

STUDY OF QUALITY INDICATORS IN OPERATION THEATRE AT THE MISSION HOSPITAL, DURGAPUR

Dissertation Submitted to



The IIHMR University, Jaipur

for the partial fulfillment for the award of the degree of

Masters of Business Administration (MBA)

in

Hospital and Health Management

by

Ms. Sukanya Tewari

Under the Supervision and Guidance of

Dr. Arindam Das

Professor and Dean Researcher, IIHMR University

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled ‘Study of Quality Indicators in operation theatre at The Mission Hospital, Durgapur’ is the bonafide record of my original researchwork. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

(Signature)

Ms. Sukanya Tewari

Date:

COMPLETION CERTIFICATE



Ref: TMH/HRD/Per.F/May-23/120

Date-31.05.2023

TO WHOM IT MAY CONCERN

This is to certify that **Ms. Sukanya Tewari** student of **M.B.A in Hospital & Healthcare Management** at **IIHMR University, Jaipur**, has undergone **Dissertation Program** in the department of **Quality Assurance** at **The Mission Hospital, Durgapur** from **01.03.2023** to **31.05.2023**. Her topic for Dissertation was **"Study of Quality Indicators of Operation Theatre"**.

During the period of dissertation she has been found sincere.

We wish her all the very best for her future endeavors.

For The Mission Hospital, Durgapur


Ramesh Lall
President- HR & Admin.

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President (HR & ADMIN)
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CERTIFICATE

This is to certify that dissertation titled ‘Study of Quality Indicators in operation theatre at The Mission Hospital, Durgapur’ is a record of the research work undertaken by Sukanya Tewari in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management Jaipur) under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide
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Date

Date

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ABSTRACT

Background

The broad aim of this study is to analyze Quality Indicators of Operation Theatre with its utilization and to identify the gaps.

Methodology

The study area was The Mission Hospital, Durgapur. Study was done from 1st March to 30th April, 2023. The data was collected from 1st January 2023 to 30th April, 2023. The sample size from January to April is 2953. The sampling technique used is Non-probability convenient sampling.

The study type was cross-sectional descriptive study. The data collected during January & February are retrospective study whereas the data from March & April are Prospective study. The study covered 5 areas: Cardiac OT, Neuro OT, Ortho OT, General OT, Major OT (Gynae surgery).

Main outcome measures were Utilization of each Operation Theatres, OT Quality Indicators which includes scheduling related, safety related as well as anesthesia related indicators.

Results

The average percentage utilization of Cardiac OT 1 & 2 , Neuro OT, General OT 3 & 4 , Ortho OT 1 & 2, Major OT (Gynae surgery) are 90.84%, 79%, 58.75%, 65%, 74.64%, 72.93%, 53.66% and 70.72% respectively. The average percentage of all the quality indicators of operation theatre are calculated. The summarization of Indicators from **January to April, 2023** have been calculated in this report. Average % of Rescheduling of surgeries is **2.57%** (due to the billing clearance which was not done, due to previously prolonged surgery and medically unfit patients for surgery). Average % of Re-exploration cases is **0.94%** (due to post operative bleeding in the patient). Average % of Unplanned return to OT is **0.17%** (due to due to sternal re-wiring or redo cases, or any case reoperated due to surgical site infections). Average % of planned surgery changed intraoperatively is **0.10%** (due to due unexpected patient's anatomy). Average % of Modification of anaesthesia is **0.14%** from January to April is mainly due to due to various surgical complications. Average % of adverse anaesthesia event due to anaesthesia is **0.38%** (due to

vomiting, nausea, high blood pressure, bronchospasm etc). Average % of Unplanned ventilation following anaesthesia is **0.03%** (due to surgical complications of patients such as bleeding). Average % of wrong patient , wrong surgery, and wrong site & anaesthesia related Mortality is **0.00%**. Average % of cases which starts **WITHIN** 30 mins is **37.67%**. Average % of cases which starts **PRIOR** 30 mins is **15.63%**. Average % of cases which are **DELAYED** after 30 mins is **46.53%**.

Conclusion

Effective scheduling of OT (Operation Theatres) can be attained through synergistic interaction among the OT personnel & the process of benchmarking the indicators thus facilitating optimal utilization.

Key words: Operation Theatre Utilization, Quality Indicators, Anesthesia.

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My sincere thanks to my mentor Dr. Arindam Das for his support throughout the project. I will strive to use the gained skills and knowledge on the best possible way throughout the journey.

Lastly I would appreciate all the researchers, scholars & authors whose work I have referred and cited in this report.

Sincerely,

Sukanya Tewari

(MBA-HM, 1420)

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ABBREVIATIONS

OT - Operation Theatre

ICU - Intensive Care Unit

PACU - Post Anesthesia Care Unit

CSSD - Central Sterile Supply Department

CABG - Coronary Artery Bypass Grafting

ENT- Ear Nose Throat

HMIS – Hospital Management Information System

DAMA – Discharge Against Medical Advice

UTI – Urinary Tract Infection

TSH – Thyroid Stimulating Hormone

INR – International Normalized Ratio / prothrombin time

BP – Blood Pressure

CHAPTER 1: INTRODUCTION

For hospitals, the complex of operation theatres (OT) represents a considerable financial commitment. To achieve cost effectiveness, it must be used to the fullest extent possible. In reality, as OT accounts for 50% to 60% of all hospital revenue, it is frequently regarded as the hospital's principal revenue-generating department. Additionally, downstream units like ICUs and general wards are directly impacted by what happens in the OT department. In order to attain a high level of utilization in the OT, effective coordination of diverse activities and individuals is essential (Vinukondaiah K et al., 2000).

It is concerning when scheduled procedures are postponed at the last minute, even when this occurs the morning of the procedure. Such last-minute cancellations considerably increase the inefficiency of operating room time utilisation and lead to needless resource waste.

Utilization is a simple and adequate indicator for determining a theater's effectiveness because longer usage durations improve the possibilities for income generation. According to Donham RT et al. (1996), OT utilization is calculated as the ratio of the actual hours of OT time utilized during elective resource hours to the total number of elective resource hours available.

The many types of zones in OT are:

- **Outer zones**, which include the waiting area, administration area, conference room, and patient holding area.
- **Restricted or Clean Zone**: This area comprises the locker rooms, nurse's rooms, anesthesiologist rooms, recovery rooms, clean hallways, and storage areas.
- **Intermediate zone**: this area contains the operating room, supplies, and patient delivery. additionally has numerous CSSD and autoclave supplies.
- **Aseptic zone**: consists of a scrub area, an induction area, a packaging area for instruments, and a sterilization area.
- The **disposal zone**, where biohazardous waste is disposed of and equipment is cleansed.

Operative procedures are divided into few categories:

- Major & Minor,
- Emergency & Elective,
- Ambulatory or Day-care.

According to a study by Ozkarahan I. et al. (2000), block-booking is a widespread scheduling method used by hospitals. According to a regular schedule, frequently on a weekly or monthly basis, this approach reserves specified blocks of uninterrupted operating room (OR) time for individual surgeons or surgical specialties. Only if the surgery can be finished in the allotted time are surgeons permitted to schedule cases during their designated block time. As an alternative, nonblocked or open-booking is another

scheduling strategy used by some hospitals. In these systems, surgeons submit requests for operating room time, and surgeries are scheduled on a first-come, first-served basis up until the predetermined OR capacity (planned available time), which is reached when either a maximum number of patients is reached or the predetermined OR capacity is reached.

In a research by Houdenhoven et al. (2007), the relationship between the patient mix and the hospital's willingness to accommodate overtime and the desired utilisation of operating theatres (OT) in a hospital is shown using simple statistical analysis.

There are 8 objective metrics that should be considered and monitored:

- Excess staffing costs
- Start-time tardiness (average delay in start times for elective cases per OR per day)
- Case cancellation rate
- Post anaesthesia care unit (PACU) admission delays
- Contribution margin (average revenue generated per hour of OT time)
- Turnover times (average time required for setup and clean up between cases)
- Prediction bias (deviation in estimated case durations per 8 hours of OT time)
- Prolonged turnovers (percentage of turnovers taking more than 60 minutes)

These metrics provide valuable indicators for assessing and optimizing the efficiency of the OT operations.

An operation that was initially scheduled on the final theatre list for the intended day of surgery but was either added to the list later and not conducted on that day was classified as a cancellation occurring on the intended day of surgery.

There were two categories of cancellations:

- Potentially avoidable cancellations, which included instances in which there was no theatre time available, no postoperative bed, list mistakes, administrative causes, equipment or transport issues, communication issues, patients weren't ready, or surgeons weren't available.

- Cancellations that were unavoidable, which included situations where the patient initiated the cancellation owing to a change in the patient's clinical state, emergency priorities, unprepared patients, or surgeon availability.

According to the study by Kindscher J et al. (2009), raw utilisation was estimated by dividing the entire amount of time patients spent in the operating room (in minutes) by the amount of time resources were available. It shows the proportion of the total number of elective cases that were handled in the operating room time.

It was calculated in percent (%) as:

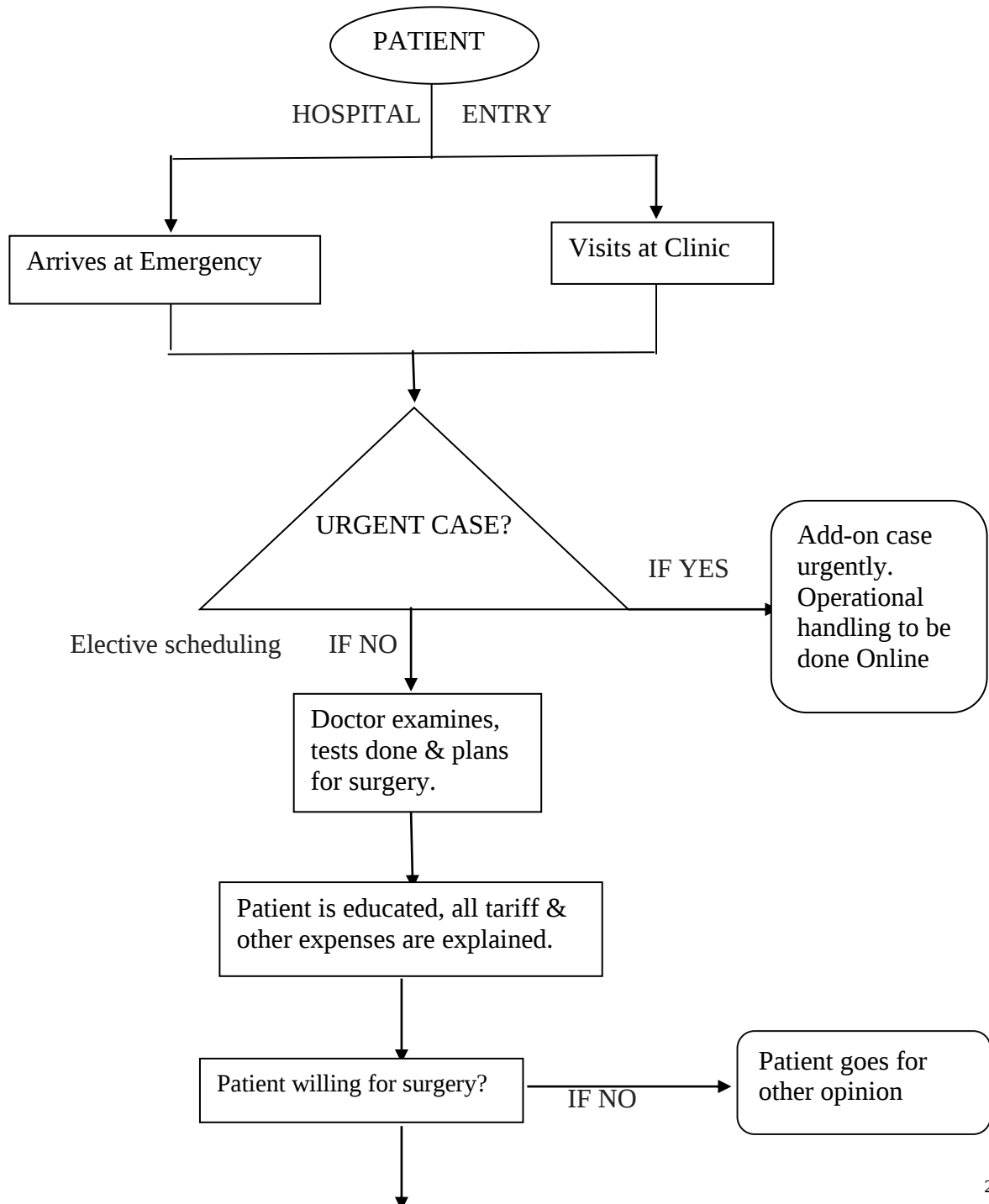
Total hours of cases performed ÷ total hours of OT time allocated × 100

The percentage of resource hours spent on a particular activity was calculated as:

Mean time per day (min) for that activity on OT table / Resource hours per day * 100

The room turnover time was applicable only when a second case was scheduled and operated to immediately follow the first case on a particular OT table. Hence, “n” (i.e., number of days) for calculating mean time.

1.1 PROCESS FLOW



IF YES

OT is booked in advanced with the intimation of OT Coordinator including patient details & time. Finally patient is intimated before the day of surgery

On the day of surgery, the OT Coordinator calls the ward to shift the patient from ward to Pre-operative holding area

Patient is handed over to the pre op Nurse 15 mins prior to surgery. All details are checked by the Nursing staff

Patient is handed over to the OT Nurse & OT technician just before surgery. All details are checked by the Nursing staff & technicians.

Patient is taken for surgery

Once surgery is done, patient is shifted to Recovery for 1-2 hours

Patient is advised to shift in IP Area and checked at regular intervals

Patient recovers & discharged. Discharge summary is handed over to the patient

1.2 AIMS AND OBJECTIVES

Aim:

The broad aim is to study and analyze quality indicators of the Operation Theatre and to identify the gaps (if any).

