



COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF HEALTH SCIENCE

**STARTING TIME DELAY IN OPERATING THEATRE AT UNIVERSITY TEACHING
HOSPITAL OF KIGALI (UTHK)**

A dissertation submitted in partial fulfillment of the requirements for Master of Hospital
and Healthcare Administration (MHA)

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DECLARATION

I hereby declare that this capstone project entitled “**Starting time delay in operating theatre at University teaching Hospital of Kigali (UTHK)**” is my own work. It has not been submitted for any degree or examination at any other learning institution. All references, have to the best of my knowledge, been correctly reported and acknowledged.

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YAMURAGIYE Assumpta

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Date

DEDICATION

This capstone dissertation is dedicated to my husband SUNDAY Francois Xavier and our daughters ABERA Laura Alleluia and MUTIMUCYEYE Lauranne Alégria whom I deprived my presence and care during my studies.

ACKNOWLEDGEMENT

I would like to express my deep gratitude to university of Rwanda to have facilitated me to undertake this program

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Finally, my gratitude are offered to all of those who supported me in one way or another during the completion of my studies and this project

ABSTRACT

Background

Operating theatre starting time as one of the aspects of theatre efficiency has been a concern at university teaching hospital of Kigali. Only 3% of first surgeries used to start punctually while all 97% were late. The objective of this study was to increase the percentage of first surgeries starting on time from 3% to 25% in six months period from September 2016 to March 2017

Methods

A pre and post intervention study design was used. A baseline assessment, details root causes analysis that identified Anesthetists and surgeons tardiness to be the main cause to start late was done then a clear policy on staff arrival time was developed and implemented. Finally an evaluation was conduct to assess the results of the intervention

Results

A significant improvement was observed, the percentage of on time start increased from 3 to 27% ($P < 0.001$), the average duration of delay per surgery decreased significantly from 86 minutes to 31 minutes ($P < 0.001$).

Conclusion

By applying the strategic problem solving model more hospital quality assurance challenges could be solved without additional cost.

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LIST OF ACRONYMS AND ABBREVIATIONS

ASA: American Society of Anesthesiologists

CHUK: Centre Hospitalier Universitaire de Kigali

CMHS: College of medicine and Health Sciences

ENT: Ear nose and Throat

IV: intravenous line

MHA: Master of hospital and health care administration

OR: Operating room

OT: Operating theatre

UTHK: University Teaching Hospital of Kigali

DEFINITION OF KEY TERMS

Delay: long waiting because of system inefficiency (1)

Strategic problem solving: a process to identify a challenge or barrier to high quality care and implement and evaluate measurable solutions to identified problem and it is a team activity.

Operating room: Operating room (OR) also called operating theatre (OT) is a place within a hospital where surgical procedures are performed in a sterile environment

Surgery: The treatment of injuries or disorders of the body by incision or manipulation especially instruments.

CHAPTER ONE: INTRODUCTION

BACKGROUND

The University Teaching Hospital of Kigali (UTHK) commonly known as Centre Hospitalier Universitaire de Kigali (CHUK) is a referral hospital located in the Centre of Kigali city, Nyarugenge District. It was established in 1918 until 1928 as health Centre and became a hospital in 1965. With the enactment law N° 41/41/2000 of 7/12/2000 on the establishment and organization of Kigali Hospital Centre it was an integral part and became a public institution with legal personality known as University teaching hospital of Kigali. It has 560 beds and serves about 1,000,000 people largely from Urban areas of Kigali (2).

The UTHK counts more than 732 hundred health workers of different categories: 56 Medical doctors and dentists, 425 nurses, 51 midwives, 100 paramedic and 100 administrative staffs (3). Among the services provided by UTHK include but not limited to; accident and emergency, surgery, internal medicine, pediatrics, obstetrics and gynecology, anesthesia and critical care, radiology, pharmacy, ophthalmology, Odonto stomatology, dermatology, ENT, laboratory, physiotherapy, social services, nursing, human resources, finances, procurement, general administration, research, ICT, technical service and nutrition(2).

The operating theatre is one of the services in the department of surgery at UTHK located in the center of the campus, next to the inpatient orthopedic and burn ward. It has six operating rooms, a preoperative area and a recovery room. There are also rooms for changing, teaching, tea, storage, cleaning and office-work. It is staffed by 3

orthopedic surgeons, 2 urologists, 1 neurosurgeon, 5 general surgeons, 3 anesthesiologists, 28 anesthesia technicians, 35 nurses, and 12 supporting staff. A large number of students from various schools are regularly rotating in operating theatre, including residents in surgery and anesthesia, interns, nurses and anesthesia technicians (2)

Various surgical operations are being performed in this unit including orthopedics, general, urology, ENT and neurosurgery. In the year 2015 the total number of operations performed was 6706, translating to 559 operations per month and 19 per day(4).

The starting time for the first surgeries was fixed at 8: 00 am except Monday, Wednesday and Friday the days that morning staff meetings were supposed to take long because case presentations usually make the meetings to stretch out and the incision time was therefore fixed at 8:30 am (2).

1.2 PROBLEM STATEMENT

There was a delay to start the first surgery in the operating room at UTHK.

At CHUK/UTHK, one of the factors that had a considerable effect on theatre delays is the delay in starting the first case of the day. Starting late has always been a challenge in OR at UTHK and the operating team including nurses, surgeons and anesthetists have agreed during the meeting with OR users that the starting time for the first surgeries should be fixed at 8: 00 am except Monday, Wednesday and Friday the only days the morning staff meetings are supposed to take long because case presentations

on the above mentioned days usually make the meetings to stretch out and the starting time have been therefore fixed at 8:30 am. (2)

Despite the agreement between the operating theatre users to start the first elective surgery at 8:00 and 8: 30 am on Monday, Wednesday and Friday, most of the first surgeries in OR at UTHK/CHUK started late between 9:30 and 10:30 am and this can be associated with subsequent delays which can affect negatively the effective use of OR as well as quality health care delivery. A baseline assessment conducted in March 2016 when starting this project revealed that only 3% of first surgeries started on time while all 97% started late with the average delay per surgery equal to 86 minutes per surgery. As a rule, the ministerial order with regard to respect of working hours stipulates that the non respect of working hours should constitute the disciplinary fault(5). Daily working hours in public service start from 7 a.m up to 5 p.m with a break of one hour running from 12 noon up to 1.p.m. working hours of every Friday starting from 3p.m to 5p.m. shall be reserved to sports activities(5). However during the observation staff used to come on time but spending much time in their way to go in operating room resulting in delay to start the operations. Besides, some of the operating team members used to come on time and attend the morning staff meetings which could take long without sound reasons as an example taking time discussing on social aspect of the staff. Again the area where staff meeting for anesthetists takes place is far from the OR which could also make staff anesthetists to take a long time to arrive in OR at the end of the morning staff meetings especially when the meetings have stretched out.

