

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

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- Operation theatre (OT) is highly specialized environment that requires high degree of attention to Quality Indicators to ensure patient safety and successful outcomes.
- In any hospital, the operation theatre (OT) complex is said to be the primary source of revenue generation with around 50%–60% of revenue generated only with this area.
- It is also a costly component of a hospital budget expenditure.
- To achieve a high level of utilization in the OT, it is necessary to efficiently coordinate a number of activities and personnel.
- OT utilization is defined as the quotient of hours of OT time actually used during elective resource hours and the total number of elective resource hours available.
- A study conducted by Tyler DC et al. (2003), the ideal utilization of an Operation theatre is between 85% to 90% (variability in the duration of different cases has been considered).

Operative procedures are classified as:

- Major and Minor
- Emergency and Elective
- Day- care

REFERENCE: Vinukondaiah K, Ananthakrishnan N, Ravishankar M. Audit of operation theatre utilization in general surgery. *Natl Med J India*. 2000;13:118–21.
Donham RT, Mazzei WJ, Jones RL. Columbus (OH): Association of Anaesthesia Clinical Directors; 1996. Association of anaesthesia clinical directors' procedural times glossary: Glossary of times used for scheduling and monitoring of diagnostic and therapeutic procedures.
Tyler DC, Pasquariello CA, Chen CH. Determining optimum operating room utilization. *Anesth Analg*. 2003 Apr;96(4):1114-1121.

AIMS & OBJECTIVES

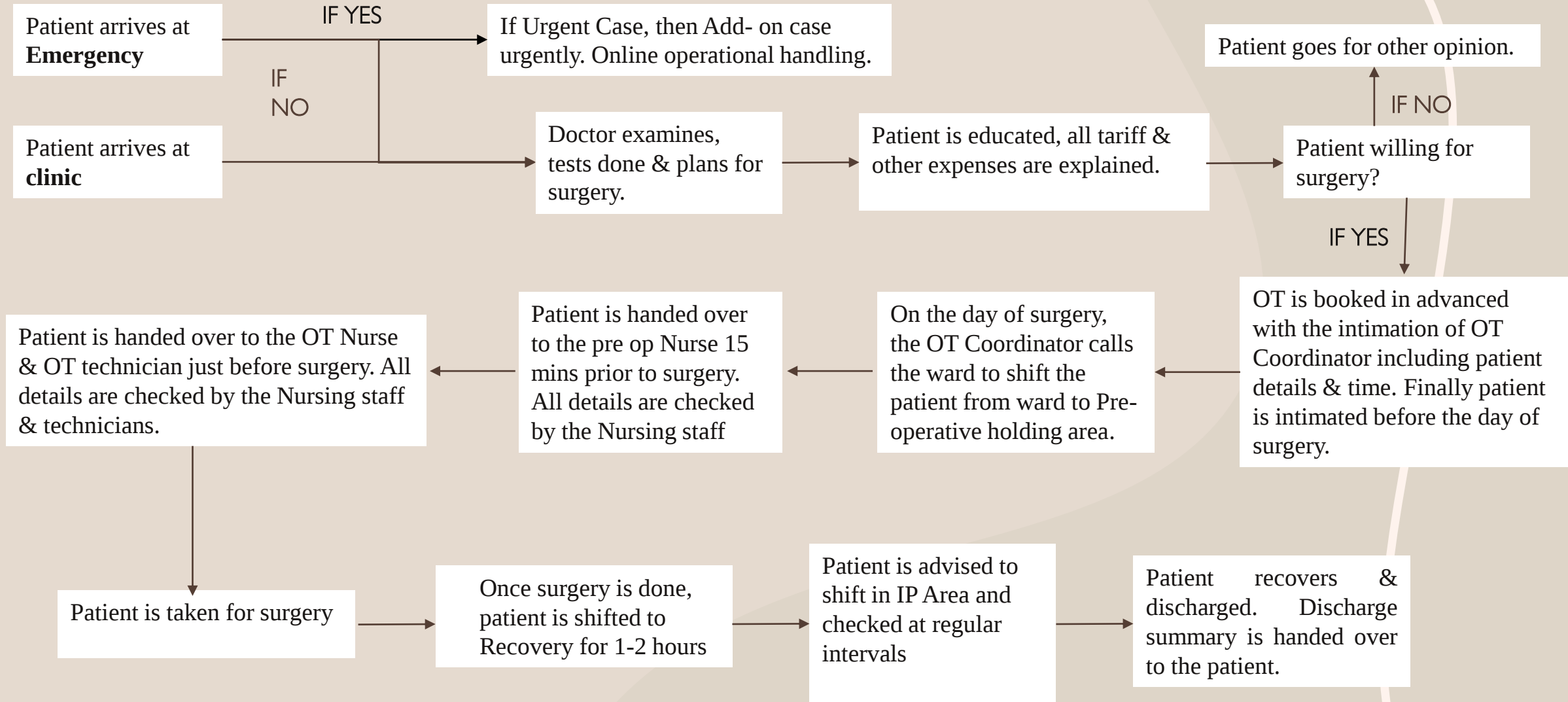
The broad aim is to study and analyse Quality Indicators of the Operation Theatre and to identify the gaps (if any).

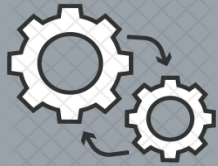
Specific **objectives** of this study are:

- To examine the utilization of OT.
- To identify the reasons for rescheduling and postponed surgeries.
- To identify the proportions of Planned and unplanned surgeries.



PROCESS FLOW





STUDY TYPE

Cross-sectional descriptive study from 1st January, 2023 to 30th April, 2023.

Data of January : Retrospective study

Data of February: Retrospective study

Data of March : Prospective study

Data of April: Prospective study



STUDY DURATION:

Sample size : January to April is 2953.

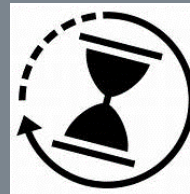
Study area : OPERATION THEATRE

Sampling method : Non-probability convenient sampling



SOURCE OF DATA:

OT register from every OTs , HMIS software, OT Booking register, Computer entry register, Incident reports of patients for the indicators, OT recovery register.



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.

CARDIAC OPERATION THEATRE UTILIZATION (Jan to April 2023)

$$\text{OT Utilization \%} = \frac{[\text{Hours utilized} + (\text{total no of surgery} \times \text{cleaning time})]}{(\text{total working hours} \times \text{total no of OTs} \times \text{total working days})} \times 100$$

