# STRUCTURAL AND PROCESS ANALYSIS OF A RWANDAN ICU SETTING IN PROMOTING QUALITY PATIENT CARE

**Timothee Shahidi, MA, RN**
University Central Hospital of Kigali (CHUK) Rwanda
timoshatw@yahoo.fr

**Zethu Z Nkosi, PhD, RN**
University of South Africa

**Thembekile E Masango, PhD, RN**
University of South Africa

## ABSTRACT

The purpose of this study was to explore and describe the structure and processes of quality patient care at the University Central Hospital of Kigali (CHUK)/Intensive Care Unit (ICU), using Donabedian's model and the Joint Faculty of Intensive Care Medicine (JFICM) minimum standards for quality patient care. A descriptive and exploratory quantitative study was conducted using self-reporting questionnaires for healthcare workers and a self-developed checklist for document analysis. The sample consisted of 32 healthcare workers in the ICU and the researcher observed the files of 20 patients during the period of data collection from 20 June 2010 to 20 July 2010. The results showed that while the ICU was in a self-contained area, access to other departments was not easy; and, the actual work environment did not comply with the recommendations of the JFICM minimum standards for ICUs. The equipment was not adequate for the workload in the unit. The documents showed that policies, procedures, guidelines and protocols were not available. Patient assessment and monitoring were done without any guidance. The findings demonstrated that quality patient care was inadequate and needed improvement.

**Keywords**: intensive care unit, patient care, process, quality, standards, structure

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# INTRODUCTION AND BACKGROUND

Quality healthcare is defined by the Institute of Medicine as care that is safe, timely, effective, efficient, equitable and patient-centred (Arca, Enters, Christensen, Jeziorezak, Sato, Thielke & Oldham, 2014:203). Improving safety is fundamental to quality healthcare and is one of the most urgent issues facing healthcare today (Curtis *et al*., 2006). The safety and quality agenda has been adopted by healthcare systems worldwide and is understood as the degree to which potential risk and unintended results in healthcare are avoided or minimised through continuous assessment of how well the organisation is performing in its goal to improve clinical care (Gardner, Gardner & O'Connell, 2013:150). Quality is a reflection of the values and goals currently perceived in the healthcare system and in the larger society (Donabedian, 2005:700, as quoted by Curtis *et al*., 2006). Nurses working in the ICU need to have specialised training so as to be able to render quality patient care and operate complex ICU equipment that save patients' lives (Fortis, Weinert, Bushniki, Koehler & Beilman, 2014:681). Nurses have an important contribution to make in the promotion of health. If nurses become involved in the evaluation of nursing care they should have a clear concept of what nursing is. The nursing profession has a responsibility to develop standards and criteria for the evaluation of nurses' contribution in patient care (Van Maanen, 2006:8).

Curtis *et al*. (2006) argue that in quality care improvement the structures, processes and clinical activities occurring in a critical care setting should be evaluated and considered for possible improvement initiatives. Structure represents the first component of the quality of care and can be defined as the way we design, resource and organise the health facility or unit. Design includes how an ICU should be integrated within the hospital alongside other services and other departments such as the X-ray department, the operating theatre and the emergency department. Integration may also include the relationship of the hospital to other healthcare facilities to accommodate the referral system.

In 1988, Donabedian developed a model on quality in healthcare consisting of three aspects of care components, namely structure (organisation, resources and equipment), processes (input) and outcome (results). The structure standards include the integration of ICU with other services or health systems, the ICU building design, its size, the number and qualifications of staff, its equipment and operational requirements. According to Gunning and Gillbe (2006), an ICU design includes the building and its layout, its size, patient area and bed space and a move towards 100% single-bedded rooms. Storage areas, an isolation area, the flow of soiled linen and organic waste, the office space for designated health workers, a waiting room for visitors and grieving families and a seminar room all need to be taken into account (Gunning & Gillbe, 2006). The organisational structure and processes are integral to the delivery of critical care services and central to patient outcomes (Frankel &

Moss, 2014:463). Hospital level variations in structure and processes of care and use of protocol may affect clinical outcomes in ICUs (William *et al*., 2013:344). Patients in critical care units with better working environments for nurses experienced 11% lower odds of 30-day mortality than those in worse working environments (Kelly, Kutney-Lee, McHugh, Sloane & Aiken, 2014:1090).

