COMPARING QUALITY IMPROVEMENT METHODOLOGIES IN PUBLIC AND PRIVATE HOSPITALS IN NIGERIA, AND EFFECTS ON PATIENT SAFETY CULTURE AND OUTCOMES

.

by

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Abstract

Quality improvement methodologies have not yet been widely adopted in many parts of Africa. Nigeria is no exception to this trend. In view of this, healthcare processes in Nigeria are not always standardized, safe, timely, or efficient. Nevertheless, over the past five years, government health departments have made renewed efforts to implement quality improvement programs in state hospitals. Many of such programs tend to address the prevention of hospital acquired infections (HAIs), and obstetric safety. A few private hospitals have also attempted to implement a variety of quality improvement initiatives. However, there is currently insufficient data highlighting quality improvement methodologies utilized by Nigerian hospitals, or the possible effects of such methodologies on patient safety culture, and outcomes. This has severely hindered public policy development in the area of patient safety.

Objectives: The main focus of this descriptive study therefore, was to compare quality improvement methodology models in the private and public hospital sector. Secondly, the study aimed to assess the impact of different quality improvement methodology combinations, such as Lean management process, Six Sigma, Root cause analysis (RCA), Kaizen, 5S, Failure modes effect analysis (FMEA) and Plan-Do-Study-Act (PDSA) cycles on patient safety culture, and outcomes such as near misses, incidents, and obstetric indicators. Lastly, the study was designed to: (a) test statistical associations related to differences in the safety environment in private, versus public hospitals, and (b) examine possible barriers to quality improvement programs in the hospital sector.

Methodology: Three hospitals were selected in three different socioeconomic neighbourhoods (low, middle and high income). The 240bed state hospital was located in a low-income area of the city, while a 70bed private tertiary hospital was situated in a high-income district. A standardized survey questionnaire was administered to 203 clinical staff in all three hospitals by a stratified random sampling method, of which there were 112 responses. The study also included 21 in depth interviews, on-site, infection control evaluations, and 1727 obstetric record audits

Results: Two of the hospitals (the state hospital, and a 15bed private secondary care hospital) reported similar quality improvement methodologies, but with little impact on patient safety. The public hospital reported more ‘never events’ and preventable clinical errors, while medication errors and patient safety errors were reported equivocally by all hospitals

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Introduction

The quality movement was birthed in the early part of the 20th century by a number of "quality gurus," who had pioneered the emergence of quality management programs in Japan in the 1950s. In addition, a number of these gurus, such as Edward Deming, Walter Shewart, Frederick Taylor, and Joseph Juran,had introduced the concept of quality improvement in the workplace(Kleinman and Dougherty 2013). Typically, quality improvement philosophies encourage a sequence of activities that promote problem identification, quality interventions, and performance evaluation (Boat and Spaeth 2013).Furthermore, Quality improvement has been defined by the Institute of Medicine as the extent to which health care services improve community health outcomes (Society for Quality and Healthcare in Nigeria2009). According to Weston and Roberts (2013) quality improvement methodologies that are effectively applied in hospital settings, enhance; healthcare outcomes, service delivery processes, patient satisfaction, economic efficiency, standards of care, and better population health. Kleinman, and Dougherty (2013) further defined quality healthcare as; safe, efficient, effective, timely, customer–centric and equitable care.

Over the past two decades, however, researchers have found that quality improvement methodologies did not consistently lead to better patient care outcomes in all spheres of health care (Kleinman and Dougherty2013) In addition to traditional methodologies such as the Plan–Do-Study-Act (PDSA), a variety of quality improvement interventions such as lean management, six sigma, root cause analysis, and continuous quality improvement cycles(CQI) have also been widely implemented as alternative quality techniques for healthcare institutions around the world (Gowen, et al. 2012). Nevertheless, little is known about the efficacy or impact of these methodologies on patient safety in resource limited, African hospital settings. In addition, not enough research has been carried out to date regarding the status of patient safety in Nigerian hospitals, and virtually no comprehensive reports exist regarding the pattern of quality improvement methodologies in use at Nigerian hospitals (eg at both secondary and tertiary levels of care in private and public hospitals).

Therefore, the purpose of this report is to summarize the findings of a descriptive mixed quantitative and qualitative study carried out in three Nigerian hospitals (a private tertiary hospital, secondary private hospital, and a state hospital).The study involved 112 employee surveys, 21 semi-structured in depth interviews, infection control audits, and 12 month obstetric record audits. The overall aim of the study was to compare the effect of quality improvement methodologies on patient safety attitudes, standards, and outcomes.

Background

Despite the global acceptance of these methodologies, nevertheless, there is conflicting evidence regarding the impact of some quality improvement techniques on patient safety and clinical errors (Mauger et al. 2014) For instance, despite a plethora of hospital based quality improvement initiatives, the USA reports up to 1.7 million hospital acquired infections every year, and approximately 400 clinical errors annually (Mauger et al. 2014 ;McFadden et al. 2015).Campbell (2013, p.1) also confirmed that 3000 patients die annually in the UK from preventable deaths. Hence, in evaluating data from a range of quality improvement programs targeting patient safety, a few researchers such as Gowen et al. (2012) have argued that lean management initiatives and continuous quality improvement methodologies are likely to be more effective in addressing patient safety issues than six sigma programs.

Nevertheless, I find that hospital-based quality improvement methodologies that focus on specific process improvements rather than on complex systemic changes, have a greater impact on patient safety outcomes (Crowl et al. 2015). This form of incremental improvement has also been found to decrease the incidence of program failures (Brooks et al.,2014). Process related methodologies may also place less demand on a hospital's financial resources (this being an identified key barrier to quality improvement activities in Nigeria) (Society for Quality in Healthcare in Nigeria 2014).Thus, in terms of patient safety, methodologies that promote incremental process improvements rather than large complex systemic changes, may be more suited to hospitals in resource poor environments such as Africa. I also find that hospitals that adopt a methodology mix (such as PDSA, and lean management combinations) appear to report consistently better patient safety outcomes, than those that implement elements of isolated methodologies.

However, many African health organizations are presently trailing behind with respect to quality improvements (Society for Quality in Healthcare in Nigeria 2014). In Nigeria, for instance, due to the availability of international donor funding, public facilities rather than private hospitals are more likely to have implemented comprehensive quality improvement programs, and state owned public hospitals are more likely than private hospitals to have initiated quality improvement programs. However, there is presently a dearth of data regarding the pattern and nature of quality improvement methodologies in use at both public and private hospitals in Nigeria. Furthermore, most African and Nigerian research studies describing quality improvement initiatives in health settings have focused either on HIV, infection control

improvements, or on maternal and child health related programs(Ogoina et al. 2015; Saka et al. 2011; Society for Quality in Healthcare in Nigeria 2014).

For example, the available evidence addresses the impact of quality improvement methodologies on patient safety in European and American hospitals but offer little insight into African health care. For instance, a 2014 nation- wide survey carried out by the Society for Quality in Healthcare in Nigeria, reportedly involved two hospital stakeholder interviews in 20 private hospitals. Their findings suggest that most reputable Nigerian private hospitals have some quality standards in place, such as customer surveys, departmental policies, and clinical indicator tracking. Nevertheless, while the survey described elements of quality management systems, and accreditation efforts at the various hospitals, it did not capture information about quality improvement tools and techniques. Furthermore, the effect of existing quality improvement initiatives on patient safety outcomes in target hospitals, was not documented. In terms of definition, the World Health Organization (2016) has defined patient safety as a system of error and adverse events prevention. However, since health departments do not currently have any legislation enforcing the disclosure of hospital patient safety outcomes, hospital data comparing the patient safety performance of public and private health institutions in Nigeria, is not widely available.

Therefore, this observational study will also seek to test the hypotheses that:;

(a)Null Hypothesis 1- There is no difference between hospitals which use different quality improvement methodology combinations, in terms of improvements in targeted areas.

(b)Null Hypothesis 2-There is no difference in effect between hospitals that adopt process improvement techniques and hospitals that use non process related quality improvement techniques.

c) Null Hypothesis 3- There is no difference between patient safety indicators at public hospitals, and patient safety indicators at private hospitals in Nigeria

Through this study, I will also examine barriers to quality improvement in three Nigerian hospitals, and offer recommendations regarding state wide initiatives that can address patient safety programs in hospitals, institute mandatory reporting, and improve associated public policies in for the Nigerian hospital sector.

Literature Review on Quality Improvement Methodologies and Tools

The literature review indicated that numerous patient safety related quality improvement approaches have been adopted across Europe and the USA with varying levels of success. For instance, Wang et al. (2015) reported a 60.9% reduction in medication error rates, after a 3200bed hospital implemented 1686 Plan-Do-Check- Act (PDCA) quality improvement cycles, and 88 continuous quality improvement programs. The approach was multi-faceted, and process focused. Interventions also utilized lean management techniques such as process standardization (Wang et al. 2015).

Furthermore, a large body of evidence supports the fact that quality methodologies may be classified as: Lean management techniques (the Toyota way), the Six Sigma approach, the Plan-Do-Study-Act (PDSA) by Edward Deming, also known as the Plan-Do-Check-Act, Continuous quality improvement cycles (CQI) (Bandyopadhyay and Coppens2005; Gowen et al. 2012), Root cause analysis (World Health Organization n.d.)the Failure modes effects analysis (FMEA), and the Clinical practice improvement approach (CPI) (World Health Organization n.d.). Regardless of the approach however, most quality improvement techniques utilize: a collaborative team approach, a process of problem identification, a diagnostic evaluation of the problem, the implementation of a solution or set of solutions (following some form of data analysis) and a performance monitoring framework (Batalden and Davidoff 2007; Gowen et al. 2012).Quality tools are also widely utilized.

Therefore, a range of quality tools can aid the diagnostic process. Seven of these tools were created by a Japanese Professor named Kaoru Ishikawa: the Ishikawa cause and effect diagram(also known as the Fish bone diagram), the check sheet for data gathering, the process control chart for monitoring variations, and the histogram, pareto chart, scatter diagram and run charts for presenting data. These tools are relatively visual and analytic (The American Society for Quality 2005) and are often used in combination with a range of quality improvement methodologies (World Health Organization n.d.).Other effective quality tools include: idea generation tools such as the brainstorming approach, the tree diagram, and the affinity diagram (for classifying ideas).

Quality Teams and Quality Improvement Inconsistencies

Nevertheless, researchers have highlighted numerous inconsistent results with respect to some quality improvement methodologies. In some studies, an integrated lean management methodology and PDCA approach was implemented by multiple quality teams. This was found

to be effective in reducing medication error rates in a large American health service. McClead et al. (2014) described a second study in which a two-year quality improvement program was designed to reduce adverse medication errors in a paediatric department. Departmental staff focused on a combination of PDSA cycles, elements of lean management, such as process evaluations, and Six-sigma process controls (McClead et al. 2014). At the end of the study period, (between 2010 and 2013), adverse medication events (such as wrong patient errors, wrong dose errors, wrong medication errors and other forms of drug administration errors) had declined by 76.5% (McClead et al.2014).

On the other hand, a third study carried out by Maclaurin and McConnell (2011) reported a less successful overall outcome. In this study, a quality improvement initiative was launched at several Canadian residential facilities for seniors, with the aim of reducing the incidence of falls and ventilator related infections (MacLaurin and McConnell 2011). State level teams in 10 states selected the PDSA quality improvement methodology and were trained prior to implementation. However, while ventilator infection rates declined from 15.9 /1000 to 3.9/1000 within 12 months, the rate of falls increased from 5.58 /1000 residents to 7.04 /1000 residents during the same period. This outcome may suggest that compared to the other studies in which a more integrated approach was utilized, methodologies such as PDSA may not be consistently effective when implemented in isolation. This poor response to single methodology programs may thus reflect the difficulty in applying traditional quality methods to the highly complex, technology dependent health care systems of today.

In addition, White et al. (2011) disagree with the notion that quality team specifications are required to improve patient safety outcomes. According to their meta-analysis of 99 articles involving quality and safety teams in 6674 hospitals, the evidence did not fully support the view that the activities of successful quality teams differed significantly from that of unsuccessful quality teams. Despite the recommendations of Edward Deming and Joseph Juran, the study may indicate that in today's increasingly complex healthcare environment, quality improvement methodologies, rather than quality team specifications, may be more critical to the success of patient safety improvement programs. The other study findings also suggest that when integrating one approach with complimentary techniques, it may not be entirely necessary to implement all the components of each selected methodology.

