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Impact of the Multidisciplinary ICU Daily Goals Checklist on quality of pain management in critically ill patients at a University Teaching Hospital of Kigali/Rwanda

Dissertation submitted in partial fulfilment of the requirements for the award of Master of Medicine degree in Anaesthesiology

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DECLARATION

I declare that this dissertation is the result of my own work and has not been submitted for any other degree award at the University of Rwanda or any other institution.

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ABBREVIATIONS

ACTH: Adrenocorticotropic Hormone

AHRQ: Agency for healthcare research and quality

CHUK: Centre Hospitalier Universitaire de Kigali

DALYs: Disability Adjusted Life Years

GCS: Glasgow Coma Scale

HDU: High Dependent Unit

HRQoL: Health-related quality of life

ICU: Intensive Care Unit

IRB: Institutional Review Board

JCAHO: Joint Commission for the Accreditation of Healthcare Organizations

MIDGC: Multidisciplinary ICU Daily Goals Checklist

OPD: Outpatient department

RASS: Richmond Agitation and Sedation Scale

UR: University of Rwanda

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DEDICATION

I dedicate this work to God Might who helped me all along the work and studies.

To my wife Rebecca NYIRABUKEYE, my son KWIZERA SHAMI Layan for their perseverance.

To my father NDEKEZI Jacques for his endless love and support

To mighty God for his unmeasurable love, protection and guidance.

ABSTRACT

Background: In various resource settings, pain assessment and management modalities are often limited by the lack of adequate health care resources, knowledge, the culture and the lack of systematic approach to its management.

Aims: To investigate the impact of the Multidisciplinary ICU Daily Goals Checklist (MIDGC) on quality of pain management in ICU patients in a variable resource environment at University Teaching Hospital of Kigali, CHUK.

Methods: Data on pain assessment, management and pain intensity for 132 ICU adult patients were collected on a same hour on odd days of the week for 8 weeks before the introduction of the MIDGC at CHUK and for 135 patients after its implementation. We compared the frequency and quality of pain assessment and management between the 2 periods by using the chi-square test on Epi Info 7 software.

Results: Before the implementation of the checklist, there was no documented use of pain assessment tool whereas after its implementation, the tool was used in all but one patients (99.09%). There was also a reduction of pain scores during the post-implementation period: proportions of patients with severe pain decreased from 34.8% (47 patients) to 8.3% (11 patients), corresponding to a reduction of 26.5% [95CI:4.2%-43.4%], $p<0.0001$; that of patients with mild pain increased from 14.1% (19 patients) to 59.9% (79 patients), corresponding to an increase of 45.8% [95CI:21.1%-68.2%], $p<0.0001$.

Conclusions: The use of the MIDGC is of great importance in improving the quality of pain management among other interventions and may be used during ICU daily rounds. It has an impact on use of pain assessment scales and improves pain management among critically ill patients.

Key words: Checklist, Pain management, quality of pain, intensive care unit, Adult Non-verbal pain scale

CHAPTER I. BACKGROUND

1.1. Introduction

There is a mounting evidence that more than 70% of ICU patients experience pain at rest or during daily procedures (1,2). In many cases, this pain remains undertreated and unrecognized, partially due to ability for pain to mimic other stressors in critically ill patients and patients' inability to self-report(3,4).

Several painful procedures and interventions are performed during the ICU stay while patients are unable to report pain themselves as it is a good way of pain assessment(4,5). ICU patients are at particular risk for poor pain management because of difficulties in pain assessment and communication(6,7). Relatively little is done about pain assessment and control in these patients(8,9). From the available literature, failing to document and manage pain in ICU is common in many health facilities(9).

The adult non-verbal pain scale is a pain scaling tool with scores ranging from 0 to 10; the lowest scores indicating less pain and 10 indicating the most intense pain(7,10). It used during ICU daily rounds, aiming at pain assessment and grading for a directed pain management(11).

The Multidisciplinary ICU Daily Goals Checklist is a checklist tool used in ICU daily rounds on critically ill patients, aiming at working as a team, sharing the experience and knowledge on updated patient-care, improved communication and collaborative ways to solve problems(12,13). It improves communication and practice among health care workers, enhances patient safety and daily progress, and ensures recovery from critical illness(13,14). It has got pain management components in its entirety but no current study has revealed it can improve pain assessment and management(9).

Protocol-guided multidisciplinary rounds do not only give a room to improve guidelines implementation, but also they help to close gaps between disciplinary priorities(15,16). The use of the checklist within the ICU can help increase interdisciplinary engagement, aiding communication and collaboration(17,18). It is of critical importance when several disciplines beyond physicians and nurses are also involved in the delivery of ICU care as it aids in

prevention of further missed complications like chronic pain due to undertreated, neglected or not treated acute pain(19).

In low resource settings, ICUs are understaffed in nursing and medical professionals and the critical care training remains insufficient(20,21). Data on pain in ICU patients are generally lacking and it is the case for the University Teaching Hospital of Kigali (CHUK), Rwanda. We hypothesized that implementation of the MIDGC can improve pain assessment and management among adult critically ill patients in these settings.

I.2. Literature review:

Pain among ICU patients is very common. Critically ill patients often experience moderate-to-severe pain at rest and during interventions or procedures along their stay in ICU, though they are unable to self-report, their pain is underestimated, undertreated or even not treated at all(22,23).

Prevalence and incidence of pain in ICU:

Pain has become an enormous problem globally. It is estimated that around 20% of adult patients are diagnosed with pain worldwide and 10% among them are newly diagnosed chronic pain per year(7,24). Among those patients suffering from pain, some may suffer from acute, chronic intermittent pain or a combination of them(25). However, fewer than 2% adult patients seek medical consults for pain(26,27).

