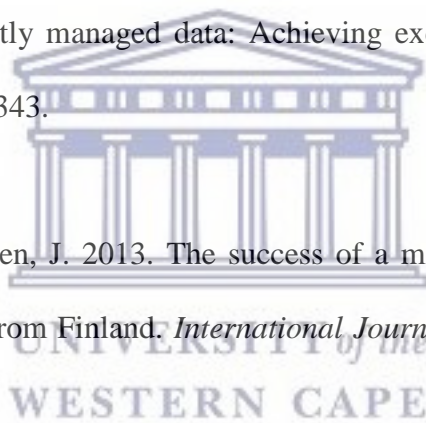
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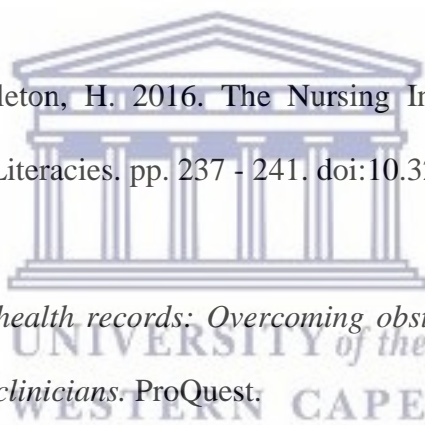
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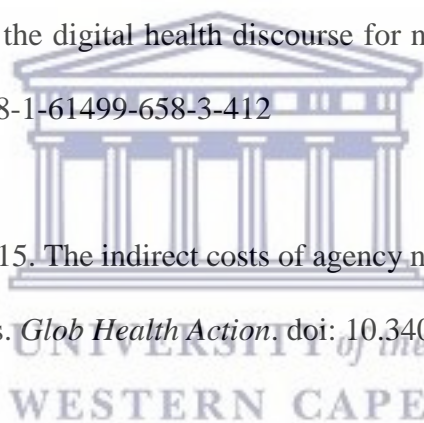
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Annexure A: Ethics approval



**OFFICE OF THE DIRECTOR: RESEARCH
RESEARCH AND INNOVATION DIVISION**

Private Bag X17, Bellville 7535
South Africa
T: +27 21 959 2988/2948
F: +27 21 959 3170
E: research-ethics@uwc.ac.za
www.uwc.ac.za

17 March 2017

Mrs MM van As
School of Nursing
Faculty of Community and Health Sciences

Ethics Reference Number: BM17/2/11

Project Title: Guidelines for nurse managers to promote the competency levels of professional nurses to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Approval Period: 10 March 2017 – 10 March 2018

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval. Please remember to submit a progress report in good time for annual renewal.

The Committee must be informed of any serious adverse event and/or termination of the study.


The permission from the health facility and/or health department must be submitted for record keeping to BMREC.

A handwritten signature in black ink, appearing to read 'Patricia Josias'.

*Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape*

PROVISIONAL REC NUMBER -130416-050

Annexure B: Permission to conduct research: National Health Research Data Base (NHRD)



The National Health Research Database

Log off My Account (martha.vanas@westerncape.gov.za) Help & Support




Home Submit New Proposal Manage Proposals Manage Researchers Researcher Resources About

MY RESEARCH PROPOSALS

Conclude Proposal

Submit New Proposal

You will find a list of research submissions that have been supplied and/or submitted by yourself.

Ref. No.	PHRC	Submitted?	Status of Application	Title of Study	Status of Project	Est. Completion Date	View Docs.	Comments	Amend
WC 2017RP39 522	WC	Yes	Approved	Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape	On-Going	2018/03/03			



UNIVERSITY of the WESTERN CAPE

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Annexure B1: Permission to conduct research: Mitchells Plain, False Bay & Eerste river



STRATEGY & HEALTH SUPPORT
Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House,, 8 Riebeeck Street, Cape Town, 8001
www.capecapegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape
Robert Sobukwe Road
Bellville
Cape Town
7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Mitchells Plain Hospital	Mr Hans Human	021 377 4306
False Bay Hospital	Dr Wendy Waddington	021 782 1121
Eerste River Hospital	Dr Adele Anthony	021 902 8019

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of

completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely



Dr A Hawkrige

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 15/5/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B2: Permission to conduct research: Stikland



STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Maritha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Stikland Hospital

Liezl Koen

021 940 4455

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report

completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely



Dr A Hawkrige

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 15/5/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B3: Permission to conduct research: Karl Bremer



STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Karl Bremer Hospital

Dr Linda Naude

021 918 1222

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report

(Annexure 8) to the provincial Research Co-ordinator
(Health.Research@westerncape.gov.za).