1.3 OBJECTIVE OF THE STUDY

To increase the percentage of first surgeries starting on time from 3% to 25% in six months period from September 2016 to March 2017.

1.5 JUSTIFICATION OF THE PROJECT

Operating theatre is one of hospital settings that generate income for the hospital, therefore efficient use of it is essential for hospital management and service delivery (6).

Starting time is one of the aspects of theatre efficiency therefore decreasing the starting time delay increase clients satisfaction, reduces the unplanned cancellation, work under stress, increase the capacity of the hospital to take more elective surgeries, reduce overtime associated cost, and increase the theatre productivity as well as reduction in theatre list lengths, over- run times and improve quality health care services(7). However one of the concerns in operating room at UTHK is the starting time delay that needs to be addressed. The objective of this study is to reduce the starting time delay which will improve the efficiency as well as increasing the customer satisfaction to quality health care service delivery.

1.6 ORGANIZATION OF THE DISSERTATION

This capstone dissertation is divided into six main chapters: Chapter one introduces the setting and background information related to this project. Chapter two describes the literature review on starting time delay as one of the aspect of the theatre efficiency. The third chapter describes the design of the project, a detailed root cause analysis and the selection of intervention is described. Chapter four presents the results of the implementation and the statistical significance, chapter five contains the discussion

based on the results of the project. Finally the chapter six contains conclusion and recommendations.

CHAPTER TWO: LITERATURE REVIEW

Delay to start the surgical procedures in operating room is not uncommon occurrence through the world, it is a common topic of discussion during the operating room committee meetings (8). In USA the delays in operating room are frequent. A study conducted in one tertiary hospital in southern USA revealed that 61.5% of all cases were delayed and the delay rate for the first case was 27.2% (9). Likewise, a benchmark study of 13 hospitals in Netherlands and Belgium showed that for a variety of reasons surgeries consistently started too late(7). However the length of delays is different from one hospital to another. Vaughan(10) identified the delay duration of 15 minutes per surgery in his study conducted in two Australian hospitals. There is however a clear difference from a study by Kevin(11) where the average duration of delay per surgery was 44.8 minutes to 48.6 minutes. In Australia, Vaughan(12), realized in two hospitals that not all surgeries involved delays but they were found in a number of cases. He therefore suggested to improve by preventing avoidable delays to contribute theatre efficiency(1). A study conducted at in Queen Elizabeth Barbados hospital identified only 4 % of surgeries started punctually while all 96% started late(13). Again, another study conducted in a tertiary care hospital found a proportion of 33% of on time starts and 67% that started late (14) . The difference in the percentage of on time starts varied and this could be explained by variations in terms of location and reasons for the delay. It was found in India that 43.5% of surgeries started late and 66.5 % were on time with the reasons being mainly the surgeons and anesthetists availability(15). Similarly in south Africa, a study conducted by Van(16) identified the starting time delays in operating room and the causes were mainly Surgeons related

factors. He therefore suggested the improvement to contribute to theatre efficiency, and this was in agreement with what Hartman suggested after a case study to improve the theatre efficiency (17). Despite the scarcity of literature talking about OR starting time delay in African countries, it is expected to be a problem considering the fact that even in developed countries they still experience the delays in OR. A baseline survey conducted by the researcher when starting this project in March 2016 at UTHK indicated that only 3% of surgeries started on time while 97% of cases were late for various reasons.

2.1 Operating room starting time definition

The definition of starting time varies widely in the literature, some use incision time others consider patient in OR while for others starting time is determined by anesthesia induction (15,6). In this project anesthesia induction time was considered the starting time due to the fact that at UTHK the anesthetist is the one to request for bringing in the patient when anesthesia is ready. According to a number of literatures on Hospital quality Improvement in healthcare delivery, delays can be defined as long waiting because of system inefficiency. If a case is supposed to start at 8 am but the case starts at 8:30am, this equates to a 30 minute start-time delay (1).

Starting late means a considerable waiting time for patients, staff and waste of resources (19). In a well functioning OR 90% of first surgeries should start on time to contribute to the efficiency use of the theatre room (1)

2.2 Effects of delay to start the first surgeries

A delay to start the first surgeries usually causes the subsequent delays on the theatre list. It increases the length of stay, increase the risk of hospital acquired infection, increase the total cost for health care services as well as creating the dissatisfaction, frustration and anxiety for the patient and relatives especially when a patient has fasted for a long time. The delay in starting time increases the hours that the theatre is not in use and therefore contribute to the low productivity and the decrease in income generation and timely service delivery to the clients (20). Starting late the first case of the day in OR can be one of the factors that lead to unsafe working environment and increases the risk of health care team errors, stress of staff and client as well as unplanned cancellation of patients on theatre list (21). However not all delays are associated with negative impact, for example ensuring that the patient is well prepared can take time but finally provide a best outcome for the patient(10).

2.3 Advantages of operating room starting on time

Starting on time contributes to high quality of health care services, it increases the clients satisfaction, reduces the unplanned cancellation, work under stress, increase the capacity of the hospital to take more elective surgeries, reduce overtime associated cost, prevention of health related risks among staff, increase the theatre productivity as well as reduction in theatre list lengths and over- run times (7). Despite all of these advantages, some literatures highlight that most of the time when starting punctually, the time saved is not enough to take more surgeries (17,22,23). However, even if taking more surgeries is not possible with time saved, if avoidable delays are fixed, it

could be an opportunity for staff to organize for the next day or have time to read and refresh their knowledge which is positive for any organization(24).

2.4 Causes of operating room starting time delay

A wide range of literature highlight surgeons and anesthetist availability as well as lack of patient preparation as main cause of starting time delay in OR [10, 11,12,5,13,14,15,16,8,17, 18]. However some literature groups the factors into categories such as Surgeons related factors, Anesthesia related factors and patient related factors, while others list the causes without grouping them into categories.

On top of the three causes, Edward(25) add communication gap between OR team, equipment problem, supply delay, and lack of timely OR preparation. According to Caitlin and Vaughan(13,19) In low and middle income countries the power failure as well as oxygen supply could also lead to stating time delay.

2.5 Interventions to reduce starting time delay

Different strategies have been used to reduce the starting time delay worldwide. In a study conducted in 2011, Anastasias (28) used a six sigma approach that uses the DMAIC (define, measure, improve and control) to achieve the improvement in starting time from 13% to 80% in one hospital and 7 to 83% in another hospital. Similarly, James (32) used an eight steps approach for transforming an organization to increase the percentage of first surgeries starting on time from 6 to 60% over a nine months period. However, a study conducted in a community teaching hospital revealed that a punitive approach such as loss of allocated time for Surgeons can increase the percentage of on time starting from 14 to 68% in a twelve month period (18).This is

however a challenge to clients because they don't benefit from surgery postponement as a result of Surgeons being late. A wide range of literature have demonstrated that enhancing team communication as well as developing policies on starting time are associated with a high impact to reduce the starting time delay and improving the theatre productivity (32–35). There are however no standard solution to overcome the problem of delays in OR. Strategies depend on the contextual aspect as well as identified reasons. Experiences demonstrated that daily feedback , rewarding the best staff in efficiency use of theatre and regular supervision are associated with the improvement in starting time (24,22,28,32). Despite the good impact associated with these interventions, the feasibility is relatively difficult making them to be less used than policy making and regular supervision.

