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Development of guidelines to improve the implementation of infection prevention and control measures in public hospitals in Gauteng Province

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Abstract

The purpose of this study was to develop guidelines that will improve the implementation of the infection prevention and control measures (IPC) in the public hospitals, in Gauteng Province.

Method: An explanatory, mixed methods design was used, involving the collection of qualitative data after a quantitative phase, to follow up in more depth on the quantitative data in the first quantitative phase of the study, 120 questionnaires, of 40 questionnaires were distributed per hospital. Data was collected from three (3) public hospitals, namely an academic, district and regional hospitals to collect data from nurses working there.

The second qualitative phase was conducted, using semi- structured interviews, with the sample of nurses who participated in 5 focus group from the different hospitals under study. In this exploratory phase, follow up, factors influencing implementation of infection prevention and control were explored. The exploratory follow up was to build upon the initial quantitative results in order to develop a systematic guideline. The qualitative data was transcribed, and the quantitative data was analysed by a statistician. Using the mixed method, both data were integrated and triangulated in developing the guidelines for nurses working with patients on preventing hospital acquired infections in the wards.

Results: Most nurses have been found that they have attended an hour to a day IPC training, which they alluded has no impact to their implementation as is too short. Study also found that institutions where nursing qualifications was obtained has significant impact to implementation of IPC measures. There is an agreement that continuous training on

Conclusion: The Inclusion of IPC module must be recognised, to inform and influence nurses. Continuous in-service training provided on IPC measures to both nurses, student nurses and nurse managers for updates towards changing health systems. Nurses need to be involved in drafting the IPC policies and in procurement of material resources as work on the ground with patients. Support program to nurse managers need to be developed.

Keywords

implementation, nurses, infection prevention and control, hospital acquired infections, public hospitals, measures

1. Introduction

An observational study conducted by Brouwer, et al (2014) found that despite the policy on IPC management being available in the hospital; very few recommendations were found to be applied in practice, and many nurses had a poor knowledge of the related policies and its practices. Ider et al (2012: 174-175) study done in Mongolia highlights that the compliance of hand hygiene, the attitude and knowledge among the nursing staff are the biggest challenge in non-adherence to infection control measures in the public hospital. Gammon (2008:157-167) in United Kingdom (UK), supported that there was sub-optimal compliance to the IPC program in the public hospitals, evidenced by poor IPC measures, such as hand washing, isolation and aseptic techniques during wound dressing varied amongst the healthcare workers, despite the available resources and the knowledge of the nurses.

Chen, Liu and Hwang's (2011:450-457) study in Taiwan showed that it was more expensive to control infections than to prevent them, therefore adherence to IPC policies and measures was noted to be very important. A budget was needed in the hospital to provide essential preventative measures in, to minimise infections. Staffing and cost had an enormous impact to minimise infections in relation to the IPC program, and there were enormous costs incurred during an outbreak of any infection.

The Global burden of hospital acquired infections

Health care-associated infections (HCAI), also referred to as "nosocomial" or "hospital" infection, is defined as an infection arising in patients, during hospital care. This infection was not present as at time the patient was admitted and as at the time of arrival at the health facility (WHO 2011). HCAI must be reported as the most frequent adverse event that must be reported monthly, when a patient becomes infected in the health institution, during in-patient care. No institution or country has claimed to have a direct solution or to have solved the problem of HCAIs yet. Data based from several countries has estimated that yearly, many patients around the world are affected and some succumb due to HCAIs

Systematic reviews of literature conducted by Ider et al (2012: 175) identified that both developed and developing countries have high numbers of cases of the HCAI problem. Ider et al (2012: 175) informed that HCAI as the most frequent adverse event in health care, was the biggest challenge around the world, and remains unknown due to the difficulty in obtaining reliable data. However, the burden of HCAI results in prolonged lengths of hospital admission days, increased micro-organisms' resistance to antimicrobials, and related deaths due to adverse events (WHO 2019). The Surveillance systems in the infection prevention and control (IPC) programme is the cornerstone to identify and manage HCAIs (Allegranzi, et al 2011:228-241).

Effective surveillance systems on the efficacy of nosocomial infection control should prevent a significant proportion of HCAIs from occurring

The burden of Hospital Acquired Infections in South Africa

After several reports in South Africa on the establishment of a hospital-wide, surveillance system, as it was not available in the health care institution, South Africa has now reported a system for the first of its own kind, NDoH' s Ideal Clinic Facility Framework (NDoH 2018:6-354). The intention of the surveillance systems was to put in place comprehensive baseline data, whose effect was to lead to the reduction of HAIs on a yearly basis (Lowman 2016: 489-490).The envisaged Clinic Facility Framework exists to benchmark and ascertain the current state of practices envisaged under the IPC framework at public hospital facilities. The Ideal Health Facility Framework is composed of ten (10) components and thirty-two (32) subcomponents. Sub-component eighteen (18) and ten (10) describes the measure for IPC hygiene and cleanliness respectively. (NDoH 2018: 36-87).

Despite, the availability of personnel development programs through education and training , procedures, well designed policies and detailed guidelines regarding prevention and control of infections practices, the statistics presented at meetings attended by the researcher, showed that the infection rates in the public hospital was very high. Very important functions of the infection control practitioners were to manage the challenges, and to control and prevent the outbreaks of infection within the health institutions. However, the implementation of IPC measures in the wards, remained poor, as evidenced by the recurring infections outbreaks, within certain health institutions. The Office of the Health Standard Compliance (OHSC) in South Africa conducted audits on the prevention and control of infections in different public hospitals, in the Gauteng Province in 2013 (OHSC, 2013). Despite, having infection prevention and control policies and trained infection prevention practitioners, the findings/results showed a worrying trend of non-compliance towards the prevention and control of infections standards and required practices. Therefore, the need to develop and to promote the execution of measures meant to prevent and control infection in the public hospitals (The Auditor General's Report, 2012).

The researcher attempted to develop guidelines to enhance the effective execution of measures meant to prevent and control infection in the public hospitals in Gauteng Province.

2. Methodology

This study employed the mixed methods research design. Creswell (2015) asserts that the mixed methods research integrates both the quantitative and qualitative research methodology and procedures in one study. The explanatory, mixed methods design was used, as well as the concurrent triangulation design. In the quantitative phase of the study, questionnaires were availed to the nurses employed in a public hospital. The questionnaire included questions that sought to explore the factors that influences the implementation of infection prevention and control measures in the public hospital. In the qualitative phase, the researcher made use of semi structured interviews to elicit responses from participants, with the same sample of nurses who have completed the questionnaires, until data saturation has been achieved. In this qualitative follow up phase, the factors influencing the implementation of infection prevention and control was explored. The quantitative data was analysed by a statistician, and the qualitative data was transcribed by the researcher for the purposes of open coding. Analysing and interpreting both the data, assisted the researcher with the

findings, to conceptualise and develop the guidelines that will influence the implementation of IPC measures in the public hospitals.