4. The reference number above should be quoted in all future correspondence.

Yours sincerely



Dr A HAWKRIDGE

DR A HAWKRIDGE
DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 15 | 5 | 2017.



UNIVERSITY of the
WESTERN CAPE

Annexure B4: Permission to conduct research: Victoria



Western Cape
Government

Health

STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Narton Rose House, 8 Ricobock Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Victoria Hospital

Patrick Jetha

021 799 1125

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely



Dr Hawkridge

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 15/5/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B5: Permission to conduct research: Mowbray Maternity



**Western Cape
Government**

Health

STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House., 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Mowbray Maternity Hospital

Mrs Karin Moore


021 659 5579

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely

 A. HAWKRIDGE.

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE:

19/5/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B6: Permission to conduct research: Helderberg & Khayelitsha



**Western Cape
Government**
Health

STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House., 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:


Helderberg Hospital	Dr Werner Viljoen	021 850 4704
Khayelitsha District Hospital	Dr Moses Witbooi	021 360 4386

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely

 AD HAWKRIDGE

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 24/5/2017



UNIVERSITY *of the*
WESTERN CAPE

Annexure B7: Permission to conduct research: Lentegour



STRATEGY & HEALTH SUPPORT
Health.Research@westerncape.gov.za
tel: +27 21 483 6957; fax: +27 21 483 9895
5th Floor, Norion Rose House., 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Lentegour Hospital

Ms Nadine Jacobs

021 370 1105

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report

(Annexure 8) to the provincial Research Co-ordinator
(Health.Research@westerncape.gov.za).

4. The reference number above should be quoted in all future correspondence.

Yours sincerely



Dr A Hawkrige

DR A HAWKRIDGE
DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 6/6/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B8: Permission to conduct research: Western Cape Rehab Centre



Western Cape
Government

Health

STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House., 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Mariha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Western Cape Rehab Centre

Laetitia Saville

021 360 4627

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report

(Annexure 8) to the provincial Research Co-ordinator
(Health.Research@westerncape.gov.za).

4. The reference number above should be quoted in all future correspondence.

Yours sincerely



AJ HAWKRIGE.

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 20/7/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B9: Permission to conduct research: Wesfleur



STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape
Robert Sobukwe Road
Bellville
Cape Town
7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Wesfleur Hospital

Dr Ziefred McConey

021 571 8052

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely



Dr A Hawkrige

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 20/7/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B10: Permission to conduct research: Valkenberg



**Western Cape
Government**

Health

STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House., 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape
Robert Sobukwe Road
Bellville
Cape Town
7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

Valkenberg Hospital Estelle Malgas **021 826 5805**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

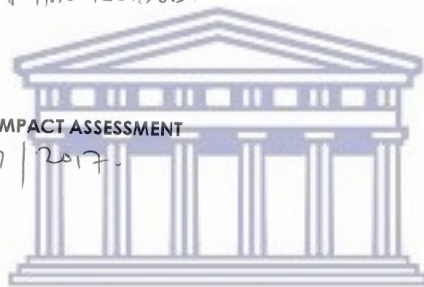
Yours sincerely

 A. HAWKRIDGE

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 28/7/2017



UNIVERSITY of the
WESTERN CAPE

Annexure B11: Permission to conduct research: New Somerset



STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel: +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:

New Somerset Hospital

Dr Donna Stokes

021 402 8263

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely



AS HAWKRIDGE.

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 22/8/2017.



UNIVERSITY of the
WESTERN CAPE

Annexure B12: Permission to conduct research: DP Marais & Brooklyn Chest



STRATEGY & HEALTH SUPPORT

Health.Research@westerncape.gov.za
tel. +27 21 483 6857; fax: +27 21 483 9895
5th Floor, Norton Rose House., 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_2017RP39_522
ENQUIRIES: Ms Charlene Roderick

University of the Western Cape

Robert Sobukwe Road

Belville

Cape Town

7535

For attention: Mrs Martha Van As

Re: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact following people to assist you with any further enquiries in accessing the following sites:


DP Marais Hospital	Sr Siziwe Ntsabo	021 508 7414
Brooklyn Chest Hospital	Sr Siziwe Ntsabo	021 508 7414


Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely


DR A HAWKRIDGE
DIRECTOR: HEALTH IMPACT ASSESSMENT
DATE: 23 / 8 / 2017



UNIVERSITY of the
WESTERN CAPE

Annexure C: Permission to conduct research: Red Cross WMC



Dr Jane Kowadza
Manager: Medical Services
Email: Jane.Kowadza@westerncape.gov.za
Tel: +27 21 658 5788 fax: +27 21 658 5166
RXH: RCC68

Ms M Van As
Red Cross War Memorial Children's Hospital

Dear Ms M Van As

APPROVAL OF RESEARCH

PROJECT TITLE: GUIDELINES FOR NURSE MANAGERS TO PROMOTE THE COMPETENCY LEVELS OF PROFESSIONAL NURSES, TO UTILISE THE ELECTRONIC SYSTEM FOR STAFFING OF AGENCY NURSES, IN PUBLIC HOSPITALS IN THE WESTERN CAPE

It is a pleasure to inform you that approval is hereby granted to conduct the above-mentioned study at Red Cross War Memorial Children's Hospital.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Jane Kowadza", written over a faint blue watermark of a classical building with columns.

Dr J Kowadza
Manager: Medical Services
Date: 02.05.17

**UNIVERSITY of the
WESTERN CAPE**

www.westerncape.gov.za

Annexure D1: Permission to conduct research: Groote Schuur



GROOTE SCHUUR HOSPITAL

Enquiries: Dr Bernadette Eick

E-mail : Bernadette.Eick@westerncape.gov.za

Mrs M. Van As
Department of Health: Nursing Directorate
4 Dorp Street
CAPE TOWN

E-mail: Martha.VanAs@westerncape.gov.za

Dear Mrs Van As

RESEARCH PROJECT: Guidelines for Nurse Managers to Promote The Competency Levels of Professional Nurses To Utilise The Electronic System for Staffing of Agency Nurses in Public Hospitals in the Western Cape

Your recent letter to the hospital refers.

You are hereby granted permission to proceed with your research which is valid until **30 April 2018**.

Please note the following:

- a) Your research may not interfere with normal patient care.
- b) Hospital staff may not be asked to assist with the research.
- c) No additional costs to the hospital should be incurred i.e. Lab, consumables or stationary.
- d) **No patient folders may be removed from the premises or be inaccessible.**
- e) Please provide the research assistant/field worker with a copy of this letter as verification of approval.
- f) Confidentiality must be maintained at all times.
- g) Should you at any time require photographs of your subjects, please obtain the necessary indemnity forms from our Public Relations Office (E45 OMB or ext. 2187/2188).
- h) Should you require additional research time beyond the stipulated expiry date, please apply for an extension.
- i) Please discuss the study with the HOD before commencing.
- j) Please introduce yourself to the person in charge of an area before commencing.
- k) On completion of your research, please forward any recommendations/findings that can be beneficial to use to take further action that may inform redevelopment of future policy / review guidelines.
- l) **Kindly submit a copy of the publication or report to this office on completion of the research.**

I would like to wish you every success with the project.

Yours sincerely

DR BERNADETTE EICK
CHIEF OPERATIONAL OFFICER
Date: 12 May 2017

C.C. Mr L. Naidoo, Mr A. Mohamed
G46 Management Suite, Old Main Building,
Observatory 7925

Tel: +27 21 404 6288 fax: +27 21 404 6125

Private Bag X,
Observatory, 7935

www.capegateway.gov.za

Annexure D2: Permission to conduct research: UCT



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room 833-48 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6482
Email: jumayah.ardelien@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

25 April 2017

HREC REF: 252/2017

Mrs M van As
Department of Health
Directorate of Nursing Services
4 Dorp Street, 10th floor
Cape Town

Dear Mrs van As

PROJECT TITLE: GUIDELINES FOR NURSE MANAGERS TO PROMOTE THE COMPETENCY LEVELS OF PROFESSIONAL NURSES, TO UTILISE THE ELECTRONIC SYSTEM FOR STAFFING OF AGENCY NURSES, IN PUBLIC HOSPITALS IN THE WESTERN CAPE

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has formally approved the above-mentioned study.