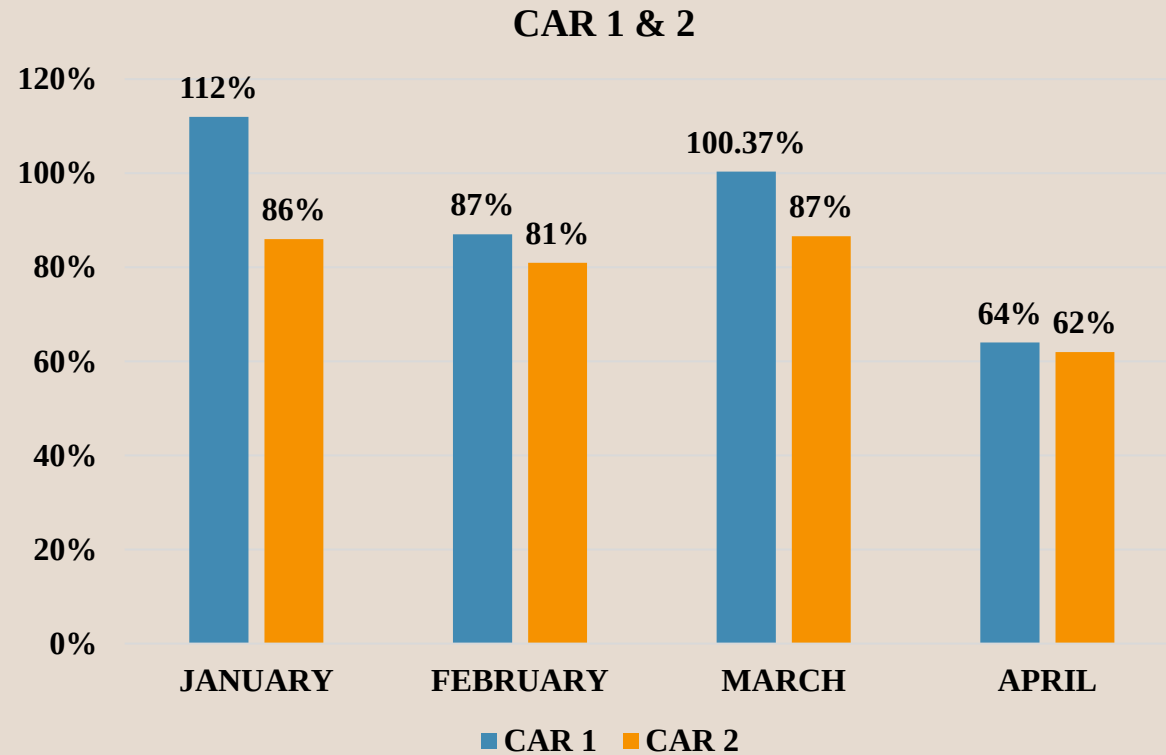


Table 1. Cardiac 1

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

Table 2. Cardiac 2

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

INTERPRETATION

In cardiac OT 1 , it is observed that **January** has the highest utilization % (**112%**) followed by **March** (**100.37%**), **February** (**87%**) and **April** (**64%**) as shown in the table 1. In cardiac OT 2 , it is observed that **March** has the highest utilization % (**87%**) followed by **January** (**86%**), **February** (**81%**) and **April** (**62%**) as shown in the table 2. It is noted that **Cardiac 1** is utilized more than **Cardiac 2** for every months as shown in the graph.

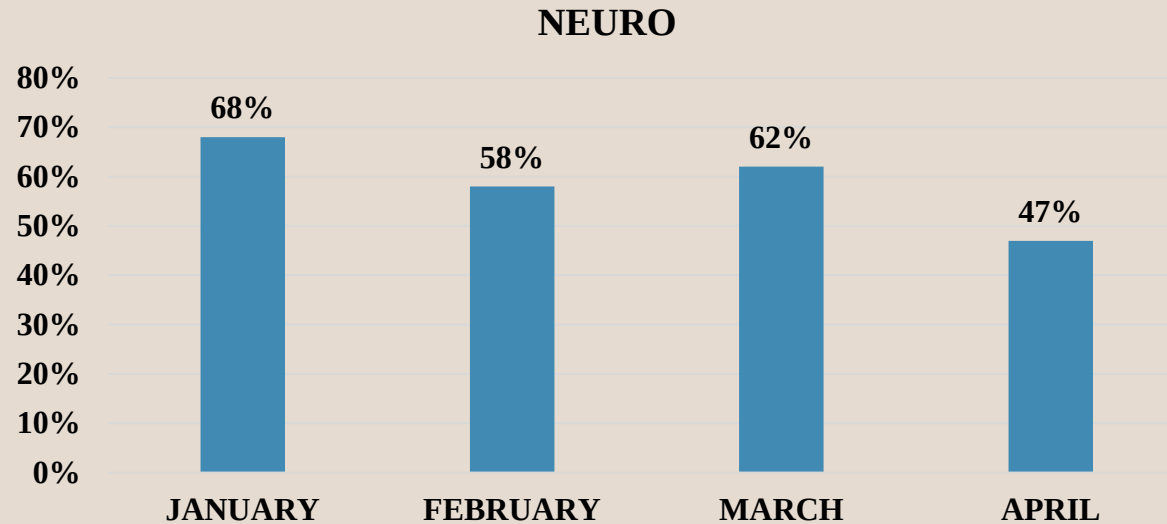


Table 3. Neuro OT

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	48	68%
February	38	58%
March	46	62%
April	31	47%

INTERPRETATION

In Neuro OT, it is observed that **January** has the highest utilization % (**68%**) followed by **March (62%)**, **February (58%)** and **April (47%)** as shown in the graph.

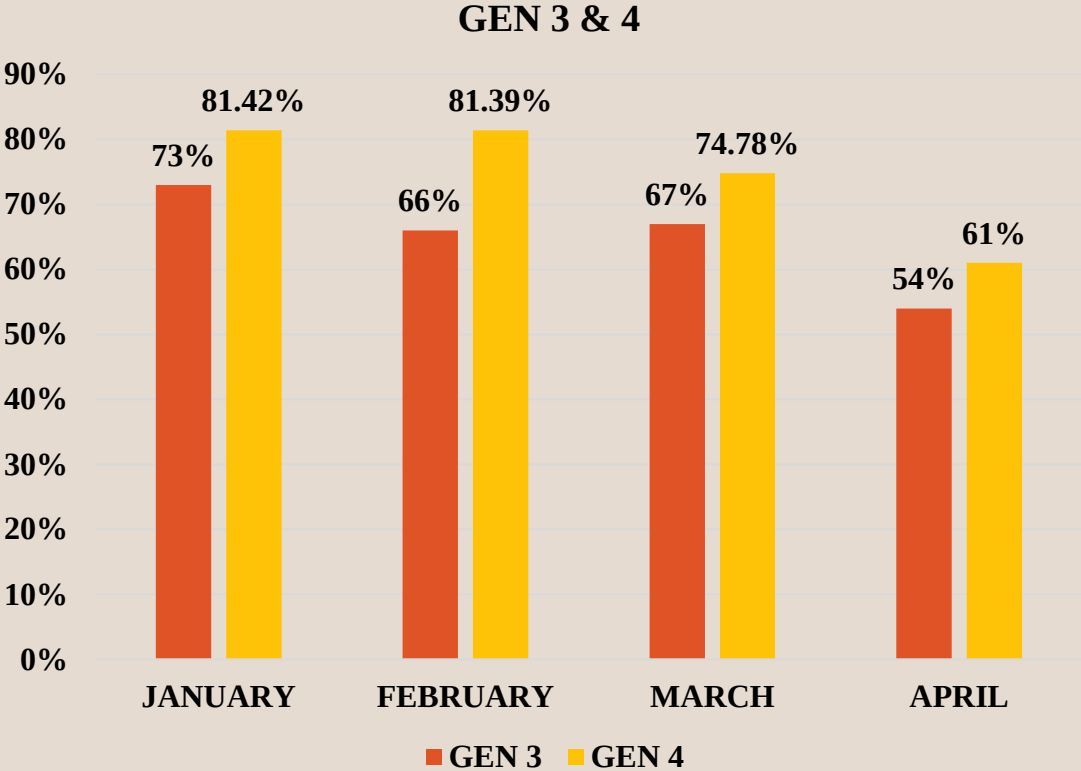


Table 4. General 3

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

Table 5. General 4

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

INTERPRETATION

In General OT 3, it is observed that **January** has the highest utilization % (**73%**) followed by **March (67%)**, **February (66%)** and **April (54%)** as shown in the table 4. In General OT 4, it is observed that **January** has the highest utilization % (**81.42%**) followed by **February (81.39%)** , **March (74.78%)**, and **April (61%)** as shown in the table 5. It is noted that mostly **General OT 4** has more utilization than **General OT 3** in every months as shown in the graph.