To measure aspects of quality care, stakeholders in healthcare (healthcare providers and patients) need a robust way to measure quality of care. The measurements are referred to as indicators and are defined as parameters that give an indication of the quality of care (Van Der Voort, Van Der Veer & De Vos, 2012:1086). The JFICM (2003) developed minimum standards for quality patient care in ICU based on Donabedian's classification. These standards are classified into three levels namely:

Level 1: Higher level of observation. No ventilation required.

Level 2: Active management by critical care to treat and support critically ill patients with a single organ failure. Need ventilation.

Level 3: Active management by critical care team to treat and support critically ill patients with two or more organ failures. Need ventilation.

In this study, only the structure and process components of the standard of quality patient care will be looked into using Donabedian's model and the JFICM minimum ICU standards, with the aim of analysing the structure in promoting quality patient care in the context of ICU at CHUK in Rwanda.

## PROBLEM STATEMENT

Poor quality patient care is a major problem of many hospitals in Rwanda, and CHUK is no exception, especially in ICU (Rwanda Ministry of Health Report, 2005). The management of patients admitted to ICU includes a complex array of biomedical equipment and sophisticated diagnostic and therapeutic regimen by highly knowledgeable and skilled professional nurses. Improving the efficiency of critical care service is needed as the lack of ICU-trained staff, equipment, viable policies and protocols impacts negatively on patient safety and quality patient care.

## AIM OF THE STUDY

The aim of the study was to explore and describe the quality care given to patients in CHUK ICU, Rwanda, guided by the structure and process of Donabedian's model and the JFICM minimum standards of quality care.

# RESEARCH OBJECTIVE

The study seeks to describe quality care (process and structure) provided to patients admitted in ICU at CHUK.

# DEFINITION OF KEYWORDS

**Intensive care unit:** A hospital unit in which special equipment and skilled personnel are concentrated for the care of seriously ill patients requiring immediate and continuous attention (Fortis *et al*., 2014:677).

**Patient care:** The management and care of a patient or the combating of disease or disorder (Fortis *et al*., 2014:678).

**Process:** A series of operations, events, or steps leading to the achievement of a specific result; also to subject to such a series to produce desired changes (Gardner, Gardner & O'Connell, 2013:147).

**Quality** is defined as having several dimensions such as appropriateness, equity, accessibility, effectiveness, acceptability and efficiency (Booyens, 2008:596). In this study, quality means accessibility, acceptability and efficiency of equipment and staffing.

A **standard:** A written description of a desired level of performance, containing the characteristics associated with excellence (Booyens, 2008:607).

**Structure:** Refers to the support system such as human, financial and physical resource (Booyens, 2008:607).

# METHODOLOGY

## The research paradigm and design

Positivism is a philosophical concept referring to a particular set of assumptions about the world and appropriate ways of studying it. Positivism predominates in science, and quantitatively measures independent facts about a single apprehensible reality. Data and its analysis are value-free and data does not change because it is under observation. Evidence for a study in the positivist paradigm is gathered according to a specific plan, using formal instruments to collect the needed information (Polit & Beck, 2012:115). The research approach used was a quantitative, exploratory descriptive design.

## Setting description

The study was conducted in the ICU at CHUK in Rwanda. The ICU at CHUK, which is equipped for critically ill patients, is divided into three blocks. The first block contained four beds for patients, the second had three beds, and the third block

was an isolation room containing two beds. The unit admits both male and female patients, adults and children, suffering from different types of critical illnesses.