The Case for an Integrated PDSA Approach to Quality Improvement

In terms of critical success factors, therefore, the traditional PDSA cycle as a sole form of quality improvement, has a number of deficiencies in relation to patient safety. One main

deficiency is that the original concept proposed by Demings and Shewart addressed systemic changes rather than process improvements. Taylor et al. (2013) defend this rationale by explaining that the likelihood of success with quality improvement projects is higher when teams make incremental changes to work processes rather than to complex systems. The second inadequacy in the PDSA approach, is related to an apparent lack of clarity in the PDSA planning process. To address this, Taylor et al. (2013) recommend that the planning phase be preceded by at least five preliminary steps: eg FOCUS, the identification of the target process, assignment of a working group, the collation of information about the process, examining and understanding root causes and the determination of improvement interventions.

Hence, with the help of an integrated model (which incorporates these four additional steps), work teams may then apply the PDSA cycles to the secondary causes of a specific safety issue (Taylor et al. 2013). Therefore, the recommendations made by Taylor et al. (2013), represent an innovative root cause analysis approach to structured PDSA cycles. In a similar way, the Six Sigma approach had a greater impact on patient safety outcomes when used in combination with root cause analysis methodologies, PDSA cycles or lean management techniques (McClead et al. 2014).

Characteristics of Six Sigma and Other Quality Improvement Methodologies

The Six Sigma approach, which aims to reduce error rates to fewer than 3.4 errors per million encounters, was first introduced by Motorolain 1980. (Bandyopadhyay and Coppens 2005). The World Health Organization (2016) describes the five stages of Six Sigma as; D-Define, M-Measure, A-Analyse, I-Improve and C-Control. Nevertheless, despite its similarity to the PDSA improvement approach, the Six Sigma methodology utilizes a more formal project management structure (Bandyopadhyay and Coppens 2005). Furthermore, according to Gowen et al. (2012), an isolated Six Sigma approach is the least effective, compared with Lean management and CQI, in addressing patient safety problems. This could also be associated with the tendency for Six Sigma's black belt and green belt trainees to focus far more on large systemic changes, than on simple work processes. Moreover, most clinical error prevention techniques will often require in depth process evaluations, and analysis (Mc Clead et al.2014), a project step that is not clearly specified by the DMAIC approach. Hence some studies suggest that quality improvement projects that aim to use Six Sigma techniques, may benefit from additional process focused tools and methodologies, such as process mapping, process audits, and process standardizations (Bandyopadhyay and Coppens 2005; McCleads et al. 2014).

Furthermore, a number of these process focused steps are integral aspects of the lean management approach.

Lean Management Methodologies

Thus, in a similar way to Six Sigma, Lean management techniques are designed to "add value to the customer" by eliminating wasteful elements in the system (Mc Fadden et al. 2015, p.38). Originally designed to improve industrial processes, lean management is becoming increasingly beneficial to health systems when harnessed to Six Sigma. According to Mc Fadden et al. (2015) for example, Lean management does not have any inherent effects on patient safety, but in tandem with Six Sigma, provides greater clarity regarding project goals, and helps to speed up patient response times. The evidence also indicates that key components of lean management may include: Kaizen (a Japanese initiative that enhances management by fact, and continuous improvement cycles) (The Kaizen Institute 2016),5S workplace modifications, process mapping, and Just-in-time, inventory management initiatives (Gowen et al. 2012).

Experimental Quality Improvement Methods

A few experimental quality improvement models have also been successfully applied in healthcare settings. For instance, the Centre for Quality and Productivity Improvement [CQPI] (2016) in the U.S described a systems/process modification approach to patient safety. Citing Carayan et al. 2006, the article addressing patient safety improvements that were linked to a systems re-engineering initiative program (SEIPS). This approach involves work systems evaluation methods that require quality teams to analyse deficient processes within a work system framework (CQP, 2016).An American health facility also applied a risk reduction technique that achieved a 60-93% decline in the number of medication errors, by automating patient identification processes. Nevertheless, on account of financial constraints, many of these quality improvement pathways are not yet fully implemented in developing African countries.

The Nature of Quality Improvement Programs in Resource Poor Environments

Hence Quality improvement initiatives in African countries tend to be sponsored by international agencies and governmental bodies: the main objective being the achievement of the millennium development goals (MDGs).For instance, in 2012, a Ghanaian district hospital utilized an integrated CQI and lean management approach to address preventable maternal and neonatal mortalities in the community (Srofenyoh et al. 2012).Team members assessed and

standardized care processes, implemented a more structured triage system, obtained the buy-in of physicians and monitored patient outcomes (Srofenyoh et al. 2012).By the end of the study period, maternal mortality rates had declined by 34%, stillbirths by 36%, and post-partum haemorrhage by 12.9% (Srofenyoh et al. 2012).

In Nigeria, Galadanci et al. (2011) also implemented a continuous quality improvement project in 10 rural state hospitals. The aim of the 12month program was to fulfil the requirements of the MDGs for preventable maternal and perinatal mortalities. The program was sponsored by two federal teaching hospitals and a German governmental agency (Galadanci et al. 2011).In addition, team members assessed processes, and implemented aspects of lean management (such as the obstetric care process standardizations, and the disinfection of the obstetric environment). Thus, state health teams effectively reduced maternal mortality rates from 1790/100,000 live births to 940/100,000 live births (Galadanci et al. 2011).

Furthermore, a more recent study by Ogoina et al. (2015) described a one year, quality improvement program at a Nigerian federal teaching hospital. The program successfully improved infection control compliance rates by approximately 30%. However, specific safety outcomes such as obstetric adverse event rates, and international patient safety indicators were not reported. The main approach involved a continuous quality improvement initiative that also included lean management techniques. Hence, the research team focused on process standardization, policy design and implementation, and workplace modification (Ogoina et al. 2015). These study findings thus suggest that quality improvement programs in African, and Nigerian hospitals may be relatively limited to just a few methodologies such as lean management methodologies, and continuous quality improvement. This in turn, may be related to knowledge, skills, and resource gaps, and a range of other barriers (Ogoina et al. 2015).

Barriers and Facilitators of Quality Improvement Initiatives

Regardless of geographical location, however, quality improvement initiatives that focus on patient safety issues, will need to ensure staffing adequacy (Brooks et al. 2014;Ogoina et al. 2015; Pannick et al. 2014).The availability of funding, (Brooks et al. 2014; Ogoina et al.2015), and improvement materials are also essential aspects of the program (Ogoina et al. 2015). In addition, Pannick et al. (2014) further observed that nurses with Bachelor of Science degrees contributed to better patient outcomes (eg lower 30 day readmissions, and fewer preventable mortalities). Program failures have also been blamed on poorly designed interventions, time constraints, unrealistic performance measures, and the size and complexity of projects (Brooks et al. 2014). Thus, the evidence suggests that the three most relevant criteria for successful projects, should be: (1) resource availability (human and monetary resources), (2) improvement

methodology (a focus on incremental change and work processes), and (3) staff competencies and experience (Pannick et al. 2014).

Research Methodology

Hospital Selection Criteria

In order to capture information regarding the nature and impact of previous or current quality improvement initiatives, I selected pre-accreditation healthcare facilities of different specialty strengths. Selected hospitals were situated in three separate districts, offering varying levels of care to different socio-economic groups, in the private and public sectors.

District selections were made to ensure the representation of hospitals in low income areas, middle income areas, and high- income areas. I identified two private hospitals (one secondary care, a tertiary level institution), and a public secondary care hospital. One of the private hospitals was situated in a high- income area, and the other in a middle- income area of Lagos, Nigeria. The state hospital was in a low- income area of the city.

Selection criteria also included: (a) confirmed reports that the hospital had implemented a change management program, or addressed quality health issues within the past 12 months, and that (b) the hospital had not applied for, or acquired accreditation status. (c) The hospital was to have a non-teaching status. The above criteria were adopted to minimize study bias that could arise from socioeconomic inequalities, established accreditation processes at target hospitals, or ongoing research programs, at teaching hospitals. After general enquiries from medical staff at various institutions, Hospital S a private tertiary hospital with 70 beds, Hospital R with 15 beds, and State Hospital G with 240 beds, were found to meet all the specified criteria. Permission to conduct the survey was obtained from the Lagos State Hospital Board, and from the Ethics Committee of the state hospital.

A multi-pronged approach involving surveys, interviews, and audits, was then adopted to examine possible links between quality improvement methodologies, patient safety culture, clinical outcomes, and rates of reported incidents at target hospitals. Indicators indicating compliance with all international patient safety goals were also examined.

Patient Safety Culture Assessments

Firstly, the aim of data collection was to gather and compare information regarding patient safety culture at the three hospitals, by examining employee attitudes to patient safety issues. To achieve this, a standardized patient safety survey questionnaire (Safety Attitudes

Questionnaire [SAQ] by Sexton et al. (2010) was modified slightly (by including a few questions addressing blame culture), after obtaining written permission from its publishers.

The SAQ Questionnaire offered 32 questions on a Likert scale (ranging from 1- disagree strongly to 5- agree strongly). In order to examine responses regarding patient safety culture, 35 SAQ questions were grouped into four sections, such as; questions 1 to14; communication and support with respect to error reporting, and error prevention, questions 15 to 23 concerning personal factors that impinge on patient safety (eg fatigue, and job satisfaction), questions 24 to 32 addressing the performance and attitude of the hospital's management to patient safety, and questions 33 to 35 addressing teamwork.

A stratified random sampling system was adopted, to ensure that more than one type of clinical staff population was included in the sample, and to exclude non- clinical staff at the target hospitals. The sample size included every employee within the selected strata .On account of the non- availability of staff lists at two of the hospitals, all personnel in randomly selected nursing sub-units, (eg emergency room, wards, dialysis, theatre, outpatients, and obstetric units) were surveyed in Hospital G and Hospital S, while all personnel in the laboratory service, physician units, and pharmacy were also surveyed in hospitals G and hospitals S. In hospital R, only the nursing unit and physician units were approved for surveys, and every employee in both units were surveyed. In Hospital S, 86 clinical personnel were given questionnaire, with 37 returned questionnaires (43% response rate), while in Hospital R, 40 clinical employees were surveyed, with 34 responses (85% response rate).Lastly in public hospital G, 77 persons were surveyed, and 41 responses were received (53.2% response rate). Therefore, 112 responses were received from the three hospitals out of 203 administered SAQ surveys (55.1% mean response rate).

Assessment of Safety Outcomes; Incident and Near Miss Surveys

The 203 surveyed persons administered SAQ questionnaires, were also asked to contribute anonymously to questions addressing incidents and near misses within the previous six months. 35 questions were grouped according to historical incident data from a private hospital database, into six out of seven international patient safety areas: Identifying patients correctly, communication between caregivers, medication safety processes, hospital acquired infections (HAIs), patient falls, and wrong site/wrong side surgeries. In addition, surveyed persons were asked to indicate if the described clinical error ever happened, or almost happened eg 1- no near miss or event of this nature ever experienced by me, 2- Almost happened (near misses),

3-Actually happened once or twice, 4-Definitely happened multiple times, and 5- Happens every day or every week.

In Depth Semi-structured Interviews

Furthermore, in-depth interviews(adopted from the En-Qual questionnaire)involving a range of hospital leaders, were carried out at all three hospitals, to assess the pattern of quality improvement methodologies, and the nature of current or previous quality improvement projects at the hospitals. Questions also included enquiries about possible barriers to quality improvement. Ten hospital leaders were identified at each hospital eg the heads and deputy heads of; nursing departments, laboratory departments, pharmacists, physicians, and quality departments. Out of 30 invitations, only 21 persons agreed to be interviewed. (70% response rate), and 15 questionnaire sections with 1 to 20 sub sections each, (94 options) were presented to the hospital leaders.

In addition, questions covered a range of quality improvement methodologies such as training, and skills in: Six Sigma methodologies, Root cause analysis techniques (RCA), the Plan-Do-Study-Act [PDSA] cycle, Lean management (process related) techniques, 5S methods, Kaizen elements of lean management, continuous quality improvement methods, failure modes effect analysis (FMEA),and clinical practice improvements (CPI). Responders were also asked to; (a) demonstrate specific skills in all quality improvement methodologies, and to (b) confirm whether quality improvements initiatives within the last 12 months, involved identifying patients correctly, communication, medication safety, infection control, patient fall prevention, medication reconciliation processes, or wrong site, wrong side surgeries.