ORTHO OPERATION THEATRE UTILIZATION (Jan to April 2023)

ORT 1 & 2

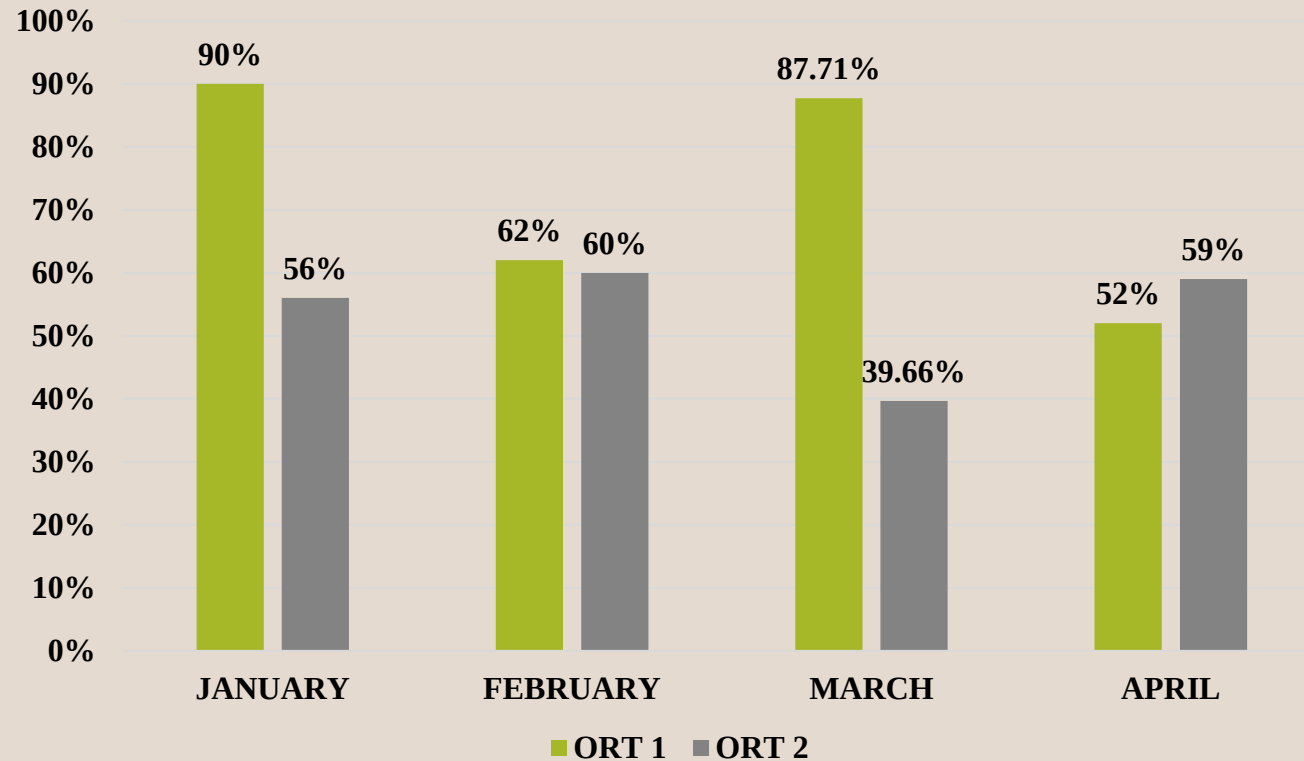


Table 6. Ortho 1

VARIABLE	FREQUENCY (n)	PERCENTAGE %
January	117	90%
February	94	62%
March	135	87.71%
April	82	52%

Table 7. Ortho 2

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

INTERPRETATION

In Ortho OT 1, it is observed that **January** has the highest utilization % (**90%**) followed by **March (87.71%)**, **February (62%)**, and **April (52%)** as shown in the table 6. In Ortho OT 2, it is observed that **February** has the highest utilization % (**60%**) followed by **April (59%)**, **January (56%)**, and **March (39.66%)** as shown in the table 7. It is noted that **Ortho OT 1** is utilized more than **Ortho OT 2** in every months as shown in the graph.

5TH FLOOR OPERATION THEATRE UTILIZATION (Jan to April 2023)