## Population

CHUK has only one ICU. The study population comprised 27 nurses and 5 student nurses who were working in the ICU during the period of data collection. The total population was 32 healthcare workers (N=32) and 20 patient files that were randomly sampled.

## Participants

A census was used to get the total population in this study. Due to limited numbers of health workers, the total population was sampled, meaning that the sample of 32 participants included all the nursing staff who were working in the ICU during the period of data collection, 20 June to 20 July 2010.

## Records

The files of 20 patients were consulted by the researcher in order to fill in the checklist during the data collection period. The checklist comprised data from patients' files and other observations concerning the structure and process in the ICU at CHUK

## Sampling technique

A non-probability, purposive sampling technique was used. All nurses and student nurses working in ICU at CHUK during the period of data collection constituted the study population. All relevant documents, namely the nursing care files and monthly reports were consulted by the researcher, as well as the patients' files during the period 20 June to 20 July 2010. The patients were not involved in the study because of intensive care ethical procedures, which protect vulnerable patients who are unconscious or heavily sedated.

## Data collection

Data collection is the method of selecting participants and gathering data from them (Burns & Groove, 2009:112). A self-developed instrument was guided by the JFICM (2003) minimum standards. The questionnaire covered the demographics and ICU structure, the design, staffing requirements, the ICU equipment and operational requirements that represented the process of the study. The researcher used the structure standards and the processes of the ICU at level III because CHUK

is considered to be at that level according to its status as a referral, university and teaching hospital (*Rwanda Ministry of Health Report*, 2005).

A checklist was developed to describe the structure and process of quality patient care in the unit and the research followed the JFICM (2003) minimum standards. The participants were invited to the study during the lunch break where debriefing and consent were obtained. Questionnaires were given to the participants and were collected after three days. They were kept under lock and key in the nurse manager's room.

The researcher examined the documents in a private room within the ICU. All the documents and patients' files fell within the same period of data collection (from 20 June to 20 July 2010) and were used to fill in the checklist. The total number of patients' files examined during that period was 20, these being the total number of patients present in ICU at the beginning of the data collection period (20 June 2010) as well as those admitted during the data collection period.

The validity refers to the degree to which an instrument measures what it is supposed to measure (Polit & Beck, 2012:227). The questionnaire, which corresponded with the structure of the ICU, was used and the checklist was used to direct the researcher's observations regarding the following: design (integration and building size, environment); ICU staff requirements, equipment, monitoring of ICU patients and equipment, interventions done, infection control, documentation, communication and operational requirements. This represents the process in the study. Before collecting data, the instrument was given to a specialist in ICU, at the School of Nursing, to be scrutinised and validated. The assistant biostatistician of the School of Nursing supervised the researcher in checking the tool. A pilot study was conducted to check this instrument before its use.

Reliability was ensured by conducting a pilot study that took place over two days, on 16 June and 17 June 2010. Participants were sampled within the ICU at the hospital, which has an ICU similar to the ICU at CHUK. The results were interpreted and analysed on 17 June 2010. A simple random sampling was used to select five participants from all personnel working in the department to fill out the instrument of the pilot study. The pilot group consisted of nurses working in the unit at that hospital. The participants were given the questionnaire to complete after having been given an explanation on how they should fill it out. The purpose of the study was explained to the pilot group and consent was obtained before data collection. The findings from the pilot study did not warrant any changes in the questionnaire.

The researcher requested permission from the Ethics Committee of the School of Nursing at the University of KwaZulu-Natal first, and then from the hospital director and nursing department at CHUK, before collecting data. Permission and consent were also obtained from the participants after explaining the purpose and benefits of the study. Ward routine was not disturbed as data was collected during the participants' free time. In addition, a box where the questionnaires could be dropped

was made available to the participants. The researcher returned later in the day to collect the completed questionnaires. Data was analysed quantitatively by SPSS version 18 and was presented in frequencies, tables and graphs. A checklist was designed to analyse sampled documents. Analysis was done manually.