3. Results

Below are the results that are categorized into Quantitative (3.1) and Qualitative(3.2) as the study is mixed methods research design. The researcher had not decided on the specific number of nurses (non-finite population) from the 3 sampled hospitals. However, determining the sample sizes involve resource and statistical issues. The researcher needed more of nurses to participate, as such ,to determine the sample of unknown population, mathematical formular was used to construct a 95% confidence interval for the p value with a margin of error equal to 4%, the following formula was used to estimate the number of nurses (sample) from each hospital in an unknown population on a 95% standard normal deviation is as follows: $n= Z^2(p)(1-p)/ C^2 =361$. However, the participation of the nurses was taken into consideration, through their willingness and their rights were explained before they participate. Therefore, the sample size n=120 (361/3) of the 3 different hospitals n=120 (361/3). One hundred and twenty questionnaires were printed for distribution, and were equally divided to three hospitals (120/3)= 40 questionnaires were distributed to individual hospital. Fourty questionnaires were distributed randomly to selected nurses for each hospital.

3.1. Quantitative data results

Hospital type

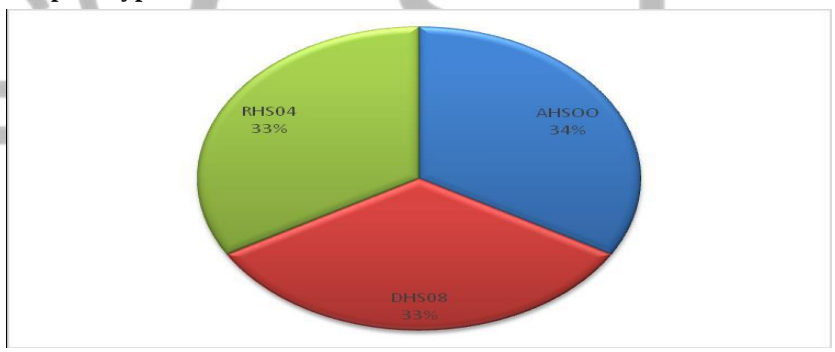

Figure 1: type of hospital

According to figure 1,120 participants across the three hospitals located in Tshwane district were recruited to participate in the study. A total of 120 participants responded to the questionnaires given, making it 100% response rate.

Results in depicts hospital sample distribution of the participants. Results shows that the study area consists of three hospital with equal percent representation of the sample. Each hospital constitutes 33% of the total sample size.

The DHIS, was developed to collect gathered routine data from all public health facilities in the country and is intended to support decentralized decision making and health service management. The DHIS allows nurses to analyses their levels of service provision, predict service needs, and assess performance in meeting health service targets. It also assists in distribution of resources, based on level of care provided.

Gender

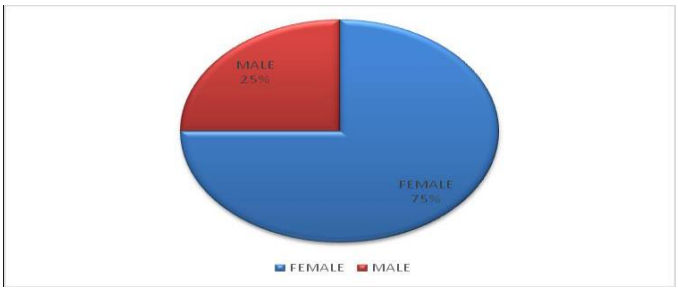

Figure 2

Figure 2 depicts the Gender distribution of the participants. Results shows that there were more females than males. Females were 75% compared to 25% male counterparts. Most nurses were therefore female. This is supported by the study done by Bannett-Landau and Henle (2014:10-13) who found that history of nursing profession by Nightingales image portrayed as women's profession. Beside that the professional acceptance in nursing role by society and colleagues have negative attitude regarding male nurses, though there is change of such perception. The study further found that besides being minority in nursing workforce, they found that there is significant increase of male nurses in different countries.

Qualification

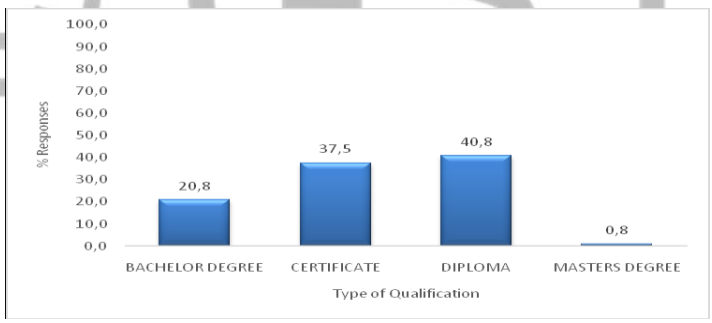

Figure 3: Qualification

The qualifications of the participants were required to determine who possess tertiary qualifications. It is of belief that the higher the knowledge the critical thinking of such nurse become. **Figure 3** depicts qualification distribution of participants. Results shows that most of the participants (40, 8%) had diploma followed by 37, 5% of participants with just a certificate while 20, 8% held bachelor's degree. There were few participants (0, 8%) with a Master's degree.