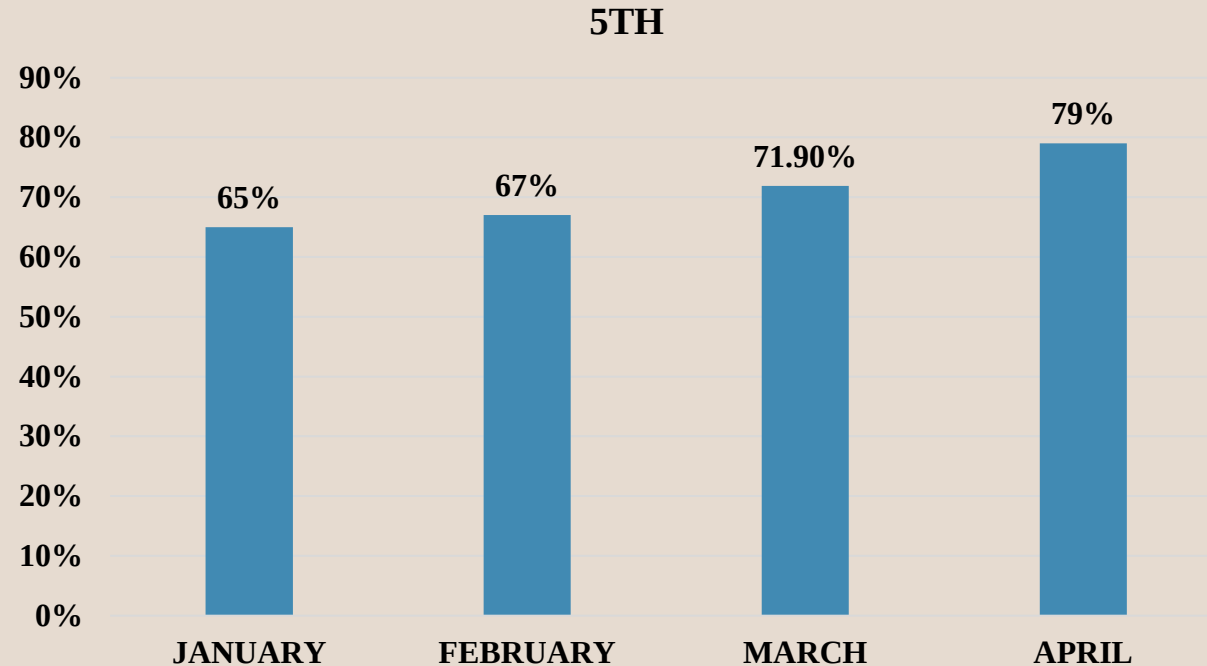


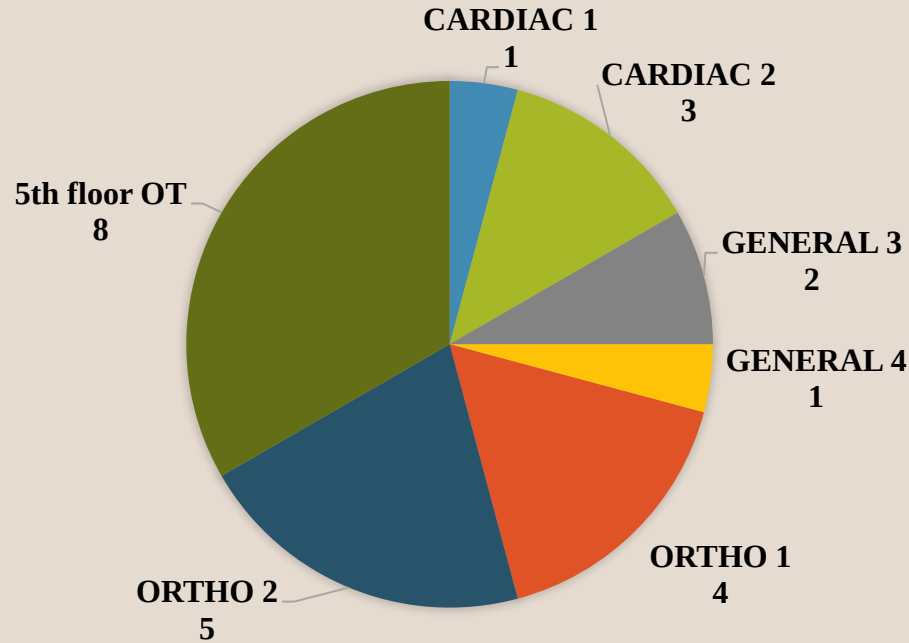
Table 8. 5th floor OT

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

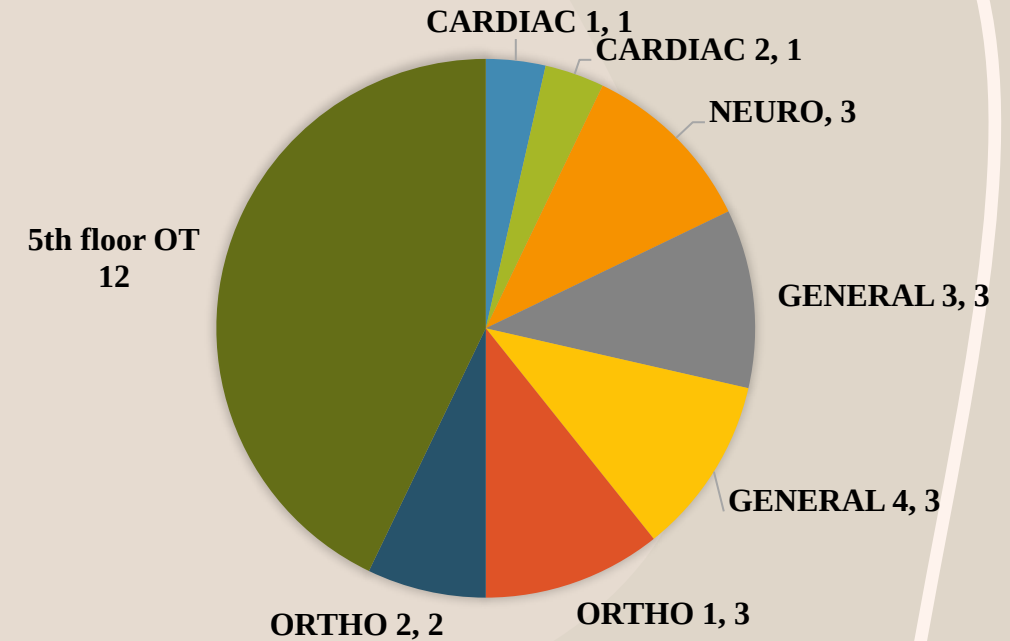
INTERPRETATION

In 5TH Floor OT, it is observed that **April** has the highest utilization % (**79%**) followed by **March (71.90%)**, **February (67%)** and **January (65%)**, as shown in the graph.

PLANNED & EXTENDED CASES



UNPLANNED & REXPLORATION



INTERPRETATION

In the pie chart, it is indicated that the graph being referred to includes **re-explorations** that were performed after 8 pm. **5th Floor 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.

Percentage of Rescheduling of surgeries

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

% of rescheduling of surgeries = Total number of rescheduled surgeries/Total number of surgeries*100