Infection control Audits

In anticipation that most hospitals would have addressed infection control quality improvements more commonly than other areas, infection control audits included an assessment of levels of compliance with sharps disposal, infection control policies, infection control committee responsibilities, needle-stick injury tracking, and the use of safety laboratory lancets. The audit included physical observations in clinical care areas, and record checks, while the audit format included World Health Organization (WHO)waste disposal audit questions, and a United Nations infection control assessment checklist.

Obstetric Safety Outcome Assessments

Research evidence also indicated that the second most likely area to receive quality improvements could be obstetrics, particularly in public hospitals that had been mandated to meet the MDG targets for obstetric safety. Outcome indicators included three standard, benchmarked, Agency for Healthcare Quality and Research (AHRQ) indicators.

The indicators were:

(a). The percentage (%) of birth trauma cases per 1000 deliveries

(b). The percentage (%) of women who suffered obstetric trauma, (defined as third to fourth degree perineal tears, with and without instrumentation, per 1000 deliveries

(c). The percentage (%) of women who suffered post- partum haemorrhage (over 500mls) per 1000 deliveries

Quarterly obstetric delivery records between January2015 and December 2015, were examined in respect of the required information. In total, 1727 obstetric records in all three hospitals were examined.

Analysis of Results

A confidence interval of 99% was adopted. Thus statistical significance was accepted, and null hypothesis rejected, when p= 0.01. All data from the SAQ surveys, incident reports, record audits, and indepth interviews, were analysed and cross tabulated, using PSPP statistical software. Furthermore, all null hypothesis statements were tested using Pearson's Chi square test. This was therefore used to test the Null Hypothesis 1 that:

There is no difference between hospitals which use different quality improvement methodology combinations, in terms of improvements made in targeted areas

Hypothesis 2

There is no difference between hospitals that adopt process related quality improvement methodologies, and those that utilize non process related techniques

Hypothesis 3

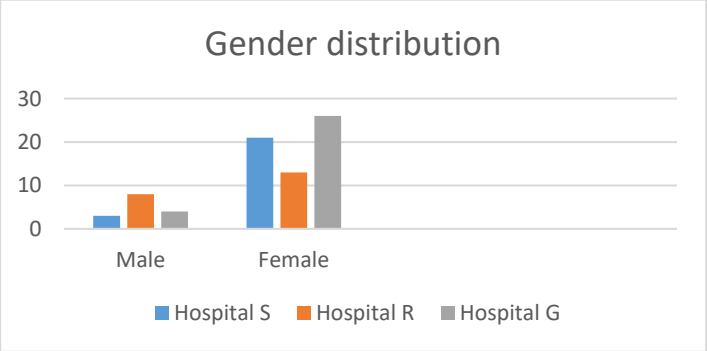
There is no difference between patient safety indicators at private Nigerian hospitals and patient safety indicators at public state hospitals

Study Findings

Overview of Findings from the SAQ surveys on patient culture

In all three hospitals, females outnumbered males by 10:1. In Hospital S, all the pharmacists were women.

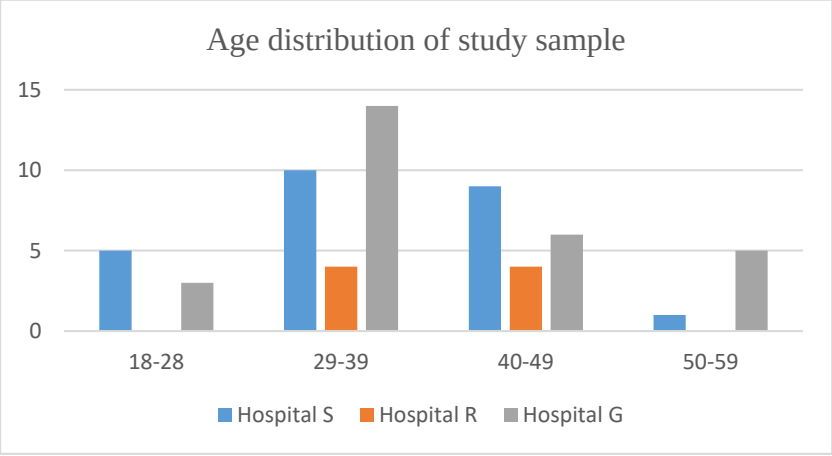
Chart 1



Age Distribution

In terms of age distribution, the state hospital G had an older population of clinical staff between 50-59 years, while Hospital S had a larger population of clinical staff between 40 and 49years. However, approximately a quarter of employees at each hospital were unwilling to provide their ages. This is a relatively normal finding in African cultures where age is a sensitive issue.

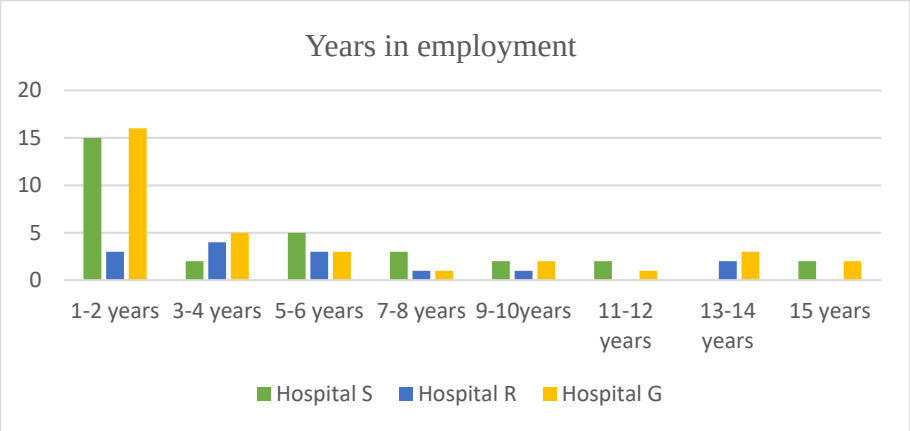
Chart 2



Years in Employment

In the study sample, all hospitals recorded a higher number of staff who had been in employment for fewer than five years.

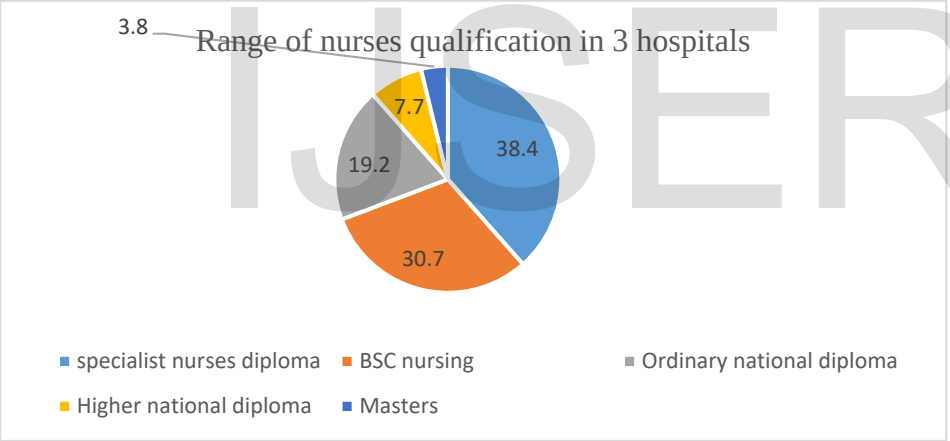
Chart 3



Qualification of Nurses

According to Pannick et al. (2014), nurses with less than a university education may contribute to quality improvement deficiencies in hospitals. In the study sample, fewer than 40% of nurses in all hospitals reported a university degree in nursing.

Chart 4



Patient Safety, Error Management, and Reporting

While responses to questions about communication were similar in all three hospitals, perceptions of safety, error reporting capacities and error management activities differed

Perceptions of Patient Safety, Error Reporting and Error Management

Table 1

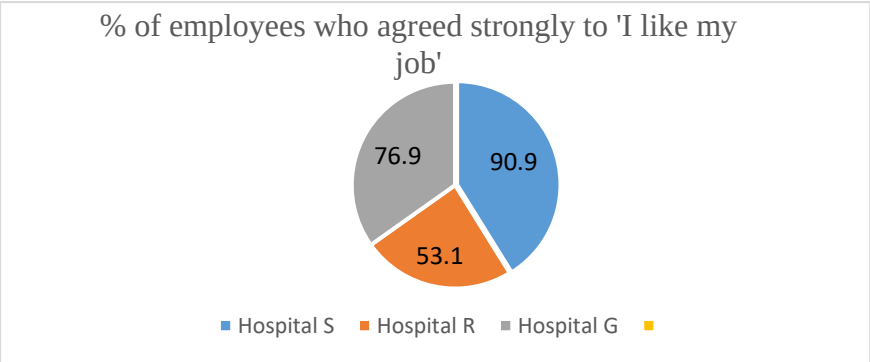
SAQ Question	% of employees that agreed strongly in private tertiary care Hospital S	% of employees that agreed strongly in private secondary care Hospital R	% of employees that agreed strongly in state secondary care Hospital G
I would feel safe being treated in this unit as a patient	65.7%	66.7%	48.8%
Medical errors are handled appropriately	61.8%	41.2%	46.3%
I know the channels to direct questions about patient safety	75.0%	50.0%	54.0%
I am encouraged by my colleagues to report patient safety concerns	68.67%	34.3%	48.7%
The culture in this clinical area makes it easy to learn from others	55.6%	26.7%	41.5%

In the above data, perceptions of patient safety were lower in the public hospital compared with the private hospitals. However, perceptions regarding error management and error reporting were slightly higher in the public hospital than in the private secondary care hospital R

Responses to Personal factors that Impinge on Patient Safety

In response to I like my Job, job satisfaction rates were highest in the tertiary private hospital S

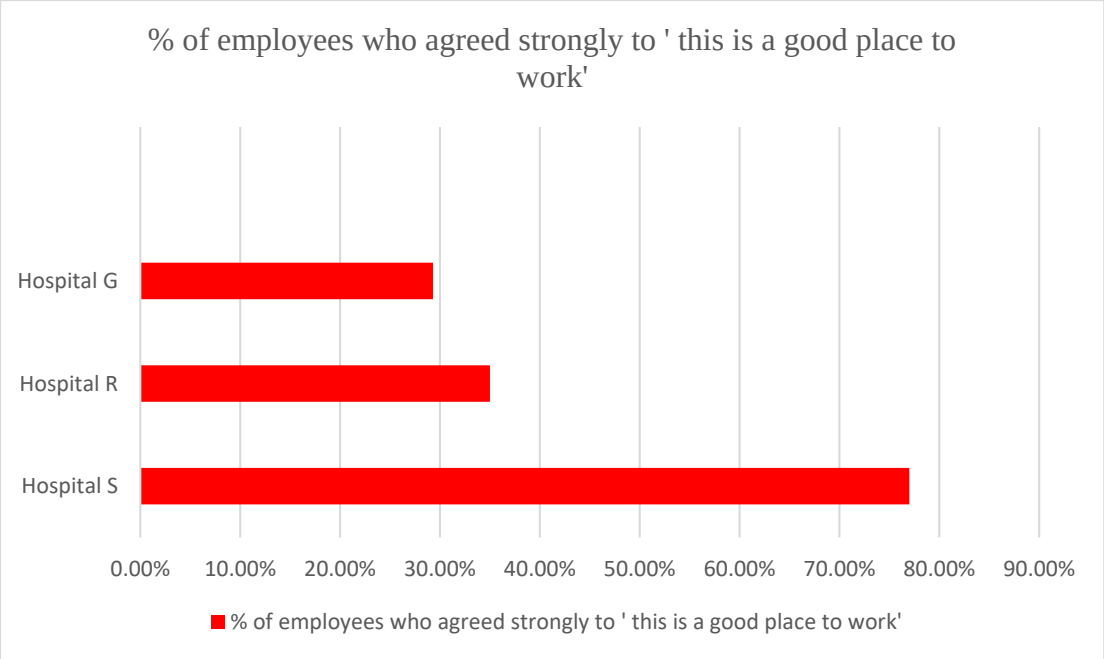
Chart 5



Perspectives about the hospital being " a good place to work"

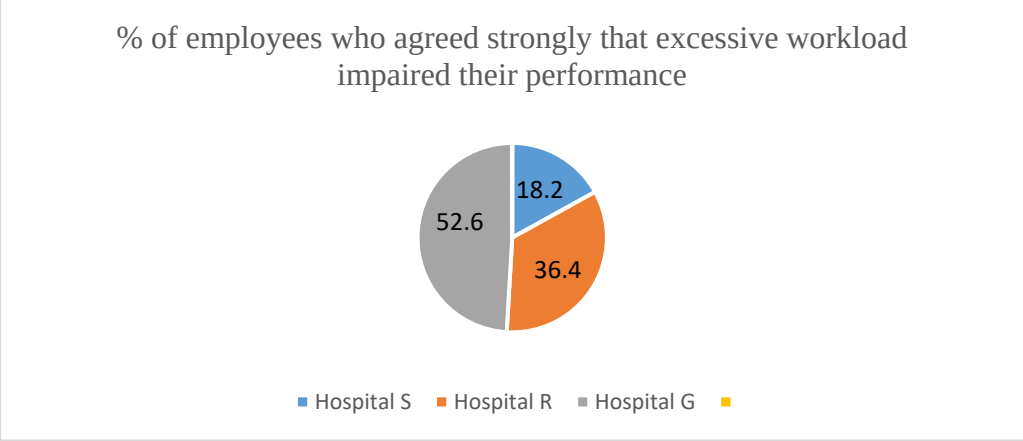
The state hospital G recorded the lowest ratings in terms of agreeing strongly to the statement

Chart 6



In the area of workload and its effect on performance, state hospital G staff were more likely to report performance impairments as a result of workload

Chart 7



Management and Leadership Perspectives

Agreements to statements that concerned hospital management's good performance were higher in private tertiary hospital S.

