ASSESSMENT OF NURSES' EARLY RECOGNITION AND RESPONSES TO CLINICALLY DETERIORATING CHILDREN IN PEDIATRIC WARDS AT 2 SELECTED REFFERAL HOSPITAL IN RWANDA

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DECLARATION

I, TUYISHIME Aphrodis Gustave, do hereby declare that this research dissertation entitled *"assessment of nurses' early recognition and responses to clinically deteriorating children in pediatric wards at 2 selected referral hospital in Rwanda"* submitted for the partial fulfillment of the requirements for the degree of Master in Nursing Science (Pediatrics) at the University of Rwanda/College of Medicine and Health Sciences, is my original work and has not previously been submitted elsewhere. I declare that a full list of references is provided indicating all the sources of information quoted or cited.

TUYISHIME Aphrodis Gustave Date: 12/06/2019

DEDICATION

1 sincerely dedicate this report to:

All might God

My beloved father for his care during my education,

My beloved brothers and sisters for your love,

My beloved direct boss at my workplace, for your support

My beloved workmates for your consideration

All my classmates for the moments shared together

May the Almighty God bless you all.

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I am thankful to all nurses of pediatric department in the University Teaching Hospital of Kigali (UTHK) and Rwanda Military Hospital (RMH) who accepted to participate in my study and made this work possible.

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ABSTRACT

Background: Clinical deterioration is more prevalent in hospitalized children and nurses working in pediatric ward but also faced with challenges to recognize children who are at a potential risk of clinical deterioration therefore these lapses in recognizing clinically deteriorating children eventually affect their response towards clinical deterioration

The purpose of the study: This study was aimed at assessing nurses' recognition and responses to clinically deteriorating children admitted in pediatric ward in 2 referral hospital

Methods: A descriptive cross sectional design, quantitative approach was used. A convenience sampling strategy was used to select 111 nurses working in pediatric department in two referral hospitals who filled semi structured questionnaire. Ethical principles involving human subjects were observed. Data were analyzed using the statistical package for the social sciences software (SPSS), version 21.0. Descriptive statistics, Pearson chi-square, Fisher test and multiple logistic regressions were used in data analysis.

Results: The majority 70(63.06 %) nurses were demonstrated to have difficulties in recognizing early signs of clinically deteriorating children and nearly a half 50(45.05%) nurses had also demonstrated inappropriate responses towards clinically deteriorating children.

Advanced level of education and ability to early recognize clinically deteriorating children were the only variables that were shown to be significantly associated with appropriate nurses response to clinically deteriorating children ($p= 0.011$ and $p=0.001$ respectively) .

Regression analysis showed that nurses with higher level education qualification and nurses who were able to recognize early clinical cues towards clinical deterioration (OR= 2.659, 95%CI=1.023-6.916and OR= 3.490: CI= 1.449-8.406 respectively) were more likely to respond appropriately to clinically deteriorating children than their counterpart nurses.

Conclusion: Generally, nurses had limited awareness on early recognition towards clinically deteriorating children and their responses to those children were hampered as well. The associated factors to their appropriate responses, were level of education and ability to early recognize clinically deteriorating children. Therefore, there is need to increase nurses awareness on early recognition of clinically deteriorating children. Moreover, further studies are needed to assess the associated factors to nurses' early recognition towards clinically deteriorating children.

Keys words clinically deteriorating children; pediatric ward; nurses; recognition; responses

LIST OF SYMBOLS, AND ABBREVIATIONS/ACRONYMS

1. ICU: Intensive care unit

2. T&T: Track and trigger

3. CP: Cardiopulmonary arrest

4. RRS: Rapid response team

5. WHO: World health organization

6. PICU: Pediatric intensive care unit

7. RR: Respiratory rate

8. HR: heart rate

9. BP: blood pressure

10. T: temperature

11. ^{0}C: Degree Celsius

12. UNICEF: United nation of children emergency fund

13. UK: united Kingdom

14. UTHK: University teaching hospital of Kigali

15. SA: South Africa

16. MET: medical emergency team

17. PMET: Pediatric medical emergency team

18. PEWS: Pediatric early warning score

19. ETAT: Emergency assessment, treatment and triage

20. ITAT: Inpatient emergency assessment, treatment and triage

21. NICU: Neonatal intensive care
22. OR: Odds ratio
23. CI: Confidence Interval
24. CMHS: College of Medicine and Health Sciences
25. UR: University of Rwanda
26. USA: United States of America
27. RMH: Rwanda Military Hospital

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CHAPTER ONE: INTRODUCTION

1.1INTRODUCTION

Ward nurses are at the forefront positions in patient care. They primarily play a fundamental role in early recognition and responses to clinically deteriorating patient in order to escalate necessary care or summon help(Hart *et al.*, 2016,p.4-7).However, sometimes given the complex clinical situation of clinically deteriorating pediatric patients ,this pose special challenges that warrant specific and appropriate skills that necessitate knowledge application in order to reach clinical judgment (Tanner, 2006,p.1-6)

There is considerable evidence that shows appropriate and timely nurses recognition and response to clinically deteriorating children greatly improves pediatric in patient clinical outcomes(Sefton*et al.*,2015,p.8)nevertheless, problems related to early recognition and responses to clinical deteriorating patients are still complex to nurses (Leonard and Kyriacos, 2015,p.1-6) .

For instance, issue like lapses in early identification and response to clinical deterioration which impedes escalating care ,have been shown to result into dramatic increase of undesirable effect among in-patients that might have been otherwise prevented if clinical deterioration would have been recognized and responded to as early as possible ,in addition the patient safety in the ward is still informed by nurses being able to timely identify and respond to patient who are clinically deteriorating (Massey et al, 2016,p.7)

According to UNICEF(2017,p.1**),** in the face of lack of knowledge and technologies for lifesaving interventions, 15000 children died mostly from preventable and treatable disease ,In sub-Saharan Africa, children admitted in various public hospital mortality rate ranged from 8% to 21%(Mpimbaza*et al.*, 2015,p.1-2)

1.2 BACKGROUND

The world has registered the greatest achievement in dropping child mortality rate from 93 to 41 per 1000 live births for the last 26 years starting from 1990 up to 2016.in regard to that since 2000,50 million of under 5 years children who would die ,through early recognition and prompt response they were saved . (UNICEF, 2017,p.4-6),however Sub-Saharan Africa still accounts for the highest under five mortality rate which stands at 19 deaths per 1000 live births that translates 17 times than the average of high income country(UNICEF, 2017,p.5) ,likewise Rwanda as part of sub-Saharan Africa also still has a staggering number of under 5 mortality rate which stands at 50 deaths per 1000 live births which mostly includes children in hospital deaths (RDHS,2014,p.4-10) .

Various authors have shown the importance of early healthcare providers initiated recognition and response to clinically deteriorating children in cutting down those childhood preventable death , Sefton and colleagues(2014, p. 4 –6) in a study conducted in United kingdom commonly known as England, in an observational cohort study that was aiming at looking at the impact a pediatric early warning system had on emergency admission to pediatric critical care unit, the benefits of early recognition and response to clinically deteriorating children was demonstrated in terms of reduced pediatric index of mortality and there was a 39% decrease of emergency cases bed capacity which in return caused a significant reduction in cancellation of major surgical cases requiring post operative management in PICU likewise In United State of America(USA),a study conducted at Cincinnati children hospital that looked at bringing an improvement about situation awareness in order to decrease unrecognized number of clinically deteriorating patient clinical and major safety event, it was found that with a reliable system to recognize and respond to clinically deteriorating children was associated with 50% reduction in unrecognized clinically deteriorating children and serious safety events(Brady et al,2013,p.5-10)similarly in a study done in Australia early recognition and prompt response to clinically deterioration in hospitalized pediatric population by trained healthcare personnel reduced unplanned admissions to ICU raised from 20 to 24 in a month and mortality dropped from 13 to 2 over this time with a risk ratio of 2.22 and 95% of Confidence Interval of 0.50 to 9.87 whereas cardiac arrest from 20 among 104 780 admissions to 4 among 35 892 admissions with a risk ratio of 1.71 over 95% of Confidence Interval of 0.59 to 5.01 (Tibbals et al, 2015,p.1-5).

The urgency for nurses to recognize and respond to clinically deteriorating patient in low resources countries, has also been demonstrated to be much more beneficial, for instance

In study done in Uganda at Mulago hospital ,following a prospective observational study about implementation of a system designed to identify early warning signs suggesting clinical deterioration , this approach used by the nurses and other healthcare providers was prompted early recognition and responses to hospitalized patient with critical illness which were warranting urgent medical attention (Kruissel *et al.*, 2016,pp4-8) similarly in Uganda a risk score to predict in patient pediatric mortality

was developed in 4 public hospital, It was demonstrated that early recognition of critical illness reduced risk of morbidity and mortality suggesting the benefit of improving triage systems in resource constrained setting (Mpimbaza *et al.*, 2015,p.5)similarly in South Africa(SA) another study showed that using a well suited resource limiting tool named sick children require emergency care now(SCEEN)to assist nurses working in primary health care in recognizing critically ill children so that the care rendered to them can become a priority (Hansoti et al, 2017,p.1-5),however in Rwanda the benefit of early recognition and response to clinically deteriorating children was emphasized study to assess healthcare providers perspective on relevance and challenge of emergency triage and assessment , treatment and another package called plus admission care clinical guideline practice(ETAT+) where it was shown the component of early recognition and promptly adequate response to children who are prone to any kind of clinical deterioration have greatly improved quality of care in Rwandan district hospitals. (Hategekimana *et al.*, 2016,p.6-8).

1.3 PROBLEM STATEMENT

Up to 3% of hospitalized children are at an added potential risk of getting clinical deterioration at many points when they are hospitalized (Giardini *et al.*, 2011,p.1).

Those children who deteriorate or die in the hospital will usually have exhibited some observable signs prior to the occurrence of any catastrophic events(Wolfe, 2014,p.3). However, failure to recognize and respond to those clinical observable signs has been shown to eventually results into unplanned admission in Pediatric intensive care unit (PICU),cardiac arrest, late or absent critical referrals and in the unfortunate event deaths occur (Sefton et al 2014, p.4–6 and Jennifer et al, 2018 p.10),similary Galen *et al.*, (2016,p2-6) have shown that 46% of unplanned ICU admissions are related to healthcare worker failure to early recognize and respond to observable signswhich were mainly failures in monitoring the patient by the nurses working in general nursing ward.

From unpublished data from March to May 2018 in one of the hospital of interest, 11 patients have been readmitted to PICU. The event happened in less than 48 hours after they had been transferred from PICU to pediatric ward (Unit manager monthly register book, 2018, p.11). Those patients whose clinical status deteriorated were reportedly being monitored by Pediatric ward nurses. However little is known about those pediatric wards nurses potentials to early recognize and respond towards clinically deteriorating children, in order to prevent unplanned PICU admission, therefore the present study is focused at assessing nurses' early recognition and response to clinically deteriorating hospitalized children at University teaching hospital of Kigali(UTHK) and Rwanda military hospital(RMH)

1.4T HE PURPOSE OF THIS STUDY

The goal of the study was to assess nurses' early recognition and their responses towards clinically deteriorating children in pediatric wards at University teaching hospital of Kigali (UTHK) and Rwanda Military Hospital (RMH).

1.5 SPECIFIC OBJECTIVES

1. To determine nurses' early recognition of clinically deteriorating children in pediatric wards at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)

2. To describe nurses' responses to clinically deteriorating children in pediatric ward at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)

3. To establish the association between nurses socio-demographic factors, early recognition and responses towards clinically deteriorating children in pediatric wards at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)

1.6. RESEARCH QUESTIONS

1. How is the nurses' early recognition of clinically deteriorating children in pediatric wards at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)?

2. How are the nurses' responses towards clinically deteriorating children in pediatric ward at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)?

3. What is the association between nurses' demographic factors, early recognition and responses towards clinically deteriorating children in pediatric wards at University Teaching Hospital of Kigali (UTHK) and Rwanda Military Hospital (RMH)?

1.7 SIGNIFICANCE OF THE STUDY

1.7.1 Research

Based on this research finding such as pediatric department nurses early recognition ability of clinically deteriorating children and their responses towards those children that will have been established will contribute in laying out the background information for further study aiming at improving or ameliorating the nurses recognition and response to clinically deteriorating children or the research finding will be used as the basis to recommend further study in that context

1.7.2 Practice

These research findings will be beneficial to nurses working in pediatric department in terms of improving or redesigning their approach towards recognizing and responding to clinically deteriorating children during their nursing practice or research finding will be used as evidence based information informing nursing practice towards early recognition and responses to clinically deteriorating children

1.7.3 Education

This research findings will be used as reference guidance material to inform the future nursing curriculum in matters regarding nurses' recognition and responses towards clinically deteriorating children for instance on where to more academic endeavors and the research project in itself will provide education to nurses

1.7.4 Leadership and management

The research findings will be used as reference point to inform establishment of guidelines or policies and directives governing early recognition and appropriate response towards clinically deteriorating children

1.8 DEFINITION OF KEY TERMS

Children: According to WHO(World Health Organization) a child is defined in terms of developmental period between the age of 28 days of live to 5years irrespective of a disease presence or not. According to this study children were referred to as all patient admitted in pediatric ward from age 0 to 15 years old.

Clinical deterioration: is defined as a complication described in healthcare settings and can develop at any point in a patient hospitalization(Jones *et al.*, 2013,pp3-7).According to this study, clinical deterioration is operationally defined as a dynamic state experienced by a patient compromising hemodynamic stability, respiratory stability and level of consciousness stability. Marked by physiological decomposition characterized by objective findings through the use PEWS(Pediatric Early Warning Score) components .The following 8 empirically validated predictors of deterioration (Heart rate, Blood pressure Respiratory rate, Respiratory effort , Oxygen requirement, Oxygen saturation and Behavior change) should be noted.

Nurses: According to Merriam Webster (2018) dictionary nurses are people who look after the sick or people with infirmity. In this study nurses are defined as specifically licensed healthcare professional who practice independently or collaboratively by providing pediatric nursing care to children admitted in pediatric ward at those 2 referral hospital of interest

Early recognition: in the first place the act of knowing what something is because of previous knowledge or experience (Merriam Webster, 2018) .In this study early recognition should be understood as the nurses' ability of noticing by initial grasp that a child is exhibiting early warning signs (the first predictors of deterioration exhibited by the patient according to PEWS) and be able to interpret those clinical cues that are characteristics of clinical deterioration

Responses: according to thesaurus dictionary (2018) this is defined as action or behavior that is done in return to other action or behavior**.** In this study responses should be understood as the nurses'reactions or practices that apply the concurrent evidence. They are based on recommended interventions guided by total score, that indicate potential clinical deterioration These include firstly alerting a more senior healthcare personnel , intensify frequency of nurses or physicians assessment and calling emergency response team as score trends upward

Pediatric wards: According Merriam Webster (2018) dictionary is defined as a unit in a hospital, where children from one month to18 years are admitted regardless of their disease.

In this study it should be understood as a special unit in a hospital, where children from age 0 to 15 years are admitted regardless of their disease which require close monitoring and medical attention

1.9 STRUCTURE/ORGANIZATION OF THE STUDY

This study is composed of 2 parts namely: The first part consists of title page, declaration, dedication, acknowledgements, abstract, table of contents, a list of symbols and abbreviations/acronyms, a list of tables, a list of figures and list of annexes. Second parts is composed of six chapters namely introduction, literature review, methodology, results, discussion, conclusion, recommendations, references and annexure.

1.10 CONCLUSION

Nurses' early recognition and responses to clinically deteriorating children is a very key and critical skill that nurses in the ward should possess in order to reduce unplanned admission to pediatric critical care unit. However those skills are noted to be limited among nurses working in pediatric wards. This study is aiming at assessing nurses 'early recognition and responses to clinically deteriorating children in pediatric wards. The results of this study will be relevant in different fields of nursing profession . Key terms were operationally defined.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Literature review is a process of getting to know the aspect of the problem of interest by getting yourself familiar with the study that were done in that area (Polit and Beck, 2008, p.48).

This chapter of literature review is composed of five topics beginning with theoretical literature which is composed of framework approaches of clinical deterioration in children, physiological changes of clinical deterioration in pediatric, clinical tools for detecting clinical deterioration and roles of nurse in recognizing and responding to clinically deteriorating children followed by the second topic which is empirical literature composed of nurses 'recognition and responses towards clinically deteriorating children, critical review , research gap identification and conceptual framework.

The literature search identified similar studies that were undertaken in the field of recognizing and responding to clinically deteriorating children. In order to retrieve these studies, a guided and ordered approach in search was used ,the key concepts were clinical deterioration, nurses recognition, responses to that,Pews,PMET and retrieved online papers via, HINARI, Google Scholar Pub Med CINAHL, EBSCO and about 40 articles were retrieved

2.1. THEORETICAL LITERATURE

This section of theoretical literature defined broadly on 3 components with regards to study variables, which are namely framework approach of clinical deterioration in children, physiological changes of clinical deterioration in children, clinical tool usedto identify and respond to clinical deterioration in children and role of nurse in identifying and reacting to clinically deteriorating children

2.1.1 Clinical deterioration in children

Clinical deterioration in hospitalized patient have been defined based on 4 main frameworks which are classified firstly as traditional framework ,this is retrospective in focus and put a lot of emphasis on end result, adverse events of clinical deterioration ,iatrogenesisand medical neglect that are related to those event and another framework defines clinical deterioration in the

context of adverse event not being caused by medical care but rather to underlying medical or surgical condition, clinical event are defined as adverse event such as unplanned admission to ICU ,cardiopulmonary arrest and some other diseaseand it is also retrospective in focus and put a lot of consideration on clinical factor by recognizing the fact that they might be antecedent instabilities before the actual clinical deterioration(Charpek et al, 2014 ,p.5).The third framework defines clinical deterioration based on physiological instability that requires patients who are classified as patient who are deteriorating to meet criteria for some aggregate track and trigger scores such as PEWS and single parameter trigger such as rapid response team, this kind of framework requires that clinical deterioration to be recognized through a reliable measurement of vital signs and observations by using change in vital signs and observations yields the potentials to timely predict the subsequent patient clinical morbidity(Lambert *et al.*, 2017,p.3-5)

The 4th frameworks uses an integrated model to stratify patient who are prone to clinical deterioration using a prospective in focus, this framework in defining the clinical deterioration is guided by patient factor and physiological condition of the patient by considering deranged vital signs in the contextual place where the patient is being treated, the underlying condition and the patient reserve therefore stratifies patient at risk of deterioration(Mpimbaza*et al.*, 2015,p.2-11)

2.1.2 Physiological changes characterizing clinical deterioration in children

A number of studies have repeatedly shown that there are observable physiological changes prior to adverse events such as cardiac arrest, unanticipated admissions to PICU and unexpected death Abnormalities in vital signs such as blood pressure, mental status, respiratory rate, respiratory effort, urine output, increased capillary refill time (CRT), pulse rate (PR) and oxygen saturation (SPO2) are common prior to the occurrence of these critical adverse events.