Approval is granted for one year until the 30 April 2018.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate Institutional approval before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 252/2017

Annexure E: Permission to conduct research: Tygerberg



TYGERBERG HOSPITAL
REFERENCE:
Research Projects
ENQUIRIES: **Dr GG**
Marinus
TELEPHONE: **021 938 5752**

Ethics Reference: BM17/2/11

TITLE: Guidelines for nurse managers to promote the competency levels of professional nurses to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

Dear Mrs Van As

PERMISSION TO CONDUCT YOUR RESEARCH AT TYGERBERG HOSPITAL.

1. In accordance with the Provincial Research Policy and Tygerberg Hospital Notice No 40/2009, permission is hereby granted for you to conduct the above-mentioned research here at Tygerberg Hospital.
2. Researchers, in accessing Provincial health facilities, are expressing consent to provide the Department with an electronic copy of the final feedback within six months of completion of research. This can be submitted to the Provincial Research Co-Ordinator (Health.Research@westerncape.gov.za).


DR GG MARINUS
MANAGER: MEDICAL SERVICES


DR D ERASMUS
CHIEF EXECUTIVE OFFICER
Date: 3 May 2011

Annexure F: Information sheet



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-9592274 Fax: 27 21-959 2271

E-mail: Martha.VanAs@westerncape.gov.za

INFORMATION SHEET

Project Title: Guidelines for nurse managers to promote the competency levels of professional nurses, to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape

What is this study about?

I am Martha van As, registered for a Masters in nursing science at the University of the Western Cape with Dr M. Bimerew as my supervisor and Prof K Jooste as my co-supervisor. I am inviting you to participate in this research project because you are a professional nurse knowledgeable or trained in NIMS working within the hospitals of the Western Cape Government Health Metro-pole. The study will explore the competency levels of professional nurses to use an electronic system, for procuring agency nurses, in public hospitals in the Metro-pole, Western Cape. This will lead to guidelines for nurse managers to promote the competency levels of professional nurses to utilize the electronic agency staffing system (NIMS) in public hospitals in the Western Cape.

What will I be asked to do if I agree to participate?

Questionnaires will be handed out to you to complete at your place of work. The researcher will collect the completed questionnaire, placed in the sealed envelope provided, from you. Written consent for the questionnaires is needed. Questionnaires will be stored under lock and key for five years after the results of the project have been published before it will be destroyed. Only my supervisor, statistician and the researcher will have access to this information.

Would my participation in this study be kept confidential?

The researchers undertake to protect your identity and the nature of your contribution. *Anonymity:* The questionnaires will be allocated numbers to ensure that your identity cannot be linked to responses, published in any format.

Confidentiality: In the study, the researcher's responsibility is to prevent data gathered during the study to be available to any other person except to the researcher, supervisor and statistician. If we write a report or article about this research project, your identity will be protected.

What are the risks of this research?

There may be some risks from participating in this research study. You may find yourself to be uncomfortable/embarrassed or tired however your participation in this research is completely voluntary and you may stop participating at any time.

What are the benefits of this research?

The significance of the study is that the results could be useful to the Western Cape Government Health with the purpose to describe actions to promote optimal implementation of an electronic agency staffing system (NIMS) in the Western Cape health care facilities.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by Martha M van As, registered at the University of the Western Cape. If you have any questions about the research study itself, please contact:

Researcher: Martha M van As
Directorate Nursing Services
10th Floor, 4 Dorp Street
Cape Town
8000
Cell Phone: 0732165610
Email: Martha.VanAs@westerncape.gov.za

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Acting Head of School of Nursing

Dr S Arunachalam
Tel. : 021 9593024

Email :- sarunachallam@uwc.ac.za

Dean of the Faculty of Community and Health Sciences:

Prof José Frantz
University of the Western Cape
Private Bag X17
Bellville 7535
chs-deansoffice@uwc.ac.za

This research has been approved by the University of the Western Cape's Senate Research Committee

Annexure G: Consent form



UNIVERSITY OF THE WESTERN CAPE

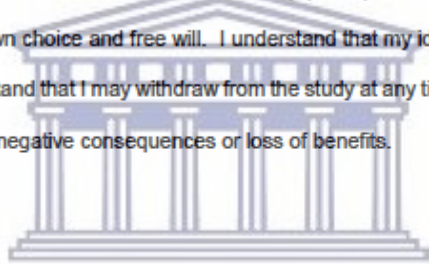
Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-9592274 Fax: 27 21-959 2271

E-mail: Martha.VanAs@westerncape.gov.za

Title of Research Project: Guidelines for nurse managers to promote the competency levels of professional nurses to utilise the electronic system for staffing of agency nurses, in public hospitals in the Western Cape.