# RESULTS

## Age and professional categories of participants (N=32)

The findings revealed that the majority of participants (56% (n=18)) were aged 31–45 years old, 19% (n=6) were aged 21–30 and 25% (n=8) aged 46–60.

## The work experience of the participants

Out of 100% (N=32) participants, 36% (n=12) had less than 1 year experience in the ICU, 12.5% (n=4) had between 1 and 3 years' experience, 16% (n=5) had 4 to 7 years' experience and 34.5% (n=11) more than 7 years' experience.

## Presentation of data about ICU: design, staffing requirements, equipment, and operational requirements

### ICU design requirements

The design of the ICU looked at the accessibility of ICU to the operating theatre, the X-ray department, the emergency department and pharmacy. It assessed whether office space was available for doctors, medical students, nurses and student nurses. It also assessed the availability of working space, bed space, a room for the telephones and other means of communication, and rooms for training and research.

**Table 1:** Accessibility of ICU to other departments (N=32)

| Item | Agree | Neutral | Disagree | Total |
|---|---|---|---|---|
| **Access of ICU to the operating theatre** | 72 % (n=23) | 9 % (n=3) | 19 % (n=6) | 100%(32) |
| Access of ICU to the X-ray department | 94% (n=30) | 6% (n=2) | 0 (0) | 100%(32) |
| Access of ICU to the emergency department | 84 %(n=27) | 13% (n=4) | 3 %(n=1) | 100%(32) |
| 24 hours access to the unit pharmacy | 88% (n=28) | 9 % (n=3) | 3 % (n=1) | 100%(32) |

| | | | | |
|---|---|---|---|---|
| **24 hours access to the main pharmacy** | 57% (n=18) | 6 % (n=2) | 37 % (n=12) | 100%(32) |
| Availability of office space to accommodate nurses and student-nurses | 31% (n=10) | 6.% (n=2) | 63 % (n=20) | 100%(32) |
| Office space to accommodate doctors and medical students | 31% (n=10) | 6% (n=2) | 63 % (n=20) | 100%(32) |
| Working space for resuscitation material | 41% (n=13) | 9% (n=3) | 50% (n=16) | 100%(32) |
| Bed space for optimal working condition | 44% (n=14) | 3 % (n=1) | 53 % (n=17) | 100%(32) |
| Room for phones & communication materials | 50% (n=16) | 6 %( n=2) | 44 % (n=14) | 100%(32) |
| A room for education and research in the ICU | 31% (n=10) | 6% (n=2) | 63% (n=20) | 100%(32) |

The majority of participants agreed that the ICU was accessible to X-ray (97.6% (n=40)), operating theatre (72% (n=30)) and emergency department (78 %, n=32)), whereas 73.2% (n=30) disagreed that there was a room for education and research. The majority stated that the office was not available for staff members.

## Staffing requirements

Staffing was looked at in terms of the availability of a specialist consultant in the ICU, a specialist in intensive care medicine for the trainees, a registered nurse to provide direct patient care, a nurse responsible for the care of patients needing complex support, a nurse responsible for the care of post-operative patients with epidurals, as well as social workers and cleaning staff.

**Table 2:** Staffing requirements (N=32)

| Item | Agree | Neutral | Disagree | Total |
|---|---|---|---|---|
| Availability of specialist consultant | 88 % (n= 28) | 6 % (n=2) | 6 % (n=2) | 100%(32) |
| Availability of specialist doctor to the trainees | 84% (n=27) | 3 % (n=1) | 13 % (n=4) | 100%(32) |

| | | | | |
|---|---|---|---|---|
| Registered nurse responsibility in direct patient care | 44% (n=14) | 6 % (n=2) | 50% (n=16) | 100%(32) |
| Availability of 2 nurses for an artificially ventilated patient | 6 % (n= 2) | 3 % (n=1) | 91 % (n=29) | 100%(32) |
| Post-operative patients require 1 nurse per 2-3 patients | 6% (n=2) | 21% (n=7) | 73 % (n=23) | 100%(32) |

The staffing requirements were not met as indicated in Table 2. The registered nurses were not ICU-trained and the ratio of nurses to the ventilated patients was inadequate.