Institution where Qualifications obtained

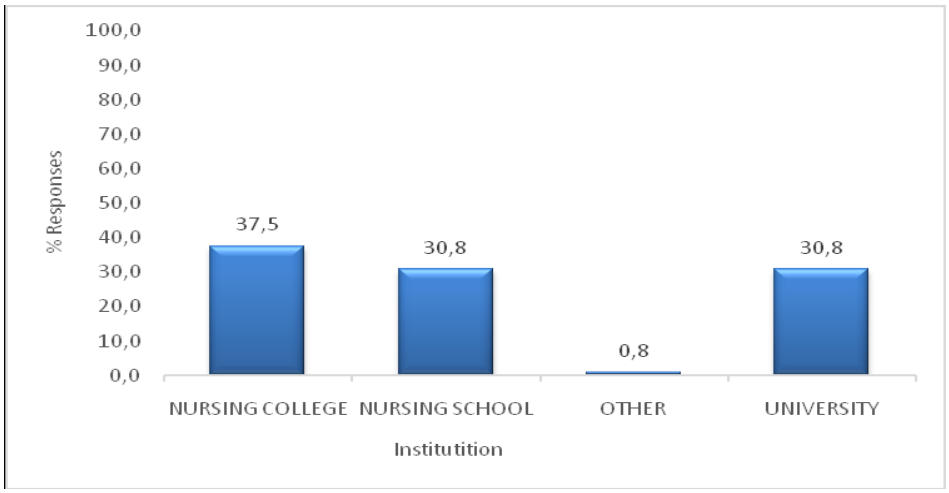

Figure 4: institution where qualification obtained

Figure 4 shows Institution where Qualifications of participants were obtained. Results shows that 37,5% of participants obtained their qualification in Nursing college while 30,8% from a Nursing school and another 30,8% from a university. There were few participants who indicated that their qualification was obtained from other (0,8%) institution. The South African Nursing Council (SANC) objectives are to promote provisioning of nursing services and regulation of nursing education; set and control standards and quality of nursing education; review the scope of practice of different categories of nurses and related nursing education training programmes (SANC, 2005). Its other function is to manage accreditation of Nursing Education Institutions that accommodate nurses and offers training and practices. The dominance of nursing schools shows the growing number of nurses as in need of training as nurses. This is supported by an article by IOL newspaper media published on 31 January 2016, titled "state blamed for state of nursing in SA" informed of the state of nursing in South Africa, where by idea of closing nursing schools, by the government were seen as contributed largely to the mass production of inadequately skilled and unqualified nurses in the country.

Study done by Hegarty et al (2009:6) found that the major trends in nursing education over the last century, has been towards professionalization through the lengthening of training phases, with the shift from a hospital-based apprenticeship model to professional education in institutions of higher learning. The study found significant weaknesses in the policy capacity of the main institutions, responsible for the leadership and governance of nursing. This has promoted the mushrooming of nursing schools and closure of government sponsored nursing colleges.

The IOL newspaper article supported the study done Hegarty et al (2009:6) that articulated that the decision might have led to a sharp drop in the standards of nursing as it opened a gap from which unscrupulous colleges and bogus training institutes mushroomed.

Experience

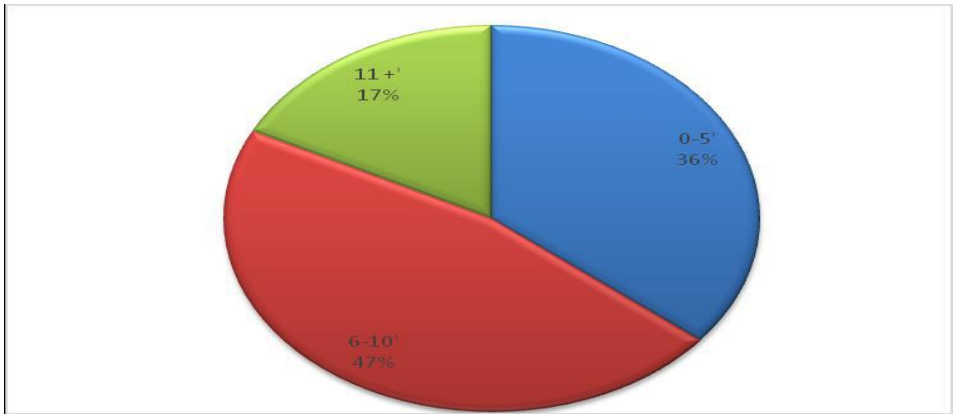

Figure 5: experience

Figure 5 depicts the number of years of experience in the nursing career. Results shows that 47% of participants had between 6-10 years of experience follows by 36% of participants with 5 years and below while 17% of participants had working experience of 11 years and above. The aim of the question on the participants' experience in nursing was to distinguish between participants who have five years' or less service, participants who have between six- and ten-years' service, participants who have between eleven years and above years' service. This distinction could assist with determining whether different opinions exist between the various groups of nurses regarding infection control measures.

The study done by McHugh and Lake (2011;276-287) study on the clinical nursing expertise, that was found as fundamental to quality of care, found that educational and experiential level of individuals nurse influence the clinical nursing expertise . The study noted that the number of years on job in similar situation create competence, however, competence was found not automatically confer to experience.

Experience was defined as the time in practice and self-reflection that allows preconceived notices and expectations to be confirmed or refined in real circumstances, e.g. when the nurse encounter patient condition and situation was not seen as experience, but reflection on encounters of circumstances that refine the nurse moment of decision making.

Reason is that nurses who have ten years' or longer service at nursing were involved in many changes of nursing care with major experience, as discussed in chapter 2 and that these participants were exposed to all the changes in the nursing service. The participants who have between six- and ten-years' service at nursing, had more exposure to total quality efforts after redefining the then nursing and professionalization of nursing. The participants who have less than four years' service most probably are still learning on quality improvement and changes in nursing care.

A study done by Acebedo-Uridiales, et al (2014:173) found that an experience in

nursing causes nurses to have natural and spontaneous respond during situations. Spontaneous respond is influenced by practical knowledge that the nurse acquires in a day to day patient care. They also found that the experiences describe a contextual practical knowledge in that the more experienced nurses develop as a natural and spontaneous response. In critical patients the application of everyday practical knowledge greatly influences their well-being. In those cases in which the nurses describe how they have protected the patients from error, this practical knowledge can mean the difference between life and death.

Type of the hospital

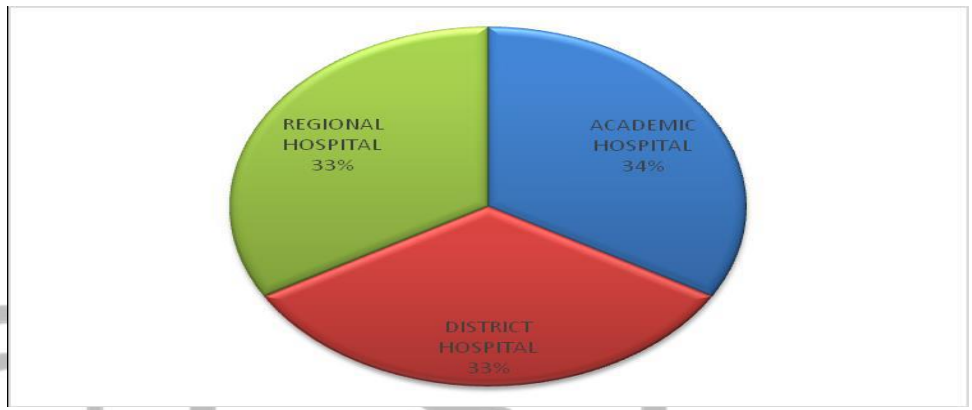

Figure 6: type of hospital

Figure 6 shows the type of hospital participants are working. The distribution is equal per each hospital type, i.e. 34% participants were in academic while 33% were from the regional hospital and 33% from district hospital.

Nurses category

Figure 7 below depicts the Nursing category participants belonging to. Results shows that majority of participant (61.7%) were professional nurse compared to 20.8% who were enrolled nurses and 17.5% Auxiliary nurse assistant.