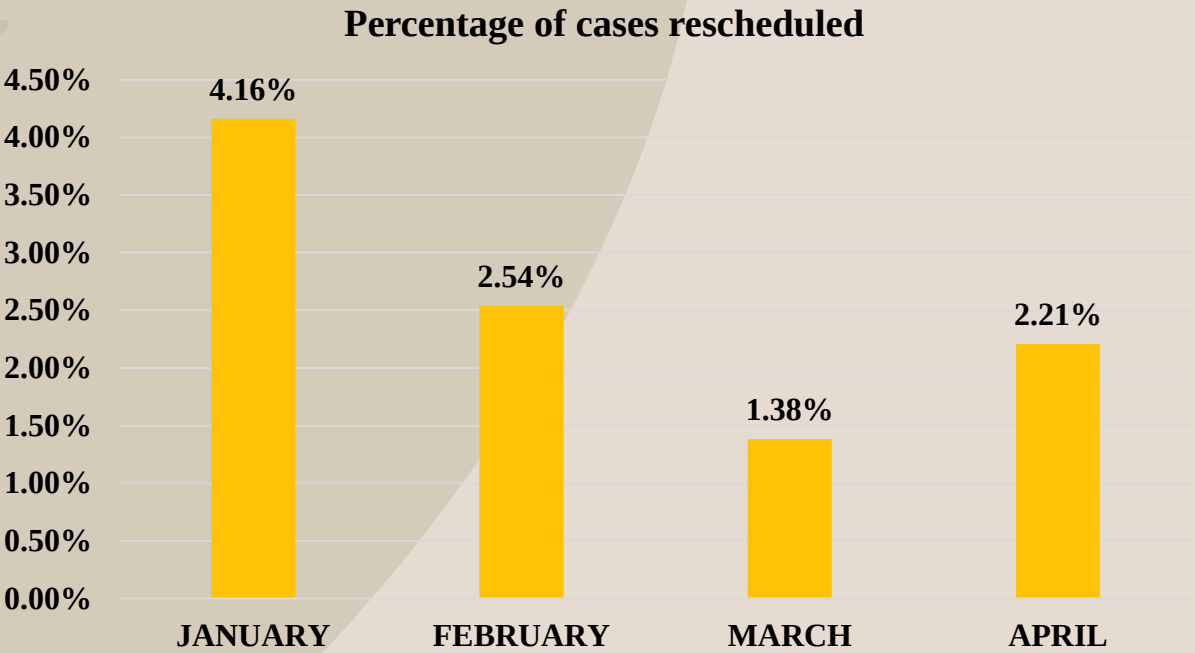


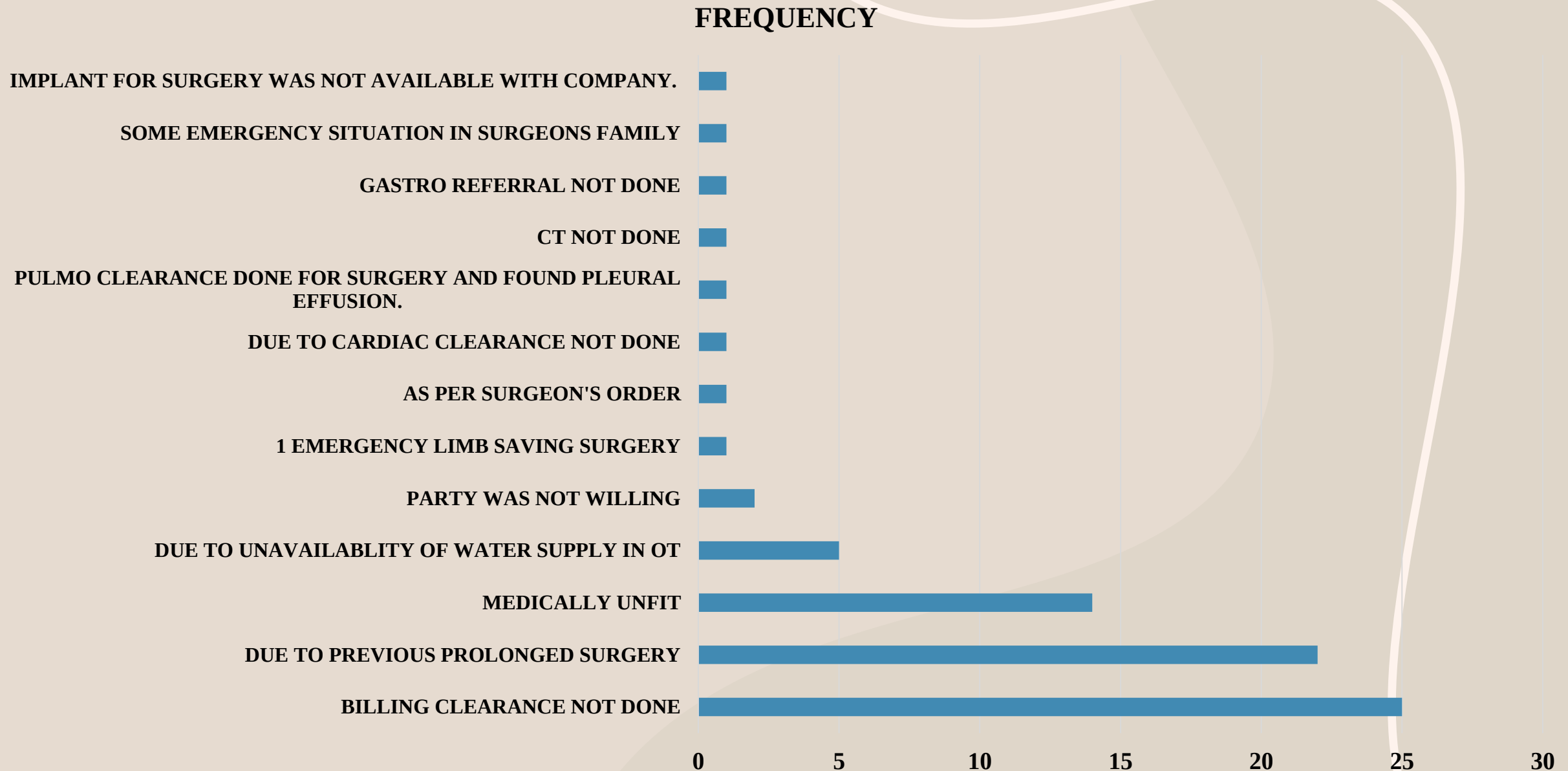
Table 9.

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

INTERPRETATION

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

Analysis of reasons for rescheduling of surgeries Jan–April, 2023

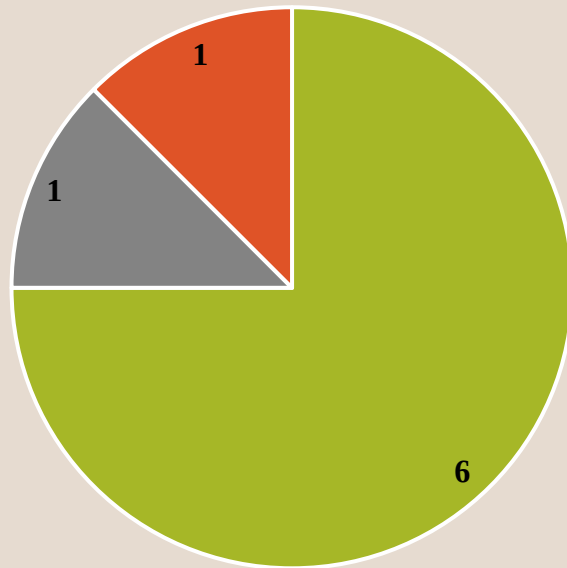


Percentage of cancellations of cases from Jan- April 2023

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

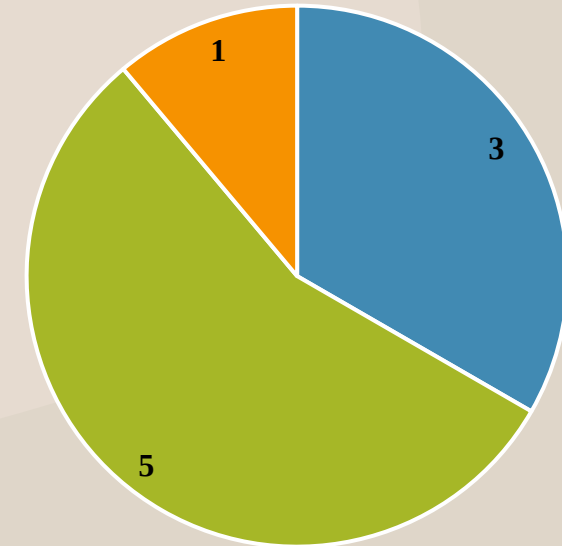
Table 10.

JANUARY frequency



■ Patient refusal ■ Patient DAMA ■ Unavailability of surgeon

FEBRUARY frequency



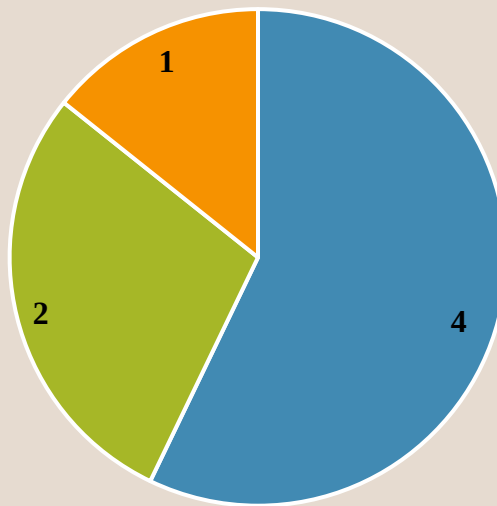
■ Patient DAMA
■ medical reasons (UTI, Bleeding, no fit form, high K+)
■ Patient unwilling

Percentage of cancellations of cases from Jan- April 2023

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

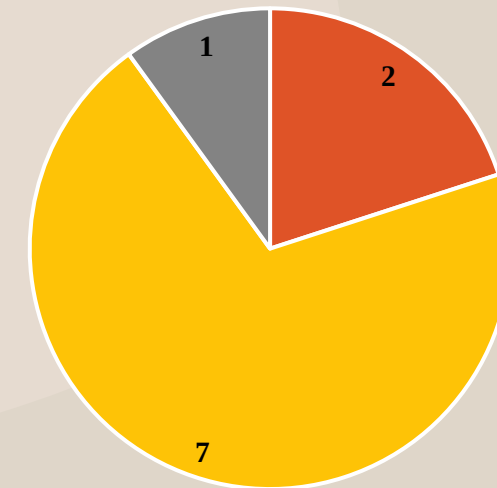
Table 11.