CHAPTER THREE: METHODOLOGY

3.1 STUDY DESIGN

A pre and post interventional study design was used in this project. The pre intervention period involved data collection on starting time delay in operating room and the detailed root causes analysis to identify the final root causes and propose the interventions. Based on the identified root causes which was anesthetists and Surgeons coming late in OR, an intervention that was to develop the clear policy on staff arrival time was developed and implemented then the assessment was conducted to evaluate the results of the intervention.

The baseline data collection was in March 2016, the root cause analysis was done in July 2016 and the interventions were proposed in August 2016. The implementation of the new policy started September 2016. An evaluation of the post intervention phase was conducted during around three months from 22 December 2016 to 31 March 2017.

3.2 BASELINE DATA COLLECTION PROCEDURE

A retrospective data collection on starting time for the first surgeries in March 2016 using theatre log books available in each operating room was done. The actual starting time was compared to the time the operation was supposed to start which was at 8:30 am on the days that the morning staff meetings were supposed to take long and 8: 00 am for the rest of the days as agreed by all the operating theatre team. The calculation of the duration of delay was done by making a difference between actual times the operation started minus the time the operation was planned to start for all first elective surgeries during the period of the survey which was in March 2016. The average

duration of delay per surgery as well as the proportion of surgeries that started late versus started on time has been also calculated using the following formula:

Proportion of on time start = $\frac{\text{Number of first surgeries starting on time} \times 100}{\text{Total number of first surgeries}}$

Proportion of surgeries starting late = $\frac{\text{Number of first surgeries starting late} \times 100}{\text{Total number of first surgeries}}$

Magnitude of the problem

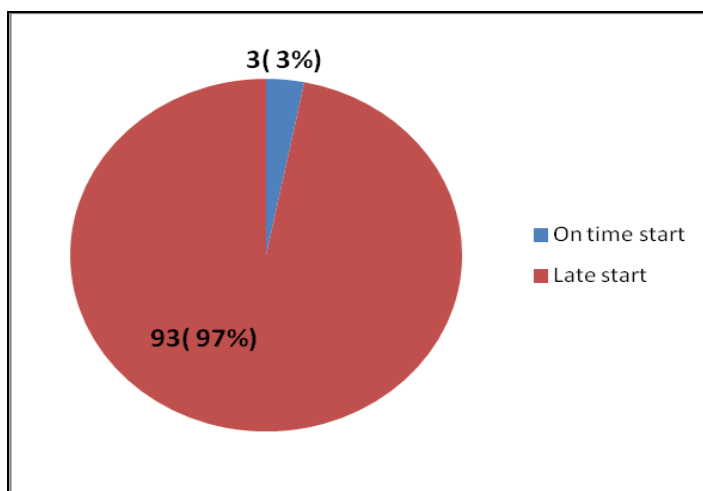


Figure 1: Proportion of first cases started on time vs cases started late in March 2016

For 96 first surgeries of the day analyzed in 23 working days in March 2016. Almost 97% of cases started late with the average duration of delay equal to 86 minutes per surgery. Only 3% of surgeries started on time during the period of audit.

3.3 ROOT CAUSE ANALYSIS

To conduct the root cause analysis a brainstorming with the operating team including Surgeons, Nurses and anesthetists during the common staff meeting was organized to identify the reasons for delay in OR from clinical staff perspective. In the brainstorming session, 58 staff participated. Among them 26 were nurses, 8 were anesthesia technicians, 1 Anesthesiologist, 19 residents doctor in anesthesia and Surgery and 6 Surgeons including the Medical director and the Head of Surgery department. (Appendix 8)

A literature search was also conducted to identify the causes of starting time delay in OR in different settings worldwide. The following root causes were proposed:

1. Surgeon coming late
2. Anesthesia coming late
3. Nurse coming late
4. Staff bringing patient late
5. Communication gap between operating team: the team does not know if the Surgeon has arrived or if anesthetist is ready. Team that could be ready, nothing missing but delay to start because of poor communication between the team members
6. Equipment problem
7. Pharmacy or supply delay (stock out or delay to get medications)

8. Lack of timely OR preparation
9. Difficulty Intravenous line (IV difficult)
10. Patient not well prepared
11. Oxygen supply problem

A wide range of literature suggest similar causes but grouping them into categories such as surgeons related factors, patient related factors, anesthesia related factors etc.

[10, 11,12,5,13,14,15,16,8,17, 18].