Objectives:

1. To examine the utilization of OT.
2. To identify the reasons for rescheduling of surgeries
3. To identify the proportion of planned and unplanned surgeries.

CHAPTER 2: REVIEW OF LITERATURE

AUTHOR (YEAR)	STUDY LOCATION	SAMPLE SIZE & SAMPLING TECHNIQUE	DESCRIPTION (salient features)
Vinukondaiah K, Ananthakrishnan N, Ravishankar M.(2000)	Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry.	In OT, 1773 cases operated for 279 functional days Prospective study (12 months)	The overall utilization rate of operating time reached 91.5%. Among the 310 cases that were cancelled, 65.2% were due to insufficient operating time, 13.9% were emergency surgeries scheduled during elective sessions, and 11.3% were attributed to patients' lack of fitness. 43.6% of cases experienced delays, while 63.6% were completed ahead of the scheduled closing time. The primary factors contributing to inefficiency in the operating theater include delays in starting surgical lists, under-scheduling, interruptions caused by emergency surgeries, administrative issues, anesthesia induction, and

			recovery policies.
Tyler DC, Pasquariello CA, Chen CH.(2003)	The ORs of the Children's Hospital of Philadelphia.	All cases of adenoidectomy with or without tonsillectomy (T&A) for the period January 1 to June 30 1999 were collected. Retrospective study (6 months)	The ideal utilization range for an operation theatre is between 85% and 90%, taking into account the variability in the duration of different cases. To assess the economic efficiency of an operating room suite, both underutilization and overutilization can be taken into consideration.
Schofield WN, Rubin GL, Piza M, Lai YY, Sindhusake D, Fearnside MR, Klineberg PL. (2005).	Major metropolitan tertiary hospital, Australia.	Prospective survey from 13 May to 15 November 2002 (6 months). Out of 7913 cases, 941 were cancelled. 724 out of 5472 elective procedures on working weekdays.	A significant portion of cancellations, accounting for 60%, had the potential to be avoided. The primary reasons for these cancellations included cases with previously prolonged surgeries (18.7%), unavailability of postoperative beds (18.1%), cancellations initiated by the patients themselves (17.5%), and changes in the patients' clinical status (17.1%).

			An additional 21% of cancellations were attributed to various procedural reasons, such as patients not being ready, lack of available surgeons, errors in scheduling, administrative issues, and failures in communication.
Dacey LJ, Munoz JJ, Baribeau YR, Johnson ER, Lahey SJ, Leavitt BJ, Quinn RD, Nugent WC, Birkmeyer JD, O'Connor GT (1998).	5 centers performing cardiac surgery in Maine, New Hampshire, and Vermont.	Regional cohort study. Patient characteristics, treatment variables, and outcome measures were collected prospectively. Total 8586 CABG cases, 305 patients underwent re-exploration for bleeding.	Primary assessment criteria: Reoperation due to postoperative hemorrhage, mortality during the hospital stay, and duration of hospitalization.
Nadakarni M, Prakruthi D.(2015)	Raja Rajeswari Medical College and Hospital. It is a 1,000-bedded, urban, tertiary care, medical college and hospital located in Bengaluru,	Retrospective study (11 months). Total 4147 patients were considered.	The rate of anesthesia plan modifications was 13.72%. Unplanned ventilation occurrences after anesthesia amounted to 9.11%. Adverse events related to anesthesia, such as

	Karnataka.		delayed recovery of consciousness in 25.9% of cases and low blood pressure in 18.27% of cases. There were no instances of anesthesia-related mortality reported in this study.
Lakshmi Bhaskar N, Satish Kumar SN. (2015).	Nizam's Institute of Medical Sciences(NIMS), Hyderabad, India.	Retrospective study (11 months). July 2010 to June 2011. Out of 8201 cases, 7481 were Elective & 720 were Emergency Surgeries.	The utilization rate of operating theater complexes was 72.51%, which was considered optimal. The majority of the allocated time was utilized for scheduled elective surgeries, while unscheduled hours were dedicated to emergency surgeries.
Naik SV, Dhulkhed VK, Shinde RH. (2018).	1000 bedded tertiary care teaching hospital in rural Maharashtra.	Prospective study (2 months). November 2017 to December 2017. Total time (in mins) taken for procedures in ENT were 490, ortho were 478.33, general & oncosurgery were- 305,295 & 289	The reasons for delays included late transfer of patients from the ward, administrative issues such as unprepared instruments or non-functional OT lights, patients' medical conditions, and late arrival of surgeons.

		respectively.	
Adrian Liao, Ph.D., Jeana E. Havidich, M.D., Richard P. Dutton (2014).	NACOR data	Retrospective observational study included 3,220,032 cases reporting the presence or absence of adverse events (2010 to 2013).	The overall rate of adverse events saw a decline from 11.8% in 2010 to 4.8% in 2013. The most frequently observed minor complication was postoperative nausea and vomiting, accounting for 35.53% of cases, while medication errors constituted the most common major complication at 11.71%.
Birkmeyer JD, Hamby LS, Birkmeyer CM, Decker MV, Karon NM, Dow RW (2001).	General surgery section at Dartmouth-Hitchcock Medical Center in Lebanon, NH,	Prospective cohort study at a rural tertiary care center between (September 1998 to March1998). 3044 patients were considered, 107 was unplanned return to OT.	Unplanned returns to the operating room, mortality rates, and hospital charges serve as the primary outcome measures. The reasons for reoperation included anastomosis-related issues (18% of cases) and wound complications (23% of cases).
Velting S, Ahire N (2022).	750 bedded Multispeciality Hospital in	prospective study between 1st May 2019 to 15th May 2019.	The cumulative operating room utilization time for the study period amounted to 1820 hours.

	Mumbai, India	726 operated cases were considered.	Within the entire 5th floor operating theater complex, only 655 hours were actually utilized out of the available 1820 hours during the study period. This resulted in a utilization rate of only 36%.
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CHAPTER 3: METHODOLOGY

Study design: Retrospective (JANUARY and FEBRUARY) and prospective (MARCH, APRIL) study. Duration of the study was from 1st March, 2023 to 30th April , 2023.

Study setting: The study was conducted in The Mission Hospital, Durgapur which is a 350 bedded super-specialty hospital.

1. **Inclusion criteria:** Surgeries done on working days i.e. Monday to Saturday. Observation were recorded for the scheduled routine cases which were scheduled on the list on the previous day till 8:00 pm.

2. **Exclusion criteria:** Surgeries done on weekend (Sunday) & Public holidays.

3. **Study tools:** MS Excel

Sample size: January to April is 2953.

Study type: Cross-sectional descriptive study.

Sampling technique: Non-probability convenient sampling.

Data collection procedure: Main OT register from every OTs , HMIS software, OT Booking register, Computer entry register, Incident reports of patients for the indicators, postponed / cancelled register.

Parameters observed were:

- OT start time- The time the first case was shifted inside OT. Any delay > 30 mins was noted down .
- Patient in time- when the patient wheels in to the OT. It is compared with the scheduled time.
- If case gets postponed and rescheduled > 4 hours, it was noted.
- Reasons for cancellations were observed.
- Patient out time- when the patient goes out of the OT. The extended time > 8:00pm (20:00) is noted to analyze utilization beyond the duration.
- For utilization of OT: Total time taken (in mins) for each case in each OT has been observed. Difference between patient out time and patient in time is carried out. Cleaning time is considered.
- For anesthesia related indicators, number of surgeries performed under general

anesthesia, spinal anesthesia, block & sedation are considered.

3.1 OPERATIONAL DEFINITIONS:

- OT UTILIZATION

Total hours used for surgery with total hours available for surgery.

Formula: *Total time (mins) used / total time available for surgery * 100*

- RESCHEDULING OF SURGERIES

Rescheduling of patient includes cancellation & postponement (>4hours) of surgeries.

Formula: *Number of cases rescheduled / no of surgeries performed * 100*

- RE-EXPLORATION

Percentage of cases where re-exploration was done during the same admission.

Formula: *Number of re-explorations done during same admission/ total Number of surgeries *100*

- WRONG SITE, WRONG PATIENT, WRONG SURGERY

% of cases to prevent adverse events like wrong site, wrong patient , wrong surgery have been adhered to.

Formula: *Number of cases where the procedure was followed / Number of surgeries performed * 100*

- PLANNED SURGERY CHANGED INTRAOPERATIVELY

Formula: *Number of cases planned surgery changed / Number of surgeries performed * 100*

- MODIFICATION OF ANAESTHESIA PLAN

Anaesthesia plan is the outcome of pre- anaesthesia treatment. Any changes done after this shall be considered as modification anaesthesia plan

Formula: *Number of patients in whom the anaesthesia plan was modified/ Number of patient who underwent anaesthesia * 100*

- ADVERSE ANAESTHESIA EVENTS

Adverse anaesthesia events are any untoward medical occurrence that may present during treatment with an anaesthetic product which does not necessarily have a casual relationship with this treatment.

Formula: *Number of patients who developed adverse anaesthesia events / Number of patient who underwent anaesthesia * 100*

- ANAESTHESIA RELATED MORTALITY RATE

Any death where the cause is probable or possible.

Formula: *Number of patients who died due to anaesthesia / Number of patient who underwent anaesthesia * 100*

- UNPLANNED VENTILATION

Formula: *Number of patients requiring unplanned ventilation following anaesthesia/ Number of patient who underwent anaesthesia * 100* .

CHAPTER 4: DATA ANALYSIS

PERCENTAGE OF OT UTILIZATION :

CARDIAC 1 & 2

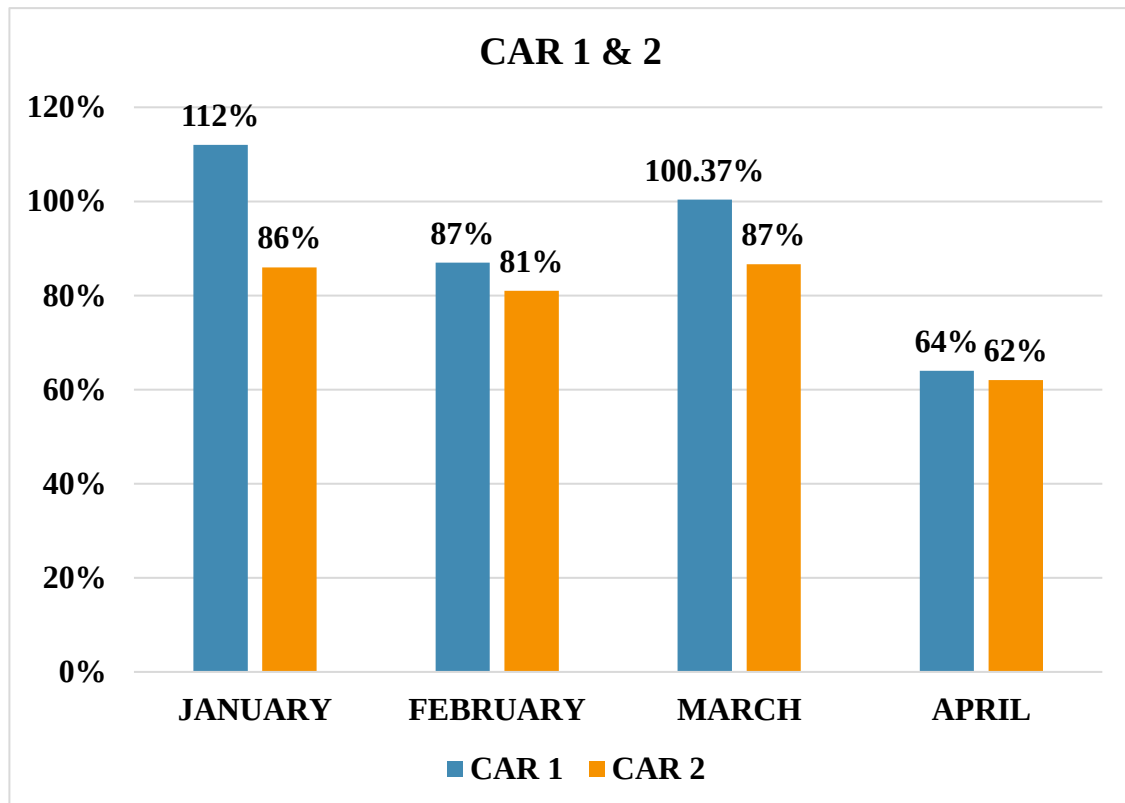


Figure 1. % Utilization in Cardiac 1& 2

The figure 1 suggests that an observation made in a cardiac OT 1 & 2 , where the utilization percentages for different months were analysed. Let's break down the interpretation for Cardiac OT 1 :

The analysis reveals that **January** had the highest utilization percentage among the observed months, reaching **112%**. This percentage indicates that the cardiac OT 1 which are planned but extended beyond its utilization time thus it might show overutilization. Also there is a possibility of an increased demand for cardiac surgeries or procedures, potentially leading to a higher workload for the healthcare professionals in the OT.

Following January, **March** had a utilization percentage of **100.37%**. This figure implies that the OT was fully utilized during that month, meeting the demand for cardiac procedures adequately. While not exceeding capacity like January, March still had a

substantial workload.

February had an utilization percentage of **87%**. This indicates that the OT was operating at a high capacity, but not to the extent observed in January or March. It suggests that there was a relatively lower demand for cardiac procedures compared to the previous two months, resulting in a slightly lower workload.

Finally, in **April**, the utilization percentage dropped further to **64%**. This percentage suggests that the OT was operating at a considerably lower capacity during that month. It implies a reduced demand for cardiac procedures, resulting in a relatively lighter workload for the healthcare professionals in the OT compared to the previous months.