In response to the statement- The hospital management supports my daily efforts

Chart 8

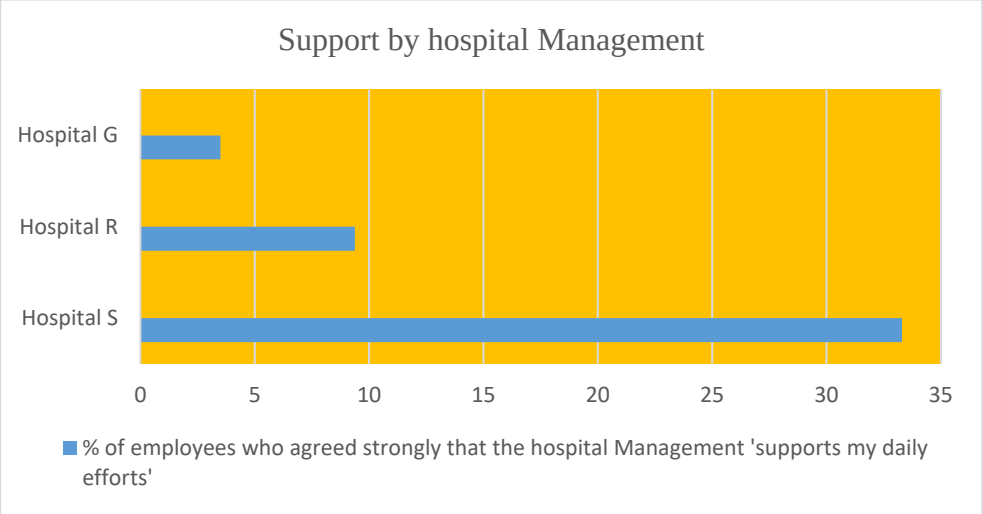
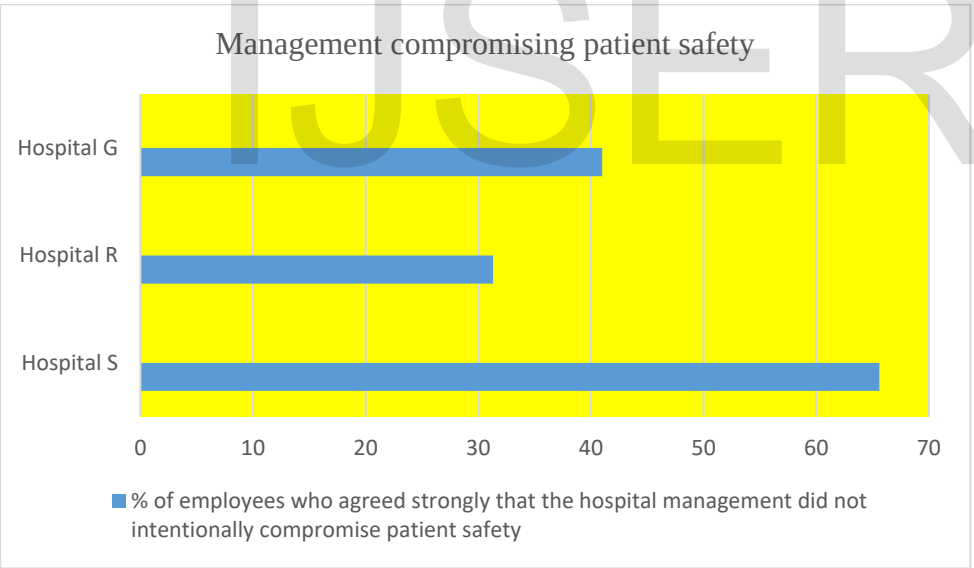


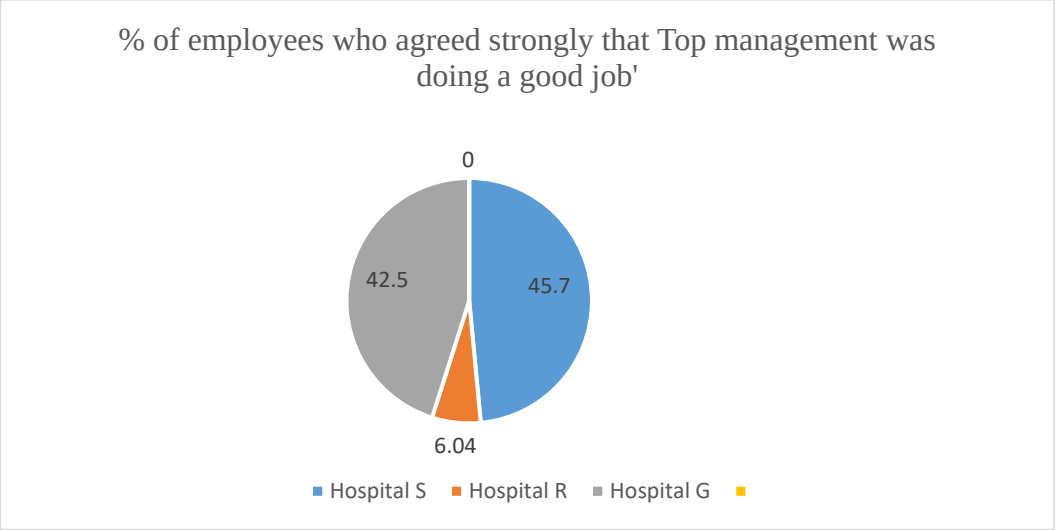
Chart 9

Employees at the private secondary hospital R, had the lowest levels of agreement to the statement' the hospital management does not knowingly compromise patient safety'



In response to the statement ' Top management is doing a good job'

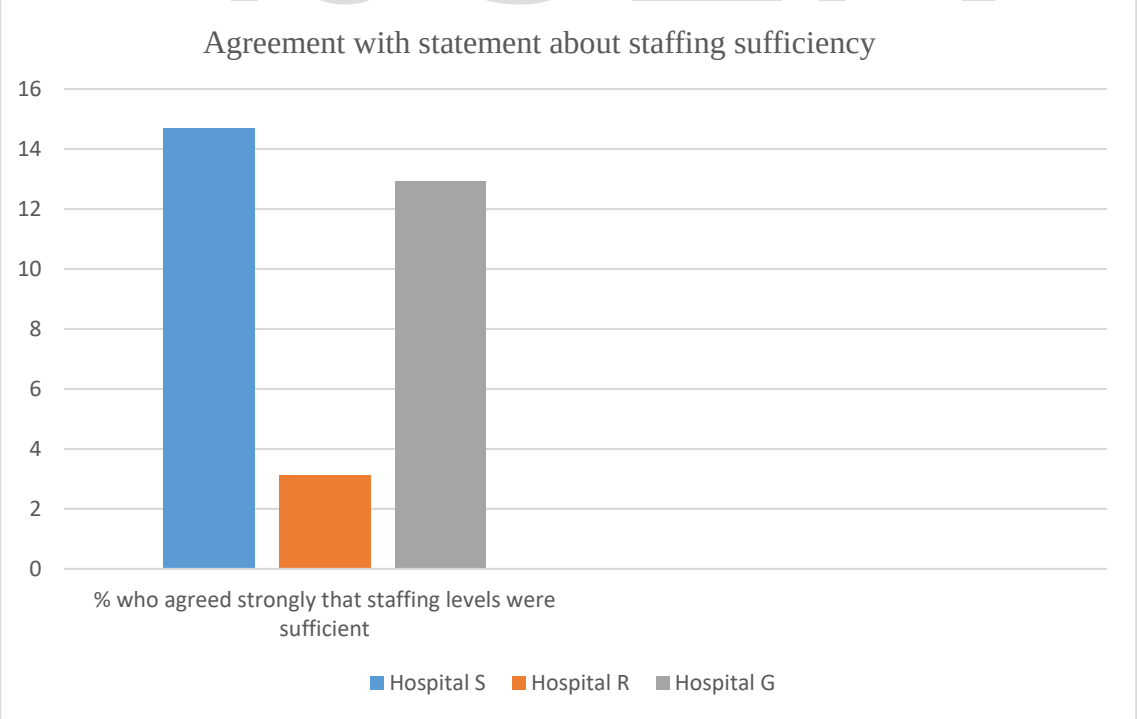
Chart 10



In terms of staffing however, low levels of agreement (< 20%) were recorded at all three hospitals.

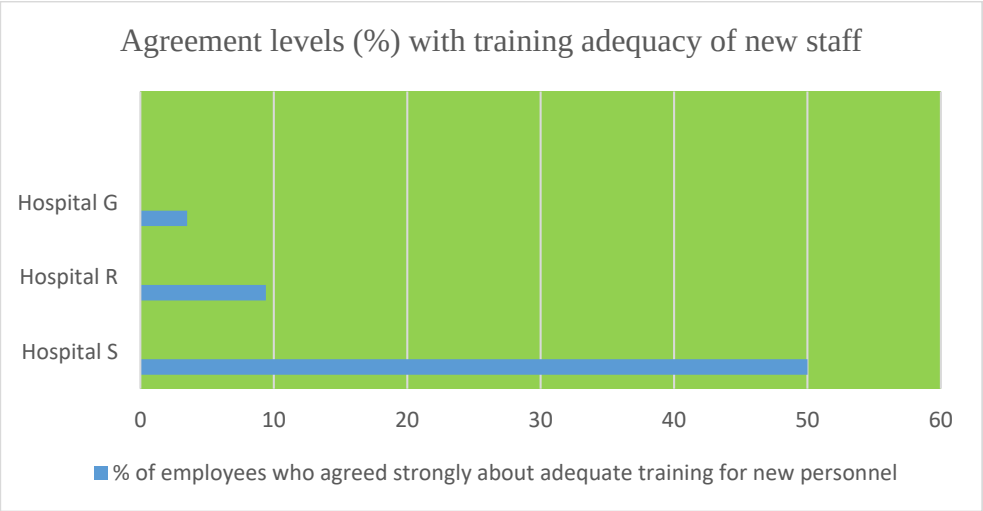
Private secondary care hospital R reported the lowest levels of agreement with a statement about sufficient staffing