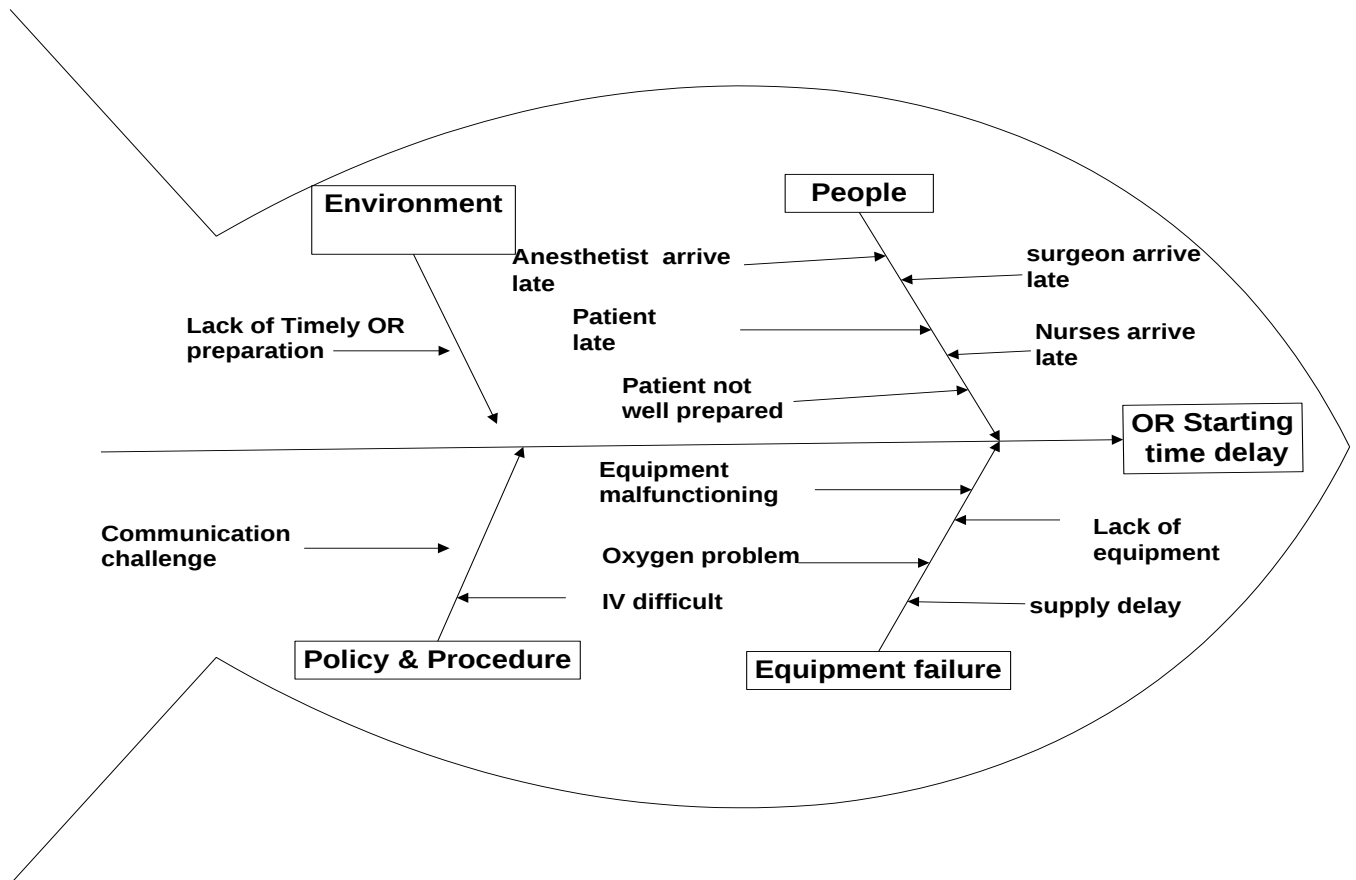


Figure 2: Fishbone diagram summarizing the possible root causes

To verify each suggested root cause, 96 first surgeries were observed prospectively during five working days from 11 July to 12 August 2016. A standardized data collection tool designed and validated by the six sigma organization was used to collect data on staff arrival time and the reason for delay whenever they did not start on time. The reason for delay was discussed and agreed upon by all operating team members including surgeons, anesthetists and nurses before filling the data collection sheet.

Data analysis was done using Microsoft Excel. Many causes of starting time delay have been identified and they affected the starting time at different proportion.

Among 96 first surgeries observed during the period to conduct the root cause analysis, 4 cases started on time while 92 cases started late.

Table 1: Causes of starting time delay identified through observation
From 11/7/2016 -12/8/2016

Causes of delay	Frequency	%	Comments
Anesthetist late	28	30	Accepted
Surgeon late	21	23	Accepted
Equipment problem	14	15	Accepted
Lack of timely OR preparation	11	12	Accepted
Intravenous line (IV) difficult	2	2	Rejected
Patient late	4	4	Rejected
Communication problem	8	9	Accepted
Oxygen problem	4	4	Rejected
Patient not well prepared	1	1	Rejected
Supply delay	0	0	Rejected
Nursing late	0	0	Rejected

Causes of starting late were very complex, however with the table above, it is clear that the first leading cause of starting late was anesthetists and surgeons coming late, lack of timely OR preparation, communication problem and equipment problem which was most of the time lack of monitoring equipment, laryngoscope and pediatric anesthesia circuit from our own observation. Nurses used to come on time and the medication

supply was on time during the time of data collection. Other causes have been rejected as their frequencies are not very high.



Figure 3: Average staff arrival time

When looking at the figure above, the average arrival in OR for anesthesia team is 8:13. It sounds almost impossible to start at 8:30 or 8:00 a situation contrary to what operating team members had agreed upon. According to ASA (31) an anesthetist need atleast 30 minutes to prepare before conducting an anesthesia induction and if he/she arrives at 8:13 it will already be late. With regard to surgeon arrival time, it is clear that they also arrived late even if they are usually supposed to come last after everything is ready. Some of the Surgeons arrived in OR around 11:00 am while in anesthesia team there is no one who come beyond 9:30 am. This make the average arrival time for surgeons to be higher than anesthesia despite the fact that the frequency in tardines was higher in anesthesia team than in in surgeons team. According to literature, a

surgeon should arrive fifteen minutes before the induction time to participate in surgical safety checklist together with the rest of the team [19, 20]. During the observation, we realized that there was no standard arrival time in OR, and therefore judging who was late was depending on who came first.

When looking at the average arrival time for nurses in OR , it is clear that they arrived earlier than the rest of the team, however during the observation it was realized that it was only one nurse that was allocated in each operating room and this can lead to lack of timely OR preparation as the nurse was having many tasks at the same time. An operating room should have a circulating and a scrubbing nurse to be efficient (38,39).

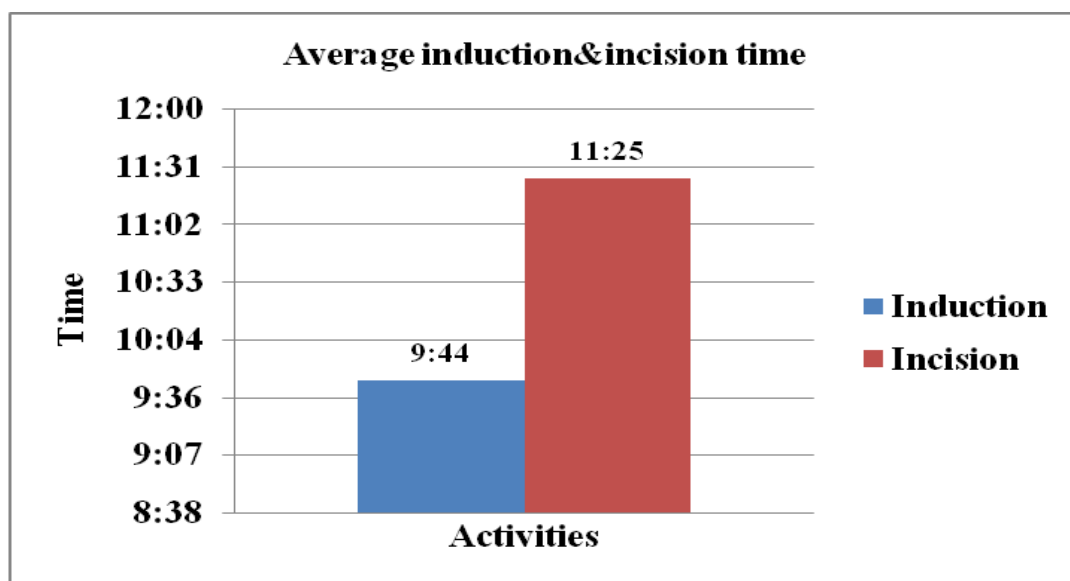


Figure 4 : Average induction and incision time

From the table above, the average induction time is at 9:44 which is far from the standard that is 8:00 or 8:30 on staff meeting days. The incision is at 11:25 this might be due to the fact that positioning or other patient preparations after anesthesia induction might take long in some surgical procedures like neurosurgeries and orthopedics which

could appear as a delay to start while it is actually not a real delay as surgeons have started the procedure before incision.