Overall, the interpretation indicates a fluctuation in the utilization of the cardiac OT throughout the observed months, with January and March being the busiest, February being moderately busy, and April experiencing a significant drop in utilization. This information may help in understanding the patterns of cardiac procedure demands and planning resource allocation accordingly in the future.

Table 1. Number of cases operated in Cardiac 1

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	77	112%
February	59	87%
March	75	100.37%
April	38	64%

The given information pertains to observations made in Cardiac OT 2. The utilization percentages for different months were analyzed and presented in Table 2.

According to the analysis, **March** exhibited the highest utilization percentage among the observed months in Cardiac OT 2, reaching **87%**. This percentage indicates that the operation theatre was operating at a relatively high capacity during that month. It suggests a significant demand for cardiac procedures or surgeries, potentially resulting in a heavy workload for the healthcare professionals in Cardiac OT 2.

Following March, **January** had an utilization percentage of **86%**. This figure implies that the OT was almost fully utilized during that month, with a slight decrease compared to March. It suggests a considerable demand for cardiac procedures, signalling a substantial workload for the healthcare staff.

In **February**, the utilization percentage dropped slightly to **81%**. This decrease indicates a comparatively lower demand for cardiac procedures during that month, resulting in a somewhat lighter workload for the OT staff in Cardiac OT 2. Despite the decrease, the OT still operated at a relatively high capacity.

Finally, in **April**, the utilization percentage further dropped to **62%**. This percentage suggests a significant decrease in the demand for cardiac procedures, resulting in a much lighter workload for the OT staff compared to the previous months. The OT operated at a considerably lower capacity during April.

Overall, the interpretation reveals fluctuations in the utilization of Cardiac OT 2 throughout the observed months. March and January were the busiest, with March having the highest utilization percentage. February followed with a slightly lower percentage, indicating a moderately busy month. Finally, April experienced a significant drop in utilization, resulting in a notably lighter workload for the OT staff.

Understanding these utilization patterns can assist in resource planning and scheduling for Cardiac OT 2, ensuring appropriate allocation of staff and equipment based on the varying demands for cardiac procedures throughout the different months.

Table 2. Number of cases operated in Cardiac 2

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	47	86%
February	44	81%
March	59	87%
April	37	62%

It is evident that there is a comparison between Cardiac OT 1 and Cardiac OT2. Based on

the available information and the provided Figure 1, it is observed that Cardiac OT 1 is used more extensively than Cardiac OT 2 throughout each month.

NEURO OT

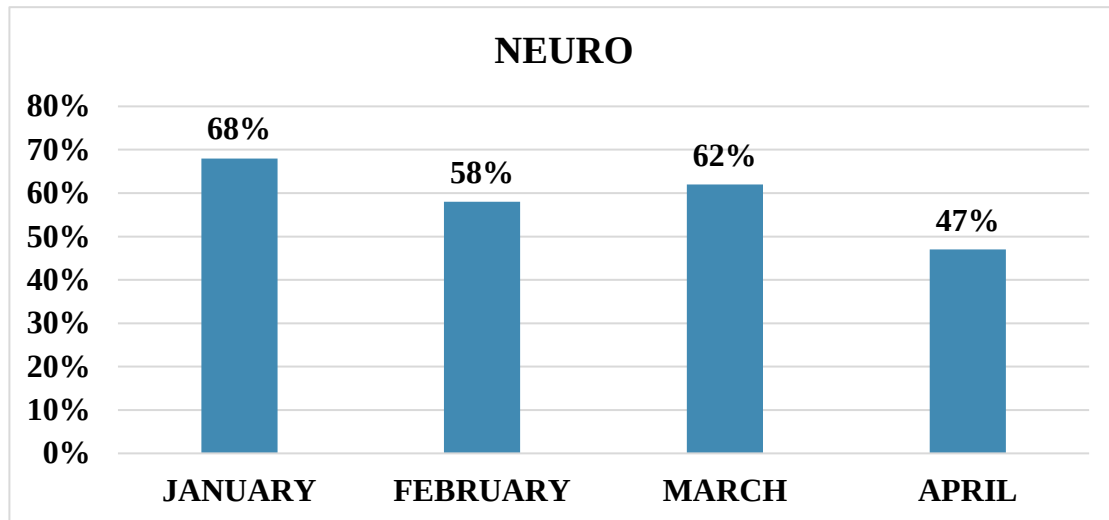


Figure 2. % Utilization in Neuro OT

It is evident that there is a comparison of utilization percentages within the Neuro OT across different months. According to the information provided in Table 3, it can be observed that **January** has the highest utilization percentage of **68%**. Following January, **March** has the second-highest utilization percentage of **62%**, while **February** has a utilization percentage of **58%**. Finally, **April** has the lowest utilization percentage among the listed months, with a value of **47%**.

The table likely presents a summary of the utilization percentages for each month, indicating the extent to which the Neuro Operation Theatre was utilized during those specific periods. The higher the utilization percentage, the more the facility was put to use.

Table 3. Number of cases operated in Neuro OT

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	48	68%

February	38	58%
March	46	62%
April	31	47%

GENERAL 3 & 4

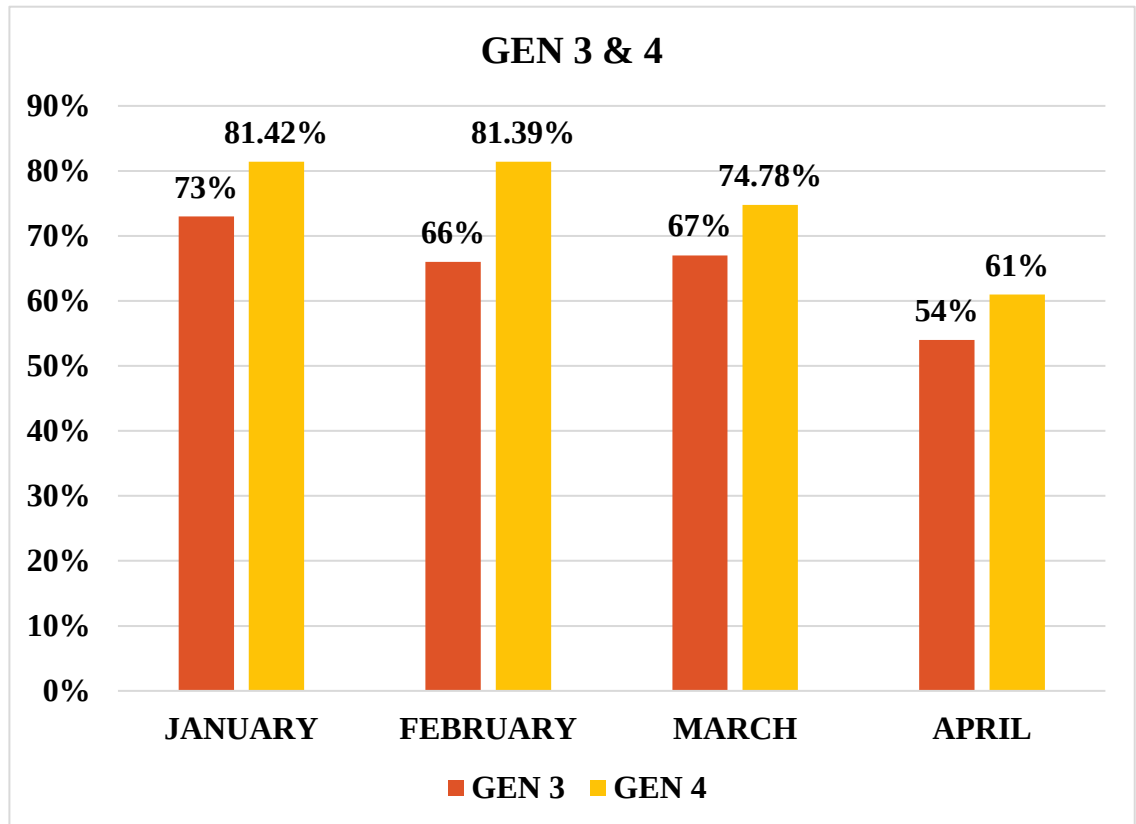


Figure 3. % Utilization in General 3 & 4

It is evident from Figure 3 that there is an analysis of the utilization percentages within General OT 3 across different months. According to the information presented in Table 4, it can be observed that **January** had the highest utilization percentage, which is recorded at **73%**. Following January, **March** had the second-highest utilization percentage with **67%**, while **February** had a utilization percentage of **66%**. Lastly, **April** had the lowest utilization percentage among the listed months, with a value of **54%**.

Table 4. Number of cases operated in General 3

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	128	73%
February	113	66%
March	131	67%
April	102	54%

It is evident that there is an analysis of the utilization percentages within General OT 4 across different months. According to the information provided in Table 5, it can be observed that **January** had the highest utilization percentage of **81.39%**. Surprisingly, **February** also has the same utilization percentage of **81.39%**. Following January and February, **March** had the third-highest utilization percentage with **74.78%**, while **April** had a lowest utilization percentage of **61%**.

Table 5. Number of cases operated in General 4

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	143	81.42%
February	145	81.39%
March	131	74.78%
April	109	61%

There is a comparison between the utilization of general OT 3 and general OT 4, over a period of time. The interpretation can be summarized as follows:

The observation made is that general OT 4 has consistently higher utilization than general OT 3 throughout each month. This conclusion is drawn based on the data presented in Figure 3, which presumably displays the utilization levels of both types of hours utilized over a given timeframe.

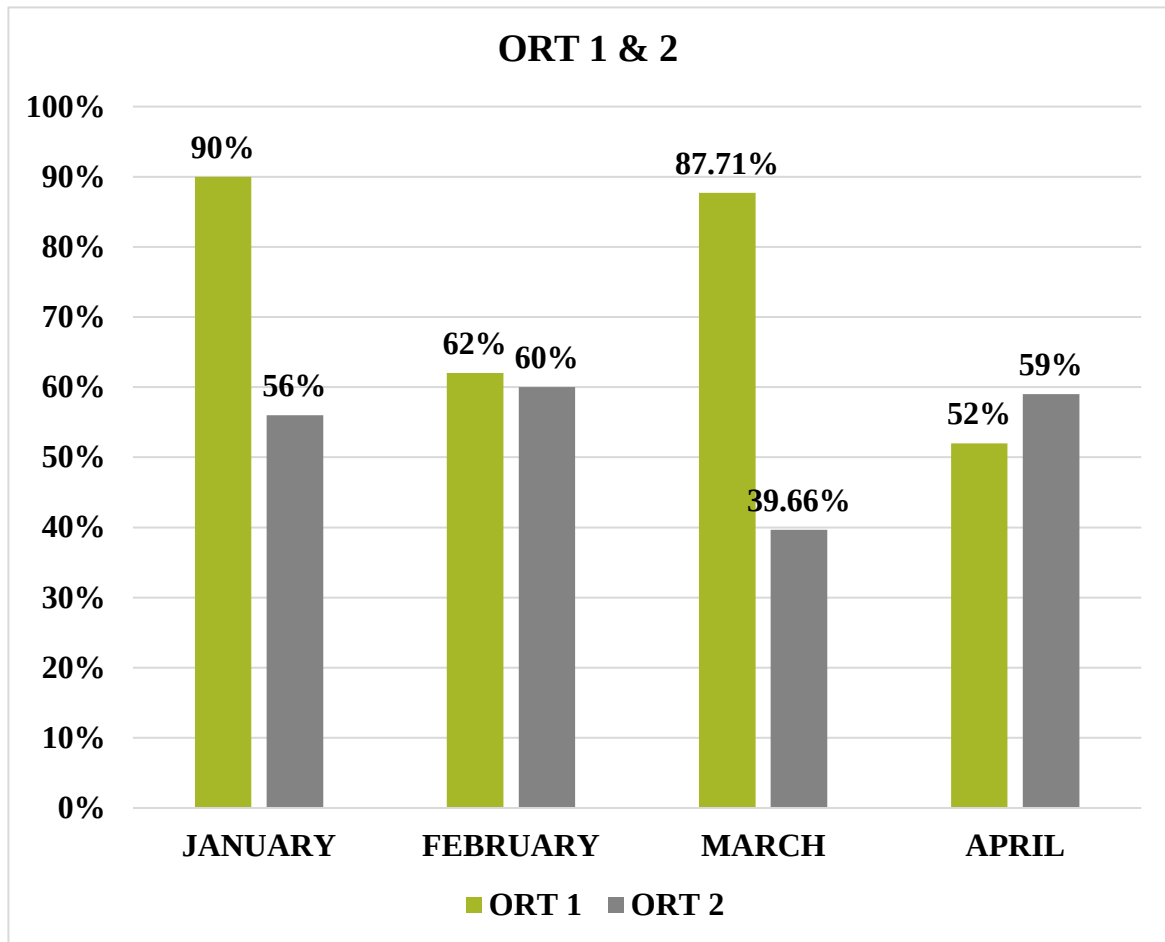


Figure 4. % Utilization in Ortho 1 & 2

From the figure 4 the data is provided for the interpretations of utilization percentages for two different types of Ortho OT (Ortho 1 & Ortho 2). The Table 6 shows the utilization percentages for Ortho OT 1 across different months. The interpretation reveals that **January** has the highest utilization percentage, which is **90%**. Following January, **March** has the second-highest utilization percentage with **87.71%**. **February** has a relatively lower utilization percentage of **62%**, and **April** has the lowest utilization percentage of **52%** among the months listed.

Table 6. Number of cases operated in Ortho 1

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	117	90%

February	94	62%
March	135	87.71%
April	82	52%

The Table 7 shows the utilization percentages for Ortho OT 2 across different months. The interpretation states that **February** has the highest utilization percentage, which is **60%**. Following February, **April** has the second-highest utilization percentage with **59%**. **January** has third highest utilization percentage of **56%** and **March** has the lowest utilization percentage of **39.66%** among the listed months.