MARCH frequency



- Medical reasons(high TSH, fever, previously prolonged disease)
- Patient DAMA
- permission hold

APRIL frequency



- party refusal
- medical reasons(high TSH, creatinine, INR, BP, vein not found)
- delayed to get permission

Re-exploration Rate

Re-exploration rate= Total number of re-exploration/ Total number of surgeries*100

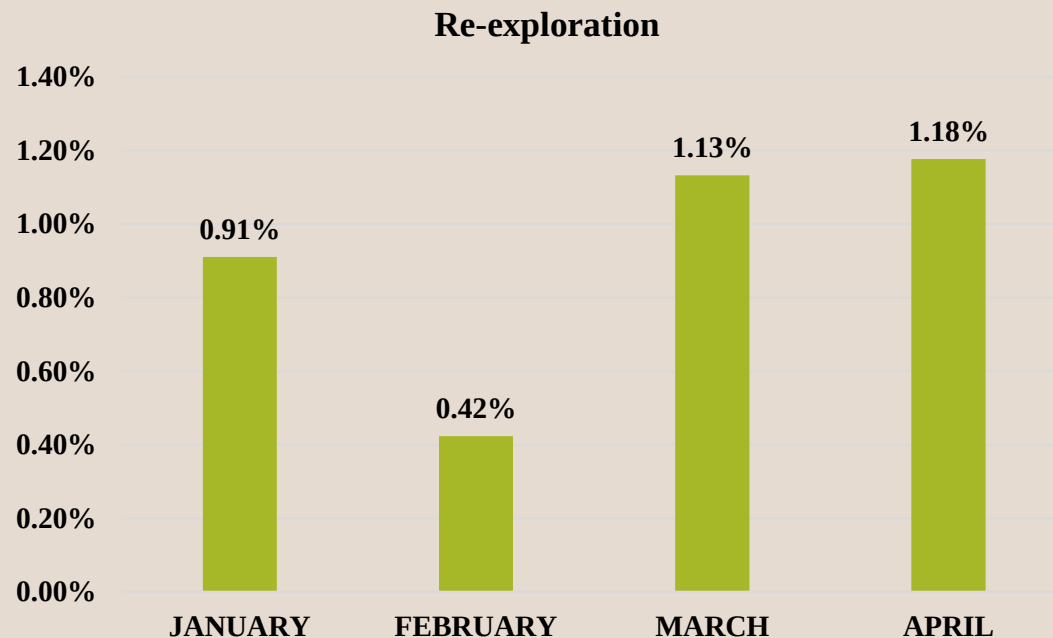


Table 12.

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

Cardiac re-explorations

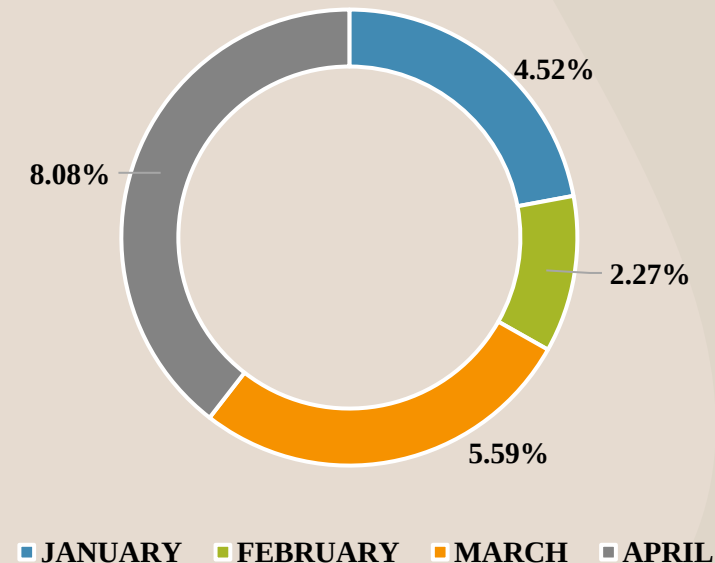


Table 13.

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

PREVALENCE RATE :

Re-exploration for bleeding, which occurs after 2% to 6% of cardiac procedures.

INTERPRETATION

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

Percentage of unplanned return to OT

% of unplanned return to OT = Number of unplanned return to OT / Total number of surgeries * 100

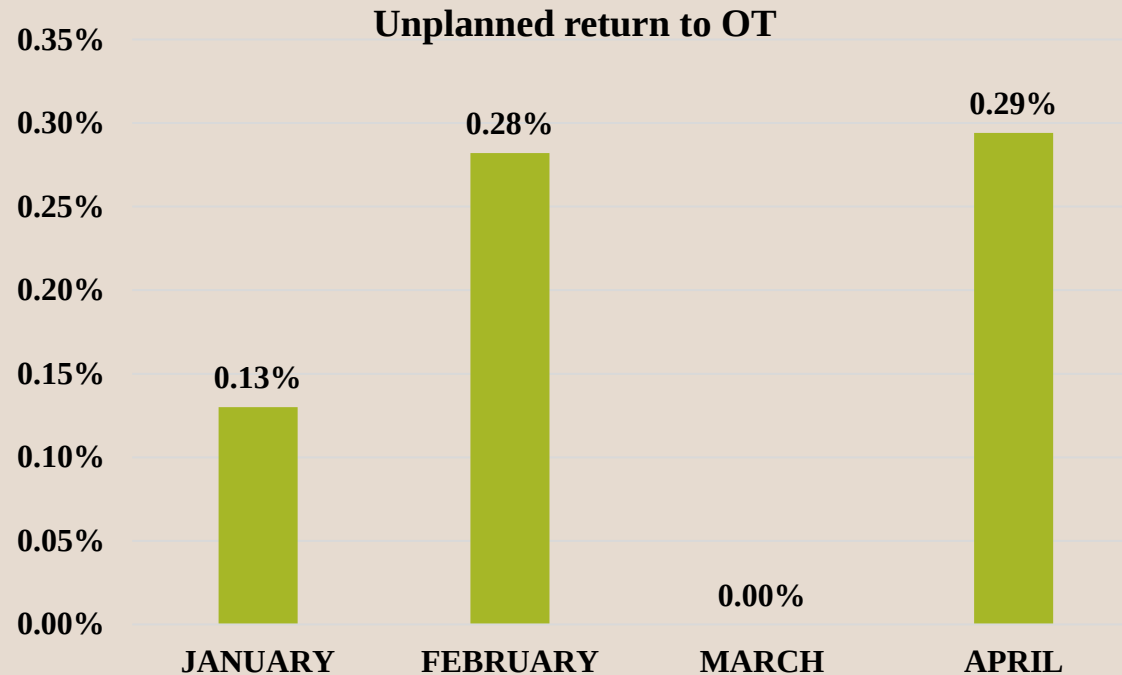


Table 14.