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.



Respondent's name.....
UNIVERSITY of the

Respondent's signature.....
WESTERN CAPE

Date.....

Annexure H: Questionnaire

Utilising an electronic system for staffing of agency nurses (NIMS: Agency module)

Section 1: Demographical information

This section of the questionnaire refers to the background information. Although some items may appear sensitive in nature the information will provide the researcher with the uniqueness of the different groups of respondents.

1. **Current post in nursing** (please tick one box)

A professional nurse in charge of a unit	
A professional nurse working in a unit	

2. **Age (in years)**.....

3. **Highest qualification in nursing** (please tick one box)

Diploma in nursing (R683: 2-year bridging)	
Diploma in nursing (R425: 4 years)	
Degree in nursing (R425: 4 years)	
Post basic qualification	

4. **Years of experience after registration as a professional nurse**

Health facility you are currently working in (please tick one box):

PHC facility	
District hospital	
Secondary hospital	
Tertiary hospital	
Specialized e.g. Psychiatry, WCRC, Mowbray Maternity	

Please answer all the items BELOW by placing a cross (X) in the appropriate block using the extent to which you are proficient (being an expert):

- 1 = Totally unproficient (Novice)
 2 = Unproficient (Advance beginner)
 3 = Neither proficient or unproficient (Competent –bare **minimum** required for acceptability)
 4 = Proficient (a level of expertise that is **above the minimum**)
 5 = Totally proficient (Expert / superior/master)

	Novice	Advance beginner	Competent	Proficient	Expert
6. Word processing (e.g. using Word in Microsoft office)	1	2	3	4	5
Spreadsheet (e.g. Excel in Microsoft office)	1	2	3	4	5
Database (e.g. Access in Microsoft office)	1	2	3	4	5
Email (e.g. Outlook, GroupWise)	1	2	3	4	5
Internet (use for access to World Wide Web/ www)	1	2	3	4	5

NIMS COMPETENCY QUESTIONNAIRE

Tel: +27 21 483 8589 /3802

Martha.VanAs@westerncape.gov.za

1

Intranet (networking within the Department of Health)	1	2	3	4	5
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7. Have you received formal training in any of the following? (please tick appropriate box)

Word processing (e.g. using Word in Microsoft office)	Yes	No
Spreadsheet (e.g. Excel in Microsoft office)	Yes	No
Database (e.g. Access in Microsoft office)	Yes	No
Email (e.g. Outlook, GroupWise)	Yes	No
Internet (use for access to World Wide Web/ www)	Yes	No
Intranet (networking within the Department of Health)	Yes	No

8. Did you receive training from the NIMS team in utilising the NIMS: Agency module)? (please tick one box)

Yes ; No

9. How long in years have you been using NIMS?

10 Do any of the items in the below restrict your use of NIMS? (please tick appropriate box)

	Never	Sometimes	Always
Location of the computer I am supposed to use			
Unreliable connections to the network			
Do not have time to work on the computer			
My age			
My computer/IT knowledge			
My confidence in use			
I don't have any interest in using the computer			

Section 2: Competency in the electronic system for staffing of agency nurses
(NIMS: Agency module)

Please answer all the items BELOW by placing a cross (X) in the appropriate block using the extent to which you are proficient (being an expert):

- 1 = Totally unproficient (Novice)
- 2 = Unproficient (Advance beginner)
- 3 = Neither proficient or unproficient (Competent –bare **minimum** required for acceptability)
- 4 = Proficient (a level of expertise that is **above the minimum**)
- 5 = Totally proficient (Expert / superior/master)