Table 7. Number of cases operated in Ortho 2

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	74	56%
February	81	60%
March	66	39.66%
April	87	59%

It is observed that Ortho OT 1 consistently has higher utilization than Ortho OT 2 across all months. This indicates that, on average, Ortho OT 1 is utilized more frequently or extensively compared to Ortho OT 2.

MAJOR OT

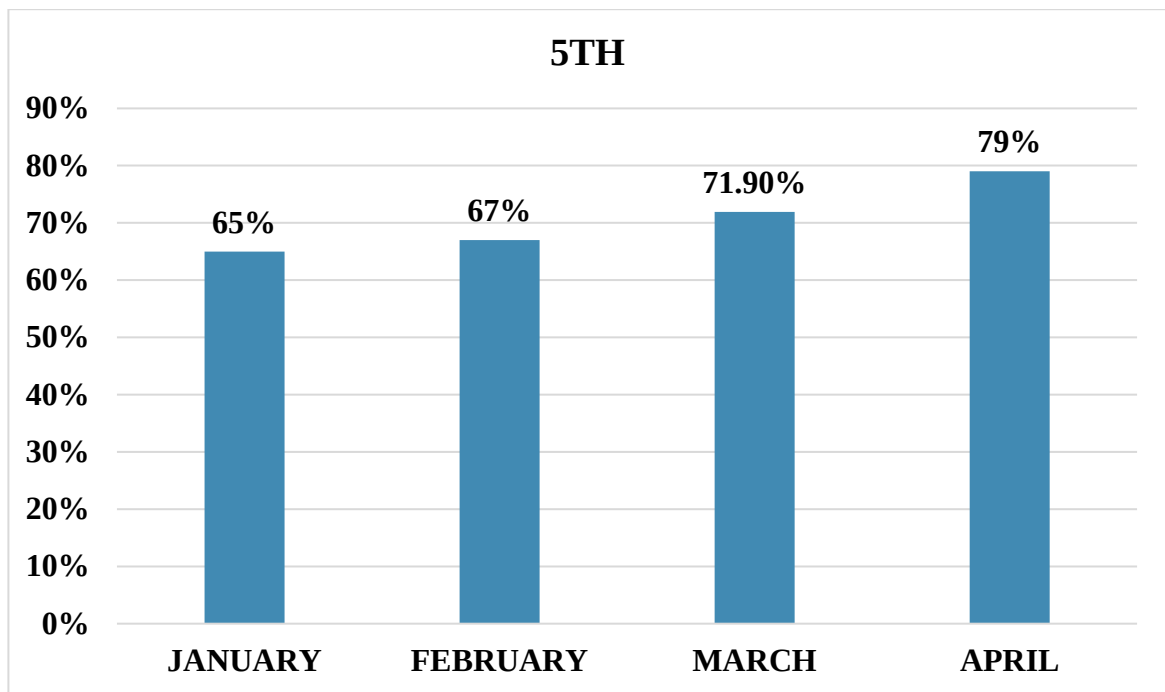


Figure 5. % Utilization in Major OT

The analysis is summarized among the listed months where the utilization percentages for Major OT are considered. **April** has the highest utilization percentage of **79%**. Following April, **March** has the second-highest utilization percentage with **71.90%**. **February** has a utilization percentage of **67%**. **January** has the lowest utilization percentage with a value of **65%**. These interpretations highlight the varying levels of utilization for Major OT hours in different months. April has with the highest utilization, while January has the lowest utilization among the months mentioned.

Table 8. Number of cases operated in Major OT

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	118	65%
February	120	67%
March	146	71.90%
April	138	79%

OT UTILIZATION AFTER 8 PM TO 8AM IN APRIL (20:00 Hours)

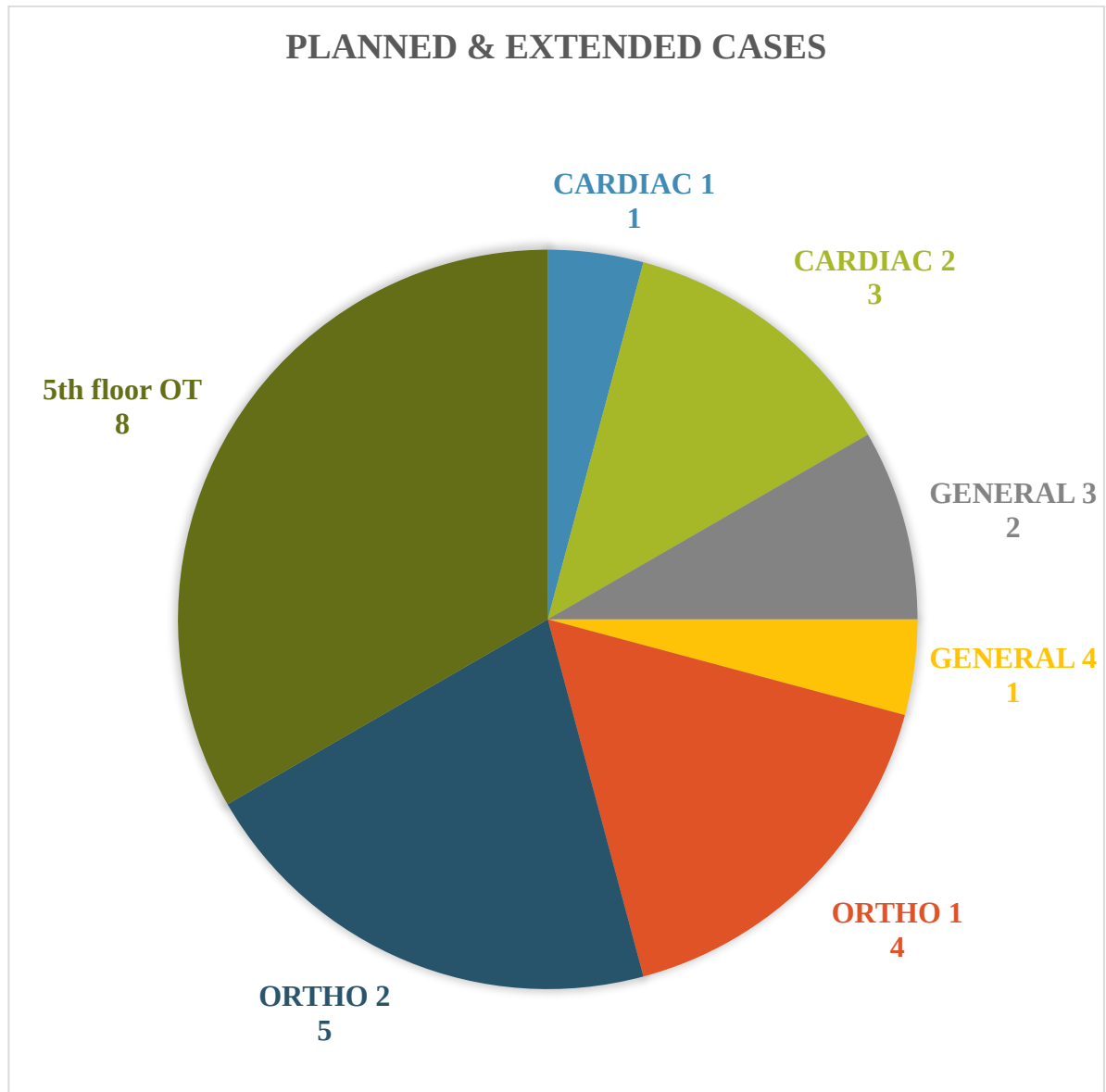


Figure 6. Utilization after 8 pm for Planned & extended cases

It is noted in Figure 6 that in April 2023, **Major OT** has the most OT utilized after 8pm (20:00 hours) for planned & extended cases. For planned & extended cases , **Ortho 1** has more cases than **Ortho 2**. For Unplanned cases,. **General 3** has more planned & extended cases than **general 4**. Cardiac 1 & cardiac 2 has planned & extended cases in which **cardiac 2** shows more cases.

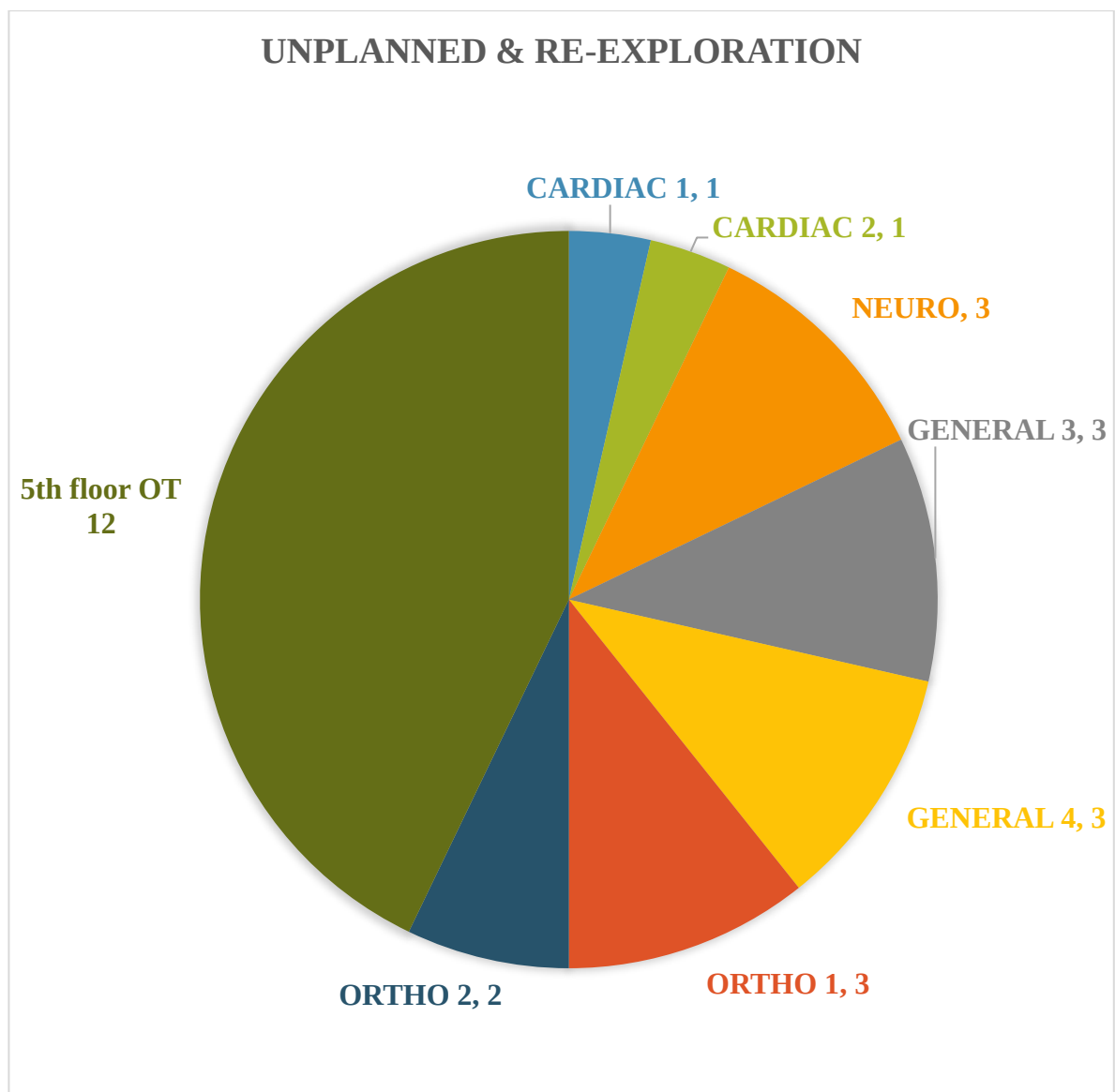


Figure 7. Utilization after 8 pm for Unplanned & re-exploration

The information provided in the figure 7 indicates that the graph being referred to includes re-explorations that were performed after 8 pm. **Major OT** has the most OT utilized after 8pm (20:00 hours) for unplanned cases. **Ortho 1** has more cases than **Ortho 2** for unplanned cases. **General 3** & **general 4** has the same number of unplanned cases. **Cardiac OT 1 & 2** has same number of unplanned cases & re-exploration.

RESCHEDULING OF SURGERIES

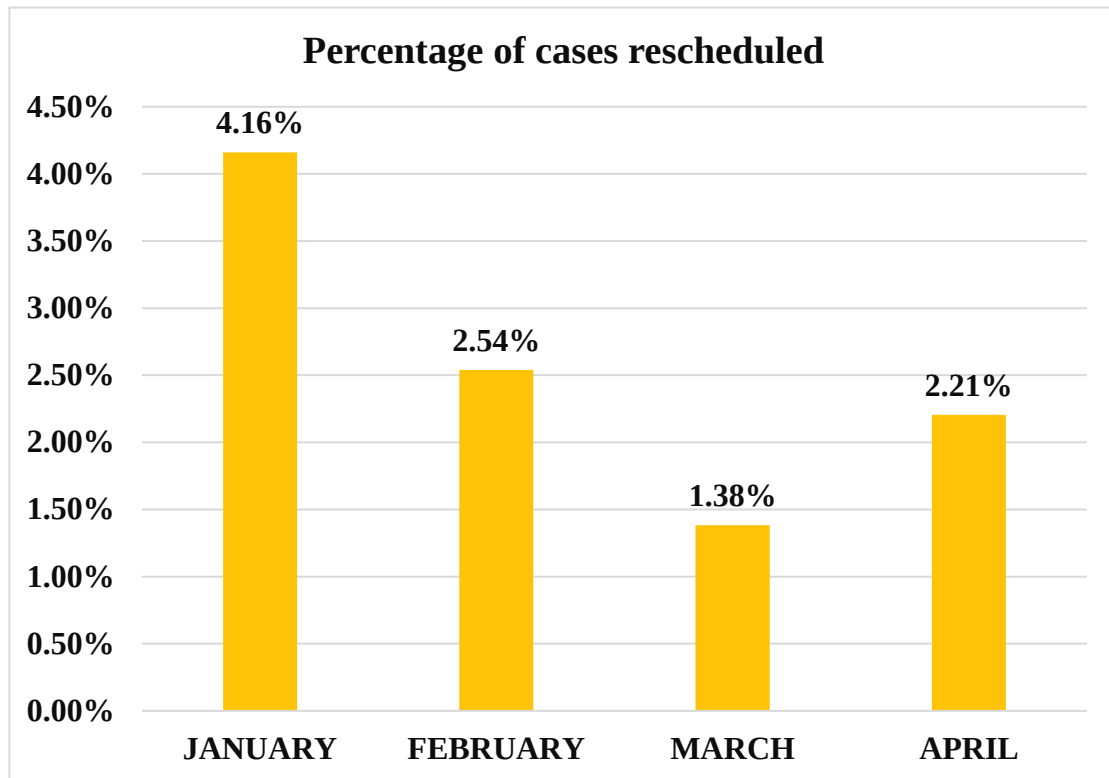


Figure 8. % of rescheduling of surgeries

It is evident from Figure 8 that the graph indicates the percentage of rescheduled cases in different months. In **January**, the highest percentage of rescheduled cases is observed, with a value of **4.16%**. **February** follows with the second-highest percentage of rescheduled cases, at **2.54%**. **April** has a slightly lower percentage compared to February, with a value of **2.21%**. **March** has the lowest percentage of rescheduled cases among the listed months which is **1.38%**.