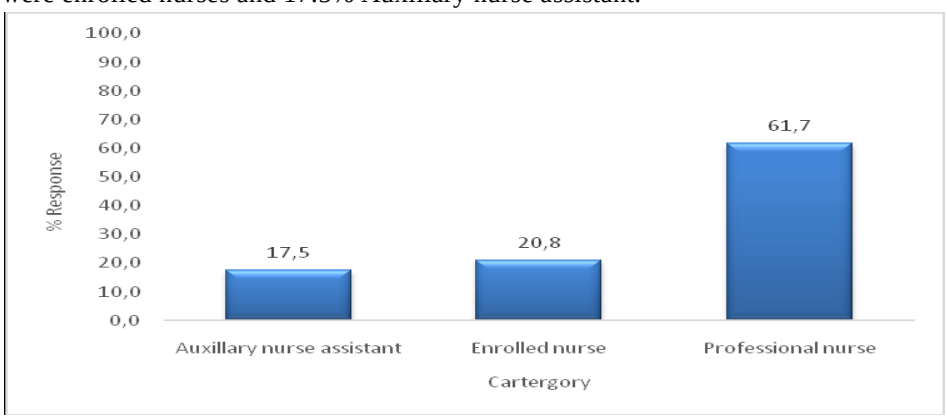

Figure 7: nurses' categories

The nursing category of the participants was used to make categories in response for the analysis of the data as shown in Figure 7. In nursing the categories which are hierarchical structure has different scope of practice and job description. This question aim was to find the most consistent number of participants in relation to their scope of practice as per South African Nursing council.

According to Government Notice Number R. 2598, Regulations Relating to the Scope of Practice of Persons Who are Registered or Enrolled under the Nursing Act, 1978, the following were noted as important for infection prevention and control measures, during nursing care. Only the practices related to infection prevention and control were elaborated in this study

The following chapters of scope of practices (SA Nursing Act 33 of 2005) were found to support that nurses as per categories have role to play on infection prevention and control:

Chapter 2: the scope of practice of registered nurses (professional nurse) informed that;

(a) The diagnosing of a health need and the prescribing, provision and execution of a nursing regimen to meet the need of a patient;

(b) The execution of a program of treatment or medication prescribed by a registered person for a patient;

(c) The treatment and care of and the administration of medicine to a patient, including the monitoring of the patient's vital signs and of his reaction to disease conditions;

(d) The prevention of disease;

(e) The prescribing, promotion or maintenance of hygiene of the patient;

(j) The facilitation of the healing of wounds and fractures, the protection of the skin in a patient;

p) The establishment and maintenance, in the execution of the nursing regimen, of an environment of a patient is promoted;

(q) Preparation for and assistance with operative and therapeutic acts for the patient;

(s) The provision of effective patient advocacy to enable the patient to obtain the health care he needs

While the Chapter 5 of the Act; the scope of practice of enrolled nurses, the following was highlighted;

(a) The carrying out of nursing care to fulfil the health needs of patients;

(c) The prevention of disease;

(d) The promotion and maintenance of the hygiene

(o) The promotion and maintenance of an environment

(q) Preparation for and assistance with surgical procedures and anaesthetic;

Chapter 6: the scope of practice of enrolled nursing assistants

(c) The care of a patient and the execution of a nursing care plan for a patient;

(d) The promotion and maintenance of the hygiene of a patient, a family and a community;

(e) The promotion and maintenance of the physical comfort, rest, sleep, exercise and reassurance of a patient;

(f) The prevention of physical deformity and other complications in a patient;

(n) The preparation for and assistance during surgical procedures;

All scope of practice shows that every category has the duty to address the infections either by patient hygiene or environmental cleanliness. National Health Act 61 of 2003, section 20, (1), informed that it is the duty of all health establishments to maintain a managed environment, to minimises the risk of infection to users, health personnel, and visitors.

Several studies of clinical evidence derived from case reports and outbreak investigations suggested an association between poor environmental hygiene and the transmission of microorganisms causing infection outbreaks in hospital. Attention had been drawn to perceived low standards in the cleanliness of hospitals, and this concern was addressed in quality assurance standards for hospital cleanliness in the introduction of National Core standards as discussed during literature review. Failure to comply with the standards may result to notices given for that establishment.

Evidence confirmed that there is association between environment and hospital acquired infections. Transmission of microorganisms from the environment to patients may occur through direct contact with contaminated equipment, or indirectly as a result of touching by nurses hands (Beggs, et al 2015: 462-474)

A study by Curran (2017:18-21) found that the environmental factors is a major issue in order to manage the infection prevention and control risks faced by nurses. The study suggested that rigorous training of nurses in cleaning and hygiene tasks were needed to improve the quality patient care. This was supported by CDC (2013) and WHO (2015) citing that environmental infection control strategies and engineering controls effectively prevent infection in the health care facilities.

Unit or Ward type

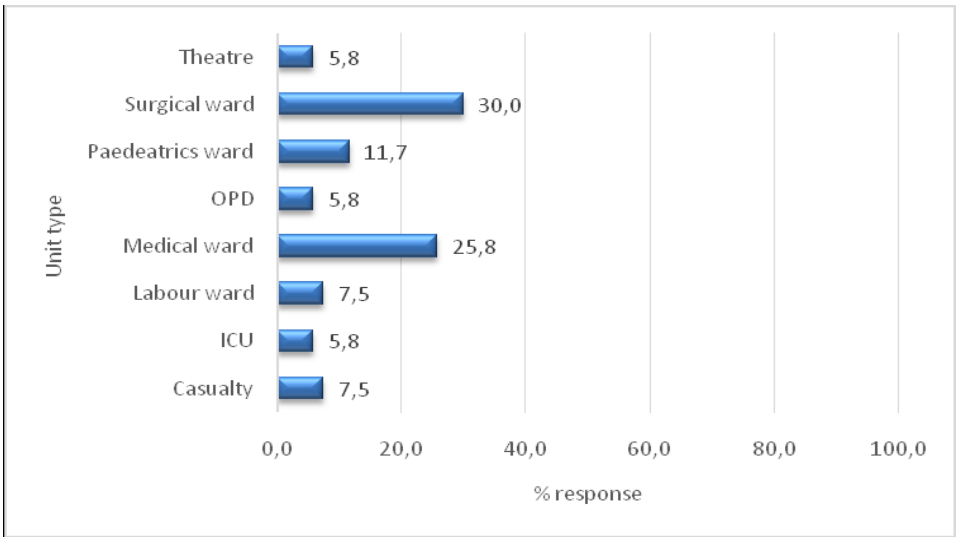

Figure 8: unit type

Figure 8 shows the type of unit participants are working under. The type of unit was used to identify the difference between the participants and area of practice. The area of practice were used to analyse the practices and knowledge of infection control practices per unit, example; Theatre, Intensive care units, surgical trauma , orthopaedics surgery and neonatal care units in responds for the data as shown in Figure 5.8. Results indicate that 30% of participants are working in Surgical ward at the time when this study is conducted followed by 25,8% of participants in medical ward while 11.7% were in Paediatrics ward. Participants working at Labour ward, casualty, OPD, Theatre and ICU were less than 8% and ranged between 5.8 % and 7.5%.