3.4 INTERVENTION

For the efficiency of OR an intervention need to be proposed to address all the identified causes of starting time delay. However, some causes such as equipment problem would have required extra resources that were beyond the intervention of this kind. However an advocacy was done and the senior management of the hospital has agreed to plan and avail the budget for buying equipments needed. It was therefore decided to address the first two root causes which were anesthetists and surgeons coming late. The following alternative solutions were proposed:

1. Develop a clear policy for staff arrival times in OR(40)
2. Hire or deploy the in charge of coordinating the beginning first cases
3. Reward the best performer (who come early)and blame the late comer (26)
4. Provide a multidisciplinary daily feedback on starting time delay(41).

After a comparative analysis (Appendix 2) that have been conducted based on four criteria including time, impact, feasibility and cost, the development and implementation of the clear of the clear policy on staff arrival time have been chosen to be implemented as a solution to reduce the starting time delay.

3.5 MEASURES

Two outcome indicators including percentage of first surgeries that started on time and average duration of delay per surgery were measured to evaluate the effect of the

intervention. The average staff arrival time in OR, average induction and incision time were also measured as process indicators. (Appendix 3)

3.6 DATA ANALYSIS PROCEDURE

All data entry as well as data analysis were done into Microsoft Office Excel 2007. The Chi square tests were used to conduct the statistical analysis of the pre and post intervention results with regard to percentage of surgeries that started on time versus surgeries that started late. The average duration of delay per surgery, average staff arrival times as well as induction and incision time were analyzed using the unpaired t test. The P-value in all indicators was set at 0.05.

3.7 ETHICAL CONSIDERATIONS

A letter from the school of health sciences requesting for authorization to conduct the quality improvement project was addressed to the director general at UTHK/ CHUK and approvals as well as the data access form were obtained from hospital ethical committee (appendix 5&6). The study did not involve the patient contact. With regard to team involved in brainstorming for the root causes, the researcher used to get the verbal informed consent as the project was involving the team work approach.

CHAPTER FOUR: RESULTS

In post intervention phase 96 first surgeries starting from 22 December 2016 to 31 March 2017 were analyzed. Starting time, proportion of on time versus late, duration of delay per surgery, induction and incision, causes of starting time delay as well as the staff arrival time were again analyzed to see the results of the intervention.

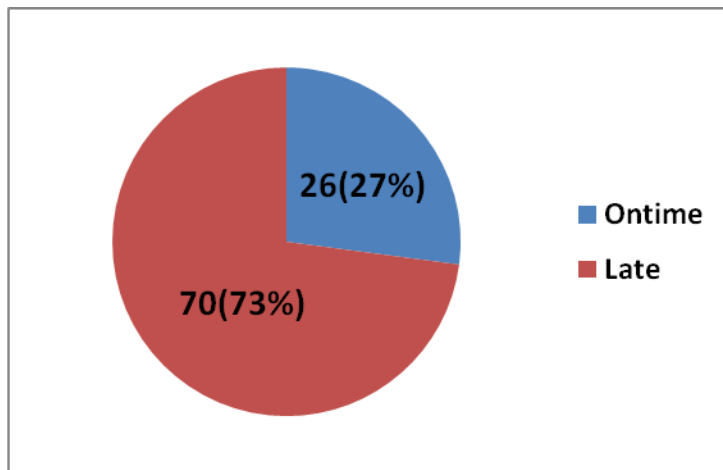


Figure 5: Proportion of starting ontime from 22 December to 31 March 2017

The figure above indicate that out of 96 surgeries observed, 26 representing 27% started on time while 70 (73%) started late and the average delay per surgery was 31 minutes.

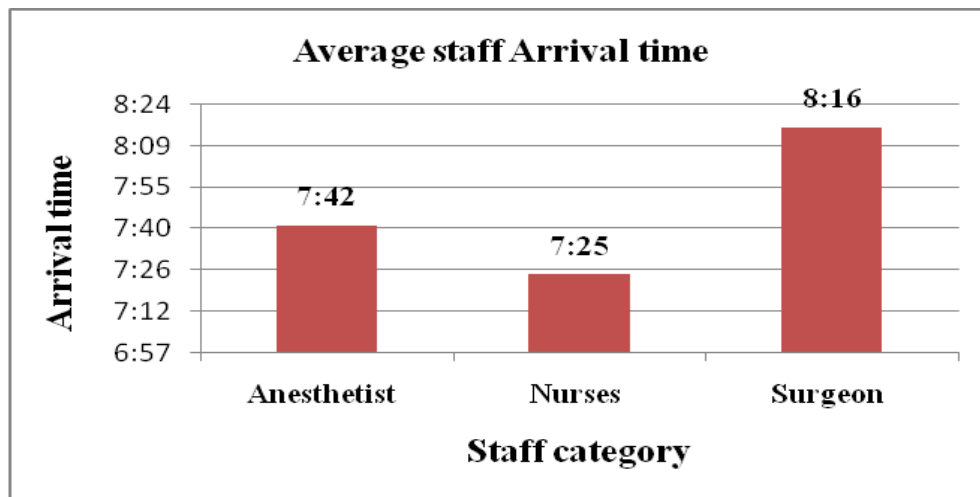


Figure 6: Average staff arrival time

From the figure above, nurses come early than the rest of the team, they arrive at 7:25, anesthetists at 7:42 and surgeons at 8:06.

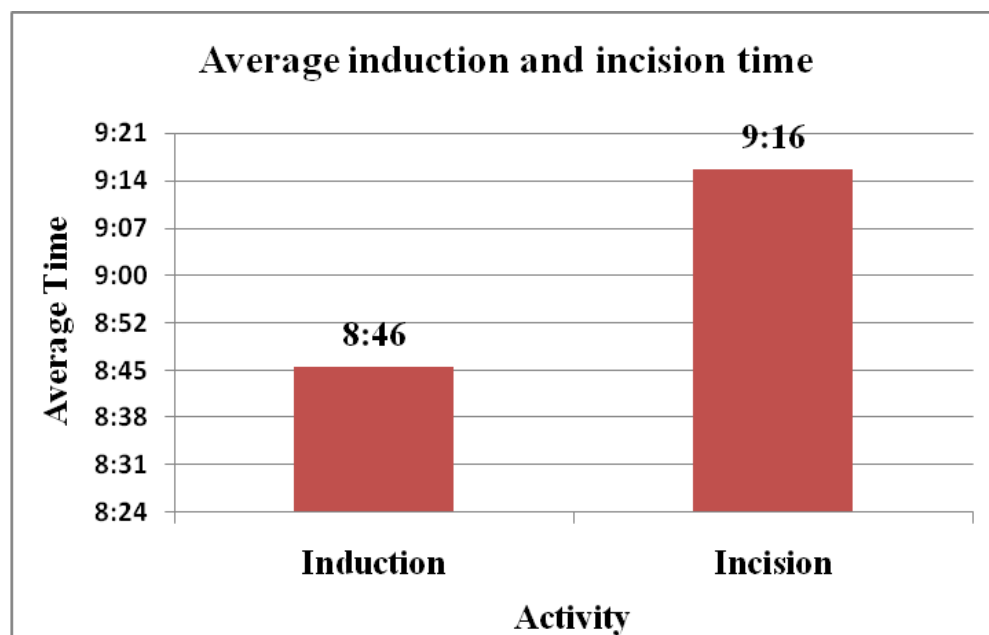


Figure 7: Average induction and incision time

The average induction time is 8:46 while according to the standard it should be at 8:15. The average incision time is 9:16