For example in study conducted in USA at Los Angeles children hospital to evaluate the ability of cardiovascular changes such as rate, color perfusion and mental status changes expressed in behaviors and respiratory patterns in terms of rate ,effort and oxygen requirement and lastly adding any pertinent medical or surgical history, all of these to determine the risk of PICU readmission, the study showed that 1 point increase score in those aggregate variables was associated with 60% increased risk of unplanned PICU readmission similarly Matthew et al (2013,pp5-7) , similarly a study that was predicting the clinical deterioration in the health facility with outcome selection,this study recruited 59,643 patients (comprising 109 ward cardiac

arrests, 291 deaths, and 2,638 ICU referrals)and it was showed that regardless of the adverse outcome 24hours before the event ,vitals signs were noted to be deranged ,those with death outcome being the most affected(Mathiew et al, 2014a,p.4-6) and Recognition of those physiological changes in the cascade of trigger arm and response arm ,it is considered as trigger arm or afferent limb in the context of rapid response team system and this is composed of a process and pathways for monitoring vital signs , a number of criteria to abide by ,taking consideration of any alterations in vital signs prior seeking any kind of assistance (Emily and Elliott, 2017,p.2-5).

2.1.3Early Clinical cues preceding and guide responses to clinical deterioration in children

By the virtue of lapses in identifying and reacting to clinical deterioration(Galen *et al.,* 2016,p2-6) remedies to that problem , such as the implementation of use of pediatric physiological track-and-trigger tools and outreach initiatives to balance patient risk of deterioration, as part of a graduated response to changes in clinical status (Seiger, 2016,p2-7) and these early warning score long ago has been used in adult population but currently there is an increasing use of early warning signs to help nurse working in pediatric ward recognizing and responding to child deterioration ,these tools are called pediatric early warning score (PEWS) widely used in UK,USA,Canada and Australia(Seiger et al, 2016,p.3)

Pediatric Early Warning Systems (PEWS) are just organization system established with a clear intent to identifying and respond timely to hospitalized children deterioration for purpose of mitigating morbidity and risk for death and these score systems have a track and trigger score that encompasses physiological parameter at times it also includes healthcare provider and parents level of concern ;these components are observed regularly with set of threshold (tracked) where escalation is warranted and initiated (triggered) (Nahdi, 2014,p.2)likewise in a big study review was that assessed important features of available PEWS system and assessing the evidence about validity and clinical utility a, this study initially identified over 564 articles and after a thorough process of screening of using set criteria , this study showed that there was a low level of evidence of pediatric track and trigger system (PTT) as a single intervention however there was moderate evidence of its impact on mortality and that translates the evidence was stronger when the PTTs was delivered as a package of interventions(Chapman, et al, 2016,p11) similarly Another review carried of about 90 studies that were chosen through a systematic approach, this review reported a lack of standard PEWS system across hospitalized

patient globally and limited harmonization of outcomes therefore this causing a major barrier to make a comparison of different PEWS that are already published and that brings about uncertainty towards education and implementation at different institution, in this study revealed a mixture of outcome measures, this went ahead clarifying that despite of so many different PEWS systems, they are currently in use however there is limited evidence on what system is most beneficial(Lambert *et al.*, 2017,p.4-8) , The Bed-side PEWS itwas demonstrated to be by far the most evaluated PEWS. Its development and testing was from one centre , currently has been subject to a multiple setting , cluster-randomized trial in 22hospitals from different country.(Chapman *et al.*, 2016,p.1-22) however the Boston PEWS has been successfully implemented in low resource country ,in a pediatric oncology hospital at Guatemala where it was demonstrated to be feasible ,low cost and well accepted for quality improvement strategy in the event resources are scarce(Randhawa and Roberts-turner, 2016 ,p1) Similarly In Malawi based on the dramatic improvement on children mortality brought by ETAT ,an inpatient triage ,assessment and treatment(ITAT) was developed to help nurses in identifying and managing deteriorating hospitalized children and this tool does not require extensive training(Olson et al, 2014,p.5)

Table 2.1The pediatric early warning score items(Mc Donnel,2012,p.12)

Item	Age group	Item subscore			
		0	1	2	4
Heart rate (bpm)	0 to < 3 months	> 110 and < 150	≥ 150 or ≤ 110	≥ 180 or ≤ 90	≥ 190 or ≤ 80
	3 to < 12 months	> 100 and < 150	≥ 150 or ≤ 100	≥ 170 or ≤ 80	≥ 180 or ≤ 70
	1-4 years	> 90 and < 150	≥ 120 or ≤ 90	≥ 150 or ≤ 70	≥ 170 or ≤ 60
	> 4-12 years	> 70 and < 110	≥ 110 or ≤ 70	≥ 130 or ≤ 60	≥ 150 or ≤ 50
	> 12 years	> 60 and < 100	≥ 100 or ≤ 60	≥ 120 or ≤ 50	≥ 140 or ≤ 40
Systolic blood pressure (mmHg)	0 to < 3 months	> 60 and < 80	≥ 80 or ≤ 60	≥ 100 or ≤ 50	≥ 130 or ≤ 45
	3 to < 12 months	> 80 and < 100	≥ 100 or ≤ 80	≥ 120 or ≤ 70	≥ 150 or ≤ 60
	1 to 4 years	> 90 and < 110	≥ 110 or ≤ 90	≥ 125 or ≤ 75	≥ 160 or ≤ 65
	> 4 to 12 years	> 90 and < 120	≥ 120 or ≤ 90	≥ 140 or ≤ 80	≥ 170 or ≤ 70
	> 80 and < 100	> 100 and < 130	≥ 130 or ≤ 100	≥ 150 or ≤ 85	≥ 190 or ≤ 75
Capillary refill time		< 3 seconds			≥ 3 seconds
Respiratory rate (breaths/ minute)	0 to < 3 months	> 29 and < 61	≥ 61 or ≤ 29	≥ 81 or ≤ 19	≥ 91 or ≤ 15
	3 to < 12 months	> 24 or < 51	≥ 51 or ≤ 24	≥ 71 or ≤ 19	≥ 81 or ≤ 15
	1 to 4 years	> 19 or < 41	≥ 41 or ≤ 19	≥ 61 or ≤ 15	≥ 71 or ≤ 12
	> 4 to 12 years	> 19 or < 31	≥ 31 or ≤ 19	≥ 41 or ≤ 14	≥ 51 or ≤ 10
	> 12 years	> 11 or < 17	≥ 17 or ≤ 11	≥ 23 or ≤ 10	≥ 30 or ≤ 9
Respiratory effort		Normal	Mild increase	Moderate increase	Severe increase/any apnoea
Oxygen saturation (%)		> 94	91 to 94	≤ 90	
Oxygen therapy		Room air		Any to < 4 L/minute or < 50%	≥ 4 L/minute or ≥ 50%

2.1.4 Role of nurses in early recognition and response towards clinically deteriorating children

Assessing and care escalation of clinically deteriorating patients is a fundamental nursing responsibility. Many pediatric patient in the hospital settings show physiological abnormalities that do not seldomly fulfill the criteria for expected typical escalation of care such as rapid response team activation, nurses are therefore in a very crucial position in recognizing patients in the initial stages of potential deterioration and escalate care to the treating team prior the deterioration of patient to extant of becoming critically ill and requiring a rapid response team activation(Considine *et al* p.1-6, 2015) however just in case external assistance is warranted nurses are the ones who frequently summon the needed help (Kaul *et al.*, 2014,p.6)

Considine&Currey (2015,p.9) have demonstrated that nurses are the health care professionals with the highest level of responsibility for the accurate measurement, interpretation an documentation of physiological observations and research has shown that through the use of nursing monitoring of vital signs and observations of clinically deteriorating children in acute

care setting , significantly improved the rate of recognition of clinically deteriorating patient in acute care setting mainly (Massey et al,2016,p.5)

Nurses are also tasked to use technologies with recording vital signs because of their utility in capturing physiological change or assisting in managing those changes as in a study done South Africa using a retrospective cohort review to assess the effect of cardiopulmonary dynamics using ECG monitoring on detecting deteriorating patient in acute care setting revealed an improvement in recognizing deteriorating patient in the ward and also the performance of the conventional models with combination of ECG monitoring that utilizes vital signs and laboratory findings improved (Moss *et al.*, 2017,p.1-13)

2.2 EMPIRICAL LITERATURE REVIEW

This section of the empirical literature is putting emphasis on evidence based findings on 2 aspects related to the variables of this study. Research studies on nurses'early recognition of clinically deteriorating children in a pediatric ward , nurse's responses towards clinically deteriorating children in a pediatric ward and associated socio demographic factor,nurses'recognition to nurses responses towards clinically deteriorating children, will be discussed in this section.

2.2.1 Nurses' early recognition of clinically deteriorating children

Recognition of clinical deterioration of acute care setting patient remains the mainstay in preventing childhood avoidable deaths (UNICEF,2014,p.7) nurses in acute care hospital are challenged with complex clinical situation facing complex patients that requires them to be able to recognize any clinical deterioration before it escalate to an clinical adverse event(Leonard and Kyriacos, 2015p.5)

In a study to explore nurses' behaviors with regard to monitoring vital signs in recognizing clinical deterioration in a general ward ,this study was undertaken in a tertiary acute care hospital where it recruited 614 ward nurses.This study showed that 59.6% of nurses falsely identified blood pressure to be the alarming indicator for clinical deterioration,46% of nurses reported that change in respiratory rate was the least alarming indicator of clinical deterioration,59..8% they claimed that oxygen saturation findings inform the respiratory status and 27,4%of nurses reported that make a quick judgment by estimating about respiratory rate

,21% of nurses reported that current way of taking vital signs was time consuming,35 % added that it is overwhelming in the same study they noticed that attitudes towards vital signs was greatly influence by their experience with a specialty more than 5 years and also it depended on weither they had a degree qualification(Mok*et al.*, 2015,p.1)

However a study conducted by Kaul and colleagues (2014,p.1-9) to explore nurses recognition of signs of deterioration and management of signs and symptoms of it ;this study used descriptive cross sectional and it used an electronic survey on 35 nurses and 17 physicians ,this study found that using the nurses ability to recognize clinically deteriorating children in pediatric ward was much more better when early clinical cues were put together in aggregate for scoring purpose using early warning signs

Moreover these nurses reported that most influencing and useful nursing assessment parameter in recognizing a clinically deteriorating child were HR(heart rate),RR(respiratory rate) ,SPO2(oxygen saturation) , oxygen requirement ,respiratory effort CRT(capillary refill time)Some few nurses falsely relied on urine output ,sedation level and parental concern to recognize that the child was actually deteriorating clinically whereas these findings were found to less specific in identifying early clinical deterioration in children(Kaul*et al.*, 2014,p1-3) In the same study by Kaul et al (2014, p.6) it was noted that in response to the short scenario item, nurses indicated that the following assessment findings were of greatest concern: (a) heart rate of 166, (b) respiratory rate of 66, (c) oxygen saturation of 92% while on 1 L of oxygen, and (d) the presence of moderate subcostal and substernal retractions with occasional grunting. In contrast, nurses some few nurses also reported greater concern for the assessment findings of: (a) absence of urine output for 12 hr, (b) a temperature of 39.1oC, and (c) parental report that the patient is typically more alert. Similarly in another study to assess final-year nursing students' ability to assess, detect and act on clinical cues of deterioration in a simulated environment where it involved 51 final-year undergraduate nursing students in Australia attended a simulation laboratory for 1.5 hours and completed a knowledge questionnaire and two (mannequin-based) scenarios simulating deteriorating patients with hypovolaemic and septic shock. Scenarios were video-recorded and reflective interviews conducted it was found that The most commonly assessed and detected signs of deterioration were altered heart rate and oxygen saturation whereas the least commonly assessed sign was capillary refill time. Concerning scenario, Respiratory rate was rarely measured across both scenarios. Overall, appropriate assessment and

recognition of clinical cues decreased as the scenarios proceeded and deterioration worsened. The most common clinical sign identified as a cue in the hypovolaemia scenario was falling oxygen saturation, and in the sepsis scenario this was raised temperature (Endacott *et al.*, 2010,p. 1-4)

2.2.2 Nurses response towards clinically deteriorating children

In a study to explore nurses recognition and management of deteriorating children using aggregate scoring , in this descriptive, cross-sectional study which used an electronic survey with 35 nurses and 17 physicians, nurses were able to display effective communication about the deterioration status findings by alerting the charge nurse a and physician and they would invite each one of them to come on the bedside to assist , they ensured that cardiopulmonary and oxygen saturation were monitored regularly ,they considered repeating the reassessment every 15 min ,they even considered notifying the attending physician, they also considered activating the rapid response team and eventually they were able to document every actions in the progress note (Kaul *et al.*, 2014,p.6)

in addition ,Tibbals and colleagues(2015,p.1-3) demonstrated that nurses who had concerns of clinically deteriorating children in pediatric ward immediately called Medical Emergency Team was,this was associated with a drop in cardiac arrest from 20 to10, among 780 admissions while death dropped from 13 to 2 over this time and unplanned admissions to ICU raised from 20 to 24 in a month. Similarly in the same study 62 % nurses were shown to have called MET for reason such as hypoxemia(saturation less than90% in saturation less than 60% in any amount of oxygen (cyanotic heart disease) this accounting for 42% of all the reason of calling MET and 17% of nurses called MET because of worries about clinically deteriorating children, this accounted for 39% of all call .the remaining reasons for call were noted to be tachypnea(13%),hypotension(2%) ,Bradycardia(7%) ,cardiac arrest (2%) ,altered neurological function (20%) ,airway compromise (27%)and tachycardia (14%)

Another meta analysis study conducted by Allen et al (2016, pp1-20) that critically analyzed the current evidence with regard healthcare personnel responses to clinical deterioration with the use of a rapid response team model, twenty nine paper were recruited by this review ,this review revealed that calling upon critical care outreach services has been demonstrated to enhance clinical decision making ,prevented unnecessary delay and addressed the gaps in wards to

prevent negligible clinical cues from escalating to critical clinical cues and also yielded critical care knowledge and clinical expertise to ward staff .

A study to assess final-year nursing students' ability to act on clinical cues of deterioration in a simulated environment where it involved 51 final-year undergraduate nursing students in Australia attended a simulation laboratory for 1.5 hours and completed a knowledge questionnaire and two (mannequin-based) scenarios simulating deteriorating patients with hypovolaemic and septic shock. Scenarios were video-recorded and reflective interviews conducted it was found that Within 1 minute of starting the hypovolaemia scenario, 19(37%) students turned to the monitor to assimilate the patient's baseline vital signs and 17 students undertook a comprehensive pain assessment before glancing at the monitor to check the vital signs. A further seven did not look at the monitor until prompted by an alarm; at the extreme, one student did not look at the monitor until 35 minutes into the scenario. Two students did not trust the monitor data and undertook manual assessment (for example of blood pressure and pulse) and six remained in an initial state of frozen inactivity. Of note, the 19 students who immediately assessed the patient's vital signs were most likely to draw the correct conclusions and take appropriate action (Endacott *et al.*, 2010,p.1-5).

2.2.3 Socio-demographic factor and nurses' early recognition to nurses' responses towards clinically deteriorating children in pediatric ward

A study to evaluate what factors predisposing acute care nurses to activate the emergency medical services, this study aimed at looking at the relationship between educational level with seeking more help after recognizing a clinically deteriorating patient it was noted nurses who had completed 4 years of nursing were more likely to know what further nursing intervention was required and when to call for emergency medical service as opposed to nurses who had completed 2 years of nursing school, having been trained in basic life support was also associated with knowing what next intervention and when to seek for more help(Pantazopoulos *et al.*, 2012,p.3-4)

2.3 CRITICAL REVIEW AND RESEARCH GAP IDENTIFICATION

This section of the critical review and research gap identification focuses on early recognition and response towards clinical deterioration.

Patient survival often depends on nurses' decisions based on their interpretation of a patient's vital sign recordings however in a study entitled *" Delayed Recognition of Deterioration of Patients in General Wards Is Mostly Caused by Human Related Monitoring Failures: A Root Cause Analysis of Unplanned ICU Admissions"* this study was conducted in Netherlands it was noted that Out of 49 cases, 156 root causes were identified. The most frequent root causes were healthcare worker related (46%), which were mainly failures in monitoring the patient. They were followed by disease-related (45%), patient-related causes (7, 5%), and organizational root causes (3%). In only 40% of the patients vital parameters were monitored as was instructed by the doctor. 477 vital parameter sets were found in the 48 hours before ICU admission, in only 1% a correct MEWS was explicitly documented in the record This in-depth analysis demonstrates that almost half of the unplanned ICU admissions from the general wards had healthcare worker related root causes, mostly due to monitoring failure in clinically deteriorating patients (Galen *et al.*,2016,p.6-11)

Concerning nurses' responses in a study to assess student nurses ability to detect and act on clinical information ,it was found that student nurses may take any responses to those clinical cues without a clear rationale of their behavior(Endacott*et al.*, 2010,p.6-7),Similarly in another study showed that frontline nurses/midwives minimally depend their decision on physical assessment and more importantly on vital signs alone (chua et, 2016,p.1) in support with this also some nurses where shown to delay their responses towards clinically deteriorating children encouraging more fluid intake and spacing observation to 2hourly observation.(Kaul*et al.*, 2014,pp.6) and again a number of studies in this field has focused on improving nurses ability to recognize and respond to clinically deteriorating children however even the few studies ones which looked at nurses ability to do so focused on nursing student, therefore having scarcity of such studies in already practicing nurses(Leonard and Kyriacos, 2015,p. 2-6,Bucknall *et al.*, 2017,p.5)

In a study done by Brown et al that had a purpose to explore nurses knowledge and perception of rapid response team ,this study was quantitative in nature and it was prospective descriptive design ,in a 175 bed capacity rural hospital however this hospital was not teaching ,recruited 57 nurses as participants

This study demonstrated that in spite of nurses being able to recognize clinically deteriorating patient but discrepancy happened in realizing that the condition was requiring urgent intervention however the nurses did not let physician response to dictate them about calling the rapid response team(Brown, Ann and Hill, 2012,p.2-3)however another study done in acute pediatric hospital ,to describe the process of implementing pediatric early warning signs as an evidence based tool in order to reduce cardiopulmonary arrest incidences in children admitted in that acute care setting showed that nurses were able to escalate care without activating the Rapid response team (Randhawa and Roberts-turner, 2011,pp .9) 07886895015

In a descriptive observational survey study conducted by Leonard and Kyriacos(2015p.5) that was aiming at assess nurse student ability ' ability to identify abnormal recordings for respiratory and heart rate, oxygen saturation level, systolic blood pressure, level of consciousness, urinary output and normal temperature, it was noted that student nurses who had difficulty identifying abnormal recording equally manifested delayed response in calling a more senior person

Several studies have shown that having working experience of more than 5 years, previous training in resuscitation or PEWS use and education level are associated to appropriate and prompt responses to clinically deteriorating patients(Mok et al,2015,p210)

2.5 CONCEPTUAL FRAMEWORK

This study was done in view to assess nurses recognition and response to clinically deteriorating children in pediatric ward using the conceptual model called clinical judgment model developed by tanner(Tanner, 2006,pp.1-6),It was used in the article retrieved from Hinari entitled "Medical-surgical nurses' perceived self-confidence and leadership abilities as first responders in acute patient deterioration events"(Hart *et al.,* 2014,pp.3-4) this model was grounded on the variables that linked to early recognition and response towards clinically deteriorating patient in clinical setting whereby it was grounded on 4 assumptions namely :noticing ,interpreting, responding and reflecting

Tanner clinical judgment model is one of the widely used model to plan professional individual career growth and clinical decision making pattern. . Thus nurses working in clinical setting need

to be able to be aware of early recognition and respond appropriately to clinically deteriorating children. .