Prevalence of pain among ICU Patients is estimated around 33% at rest and 10% of them experience moderate to severe pain(28). However, earlier studies reported that around 61% of ICU patients have pain at rest and 33% experience moderate-severe pain(1,29). The procedures and interventions which are performed on ICU patients are the main causes of pain in ICU(30). Among physical impairments post-ICU discharge, chronic pain conditions can last for several years and contribute to long-standing decreases in health-related quality of life (HRQoL) in these patients(4). Within the first months post-ICU discharge, the incidence rates of new pain conditions range between 22.1% and 44%, and the prevalence rates of moderate to extreme pain conditions after critical care range between 36% and 60%(26,31).

Causes of pain in critically ill patients:

Pain among ICU patients may have different causes. Though, it is subjective in nature and multifactorial, ICU patients can't report themselves(17). Pain is experienced at rest and during daily procedures like turning positions, suctioning of the oral cavity and airways, drain removal, wound care, catheter insertion, IV lines access and bedside surgical interventions(32). Pain may be of categories depending to risk factors. there is acute pain related to ongoing diseases, intermittent pain associated with ICU procedures, persistent pain associated with invasive procedures, and chronic pain that occurred before ICU admission(33).

Non-treated pain triggers catecholamines surge, which then causes systemic vasoconstriction, impaired tissue perfusion and impaired tissue oxygenation which further aggravates pain(2). Hypermetabolic conditions in critically ill patients cause hyperglycemia, and protein breakdown resulting in impaired wound healing, increased wound infections and later on pain(15,34). Untreated pain inhibits immune cells activity, resulting into persistent pain(29,32).

Need of pain assessment and management in ICU

Mounting evidence shows that negative outcomes like longer duration of mechanical ventilation, increased length of ICU stay, increased morbidity and mortality, increased costs, post-ICU discharge pain are due to inadequate pain assessment and management among ICU patients(31).

Pain in critically ill patients may be left underestimated, undertreated or unassessed because they are unable to self-repot their pain experience (verbally or pointing at visual pain scales) (2,25). They are some physiological indicators of pain like increased heart rate and blood pressure but they are not specific to pain mainly among ICU patient who require ICU care(35). The American Society for Pain Management Nursing showed steps through which one may assess pain. These are patient's self-report of pain, use of pain scale, patient's next of kin report about patient's pain behaviors and trial of analgesia and reassessment in afterwards(8,36).

Table 1. The Adult Non-Verbal Pain Scale

	0	1	2	SCORE
Face	No particular expression or smile	Occasional grimace, tearing, flown or wrinkled forehead	Frequent grimace, tearing, frown or wrinkled forehead	
Activity (movements)	Lying quietly Normal position	Seeking attention through movement of slow cautious movements	Restless activity and/or withdrawal reflexes	
Guarding	Lying quietly No positioning of hands, over areas of body	Splinting areas of the body, tense	Rigid, stiff	
Physiology I (Vital signs)	Stable vital signs No change in past 4 hours	A change over past 4 hours in any of the following: SBP>20, HR>20, RR>10	Change over past 4 hours in any of the following: SBP>30, HR>25, RR>20	
Respiratory	Baseline RR/SpO2 Complaint with ventilator	RR>10 above baseline or 5% SpO2 decrease. Mild asynchrony with ventilator	RR>20 above baseline or 10% SpO2 decrease Severe asynchrony with ventilator	
REVISED ADULT NON-VERBAL PAIN SCALE Total score				

(**Source:** The Use of the Behavioral Pain Scale to Assess Pain in Conscious Sedated Patients *Anesthesia & Analgesia110(1):127-133, January 2010*(7).

Outcomes of pain assessment and management in ICU

Evidence showed that a well-assessed pain intensity lead to improved pain management and quality of life of patients in ICU and post-ICU discharge(14,20). Decreased length of mechanical ventilation, decreased length of ICU stay, decreased morbidity and mortality and lower costs(22,31). Some literature showed that there is no routine pain assessment in ICU patients of low resource countries in spite of reported prevalence of pain among those patients(26). Literature strongly recommends regular pain assessment at rest, before, during and after ICU daily care interventions and subsequent analgesia using pain scale tools(4,32,37).

The multidisciplinary ICU daily goals checklist:

The Multidisciplinary ICU Daily Goals Checklist is a checklist tool used in ICU daily rounds on critically ill patients(38), aiming at team-working conditions, experience and knowledge sharing in providing updated patient-care, direct communication and collaborative ways to problem-solving(9). It improves communication and practice among health care workers, enhances patient safety and daily progress, and enhances recovery from critical illness(13,39). It has got pain management components in its entirety but no current study has revealed it can improve pain assessment and management(40). Teixeira et al. revealed that implementing the quality rounds checklist in surgical intensive care Unit increased considerably rates of compliance to clinically relevant preventive measures(41).

Protocol-guided multidisciplinary rounds do not only give a room to improve guidelines implementation, but also they help to close gaps between disciplinary priorities(42). Checklists are very good tools recommended by institutions like the US-based national quality forum with the support from the Agency for healthcare research and quality (AHRQ)(3,33). The AHRQ recommends documentation of all discussed decisions grand rounds to ensure the safety and prevention of medical errors(43). The use of the checklist within the ICU can help increase interdisciplinary engagement, improving communication and collaboration(44,45). Different disciplines beyond clinicians are also involved in the delivery of care in ICU as it aids in prevention of further missed complications like chronic pain due to undertreated, neglected or not treated acute pain(25). Mounting evidence showed that daily goal checklist use in ICU help

to increase evidence-based practice and hence prevent medical errors(14). However, some literatures revealed persistence of quality gaps despite checklists implementation(46).

I.3. Rationale

A. Pain assessment and management in ICU is very important as it causes multiple life-threatening effects on critically ill patients. Pain is deleterious to patients especially those who are unable to express themselves like intubated ones. Pain management requires use of assessment tools and management checklists for multidisciplinary approach. There no documented use of pain assessment tools at CHUK.

B. There is no data available on impact of the Multidisciplinary ICU Daily Goals Checklist on pain assessment and management at CHUK/Rwanda.

I.4. Research question and hypothesis:

Question: Can the multidisciplinary ICU daily goals checklist significantly improve pain assessment and management among ICU patients at CHUK?