While nurse patient ratio remains detrimental to patient care, different units offer different level of care by different speciality of nurses. This implies that such different level of care per unit will have more imposed measures of infection prevention and control. Neonatal intensive care unit, Theatre, Intensive unit and some surgery high care need more skilled nurses than general wards (Jooste & Prinsloo, 2013:519-527). However, several reports and studies showed outbreak of infections in the intensive units than general wards (Bobo & Dubberke, 2010:324-334). Most of such studies found that nurses does not wash their hands properly during patient care (Amoran and Onwube (2013:156-163)

Section B of questionnaire

Infection control training

Studies done by Storr et al (2017:6) informed that training on infection prevention and control is of utmost value towards patient care, however, **figure 9** shows nurses remain less trained or knowledgeable towards infection prevention and control. Of 30.8%

(n=72) of nurses in hospital investigated showed not having any training to infection, whereas 9.2% (n=11) showed they cannot remember if training ever happen as shown in figure 9.

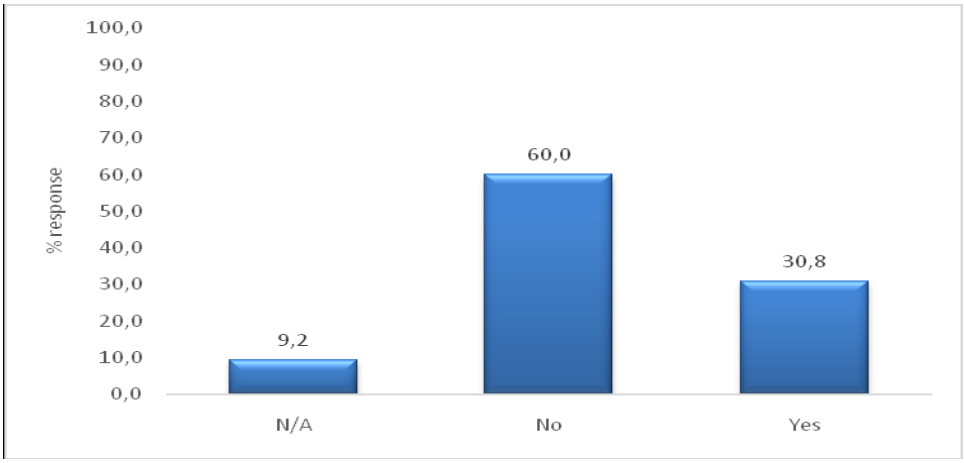

Figure 9: Infection control training

It was also noted in the study by Salem (2019: 422-425) whereby the results revealed that most of the nurses had good knowledge about infection control measures, but they showed lack of practice in hand washing and using gloving which are the most significant items to prevent transmission of infection. The study suggested that nurse managers need to supervise the nurses on the practicing infection prevention standards and techniques and monitor nursing adherence to policies of the hospital mean while promoting feedback on practice, individual reinforcement and appropriate rewards for the good practice.

According to Gilbert and Kerridge (2019:212), the training of human resources in nursing with the emphasis on infection prevention and control was found challenging, especially due to the constant evolution of the theme. It was suggested that nursing education requires, to overcome conceptual weaknesses and misconceptions for the development of safe health care settings.

Duration of the IPC training

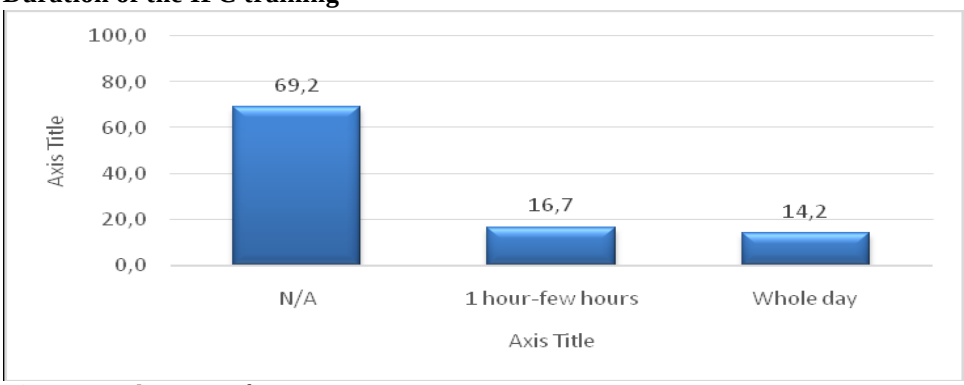

Figure 10: duration of training

Figure 10 above depicts the duration of the IPC training attended by Participants. Although majority of the participants did not attend the IPC training, 16.7% of the participants attended for 1 to few hours while 14.2% attended the whole day.

Koo et al (2016:1241-1246) did the study to assess the effectiveness of an educational program in increased knowledge of infection prevention and control measures. They found that an interactive training, improved IPC measures to nurses especially for those involved in direct patient care. Direct patient care was found to be any aspects of the health care of a patient, including treatments, counselling, self-care, patient education and administration of medication. The study is focusing to the nurses who are directly involved of patient care.

Study by Chitimwango (2017: 91) with that of Say et al (2014:43) concluded that, despite performing well in knowledge and showing a positive attitude towards infection prevention and control, nurses had unsatisfactory practice levels, regarding infection prevention and control, that tend to expose the patients to infection-related diseases. A study also found that IPC was substandard in most educational institutions and those offering it have showed sub minimal standard on style or manner the way is delivered Chitimwango 2017: 91)

Type of IPC training attended

		Frequency	Percent
Valid	N/A	83	69,2
	Certificate	7	5,8
	In-service training	30	25,0
	Total	120	100,0

Table 1: type of training

Table 1 shows the type of IPC training attended by the participants. Results shows that 25% attended the in-service training while 5.5% of the participants attended training in which they were certificated.

IPC update information

Figure 11 below depicts participant's responses regarding recently receiving IPC update of information. Results shows that majority of participants (81.7%) have been receiving IPC information update recently compared to 5.8% that were not receiving the IPC information.

Figure 11 elaborate the duty of the management to take care of the nurses and need to provide the suitable and sufficient information and training more often in order to ensure that the nurses are competent to carry out the nursing activities. Management also ensure that the nurses remain competent by providing refresher training at appropriate

intervals (Amoran and Onwube 2013:158-161). Prevention of infections is the primary aim of nurses in improving of patient quality care, as such current practices and care bundles need to be known in order to align with current practices. A care bundles are set of evidence informed practices or intervention that are performed collectively and reliably in order to improve the standard of quality patient care with the aim to prevent and manage the different infections (McCarron 2011;30-33) The care bundle are the on-going process that has to be repeated consistently until the patient status has been improved. McCarron (2011;30-33) informed that such process or steps assist in reducing infections incidence as such decreases length of stay of patient.