## ICU equipment requirements

Regarding the ICU equipment, the researcher looked at whether the equipment and its monitoring were appropriate for the workload of the unit, whether there was enough equipment in the unit and whether there was a regular system in place for checking the safety of the equipment. The researcher also looked at whether there were enough ventilators, defibrillators, equipment to control patients' temperatures as well as chest drainage equipment, and whether there were beds for patients needing specialised care in the ICU.

**Table 3:** ICU equipment requirements (N=32)

| Item | Agree | Neutral | Disagree | Total |
|---|---|---|---|---|
| Quantity and monitoring of equipment | 25% (n=8) | 6% (n=2) | 69% (n=22) | 100%(32) |
| Quantity of equipment vs the workload of the unit | 9% (n=3) | 2% (n=1) | 89% (n=28) | 100%(32) |
| A regular system for checking the safety of equipment | 38% (n=12) | 9% (n=3) | 53% (n=17) | 100%(32) |
| Sufficient ventilators in the unit | 19% (n=6) | 6% (n=2) | 75% (n=24) | 100%(32) |
| Availability of defibrillators in the unit | 66 %( n=21) | 6% (n=2) | 28% (n=9) | 100%(32) |
| Equipment for the control of patients' temperatures | 41% (n=13) | 6 %( n=2) | 53% (n=17) | 100%(32) |
| Chest drainage equipment | 47% (n=15) | 9% (n=3) | 44% (n=14) | 100%(32) |

| | | | | |
|---|---|---|---|---|
| Availability of ICU beds | 81% (n=26), | 13% (n=4) | 6% (n=2) | 100%(32) |

The respondents in the study proclaimed that the equipment in ICU is inadequate to allow them to render quality patient care as 83% (n=34) disagreed that there were sufficient ventilators.

### Operational requirements

The operational requirements considered included the admission of patients, policies, records, and a written orientation programme, in-service training for doctors and nurses, programmes for research, nurses' presentation of research findings, an infection-control programme and access to the unit pharmacy as well as to the main pharmacy.

### Documentation of admissions

In response to whether every ICU patient admitted was documented, the majority of participants (96.9% (n=31)) agreed while 3.1% (n=1) disagreed.

### An orientation programme in the unit

Regarding the existence of an orientation programme in the ICU, the research shows that more than half of participants, 66.3% (n=21), disagreed, 21.2% (n=7) agreed, while 12.5% (n=4) remained neutral.

### In-service training for both medical and nursing staff

Data reflects that according to 75% (n=24) of the participants, the ICU did not provide in-service training for medical and nursing staff, 6.25 % (n=2) agreed that it did, while 18.25% (n=6) were neutral.

### The existence of a research programme

As to whether an active research programme existed in the ICU, 81.25% (n=26) of the participants disagreed, while 19.5% (n=4) agreed, and 6.25% (n=2) were neutral.

### Presentation of nurses' research findings

Regarding whether nurses' research findings were presented, 75% (n=24) of the participants disagreed with this statement, 16% (n=5) agreed, while 9% (n=3) were neutral.