Hypothesis: The multidisciplinary ICU Daily Goals Checklist can have a measurable impact on pain assessment and management among critically ill patients in ICU at CHUK.

I.5. Study objectives:

I.5.1 General Objective:

i. To investigate whether the multidisciplinary ICU daily goals checklist improve pain assessment and pain management among ICU patients at CHUK.

1.5.2. Specific objectives:

- To evaluate rates of pain assessment in ICU before and after implementation of the tool at CHUK
- To assess the impact of the multidisciplinary ICU daily goals checklist implementation on pain scores among ICU patients at CHUK

CHAPTER II. METHODS

II. 1. Study design:

Prospective pre and post interventional analytical study

II. 2. Study setting:

CHUK is the main public tertiary and university teaching hospital which serves more than 120 000 outpatients per year. It is located in Kigali city and is equipped with 7 ICU beds and 4 HDU beds. They are medico-surgical ICU. The ICU and HDU serve more than 45 patients per month(47).

II. 3. Study population:

The study population include all 18+ years old patients admitted into ICU during the study period (before and after the MIDGC implementation) (May 2019 to December 2019) and who were unable to self-report being in HDU intubated.

Inclusion criteria:

All 18+ years old patients admitted into ICU during the study period (before and after the MIDGC implementation) (May 2019 to December 2019).

Exclusion criteria:

All patients with overt diseases affecting the brain (severe head injury, intracranial hemorrhage, and meningitis) with decreased level of consciousness (GCS movement <3).

Patients requiring neuromuscular blocking agents and those with a RASS < -2 were also excluded from the study.

II. 4. Sample size:

Assuming that only 40% of patients in ICU and HDU at CHUK get adequate pain management and the implementation of ICU daily goals checklist had to increase this proportion by 50%, we needed a sample size of at least 194 patients, 97 patients in pre and 97 in post implementation to detect such a difference with a power of 0.8 and an alpha error of 0.05.

II. 5. Data collection:

Pre-intervention baseline data collection: An assigned and trained research assistant collected data on the following variables: age, sex, diagnosis at ICU admission, classification as surgical or medical patients, pain score at admission, pain score during ICU/HDU stay after the MIDGC implementation, need of additional pain medicines, treatment given to the patients filling out the questionnaire. The capillary serum glucose was also taken and a *de novo* hyperglycemia with glucose > 180 mg/dl were taken as a surrogate of hormonal consequence of pain. Pain-related deconditioning complications defined as new onset of the muscle atrophy, decrease in muscle strength and impaired motor control along the ICU stay were also collected. We collected also whether there was a need for additional pain medicines defined as subsequent prescription of analgesic drugs to the preexisting ones on the daily prescription.
The research assistant had to collect data regularly at every second day of the week (Monday, Wednesday and Friday), from 10-12h00. The research assistant assessed pain using the adult non-verbal pain scale tool that was provided by the primary investigator.

Intervention: We trained about the MIDGC, its use and prompt communication among ICU staff. We did a 1-day workshop training about the MIDGC use to all ICU staff including nurses, nutritionists, residents and anesthesiologists. We evaluated the training by a post-training evaluation with a pass mark of 80% and the training was repeated for those with less than 70% until they reach the pass mark. We provided the MIDGC for each ICU bed for use during rounds with on wall-hung checklist above every bed.

Post-intervention data collection: age, sex, diagnosis at ICU admission, surgical or medical patients, pain score at admission, pain score along ICU/HDU stay, need of additional pain medicines, treatment given to the patients and the rate of de novo hyperglycemia and that of pain-related deconditioning complications were collected.

II. 6. Data entry and Statistical analysis

Data entry and analysis were done using Epi-info7 and we calculated rates of adequate pain management as proportions of those with mild pain and compared them between the two periods. Period 1: participants before the MIDGC implementation, Period 2: participants after the MIDGC implementation. We did the same comparison for proportions of patients with severe pain as a surrogate of rate of poor quality of pain management. We compared also the rates of hormonal consequence of pain between the two periods.

All comparisons were made by using the chi-square test and a $p<0.05$ was considered as statistically significant.

II. 7. Ethical considerations

Ethical issues:

- We obtained an ethical approval from the IRB of the University of Rwanda, College of Medicine and Health Sciences
- We had obtained also an ethical approval from the University Teaching Hospital of Kigali to conduct this data collection in its ICU and a waiver of the consent form as the study did not have any harm to the patients.

Data confidentiality:

The data were kept confidential with electronic password-protected documents. Hard copies will be kept for 5 years in a locked file and after this time hard copies will be discarded. Only PI has access to these data.

CHAPITER III. RESULTS

The total number of patients enrolled was 267 participants. During our study period, 9 patients were omitted due to missing data on data collection sheets. The missing data were patient's demographics, empty MIDGC side, and lack of a well-documented diagnosis. Figure 1. Shows the enrollment flowchart of participants and the final number of participants we enrolled.