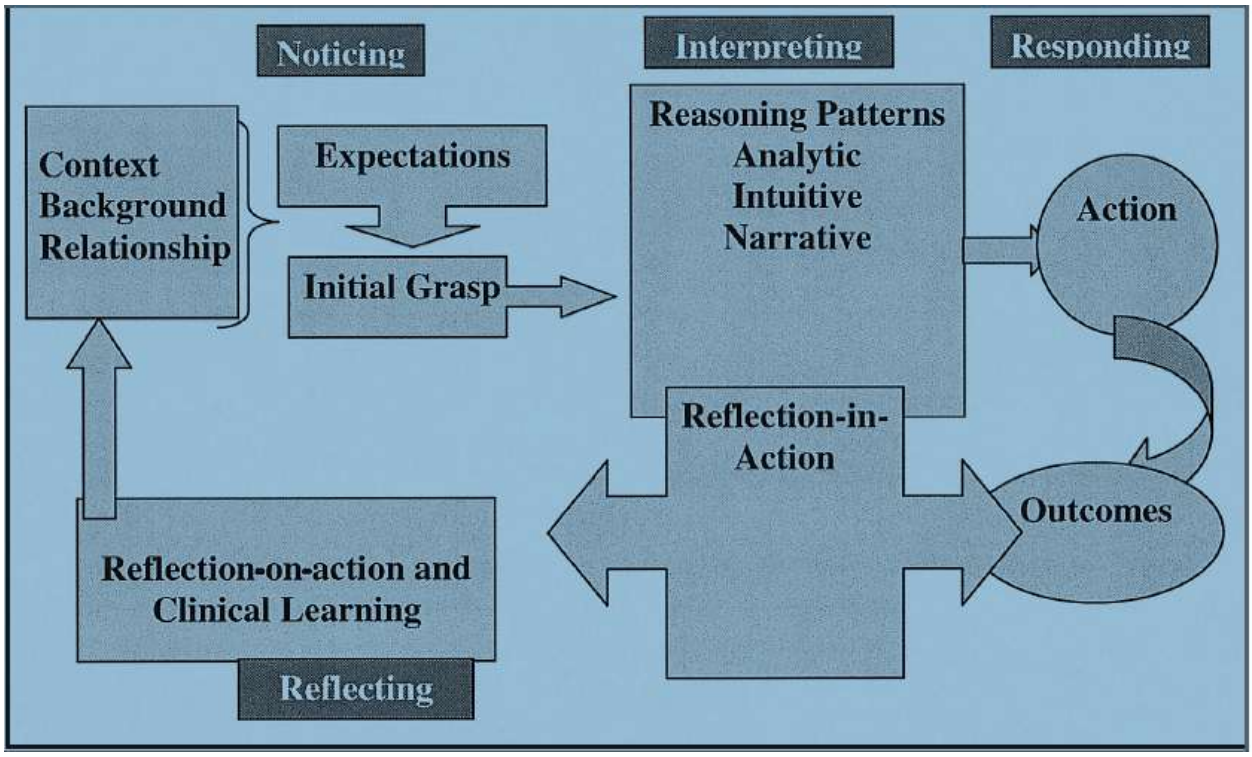

Figure 2.1: The conceptual model of the study variable by tanner (2014, p. 5)

Definitions of concepts into research variables

Noticing: in this step the nurse starts by grasping the situation at hand. It is in this step where the nurse carryout focused observations therefore gathering information from the particular situation. The nurse utilize the previous knowledge acquired from other sources such as standards protocols for assessment ,textbooks ,experience with regard to being able to recognize patterns through which a deteriorating patient undergoes depending on the patient context

In this study noticing was equated to nurses' ability to recognize early clinical cues leading to clinical deterioration in pediatric patients

Interpreting: the 2nd step the nurses build up the situation awareness from the gathered vital signs and observations and the nurses try to prioritize the nursing actions to be taken and the nurse seeks to implement the planned intervention. In this study interpreting is conceptualized into nurses ability to recognize early clinical cues ,after the nurse has been able to identify on the initial grasp ,the nurse try to identify weither the assessment finding is normal or abnormal such as increased respiratory rate ,increased heart rate desaturating ,increased work of breathing and decreased level of consciousness

Responding: the 3rd step in which the nurse feels confident in utilizing the acquired clinical skills and incorporate some leadership ability to carry out the appropriate actions.

In this study, this concept referred to nurses interventions including call a more senior person and intensify frequency of assessment

Reflecting: The 4th steps whereby the nurse reflects on the actions carried out and the patient response to that action, in this step the nurse continue to evaluate his/her choice and decisions. through this evaluation process the nurses get to identify what works better and what does not work for the purpose of future clinical situation, even if when the nurse is reflecting on the outcome of his or her own activities he or she still gain though that process the nurses widen the knowledge base and self confidence in the ability to respond to clinical context.

In this study the concept of reflection referred to nurses' ability of knowing that the nursing intervention carried out was worth it or further actions are needed

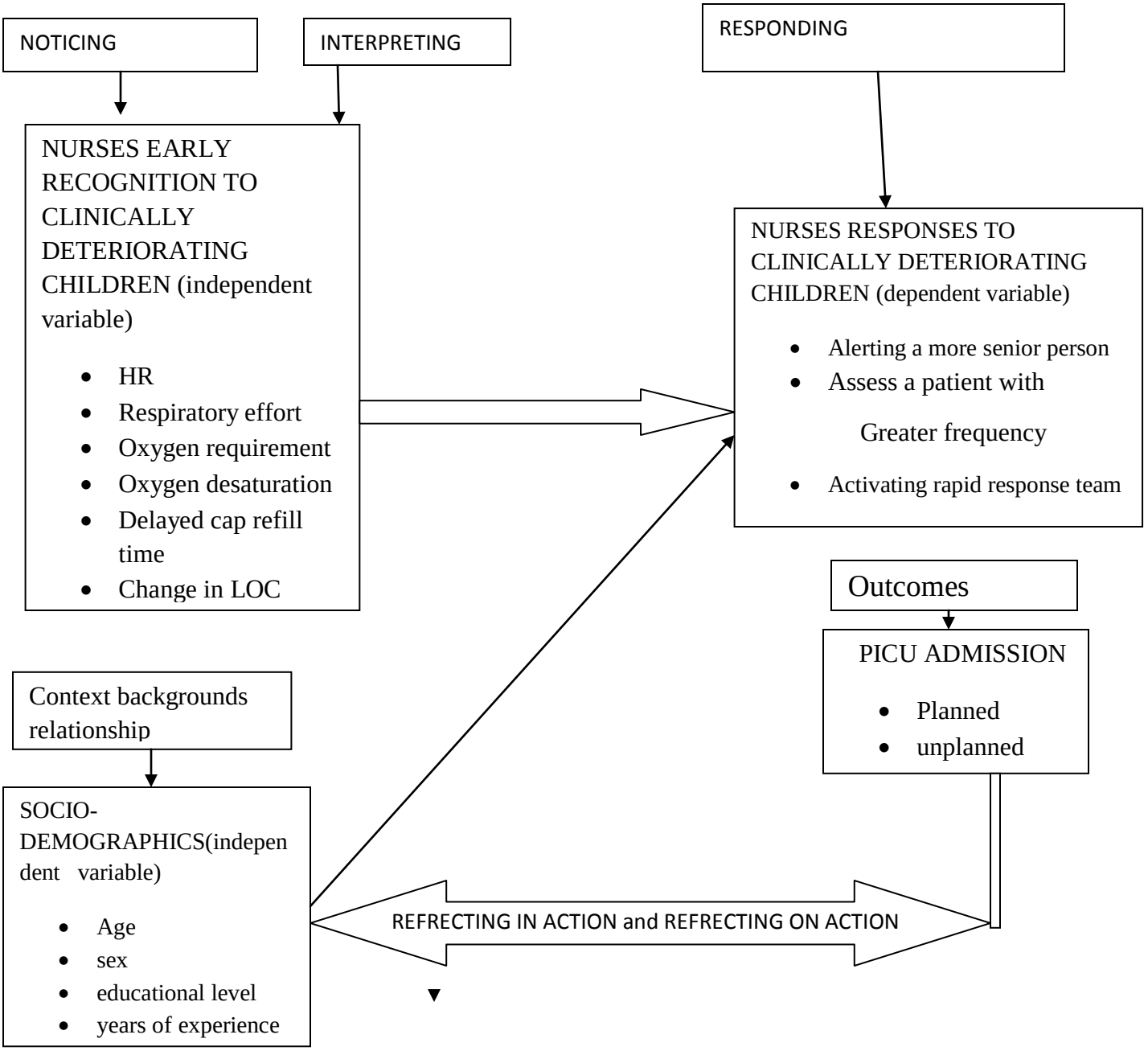

Figure 2.1 The conceptual framework adapted from the conceptual model by tanner (2006, p.5)

The above conceptual model was handy for this study in question in that it is a very functional system in understanding clinical reasoning and clinical judgment of nurses working in pediatric ward and can be very appropriate in describing their clinical decision making and actions taken towards recognition and response to clinically deteriorating children in clinical setting firstly nurses recognize clinically deteriorating children by noticing whereby they will be required to use vital signs and some other observations alongside with previous experience around clinically deteriorating children after being able to recognize clinical deterioration, nurses interpret the findings by trying to make sense out of them therefore by categorizing sick children as clinically deteriorating or not deteriorating ,in response after the nurse has identified the child as deteriorating he or she use the leadership and clinical skill to carry out actions and then nurses will use reflection by rethinking about their action for future purpose

2.6 .CONCLUSION

In chapter two, the theoretical literature highlighted that nurses working in pediatric wards play a fundamental stake in early recognizing and responding to physiological changes that precede clinical deterioration in children by use of vital signs and observations , through searching evidence in empirical literature it was noted that nurses sometimes would encounter difficulties in identifying early clinical cues towards clinical deterioration which negatively impact on how they respond towards clinically deterioration children .moreover critical review of the literature highlighted that half of the unplanned admission to PICU are due to inability to recognize early clinical cues to clinical deterioration ,even when those early clinical cues are recognized ,nurses would delay calling for assistance or respond with inappropriate responses .

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 INTRODUCION

Research methodology is referred to as a systematic inquiry that improves knowledge on the key issues considering a given profession, focusing at all its discipline (Polit and Beck 2008, p.5).

This chapter describes the research methodology that was used in this study and it tackled the research design, research approach, research setting, population, sampling, sampling strategy, sample size, data collection instruments, data collection procedure, data analysis, ethics considerations and limitations of the study addressed.

3.3 RESEARCH APPROACH

Research approach refers to a quantitative research which is formal, objective and uses a systematic process by which numerical data are processed to get new information about a particular subject, the quantitative research classified to be descriptive, exploratory, experimental or quasi-experimental (Grove, Burns and Gray, 2013, p.6)

In this study, the researcher used quantitative approach where a survey questionnaire will be used and questions will be structured and pertaining to research variable

3.2 RESEARCH DESIGN

Rebal et al(2011,p.175 **)** defined research methodology as an overall plan to acquire knowledge through a process that answers research questions, in addition the research design determines how participants are recruited and involved in the study, the process for the study, including the timing of any activity and when the study will be completed

This study used descriptive cross-sectional study design to assess nurses 'early recognition and responses to clinically deteriorating children in pediatric ward at 2 public referral hospitals in Kigali.

3.4 RESEARCH SETTING

This study was conducted in 2 selected referral hospitals in Kigali, the University Teaching Hospital of Kigali (UTHK) and Rwanda Military Hospital (RMH). UTHK is in Kigali city, Nyarugenge district. This hospital has a primary mission of serving as referral hospital as well as university teaching. This is ranked the largest hospital in the country with a capacity of receiving patients from the whole country and has 445 beds capacity and an average occupancy rate of 72% (Lukas et al., 2016, p. 5). This hospital provides a various healthcare services for instances

general pediatrics that includes pediatric high dependency unit, pediatric surgical ward, neonatology and Pediatric Intensive Care Unit (PICU) with a capacity of 3 beds. RMH is found in Kigali city, Kicukiro district. This hospital works as a referral and teaching hospital that has a mission of providing healthcare services to patients and facilitate learning of students in health fields. RMH receives civilian and military patients from the whole country and has a total bed capacity of 250 beds. The average admissions numbers is at 88% civilian and 12% military patients (RMH statistics office, 2015). The hospital provides a different heath services via various disciplines for instance, Pediatric services that includes general pediatric and pediatric surgical with a capacity of 35 beds, and neonatology ,neonatal intensive care ,pediatric critical care with 3 bed capacity, as well as other specialized departments. The pediatric department of this hospital receives patients aged from 0 to 15 years old with medical/surgical whom some warrant hospital admission and the average number of admission is 90-95 per month (pediatric unit manager book, 2018)

3.5 RESEARCH POPULATION

Population is the totality individuals, substances that meet inclusion criteria set by the researcher" (Grove, Burns and Gray, 2013, p.44). Study population is the study of a group of individuals taken from the general population who share a common characteristic, such as age, sex, or health condition to which the researchers can apply their conclusions (Polit and Beck, 2008). The population for this study will be the nurses working in pediatric wards in Rwanda. Delimitation of the population to a homogenous level group was achieved through inclusion and exclusion criteria.

The target population refers to the group of elements to which the researcher wants to make inference. At least theoretically, the population is finite and can be counted, the fundamental units of the population are elements, often elements are persons; could be also households, housing units, parts of an organization , (Polit and Beck, 2008 2010,p.63). In this study, the target population consisted of nurses working in pediatric ward at Rwanda Military Hospital (RMH), University Teaching Hospital of Kigali(CHUK), King meeting the inclusion criteria.

3.6 SELECTION CRITERIA

3.6.1. Inclusion criteria

To participate in the study, the Nurse were:

1. A registered nurse by the Rwanda Nurses and Midwives Council (RNMC) working in pediatric ward. Those registered nurses not working in pediatric department would lack the relevant experience in dealing with clinically deteriorating children.2. Having working experience of more than 6 months

3. Available during the time of data collection

4.willing to participate

3.6.2 Exclusion criteria

1. Nurses who were on leave during data collection

2. Nurses below 6 months of working experience in pediatric ward because they were lacking enough experience

3.Non consenting nurses

3.7. SAMPLING

The sampling approaches in quantitative research refer to the process of choosing a portion of the population of interest for representation in order to draw inferences and conclusions (Polit and Beck, 2008, p. 307; Grove, Burns and Gray, 2013, p. 37). The sample was selected from 2 selected referral hospital nurses who work in pediatric ward.

3.7.1 SAMPLE SIZE

To calculate the sample size, a researcher used a formula of small sample technique by Krejcie (Krejcie and Morgan, 1970, p.1)

$$N = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

Where:

n = required sample size.

X2 = the critical value for the corresponding 95% confidence interval:1.96 x1.96=3.8416x

N = the population size.

P = the estimated proportion of the outcome (assumed to be 0.50 since we don't have any previous conducted study in Rwanda to estimate the proportion of nurses in relation to recognition and response to clinical deterioration.

D = is the level of significance for the study results which is set at 5%

The target population size is 136 nurses for all strata. This means all nurses from RMH are 65 and UTHK are 71.

The specific sample size was calculated as follows:

N= 3.8416x136 x0.50 (1-0.5)/ $(0.05)^2$(136-1) + 3.84160 x 0.5(1-05) =102.06

That translates to achieve a medium effect size, with 80% power at a 0.05 significance level, a minimum of 103 participants was needed .however since the researcher already knew the total number of the respondent, the researcher opted to take all nurses from RMH pediatric department and UTHK pediatric department and secondary to increase the generalizability of the results and the power of this study, 136 nurses from 2 referral hospital were recruited via convenience sampling. Thirdly would in the small sample technique ,they provided a table demonstrating what sample you should take when you know the population ,thus this calculated sample was almost equal to that one pre calculated

3.7.2 SAMPLING STRATEGY

The researcher used the convenience sampling method, which is a nonrandom technique that does not necessitate an underlying theories or a set number of participants. , the researcher decides what needs to be known and aims to find people who are willing to provide the information by based on their experience or knowledge (Etikan et al, 2016,p.2-3)

3.7.3 Data collection instruments

A pretested self-administered questionnaire was used as tools for data collection. The questionnaire comprised of closed ended questions which consisted of 3 sections. The first section focused on demographic characteristics of the respondents and consisted of four items which are: age, gender, education level and years of experience. The second section had 4 questions regarding recognition of early signs of clinical deterioration designed in a form of multiple choice questions (MCQ)that were categorized in the assessment parameter concerning respiratory system, cardiovascular assessment and neurological assessment and one case

scenario comprising of 3 questions of which respondents were asked to read carefully and responded to it by identifying early clinical signs that indicated clinical deterioration based on systemic assessment namely respiratory ,cardiovascular and neurological assessment. The third section was composed of 5 questions related to nurses' responses to clinical deterioration. Among those 10 questions one was designed as a case scenario where respondents were asked to choose among 11 items, the appropriate responses and the remaining questions were asking the respondent confidence to respond to clinical deterioration, confidence to report clinical deterioration, confidence to know when to contact and confidence to know who to contact.