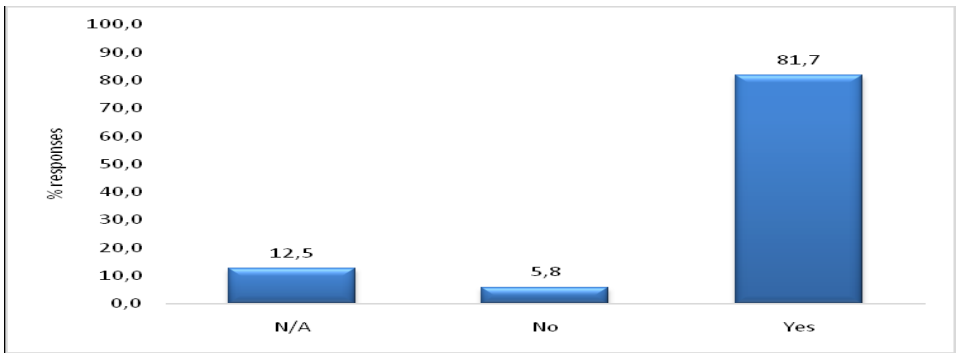

Figure 11: IPC information

How often IPC update information is received

Participants that indicated that they do receive update of IPC information, 26.7% receives the update monthly followed by those who receive when necessary, and 6.7% weekly as indicated in **figure 12**. There is a 20% of the participants who were not sure how often do they receive the IPC information.

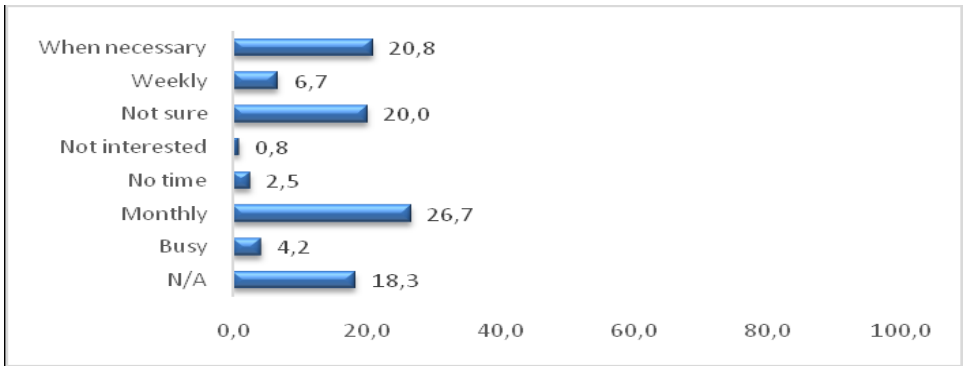

Figure 12: How often is IPC information updated

-Consistence and current practices of IPC

The participants were asked if IPC considered during nursing report taking, during handover, ward rounds and discharge summary. This question was asked in order to find if nurses do consider the current practices and consistence in putting theory into

practices. Study done by Dohle and Dawson (2017:330-244) on applying knowledge into practices, found that people struggle to transfer the knowledge into decision making, as such care should be taken not to assume that accurate information on IPC will results in decisions by nurses that help to avoid non-adherence.

IPC considered during nursing report taking

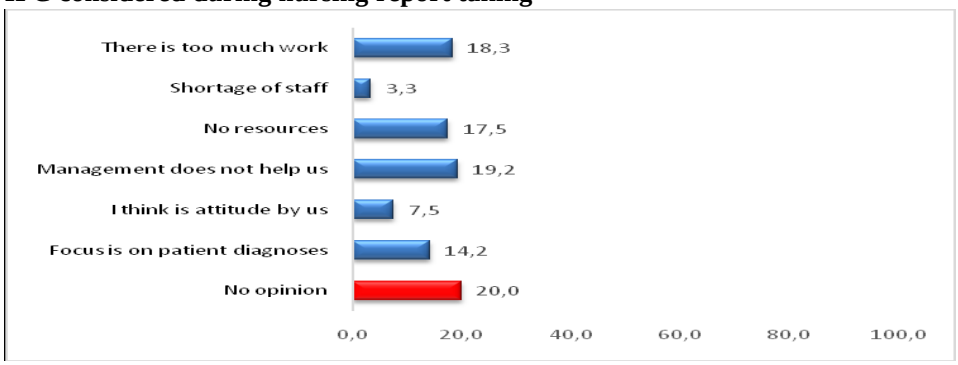

Figure 13: Consideration of IPC measures

Figure 13 depicts If IPC considered during nursing report taking, during handover, ward rounds, discharge summary. Majority of participants (80%) indicated that IPC is not considered during nursing report taking, during handover, ward rounds, discharge summary compared to 14.2% of participants that do consider during nursing report. Participants indicated that reasons for not considering IPC during nursing report taking, during handover, ward rounds, discharge summary is due to lack of management assistance (19.2%); too much work (18.3%); lack of resources (17.5%), focus is on patient diagnoses (14.2%) . Attitude by health care professionals contributes 7.5% while shortage of staff is 3.3%.

IPC measures that are challenge or difficult to sustain or implement

	Yes		No		Not sure		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Isolation	103	85,83			17	14,17	120	100,00
Hand hygiene	0	0	106	88,33	1	0,83	107	89,17
Environmental hygiene	10	8,33	106	88,33	22	18,33	138	115,00
Screening of patients	15	12,50	78	65,00	22	18,33	115	95,83
Patients care coordination. E.g.	41	34,17	68	56,67	0	0,00	109	90,83

wound dressing								
Antibi-otic steward-ships	36	30,00	82	68,33	2	1,67	120	100,00
Wearing of pro-tective clothing	0	0,00	115	95,83	0	0,00	115	95,83

Table 2: IPC measures that are challenging

Table 2 presents IPC measures that are challenges to sustain or to implement. The results show that majority of participants (85.8%) indicated that Isolation is an IPC measure that is difficult to implement compared to hand hygiene; environmental hygiene; screening of patients; patients care coordination. E.g. wound dressing; antibiotic stewardships and wearing of protective clothing. Results revealed that majority of participants can implement hand hygiene; environmental hygiene; screening of patients; patients care coordination. E.g. wound dressing; antibiotic stewardships and wearing of protective clothing IPC measures with ease. The next table presents Engagement of IPC issues by nurses

Wearing of PPE, antibiotic stewardship, patient coordination, screening of patients, environmental hygiene and isolation were requested to be answered as agree, disagree and not sure. These questions assist in improving training, resources, attitude and management involvement

a. Wearing of personal protective equipment (PPE) - refers to protective within the context of IPC as clothing (gowns), gloves, facemask or face shield, and respirators. To minimise communicable disease exposure, PPE are specialised equipment's or clothing used to prevent any contact with hazardous substance. Its use is an integral part of infection control and prevention measures that protect nurses from exposure to any potential infectious materials.