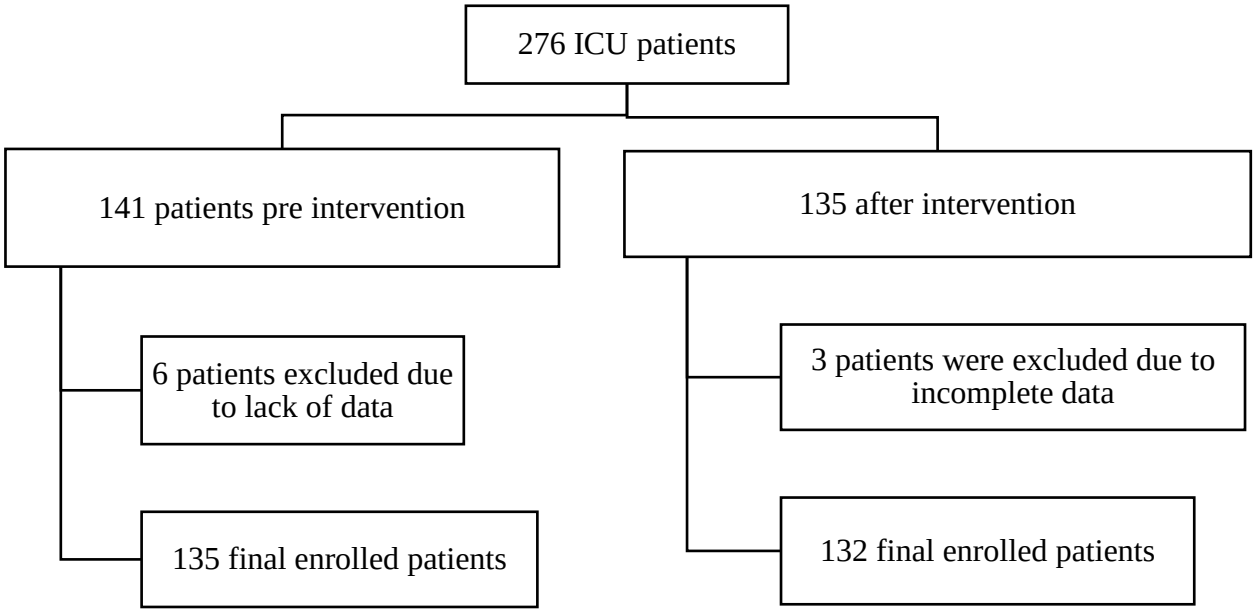

Figure 1. Patients' enrollment flowchart

We finally enrolled 267 patients. Before the MIDGC implementation, a hundred thirty-two patients were enrolled including 69 females (52.27%) and 63 male participants (47.73%) and 135 participants among them 58 females (42.96%) and 77 male participants (53.04%) after the intervention.

Both period I and period II were equally managed as per clinical needs. The daily ICU care and interventions were delivered equally to both groups. Use the same pain assessment tool and same MIDGC checklist for both groups. The assessment and data collection were done on same time interval of the day.

The mean age for patients in pre-intervention phase was 42.34 +/-16.4 years whereas in post MIDGC implementation, the mean age was 43.96 +/-18.5 years (p=0.056).

The majority (42.5%) of ICU admissions at CHUK were due to respiratory failure and mild to moderate traumatic brain injuries who undergo surgeries. On admission in the ICU, 32.26% of ICU patients (both medical and surgical patients) were coming from the operating theatre and 20.6% from Obstetrics and gynecology department and 20.22% from the accident and emergency department.

All patients' baseline characteristics did not statistically differ. The presence of Foley's catheter differs in period I from period II, probably due to the effect of subsequent pain evaluation and pain management which lead to avoiding unnecessary catheter insertion or duration as source of pain (before: 99.2% had indwelling catheters vs 87.1% post MIDGC implementation, p-value<0.001).

Table 2. Patients' baseline characteristics before and after the MIDGC implementation

Characteristics	Period 1 (n=135)	Period 2 (n=132)	p-value
Age	42.34 +/- 15.4 years	43.96 +/- 18.5 years	0.056
Gender			
Male	77 (57%)	63 (47.7%)	0.142
Female	58 (43%)	69 (52.3%)	0.142
Additional surgical needs: relook, debridement	34 (25.1%)	25 (18.9%)	0.062
Mechanical ventilation support need:			
Gastric Ulcer prophylaxis	5 (2.9%)	12 (9.1%)	0.158
Spontaneous breathing	44 (32.5%)	47 (35.5%)	0.154
Weaning mechanical ventilation	66 (48.8%)	55 (41.6%)	0.153
Mechanical ventilation need: continuous ventilation, no room to weaning process	20 (14.8%)	18 (13.6%)	0.151
Central line presence	35 (25.9%)	23 (17.4%)	0.072
Trauma patients	43 (32.1%)	38 (28.9%)	0.102

GU: Gastric Ulcers, Period 1: before MIDGC implementation, Period 2: Post MIDGC implementation

The outcomes post-MIDGC implementation comparing both groups of participants

Table 3 shows a summary of the outcomes and differences to chosen tangible causes of pain during post-MIDGC implementation. For example, the presence of the central line catheter was associated with increased pain scores during our study pre 25.9% vs 17.4% post intervention but there was no statistical significance (p-value: 0.072).

Table 3: Main outcomes of the MIDGC implementation

Outcomes	**Period 1 (n=135)**	**Period 2 (n=132)**	**p-value**	**Odds ratio**
Pain over 10 score: Mild pain: 0-2 Severe pain: 7-10	 19 (14.1%) 47 (35.6%)	 79 (59.8%) 11 (8.1%)	<0.001	17.8[7.8-40.6]
Additional pain medicine need	109 (80.7%)	41 (31.0%)	<0.001	0.9[0.5-1.6]
Adult Non-verbal pain scale use	1 (0.74%)	109 (82.5%)	<0.001	635[84.4- 4777.9]
RASS score<2 RASS Score>=2	94 (71.1%) 41 (28.9%)	124 (93.9%) 8 (6.1%)	<0.001	6.8[3.0-15.1]
Hormonal consequences: de novo hyperglycemia	90 (66.7%)	92 (69.7%)	0.602	1.2[0.7-1.9]
Deconditioning: ICU-related neuropathy, ICU-acquired weakness	91(61.4%)	58 (43.9%)	<0.001	0.4[0.2-0.6]

Our study revealed that after implementing the MIDGC tool, pain assessment and management improved. The proportion of patients with severe pain decreased from 34.8% (47 patients) to 8.3% (11 patients), corresponding to a reduction of 26.5% (95CI:4.2%-43.4%, p<0.0001). The proportion of patients with only mild pain increased from 14.1% (19 patients) to 59.9% (79 patients), corresponding to an increase of 45.8% (95CI:21.1%-68.2%, p <0.0001).

The pain assessment tool (the adult non-verbal pain score) was seldom used before the MIDGC implementation training and its use showed a tremendous increase from 0.47% to 86.3% post intervention (95CI: 4.06%-88.6%, p <0.001).