3.9 VALIDITY AND RELIABILITY OF RESARCH INSTRUMENT

The ideal quantitative research must have an accuracy and consistency in measurement. The instrument, questionnaire, or procedure must measure what they are supposed to measure and be consistent to what they are measuring (Rebar *et al.*, 2011, p.161–162).

3.9.1 Validity of the research instrument

The validity is the degree to which an instrument measures what it is supposed to measure (Polit and Beck, 2008, p.422).

Face validity refers to the extent to which a test appears to measure what it is intended to measure ((Polit& Beck, 2004,p 400).This was the weakest validity since it was merely subjective, superficial assessment of whether the measurement procedure used in a study appeared to be a valid measure for given variable but it was considered throughout by structuring the content of instrument into three main readable and clear parts which consists socio-demographic characteristics ,Nurses'early recognition to clinically deteriorating children and their responses towards clinically deteriorating children.

The content validity is the extent to which the elements within a measurement procedure are relevant and representative of the construct that they will be used to measure (Polit& Beck, 2004,p 423).the questionnaire was adapted to fit the pediatric context in Rwanda by a panel 2 pediatric nurses experts ,1 senior pediatrician and 2 academic staff namely my supervisors were consulted order to assess whether all contents to be measured have been included. Content validity ration of the instrument was considered in this study after being rated by the experts afterwards it was calculated by using Lawshe formula as follows; Content validity ratio (CVR) = [(E – (N / 2)) / (N / 2)] where (N) stand for the total number of experts and (E) Stand for the

number of experts who rated the instrument as essential. It should measure between -1.0 and 1.0. The closer to 1.0 the CVR is, the instrument is considered being more essential conversely the closer to -1.0 the instrument is considered being more non-essential. The CVR from the adapted instrument of this study happened to be 0.7

Secondarily,to ensure adequately the content validity of that questionnaire used in this study; the content validity index was considered(Polit& Beck, 2004,p 423).Therefore this instrument was given to two types of experts 3 clinical staff namely 2 nurse experts in pediatric nursing and 1 medical doctor specialist in pediatric and 2 academic staff experts for rating the instruments afterwards content validity index was computed and was found to be relevant .Lynn recommended that Item –Content Validity Index should be not lower than 0.78(polit & beck,2004,p424).Therefore item content index equal to 0.80 was considered as highly relevant

3.8.3 Construct validity refers whether the instrument measures the distinct dimension (construct) they are intended to measure ((Polit& Beck, 2004,p 423) thus it does not have a criterion for comparison rather it utilizes a hypothetical construct for comparison. It is the most valuable and most difficult measure of validity. It is a measure of how meaningful the scale or instrument is when it is in practical use ((Polit& Beck, 2004,p 424) therefore construct validity was achieved by checking items in the data collection tools against study objectives and concepts in the framework to determine whether all construct under study have been measured

Table 3.1 Construct validity relating objectives, conceptual framework and questionnaire

Objectives	**conceptual framework concepts**	**items on questionnaire**
Objective 1		
To determine nurses' early recognition of clinically deteriorating children in pediatric ward at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)	Noticing and interpreting	Questions from section 2 : 2.1,2.2,2.3,2.4,2.5.1,2.5.1,2.5.2 and 2.5.3 related to nurses'reconition of early signs of clinical deterioration through noticing and interpreting the following signs: 1.Increase in respiratory rate

		2.Oxygen saturation 3.Increased work of breathing 4.incresase in heart rate 5.Delayed cap refill time 6.Decreased urine output 7.Decrease in blood pressure 8.Gradual drop in mental status
Objective 2		
To describe nurses' responses to clinically deteriorating children in pediatric ward at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)	Responding and reflecting	Questions from section 3 related nurses responses to clinically deteriorating children on part 1 with the following questions 3.1,3.2,3.3,3.4 and part 2 concerning responding to a case scenario mainly question 3.5.1
Objective3		
To establish the socio-demographic factors associated with nurses' response towards clinically deteriorating children in pediatric ward at University teaching hospital of Kigali (UTHK) and Rwanda military hospital (RMH)	Context background relationship	Questions from section 1 related to socio demographic factors namely 1.1,1.2,1.3 and 1.4 and questions from section 3 related to responses 3.1,3.2,3.3,3.4 and part 2 concerning responding to a case scenario mainly question 3.5.1

In summary:

The internal validity: was controlled by avoiding the use of complicated and confusing words in data collection tools and by removing or substituting complicated or jargon wards a pretesting of the tool, before conducting the main study . In other wards by ensuring face, content and construct of the used instrument.

The external validity: was controlled by selecting a representative sample size from the sampling frame with a random sampling of participants. Researcher selected participants at random, making sure that all participants fulfill the inclusion criteria to prevent selection bias (questionnaire annexure II).

3.8.2 Reliability

The reliability of an instrument is defined to be the consistency at which the instruments measures the target attribute (Polit and Beck, 2008, p. 416). The questionnaire that was used for this study was developed and pretested for validity and reliability by Endacott Ruth, Julie Scholes, Penny Buykx, Simon Cooper, Leigh Kinsman and Tracy McConnell-Henry (2010,p.4), this questionnaire was found to be valid and reliable with Cranach alpha coefficient 0f 0.73 ,it was used in their article entitled "Final-year nursing students' ability to assess, detect and act on clinical cues of deterioration in a simulated environment ", the researcher asked the permission to use this questionnaire and the permission was granted from the author (annexure II).This tool in order to be tailored to the current research context the following process was made .In this study the reliability of this questionnaire was tested using test retest approach by distribution the same questionnaire among 10 nurses working in pediatric department from another referral hospital which is not among the 2 referral hospital of interest and those nurses were supposed to be filling the same inclusion criteria as research participant. The Cronbach's alpha coefficient was computed on the second set and revealed 0.71 translating that the items were connected and related to each other at 71%

These results showed that the instrument was reliable in assessing nurses 'recognition and response to early clinical signs of deterioration. According to Sharma, B. (2016) acceptable Cronbach's alpha is equal or greater than 0.7

3.9 DATA COLLECTION

Data collection assisted the researcher in gathering information from respondents A structured data collection approach was used and a self-administered questionnaire containing MCQ and case scenario base questions was administered to respondents.

All participants were given the same questionnaire with predetermined and standardized words. The order of questions was kept uniform and possible responses were given to participants in order to choose the corresponding one, the approach that facilitated the quantification of the findings. The data collection instrument, pilot study, and data collection procedure are below described.

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3.9.1. Data collection procedure

After obtaining ethical clearance from IRB/CMHS(annexure VI), the researcher proceeded to look for the ethical clearance from the 2 respective referral hospital namely Rwanda military hospital and Kigali teaching university hospital, thereafter the ethical clearance was presented to the unit managers of both pediatric ward in order to get access to staff nurses and the purpose of the study was clarified to the them and then the staff nurses were given all necessary information as the questionnaires were in English language because all nurses in two selected referral hospitals were trained in English and it was used in their daily working activities. Each respondent read and responded to the questions and the researcher was available to answer any question from the respondents though the researcher kept away from close proximity of the participants while filling the forms for assuring anonymity. those who were willing to take part in the research were asked to sign a consent form and they were informed about the use of the code numbers on behalf of their names **.**The researcher collected the envelop that had been gathered by the unit manager instead of the research himself collecting the questionnaire

3.10 DATA ANALYSIS TECHNIQUES AND PROCEDURES

Data were checked daily for completeness and were cleaned, edited, counter-checked for accuracy. The SPSS version 21 was used in order to process, compile and analyze the data from questionnaires conducted during data collection by using both descriptive and inferential statistical analysis. Descriptive analysis using frequency and percentages was computed to describe the socio demographic factor, nurses' early recognition to clinically deteriorating children and nurses responses towards clinically deteriorating children. Pearson chi-square test,

Fisher exact test and odds ratio with corresponding 95% confidence interval was computed to find the association between independents variables (Socio-demographic factors and nurses early recognition) and dependent variable (nurses' responses). Multivariate logistic regression analysis was used to examine the independent factors associated with nurses' responses to clinically deteriorating children, while simultaneously controlling for potential confounders. A $p \leq 0.05$ was considered as statistically significant.

3.11 ETHICAL CONSIDERATIONS

The research using humans as study participants must ensure that human rights are conserved (Polit and Beck, 2008, p.141). Grove and colleagues recommend that a research that is done ethically must protect rights of study participants, obtain informed consents from the study participants, get approval from the institutional review board after submitting a research proposal and balance benefits and risks in a study (Grove, Burns and Gray, 2013, p. 159).

3.11.1 Permission

After obtaining the ethical clearance from UR CMHS (annexure V), the researcher presented the ethical clearance to the review board of the respective 2 referral hospitals and the permission to collect data was granted to the researcher (Annexure VI and VII).

3.11.2 Rights and Beneficence

Right to self-determination

Prospective participants with sufficient information regarding the nature of the research and its possible risks and benefits are in a position to make appropriate decisions, permitting them to consent to or decline participation voluntarily from the study (Polit and Beck, 2008, p. 150–151). The respondents were assured of the right to self-determination, explained that the study is part of the academic requirement and that data obtained are for research purposes only and will be kept confidentially. The research purpose and its significance, the nature of the questionnaire and procedure to use when collecting the data were fully explained to participants. The respondents were explained that it is voluntary to take part in the study with rights to withdraw or withhold information at any time without any related consequence.

Risks

The researcher assured that there is no potential risk from participation and that everyone will have the equal chance to be selected for the study to meet the required sample. In addition, the respondents were informed that there is no compensation in terms of money associated with

participation in the study. The contact information of the researcher, the Chairperson of UR-CMHS/IRB and Deputy Chairperson of UR-CMHS/IRB were provided to research participants.

Right to privacy

This is a concept in research ethics which states that a person in human subject research has a right to privacy when participating in research. Privacy refers someone's right to keep their personal matters and relationships secrets (Paivaet al.2014).

The privacy of the participant in this study was protected by giving them control over the information that they share with the researcher. Again the researcher secluded a safe room for interviewing participants and ensured that sensitive information was not overheard.

Right to anonymity:

participation is anonymous when it is impossible to know whether or not an individual participated (penny,2014) hence it is impossible to maintain participant anonymous in this study since the researcher used face to face structured interview scheduled guide however confidentiality which refers keep a participant's personal information private(Jessica& Denise ,2013) In these cases, participants provided personal information (e.g. name, address, phone number and etc)but because it was confidential, only the researcher and those analyzing the data can identified the responses of individuals, and they did not share this connection with anyone outside of the project .The researcher took steps to protect participants' identities and their information from being discovered by others

Right to fair treatment or justice:

This means that the researcher has explained the research study fully and has described the subject's right to refuse to participate and discussed the risks and benefits of participation. This principle requires that researchers are always fair to the participants in their research and that the needs of research respondents should always come before the objectives of the study (Leslie, 2015)justice was respected since the researcher was fairly select the participants and all benefits from the results of this study were equally distributed and right to protection from discomfort and harm was not forgotten because participants were protected from the risk of physical, psychological, social, economic, and legal harm

3.11.3 Consent, anonymity and confidentiality

Research participants have the right to take part in the study and expect that any data they provide will be kept confidentially without the linkage of participants to their data (Polit and Beck, 2008, p. 149).

Nurses who were interested in participating in the study were identified and signed informed consent forms. The research participants' anonymity and confidentiality were assured by giving a code to each participant and using those codes instead of their names when filling the questionnaire. Responses were treated strictly confidentially and the filled questionnaires were kept in a locked filing cupboard in the researcher's room and the data in soft copy was saved in a separate password protected computer files to be accessed by only the researcher and research supervisor.

A detailed consent form for study participants is shown in annexure III and IV

3.12 DATA MANAGEMENT

All data in two selected referral hospitals were collected by the researcher using a pretested questionnaire. The questionnaire was checked for completeness and data were entered in an excel sheet then imported to statistical package for the social sciences software (SPSS), version 21 in order to create a codebook for data analysis. Before analysis data cleaning was done in SPSS. The soft copies of data were kept in a password controlled personal computer only accessed by the researcher. The filled questionnaires are being kept in locked cupboard, after five years they will be destroyed by burning them.

3.13 DATA DISSEMINATION

After analyzing the data, the researcher will present findings to the school of nursing and midwifery. Also the researcher will present them to the respective hospitals, prepare a manuscript for publication and finally findings will be presented in local and international conferences before being published in a high impact peer reviewed journal.

3.14 LIMITATIONS AND CHALLENGES

The challenges to this study were the time to get ethical clearance approval. The research ethics committee from the referral hospitals meets once in the month, so to get the ethical clearance approval from those referral hospitals delayed the scheduled time for data collection for a period of approximately four weeks. To overcome this delay, a researcher assistant to assist in data collection which in the end caused an unplanned financial requirement and respondent were given limited time to answer the questionnaire therefore this could comprise their response coverage thus affecting the results

Accessing the nurses presented a challenge to the researcher as the nurses were busy; however this was mitigated by allowing them to respond to the questionnaire in their free time

The research design used for this study wasn't the most appropriate for this type of study but in view time the researcher opted to a cross section design instead of cohort design which could allow to observe nurses responding towards clinically deteriorating children.

Bias is any trend or deviation from the truth in data collection, data analysis, interpretation and publication which can cause false conclusions ().

Information bias: was anticipated in this study since the researcher might have selected or encouraged one outcome or answer over the other others. This was interrelated with the procedure the researcher used during data collection.

Recall bias: or Reporting bias due to people who could not remember completely or accurately of what happened in the past (Polit and Beck, 2008, p. 149) .This was expected as limitation for this study since respondents of this study were more or less likely to recall and relate information on exposure depending on their outcome status, or to recall information regarding their outcome dependent on their exposure.

Otherwise **no selective bias** which is an error in selecting participant (Polit and Beck, 2008, p. 180). This was not was in this study since census population was considered where everyone eligible for inclusion criteria in the population of this study selected for the data collection.

3.12 CONCLUSION

In chapter three the research methodology of the study was described in detail. The research design, research approach, research setting, population, sampling, sampling strategy, sample size, data collection instruments, validity and reliability of instruments as well as content validity relating objectives, conceptual framework and questionnaire well explained in detail. Data collection procedure, data analysis, ethical considerations, data management, data dissemination, limitations and challenges were also described.

CHAPTER FOUR: PRESENTATION OF RESULTS

4.1 INTRODUCTION

The results of this study were based primarily on the data obtained from the two selected referral hospitals in Kigali. A total of the 136 nurses were expected however due to drop out a total of 111 nurses working in pediatric department were recruited and completed the questionnaires about assessment of nurses 'early recognition and responses to clinically deteriorating children in pediatric wards. . Data were analyzed using the statistical package for the social sciences software (SPSS), version 21.0Descriptive statistics including frequencies and percentages were first performed. Afterwards bivariate and multivariate analyses were conducted to identify the association among study variables: Pearson chi-square test, fisher exact test and odds ratio with corresponding 95% confidence interval was computed to find the association between independents variables and dependent variable (nurses' responses to clinically deteriorating children). Multivariate logistic regression analysis was the used to examine the independent factors associated with short birth spacing, while simultaneously controlling for potential confounders. A $p \leq 0.05$ was considered as statistically significant.

4.2 DESCRIPTIVE ANALYSIS OF PARTICIPANT RESPONSES

Descriptive analysis was used to interpret the demographic data: age, sex, education level, years of working in pediatric department, nurses 'early recognition and responses towards clinically deteriorating children in pediatric department**.** All the above variables were presented in tables showing frequencies and percentages and moreover nurses 'early recognition and responses were presented in figures

4.3 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTSSOCIO-DEMOGRAPHIC CHARACTERISTICS

The response rate of the respondents (N=111) was 82%. According to the results, the age of the respondents ranged from 27 to 47 years old, their mean age was 34.24 years old (SD±:4.617) with a median of 33 years old. Almost a half (52.3%) participants were in the age category between 30-34 years with [58 (52.3%)]. Concerning gender, the majority [87 (78.9%)] were females with advanced diploma A1 (79(71.2%) participants as opposed to males who were found to be [24 (21.6%)] participants. Regarding level of education of education, working experience in pediatric department was as follows, the majority [36 (32.4%)] were between 1 to 3years followed by [35(31.5)] were between 3 to 5years.