Chart 11



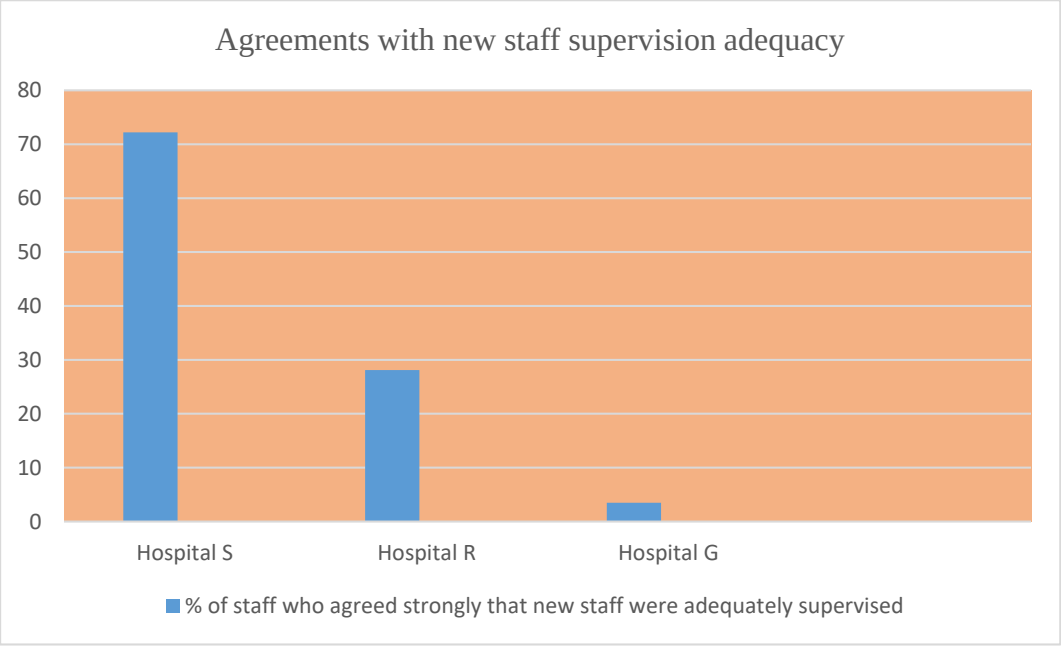
In addition, agreements with the statement' the hospital is doing a good job of training new personnel revealed lower levels of agreement at the private secondary care hospital R

Chart 12



Furthermore, when employees were asked about supervision of new staff, agreement levels were low in both the private secondary care hospital R and the state hospital G

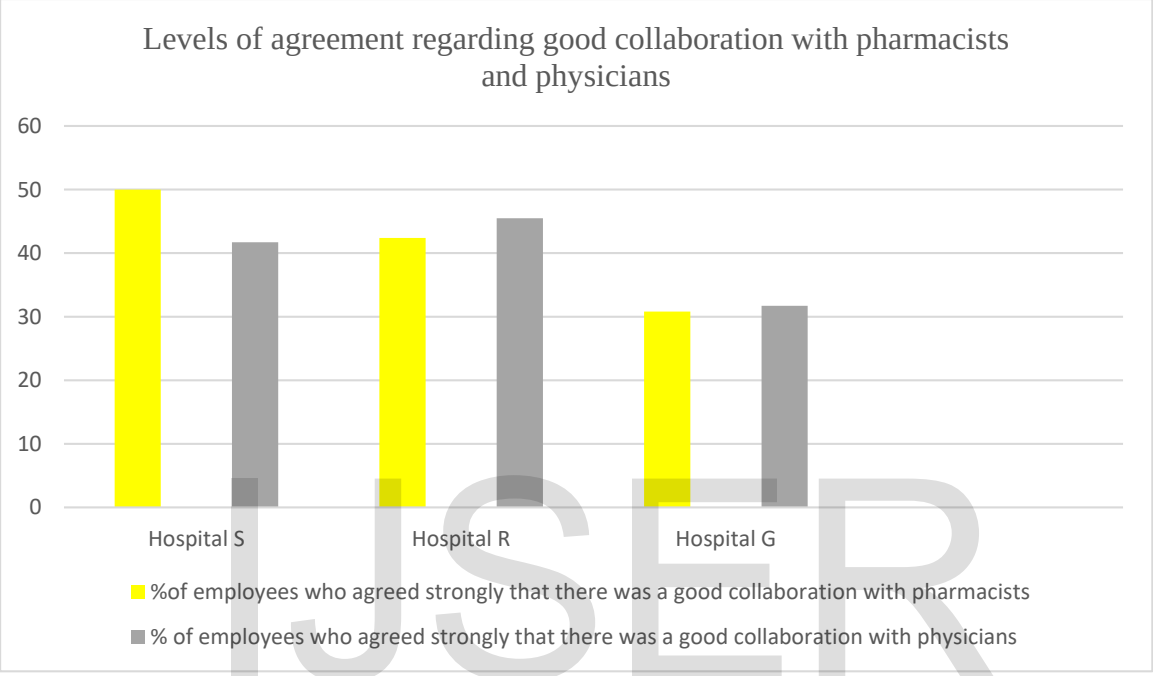
Chart 13



Perceptions of Teamwork

From the perspective of teamwork, and collaboration between departments, state Hospital G reported the lowest agreement levels with statements about experiencing good collaboration with either physicians or nurses

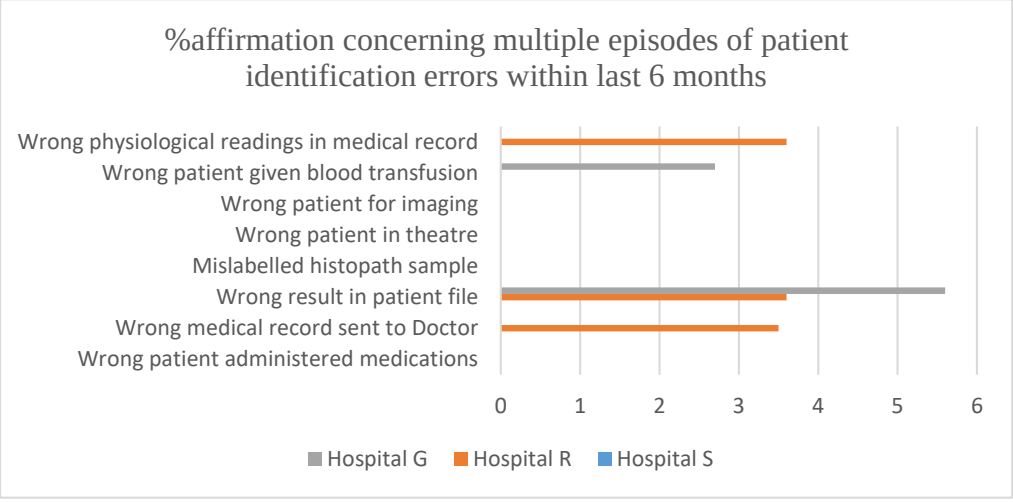
Chart 14



Incident Data Findings

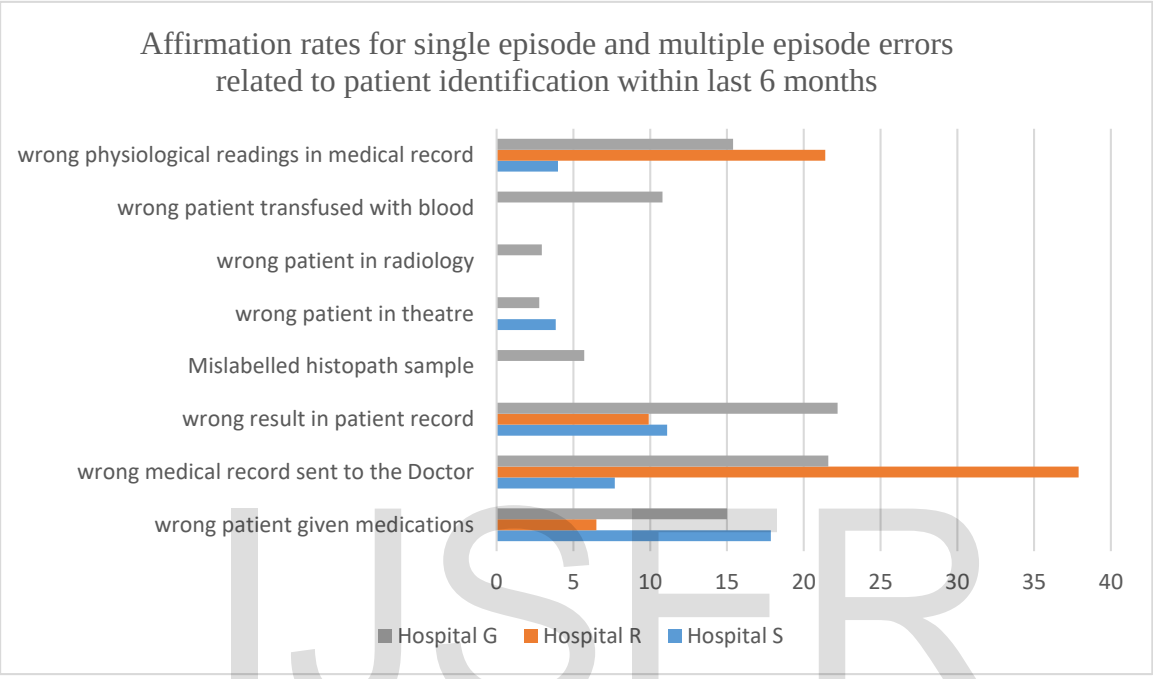
The incident data responses revealed that error rates for patient identification processes were reported more frequently by state hospital G staff and private secondary hospital R

Chart 15



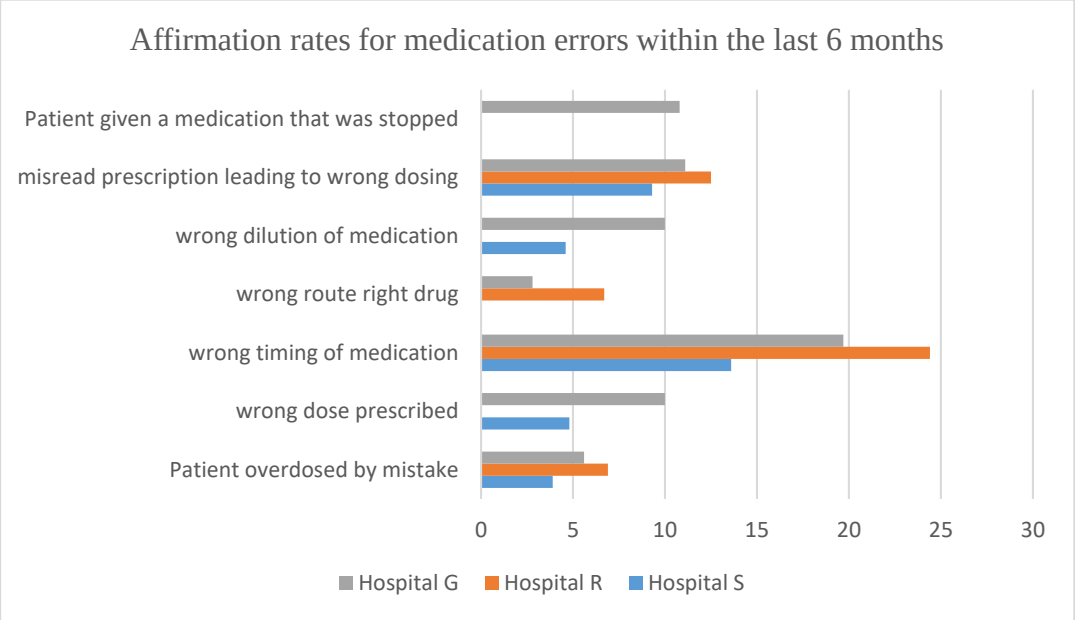
Nevertheless, overall reported rates for two types of patient identification errors (both single episode reports and multiple episodes) were higher in Hospital R, with a higher range of errors (all error types confirmed) in state hospital G

Chart 16



In terms of both single and multiple episodes of medication errors, the private tertiary centre-Hospital S reported the highest number of multiple episodes, but Hospital R, the largest rates for several error types, and state Hospital G, the greatest no of error types