The proportion of patients who needed additional pain medicines decreased from 80.7% (109 out of 135) to 31.06% (41 out of 132); corresponding to a reduction of 61.4% [(95%CI: 39.7-87.02.7%), p <0.001)].

The proportion of patients with adequate pain management (Adult Non-Verbal Pain score<3 out of 10) increased from 19.1% (26 out of 135) to 68.9% (91 out of 132) corresponding to an increase of 68.5% [(95%CI: 60.3-76.7%], p <0.001). The implementation of the MIDGC improved the use of pain assessment tool; the study showed that there was an improvement on how often the Adult Non-verbal Pain Scale compared to pre-implementation phase. The proportion of using the Adult Non-verbal Pain Scale increased from 0.74% (before the MIDGC) to 82.5% (after the MIDGC), corresponding to an increase of 99.1% (p <0.001).

The sedation goals and the need of additional sedation medicines decreased from 24.4% (before the MIDGC) to 15.16% (post the MIDGC implementation), but not significantly (p: 0.06).

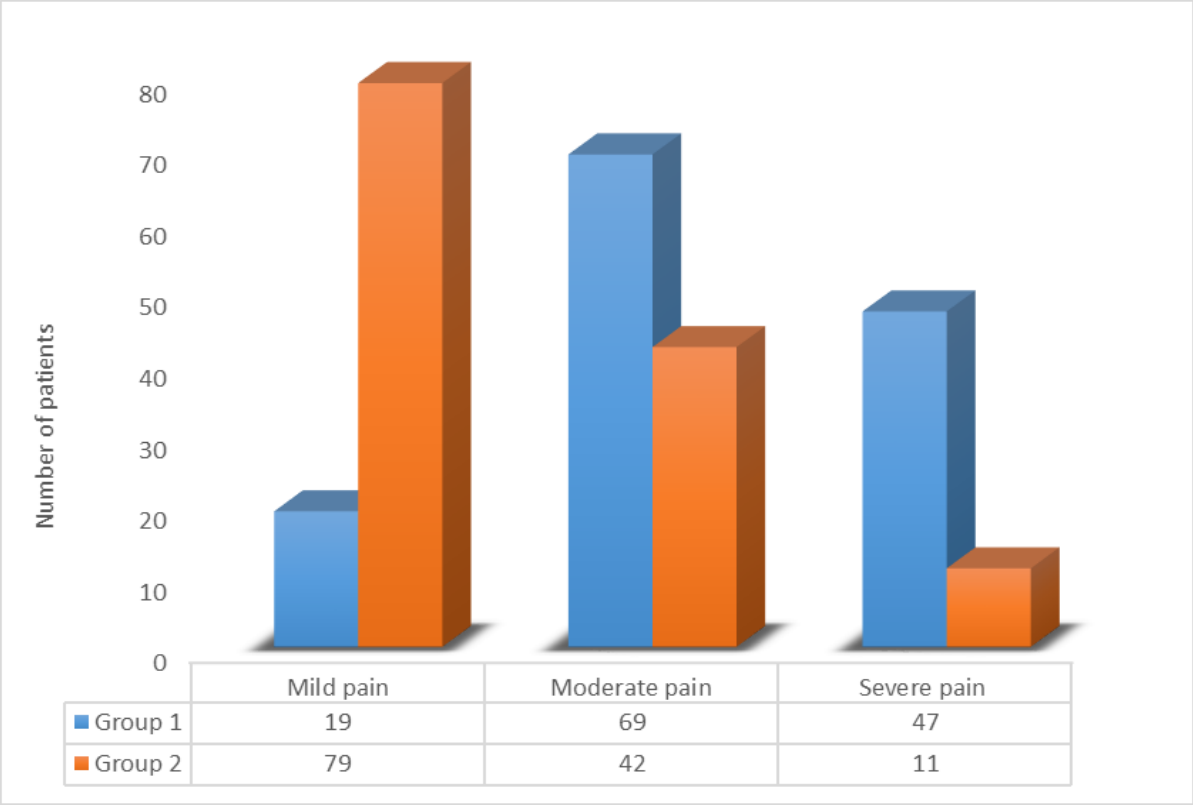

Figure 2. Pain scores after and before the MIDGC implementation

CHAPTER IV: DISCUSSION

In 2015, the World Health Organization (WHO) estimated that almost 83% of the world population live in countries with poor or no access to pain management(22,28). Up to 40–70% of critically ill patients have intense pain. Some authors reported that almost 30% of critically ill patients may have pain at rest and 50% during various nursing and medical interventions(30). Recently, a study from high resource settings reported that around 33% of critically ill patients experienced pain at rest(2). Another study showed that 61% of ICU patients experienced pain at rest and 33% among them had moderate to severe pain(31). Literature does not show a significant relation of pain severity with age and gender. However elderly age and comorbidities are more likely the most common risk factors of chronic pain(29). At CHUK, our study showed that age and gender are independent factors to pain severity before and after the MIDGC implementation.

There is evidence showing that pre-existing and underlying diseases predispose the critically ill patients to severe pain(4,48). This is associated to wounds, drains, indwelling tubes' placement like endotracheal intubation, chest tube insertion and removal and Foley catheter insertion. Daily nursing procedures like endotracheal suctioning, positioning, injections and sampling are the most common causes of pain on top of the ICU-admission clinical conditions(4). The MIDGC implementation showed the same trend with increased pain severity on patients with wounds who underwent debridement, catheter indwelling and catheter removal.

Patients discharged from ICU settings reported that an intense stress during ICU stay is due to pain experience(1,30). The ICU patients have increased risks to having chronic pain which is mainly associated with inadequately treated pain, delirium, physical dysfunction and cognitive decline(33). Critically ill patients suffer pain due to the disease process plus pain secondary to common procedures(30). Changes in positions, sucking of the oral cavity and bronchial tree, wound care, removal of drains, intravenous accesses or intubation are among procedures and interventions that potentially cause pain or discomfort in critically ill patients(4). However, the chest tube removal, wound drain removal, and arterial line insertion are the most painful procedures in ICU(4,19).