Table 9. Percentage of cases rescheduled

VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
January	32	769	4.16%
February	18	709	2.54%
March	11	795	1.38%
April	15	680	2.21%

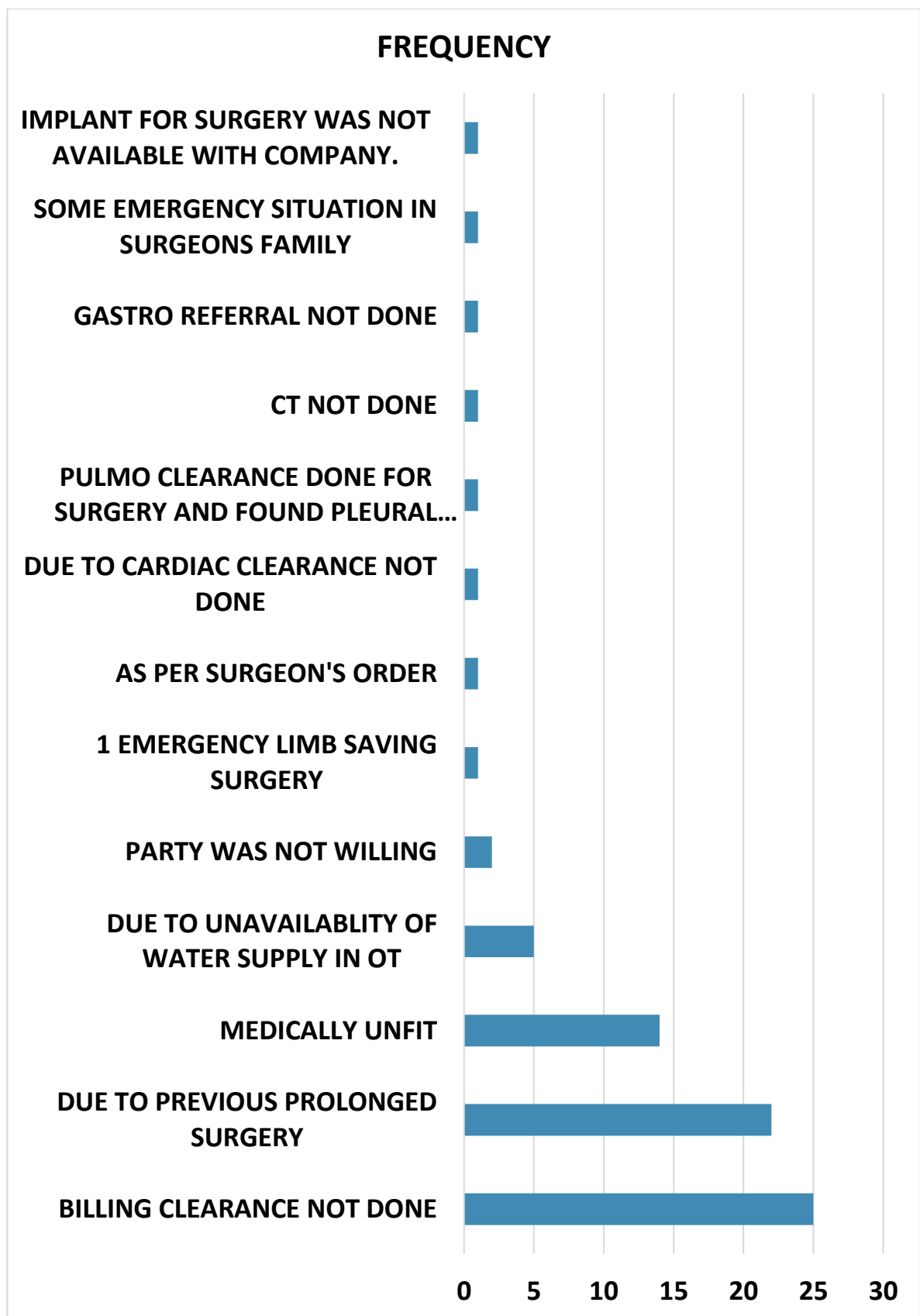


Figure 9. Analysis of reasons for rescheduling of cases

PERCENTAGE OF UNPLANNED RETURN TO OT

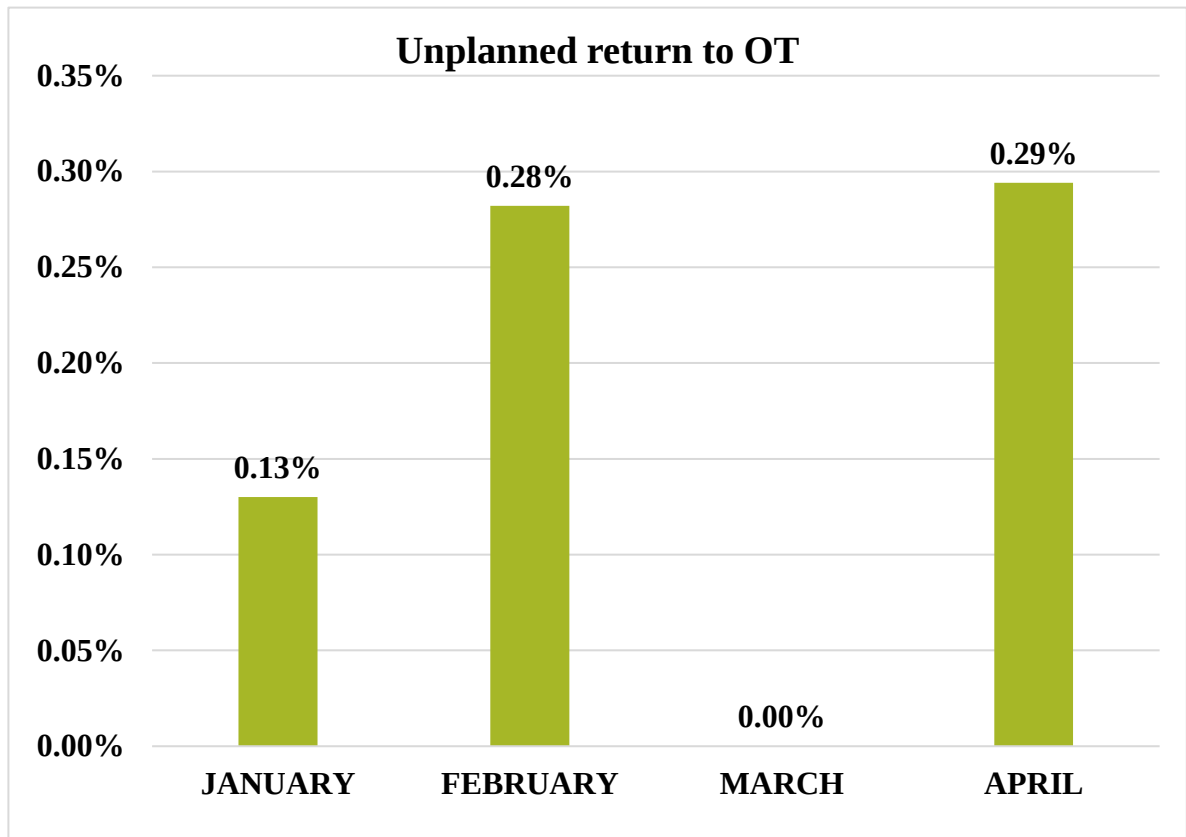


Figure 10. % of unplanned return to OT

It is evident from the graph that **April** has the highest percentage of unplanned return to OT (**0.29%**) followed by **February (0.28%)** & **January (0.13%)**. Unplanned return to OT can be due to sternal re-wiring or redo cases, or any case reoperated due to surgical site infections.

PREVALENCE RATE: A study by Birkmeyer JD et al. (2001) found that **3.50%** cases had an unplanned return to the OT.

Table 10. % of unplanned return to OT

VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
January	1	769	0.13%

February	2	709	0.28%
March	0	795	0.00%
April	2	680	0.29%

RE-EXPLORATION RATE

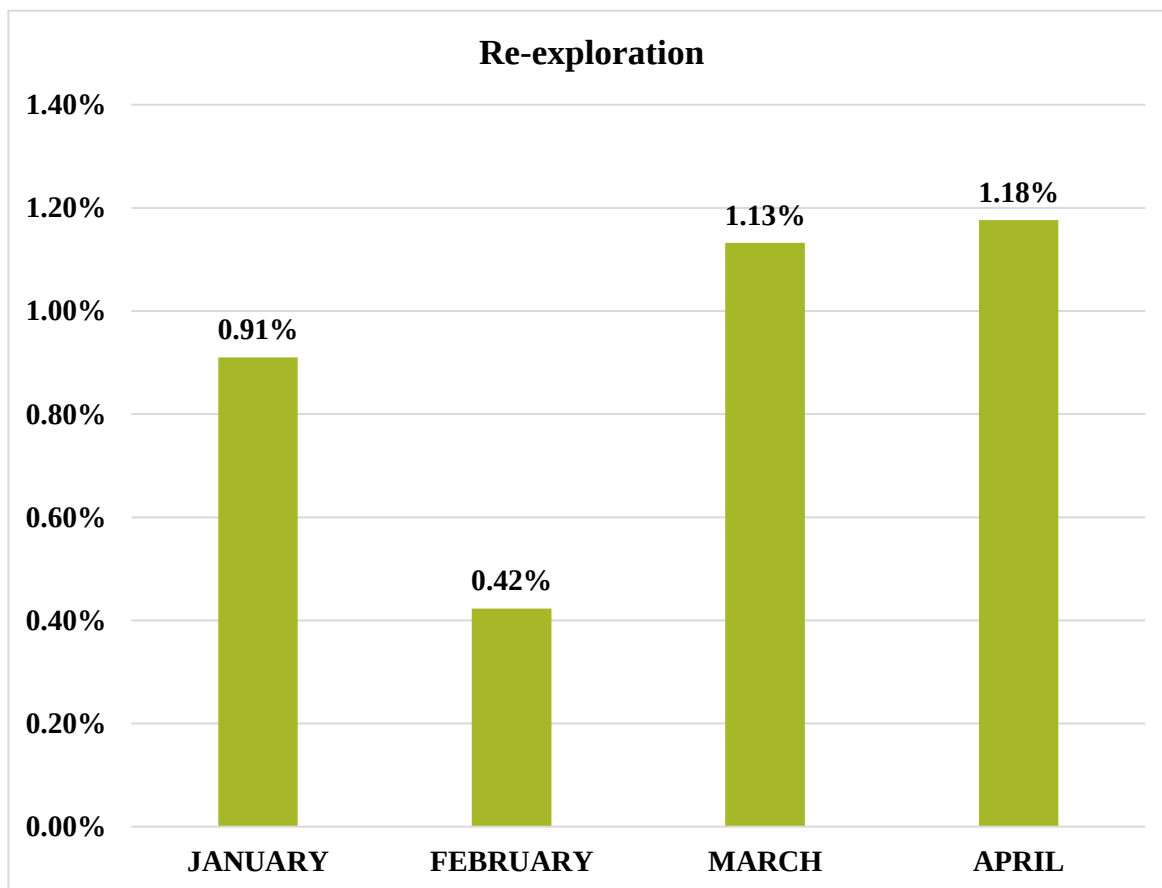


Figure 11. % of Re-exploration

It is evident from Figure 11 that **April** has the highest percentage of re-exploration to OT (1.18%) followed by **March** (1.13%) & **January** (0.91%), **February** (0.42 %).