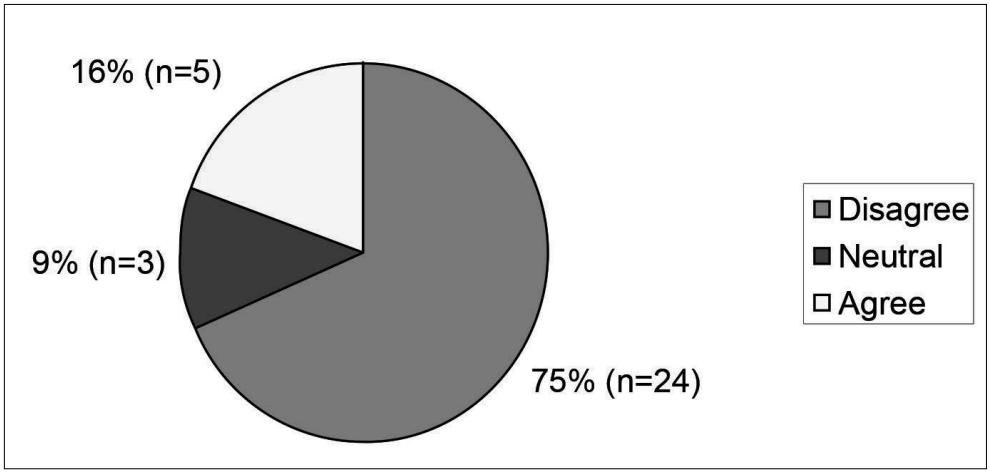


**Figure 1:** The existence of a research programme

### Infection control programmes in the unit

As to whether infection control programmes existed in the unit, 78% (n=25) of the participants disagreed that it existed, 16 % (n=5) agreed, while 6.25% (n=2) were neutral.

## DISCUSSION

The demographic data demonstrated that the majority of the participants in this study were female (61%) as compared with the 39% males, and all had a qualification in nursing and years of experience. This is in line with global nursing demographics. According to Kelly *et al*. (2014:1069), patients in hospitals with better critical care nurse work environments and higher proportions of critical care nurses with a bachelor's degree in nursing experienced significantly lower odds of death.

The finding of the study in terms of staffing and available resources is not in line with global critical care standards. According to the JFICM (2003), the critical care unit should have trained *medical personnel* and at least 50% of ICU trained nursing faculty, healthcare assistants who are also trained in critical care, allied health professionals and support staff. Resources should be readily available to carry out duties and for continuous professional development.

### Accessibility to other departments

In terms of ICU design, the study revealed that the majority of participants (73.2% (n=30)) agreed that the ICU had access to the operating theatre 24 hours a day.

According to the recommendations of the JFICM (2003*), a*n emergency operating theatre must be available.

The ICU is close to the physiotherapy and X-ray departments, but was not so close to the operating theatre, internal medicine, and the surgery and emergency departments; the radiography department is easily accessed; the unit pharmacy and the main pharmacy are both accessible all the time and 58.5% of the participants agreed that there was easy access to the main pharmacy. According to standards in the JFICM (2003), the ICU should have an appropriate design, providing a suitable environment with adequate space for patient care delivery, storage, staff accommodation (including office space), education and research. Florida (2007) argues that rooms for the staff should be sized and located to provide privacy and satisfy their intended function. Results of the current study showed, however, that 73.2% (n=30) participants disagreed with the existence of a room for education and research in ICU and 19.5% (n=8) agreed.

## CU staffing requirements

CHUK has only three specialist anaesthetists; a specialist consultant was always available in the ICU; nurse to patient ratio was 1:1 for the critically ill; a physiotherapist and dietician were always available in the unit; the dietician or nutritionist sometimes doubled up as social workers; and a general technician and electrician repaired materials and equipment, while there was no engineer (*CHUK annual report*, 2010). According to the JFICM (2003), the ICU did not meet all the staffing and equipment requirements. Frankel and Moss (2014:464) alluded to lower mortality rates, if there is an adequate nurse/patient ratio, and Kelly *et al*. (2014:1090) alluded on ensuring better environments for good patient outcomes**.**

## ICU equipment

The results reveal that nurses' observations and blood gas analysis examinations on ICU patients were not done at clinically appropriate intervals; the ICU did not have piped gas supply failure alarms and oxygen supply failure alarms were not automatically activated to monitor oxygen supply pressure; no oxygen analyser or humidifier of temperature was available, but there were two old ventilators in the unit that were used on all critically ill patients needing ventilation. According to Rello (2008), when a patient is admitted to the ward or ICU other important decisions include issues of fluid resuscitation. This includes high volume options and crystalloids (saline and Ringer's solution), whereas lower volume options include hydroxyethyl starch solutions, gelatine and albumin.