In developed countries like USA, the Joint Commission for the Accreditation of Healthcare Organizations (JCAHO) encourages standardized ways of pain assessment and management in accredited hospitals and other health care settings(15,49). Relatively little is known about assessment and management of pain in critically ill patients, mostly about risks and outcomes to poorly managed pain among those patients(17). At CHUK, there were no preliminary data on how pain is assessed and treated until after the MIDGC was implemented at CHUK. The best practice in ICU pain management requires structured approaches, such as evidence-based guidelines, protocols, and clinical checklists as evidenced by successful improvement effort in a variety of health-care settings and tools(20). However, in resource-limited settings, few studies have evaluated the effect of these tools and checklists on pain assessment and management practices(26). This supports the implementation of the MIDGC at CHUK with the intention to improve the use of evidence-based guidelines, protocols and clinical checklists.

Michael A *et al*. used a checklist tool and their intervention was successful, probably because they were targeting multiple points in the decision- making process(12). The MIDGC implementation at CHUK showed an improvement on pain assessment and pain management which explain timely decision-making. Even though pain assessment and management is difficult in sedated critically ill patients, there is a paramount need of adequate pain management by using a systematized way of approach(18). With the MIDGC implementation, we were able to significantly improve pain assessment and management for ICU patients at CHUK. The MIDGC implementation lead to an increased percentages of mild pain scores to 45.8 % compared to period 1 (before intervention) and the severe pain score rates decreased by 26.5%. Chanques *et al.* revealed that systematic evaluation of pain and agitation by nurses with rapid call to a physician in case of pain and agitation, (using the Behavioral pain scale and the Richmond agitation and sedation scale), was associated with a decreased incidence of pain and agitation and decreased duration of mechanical ventilation(49). Implementing a systematic way of pain and agitation evaluation during daily rounds helped to decrease the incidences of severe pain and agitation as reported by Davidson et al. in their study(48).
In our study, we initially had a main objective of improving pain assessment and pain treatment after implementing the MIDGC tool in ICU at CHUK. Kemp et al. revealed that as many as the

nurse's assessments documented, there were many Physician's assessments and therefore improved pain management(19). This evidence highlights for ICU staff the opportunities to improve pain assessment and treatment(10).

Kotfis et al. in their study, revealed that regular pain assessment improves the pain management and quality of life of ICU patients along the ICU and after discharge(34). Pain management in critically ill patients is pivotal on reliable and repeatable tools and checklist(12). This supports the MIDGC use as it helps check out and to make a plan addressing all patient's parameters during rounds. The pain assessment and management requires interdisciplinary approach(9,14). The interdisciplinary approach is well reflected with the MIDGC tool and it helps in pain monitoring and interventions required for its treatment. Using checklists during pain assessment and management is not new in itself. But, the MIDGC tool has never been used as a tool to boost pain management. This may be one of the strengths of our study. This design was appropriate to test the study hypothesis because it compared groups through a systematic evaluation of pain and agitation among other tools used to evaluate pain and agitation.

There are some limitations in this study. The observation rate of pain evaluation, the adult non-verbal pain score, is not the only reliable pain assessment tool used in ICU patients. The study was conducted in one single center and no preliminary data in Rwandan medical centers to compare with our findings. Therefore, the conclusion could not be generalized. Our data collection was done on fixed intervals of day time and we may have missed additional episodes of pain during other periods of the day and during the night. This study did not address the satisfaction of patients during ICU stay and their pain experience. It could have also been interesting to evaluate the impact of the MIDGC on ICU mortality and chronic pain incidence post-ICU discharge. We recommend further studies to address those issues in Rwandan health facilities.

Pain is a subjective experience and its management is complex since its perception is influenced by hormonal behavior of each individual among other many factors(10). Critically ill patients do not only suffer from ICU-acquired weakness but also physical impairment due to undertreated or underestimated pain(42,50). Post-ICU discharge pain experience reported by ICU survivors is chronic and affects the quality of life by increasing the Disability Adjusted Life Years

(DALYs)(24). The MIDGC implementation in ICU at CHUK lead to decreased deconditioning by a rate of 56.8% but we unfortunately did not evaluate the impact on physical fitness after discharge between the two periods.

There is a huge gap in patients' pain management in ICU at CHUK but a simple tool like the MIDGC can help in addressing that gap by reducing the pain scores and improving quality of pain management. The proportion of patients with mild pain (pain scores between 0-2) showed an increase of 76.4%.

CHAPTER V. CONCLUSION

Pain in critically ill patients is poorly evaluated and managed at CHUK. However, the implementation of a simple and holistic tool such as MIDGC showed that it can significantly improve pain assessment and management. Further studies are guaranteed to evaluate its impact on post-discharge pain experience for ICU patients and their satisfaction. In the absence of protocols for pain management, the study revealed that both pain assessment and management significantly improved.

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We are thankful for the unmeasurable support of the nurses and doctors of the ICU at University Teaching Hospital of Kigali and the College of Medicine and Health Sciences at University of Rwanda.

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ANNEXES

The IRB approval from university of Rwanda- CMHS:

Kigali, 13th /05/2019

Dr Jackson KWIZERA NDEKEZI
School of Medicine and Pharmacy, CMHS, UR

Approval Notice: No 205/CMHS IRB/2019

Your Project Title ***"Pain Assessment And Management Among ICU Patients At CHUK: Can A Multidisciplinary ICU Rounds Checklist Improve Pain Management?"*** has been evaluated by CMHS Institutional Review Board.