Table 11. % of Re-exploration

VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
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January	7	769	0.91%
February	3	709	0.42%
March	10	795	1.26%
April	8	680	1.18%

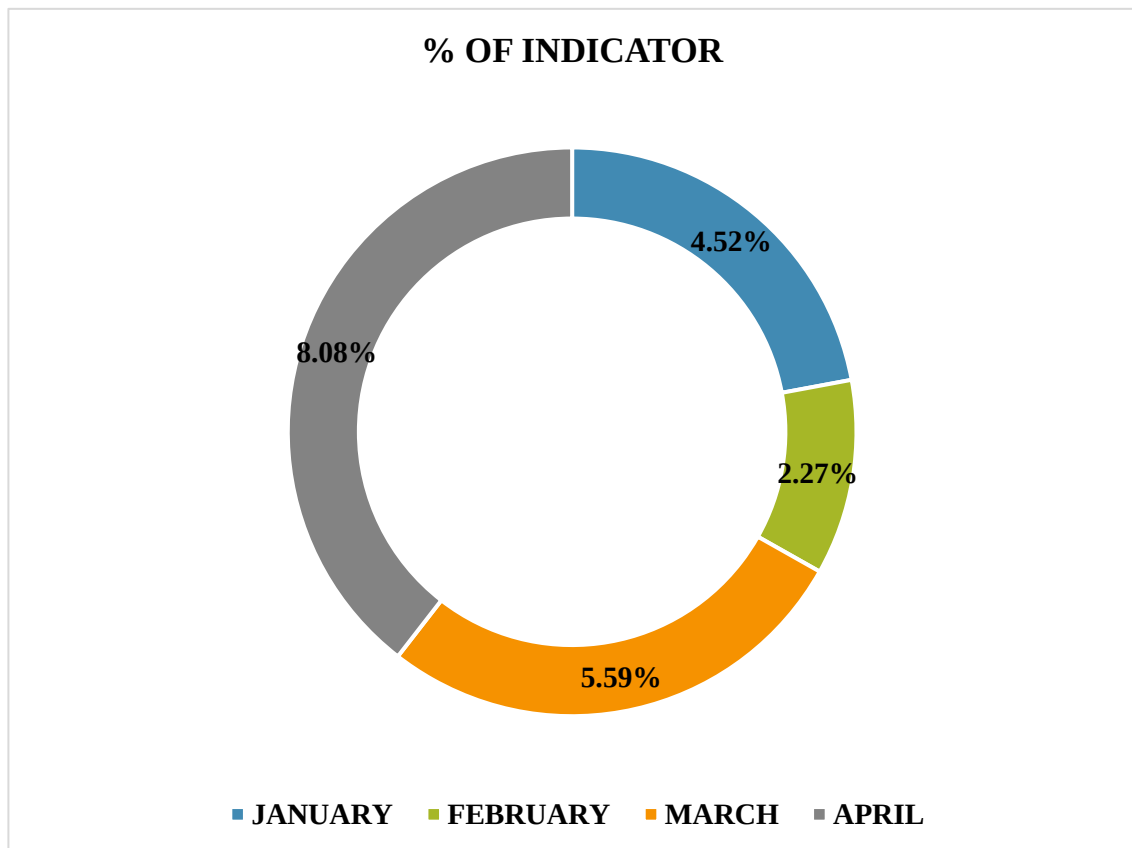


Figure 12. % of Re-exploration for Cardiac cases only

It is evident from Figure 12 that **April** has the highest percentage of re-exploration to OT (**8.08%**) followed by **March** (5.59%) & **January** (4.52%), **February** (2.27%). Re-exploration can be mainly due to post operative bleeding.

PREVALENCE RATE :According to a study by Dacey LJ et al. (1998), Re-exploration for bleeding, which occurs after **2% to 6%** of cardiac procedures.

Table 12. % of Re-exploration for Cardiac cases only

VARIABLE	FREQUENCY OF CARDIAC CASES (n)	TOTAL CARDIAC CASES	PERCENTAGE %
January	7	155	4.52%
February	3	132	2.27%
March	9	161	5.59%
April	8	99	8.08%

PERCENTAGE OF PLANNED SURGERY CHANGED INTRA-OPERATIVELY

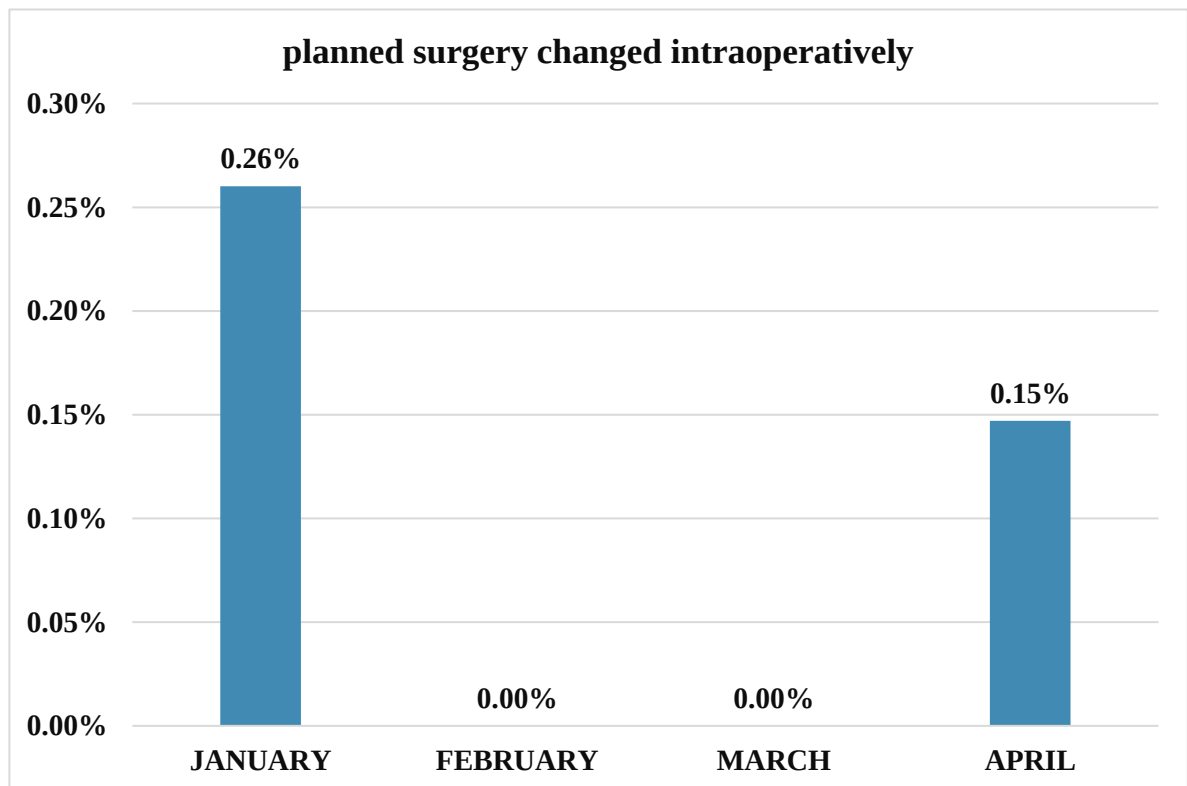


Figure 13. % of planned surgery changed intraoperatively

It is evident from figure 13 that in the graph **January (0. 26%)** has the highest % of planned surgery changed intraoperatively followed by **April (0.15%)**. Any planned surgery

changed intra-operatively can be due to patient's anatomy.

Table 13. % of planned surgery changed intraoperatively

VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
January	2	769	0.26%
February	0	709	0.00%
March	0	795	0.00%
April	1	680	0.15%

MODIFICATION OF ANESTHESIA PLAN

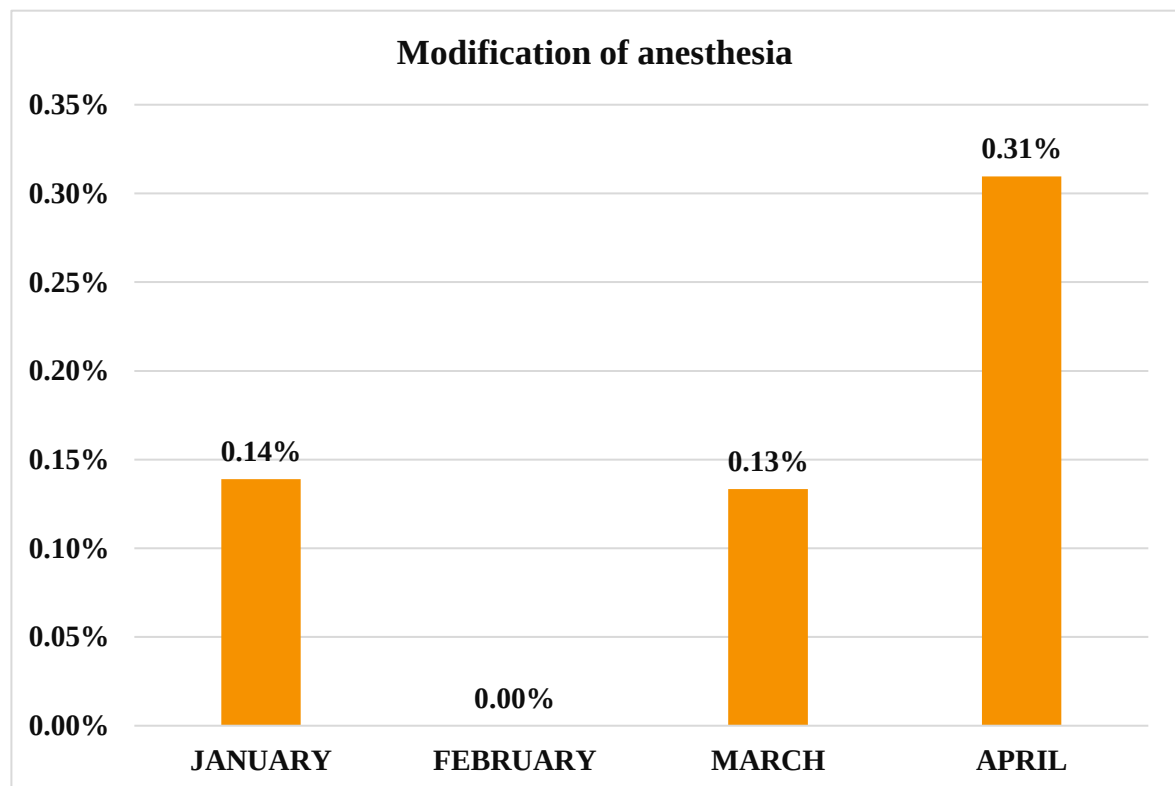


Figure 14. Modification in anesthesia plan

INTERPRETATION

It is evident from the graph that **April** has highest % (**0.31%**), followed by **January** (**0.14%**) & **march** (**0.13%**). Modification of anaesthesia plan can be due to various

surgical complications.

PREVALENCE RATE : According to a study conducted by Nadakarni M et al. (2015), the modification in anesthesia plan is **13.72 %**.

Table 14. Modification in anesthesia plan

VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
January	1	720	0.14%
February	0	670	0.00%
March	1	750	0.13%
April	2	646	0.31%

ADVERSE EVENTS DUE TO ANESTHESIA

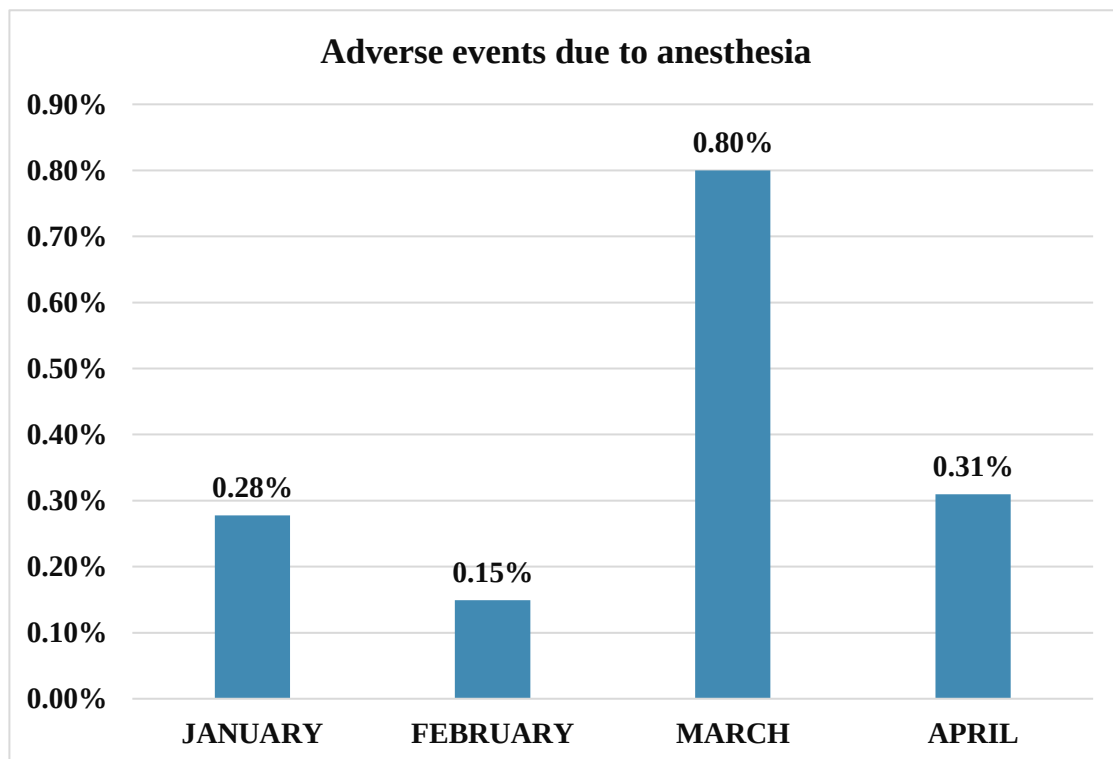


Figure 15. Adverse events due to anaesthesia

INTERPRETATION

It is evident from the graph that **March** has highest % (**0.80%**), followed by **April** (**0.31%**), **January** (**0.28%**) & **February** (**0.31%**). Adverse event due to anaesthesia can be due to vomiting, nausea, high blood pressure, bronchospasm etc.

PREVALENCE RATE: A study conducted by Adrian Liao et al (2020), the percentage of adverse events due to anesthesia is **4.8%**.