Of 120 participants, 95.8%) (n=115) responded that they disagree that wearing PPE is difficult issue, while 4.2% (n=5) participants says they are not sure if they agree or disagree.

A study done by Porto and Marziale (2016:37) on reasons and consequences of low adherence to standard precautions by nursing team found that the low adhesion to standard precautions such as PPE was linked to individual aspects of nurses, nursing management and educational institutions, beside the best intervention strategy carried out that showed little efficient since it only focus on the nurse as worker.

The findings showed that there are inadequate provision of resources and protective equipment, and inadequate working conditions, with the consequence of accidents to patients and occupational disease to nurses.

b. Antibiotic stewardship- CDC 2013 report provides the snapshot of dangers posed by antibiotic resistance organisms in the care of patients. The paper reaffirms critical role in the prevention and control of health care associated infections.

A study by Manning et al (2018:364-365) on synergy of IPC to keep patients safe and improve patient outcomes found that the increased incidence of multidrug resistance infections have become the safety concern for patients across the hospital. As a result, in practice nurses are fore front health care professionals to help foster collaboration to lend support and care at the forefront of patient care. The study found that training the bedside nurses in culture techniques on antibiotic use can improve on reducing antibiotic resistances.

The participants response shows that (68.3%) participants (n=82) disagree that antibiotic stewardship is difficult to implement, (30%) of participants (n=36) agree that to implement antibiotic stewardship is difficult, and (1.7%) of participants (n=2) says they are not sure.

c. Patient care coordination- Is defined as the function that assist to ensure that the patients' needs are met with deliberate organisation of nursing care activities with patient involved in the hospital by nurses (American Nursing Association; ANA: 2012). Purpose of this question is to find if the nurses are working towards patient goal and employer's mission, vision and objectives.

A quality improvement and cost control rely on effective coordination of patient care, e.g. wound dressing, giving of medication, insertion of intravenous lines; which the nurses play an essential role. Nurses link several approaches on promoting quality, efficient and safety that improve health outcome that is patient centered (Cropley and Sanders 2013:189-94).

d. Screening of patients- According to Manning et al (2016:364-365), screening of patients are central elements of nursing care and easy to do. Of 120 participants, (65%) participants (n=78) responded that they disagree the screening is hard to implement, (16.7%) participants (n=20) agree screening has challenges, while (18.3%) participants (n=22) responded they are not sure if there is challenges in screening patients.

Papathanasiou, et al (2014: 283-286) highlighted that screening of patients (nursing assessment), which is a first step in five (5) steps of nursing process involves the systematic and continuous collection of data sorting , analysis and organisation such data whereby critical thinking skills are applied during nursing care process in order to provide the decision making framework to develop the nursing care plan for patient with incorporation of evidence based practices.

This first step makes it successful for patient evaluation, in identifying any nursing parameters, needed to plan and deliver nursing care to patients. Failure to do screening of the patients predisposes nurses and other patients at risk of infection (Toney-Butler &Unison-Pace 2018:27).

e. Environmental hygiene- as highlighted in different chapters of this study as far as Nightingales era nursing has shown that environment hygiene play vital role in the

management of infection and patients care and supported by SANC act's Scope of practice of all nursing categories showing that the most important practice the nurse can do is address environment first.

This question was asked to find if all nurses understand their roles. Seventy-eight 64.2%) of participants (n=78) disagree that managing environment for patient care is a challenge, (17.5%) (n=20) are agreeing that environmental hygiene is difficult to implement, whereas (18.3%) of participants (n=22) are not sure. Several studies showed that nurses are leaders in advocating for and implementing environmental principles into their professional roles and practices (Beggs, Knibbs, Johnson & Morawska; 2015:462-474). Precautionary principles imply that there is ethical imperative in preventing diseases than just treating them, accordingly, transferring the burden of proof to those creating risk through nursing practices.

f. Hand hygiene- is reported as most effective way of preventing the transmission of health care associated infections towards patients, nurses and community, however, remains under done. Studies showed that nurses are both factors for non-compliance to hand hygiene.

g. Isolation- According to study done by Bowling and Taylor (2017:238-240), consequences of not isolating the infected patients is dire high. The study found that patients who are in contact precautions had much benefit when nurses in the isolation area as they recover earlier as there is minimal re infection. During hospital stay, some patients require isolation in order to curb the spread of contagious illness or infections. The knowledge of nurses on infections and available of resources were found to be biggest role during this measure. Porto and Marziale (2016:38) found that infrastructure, resources and knowledge has been identified as issues that nearly make it difficult to control Ebola outbreak in one of African country.

In this study, 86% participants (n=103) has agreed that isolating patients is the hardest IPC measure they are experiencing, while 14% of participants (n=17) highlighted that they are not sure if is hard to implement isolation precautionary measures

Engagement of IPC issues

Results **(figure 14**) shows that majority of participants agree (72.5%) are pleased with the way they are implementing IPC measures in the ward/unit; they are inspired to meet quality patient care at work (93.3%); they are determined to give my best effort at implementing IPC measures daily (65.0%); When at work, they are completely satisfied implementing IPC measures as my job duties (60.8%) compared to participants that do not agree. However Majority of participants on the contrary disagree that they are satisfied with the investment my hospital makes in training and education of IPC issues (66.7%); IPC coordinators develop them on IPC issues (55.0%); and that they are so involved in IPC issues that my patients get well with no complications (60%). Also, most of the participants (45%) although not in majority disagree that they are satisfied with in-service training offered by IPC coordinator and 40% also agree that they feel

completely involved in IPC related issues although 43% did agree that they get confident to implement IPC measures.

The following question were asked to identify and determine the variables highlighted with red in which the participants feels engaging with, in order to identify the best practices and challenges affecting the implementation of IPC measures.

The variables such as “pleased, satisfied, develop, inspired, involved, confident, determined” were identified and highlighted.