Name of Members	Institute	Involved in the decision		
		Yes	No (Reason)	
			Absent	Withdrawn the proceedi
Prof Kato J. Njunwa	UR-CMHS	X		
Prof Jean Bosco Gahutu	UR-CMHS	X		
Dr Brenda Asiimwe-Kateera	UR-CMHS	X		
Prof Ntaganira Joseph	UR-CMHS	X		
Dr Tumusiime K. David	UR-CMHS	X		
Dr Kayonga N. Egide	UR-CMHS	X		
Mr Kanyoni Maurice	UR-CMHS	X		
Prof Munyanshongore Cyprien	UR-CMHS	X		
Mrs Ruzindana Landrine	Kicukiro district		X	
Dr Gishoma Darius	UR-CMHS	X		
Dr Donatilla Mukamana	UR-CMHS	X		
Prof Kyamanywa Patrick	UR-CMHS		X	
Prof Condo Umutesi Jeannine	UR-CMHS		X	
Dr Nyirazinyoye Laetitia	UR-CMHS	X		
Dr Nkeramihigo Emmanuel	UR-CMHS		X	
Sr Maliboli Marie Josee	CHUK	X		
Dr Mudenge Charles	Centre Psycho-Social	X		

After reviewing your protocol during the IRB meeting of where quorum was met and revisions made on the advice of the CMHS IRB submitted on 10th May 2019, **Approval has been granted to your study.**
Please note that approval of the protocol and consent form is valid for **12 months.**

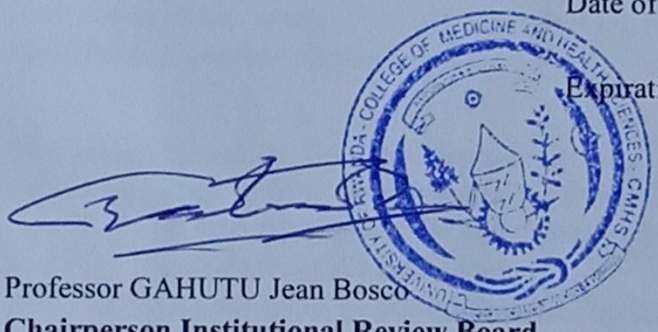
You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrolment of participants.
3. All consent forms signed by subjects should be retained on file. The IRB may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the IRB in a timely fashion and before expiry of this approval
5. Failure to submit a continuing review application will result in termination of the study
6. Notify the IRB committee once the study is finished

Sincerely,

Date of Approval: The 13th May 2019

Expiration date: The 13th May 2020



Professor GAHUTU Jean Bosco
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

The data collection tool

I am conducting a study to evaluate the impact of the Multidisciplinary ICU Daily Goals Checklist on pain assessment and management at CHUK. This questionnaire will be used to fill out the data collection sheet and provide the needed information. We will collect data from patient's files and from electronic database of CHUK, the openclinic, whereby we can miss information. This data collection sheet will help us build up a database for the research purpose but also it will help work on my research thesis in fulfillment of academic requirements at University of Rwanda. Additionally, the information provided shall help improve the quality of patient care after submitting the work and receiving peer-review. It will require your expertise level in assuring tangible information and efficient, accurate and complete data during collection.

Please answer **ALL** Questions **in both part 1 and part 2**. This is an anonymous questionnaire.

The following are the objectives of the study:

- To evaluate rates of pain assessment tools in ICU before and after implementation of the tool at CHUK
- To assess the impact of the multidisciplinary ICU daily goals checklist implementation on pain scores among ICU patients at CHUK

PART 1: **Demography:**

Answer the following questions about demography:

1. Study ID of the patient: ☐
2. Age of the patient: ☐
3. Sex of the patient: ☐ Male ☐ Female
4. Diagnosis at admission: ☐ Respiratory failure ☐ TBI ☐ Brain mass ☐ Tetanus ☐ Cerebral malaria ☐ Sepsis ☐ Polytrauma ☐ Eclampsia ☐ others ☐
5. Department from which the patient is coming: ☐ GO ☐ IM ☐ SURGERY ☐ Operating theatre ☐ GO theatre ☐ A&E
6. Date of admission in ICU: ☐

PART 2. Answer the following questions with regard to specific answers:

1. Which pain assessment tool used? **Circle the answer that apply**
   - **a)** Behavioral Pain Scale (BPS)
   - **b)** Critical Care Pain Observation Tool (CPOT)
   - **c)** Adult Non-verbal pain scale
   - **d)** None

2. What was the pain score? **Use the Adult Non-Verbal Pain Scale**
    - **a)** 0-2
    - **b)** 3-6
    - **c)** 7-10
3. Is there pain management protocol available to use? ☐ **YES** ☐ **NO**

4. Is there pain assessment tool in use? **Tick the letter that applies:** ☐ **YES** ☐ **NO**

5. Pain medicine? **Tick the answer that applies**

    a) has adequate pain medicine
    b) needs additional pain medicine

6. Sedation RASS goal: **Circle the answer that applies after writing the RASS scale**
    - **a)** ☐
    - **b)** Has adequate sedation
    - **c)** Needs additional sedation

7. Mechanical ventilation need: **Circle the answer that applies**
    - **a)** Wean mechanical ventilation
    - **b)** Spontaneous breathing
    - **c)** GI prophylaxis

8. Fluid status goal: **Circle the answer that applies**
    - **a)** Euvolemic
    - **b)** Negative fluid balance
    - **c)** Active fluid resuscitation

9. Vasopressors need: **Circle the answer that applies**
    - **a)** Need to wean off vasopressors as tolerated to MAP of 65mmHg
    - **b)** N/A

10. Central venous catheter need: **Circle the answer that applies**
    - **a)** Not present/not needed
    - **b)** Not present but needed
    - **c)** Present and needed
    - **d)** Present and not needed

11. Foley catheter: **Circle the answer that applies**
    - **a)** Not present/not needed
    - **b)** Not present but needed
    - **c)** Present and needed
    - **d)** Present and not needed