Regarding operational requirements, the researcher established that in the CHUK ICU there were no guidelines and protocols available to workers to help them implement nursing care; no written and defined job descriptions existed for any

of the workers, including the nurse in charge; and, there was no active programme of research in the unit, while infection control programmes did exist (Van der Voort, Van der Veer & De Vos, 2012:1088).

The *process of implementation* of quality patient care reveals that 88% (n=36) disagreed that there were two nurses at all times for an artificially ventilated patient and 73% (n=30) disagreed that 2–3 post-operative patients with epidural required one nurse; pulse, ECG, and arterial blood pressure were monitored, and the respiratory function was assessed at frequent intervals; there were two nurses at all times for an artificially ventilated patient, and 73% (n=30) disagreed that 2–3 post-operative patients with epidural required one nurse; equipment and its monitoring were appropriate; the nurses collaborated with patients' families in the protection from ICU microbes in order to prevent contamination of family members of patients; isolated patients were not allowed visitors and only doctors and nurses working in that room were allowed to enter (Dhillon, Shah & Rimawi, 2011:35).

Nursing documentation reports at CHUK were often incomplete with the nursing care plans and nursing duties written in handbooks; and patient admissions were properly documented in the register. It is crucial to keep ICU records as documentation included critical care, evaluation and management, and procedures, which facilitated record-keeping of other patient-care activities (Carpenter, Gregg, Owens, Buchman & Coopersmith, 2012:4). To facilitate integration, the importance of clinical record systems cannot be over-emphasised in the support of rapid clinical decisions (Haller, Myles, Stoelwinder, Langley, Anderson & McNeil, 2007:178).

According to the communication results, CHUK ICU did not have guidelines to monitor nurses' practices or *written protocols* outlining the role of the nurse in charge; written nursing reports were very poor; the isolation room did not have policy or procedure guidelines; and, there were no protocols or guidelines for the admission and discharge of ICU patients. This is in contrast with Sax, Clack, Touveneau, daLiberdae Jantarada, Pittet, and Zingg (2013) who state that ICUs, which implement policies and best practice guidelines, have demonstrated success and good patient outcomes.

## CONCLUSION

The study demonstrated that the Donabedian framework of structure and process is a valuable and validated approach to examine the quality of an ICU. The majority of participants perceived that the ICU was well integrated into the other departments in CHUK; that there was adequate and appropriate lighting for clinical observation, but the office space for both nurses and doctors and storage space for ICU material and equipment were inadequate to meet the requirements of quality. While the registered nurses seemed to be adequate, none of them were qualified in intensive care nursing.

## RECOMMENDATIONS

Recommendations will be made to the Rwandan Ministry of Health to create a mechanism in hospitals to oversee the implementation of policies and protocols of quality patient care. The ministry should also supervise an action plan for quality patient care in the current health settings.

For CHUK to equip its ICU with apparatuses such as ventilators, aspirators and equipment for dialysis, the hospital needs to properly plan and budget, as quality cannot be improved without the necessary equipment.

CHUK should have written policies, guidelines and protocols in place and ensure that these are implemented. It should furthermore improve on nursing documentation, infection control and medical care, and nursing procedures at unit level should be fully implemented. More qualified staff are needed for the success of the quality improvement programme.

## LIMITATIONS

The research covered a limited period of time. One month was used to collect data while research was applied only to CHUK, and can therefore not be generalised in terms of other hospitals in Rwanda. The small sample and research covered only two of the three aspects within the chosen conceptual framework, namely structure and process.

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