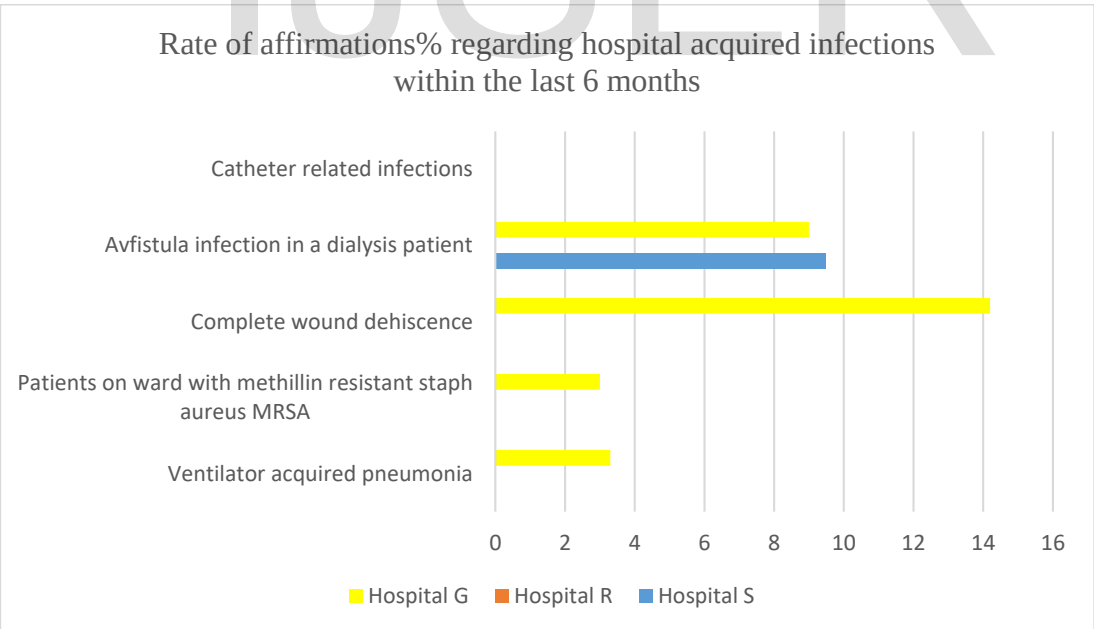
Chart 17



Incident Data for Hospital Acquired Infections

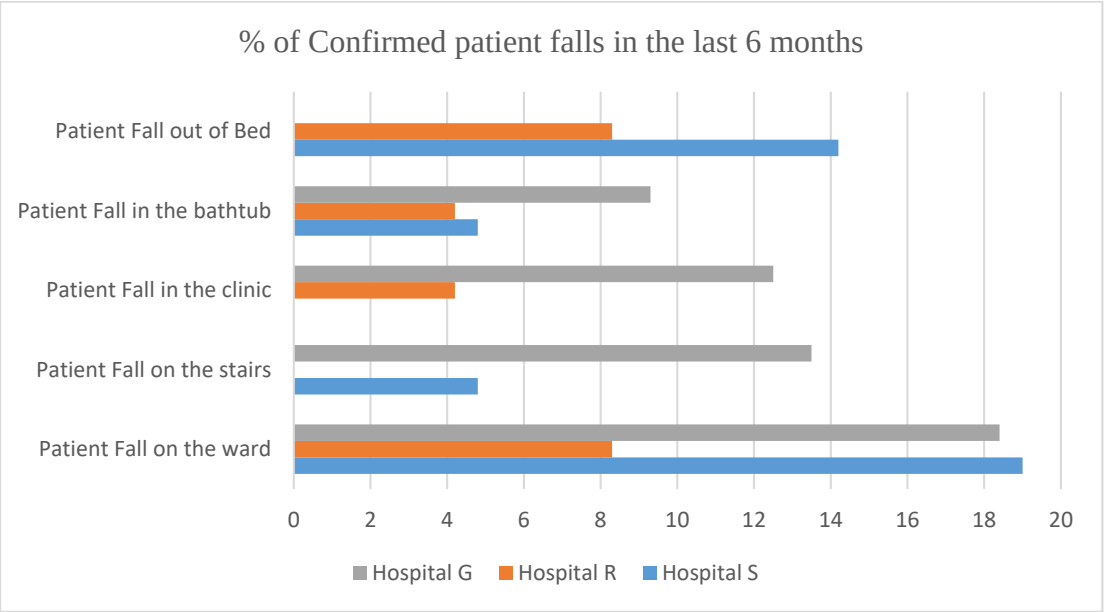
The data shows that state Hospital G had the highest number of error types and the highest confirmed rates, while private Hospital R had no reported infection types

Chart 18



Incident Data for Patient Falls

Chart 19



According to the data, private tertiary Hospital S, and State hospital G had the highest patient fall confirmations, including multiple weekly episodes

Statistical Analysis Results of SAQ and Incident Surveys

According to a confidence interval of 99%, statistical significance was accepted at a p value of 0.01. (eg, the probability that the difference between two variables is due to chance, is less than 1% or less)

Table 2

Chi square test was used to determine whether there was any association between variables related to quality improvement barriers	Chi square value	Degrees of freedom df	P value
(a) A statistical association was found between poor perceptions of error management at hospitals, and low levels of agreement concerning training adequacy	149.59	25	P=0.000

(b) There was a statistical association between employees who disagreed that disagreements were handled appropriately, and their perceptions of low patient safety support from colleagues	70.56	20	P=0.000
(c)A statistical association was found between confirmation rates for delayed inpatient care, as a result of non-availability of physicians on call, and low levels of agreement regarding interdepartmental coordination	91.37	15	\p=0.000
(d) There was a statistical association between confirmed reports concerning patient 1.falls in the bath tub, and 2.patient falls on the ward, and low rates of agreement about supervision of new staff	1.)118.99 2) 89.67	25	P=0.000 P=0.000
(e) There was a statistical link between reported wrong medication dilution rates, and reports of training inadequacies	95.19	20	P=0.000
(f) Prescribing error reports were also statistically linked to supervision inadequacy reports	87.18	15	P=0.000
(g) Wrong patient medication errors were statistically linked to low reported rates of collaboration with pharmacists at the hospitals	102.50	15	P=0.000
(h) Reports about feeling safe to be treated as a patient was statistically linked to 1.)the ability to direct questions to the appropriate parties about patient safety and to 2)perceptions about management's ability to address errors	1)47.81 2)51.01	15 25	P=0.000 P=0.002
(i)Low perceptions of the hospital's attitude towards a no blame culture was statistically linked to the hospital management's negative attitude to staff suggestions	43.10	24	P=0.01
(j) Report rates for wound dehiscence incidents were statistically linked to reports that management was knowingly compromising patient safety	46.19	16	P=0.000
(k) wound dehiscence report rates were also statistically linked to reports about training inadequacies	88.83	20	P=0.000
(l)wrong medication timing errors were statistically linked to staffing inadequacy reports	91.62	25	P=0.000
(m) Reported incidents of misfiled patient results was statistically linked to low interdepartmental coordination affirmation rates	64.75	25	P=0.000
(n) Lastly, job satisfaction was statistically linked to reports about excessive workload. Excessive workload reports were higher at the state Hospital G	32.37	16	P=0.009

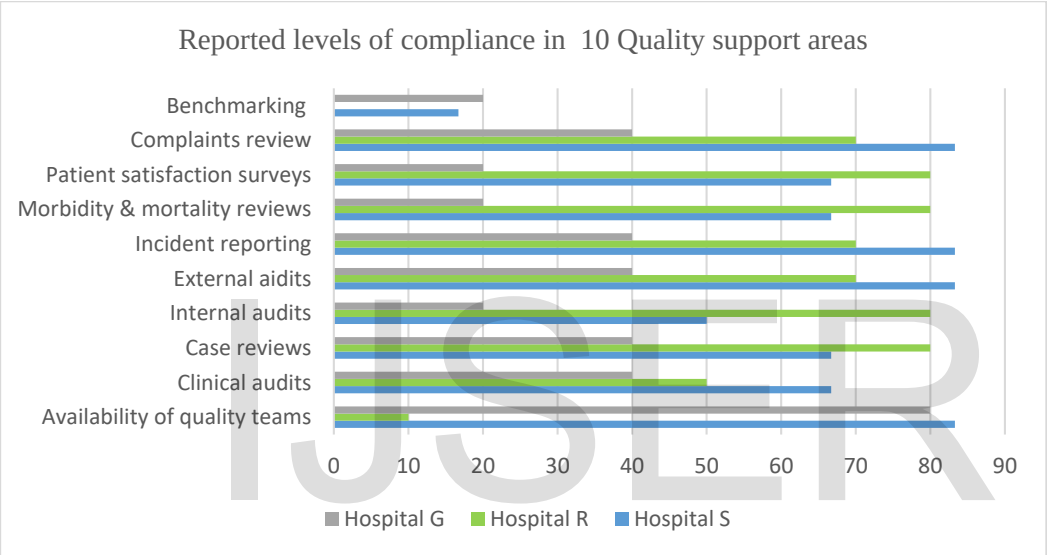
In summary, a number of reported clinical incidents and errors were statistically linked to quality improvement barriers such as: poor error management, insufficient interdepartmental

teamwork, training inadequacies, and staffing supervision deficiencies. Only one type of error (wrongly timed medication) was linked to staffing shortages.

Semi-structured In-depth Interview Results

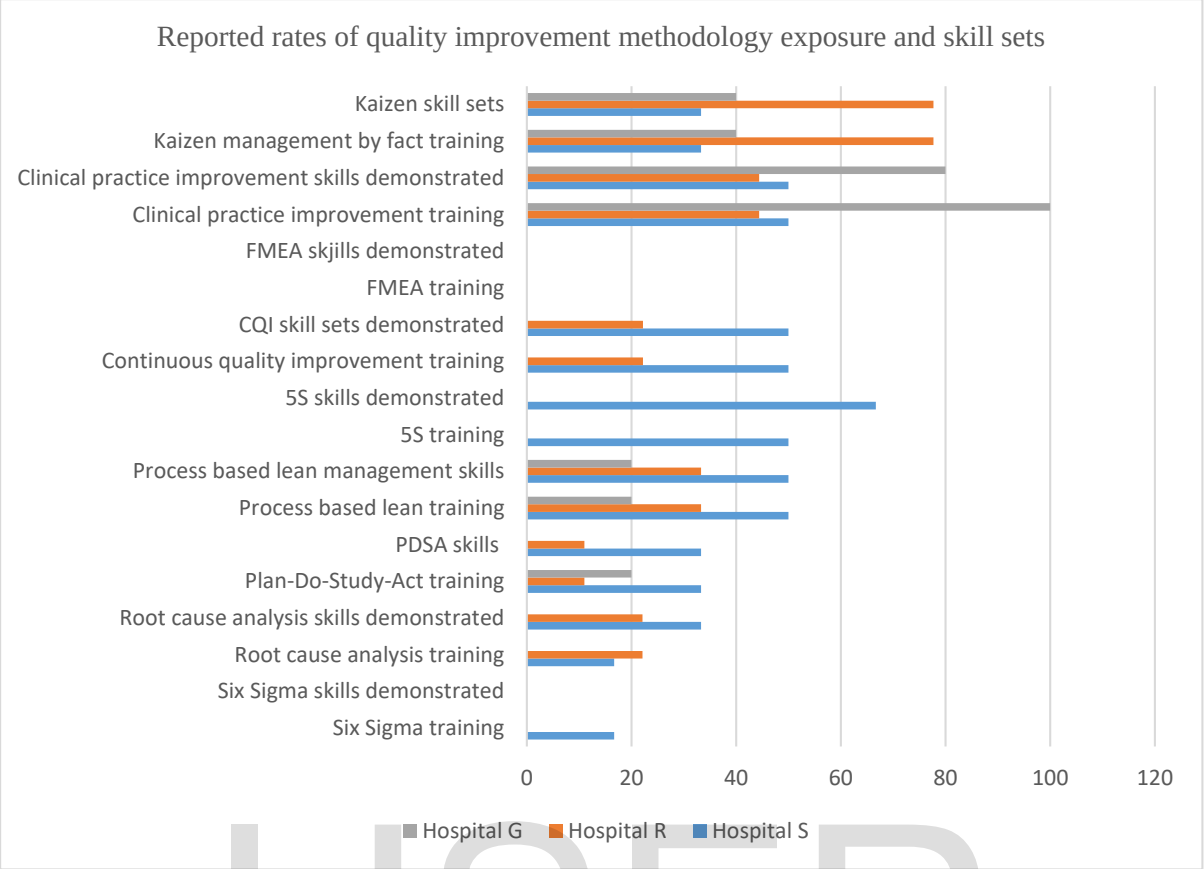
In terms of the hospital's quality improvement support framework, state Hospital G had the lowest levels of compliance in 8 quality support areas, while its highest level of compliance was related to the presence of quality teams (called Service Charter teams) and private tertiary care Hospital S had the highest levels of reported compliance in 5 quality areas

Chart 20



Distribution of Quality Improvement Methodology Exposure, and Specific Quality Improvement Skill Sets in the Three Hospitals

Chart 21



The above data revealed that the predominant quality improvement methodology adopted by the state hospital G was the Clinical practice improvement (CPI) method, while private tertiary hospital S demonstrated equal levels of skill sets in; a process based lean management methodology such as process mapping and process flow charting, in 5 S methodologies, and in continuous quality improvement CQI methodologies. Private secondary care Hospital R demonstrated higher skills in the lean component related to Kaizen management by fact methodology and a slightly lower skills set in Clinical Practice improvement methodologies.