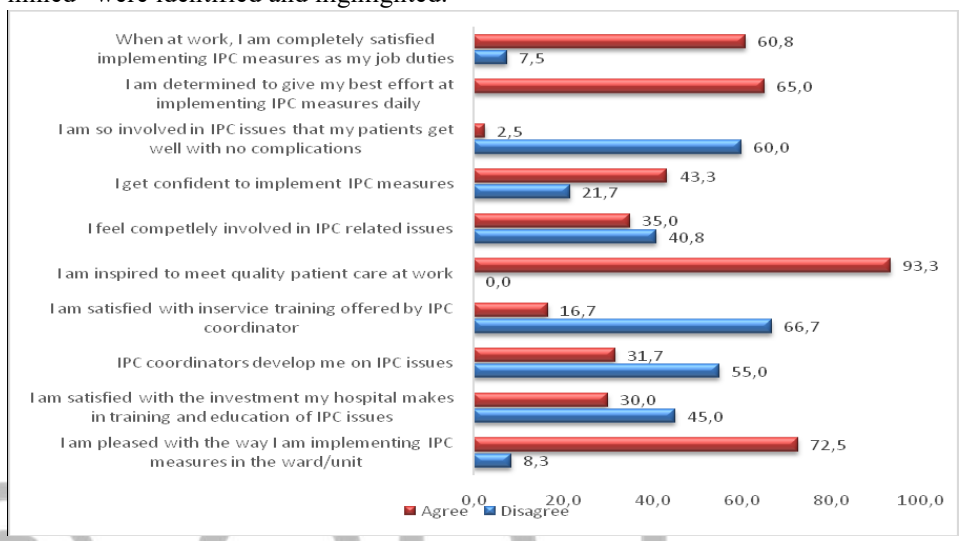

Figure 14: Engagement of IPC issues

Recommendations for improving the implementation of IPC measures

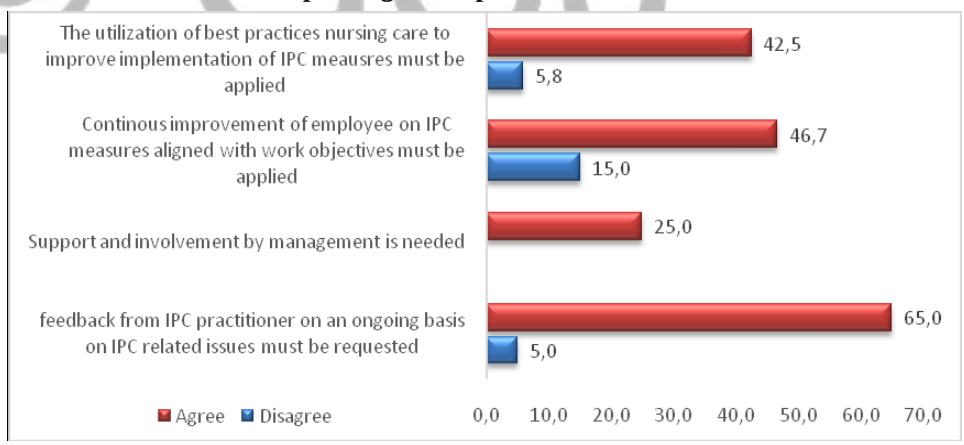

Figure 15: recommendations

Results in **figure 15** shows that majority of participants agree that feedback from IPC practitioner on an ongoing basis on IPC related issues must be requested compared to 5% that disagreed. Also 46.7% of most participants agree that Continuous improvement of employee on IPC measures aligned with work objectives must be applied compared to its counterparts while another 42% agreed that utilization of best practices

nursing care to improve implementation of IPC measures must be applied compared to 5.8% that disagreed. Results further shows that 25% of the participants agree that support and involvement by management is needed.

Utilization of best practices

Study by Birgand, et al (2015:1067-1071) highlighted that the reasons for successful and unsuccessful implementation of IPC measures are often multiple and interconnected. The study reviewed the key elements that contributed to success of implementation of IPC measures including best practices such as, improved surveillance systems and use of bundles and communication of such improvement through meetings, policies and other media of communication.

Wale, et al (2016:405-411) , in support of the participants responds, asserted that for best practices, education and training was also found to be important component for accurate implementation of IPC .It was also reported that experiences of nurses can influence IPC practices. Best practices that involve behaviour change were also found to be successful in the intervention to improve implementation of IPC measures.

The continuous improvement on IPC related issues

Continuous improvement is defined as an ongoing effort to improve the quality of care delivered by a nursing service (Oxford dictionary online)

Of 120 participant's responses, 46.7% agree that continuous improvement of employees on IPC related issues can improve the implementation of IPC measures. 16.7% strongly agree, 21.7% neutral and 15% disagree.

Study done by Mauger, et al (2014:274-283) on implementing quality improvement strategies to reduce healthcare-associated infections, alluded that nurses and other healthcare providers needed to be constantly improved on new changes and practices to be always on board.

It was highlighted that a culture of continuous improvement ensures a service is responsive to change and can continually develop a quality service that is of value to its patient care. The following were identified as important for continuous improving of care of patients:

-Patient care-focused,

-Strategic planning and implementation: A framework or model should be used as the basis to establish a procedure.

-Involvement of key stakeholders such as nurses, Doctors, patients, infrastructure, supply chain, Doctors and management:

-Innovation such as research and best practices on patient care, and

-Regular monitoring and evaluation: organization must have instruments to assess customer satisfaction and needs

-Continuous improvement:

Support and involvement by management

Of all participants who responded to the questionnaire 25.0% agree that support and involvement of management can improve the implementation of IPC measures.

Study by Tzempelikos (2015:32-44) provides an integrative empirical examination of the influence of top management in performance of personnel and offer insights on which ways management determines performance success. It was found that employees view management as role players, and decision makers, who can address issues on hand at that time. Results show that management commitment positively affects management involvement, which totally mediates the relationship between commitment and quality by employees

3.2. Qualitative data results

During the qualitative phase of the study, semi structured questions was used in the interviews that was conducted, with the same sample nurses who have completed the questionnaires.

During qualitative phase, the factors and the knowledge of the nurses influencing the implementation of infection prevention and control measures were explored. The purpose of such was to build upon the initial quantitative results obtained from participants through questionnaires, in order to develop the guidelines that will influence the implementation of IPC measures in public hospitals

The participants gave their views regarding their experiences on the factors that influence the implementation of infection prevention and control measures in a public hospital at Gauteng Province. The themes that emerged from focus group interview are outlined below: Challenges regarding knowledge and attitudes towards infection prevention and control measures, Inadequate hospital infrastructure, and Ineffective management practices as shown in table 3.

THEMES	SUB-THEMES
1.Challenges regarding knowledge and attitudes towards infection prevention and control measures	1.1 Knowledge and attitude of nurses 1.2 Knowledge and attitude of nursing management 1.3 Knowledge and attitude of other healthcare personnel
2.Inadequate hospital infrastructure	2.1 Poor hospital maintenance 2.2 Structural challenges
3.Ineffective management practices	3.1 Inadequate human and material resources 3.2 Ineffective communication and support 3.3 Inadequate education and training on infection prevention and control measures

Table 3: Themes

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