Table 2: Postintervention causes of starting time delay observed From 22 December to 31 March 2017

Causes of delay	Frequency	%
Anesthetist late	2	3
Surgeon late	23	33
Equipment problem	25	36
Lack of timely OR preparation	5	7
IV difficult	3	4
Patient late	16	23
Communication problem	0	0
Oxygen problem	0	0
Patient not well prepared	1	1
Supply delay	0	0
Nursing late	0	0

According to the table above, the frequency of tardiness for anesthetists decreased (3%). The most frequent causes of starting late are equipment problem (36%), Surgeons late (33%) and patient late (23%).

Table 3: Summary of pre and post intervention results

Indicators	Pre interventions	Post interventions	Change (in % or minutes)	P value
Sample size (N)	96	96	-	-
Percentage of surgeries Started late	97	73	24	<001
Percentage of surgeries started on time	3	27	24	<001
Average duration of delay per surgery in Minutes	86	31	55	<001
Average Anesthetists arrival time	8:13	7:42	31	<001
Average Nurses arrival time	7:57	7:25	32	<001
Average Surgeon arrival time	8:39	8:06	33	<001
Average induction time (starting time)	9:44	8:46	58	<001
Average Incision time	11:25	9:16	129	0.0636

According to this table, the percentage of surgeries that started on time increased significantly and the average delay per surgery decreased from 86 min to 31 which is very significant ($P<001$). The average staff arrival time as well as induction time have

also improved. Although not statistically significant, the incision time also improved from 11:25 to 9:16

Table 4: Causes of starting time delay pre and post intervention

	Pre intervention		Post intervention		Change	Comments
	n= 93		n= 70			
Causes of delay	Freq	%	Freq	%		
Anesthetist late	28	30	2	3	27	improved
Surgeon late	21	23	23	33	10	Not improved
Equipment problem	14	15	25	36	21	Not improved
lack of timely OR preparation	11	12	5	7	5	Improved
IV difficult	2	2	3	4	2	Not improved
Patient late	4	4	16	23	19	Not improved
Communication problem	8	9	0	0	9	Improved
oxygen problem	4	4	0	0	4	Improved
Patient not well prepared	1	1	1	1	0	No change
Supply delay	0	0	0	0	0	No change
Nursing late	0	0	0	0	0	No change

Causes of starting late such as anesthetist late, lack of timely OR preparation, communication problem and Oxygen have improved while many other causes like as

surgeons coming late, equipment problem, health care professionals bringing the patient late have not improved. For the rest of the causes there was no change in post intervention period.

CHAPTER FIVE: DISCUSSION

This project was to reduce the starting time delay in operating theatre at UTHK by increasing the percentage of surgeries starting on time addressing mainly the anesthetist and surgeons coming late in theatre as the main root cause. There are other causes contributing to the starting time delay that should also be addressed however not possible within the scope of this project. A meeting with theatre users was organized to propose the solutions to overcome the challenge of staff tardiness. It was realized that there was no policy on arrival time in OR and that was identified as a reason to be late or to sometime have the morning staff meeting that stretch out without sound reasons. It was therefore decided to develop the clear policy on staff arrival time especially for anesthetists and surgeons. With the policy in place every staff was supposed to abide by the new policy. There was also orientation on the new policy which made the head of the concerned units including nurses, anesthesia and surgeons to time keep the morning staff meeting and to sensitize the staff to go immediately in OR at the end of the meeting without wasting time in their way. It was also realized that there were some staff that used to be late while they did not even attend the meetings. Since the implementation of the new policy on arrival time in OR started, there is an observed improvement, the percentage of surgeries started on time increased from 3 to 27% whereas the late decreased from 97 to 73% ($P < 0.001$). These results are different from a study conducted at Harrisburg hospitals where starting time in OR improved from 13% to 80% in one hospital and 7 to 83% in another hospital by applying the six sigma approach(28). According to a wide range of literature, different percentages of increase in on time starting have been achieved using a range of strategies including

policy development, education, rewarding etc. The variation in strategies used could be explained by the difference in causes of the delays (9,12,18,19,22,23,25,26,29–32,42,43) . The results from this study indicate that the achievement (27%) was beyond the expectation that was to increase the on time from 3 to 25%. However it is clear that the fixed objective was even small compared to the standard that suggests at least 90% of on time start in a well organized OR(19). This could be explained by the fact that there are many causes of starting time delay that have not been addressed within the scope of this project. Again the time constraints for the intervention could be a factor to fix an achievable objective. However the project will continue and slowly by slowly the percentage of on time will increase. According to Mohinder (14),there are various reasons to start late in OR however if avoidable delays in OR can be fixed it could be an opportunity for reducing the waste of time and improve theatre efficiency as well as clients satisfaction.

Concerning the starting time, it has improved from 9:44 to 8:46 ($P < 0001$). However there is still a need improve from 8:46 and meet the standard which is 8:15. Similar improvement was observed in a study conducted in India where the starting time improved from 8:45 to 7:30(15). However the study was considering the patient in OR as the starting time situation contrary to our project where the anesthesia induction time have been considered the starting time. The average duration of delay per surgery improved significantly from 86 minutes to 31 minutes ($P < 0001$). This significant improvement was due to the awareness and regular supervision after the policy was in place. This is in agreement with other studies that have been conducted whereby anesthesia induction time and incision time improved significantly after staff training and

raising awareness(33, 22). With regard to staff arrival time, it is clear that it has improved significantly for anesthetists, nurses and Surgeons from 8:13 to 7:42, 7:57 to 7:25, and 8:39 to 8:06, respectively($P<001$). Similar improvement was achieved in Austraria and India where Surgeons used to come late and improved after policy on arrival time was fixed (22,28). According to ASA (31) an anesthetist need atleast 30 minutes to prepare before conducting an anesthesia induction and if he/she arrives at 7:45 it would be possible to start at 8:15 without delay. According to literature, a surgeon should arrive fifteen minutes before the induction time to participate in surgical safety checklist together with the rest of the team[19, 20]. It was therefore agreed that Surgeon should arrive at 8:00. However, there is still a need to improve on arrival time for Surgeons to continue the process of starting time improvement.