Nevertheless, the failure modes effect analysis technique was unknown, and only a minor percentage of the study population could demonstrate Six Sigma, or root cause analysis techniques

% of employees at each hospital who reported Quality Improvement Initiatives in each International Patient Safety Goal Area within the Past 12 months

Table 3

Quality improvement initiatives within past 12 months	Hospital S	Hospital R	Hospital G
Improvements in patient identification processes eg Hospital R implemented automated computerized records	33.3%	30%	20%
Improvements in communication eg team briefing, handoff processes etc	50%	60%	60%
Improvements in medication safety	16.7%	30%	0%
Improvements in Infection control processes	100%	70%	60%
Improvements in medication reconciliation	0%	0%	20%
Improvements in falls prevention	33%	0%	0%
Improvements in wrong site surgery prevention	0%	0%	0%
Others-obstetric safety	0%	0%	20%

According to the data, all three hospitals addressed primarily infection control quality improvements within the past 12 months, along with improvements in communication processes (mostly handoffs and team briefing processed). A lower percentage of staff reported quality improvements in patient identification processes, medication safety (private Hospital R), falls, and obstetric safety (mostly related to improving access to an emergency delivery pack).

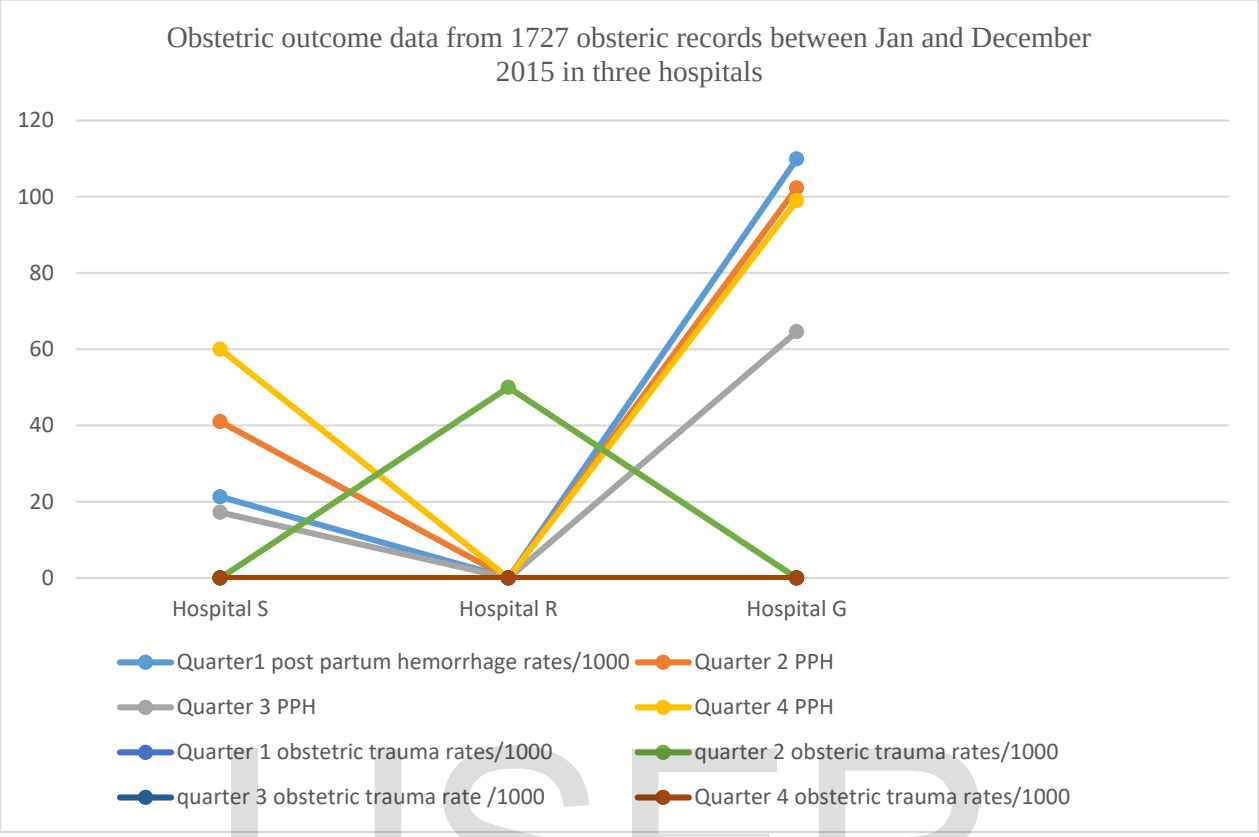
Outcome Results for Infection Control Standards Audit

The infection control audit revealed that state hospital G fully met three out of seven standards: Use of appropriate sharps bins, the availability of sharp bins, and the composition of the infection control committee. The hospital could not however provide a written infection control policy, did not use retractable laboratory lancets, did not track needle stick injuries, and reported fewer than three verifiable infection control responsibilities.

The private hospital R met four out of seven standards, and private tertiary care Hospital S met five out of seven standards listed for infection control and prevention

None of the three hospitals used retractable lancets, and none was able to produce a needle stick injury record.

Chart 22*Obstetric Outcome Data*



The obstetric data revealed that State Hospital G had twice the post- partum haemorrhage rates (more than 500 mls blood loss during delivery), as private Hospital S, while private Hospital R did not record any cases of post-partum haemorrhage, but reported an obstetric trauma incident (associated with a third to fourth degree perineal tear) in quarter two 2015.

Table 4 : *Examining Statistical Analysis Results for Quality Improvement Interviews in the Light of Complimentary Study Data*

Pearson's chi square test was used to examine associations between variables related to quality improvement methodologies and reported quality improvement initiatives Statistical significance was accepted at p=0.01	Pearson Chi square value	Degrees of freedom df	P value
(a) A statistical association was found between staff qualifications and Lean process based skills. Employees in all three hospitals who had a Masters degree were more likely to possess Lean process based skill sets	30.30	10	P=0.01

(b) Kaizen skills also more likely to be exhibited by employees with a Masters degree	28.00	10	P=0.002
(c) There was a statistical association between Lean process based skill sets and training opportunities eg training opportunities provided most of the time" .	24.39	8	P=0.002
(d) Kaizen skills, were more likely to be found in persons who reported infection control improvement initiatives	20.52	4	P=0.000
(e) Lean process based skill sets also statistically linked to affirmations regarding infection control improvements within the last 12 months (Infection control audit data confirmed that hospital S which adopted primarily Lean process based approach met more standards for infection control) In the incident data, Hospital R reported a slightly lower infection rate because it did not provide dialysis services with which to measure AV fistula infection rates	14.51	4	P=0.006
(f) Lean process based skill sets were significantly associated with confirmations of patient identification improvement initiativeseg Data confirmed that hospitals with employees who had lean process based skills such as those in Hospital S, reported fewer recurring patient identification incidents (Hospital S did not report any multiple episodes of wrong patient errors compared with Hospital R and state Hospital G, which both had three multiple episodes each)	24.01	4	P=0.000
(g) Hospital S was statistically linked to a predominantly Lean management process based approach to quality improvement	23.2	6	P=0.001
(h) Employees with Kaizen management by fact skill sets were also more likely to report improvements in patient identification However, the Kaizen dominant hospital (Hospital R) had higher reported rates of wrong patient errors than the Lean process based hospital (Hospital S)	22.67	4	P=0.000
(i) State Hospital G was statistically associated with the use of Clinical practice improvement methodologies	26.94	6	P=0.000
(j) Clinical Practice improvement methodologies also linked to infection control initiatives. Complimentary data shows that state hospital G reported the widest range, and highest levels of infection control errors	15.4	4	P=0.004
(k) Kaizen quality improvement skills were statistically associated with reporting rates of medication safety improvements. Complimentary data reveals a low recurring medication error	26.75	4	P=0.000

rate for Lean Kaizen dominant hospital R, compared with Hospital S or State Hospital G			
(l) Employees in private tertiary care Hospital S more likely to report access to training in quality improvement " most of the time" (83.3% most of the time, in Hospital S compared with 33.3% most of the time in Hospital R, and 20% most of the time in state Hospital G)	40.29	12	P=0.000
(m) Employees with Lean process based skills and Kaizen skills were more likely to demonstrate the use of a fish bone diagram	22.06 Kaizen 25.86 Lean process	4 4	P=0.000 P=0.000
(n) Employees with 5S skills statistically linked to patient identification improvement initiatives. Private tertiary care Hospital S employees reported equal skill sets in Lean process based methodologies and 5S quality improvement methodologies	23.83	4	P=0.000
(o) Plan Do Study Act cycle skills less likely to be linked to medication safety initiatives	23.02	4	P=0.000
(p) Employees who could demonstrate continuous quality improvement skills statistically associated with reported improvements in patient identification	22.88	4	P=0.000

In addition, Obstetric safety outcomes were not statistically associated with reported obstetric quality improvements at state Hospital G. p>0.01

There was also no statistical significance between reported patient safety rates/clinical errors, and hospital ownership (eg private ownership and public ownership). Therefore, preventable clinical errors are just as likely to occur in public hospitals as in private hospitals P>0.01.

There was no statistical significance between specific hospitals (Hospitals S, R or G) in terms of best overall patient safety indicators P >0.01 (besides lower rates of administering discontinued medications in Hospitals R and S). All hospitals had mixed results eg (private hospital S had low ratings for hospital acquired infections, but high reported rates of patient falls).

In summary the following findings apply to private tertiary Hospital S, secondary care private Hospital R, and state Hospital G.

Table 5

Comparing Quality Improvement methodologies at three hospitals, and Effects on Patient Safety Culture and Outcomes

Variables	Hospital S Private tertiary care	Hospital R Private secondary care	Hospital S State secondary care	P value for Pearson Chi square test =0.01 significance
Quality improvement methodology combinations identified at each hospital	a)Dominant - Lean management (process based component eg process mapping and flow charts) Combined with b)5S methodologies 50% of study group confirmed c) Continuous Quality improvement methods (CQI) 50% of study group confirmed d) Plan-Do-Study-Act 33% of study group confirmed	a)Dominant quality improvement methodology Kaizen management by fact (no process mapping or analysis ‘ Combined with b) Clinical practice improvement methodology (CPI) 50% of study group confirmed	Dominant quality improvement methodology Clinical Practice improvement methods Combined with b) Kaizen management by fact methods 40% of study group confirmed	Association between Hospital S and Lean management-process based methodology p=0.001 Association between Hospital R and Kaizen methodology as a dominant method p=0.000 Association between Hospital G and Clinical practice improvement technique as the dominant method p=0000
Reported areas of improvement according to % of study population who reported them	1.Infection control initiative (100% of study group confirmed) 2. Patient identification improvement 33% of study group confirmed 3.Communication improvements 50% of study group confirmed 4.Falls prevention 33% of study group confirmed In Hospital S lean process skills linked to patient identification improvement reports, falls prevention programs, and medication safety	1.Infection control initiative - 70% of study group confirmed 2.Communication improvements 60% of study group confirmed 3. Patient identification improvement 30% of study group confirmed 4 Medication safety30% of study group confirmed In Hospital R Kaizen skills were associated with communication improvement reports p=0.000, patient identification	1.Infection control improvement -60% of study group confirmed 2.Communication improvements -60% of study group confirmed 3.Patient identification-20% of study group confirmed 4. Obstetric safety 20% In Hospital G, Clinical practice improvement methodology was associated with infection control improvement reports p=0.004 In Hospital G Clinical practice improvement methods associated	P values < or = 0.01 for all associations between reported improvements and dominant quality improvements in specific hospitals PDSA not applied to medication safety improvements in Hospital S p=0.000 5S skills not fully applied to medication safety or patient identification improvements in Hospital S p=0.000, p=0.000 Clinical practice improvement skills not statistically linked to obstetric safety improvements p=0.000