Table 4.1: Demographic characteristics of study participants (N=111)

Variables	Frequency(n=111)	Percent (%)
Age in years		
25-29	11	9.9
30-34	58	52.3
35-39	25	22.5
40-44	12	10.8
45+	5	4.5
Mean(SD)=34.24(4.617)		
Gender		
Male	24	21.6
Female	87	78.4
Education Level		
A1	79	71.2
A0	32	28.8
Working Experience in Pediatrics department		
<1year	17	15.3
1-3 year	36	32.4

3-5 year	35	31.5
5 year and above	23	20.7

4.4 NURSES EARLY RECOGNITION TOWARDS CLINICALLY DETERIORATING CHILDREN

Out of 111 participants, half of the responded that they were strongly confident in recognizing early signs of clinical deterioration in children, similarly another half of the responded that they were moderately confident in recognizing early signs of clinical deterioration in children and only [1(0.9%)]Participant reported that they had no confidence in recognizing early signs of clinical deterioration in children. Regarding respiratory assessment, a high proportionof participants [38(34.2%) chose the respiratory rate as the most influential parameter that could dictates early recognition of clinical deterioration, followed by [37 (33.3%)] Participants who answered that respiratory effort was the most influential parameter in early identifying clinical deterioration they had it whereas few participants by [7 (6.3%)] chose that oxygen requirement was an influential parameter to look at,. Concerning cardiovascular assessment a high number of participants [48 (43.2%)] answered that heart rate was the most influential cardiovascular parameter in early identifying clinical deterioration in children, followed by [22 (19.8%)] participants who answered that blood pressure was the most influential parameter to look at and less participants [15 (13.5%)] answered that capillary refill time was the parameter to look at. Concerning neurological assessment, a large proportion of [41 (36.9%)] participants answered that they would recognize early signs of clinical deterioration as soon as the child was still alert but starting to get more irritable, [28 (.25.2%)] participants reported they would look at how the child is responding to voice and very few participants [3(2.7%)] reported that they would consider parental concern

On a case scenario assessment, the majority of participants [50 (45.%)] reported that moderate subcostal and intercostals recession and occasional grunting was the most influential respiratory assessment to look at whereas [37 (33.3%)] participants reported that respiratory rate of 66 breaths per minute in a 2 year old was the most influential respiratory parameter that could indicate that clinical deterioration was starting to take place and one participant [1 (0.9%)] answered that she was not concerned about those respiratory assessment findings it ,concerning

cardiovascular assessment , [32 (28.8.%)]stated that a heart rate of 166 beats per minute in a 2 years old would initially indicate that something is starting to get wrong, whereas [31 (27.9%)] reported that blood pressure of 118/48mmhg in a 2 years old child was the most influential cardiovascular assessment parameter to look out and few participants [20 (18%)] responded that they would look at hands and feet which were cool with cap refill time more than 3 seconds, [25 (22.5%)]participants also reported that dry diaper and parents reporting that last diaper change was 12 hours ago would stand as an early sign of clinical deterioration and surprisingly very few participants [3 (2.7%)] indicated that a fever of 39.1 degree Celsius was also part of the cardiovascular assessment parameter that served as a red flag to clinical deterioration

Concerning neurological assessment parameter during a case scenario analysis, the vast majority participants [64 (57.7%)] responded that a child who was not responding to pain by being unable to reach the stimulus, [36 (32.4%)] and few participant [11 (9.9%)] answered that they would rely on trends of neurological status such as mother reports claiming that the child was playful 12 hours ago, as a red flag for neurological status deterioration

Table 4.2: Nurses 'early recognition towards clinically deteriorating children.

Variables	Frequency(n=111)	Percent (%)
Confidence in early recognition of clinical deterioration		
Not confident at all	1	0.9
Moderately confident	55	49.5
Strongly confident	55	49.5
Influential respiratory parameter		
Respiratory rate	38	34.2
Oxygen requirement	7	6.3
Oxygen saturation	29	26.1
Respiratory effort	37	33.3
Influential cardiovascular parameter		
Heart rate	48	43.2
Blood pressure	22	19.8
Urine output	3	2.7

Capillary refill time	15	13.5
Pulses	23	20.7
Influential neurological parameter		
Alert and irritable	41	36.9
Only responding to voice	28	25.2
Only responding to pain	14	12.6
Unresponsive	25	22.5
Parental concern	3	2.7
Scenario assessment on respiratory parameter		
RR:66Breaths per minute	37	33.3
SPO2:92%	12	10.8
2l of oxygen via nasal cannulae	11	9.9
Moderate subcostal and intercostal recession and occasional grunting	50	45.0
I am not concerned with this findings	1	0.9
Scenario assessment on cardiovascular assessment		
Hr:166 beats per minute	32	28.8
BP:118/48mmhg	31	27.9
Temperature:39.1 degree Celsius	3	2.7
Dry diaper and parents report last diaper change was 12 hours ago	25	22.5
Hands and feets are cool with cap refill time more than 3 seconds	20	18.0
Scenario on neurological assessment		
Mother claimed that the baby is excessively asleep awakening only on vigorous voice call	36	32.4
He is objectively responding to pain by extending arms but unable to reach stimulus	64	57.7
Mother added that he was playful 12 hours ago	11	9.9

4.5 OVERALL NURSES RECOGNITION ABILITY TOWARDS CLINICALLY DETERIORATING CHILDREN

On a scale of 0-11 rating the nurses' ability to recognize early signs of clinically deteriorating children, whereby all variable assessing recognition were assigned a score based to the most appropriate responses and the least response awarded 0 points out of 11 points ,below 6 points was considered inability to recognize early signs of clinically deteriorating children and above 6 points out 11 points was considered being able to recognize early signs of clinical deterioration

The figure below shows that [70(63.06 %)] participants were shown to be have difficulties recognizing early signs of clinically deteriorating children whereas [41(36.94%)] participants were shown to be able to recognize early signs of clinically deteriorating children

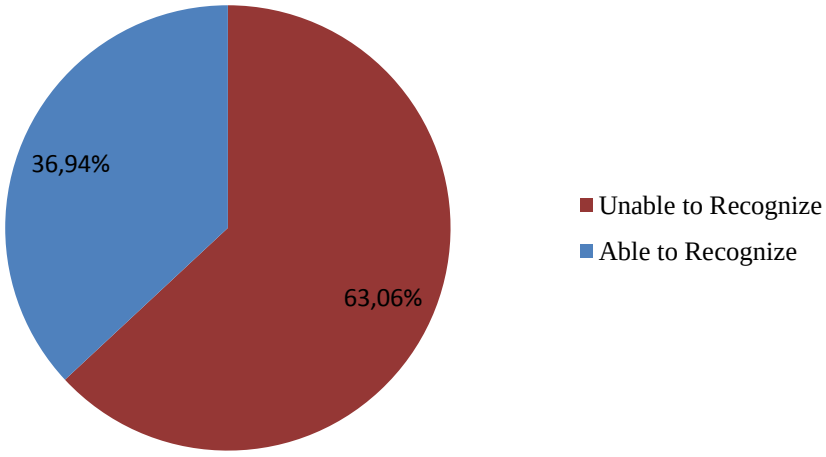

Figure 4.1 Overall nurses 'early recognition of clinically deteriorating children

4.6NURSES RESPONSES TOWARDS CLINICALLY DETERIORATING CHILDREN

Out of 111 participants , [57(51.4 %)] reported that they were strongly confident in taking next steps towards clinical deterioration , [51(45.9 %)]participants reported that they were moderately confident in taking next step towards clinical deterioration whereas [51(45.9 %)] participants reported that they were not confident at all taking next step towards clinically deteriorating children, concerning having confidence in reporting abnormal observations [82(73.9 %)] reported that they were strongly confident about reporting abnormal observations , [28(25.2 %)] answered that they were moderately confident in reporting abnormal observations whereas [1(0.9%)]reported that they were not confident at all about reporting abnormal observations, concerning having confidence in knowing when to contact the senior person, [96(86.5 %)]reported that they were strongly confident in knowing when to contact a more senior person, [14(12.6 %)] participants responded that they were moderately confident in knowing when to contact a more senior person whereas [1(0.9 %)] participants responded that they were not confident at all in knowing when to contact a more senior person and concerning how participants responded to the case scenario regarding how they respond to clinical deterioration ,the majority participants [27(24.3 %)] responded that would immediately call their local resuscitation team, followed by [20(18 %)] participant who reported that they would alert the unit manager and the concerning doctor about the assessment findings subsequently [17(15.3 %)]claimed that they would consider doing repeating assessment after 15 minutes before , [14(12.3 %)] participants responded that they would first alert the doctor about the fever and obtainer an order to administer ibrufen , [11(9.9 %)] they considered obtaining an order to hook the patient on a continuous monitor, [6(5.4 %)]participant reported that they would request the unit manager and the resident to be present on the bedside for thorough patient assessment , [5(5.4 %)] participants considered reassessing if clinical status had improved the patient in 4hours to determine if clinical deterioration was happening, [4(3.6 %)] participants responded that they would consider suggesting the resident to update the senior consultant about the patient status, [2(1.8 %)]participants considered calling the pediatric intensive care unit team, [2(1.8 %)] participants reported that they would consider communicating the unit manager by requesting for reduced patient assignment , [2(1.8 %)] participants reported that they would consider complete the observation chart of the patient including vital signs every 2 hours , [2(1.8 %)]participants

answered that they would consider completing reassessment of patient including vital sign in 1 hour

Table 4.3: Nurses 'responses towards clinically deteriorating children.

Variables	Frequency(n=111)	Percent (%)
Confidence in taking next step		
Not confident at all	3	2.7
Moderately confident	51	45.9
Strongly confident	57	51.4
Confidence in reporting abnormal observation		
Not confident at all	1	0.9
Moderately confident	28	25.2
Strongly confident	82	73.9
Confidence in knowing when to contact		
Not confident at all	1	0.9
Moderately confident	14	12.6
Strongly confident	96	86.5
Confidence in knowing who to contact		
Moderately confident	12	10.8
Strongly confident	99	89.2
Scenario towards response		
Reassess if clinical status has improved the patient in 4hours to determine if clinical deterioration was happening	5	4.5
Consider calling the resuscitation team	27	24.3
Obtain an order to put the patient on monitor	11	9.9
Alert the doctor for fever and obtain an order to administer i brufen and recheck in 1hour	14	12.6
Complete the observation chart of the patient including vital signs every 2 hours	2	1.8
Alert the unit manager and the doctor about your assessment findings	20	18.0

Request the unit manager and the resident to be present on the bedside for thorough patient assessment	6	5.4
Consider communicating the unit manager by requesting for patient assignment	2	1.8
Complete reassessment ,including vital signs every 15 min	17	15.3
Suggest that the resident calls the consultant doctor to update him or her regarding the patient status	4	3.6
Complete reassessment of patient including vital sign in 1 hour	1	0.9
Consider communication with the resident the possibility of PICU consultation	2	1.8

4.7 OVERALL NURSES RESPONSES ABILITY TOWARDS CLINICALLY DETERIORATING CHILDREN

On a scale of 0-15 rating the nurses 'responses appropriateness ability towards early clinically deteriorating children, whereby all variable assessing responses were assigned a score based to the most appropriate responses and the least response awarded 0 points out of 15 points ,below 7 points was considered inappropriate response towards clinically deteriorating of clinically children and above 7 points out 15 points was considered having displayed appropriate response towards clinically deteriorating children

The diagram below shows that [71(54.95 %)] participants demonstrated appropriate responses towards clinically deteriorating children whereas [50(45.05%)] participants demonstrated inappropriate responses towards clinically deteriorating children

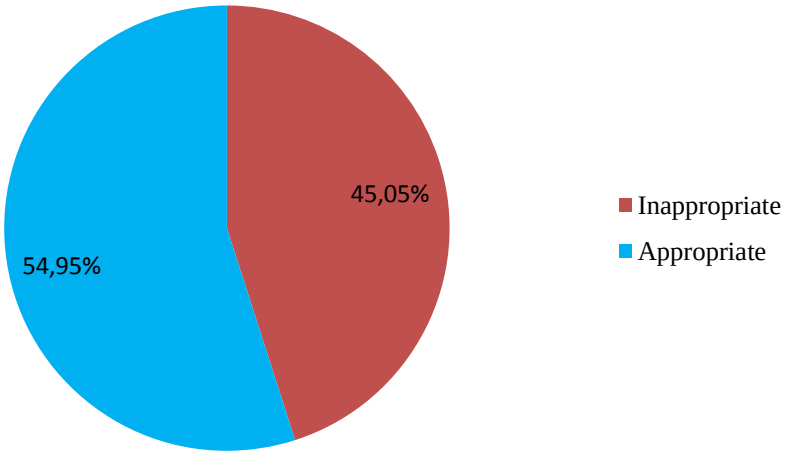

Figure 4.2: Overall nurses' responses ability towards clinically deteriorating children

4.8 BIVARIATE ANALYSIS OF ACTORS ASSOCIATED WITH NURSES RESPONSES TOWARDS CLINICALLY DETERIORATING CHILDREN

Bivariate analysis was used to determine association between demographic characteristics: age, sex, education level, years working in pediatric wards and nurses' early recognition and nurses' responses.

4.8.1 ASSOCIATION BETWEEN SOCIO-DEMOGRAPHICFACTORS, NURSES RECOGNITION AND NURSES RESPONSES TOWARDS CLINICALLY DETERIORATING CHILDREN

As shown below in table 4.4, The researcher illustrates the association between socio-demographic characteristics, nurses 'recognition and nurses' responses towards clinically deteriorating children calculated using chi-square test. Fisher exact test was used where 2 variable were predicted on 2 dependent variable (two by two table) whereas Pearson chi-square where there was more than 2 variables to be predicted on 2 independent variable(three or four by two table) The fisher exact test showed that there was statistical significant difference between nurses level of education, early recognition and nurses responses towards clinically deteriorating children($p<0.011$ and $p<0.001$ respectively).

Concerning age group, gender, and years of experience, the Pearson chi-square and fisher exact test on gender showed that there was no statistical significant difference between those variable and nurses responses . Because for each variable, p-value was greater than 0.05. Showed that was a statistically significant relationship with nurses's responses towards clinically deteriorating children ($p=0.469$,$p=0.168$ and $p=0.093$ respectively)

Table 4.4: Association between nurses' socio-demographic, early recognition variables and nurses' responses towards clinically deteriorating children

Variable	Response		Statistical test used	P-value
	Inappropriate	Appropriate		
Age in years				
25-29	7(63.6%)	4(36.4%)	Pearson chi-square	0.469
30-34	26(44.8%)	32(55.2%)		
35-39	12(48.0%)	12(52.0%)		
40-44	4(33.3%)	8(66.7%)		
45+	1(20.0%)	4(80.0%)		
Gender				
Male	14(58.3%)	10(41.7%)	Fisher's Exact Test	0.168
Female	36(41.4%)	51(58.6%)		
Education Level				
A1	42(53.2%)	37(46.8%)	Fisher's Exact Test	**0.011**
A0	8(25.0%)	24(75.0%)		
Working Experience in Pediatrics department				
<1year	9(52.9%)	8(47.1%)	Pearson chi-square	0.093
1-3 year	18(50.0%)	18(50.0%)		
3-5 year	18(51.4%)	17(48.6%)		
5 year and above	5(21.7%)	18(78.3%)		
Recognition				
Unable to Recognize	40(57.1%)	30(42.9%)	Fisher's Exact Test	**0.001**
Able to Recognize	10(24.4%)	31(75.6%)		

4.9 MULTIVARIATE ANALYSIS OF FACTORS ASSOCIATED WITH NURSES RESPONSES TOWARDS CLINICALLY DETERIORATING CHILDREN

During multiple logistic regression analysis as presented in Table above, Variables were analyzed through multivariate logistic regression analysis to examine the independent variables (with p-value of less than 20%) associated with nurses responses towards clinically deteriorating children, while simultaneously controlling for potential confounders The independent variables(age, gender, education level, experience, recognition) associated with responses towards clinically deteriorating children after controlling potential confounders are presented

From backward logistic regression, variables that were excluded in the model after considering variables with a p-value of less than 20% and controlling potential confounders were age, gender and working experience while education level and nurses recognition were found to be independent predictors of nurses responses to clinically deteriorating children, however working experience was found to be associated to nurses responses in bivariate analysis.

For participants' responses, nurses working in pediatric department who hold a bachelor degree of science in nursing were 3 times more likely to respond appropriately to clinically deteriorating children than those with who hold advanced diploma[OR= 2.6501; 95% CI =1.023-6.916,p=0.045). Concerning nurses who are able to recognize early signs of clinical deterioration were 3.5 times more likely to respond appropriately clinically deteriorating children than those who were unable to recognize early signs of clinical deterioration (OR= 3.490; 95% CI =1.449-8.406, p=0.05)

Table 4.5: Multiple logistic regressions of nurses'responses to clinically deteriorating children

Variable	AOR(95% CI)	P-value
Age in years		
25-29	0.187(0.012-2.932)	0.233
30-34	0.244(0.019-3.169)	0.281
35-39	0.166(0.012-2.276)	0.179
40-44	0.211(0.012-3.719)	0.288
45+	ref	
Gender		
Male	0.551(0.197-1.542)	0.256
Female	ref	
Education Level		
A1	ref	
A0	2.659(1.023-6.916)	0.045
Working Experience in Pediatrics department		
<1year	ref	
1-3 year	1.924(0.537-6.887)	0.315
3-5 year	1.038(0.292-3.669)	0.954
5 year and above	3.799(0.864-16.710)	0.077
Recognition		
Unable to Recognize	ref	
Able to Recognize	3.490(1.449-8.406)	0.005

AOR: *Adjusted Odd Ratio,* ***Ref:*** *reference*

4.10 CONCLUSION

The results of this study were analyzed using descriptive and bivariate analysis as well as multivariate analysis such as multiple logistic regression analysis. The research findings were presented in frequencies and percentages showing in tables and pie charts where he majority of the nurses [70(63.06 %)] were shown to be unable to recognize early clinical cue towards clinical deterioration surprisingly more than a half of the nurses [71(54.95 %)] were shown to respond appropriately towards clinically deteriorating children.

On bivariate analysis, level of education and nurses 'early recognition ability were the only variables that had a statistically significant association with nurses' responses towards clinically deteriorating children with (p =0.011 and p = 0.001 and respectively). Multivariate analysis: multiple logistic regression analysis showed that nurses with higher level education qualification and ability to recognize early clinical cues towards clinical deterioration were (OR= 2.659, 95%CI=1.023-6.916and OR= 3.490: CI= 1.449-8.406 respectively)more likely to respond appropriately towards clinically deteriorating children than their counterpart nurses.

CHAPTER FIVE: DISCUSSION

5.1 INTRODUCTION

The goal of the study was to assess nurses' early recognition and their responses towards clinically deteriorating children in pediatric ward. Within this context, this chapter is providing the discussion between three independent variables which are demographic characteristics and nurses' early recognition and one dependent variable which is nurses responses to clinically deteriorating children.

The conceptual framework was utilized to put the study in context. The number of these variables (independent and dependent) reflects the objectives which serve as the basis to discuss the findings of the study. The results of this study were based primarily on the data obtained from pediatric department nurses working in two selected public referral hospitals in Kigali.

A total of 111 participants (selected pediatric department nurses) completed a self-administered questionnaire. The response rate was 82 %. The strengths and limitations are discussed.

5.2 DEMOGRAPHIC CHARACTERISTICS

This study shows that majority of participants had only advanced diploma (A1) in General Nursing whereas a small proportion of participants had bachelor degree of science in nursing and only a very small proportion of participants had a working experience in pediatric department above 5 years. These results is seemingly indicating that the nurses working in pediatric wards at those two study sites not only have limited advanced qualification and but also their experience was limited in pediatric ward, similarly this has been confirmed by Mok and colleagues,(2015,p.10),in their study to assess nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration in general wards, of 614 ward general nurses who participated in the study whereby the majority nurses were only registered nurses , and only a smallproportion of nurses had bachelor degree in general nursing and a significantly reduced number of nurses with more than 5 years of working experiencein pediatric department

Concerning gender and age, a significantly big proportion of participants were found to be female,this results indicates that there is an existing large discrepancy as regard to having a relatively similar ratio of male to female number of nurses working in pediatric department

however the age groups frequency represents a maturity depiction of nurses working in pediatric department at 2 sites this could be explained by the fact that there is an overall preexisting discrepancy in those 2 referral hospital (RMH and KUTH Statistics ,2019) , this is consistent with a number of study for example in study done in England at a certain general district hospital, the study was aiming at evaluating the impact of a new model for the detection and management of deteriorating patients on knowledge and confidence of 213 nursing staff in an acute hospital whereby it was found that female nurses accounted for the vast majority of the participants ,the mean age in that study was shown to be 41.2 ranging from 19-61 years (McDonnell el al,2013,p45) .