From the results in post intervention period, the frequency in tardiness for surgeons increased despite the fact that the arrival time improved from 8:39 to 8:06. This could be explained by their shortage observed especially in neurosurgery, urology and orthopedic specialties where Surgeons used to start by a round in wards or by administrative activities before coming in OR. Similarly, a study conducted in a teaching hospital in India found that Surgeons related factors were the most common reasons for the delays representing 32%(14). However at UTHK Surgeons after the round in the ward and having realized that nurses and anesthetist arrived early and prepare room, patients and equipment they tried to rush as they know that the rest of the team is waiting for them which have improved also their arrival time.

Even though the project focused on staff tardiness to improve the starting time, it was realized during the comparison of causes of delay after intervention that some factors

like communication gap between the operating team, timely OR preparation, lack of oxygen were no longer appearing in the data recorded. The improvement in those factors could probably due to the discussions and raising awareness on the theatre efficiency during the meeting to reduce the starting time delay. It is probably a great achievement in relation to this project.

The frequency of staff from ward bringing the patient late in OR increased from 4 to 23% and this need to be improved as the OR staff get ready and miss the patient. This is similar to the results of the study conducted by Mohinder(14) where patient related factors contributing to delay in starting the operating list represented 18%. Although it is clear from the available guideline in the OR at UTHK that the first scheduled case of the day should be in preoperative area by 6:30. Further investigations should be done to identify the reasons why the guideline is not respected.

With regard to causes of starting time delay, our results are similar to the study conducted by Janice Wong where the equipment failure represented 57.9%, surgeons and anesthetists availability 30%, patients related factors 30%(21).

The successful results of this project are due to the collaboration and support by the operating team as well as the senior management of the unit because the problem of starting time delay was a concern to the department. Different measures including regular meeting to raise the awareness and updates of the progress of the improvement were taken to accompany the implementation of the new policy. It was also decided to shorten and time keep the morning staff meetings for all operating team to respect the

punctuality in OR as sometime the morning staff meeting were taking long without sound reasons.

As suggested by literature, any behavioral change requires strong leadership as well as effective communication(31-32). However it was not easy to get the operating team for the meeting as theatre is almost always very busy. To overcome this challenge the necessary communications were done during the morning staff meetings. With regard to leadership, the senior management of the unit was very supportive toward the project. This contributed a lot to the successful results of this project. Another challenge was that initially some of the team members in OR didn't consider the project useful rather they thought that it was for accusation purpose. It was therefore necessary to use strong communication skills to convince them and explain them about the project and finally we got to have the common understanding.

In addition to challenges sometime the operating team members used to come on time but other factors made them to start late so we advocated for those factors. The approval of the policy took long due to high turnover among the members of the policy and procedures committee that made difficult for the committee to meet and forward the policy for approval. However it was agreed to start the implementation based on the minutes of the meetings and the internal memo signed by the head of the department.

Considering the fact that this project succeeded without additional cost to the hospital a lesson was learnt that some of the hospital issues might be addressed without additional cost, again the use of a team work approach as well as regular supervision are important for the quality improvement projects to be successful.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The starting time delay in OR has been a concern at UTHK , only 3% of first surgeries used to start on time while all 97% started late with the average duration of delay per surgery equal to 86 minutes. The main root cause was anesthetists and surgeons coming late. To address this problem a policy on staff arrival time has been implemented to reduce the starting time delay. However raising staff awareness on starting time delay and supervision has also been done to accompany the intervention. After implementation there was an increase in percentage of surgeries that start on time from 3 to 27% and the starting time delay was reduced as evidenced by the average delay per surgery that shifted from 86 to 31 minutes. This improvement is a result of identifying the problem and generates solutions using an eight steps strategic problem solving approach. However we acknowledge the confounding factors that could have occurred during the project. Despite the fact that there is a significant improvement there is still a need to address other factors contributing to starting time delay to be effective enough and deliver quality health care services

6.2 Recommendations

Based on the results of this project, we recommend the hospital to address other factors contributing to starting time delay in OR especially the process of getting the patient on operating table from ward, surgeons late and equipment problem. The hospital should organize the trainings on strategic problem solving for theatre users to equip them with skills which could help in identifying and find the solutions to the problem related to theatre efficiency. For the sustainability of the project we recommend a regular supervision and communication by the senior management team of the unit. Future researchers should conduct the patient satisfaction survey after OR starting time delay has improved.

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APPENDICES

Appendix1: Data collection tool

Quality Improvement project: Reducing starting time delay in OR/CHUK

First surgeries information

Day, Date, Month& year: Tuesday 18/10/2016

Room number (G1,G2,G3, O1,O2,O3)	Anesthetist arrival time in OR	Nurse arrival time in OR	Surgeon arrival time in OR	Patient arrival in OR (A)	induction Time	Incision time	Type of operation	Type of Anesthesia	Cause of delay to start
G1	8:15	7:45	8:15	8:30	8:35	9:00	General surgery	General anesthesia	Communication problem
G2	8:20	7:58	8:15	8:25	8:45	8:55	General surgery	General anesthesia	Anesthetist late

G3	7:55	7:45	8:00	8:00	8:15	8:20	General surgery	General anesthesia	Equipment problem
O1	8:30	7:55	8:20	8:30	8:40	9:00	Orthopedic surgery	Spinal anesthesia	Anesthetist late
O2	8:00	8:00	8:05	8:15	8:45	9:00	Orthopedic surgery	Spinal anesthesia	Lack of timely OR preparation
O3	8:05	7:45	9:15	8:15	9:30	10:00	neurosurgery	General anesthesia	Surgeon late

Appendix 2: comparative analysis

Alternatives Strategies	Evaluation Criteria (5=good; 1=bad)				
	Cost	Time	Impact	Feasibility	Total
Develop a clear policy for staff arrival times in OR	5	5	5	5	20
Hire the in charge of coordinating the beginning first cases	1	2	1	2	6
Reward the best performer(who come early)	2	2	3	3	10
Provide a multidisciplinary daily feedback on starting time delay	4	4	3	1	12

Appendix 3: Monitoring and evaluation plan

Outcome indicator:

Indicators	Definition	Who	Where to get information	When
Percentage of first surgeries started on time	Number of first surgeries started at 8:15	Researcher	Look at register available in each operating room	5 working days per week for a month. Start one month after implementation, monthly evaluation
Average duration of delay per surgery	Total duration of delay	Researcher	Look at register available in each operating room	5 working days per week for a month. Starting from one month after the implementation

Process indicators:

Indicators	Definition	Who	Where to get information	When
Average staff arrival time in OR	All staff arrival time divided by the total number of staff	Researcher	Look at register available in each operating room	5 working days per week for a month. Start one month after implementation, monthly evaluation
Average Induction time	induction times	Researcher	Look at register available in each operating room	5 working days per week for a month. Starting from one month after the implementation
Average incision time	Incision time	researcher	Look at register available in each operating room	5 working days per week for a month. Starting from one month after the implementation