	p=0.000, p=0.000, p=0.000 In Hospital S lean process skills found in persons reporting communication improvements P=0.001 Lean process skills linked to infection control improvements p=0.006 5S skills linked to infection control improvements p=0.004	improvement reports, p=0.000 Medication safety improvement reports, p=0.000 And infection control improvements p=0.000	with communication improvement reports p=0.000 Clinical practice improvement methods also linked to patient identification improvements p=0.000 Clinical practice improvement methods also associated with clinical audits p=0.000 and patient satisfaction surveys p=0.001	
Comparative error rates and incidents in area of patient identification	No multiple episodes of patient identification errors	Multiple episodes reported-1.wrong lab results, 2.wrongly filed physiological readings, 3.wrong patient casefile sent to the Doctor	Multiple episodes of, 1.wrong lab results, 2.wrong patients transfused, 3.wrongly filed physiological readings,	Hospital S had zero multiple episodes reported compared with Hospital R and Hospital G
Comparative error rates and incidents in area of communication	No multiple episodes of communication related errors reported in incident data	No multiple episodes of communication related error	I error with multiple episode - patient given a medication with a history of allergy to the mediation	Multiple episodes of communication errors =0 for Hospital S and R
Comparative error rates and incidents in area of medication safety	Multiple episodes for 1wrong medication timing,2 wrong dilutions, 3misread prescriptions	1 multiple episode error type –wrongly timed medication reported	1 multiple error type-wrongly timed medication reported	All the hospitals reported medication errors. Hospital S had several multiple episode error types compared with one each in Hospital R & G
Comparative error rates and incidents in the area of infection control	No multiple episodes of hospital acquired infection types reported	No multiple episodes of hospital acquired infection reported	2 hospital acquired infection types reported to have multiple episodes-Methicillin resistant staph aureus infections(MRSA) and catheter related infections,	Hospitals S and R did not report multiple episodes of hospital acquired infections
Comparative error rates and incidents in the area of falls	2 multiple episode types –patient falls on the ward and patient falls out of bed	No multiple fall episodes recorded	3 fall types had multiple episodes-patient falls on the ward, falls in the bathtub, and falls out of bed	
Comparative error rates for	No multiple episodes of wrong site surgery	No multiple episodes of wrong side surgery	Multiple episodes of wrong breast surgeries reported	

wrong site surgeries				
Infection control standards met (out of 7)	5 standards met	4 standards met	3 standards met	None of the hospitals met the 7 standard criteria
Obstetric trauma outcomes	None reported	Obstetric trauma rate 50/1000 in quarter 2	None reported	American Healthcare Research and Quality(AHRQ) benchmark=144.9/1000
Post partum haemorrhage	Mean rate for post partum haemorrhage –all quarters = 34.9/100	Mean rate for post partum -all quarters =0 /1000	Mean rate for post partum haemorrhage – all quarters = 78.1/1000	Africa benchmark rate =10.5/1000
Birth traumas	Birth trauma rate 0/1000	Birth trauma rate 0/1000	Birth trauma rate quarter 1 = 12.3/1000	US birth trauma rate AHRQ =7.4/1000
Patient safety culture management perspective				
Management supporting employee's daily efforts	33.3% strongly agreed	9.38% strongly agreed	17.5% strongly agreed	
Staffing sufficiency	14.7% strongly agreed	3.13% strongly agreed	12.9% strongly agreed	
Hospital trains new personnel	50% agreed strongly	9.3% agreed strongly	48.6% agreed strongly	
New staff are adequately supervised	72.2% strongly agreed	28.13% strongly agreed	30.8% strongly agreed	
Top 3 Improvement areas recommended by staff	Training needs 60%confirmed Process mapping skills for quality improvements 50% confirmed Staffing adequacy 33% confirmed	Funding needs 78% confirmed Training needs 50% confirmed Better staff welfare 50% confirmed	Staffing adequacy 80% confirmed Better staff welfare 40% confirmed Better working conditions 40% confirmed	Training deficiencies statistically linked to poor wound care p=0.000 Training insufficiency also associated with medication errors p=0.000 Staffing inadequacy was associated with medications being wrongly timed p=0.000
Quality support systems in place 50-100% confirmation	1.Quality Teams 2.Clinical audits 3.Case Reviews 4.Internal audits 5.External audits 6.Incident reporting 7.Morbidity and mortality meetings 8.Patient surveys 9.Complaints review	1.Clinical audits 2.Case reviews 3.Internal audits 4.Incident reporting 5.Morbidity and Mortality meetings 6.Patient surveys 7.complaints review	1.Quality Teams 2.Clinical audits 3.Morbidity and mortality meetings	

Assessments Based on Results

Null Hypothesis 1

There is no difference between hospitals which utilize different quality improvement methodology combinations; in terms of improvements in targeted areas

Assessment-Accept the Null Hypothesis $p>0.01$.

Null Hypothesis 2

There is no difference in effect between hospitals that adopt process improvement techniques, and hospitals that use non-process related quality improvement techniques

Assessment –Accept the Null Hypothesis $P>0.01$

Null Hypothesis 3

There is no difference between patient safety indicators at public hospitals, and patient safety indicators at private hospitals

Assessment- Accept the Null Hypothesis $P>0.01$

Discussion

Similar Quality Improvement Combinations but Different Results

The findings of the study supported a number of previous studies addressing the variability, and inconsistencies of quality improvement programs. For instance, considering similarly poor ratings for staffing, and supervision inadequacies, private Hospital R's quality improvement combination methodology (which was a mirror image of state Hospital G's) resulted in significantly different outcomes. Both hospitals had adopted a similar integrated approach, involving Kaizen management by fact elements, and clinical practice improvement methods. However, although no statistical association was found, state Hospital G reported a larger range of preventable error types, and poorer patient safety outcomes, compared with either Hospital R, or Hospital S. In addition, while state Hospital G did not report any significant improvements in targeted areas, private Hospital R reported low incident rates in two improvement targeted areas; communication between caregivers, and prevention of hospital acquired infections. This may suggest that the success of any quality improvement program

(irrespective of methodology) will usually depend on both intrinsic and extrinsic factors. Many of such factors may adversely affect patient safety improvement efforts in resource poor environments (Ingabire et al.2015)

Extrinsic Barriers

Hence, according to Ingabire et al. (2015), successful quality improvement initiatives are often marred by numerous extrinsic factors such as staffing, and insufficient resources (materials such as safety lancets or sharps boxes) and financing with which to achieve desired outcomes. The study findings were also aligned with these factors. Staffing inadequacies were reported by all three hospitals irrespective of the socioeconomic status of patients. High staff turnover rates may also compromise quality healthcare (Rajan 2013). The study findings suggest that a preponderance of clinical staff who have spent fewer than five years in employment, may be a contributory factor to poor quality care in Nigerian hospitals. The study findings confirmed for example, that in all three hospitals, a larger proportion of staff (over 50%) had been in employment for fewer than five years. In the study, however, employees who had served for five to ten years were more likely to exhibit Kaizen skills. This further suggests the extent to which high staff turnover rates can deplete hospitals of trained staff, and the impact this could have on quality service delivery (Rajan 2013), and competency gaps. Thus, numerous factors related to patient safety may also be intrinsic to the employee.

Intrinsic Barriers

Intrinsic factors identified in previous studies include staff qualifications (Pannick et al. 2014), low morale (Ingabire et al. 2015), negative staff attitudes, staff violating established protocols (Agyeman-Duah et al.2014;Ingabire et al.2015), lack of teamwork, and insufficient training (Agyeman-Duah et al.2014;Ingabire et al. 2015). In addition, the study confirmed that employees with lean skills were the most likely to possess a Masters degree (p=0.001).In contrast to this requirement, only 30.7% of all nursing staff in all three hospitals possessed a BSc degree in nursing, while fewer than 2% of nurses in the study had a Masters degree. This may indicate that low levels of education amongst nursing staff may also contribute to quality improvement implementation barriers. However, a few differences in the perceptions of staff at state Hospital G, and staff satisfaction rates with working conditions, may further explain the differences observed in quality improvement outcomes, compared to private hospital R. For instance, despite state Hospital G's reportedly high rates of job satisfaction (76.9% compared to private hospital R -53.1%), fewer than 30% of employees at state hospital G

agreed strongly that the hospital was 'a good place to work' compared with 34.5% of employees at Hospital R, and 76.4% of employees at Hospital S. Interdepartmental collaboration ratings were also lower at state Hospital G, than at the other two hospitals (eg 30.8% versus over 40% at Hospitals R and S).

Role of Quality Support Systems

A question also arises concerning the role of quality support systems (also recognized as components of clinical governance) in achieving the desired outcomes of quality improvements. These quality support systems may include quality teams, clinical audits, internal and external audits, mortality meetings, patient satisfaction surveys, and complaints review systems. According to White et al.(2011) quality teams may not contribute to the success of quality improvement initiatives in hospitals. This view also supported my findings. In this case, state Hospital G had utilized specially trained 'service charter" quality teams to implement improvements at the hospital. However, patient safety outcomes were not significantly better than those in private hospital R where no active quality teams were in place. In addition, Phillips et al.(2010)observed that quality support systems may not be necessarily relevant to patient safety because few quality support systems are designed to improve patient safety. In addition, internal and external audits (or external accreditation surveys) are usually designed to enforce quality standards rather than minimise error rates (Phillips et al.2010). For instance, private tertiary Hospital S reported high patient fall rates, and medication error rates, despite being fully compliant with nine quality system support standards.

Impact of Various Quality Improvement Methodology Types on Patient Safety

Previous studies indicated that Lean management and Six Sigma combination methods were more appropriate choices for patient safety centred quality improvements (McFadden et al. (2015). McFadden et al. (2015) also stated that Lean management techniques may have little impact on patient safety outcomes except in combination with other process based methods such as Six Sigma. However, three previous studies carried out in Ghana and Nigeria revealed that Lean management and Continuous quality improvement (CQI) combinations provided the desired results in three hospital settings. The study findings further support 0the view that Six Sigma is not necessarily required to achieve acceptable patient safety outcomes. Private Hospital S in the study achieved visible improvements in four targeted areas with a combination of Lean process elements, (including 5S methods), and CQI techniques. This also supports the findings of Ogoina et al. (2015) and Srofenyoh et al. (2012) that Lean management

and CQI combinations are effective in resource poor settings. Furthermore, this study revealed that a combination of Kaizen methods, and clinical practice improvements (CPI) can also enhance patient safety outcomes. In addition, the evidence suggests that hospitals in resource poor environments may achieve desired outcomes by adopting just a few elements of Lean management (process related or not process related).

In summary

Hence, the study findings point to the fact that hospitals achieved better patient safety outcomes in targeted areas, using Lean management methods (in part or as a whole) as a centralized system of improvement. In addition, the study provided information regarding the range of quality improvement methodologies in use in Nigerian public and private hospitals. The dominant methods were Lean management methods, (including 5S and Kaizen), CQI and CPI. However, the impact of these methodologies on patient safety culture, and outcomes was somewhat inconsistent. This could explain the significant levels of preventable clinical errors observed at all hospitals, thus masking any differences that may have been present, on account of the methodology mix. Hence, the study findings suggest that; both process related and non-process related methodologies may be effective,provided that intrinsic and extrinsic barriers are identified and addressed. Specifically important barriers to consider include staffing adequacy, material resources, staff training in quality improvement, excessive workload, and staff supervision.

Conclusion

The findings of this cross-sectional study has further added to the body of knowledge concerning quality improvement methodology choices. Although the study was restricted by funding (thus limiting the number of hospitals studied to three), the evidence suggests that a range of methodologies may be relevant to patient safety initiatives in the Nigerian context. Other study limitations include the nature of the incident data collection, which was subject to recall bias, since incidents were often not documented by the organization, and employees were asked to report them retrospectively. Nevertheless, in line with the views of Spagnol, Min and Newbold (2013) the evidence supports the view that lean management methods are ideal in resource poor settings, as such methods often help to reduce waste, and manage scarce resources more efficiently.

Recommendations

Therefore, judging from the low levels and limited range of quality improvement skills exhibited at all hospitals, a state level or national level effort may be required to improve patient safety in Nigeria. A collaborative effort with the state ministry of health is also highly recommended (Agyeman-Duah 2014). The first step is for state health boards to host symposiums and training workshops on patient safety and Lean management skills, and for state health leaders to enforce patient safety indicator reporting at both private and public hospitals.

For example, lean management skills can help health institutions better address and minimize the seven wastes of healthcare : time wasting, over processing, poor bed management skills arising from patient discharge inefficiencies, high error margins, recurring incidents, deficient processes, substandard inventory management, and inefficient patient transfers(Spagnol, Min and Newbold 2013).

In addition, a suitably developed legislative instrument should ensure that hospitals nursing populations upgrade their qualifications to university degree levels. It is also essential that existing nursing continuous education requirements (CMEs) currently under the auspices of the Nigerian Nursing and Midwifery Council, incorporates regular training sessions on quality improvement methodologies.

Appendices

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