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%

PREVALENCE RATE :

3.50% cases had an unplanned return to the OT.

INTERPRETATION

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

REFERENCE: Birkmeyer JD, Hamby LS, Birkmeyer CM, Decker MV, Karon NM, Dow RW. Is unplanned return to the operating room a useful quality indicator in general surgery? Arch Surg. 2001 Apr;136(4):405-11. doi: 10.1001/archsurg.136.4.405. PMID: 11296110.

Percentage of cases in which planned surgery changed intra-operatively

Intra-operative change rate = Total number of cases changes intra-operatively/Total number of surgeries *100

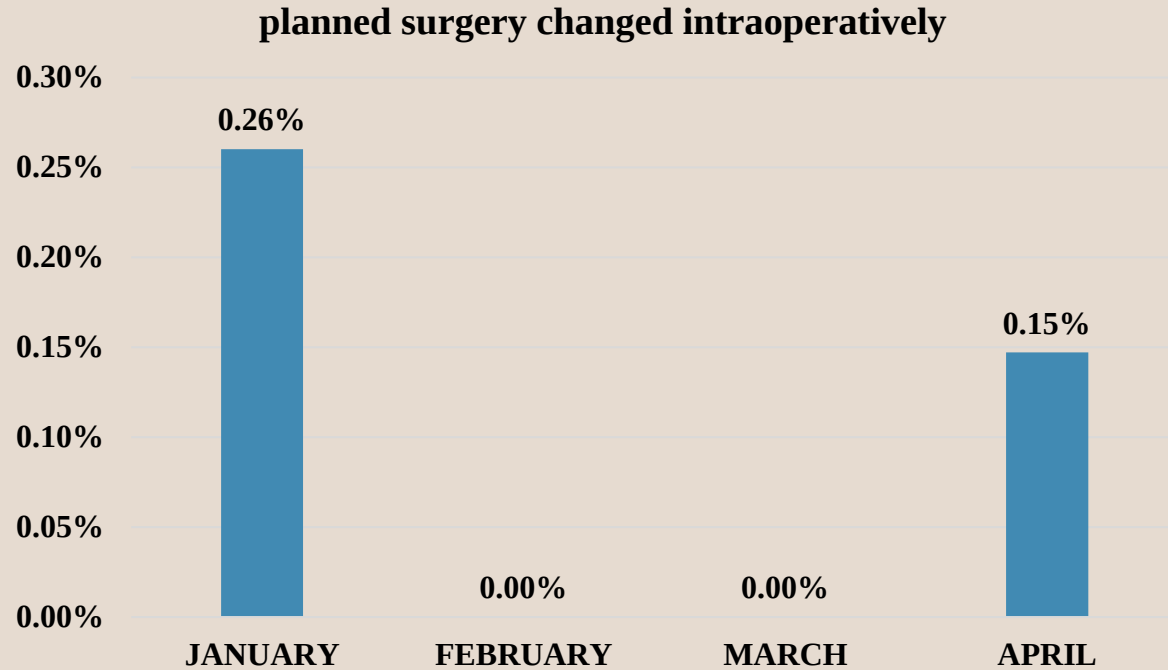


Table 15.

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%

INTERPRETATION

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

Percentage of surgeries where the organisation's procedure to prevent adverse events like the wrong site, wrong patient and wrong surgery have been adhered to

Wrong site, wrong patient & wrong surgery=Number of cases where the procedure was followed/Total number of surgeries *100

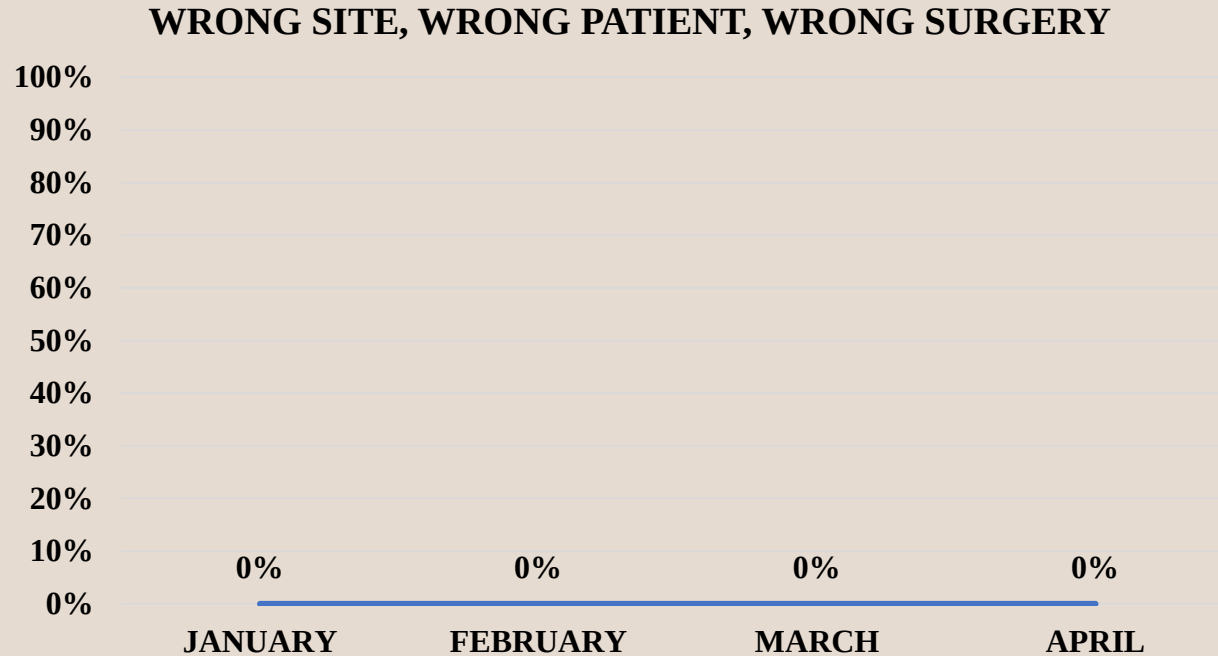


Table 16.

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

Modification in anesthesia plan

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

% Modification in anesthesia plan = Number of cases where anesthesia plan modified/ Total number of patients who underwent anaesthesia *100