5.3NURSES'RECOGNITION TOWARDS CLINICALLY DETERIORATING CHILDREN

Under this objective of determining nurses 'recognition towards critically deteriorating children The following four isolated items namely participants confidence in early recognition of clinical deterioration, the most influential respiratory parameter that serves as early sign of clinical deterioration in children, the most influential cardiovascular parameter that serves as early sign of clinical deterioration in children and the most influential central nervous system parameter that serves as early sign of clinical deterioration in children were investigated and further more 3 case scenario based items namely, the most influential respiratory parameter that serves as early sign of clinical deterioration in children, the most influential cardiovascular parameter that serves as early sign of clinical deterioration in children and the most influential central nervous system parameter that serves as early sign of clinical deterioration in children were also investigated ,in this study 111 were asked to respond to those questions regarding nurses' recognition towards clinically deteriorating children. Half of the nurses were reported that they were moderately confident about early recognition of clinically deteriorating children equally another half also reported that they were strongly confident about early recognition of clinically deteriorating children and only 1 nurse reported that she was not confident at all about early recognition of clinically deteriorating children, the results of this study shows that there was an equal balance between nurses who felt strongly confident about early recognition of clinically deteriorating children and those who were not sure whether they can easily recognize early clinical cues towards clinical deterioration .This similarity in proportions could be explained by the fact that the nurses had a mixed level of experience, there was possibly a risk of

a “ceiling effect”(Walters 2009, p3-4). However the overall score regarding nurses’ ability to recognize early clinical cues towards clinical deterioration significantly decreased after considering all items questions that were assessing early clinical cues recognition ,that translates that some participants weren’t aware that they had difficulties in recognizing early clinical cues towards clinical deterioration ,this has been confirmed by a study a study conducted by Mok et al (2015,p210) in Singapore at a tertiary acute care hospital, that was aiming at exploring nurses’ attitudes towards vital signs monitoring in the detection of clinical deterioration in general wards, of 614 ward general nurses who participated in the study ,whereby the majority of the nurses strongly agreed that they knew how to identify early clinical cues indicating clinical deterioration but as questions recognition of early clinical cues towards deterioration progressed ,a proportion of nurses who consistently showed ability to recognize early clinical cues ,almost a half of the nurses strongly disagreed that their knowledge in interpreting clinical cues to identify clinical deterioration was limited and in the end the study concluded that a bigger percentage of nurses were unaware of their knowledge deficit towards recognition of vital signs reading to clinical deterioration .

Concerning the nurses’ ability to recognize the most influential respiratory parameter that served as early sign of clinical deterioration in children. The findings of this study showed that nearly a half of the nurses directed their choice towards an increase in respiratory rate , this is basically related to theory of compensatory mechanism that stipulates that before a child shows use of accessory muscles and starts desaturating ,the body will try to increase tidal volume by increasing the respiratory rate (Citak, 2018,p10),this is not far from the available evidence as measurement of respiratory rate as a vital sign is important in detecting deterioration, as the respiratory rate often increases before other vital signs , in support with this Studies have shown an increase in respiratory rates of up until 24 h prior to ICU admission, this has been confirmed in a systematic review protocol conducted in German which was entitled ‘’effectiveness of respiratory rate in determining early clinical deterioration(Larsen & Ha, 2016,p20)

A small proportion of nurses (33nurses) ,erroneously identified respiratory effort as an early sign toward clinical deterioration ,this lapse in judgment was more evident during a case scenario responses where almost half of the nurses selected moderate subcostal and intercostal recession and occasional grunting as the first indicator of clinical deterioration ,this finding is attributed to limited knowledge of pathophysiology and lack of understanding of the physiological

compensatory mechanisms such that they were unaware of that usually children start compensating with manifesting an increased respiratory rate and increased respiratory effort come as a late sign of clinical deterioration ,this finding is congruent with existing literature for example in a study conducted in Canada by Kristina Kmpotic et al (2016p.5) that aimed at determining the patient and system factors that experienced clinicians nurses included think are associated with clinical deterioration in hospitalized children ,this study included 11 physician and nonphysician health care providers from hospitals in Canada and the United States ,the study concluded that respiratory effort classified in the signs and symptoms factor leading to clinical deterioration was not useful rather it was found to be a late sign.

Concerning oxygen saturation,27% of the nurses erroneously found it as an early indicator in this is usually a late compensatory mechanisms showing signs of decompensation, lowOxygen saturation was shown to be one of the three most common call criteria for medical emergency teams (METs) and one of the most common abnormal vital signs preceding cardiac arrest (Nurmi et al., 2015,p111). In the case scenario questions the proportion of nurses who still considered an oxygen saturation of 88% as an early alarming sign to clinical orientation dropped because nurses would wait until oxygen level fall to critical level to get concerned ,where as the evidence suggest that Oxygen saturation of < 90% in admissions, considered to be a late sign of deterioration was associated with death , and transfer to a critical area (Jacques et al., 2016,p4-8).

Concerning the nurses ability to recognize the most influential cardiovascular parameter in isolated questions and case scenario questions that serves as early sign of clinical deterioration in children, almost a half of the nurses respectively identified increased heart rate as an early sign of clinical deterioration in the MCQ(Multiple Choice Questions) and case scenario questions, however much some nurses who erroneously picked low blood pressure as an early sign of clinical deterioration ,this is again explained by the fact some nurses had limited understanding of the first key indicators of deterioration. For example, blood pressure is a relatively late sign of deterioration, because compensatory mechanisms normally first increase the heart and respiratory rates without significant changes in blood pressure (Soong,2013, p.61-90), this is consistent with a study by Van and Michell,2008,p5-111)

reported that altered blood pressure was the most common cause for activation of a medical emergency team (MET) . Urine output ,in our study 22 nurses during isolated multiple choice

questions and 25% nurses during case scenario multiple choice questions falsely identified that urine output less than what is required in 12 hours would serve an early sign of clinical deterioration , this is again due to limited awareness of the compensatory mechanism , similarly in a descriptive observational study conducted in South Africa at a nursing college in cape town ,entitled" *Student nurses' recognition of early signs of abnormal vital sign recordings"*the study recruited 77 nurse students ,it was found that also 13 nurses out of 77 nurses falsely picked low urine output as an early indicator to clinical deterioration and in addition most respondents would delay intervention until the patient is passing no urine (a (Leonard & Kyriacos, 2015,p.14) In this study the nurses ability to recognize the most influential central nervous system assessment parameter 25 nurses in MCQ and 36 nurses in case scenario that unresponsiveness to verbal command served as early sign of clinical deterioration in children, ,this finding suggest that nurses had limited knowledge knowing an early signs that indicates decreased level of consciousness ,in support with this finding Unresponsiveness to verbal commands on admission was found to be a late sign of clinical deterioration yet nurses would wait until it is obvious to call for assistance (Klause et al., 2004,p.4,Rylance et al., 2009,p.2-9).

The overall nurses recognition towards clinically deteriorating children in this study was found to be limited given the fact that, the vast majority of nurses were found to be unable to recognize early clinical cues towards clinical deteriorating in hospitalized children, this is probably due to lack of situation awareness , this finding is consistent with other research finding for example in a study conducted by Mok and colleagues (2015,p211) in Singapore at a tertiary acute care hospital, that was aiming at exploring nurses' attitudes towards vital signs monitoring in the detection of clinical deterioration in general wards, of 614 ward general nurses, it was noted that nurses had limited understanding of the key indicators of deterioration and another systematic review conducted by Odell et al. (2009,p.5) showed that ward nurses had difficulty recognizing deteriorating patients adequately, often hampered by inexperience, lack of skill and excessive workload. In a study conducted in South Africa at a nursing college in cape town ,entitled" *Student nurses' recognition of early signs of abnormal vital sign recordings"* the study recruited 77 nurse students ,it was found that final year nursingstudents had difficulty recognizing early signs of deterioration .When the readings were converted to a MEWS, students

would delay calling for more skilled assistance until critical illness was established(Leonard & Kyriacos, 2015,p.15).

5.4NURSES RESPONSES TOWARDS CLINICALLY DETERIORATING CHILDREN

Under this objective of determining nurses responses towards clinically deteriorating children The following 4 isolated items namely confidence in knowing what next actions to take towards clinically deteriorating children, confidence in reporting abnormal early clinical cues about clinically deteriorating children to a more senior member of the team, confidence in knowing when to contact a more senior member of the team and confidence in knowing who to contact about a patient who is exhibiting early clinical cues towards clinical deterioration and lastly 1 case scenario based multiple choice questions regarding the most appropriate response towards early clinical cues identified in a case scenario, in this study participants were asked to respond to those questions regarding nurses responses towards clinically deteriorating children. Almost of the nurses reported that were moderately confident in knowing what next step to take in the face of clinical deterioration ,this is possibly due to the fact that those nurses did not know how the patient would present or there was no clear guideline of what to do in the face of clinical deterioration , However the vast majority nurses reported that they were strongly confident in reporting abnormal clinical cues ,when to contact and who to contact about early clinical cues towards clinical deterioration, that was due to the fact the practice of calling a more senior person was routinely being done as normal process ,the resident physicians are readily available The vast majority of nurses who diversely considered either calling the resuscitation team

Alerting the unit manger ,alerting the doctor about the assessment findings these results clearly indicate that majority of the nurses knew that when they recognize early clinical cues to deterioration they call up on a more senior person for assistance however a small Proportion nurses also considered completing reassessment, including vital signs every 15 min that indicates that considering frequent reassessment was also an option that would tell the nurse the trend ,this related to the fact that nurses routinely notify the physician for any abnormal clinical cues and when something is wrong they tend to rely more on vital signs, this findings are in support with a study done by Mc Donnel and collegue that took place in England with an aim to evaluate the impact of a new model for the detection and management of deteriorating patients on knowledge and confidence of nursing staff in an acute hospital whereby 213 were involved in

the quantitative research and 15 nurses were involved in the qualitative part of that research, the finding were that a significant proportion of nurses reported that they were strongly confident in knowing who to contact , how to report abnormal observations and they call a more senior staff to come(McDonnell et al.,) .The overall finding suggests that most of the nurses responded appropriately towards clinical cues towards clinical deterioration. Surprisingly despite the overall inability of nurses to early recognize clinically deteriorating children, this research has shown that nurses have been shown to be able to display appropriate response to clinically deteriorating children, this is probably due to the fact that even those nurses who had difficulty in recognizing early clinical cues routinely would call for assistance or intensify assessment ,this is congruent with a study by Endaccot Ruth et al (2010,p.8) conducted on 51 final-year undergraduate nursing students in Australia attended a simulation laboratory for 1.5 hours and completed a knowledge questionnaire and two (mannequin-based) scenarios simulating deteriorating patients with hypovolaemic and septic shock revealed that recognition of abnormal observations often initiated action in the absence of comprehension of deterioration, and was much more frequent than any observed assessment or prediction of risk for deterioration

5.5 ASSOCIATION SOCIO-DEMOGRAPHIC FACTORS, NURSES'RECOGNITIONTO NURSES RESPONSES TOWARDS CLINICALLY DETERIORATING CHILDREN

Under this objective of establishing the associated socio-demographic factors, nurses 'recognition to nurses responses towards clinically deteriorating children

The associated socio-demographic factors to nurses responses towards clinically deteriorating children were found to be level of education and experience more than 5 years in pediatric department and the association between nurses' recognition and nurses responses towards clinically deteriorating children

5.5.1. Association of level of education to nurses responses

This research shows that nurses having advanced academic qualification (A0) were found to more likely respond appropriately towards clinically deteriorating children as opposed to nurses who have only advanced diploma (A1) . This findings suggest that as nurses upgrade their level of education they acquire complex decision making skills needed in order to prioritize interventions based on patients assessment findings ,similar studies have found the same association ,for example in a study done in Singapore at a tertiary acute care hospital, that was aiming at exploring nurses' attitudes towards vital signs monitoring in the detection of clinical

deterioration in general wards, in this study the highest qualification (bachelor degree) in general nursing was found to have a significant impact on the overall attitude score towards vital signs monitoring to detect and report deterioration(Mok et al,2015,p210, McDonnell et al,2012,p5-9)

5.5.2. Association of working experience in pediatric department to nurses responses

The current research finding failed to find any positive association of working experience to nurses' response towards clinically deteriorating children this is not consistent previous studies where for example Mok et al(2015,p.10) found that nurses with more than 5 years of working experience in pediatric department were more likely to respond appropriately to clinically deteriorating children than their counterpart ,Odell and collegues (2009,p.5) showed that ward nurses had difficulty recognizing and responding to deteriorating patients adequately, often hampered by inexperience, normally as nurses gain more experience they proportionally develop or acquire complex decision making skills and competency to respond appropriately to clinically deteriorating children based on assessment ,the discrepancy noted is probably due to the fact that previous studies looked at nurses who had consistent continuous professional development program during their working experience in pediatric ward or nurses who had more experience in pediatric ward therefore future study in this field might find this

5.6.3. Association of age and gender to nurses' responses

In this study age and sex ,being female or male did not yield any statistically significant difference in terms of instituting appropriate response towards clinically deteriorating children ,the research finding translates that having more female or male nurses disproportion would not contribute to reducing inappropriate responses or increasing appropriate response towards clinically deteriorating children among nurses working in pediatric department ,similar result was reported by Kaul et al (2014) by highlighting that only nurses who had prompt recognition of early clinical cues were significantly more likely to early recognize risk for deterioration and respond with appropriate interventions age and gender did not yield a statistically significant difference

Concerning age, ,did not yield any statistically significant difference in terms of instituting appropriate response towards clinically deteriorating children ,the research finding translates that having more female or male nurses disproportion would not contribute to reducing inappropriate responses or increasing appropriate response towards clinically deteriorating children among nurses working in pediatric department ,similar result was reported by Kaul et al (2014) by

highlighting that nurses age as social demographic factor did not yield a statistically significant difference to nurses responses towards clinically deteriorating children

5.6 ASSOCIATION OF NURSES RECOGNITION TOWARS CLINICALLY DETERIORATING CHILDREN TO NURSES RESPONSES

In this study nurses who are able to recognize early signs of clinical deterioration were found to more likely respond appropriately to clinically deteriorating children than those who were unable to recognize early signs of clinical deterioration ,this result suggests that if a nurse is able to identify early clinical cues towards clinically deteriorating ,he/she stands high chance of coming up with a more appropriate interventions than the one who has difficulties in identifying early clinical cues towards clinically deteriorating children as she/he may be stuck in dilemma wondering wether the current status require immediate intervention or not, thisis supported by a study done by Selfton *et al*(2014,p.97-29) aiming at exploring how the introduction of pediatric early warning score at a tertiary children's hospital affected emergency admissions to the Pediatric Intensive Care Unit (PICU) and the impact on service delivery. To compare 'in-house' emergency admissions to PICU with 'external' admissions transferred from District General Hospitals (without PEWs).the results showed that if nurses were able to recognize early warning signs through the use of a track and trigger tool, their appropriate response were evident through a significant reduction of pediatric index of mortality (PIM2): The median Pediatric Index of Mortality (PIM2) reduced. Fewer admissions required invasive ventilation for a shorter median duration; four to two days. The median length of PICU stay reduced; five to three days Another similar descriptive, cross-sectional study which used an electronic survey study by Kaul and colleagues (2014, p345-348) that involved 35 nurses and 17 physicians ,the study entitled "Implementation of the Bedside Pediatric Early Warning System

(Bedside PEWS) for nurse identification of deteriorating patients" showed that nurses who utilized a tool that helped them to early recognize clinically deteriorating children were found to respond more appropriately than nurses(without bedside PEWS) who were unable to recognize early clinical signs of clinical deterioration

5.7 STRENGTH OF THE STUDY

The researcher chose to use the totality of the whole nurses working in pediatric department instead of using the calculated sample size in order to increase power of the study and the generalizability of the findings.

The Strength was that the researcher collected data on two referral hospitals. This helped to identify the ability of nurses working in pediatric department to recognize and respond to clinically deteriorating children in a more cross-cutting way rather than facility based challenges.

The research design utilized was not the best design to assess nurses' responses therefore their responses might be considered as perceived responses

The calculated sample size for this study was 102. The minimum calculated sample size was maintained because the study considered taking account of 82% response rate. This high response rate became strength because it maintained statistical power for the study. Although the minimum sample size was achieved and maintained, the sample size is still too small to generalize the findings beyond the study settings. Therefore the results of this study are true only for the University Teaching Hospital of Kigali (UTHK) and Rwanda Military Hospital (RMH)

Another limitation was that the study considered one aspect of clinical deterioration which is clinical deterioration with regard to signs and symptoms (observations)

5.8 CONCLUSION

This chapter five discussed the results obtained from the study. The research findings were given meaning and inference to other studies relating to study objectives, conceptual framework. In addition, the strength and limitations were identified.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

In the final chapter of this study consist of a conclusion from the main findings which are presented based on the objectives and questions of the study and the recommendations for the 2 referral hospitals and for future research are also present.

6. 2 CONCLUSIONS

The majority of the nurses were found to have difficulties in recognizing early clinical cues potentially leading to clinical deterioration. The majority of the nurses were not able to recognize early clinical cues potentially leading clinical deterioration and nearly a half of nurses were found to respond inappropriately to clinically deteriorating children in pediatric wards, The study also sought to assess the association between nurses'socio-demographic factors, recognition ability and responses towards clinically deteriorating children in pediatric wards. Having an advanced level of education, working experience in pediatric department and nurses' recognition ability critical care nursing were statistically significantly associated with nurses response to clinically deteriorating children.

Multiple logistic regression analysis showed that nurses with high level of education and ability to recognize early clinical cues towards clinical deterioration were more likely to respond appropriately towards clinically deteriorating children than their counterpart nurses.