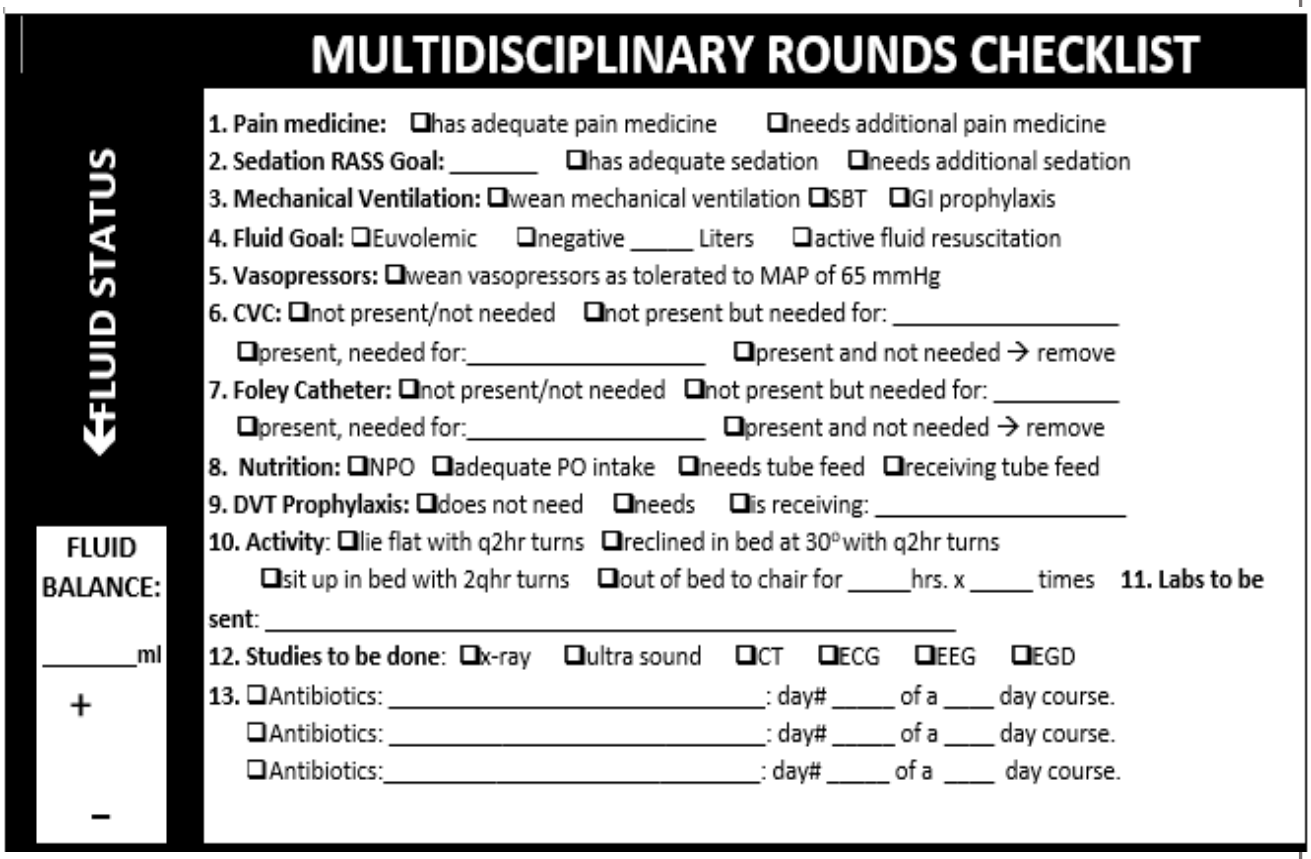
12. Nutrition status: **Circle the answer that applies**
    - **a)** NPO
    - **b)** Adequate PO intake
    - **c)** Needs tube to be fed
    - **d)** Receiving tube feed

13. DVT prophylaxis: **Circle the answer that applies**
    - a) Does not need
    - b) Needs
    - c) Is receiving

14. Activity of the patient: **Circle the answer that applies**
    - **a)** Lies flat with q 2hrs turn
    - **b)** Reclined in bed at 30 degrees with q 2hrs turn
    - **c)** Sit up in bed with q 2hrs turn
    - **d)** Out of the bed to chair

15. Antibiotics: **fill in answer that applies**
    - **a)** Antibiotic: ……..: day # …of a …. day course
    - **b)** Antibiotic: ……..: day # …of a …. day course
    - **c)** Antibiotic: ……..: day # …of a …. day course

The MIDGC



MULTIDISCIPLINARY ROUNDS CHECKLIST

FLUID STATUS

FLUID BALANCE:

_____ml

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–

1. Pain medicine: ❑has adequate pain medicine ❑needs additional pain medicine

2. Sedation RASS Goal: _____ ❑has adequate sedation ❑needs additional sedation

3. Mechanical Ventilation: ❑wean mechanical ventilation ❑SBT ❑GI prophylaxis

4. Fluid Goal: ❑Euvolemic ❑negative _____ Liters ❑active fluid resuscitation

5. Vasopressors: ❑wean vasopressors as tolerated to MAP of 65 mmHg

6. CVC: ❑not present/not needed ❑not present but needed for: _____

❑present, needed for:_____ ❑present and not needed → remove

7. Foley Catheter: ❑not present/not needed ❑not present but needed for: _____

❑present, needed for:_____ ❑present and not needed → remove

8. Nutrition: ❑NPO ❑adequate PO intake ❑needs tube feed ❑receiving tube feed

9. DVT Prophylaxis: ❑does not need ❑needs ❑is receiving: _____

10. Activity: ❑lie flat with q2hr turns ❑reclined in bed at 30° with q2hr turns

❑sit up in bed with 2qhr turns ❑out of bed to chair for _____hrs. x _____ times **11. Labs to be sent**: _____

12. Studies to be done: ❑x-ray ❑ultra sound ❑CT ❑ECG ❑EEG ❑EGD

13. ❑Antibiotics: _____: day# _____ of a ____ day course.

❑Antibiotics: _____: day# _____ of a ____ day course.

❑Antibiotics:_____: day# _____ of a ____ day course.

NURSING PROGRESS NOTES

TIME	NOTE	INITIALS

TOTAL INTAKE: ______ml

NURSES

NAME	SIGNITURE	INITIALS

PHYSICIANS

NAME	SIGNITURE	INITIALS

TOTAL OUTPUT: ________ml