Appendix 4: Letter to request for hospital attachment



COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF HEALTH SCIENCES

Kigali, May, 25th 2016

N° 180/UR-CMHS-SHS/16

To: The Director General of KUTH/CHUK

Dear Sir,

Re: Request for hospital attachment for Assumpta YAMURAGIYE

Assumpta YAMURAGIYE is a University of Rwanda Academic staff, in the College of Medicine and Health Sciences, School of Health Sciences, Department of Anesthesia. She is pursuing a Master of Hospital and HealthCare Administration (MHIA). It is a requirement for her to conduct a hospital Quality Improvement Project of 2 years (Academic year 2016-2017 and 2017-2018). Since we have had a close partnership and strong collaborative partnership, we thought it imperative to kindly request you to host our staff during the two years program. In addition, MHIA Quality Improvement Projects runs throughout the life of the hospital, Assumpta will follow-up the project at the hospital to ensure that the intended QI objective is achieved not just for MHA Degree requirement. The title of the project is **"Reducing delay in starting time in Operating Theatre at CHUK"**. She will need to work with operating team in the period of Hospital attachment 1, 2, 3 that runs for 2 years beginning June, 2016.

Thank you for your continued cooperation and understanding in this regard.

Yours sincerely,

Dr. TUMUSHIME K. David (PhD)

Dean, School of Health Sciences, UR-CMHS

Cc:

- Principal, UR-CMHS.
- Coordinator MHIA program, UR-CMHS

Appendix 5: Ethical approval



CENTRE HOSPITALIER UNIVERSITAIRE UNIVERSITY TEACHING HOSPITAL

Ethics Committee / Comité d'éthique

July 11, 2016

Ref: EC/CHUK/121/2016

Review Approval Notice

Dear Yamuragiye Assumpta,

Your research project: *"Reducing delay in starting timing in operating theatre at CHUK."*

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 11/07/2016 to evaluate your protocol of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your protocol.

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,



Dr Stephen Rulisa
The President, Ethics Committee,
University Teaching Hospital of Kigali

"The 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

Appendix 6: Data access form



CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

Department of Clinical Research CHUK

Details of the researcher:

Date: 11/3/2016

Name: Yammarasingh
First name: A. S. S. S. S. S.
Occupation:
Department/ Institution:
Telephone number:
Email:

Data Access Form

Please authorize Mr/Mrs/Dr/Prof. Yammarasingh A. S. S. S. S.
conducting a study entitled Reducing delay in starting
lining in operating theatre at CHUK.
to collect data from Theatre and Archives

N.B: You are requested to present your results to Research Department after your study.

Faithfully,


DR. STEPHEN RULISA
HEAD, DEPARTMENT OF CLINICAL
RESEARCH
CHUK

Head of Department of Clinical Research

Appendix 7: Implementation plan: GANTT CHART

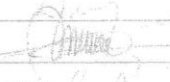
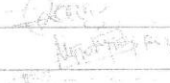
Task	Responsible	Aug 2016	Sep 2016	Oct 2017	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017	Apr 2017
Book for meeting venue and invite theatre users for a meeting	HOD of surgery									
Discuss and agree on staff arrival time in OR	All participants									
Develop the arrival time policy	Researcher and QI Team									
Approve the policy	Director general									
Orientation of Theatre users on the policy	Researcher									

Avail registers where to record the arrival times for monitoring purpose	Matron									
Record staff arrival time	QI team									
Data analysis on starting time delay	Researcher									
Share the results with all team	HOD of surgery									

Appendix8: Attendance list in brainstorming meeting

Brainstorming meeting: Cause of starting time delay in OR
Attendance list

31/7/2016

NAMES	SERVICE	TEL	SIGNATURE
1. Eguile ABAHUE	SURGERY	0788660562	
2. Eneasi Felix	Surgery	0783850362	
3. Nwagwu Benjamin	Surgery	0788831241	
4. Simon J. Nwagwu	Anesthesia	0788777002	
5. Nwagwu Violette	Theater	0788857557	
6. A. Nwagwu Violette	Theater	0788799036	
7. Eneasi Felix	Theater	0788626947	
8. KANSAWANA Francis	ENT	0788490073	
9. Nwagwu Benjamin	Theater	0788567886	
10. Umuonodi Dyna	Anesthesia	0788555546	
11. Brigitte Nwagwu	ENT	0788562087	
12. Emmanuel MUAWEINAWA	Surgery	0788498596	
13. Umuonodi Dyna	Surgery	0788682863	
14. Jc Allen Nwagwu	Surgery	0788599975	
15. Antoine Nwagwu	Surgery	0788048377	
16. Jennifer Rickard	Surgery	0789175071	
17. Nwagwu A Isaac	ENT	0788416385	

Brainstorming meeting: Cause of starting time delay in OR

37/7/2016

[illegible]

Brainstorming meeting Causes of starting time delay in OR

31/7/2016

ATTENDANCE REGISTER

MUKOZAFURA RENE	Orthopaedic Resident	0788875735	
John BUSHA John	Gen Surg Res	0798523412	
Munyanza Martin	Gen Surg Res	0783087920	
ROBERTA EMMANUEL	Physio	028383646	
CITADEL Simon	ENT Resident	0788886230	
Donella Nyiragweya	Nurse	0788482828	
Lera Nyiragweya	Nurse	0788837460	
SASARIA Edward	ENT Res	0781621357	
UMUTONI John	ENT Resident	0788684181	
ELVIS BIRINDIHO	Gen Surg Res	079877570	
TAYLOR HAYHAY	Gen Surg Res	0789971578	
YI BIRINDIHO	Gen Surg Res	0785727358	
Kansola M. Grace	Gen Surg Resident	0788505741	
Ariane HIRWA	Gen Surg Resident	0788923652	
IRABWA A. In	Gen Surg Resident	0784000115	

Brainstorming meeting
Cause of starting time delay 31/7/2016

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Appendix 9 internal memo on staff arrival time



CENTRE HOSPITALIER UNIVERSITAIRE UNIVERSITY TEACHING HOSPITAL

Department of Surgery

Kigali, 16th September 2016

INTERNAL MEMO: OPERATING THEATRE STAFF ARRIVAL TIME

PURPOSE: TO REDUCE THE STARTING TIME DELAY

1. For elective procedures, Surgeons are requested to be present in OR at 8:00 am and submit their theatre list to OR manager at least 24 hours before
2. Anesthesia providers are requested to be present in their respective OR at 7:45 am every day while nurses' arrival time in OR is 7:30 am
3. For all working days, starting time is fixed at 8:15 for all first electives surgeries
4. For the first cases on the schedule, patients coming from hospitalization wards must be in pre operative area at 7:00am
5. The first patients on the surgery schedule must enter the OR by 6:50 am

Dr NTIRENGANYA Faustin

Head of Surgery Department

Dr NTIRENGANYA Faustin
CHIRURGIEN
CHU-CHU
CHU-CHU