RECOMMENDATIONS

This study recommended the following entities:

Nursing practice (Referral hospitals)

1.Provide the trainings to the nurses in form of continuing professional development (CPD) related to the recognition and responses to clinical deterioration in children, so that the nurses working in pediatric department can have the essential knowledge and skills to that allow them to be able to recognize early clinical cues that potentially lead to clinical deterioration.

2. For safety purposes, make and implement the policies/guidelines related to the recognition and response of clinically deteriorating children

Nursing administration

3. Consider an advanced level of education at bachelors and masters during the recruitment of the new nurses working in pediatric department and for those who are already practicing considers upgrading their level of education through the formal continuous professional development (CPD).

4. The authorities need to adapt mechanisms of staff retention especially those working relatively long working experience in pediatric hospital.

Nursing education

5. To include and emphasize the component of early recognition and responses to clinically deteriorating patient with regard to signs and symptoms in the nursing curriculum starting from advanced diploma level

Nursing research

6**.** Further research is needed to conduct similar study by considering also patient characteristics, length of diseases in terms of acute or chronic condition

7. Conduct similar studies with large sample size involving all health care providers in pediatric department, not just nurses and extend the study to other referral hospital.

3. Qualitative studies are needed to explore the association of nurses experiences and their responses to clinical deterioration.

REFERENCES

Hart, P. L.,Spiva L S.,Dolly,L.,Lang-Coleman,K and Prince-Willims,N.2016'Medical-surgical nurses ' experiences as first responders during deterioration events:a qualitative study', *journal of clinical nursing* , vol 25,no.1,pp. 2769–2778. doi: 10.1111/jocn.12523.

Tanner, C. A. 2006 'Thinking Like a Nurse : A Research-Based Model of Clinical Judgment in Nursing',*journal of nursing education*,vol.45 no.6,pp.204-211

Sefton, G.,McGrath,G.,Tume,L.,Lane,S,Lisboa,P.J.G and Carrol,E.D., (2015) 'What impact did a Paediatric Early Warning system have on emergency admissions to the paediatric intensive care unit? An observational cohort study', *Intensive & critical care nursing*. Elsevier Ltd, vol.31,no.2, pp. 91–99. doi: 10.1016/j.iccn.2014.01.001.

Leonard, M. M. and Kyriacos, U. 2015 'Nurse Education Today Student nurses ' recognition of early signs of abnormal vital sign recordings', *YNEDT*. Elsevier B.V., vol.35, no.9, pp. e11–e18. doi: 10.1016/j.nedt.2015.04.013.

Massey, D., Chaboyer, W. and Anderson, V. 2016 'What factors influence ward nurses ' recognition of and response to patient deterioration ? An integrative review of the literature',*nursing open*'vol 3,no.1,pp. 6–23. doi: 10.1002/nop2.53.

United nation funds for children 2017a, *levels and trends in child mortality*. :viewed March,18, 2018< https://data.unicef.org/resources/levels-trends-child-mortality-2017/ >

Mpimbaza, A.,Sears,D.,Sserwanga,A.,Kigozi,R.,Rabahika,D.,Nadler,A.,Yeka,A and Dorsey,G., 2015 'Admission Risk Score to Predict Inpatient Pediatric Mortality at Four Public Hospitals in'.*Plos one* ,vol.10.no 7, doi: 10.1371/journal.pone.0133950.

NISR, MOH and ICF International 2015 'Rwanda Demographic and Health Survey 2014-15: Key Indicators', *Rockville, Maryland, USA: National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International.*

Brady,P.W.,Muething,S.,Kotagal,U.,Ashby,M.,Gallagher,R.,Hall,D.,Goodfriend,M.,White,C.,Bracke,M.T.,DeCastro,V.,Geiser,M.,Simon,J.,Tucker,M.K.,Olivea,J.,Conway,P.H.,and

Wheeler,S.K.,2013"Improving Situation Awareness to Reduce Unrecognized Clinical Deterioration and Serious Safety Events"*pediatrics,*vol.131 no.1 ,pp. e298–e308

Tibballs, J. and Kinney, S.2015 'Reduction of hospital mortality and of preventable cardiac arrest and death on introduction of a pediatric medical emergency team', vol.10 no.3,*pediatric Crit Care Med*,pp.306-3012, doi: 10.1097/PCC.0b013e318198b02c.

Kruisselbrink, R.,Kwizera,A.,Crowther,M.,Robichaud,A.F., O'Shea,T., Nakibuuka,J., Ssinabulya,I., Nalyazi,J.,Bonner ,A,Devji ,T., Wong ,J and Cook ,D.,(2016) 'Modified Early Warning Score (M,EWS) Identifies Critical Illness among Ward Patients in a Resource Restricted Setting in Kampala, Uganda: A Prospective Observational Study', *PloS one*, 11(3), p. e0151408. doi: 10.1371/journal.pone.0151408.

Hansoti, B., Jenson,A., Keefe,D., DeRamirez,S.S.,Anest,T.,Twomey,M.,Lobner,K.,Kelen,G.and Wallis, L. 2017 'Prioritizing the Care of Critically Ill Children in South Africa How Does SCREEN Perform Against Other Triage Tools ?',*BMC pediatrics,*vol 17,no.37, pp. 1–6. DOI 10.1186/s12887-017-0796-x

Hategekimana,C.,Shoveller,J.,Tuyisenge,L.,Kenyon,C.,Cechetto,D.F.andLynd,L.D.,2016 'Correlates of Performance of Healthcare Workers in Emergency , Triage , Assessment and Treatment plus Admission Care (ETAT +) Course in Rwanda : Context Matters', vol.11no.3,*Pros one,* pp. 1–17. doi: 10.1371/journal.pone.0152882.

Wolfe, I.,Macfarlane,A,Donkin,A.,Marmot,M.and Vinner,R., (2014) 'Why children die : death in infants , children and young people in the UK Part A', *Royal College of Paediatrics and Child Health*.pp.1-31,

Galen, L. S.,Struik,P.W.,Driesen,B.E.J.M.,Merten,H.,Ludikhuize,J.,Van der spoel,J.,Kramer,M.H.H. and Nanayakkara,B.P.W., (2016) 'Delayed Recognition of Deterioration of Patients in General Wards Is Mostly Caused by Human Related Monitoring Failures : A Root Cause Analysis of Unplanned ICU Admissions',*Plos one*,vol11no.8 pp. 1–14.e0161393 doi: 10.1371/journal.pone.0161393.

Jones,D.,Mitchell,I.Hilllmn,K. and David S.,2013'Defining clinical deterioration ', *ResuscitationElsevier Inc*., vol.84 no.1 , pp. 1029–1034,http://dx.doi.org/10.1016/.

Charpek,M.M.,Yuen,T.C.,Winslow,C.,Robicsek,A.A.,Meltzer,D.O.,Gibbons,R.D.and Edelson,D.P., 2014 'Multicenter Development and Validation of a Risk Stratification Tool for Ward Patients',*American Journal of Respiratory and Critical Care Medicine,* Vol.190,no.6, pp. 649–655. doi: 10.1164/rccm.201406-1022OC.

Lambert ,V.,Matthews,A.,McDonnel,R.andFitzsimons,J.2017 'Paediatric early warning systems for detecting and responding to clinical deterioration in children : a systematic review'.,*BMJ Open* ,vol.7,no.1,pp.1-13, doi: 10.1136/bmjopen-2016-014497.

Chapman, S. M.Wray,J.,Oultona,K.and Peter, . 2016 'Systematic review of paediatric track and trigger systems for hospitalised children', *Resuscitation*. European Resuscitation Council, American Heart Association, Inc., and International Liaison Committee on Resuscitation. Elsevier inc., vol.109, no.1, pp. 87–109. doi: 10.1016/j.resuscitation.2016.07.230.

Randhawa, S, Roberts-turner, R.,Woronick,K.and Duval,J., 2011 'Implementing and Sustaining Evidence- Based Nursing Practice to Reduce Pediatric Cardiopulmonary Arrest'.*Western Journal of Nursing Research,*vol.33,no.3,pp. 443–456 ,doi: 10.1177/0193945910379585.

Olson,D.,Davis,N.L.,Milazi,R.,Lufesi,N.,Miller,W.C.,Preidis,G.A.,Hosseinipour,M.C.and McCollun,E.D.2014,"Development of a severity of illness scoring system (ITAT) for resource-constrained hospitals in developing countries",*Trop Med Int Health,* vo1.8,no.7,pp. 871–878. doi:10.1111/tmi.12137

Considine,J.,Berry,D.,Johnson,R.andSands,N.,2016 Vital signs as predictors for aggression in hospital patients (VAPA), *Journal of Clinical Nursing*, vol.26,no.1,pp. 2593–2604, doi: 10.1111/jocn.13646

Kaul, M., Snethen,J.,Kelber,S.T.,Zimmanck,K.,Maletta,K.and Meyer,M.(2014) 'Implementation of the Bedside Paediatric Early Warning System (BedsidePEWS) for nurse identification of deteriorating patients', *Journal for Specialists in Pediatric Nursing19* (2014) pp. 339–349. doi: 10.1111/jspn.12092.

Massey,D., Chaboyer, W. and Anderson,V.2016 'What factors influence ward nurses ' recognition of and response to patient deterioration ? An integrative review of the literature',*nursing open*,vol.27,no.1,2016 pp. 6–23. doi: 10.1002/nop2.53.

Moss,T. J.,Clark,T.M.,*C*olland,F.J.,Enfield,K.B.,Voss,D.K.,Lake,D.E.and Moorman,R.,2017 'Cardiorespiratory dynamics measured from continuous ECG monitoring improves detection of deterioration in acute care patients : A retrospective cohort study',*plos one* ,vol.12,no.8,pp. 1–16. doi: 10.18130/V3/MKY17T.

Leonard,M. M. and Kyriacos, U.,2015'Nurse Education Today Student nurses ' recognition of early signs of abnormal vital sign recordings', *YNEDT*. Elsevier B.V., vol.35,no.9, pp. e11–e18. doi: 10.1016/j.nedt.2015.04.013.

Mok, W.,Wang,W.,Cooper,S.,Kim,A.E.N.and Liaw,S.K.,2015'Attitudes towards vital signs monitoring in the detection of clinical deterioration : scale development and survey of ward nurses',*International Journal for Quality in Health Care*, vol.27,no.1,pp. 207–213. doi: 10.1093/intqhc/mzv019.

Pantazopoulus, I.,Tsoni,A.,Kouskouni,E.,Papadimitrou,L.,O Johnson,E.and Xanthos,T.,.2012 'Factors influencing nurses ' decisions to activate medical emergency teams',*journal of clinical nursing*,vol.2,no.1, pp. 2668–2678. doi: 10.1111/j.1365-2702.2012.04080.x.

Endacort,R., Scholes J., Buykx P. , Cooper S. , Kinsman L. & McConnell-Henry T. 2010 Final-year nursing students' ability to assess, detect and act on clinical cues of deterioration in a simulated environment.", *Journal of Advanced Nursing* ,vol.66,no.12, 2722–2731. doi: 10.1111/j.1365-2648.2010.05417.x

Chua,W.L.andLiaw,S.K.,2015," Assessing beyond vital signs to detect early patient deterioration",*evidence basednursing* ,vol.*19*.no.*2*,pp*53.doi:* 10.1136/eb-2015-102092

Bucknall,T.K.,Harveys,G.,Considine,J.,*Mitchell,I.,Malonez.,J.R.,Graham,I.D..Mohammadreza, M.,Watts,J.and Hutchnson,A.L.,*,2017 'Prioritising Responses Of Nurses To deteriorating patient Observations (PRONTO) protocol : testing the effectiveness of a facilitation intervention in a pragmatic , cluster-randomised trial with an embedded process evaluation and cost analysis'. *Implementation Science*,vol.12,no.85, pp. 1–9. doi: 10.1186/s13012-017-0617-5.

Brown, S., Ann, M. and Hill, P. D.2012 'Rapid Response Team in a Rural Hospital', *Clinical nurse specialist*, vol1,no.1,pp. 95–102. doi: 10.1097/NUR.0b013e31824590fb.

Polit, F. D. and Beck, T. C. (2008) *Nursing Research: Principles and methods*. Seventh ed. Lippincott Williams and Wilkins.

Grove, K. S., Burns, N. and Gray, R. J.2013 *Practice of Nursing Research: Appraisal, Synthesis, and Generation of Evidence*. Seventh ed. St. Louis, Missouri: Elsevier Inc.

Rebar, R. C., Gersch, J. C., Macnee, R. C. and McCabe, S. (2011) *Understanding Nursing Research: Using Research in Evidence-Based Practice*. Third Edit. Philadelphia USA: Wolters Kluwer/ Lippincott Williams and Wilkins

Etikan,I., Musa, S. A. and Alkassim, R. S. 2016 'Comparison of Convenience Sampling and Purposive Sampling',*American Journal of Theoretical and Applied Statistics* ,vol5,no1, pp. 1–4. doi: 10.11648/j.ajtas.20160501.11.

MCDonnell, A. , TOD A. , Bray K. , Bainbridge D. , Adsetts D. and Walters,S. 2013 "A before and after study assessing the impact of a new model for recognizing and responding toearly signs of deterioration in an acute hospital". ,*Journal of Advanced Nursing*, 69(1), 41–52. doi: 10.1111/j.13652648.2012.05986.x

Giardine, A.,Fenton,M.,Rachel,E.,Derrick,G.and Burch,M., (2011) 'Clinical Deterioration in Ambulatory Children With Dilated Cardiomyopathy',*CirculationAHA*,124(10) pp. 1713–1719. doi: 10.1161/111.035956.

Krejcie, R. V and Morgan, D. W. (1970) 'Determining Sample Size for Research Activities Robert', *Educational and Psychological Measurement*, vol.38,no.1,pp. 607–610. doi: 10.1177/001316447003000308

Citak, A. (2018). Pediatric Shock, *signa vitae*, vol.*3*,no.1, pp.13–23.

Sharma, B. 2016 'A focus on reliability in developmental research through Cronbach ' s Alpha among medical , dental and paramedical professionals',*medical research*,vol.3,no.4, pp. 271–278. doi: 10.21276/apjhs.2016.3.4.43

Jacques, T., Gordon, A., Harrison, G.A., McLaws, M., Kilborne, G., 2006. Signs of criticalconditions and emergency responses (SOCCER): a model for predicting adverse events in the inpatient setting. *Resuscitation* vol69,no.1 , pp. 175–183.

Mcdonnell, A., Tod, A., Bray, K., Bainbridge, D., Adsetts, D., & Walters, S. 2012. acute hospital.,*journal of advanced nursing*,vol.2.no.1, https://doi.org/10.1111/j.1365-2648.2012.05986.x

Van Leuvan CH, Mitchell I.2008. Missed opportunities. An observational study of vital sign measurements. *Crit Care Resusc*; vol.111,no.10, pp5-10.

Harrison G.A., Jacques T.C., Kilborn G. & McLaws M.-L. 2005 The prevalence of recordings of the signs of critical conditions and emergency responses in hospital wards – the SOCCER study. *Resuscitation* vol.65.no.1, pp.149–157.

Walters S.J. 2009 Quality of Life Outcomes in Clinical Trials and Health-Care Evaluation. Wiley, West Sussex,vol.3.no.3,pp.2-4

Larsen, P., & Ha, S. J. 2016. Effectiveness of respiratory rates in determining clinical deterioration: a systematic review protocol ˚,critical care,vol.60,no.1,pp.18–20. https://doi.org/10.11124/JBISRIR-2016-002973

Odell, M., Victor, C., Oliver, D., 2009. Nurses' role in detecting deterioration in ward Patients: systematic literature review. J. Adv. *Nurs*. vol.65 ,no.10, pp. 1992–2006.

Kause, J., Smith, G., Prytherch, D., Parr, M., Flabouris, A., Hillman, K., 2004. A comparison of antecedents to cardiac arrests, deaths and emergency intensive care admissions in Australia and New Zealand, and the United Kingdom — the ACADEMIA study. *Resuscitation* vol.62 ,no.3, pp.275–282

Rylance, J., Baker, T., Mushi, E., Mashaga, D., 2009. Use of an early warning score and ability to walk predicts mortality in medical patients admitted to hospitals in Tanzania. Trans. R. Soc,*Trop. Med. Hyg*, vol.103,no.2, pp 790–794

Krmpotic, K., Bruel, A. Van Den, & Lobos, A.2016. A Modi fi ed Delphi Study to Identify Factors Associated With Clinical Deterioration in Hospitalized Children,*hospital pediatrics*,vol.6,no.10,pp.616-625 https://doi.org/10.1542/hpeds.2016-0006

Nienke Seiger,Ian Maconochie,Rianne Oostenbrink and Henriette A.Moll. 2016. Pediatric Early Warning Scores,*Pediatrics*,vol.4.no.3,pp1-46 doi:10.1542/peds2012-3594

Suud Nahdi.(2014)Summary literature review on Pediatric Early Warning System, (PEWS). *pediatrics*,vol.12.no.8,pp.12-23

ANNEXURES

ANNEXURE I: QUESTIONNAIRE

A QUESTIONNAIRE ON EARLY RECOGNITION AND RESPONSES TOWARDS CLINICALLY DETERIORATING CHILDREN IN HOSPITAL WARDS

INFORMED CONSENT

I**……. …**consent /accept to participate in this research project entitled : **Assessment of nurses recognition and response towards clinically deteriorating children in the ward at 2 selected referral hospital in Rwanda** Conducted by TUYISHIME AphrodisGustave, UR/CMHS/ Remera- Campus.

The information about this study has been availed and explained to me and all my questions have been answered. I have read this form and I feel that I have had enough information and time to consider my decision to join the study. I fully understand that by signing this form, I do not waive any of my legal rights, nor does it relieve the study investigators their duty (liability), but merely indicates that I have been informed about the research study in which I am voluntarily agreeing to take part in this research, however if you do have any other concern about your rights you may contact the chairperson of CMHS IRB :0788490522 or Deputy chairperson 0783340040 . Having understood all the information pertaining to this study I therefore agree to participate in this study by appending my signature and name below.