Indicate to what extent you are proficient in the utilisation of the NIMS system:		Totally unproficient	Unproficient	Neither proficient or unproficient	Proficient	Totally proficient
Section 2.1: Collaboration						
11	I establish a collaborative relationship with the NIMS team to ensure guidance on NIMS when facing challenges with agencies and or agency nurses.	1	2	3	4	5
12	I organize NIMS training session with the NIMS team and participate in the training sessions to motivate my colleagues to better their knowledge of the system.	1	2	3	4	5
13	I participate in fine-tuning discussions with my colleagues and the NIMS team to improve the roll-out of NIMS.	1	2	3	4	5
14	I can continue with a request for agency staff on NIMS where my colleague has left off.	1	2	3	4	5
15	I understand the role and functions of the other person/s e.g. administrative staff and colleagues in NIMS.	1	2	3	4	5
16	I know how to obtain support via desktop / telephone from the NIMS team should it be necessary.	1	2	3	4	5
17	I know how access NIMS any time to be of assistance to my colleagues.	1	2	3	4	5
18	I can assist staff of other units in the health facility to e.g. do an emergency booking.	1	2	3	4	5
Section 2.2: Utilising the system reports to support decision-making						
19	I can compile different reports for management from NIMS to assist me in motivation for more staff or agency budget.	1	2	3	4	5
20	I can generate a report from NIMS to determine expenditure in order to request agency nurses within available/remaining budget.	1	2	3	4	5
21	I draw reports from NIMS to establish the trend of different categories of agency staff used in the different disciplines, allowing me to plan strategically.	1	2	3	4	5
22	I can use NIMS to determine trends e.g. which months my health facility/unit used the most agency staff.	1	2	3	4	5
23	I am confident to write a motivation to management to approve the booking of agency staff on NIMS.	1	2	3	4	5
24	I know how to choose from the list provided (PDF) in NIMS the best skilled agency nurse for service need.	1	2	3	4	5
Section 2.3: Effective and appropriate utilisation of resources						
25	I validate my decisions regarding staffing of my health facility/unit by using electronic reports on NIMS when reporting to management.	1	2	3	4	5
26	I can capture the attendance of agency staff on NIMS including absenteeism.	1	2	3	4	5
27	I can obtain information from NIMS regarding category of staff per discipline that worked to report to management on staffing needs.	1	2	3	4	5

Indicate to what extent you are proficient in the utilisation of the NIMS system:		Totally unproficient	Unproficient	Neither proficient or unproficient	Proficient	Totally proficient
28	I can monitor on NIMS the total of hours/shifts worked by agency nurses.	1	2	3	4	5
29	I can audit agency nurses' attendance time sheets with control sheets on NIMS to monitor expenditure.	1	2	3	4	5
30	I can capture retrospective bookings of agency nurses on NIMS.	1	2	3	4	5
31	I can do emergency booking of agency nurses' on NIMS, that is emergency bookings on short notice due to increase bed occupancy, patient acuity, and staff being absent.	1	2	3	4	5
32	I can book in advance up to one (1) month on NIMS to ensure agency staff for annual, maternity, study and long-term sick leave.	1	2	3	4	5
Section 2.4: Quality Assurance: administrative factors						
33	I access NIMS through an established link on the computer.	Yes		No		
34	I know when staff are working double shifts as it is flagged red on NIMS and I cannot book the person.	Yes		No		
35	I have my own password/username to access NIMS.	Yes		No		
36	I understand that NIMS have a backup system that enables me to recover data immediately preventing agency nurse requests to be affected.	Yes		No		
37	I understand the process to follow when lodging a complaint of agency nurses e.g. not performing that was booked on NIMS.	Yes		No		
38	I attend the quarterly meetings between the nursing agency, nurse managers and the NIMS team to discuss and address challenges/problems experienced with NIMS.	Yes		No		
39	I access the NIMS system daily to monitor any deviation from the duty roster.	Yes		No		
40	I follow guidelines of the NIMS circular and step-by-step guide to prevent non-attendance of agency staff.	Yes		No		
<p style="font-size: 2em; opacity: 0.5;">WESTERN CAPE</p> <p>THANK YOU FOR PARTICIPATING</p>						

Annexure I: Editing certificate

LINGUAFIX

EDITING AND TRANSLATION / REDIGERING EN VERTALING

☎ 0826816232 / vnhelene@gmail.com

www.linguafix.net

07/03/2018

This letter is to record that I have completed a language edit of *Guidelines for nurse managers to promote the competence levels of professional nurses in utilising an electronic system for staffing of agency nurses in public hospitals in the Western Cape* by Martha van As.

The editing comprised:

- Editing grammar, punctuation, spelling and usage
- Attending to the consistency of style, tone and voice
- Pointing out confusing sentence structures, wrong word choices and ambiguous passages
- Pointing out incomplete sentences or phrases
- Querying or eliminating redundancies and verbosity
- Identifying any problems in matters of substance or structure



Helene van Niekerk

Freelance editor and translator; short course presenter in Editing Methodology (US)

M.Diac. (Play Therapy)

Postgraduate Diploma (Editing and Translation)

Short course in Academic Editing