Table 15. Adverse events due to anaesthesia

VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
January	2	720	0.28%
February	1	670	0.15%
March	6	750	0.80%
April	2	646	0.31%

PERCENTAGE OF UNPLANNED VENTILATION DUE TO ANESTHESIA

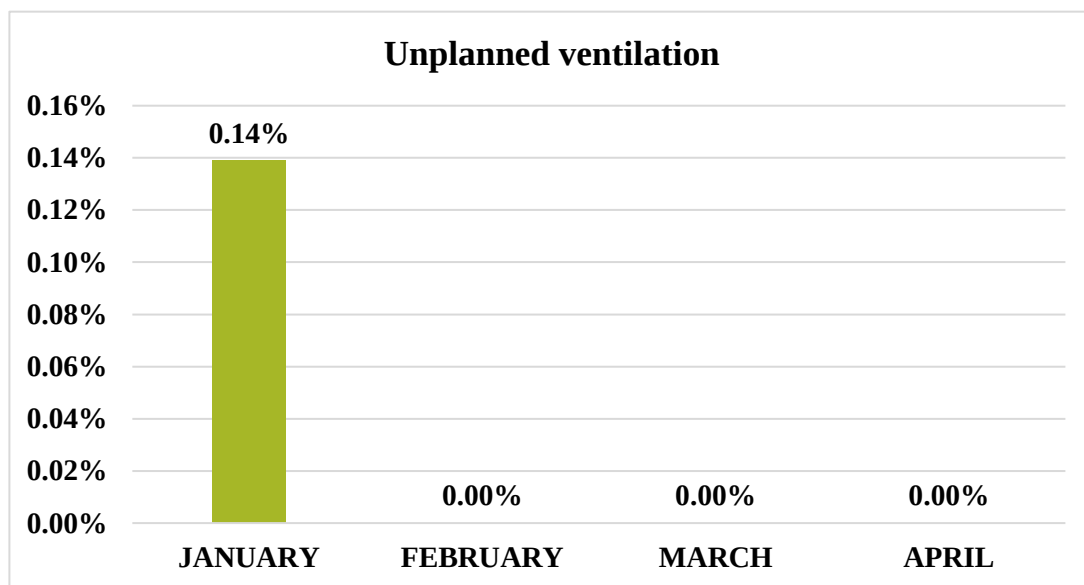


Figure 16. Unplanned ventilation due to anesthesia

From the figure 16, it is observed that **January** has the only unplanned ventilation that was required with a percentage of **0.14**. Unplanned ventilation can be due to anatomy of the patient (bleeding or

other complications).

Table 16. Unplanned ventilation due to anesthesia

VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
January	1	720	0.14%
February	0	670	0.00%
March	0	750	0.00%
April	0	646	0.00%

ANALYSIS OF REASONS FOR CANCELLATION OF CASES

Table 17. % of Cancelled cases

MONTH	TOTAL CASES	% CANCELLED CASES
January	769	1.04%
February	709	1.27%
March	795	0.88%
April	680	1.47%

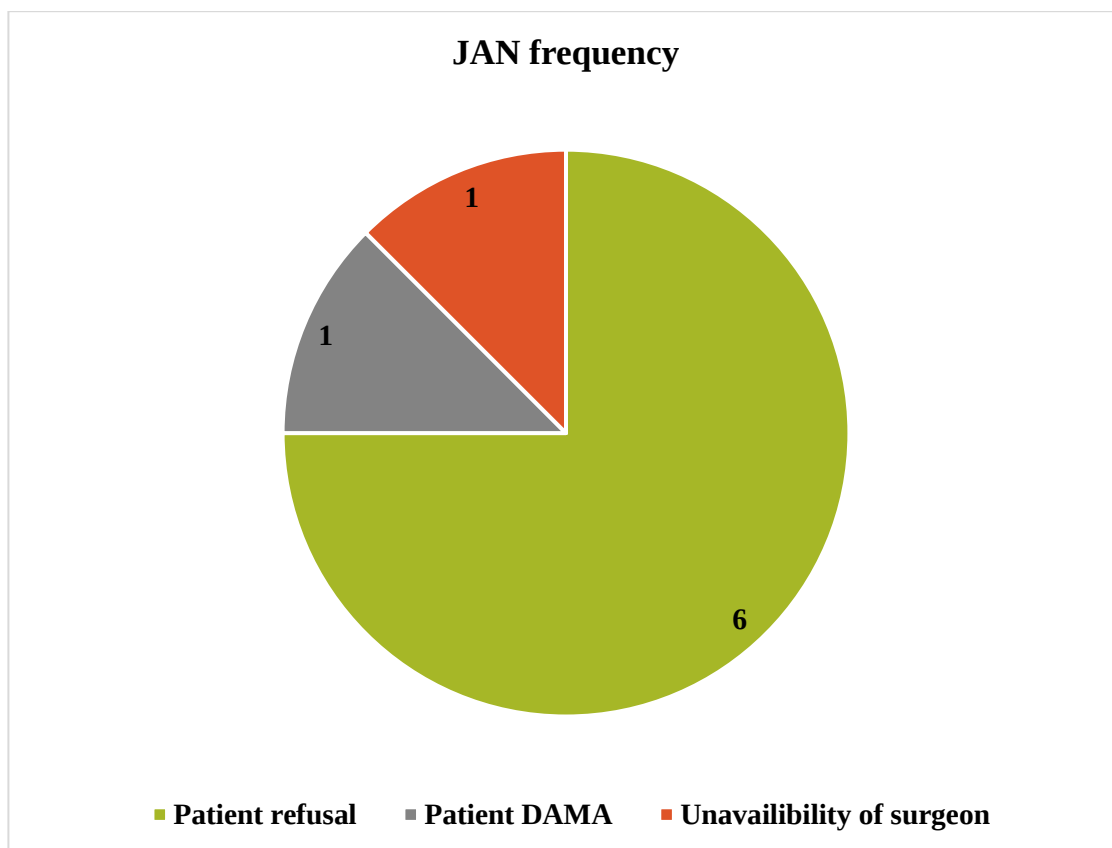


Figure 17. Cases cancelled in January

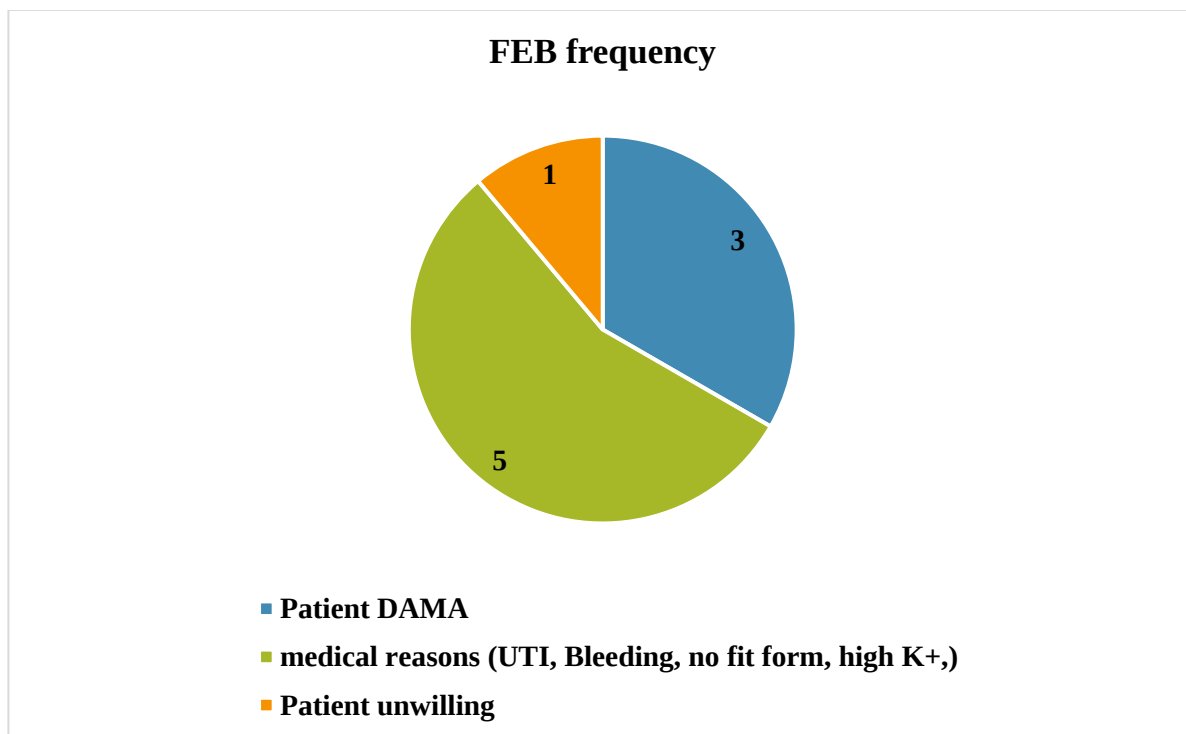


Figure 18. Cases cancelled in February

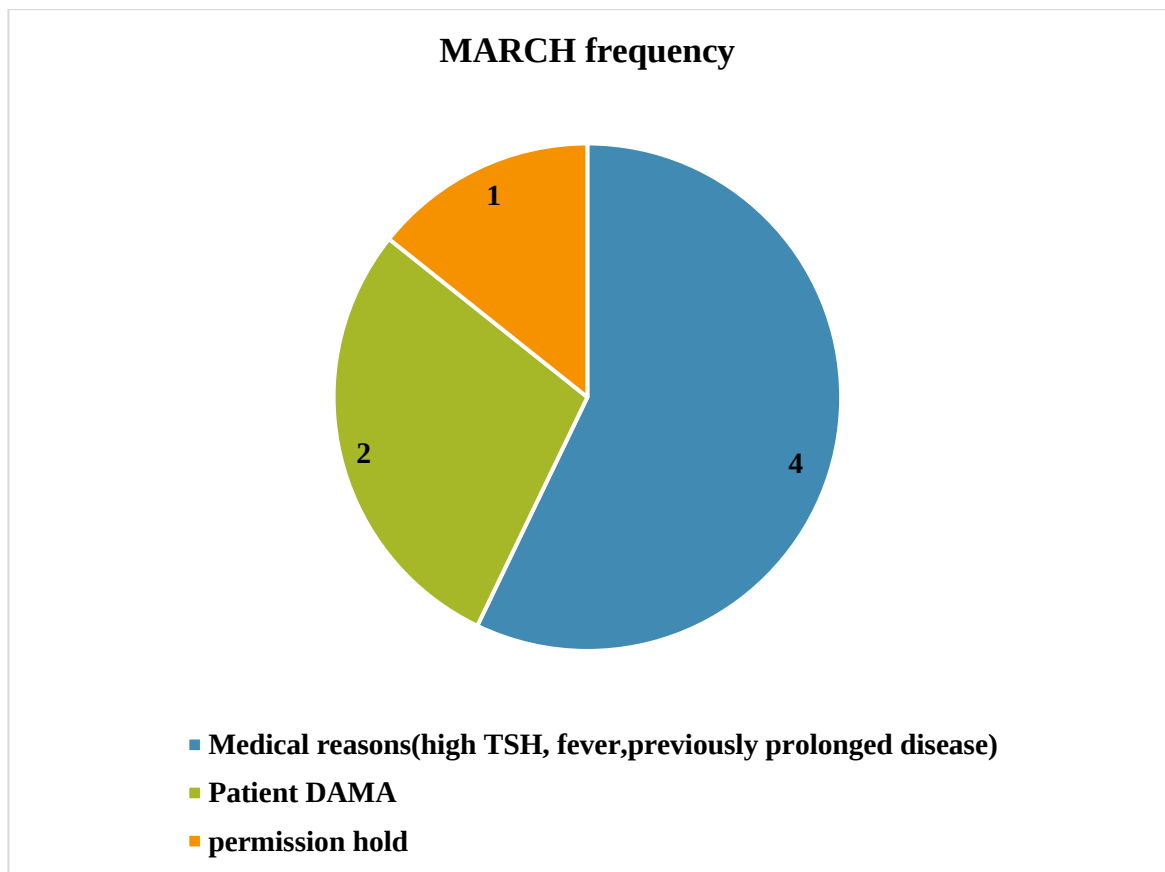


Figure 19. Cases cancelled in March

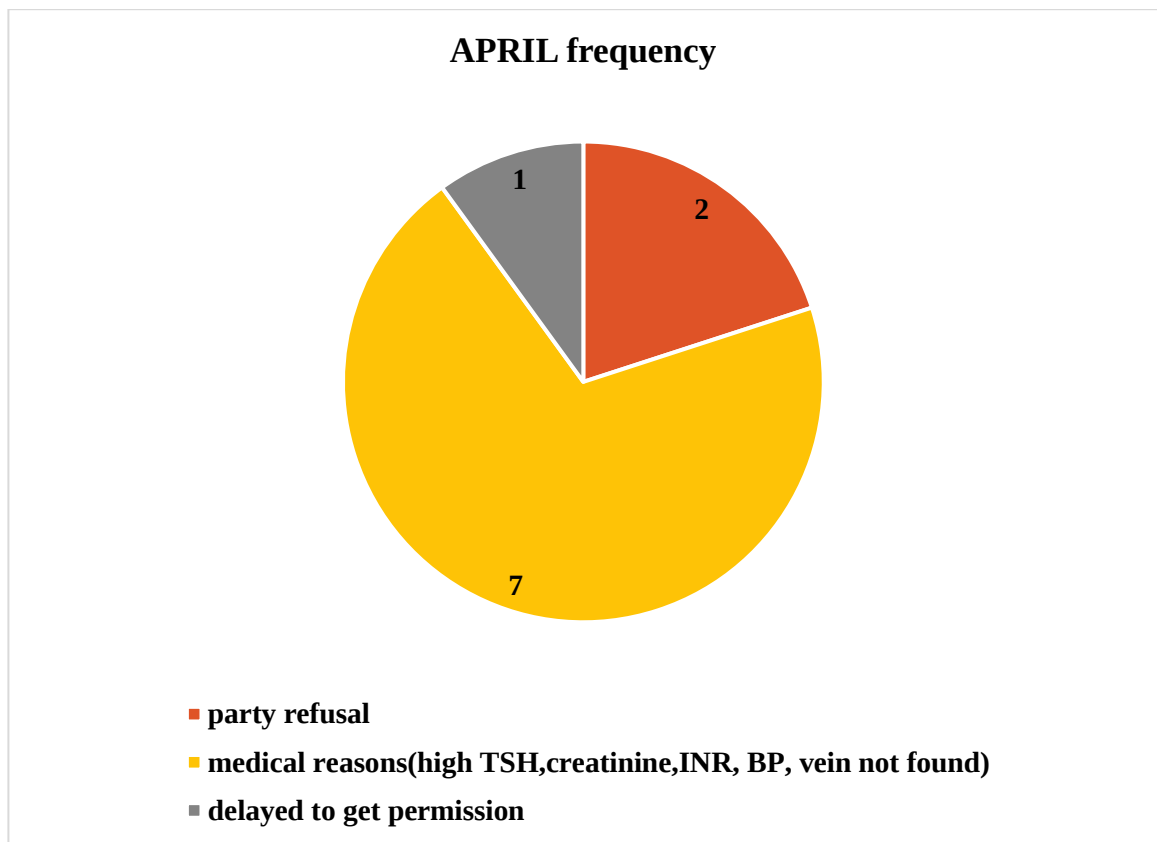


Figure 20. Cases cancelled in April

From the above Figures, we can summarize that **April** has the highest percentage of cancelled cases that is **(1.47%)**, followed by **January** which is **(1.04%)**, then **February** **(1.27%)**, & finally **March** **(0.88%)**.