Research Participant

Initials Signature

Instructions

1. Questionnaire is anonymous, don't put your name on it, put only initials where indicated

2. Please kindly provide answers to all questions except where skipping is required

3. Select the appropriate response by using a tick (√) and specify if needed

part 1: Demographic information of respondents Each item has many options. Please tick one (√) which you find appropriate for you and specify if needed.		
1.1	age	
1.2	sex	1.Male ☐ 2.female ☐
1.3	What is your education level in nursing?	1. A2 ☐

		2. Advanced diploma (A1) ☐ 3. Bachelor's degree (A0) ☐ 4. Other (specify :….....) ☐
1.4	How long have you been working in pediatric ward ?	1. 6 Months -1 Year ☐ 2. 1year and 1month - 3years ☐ 3. 3years and 1month - 5years ☐ 4. 5years and above ☐

Part 2.Questions regarding nurses early recognition towards clinically deteriorating children in the hospital **Please tick (√) which you find as appropriate for you and specify ifany**				
2.1	How confident are in to early recognizing the pediatric individual aspects of assessment that serve as red flags for a pediatric clinical deterioration	Not confident at all	Moderately confident	Strongly confident
2.2	What is the most influential parameter in your pediatric nursing respiratory assessment that you use to detect the patient's early clue of clinical deterioration	a. Respiratory rate ☐ b.Oxygen requirement ☐ c.Oxygen saturation ☐ d.Respiratory effort ☐e.Parental concern ☐		
2.3	What is the most influential parameter in your pediatric nursing cardiovascular system assessment that you use to detect the patient's early clue of clinical deterioration	a. Heart rate ☐ b.Blood pressure ☐c.Urine output ☐ d.Capillary refill time ☐ e.Pulses☐		

		f.parental concern ☐
2.4	What is the most influential parameter in your pediatric nursing Central nervous assessment system that you use to detect the patient's early clue of clinical deterioration	a. Alert and irritable ☐ b.Only responding to voice ☐ c.Only responding to pain ☐ d.Unresponsive☐ e.parental concern ☐
2.5	Please read the following scenario and use it to answer the next set of questions.you assess a 2 years old admitted in the ward from emergency unit to your unit .the following are the assessment:HR:166,RR:66,BP:118/48, Temp:39,1,given 150ml bolus of NS on Emergency Unit ,diaper dry and mother reports that last diaper was 12 ago approximately.oxygen saturation 92 % on 2 l of oxygen via nasal prolong,hands and feets are cool with cap refill time more than 3 seconds,mother claimed that the baby is excessively asleep only awakes up on vigorous voice call, the mother added that he was playful 12 hours ago,however he is objectively responding to pain by extending arms but unable to reach the stimulus . he has moderate to severe subcostal and intercostals recession and occasional grunting	
2.5.1	Which piece of the respiratory assessments will early indicate you that the child is clinically deteriorating ?select one that apply 1.RR:66 ☐ 2.SPO2:92% ☐ 3.2L of oxygen via nasal cannulae ☐ 4.Moderate subcostal and intercostals recession and occasional grunting: ☐ 5.I am not concerned with this findings ☐	
2.5.2	Which piece of the cardiovascular assessments on will early indicate you that the child is clinically deteriorating ?select one that apply 1.Hr: 166 ☐ 2.BP: 118/48 ☐ 3.Temp:39.1^0 ☐ 4.Dry diaper and parents reports last diaper 12 hours ago than 3 seconds : ☐ 5.Hands and feet are cool with cap refill time more than 3 seconds : ☐	

2.5.1	Which piece of the central nervous system assessments will early indicate you that the child is clinically deteriorating ?select one that apply 1.Mother claimed that the baby is excessively asleep awakening only on vigorous voice call ☐ 2. He is objectively responding to pain by extending arms but unable to reach the stimulus ☐ 3. Mother added that he was playful 12 hours ago ☐

	Part 3.Questions regarding nurses' responses to clinically deteriorating children in the hospital			
3.1	When you early recognize that the child is clinically deteriorating how confident are you in knowing what next step to the take(the next step include: what nursing actions to take ,what monitoring to add how frequently to reassess the patient and who to contact	Not confident at all	Moderately confident	Strongly confident
3.2	How confident are you about reporting abnormal observations relating to a deteriorating patient to a more senior member of staff?	Not confident at all	Moderately confident	Strongly confident
3.3	How confident are you in knowing **when** to contact a more senior member of staff about a patient on your ward who is deteriorating clinically	Not confident at all	Moderately confident	Strongly confident
3.4	How confident are you in know **who** to contact about a patient on your ward who is deteriorating clinically	Not confident at all	Moderately confident	Strongly confident

3.5	Following the same case scenario on number 2.5 what actions do you feel are appropriate for you to take based on your assessment(select only one that that apply) 1. Reassess the patient in 4hours to determine if clinical status has improved ☐ 2.Consider calling the resuscitation team ☐ 3.Obtain an order to put the patient on monitor or pulse oximeter ☐ 4.Alert the doctor for fever and obtain an order to administer ibuprofen and recheck in 1hour ☐ 5.Complete the observation chart of the patient including vital signs every 2hours ☐ 6.Alert the unit manager and the doctor about your assessment findings ☐ 7.Request the unit manager and the resident to be present at the bedside for patient assessment ☐ 8.Consider communicating the unit manager with requesting for decreased patient care assignment ☐ 9.Complete reassessment ,including vital signs every 15 min ☐ 10.Suggest that the resident call the consultant doctor to update him or her regarding the pt status ☐ 11. Complete reassessment of pt including vital sign in 1hour ☐ 12.Consider communication with the resident the possibility of PICU consultation ☐

ANNEXURE II: PERMISSION FOR USE OF QUESTIONNAIRE

Re: requesting the questionnaire on knowledge

Expéditeur : Ruth Endacott (ruth.endacott@plymouth.ac.uk)
À : aphrodistuyishime@yahoo.fr
Date : mercredi 2 mai 2018 à 22:59 UTC+2

Good evening
Lovely to hear from you. I'm not sure which questionnaire you are needing. I have attached the MCQ questionnaire as i think this is the one you need.

I have also attached the full report for the study. The JAN paper was one of the papers from the full study data. The report gives you all the findings.

Kind regards

Ruth

Professor Ruth Endacott, Director, Plymouth University Clinical School
and
Professor of Critical Care Nursing, Monash University, Melbourne

From: tuyishime Aphrodis <aphrodistuyishime[illegible].fr>
Sent: 27 April 2018 10:43
To: Ruth Endacott
Subject: requesting the questionnaire on knowledge

my names are TUYISHIME Aphrodis ,i am a nurse student,doing masters in nursing in RWANDA/kigali,i am doing a thesis on EARLY RECOGNITION OF [illegible] PATIENT i thought this tool you used in your study entitled <Final-year nursing students' ab[illegible] and act on clinical cues of deterioration in a simulated environment>

kindly review my request and if i happen to use you tool or modify it ,i will acknowledge your support at the end of my study
Therefore I am kindly requesting the full version of your questionnaire tool and the approval to use it

Thank you in advance for your support

Kind regard

Aphrodis TUYISHIME

REGISTERED NURSE AT RWANDA MILIT[illegible]
COUNTINUING STUDENT IN MASTERS O[illegible]ATRIC TRACK AT UNIVERSITY OF RWANDA/COLLEGE OF MEDECINE AND HEALTH SCIENCE

RWANDA/KIGALI
TEL:+025 788620545
EMAIL :aphrodistuyishime@yahoo.fr

ANNEXURE III: INFORMATION DOCUMENT

DearMadam/Sir,

My name is AphrodisGustave TUYISHIME. I am from the University of Rwanda. I am conducting a research study to fulfill the requirements for a master's degree specializing in neonatal nursing. The University of Rwanda's Institutional Review Board, a committee whose task is to make sure that research participants are protected from harm has approved this study.

Role of the researcher: I am a registered nurse in Rwanda and have practiced nursing for six years. Currently, I work in the Neonatal Intensive Care Unit (NICU) at the Rwandan Military Hospital. The researcher will ensure that the rights of research participants are protected and this is achieved by ensuring that participants receive sufficient information, which can be easily understood, and will ensure that appropriate strategies are in place to protect participants from potential adverse consequences of the research.

Purpose: I am conducting research on nurses 'early recognition and responses to clinically deteriorating children in pediatric ward. It is hoped that the information learned in this study will help to improve or inform the practice of early recognition and response to clinically deteriorating children in pediatric ward specifically in Rwandan context.

Invitation of participation: It is my understanding that you are the nurse working in pediatric ward of this hospital and who usually encounter clinically deteriorating children during your work. For this reason, I am inviting you to participate in this study, involvement in this study is voluntary so you may choose to participate or not and you will be allowed to withdraw from the study anytime you will be feel uncomfortable to continue

Risks or discomfort: There is no increased risk to your participation in this study, as you will be only asked to fill the self administered questionnaire depending on your availability.

Benefits: Your participation mighty not bring about immediate benefits, however it will inform some clinical guidelines which will ease your work.

Incentives: You will not receive any payment for your participation in this study

Confidentiality: Information gathered from you will be kept confedential and your names will be anonymous as it will be identified with a code number.

Voluntary participation: You have right to participate in this study or not, your participation is voluntary. Your choice will not have any adverse effect.

Contacts for further information: If you wish to ask any questions later about this research you may contact AphrodisGustave TUYISHIME on the following phone number: +250788620545 or at aphrodistuyishime@yahoo.fr, You may also contact Philomene UWIMANA the supervisor of this project at +25078848604.

And if you have any other concern about your rights in this study you may contact the chairperson of the CMHS/UR Institution Review Board Professor Kato NJUNWA at: njunwa@khi.ac.rw or 0788490522, or the secretary Mr. Francois Xavier Sunday at: fsunday@khi.ac.rw or 0788563311 or Deputy chairperson:0783340040

Publication: The research findings from this study will be shared to this hospital and through publication so that other interested people may benefit from this research but the names of the participant will not be used.

Consent: After you have understood, a consent form is available for you to sign for your voluntary choice to participate in this study .

URWANDIKO RUGAMIJE GUTANGA IBISOBANURO MU KINYARWANDA

Bwana,Madam,

Nitwa TUYISHIME AphrodisGustave, ndiumunyeshulimurikaminuza y' u Rwanda mu ishamiry'ubuvuzin'ubuzima; ndigukoraubushakashatsimurwegorwokurangizaicyicirocyagatatucyakaminuza. UbubushakashatsibwemeweniikigogishinzweubushakashatsimuriKaminuzay'u Rwanda ishamiry'ubuvuzin'ubuzima.Ubusanzwendiumuforomo mu BitarobyaGisirikareby'uRwanda ,

Integoy'ububushakashatsi;

Ndimogukoraubushakashatsikubijyanyeniuburyoabaforomo/kazibabashakumenyaabanabagaragazaibimenyetsompuruzabyerekanakobarikurmbabirushijejehondetsenibyoabaforomo/kazibakoraiyibabonyeibyobimenyetsokubanabarrwariyemubitarobyabana.

Ubutumirebwokugirauruhare mu bushakashatsi:nifuzagakubasabakomwakwemeramugakorerwahoubushakashatsiturebauburyoabaforomo/kazibabashakumenyaabanabagaragazaibimenyetsompuruzabyerekanakobarikurmbabirushijejehondetsenibyoabaforomo/kazibakoraiyibabonyeibyobimenyetsokubanabarrwariyemubitarobyabana.

Ingoranen'ingarukazishoborakuvuka: Ububushakashatsintangarukabufiteusibyeumwanyawanyumuzaduha .

Inyunguzishoboka:kwitabiraububushakashatsintanyungumuzahitamubugiramo, arikoibizavamobizabafashakurushahokwitakuri abo banabagaragazaibimenyetsompuruzambereyokurembabirushijeho.

Ibihembo: Ntabihembobiteganyijwekwemeragukorerahoubushakashatsi

Ubushake mu kwitabiraubushakashatsi : Kwemeragukorerwahoubushakashatsiniubushake, ushoboraguhakanagukorerwahoubushakashatsi; icyemezowafatantabwogishoborakukugirahoingarukamuriibibitaro cg kumwugawawe.

Ibanga: Ibizavamuriububushakashatsibizabikwaneza, ntamazinayanyuazagaragaraho.

Abo ushoborakubaza: Mugihemukeneyeandimakurukubijyanyen'ububushakashatsi, mwampamagarakuriizinumeroza telephone igendanwa:0788620545, Mushobora no guhamagraPhilomeneUwimanakuri 0788480604, Umwalimuugenzuraububushakashatsi. Mu giheufiteikibazokuburenganzirabwawemuriububushakashatsi, ushoborakuvuganan'ubishinzwe mu biro by'ubushakashatsi CMHS/UR kuri : fsunday@khi.ac.rwcyangwakuri telephone igendanwa 0788490522.cyangwa umwungirije :0783340040

GutangazaIbizavamuriubuBushakashatsi:

Mu gutangazaibizavamuriububushakashatsintazinaryawecyangwairy’umwana

Kwemerak’Ubushake:mbereyogutangiraubushakashatsiurasabwagusinyaurwandikorwokwemerakubushakekugirauruhare mu bushakashatsi.

ANNEXURE IV: INFORMED CONSENT

I**……. ……..**consent /accept to participant in this research project entitled : **Assessment of nurses recognition and response towards clinically**

deteriorating children in the ward at 2 selected referral hospital in Rwanda Conducted by TUYISHIME AphrodisGustave, UR/CMHS/ Remera- Campus.

The information about this study has been availed and explained to me and all my questions have been answered. I have read this form and I feel that I have had enough information and time to consider my decision to join the study. I fully understand that by signing this form, I do not waive any of my legal rights, nor does it relieve the study investigators their duty (liability), but merely indicates that I have been informed about the research study in which I am voluntarily agreeing to take part in this research, however if you do have any other concern about your rights you may contact the chairperson of CMHS IRB :0788490522 or Deputy chairperson 0783340040 . Having understood all the information pertaining to this study I therefore agree to participate in this study by appending my signature and name below.

Research Participant

Initials: Signature:

_____ _____

Date: Tel number: Tel number:

_____ _____

KWEMERA KUGIRA URUHARE MU BUSHAKASHATSI

Njyewe……..nemeyegukorerwahoubushakashatsibwitwa “kurebauburyoabaforomo/kazibabashakumenyeibimenyetsoabanabarimubitarobyabanabagaragazaaribyompuruzambereyokurembabirushijehondetse “nuburyobabyitwaromo, nahaweamakurukubijyanyenububushakatsindetsenasobanuriwekandiibibazobyanjyebyasubijwe. Nasomyeururwandikoneza ,mbonanumwanyawogutekerezakumwanzurowanjye

Numvisenezakonubwonsinyeururwandikobitavukakouburenganzirabwanjyebushoborakutitabwa hocyangwa se umushakashatsiakitwazoibyontakoreinshinganoze.ibibisobanuyekonumviseamakuruyosekubushakashatsingiyekwemerakubugiramouruhare;ugizeikibazokubijyanye n uburenganzirabwawewahamagarakuriizinumero z uwushinzweiryoshami :0788490522 cg umwungirije :0783340040.

Maze gusobanurirwaibijyanye n’ ububushakashatsinemeyekuubushakekugirauruhare mu ubushakashatsikubijyanye no kurebauburyoabaforomo/kazibabashakumenyeibimenyetsoabanabarimubitarobyabanabagaragazaaribyompuruzambereyokurembabirushijehondetse.

IkirangaUkorerwahoubushakashatsi……..

italiki……..

Umukono…….

Amazinay’ukoraubushakashatsi……..

Italiki…….

Umukono……

ANNEXURE V: ETHICAL CLEARANCE APPROVAL FROM UNIVERSIRTY

UNIVERSITY OF RWANDA — COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 14/01/2019
Ref: CMHS/IRB/052/2019

TUYISHIME Aphrodice Gustave
School of Nursing and Midwifery, CMHS, UR

Dear TUYISHIME Aphrodice Gustave

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Assessment of Nurses' Early Recognition and Response to Clinically Deteriorating Children in Pediatric Ward at 2 Referral Hospitals"***

Having reviewed your protocol and found it satisfying the ethical requirements, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Professor Jean Bosco GAHUTU
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:
- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate Studies, UR

EMAIL: researchcenter@ur.ac.rw P.O. Box: 3286, Kigali, Rwanda WEBSITE: http://cmhs.ur.ac.rw/ www.ur.ac.rw

ANNEXURE VI: APPROVAL NOTICE FROM UNIVERSITY TEACHING HOSPITAL OF KIGALI

CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

Quality Health Care
Training & Research

Ethics Committee / Comité d'éthique

February 08th, 2019 **Ref.: EC/CHUK/023/2019**

Review Approval Notice

Dear **Tuyishime Aphrodis Gustave,**

Your research project: ***"Assessment of Nurses' recognition and responses to clinically deteriorating children in pediatric ward at CHUK"***

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 08th February, 2019 to evaluate your request for ethical approval of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your research project.

You are required to present the results of your study to CHUK Ethics Committee before publication.

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,

ETHICS COMMITTEE CHUK

Dr. Emmanuel Rusingiza
The Chairperson, Ethics Committee,
University Teaching Hospital of Kigali

<<University teaching hospital of Kigali Ethics committee operates according to standard operating procedures (Sops) which are updated on an annual basis and in compliance with GCP and Ethics guidelines and regulations>>

B.P. :655 Kigali- RWANDA www.chk.rw Tél. Fax : 00 (250) 576638 E-mail :chuk.hospital@chukigali.rw

ANNEXURE VII:APPROVAL NOTICE FROM RWANDA MILITARY HOSPITAL

REPUBLIC OF RWANDA
RWANDA MILITARY HOSPITAL
Website: www.rwandamilitaryhospital.rw
P.O. Box: 3377 Kigali, Tel: (+250)252586420, Hotline: 4060
Email: info@rmh.rw

March 29, 2019 **Ref.: RMH/IRB/003/2019**

REVIEW APPROVAL NOTICE

Dear **TUYISHIME Aphrodis Gustave**
School of Nursing and Midwifery, CMHS
University of Rwanda

Your Research Project: **"Assessment of Nurses' Early recognition and Response to Clinically Deteriorating Children in Pediatric Ward at Two Referral Hospitals in Rwanda."**

With respect to your application for ethical approval to conduct the above stated study at Rwanda Military Hospital, I am pleased to confirm that the RMH/Institutional Review Board (IRB) has approved your study. This approval lasts for a period of **12 months** from the date of this notice, and after which, you will be required to seek another approval if the study is not yet completed.

You are welcome to seek other support or report any other study related matter to the Research office at Rwanda Military Hospital during the period of approval.

You will be required to **submit the progress report** and any major changes made in the proposal during the implementation stage. In addition, you are required to **present the results** of your study to the RMH/IRB before publication.

Sincerely,

Prof. Alex M. Buteera
Colonel
Chairperson Institutional Review Board, RMH