**PERCENTAGE OF CASES STARTING WITHIN 30 MINS, PRIOR TO 30 MINS,
DELAYED BY 30 MINS OR MORE.**

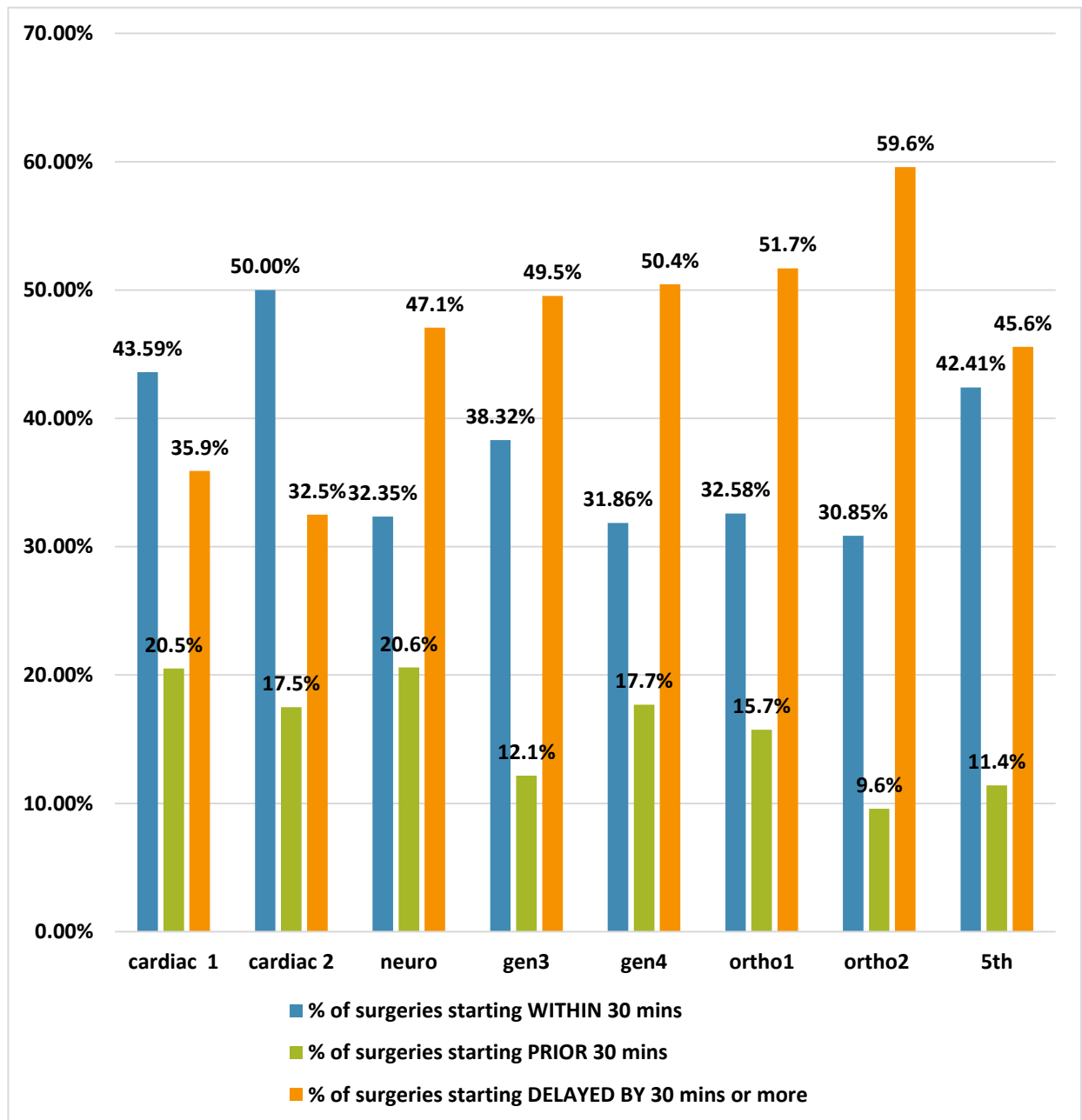


Figure 21. Cases starting in time, prior & delayed

From the above figure 21, the graph represents percentage of surgeries starting within 30 mins, surgeries starting within 30 mins and surgeries delayed by 30 mins (or more) of the scheduled time.

Table 18. Cases starting in time, prior & delayed

VARIABLE	Start within 30 mins	Start prior 30 mins	Delayed by 30 mins or more
Cardiac 1	17	8	14
Cardiac 2	20	7	13
Neuro	11	7	16
General 3	41	13	53
General 4	36	20	57
Ortho 1	29	14	46
Ortho 2	29	9	56
Major	67	18	72

CHAPTER 5: DISCUSSION

According to a study conducted by Lakshmi Bhaskar at a tertiary teaching hospital over 2 years, the optimum utilization for OT complexes found was 72.51%. In this report, the average utilization percentage from January to March for **Cardiac 1** is **90.84%** & for **Cardiac 2** is **79%**, **Neuro OT** is **58.75%**, **General 3** is **65%** & **General 4** is **74.64%**, **Ortho 1** is **72.92%** & **Ortho 2** is **53.66%** and for **5th Floor OT** is **70.72%**.

A study conducted by Aida L. et al (2019), conducted a study in which out of 4060 surgeries, 398 (9.8%) were cancelled within 24 hours of scheduled time. According to a study the cancellation ranges from 5% to 40% of the elective surgeries. In this study, it is noted that cancellation percentage in January is **1.04%** out of 769 cases, in February **1.27%** out of 709 cases, in March **0.88%** out of 759, in April **1.47%** out of 680 cases. Cancellation of surgical cases can be due to Patient refusal, patient DAMA, medical reasons like UTI, bleeding, no fit forms, high TSH or high potassium or high INR, due to previously prolonged surgery or permission hold.

The summarization of Indicators from **January to April, 2023** are as follows:

Average % of Rescheduling of surgeries is **2.57%** from January to April is due to the billing clearance which was not done, due to previously prolonged surgery and medically unfit patients for surgery.

Average % of Re-exploration cases is **0.94%** from January to April is due to post operative bleeding in the patient.

Average % of Unplanned return to OT is **0.17%** from January to April is mainly due to due to sternal re-wiring or redo cases, or any case reoperated due to surgical site infections.

Average % of planned surgery changed intraoperatively is **0.10%** from January to April is mainly due to due unexpected patient's anatomy.

Average % of Modification of anaesthesia is **0.14%** from January to April is mainly due to due to various surgical complications.

Average % of adverse anaesthesia event due to anaesthesia is **0.38%** from January to April is due to vomiting, nausea, high blood pressure, bronchospasm etc.

Average % of Unplanned ventilation following anaesthesia is **0.03%** due to surgical complications of patients such as bleeding.

Average % of wrong patient , wrong surgery, and wrong site & anaesthesia related Mortality is **0.00%**.

Average % of cases which starts **WITHIN** 30 mins is **37.67%**.

Average % of cases which starts **PRIOR** 30 mins is **15.63%**.

Average % of cases which are **DELAYED** by 30 mins or more is **46.53%**.

5.1 CAUSES:

For non-clearance of billing, few points are noted as follows:

- Insurance verification – discrepancy in the provided information and requirement of additional information & coordination with the insurance provider.
- Financial constraints – patients might have difficulty in arranging funds. They might need time to explore payment options, or secure insurance approval.
- Missing documents- incomplete documents like insurance forms, lack of medical records, missing signatures ,financial agreements etc.
- Administrative processes – might involve multiple layers of approval or coordination with various departments or adherence to specific protocols before granting the billing clearance. This might lead to consume more time before authorizing payment.

For Delayed cases (by 30 mins or more of the scheduled time)

- Mainly delayed due to the late arrival of patient , due to previously prolonged surgery, permission hold or surgeon would have decided to take the case later.
- Patient unfit for surgery

5.2 LIMITATIONS

- The Retrospective data that was captured for **Jan** and **Feb** may have some limitations. For the other Quality Indicators, the frequency of total surgeries was captured from OT Quality Indicator Register provided by the nurse in-charge. Thus, it may affect the accuracy of the data.
- For the month of January, February & March, due to time restraints the data for **% of OT Utilization** has been captured for 24 hours instead of **12 hours**.
- Data for April has been taken in two parts : 8am to 8pm & 8pm to 8am.
- In April, the surgical cases delayed by 30 mins, prior to 30 mins and within 30 mins of the scheduled time are considered.

CHAPTER 6: CONCLUSION

In conclusion, Operation Theatre (OT) utilization and quality indicators are critical in ensuring that surgical services within a hospital are effective and efficient. Utilizing the OT effectively is essential for making the best use of available resources, cutting waiting times, and increasing patient throughput. Hospitals can improve the entire surgical experience for patients while lowering costs and increasing operational effectiveness by carefully monitoring and managing OT utilization.

The performance of OTs is evaluated against quality indicators to make sure it meets or exceeds defined requirements. These indicators cover a range of topics, such as the frequency of surgical site infections adherence to safety related and scheduling related indicators, adherence to anesthetic procedures, patient satisfaction, and prompt surgery completion. Hospitals can pinpoint areas for improvement, implement evidence-based procedures, and improve patient outcomes by concentrating on these indicators.

Effective planning, coordination, and timing of surgeries are necessary for maximizing OT utilization. Hospitals may expedite the surgical process, minimize delays, and improve resource allocation by utilizing cutting-edge technology including computerized scheduling systems, real-time monitoring, and data analytics. In order to ensure seamless operations and reduce disruptions, it is also crucial to retain a committed surgical team that is both trained and well-equipped.

The best way to utilize OT is to work together with other stakeholders, including surgeons, anesthesiologists, nursing staff, and hospital administrators, to maintain high-quality surgical services. To identify and address difficulties, apply best practices, and achieve long-lasting gains in OT performance, regular communication, interdisciplinary teamwork, and continual quality improvement activities are required.

The hospital and the patients would ultimately profit from good management of OT utilization and adherence to quality indicators in a number of ways. By increasing their ability to deliver fast and safe surgical care, hospitals are better able to decrease waiting lists and boost patient satisfaction. Additionally, as it minimizes overtime costs, lowers cancellations, and maximizes the utilization of pricey infrastructure and equipment, optimized OT utilization helps to cut costs.

In conclusion, providing high-quality surgical services within a hospital depends on the effective use of operating rooms and adherence to quality standards. Hospitals can improve patient outcomes, increase resource use, and advance overall operational effectiveness by concentrating on these factors. For advancements to continue and to be secure, best practices must be continuously monitored, evaluated, and applied.

6.1 IMPLICATION OF THE RESEARCH

The research is aimed at finding out gaps in scheduling of OT. Mismanagement of OT has implications on patient satisfaction, revenue generation, utilization of hospital resources and continuity of care.

Through the study we can identify the reasons and bottlenecks of the hospital operational system.

6.2 RECOMMENDATION

Reduce the incidence of surgeries before and after the actual working hours so as to avoid overtime payments and to tackle the surgeries occurring at non-scheduled hours. When all surgeries are scheduled within the scheduled hours all the available staffs can be utilized at the same time.

It is noted that few operative patients don't get admitted to the hospital due to lack of availability of beds. Those patients shows up on the day of surgery and sometime is required by the nurses to complete necessary documental works. This leads to loss in OT utilization time. Adequate steps must be taken into action.

Suggestions for non-clearance of billing are:

- For insurance verification – ensuring all necessary information has been provided & verified. Whatever information given to the billing department regarding insurance such as past history , present disease etc should be valid.
- Communication – patient or their members should inform the billing about the status of the payment & any potential delays. Similarly billing should provide clear instructions for payment process.
- Payment plan – in cases where immediate payment is not possible, the hospital may set up a payment plan or make alternative for bill settlement.

Suggestions for delay of scheduled cases:

- Streamlining the process flow by optimizing the patient flow by implementing processes that minimize patient waiting times. This includes efficient admission & discharge processes, thereby reducing delays in transferring patients from ward to pre-op area as well as pre-op area to OT.
- Preoperative assessment by ensuring all the tests & clearances are obtained in advance. Adequate preparation of patient before surgery to be emphasized.
- OT can be provisionally booked or not booked until the patient is declared to be fit as per doctor to reduce the cause of rescheduling.

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