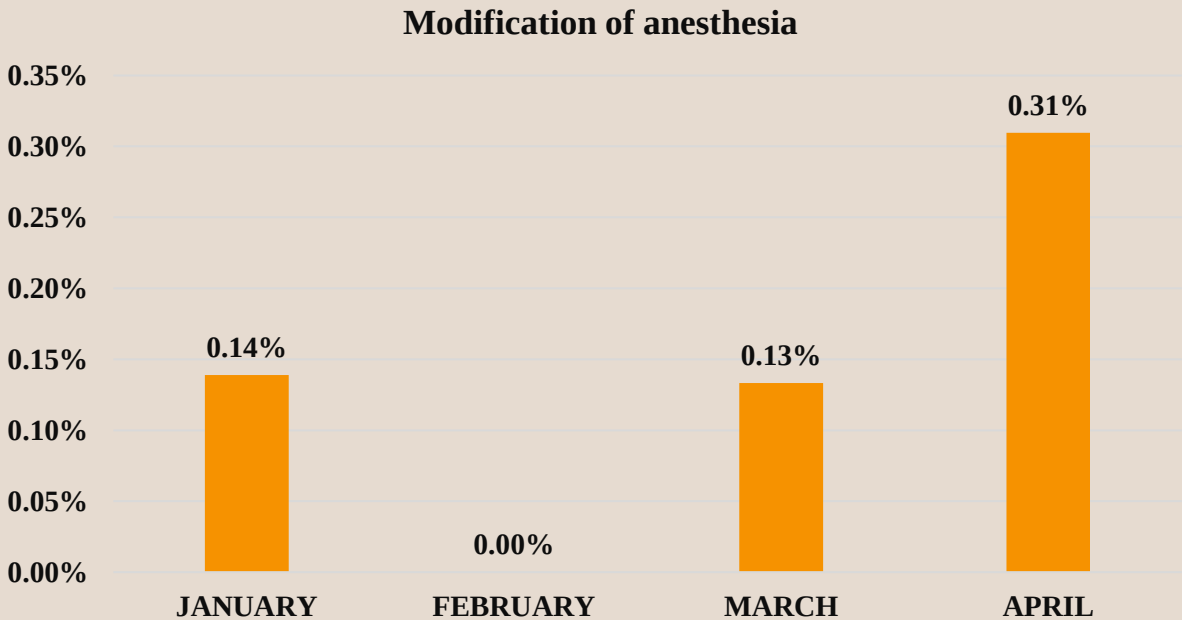


Table 10.

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%

PREVALENCE RATE :

Modification in anesthesia plan is 13.72 %.

INTERPRETATION

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

Adverse event due to anaesthesia

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

$$\% \text{ Adverse anaesthesia event} = \frac{\text{Total number of Adverse anaesthesia event}}{\text{Total number of patients who underwent anaesthesia}} \times 100$$

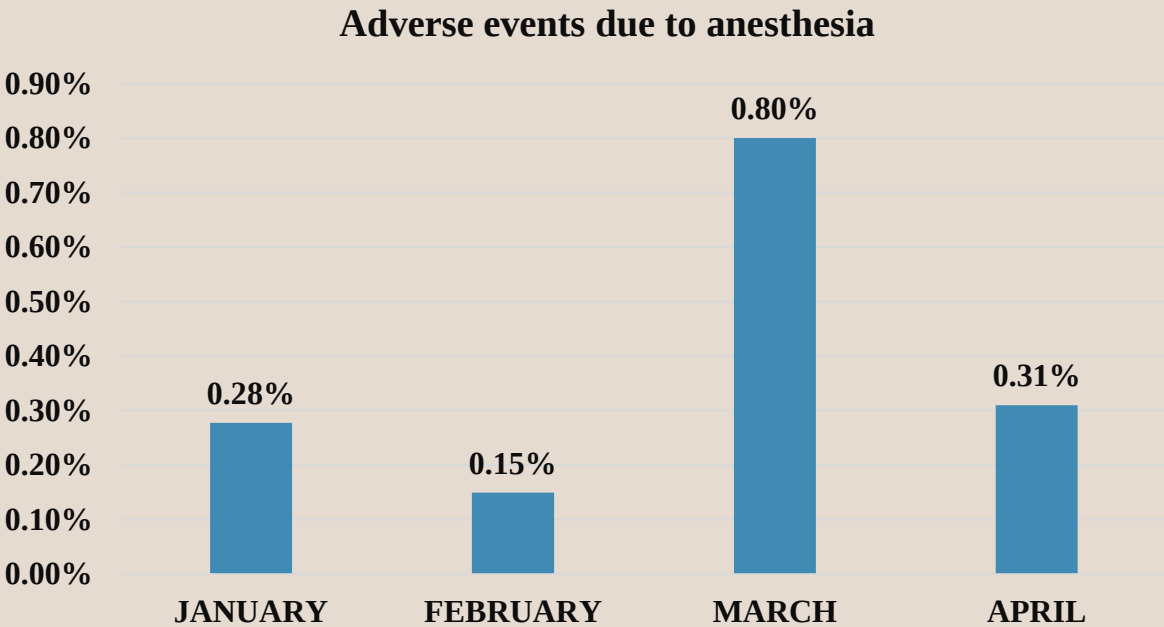


Table 10.

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%

PREVALENCE RATE:

The percentage of adverse events is 4.8%.

INTERPRETATION

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

REFERENCE: Adrian Liau et al. An Overview of Adverse Events in the National Anesthesia Clinical Outcomes Registry (NACOR). 2014. American society of anesthesiologists.
Petra Bejvancicka, Iva Brabcova et al. Adverse events in anaesthesia care. 2020;22/3: 183-192. doi.org/10.327525/kont.2020.01113

Unplanned ventilation due to anaesthesia

% of unplanned ventilation = Number of patients requiring unplanned ventilation following /Number of patient who underwent anaesthesia

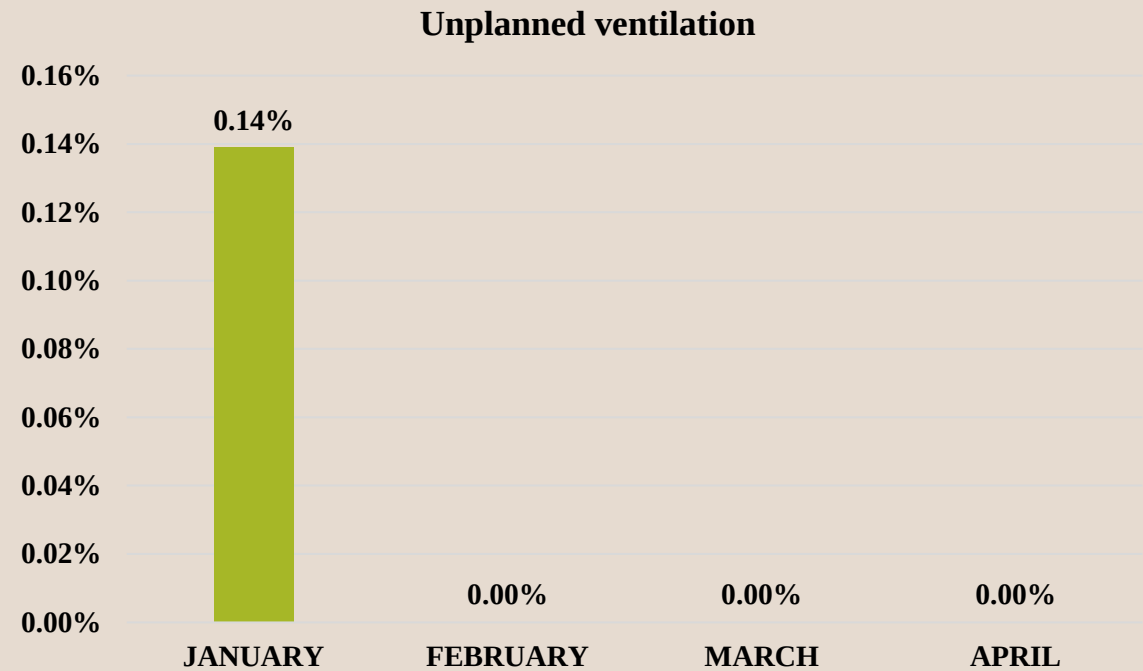


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January	1	720	0.14%
February	0	670	0.00%
March	0	750	0.00%
April	0	646	0.00%

INTERPRETATION

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

% of anaesthesia related Mortality= Number of patients who died due to anesthesia / Number of patient who underwent anesthesia *100

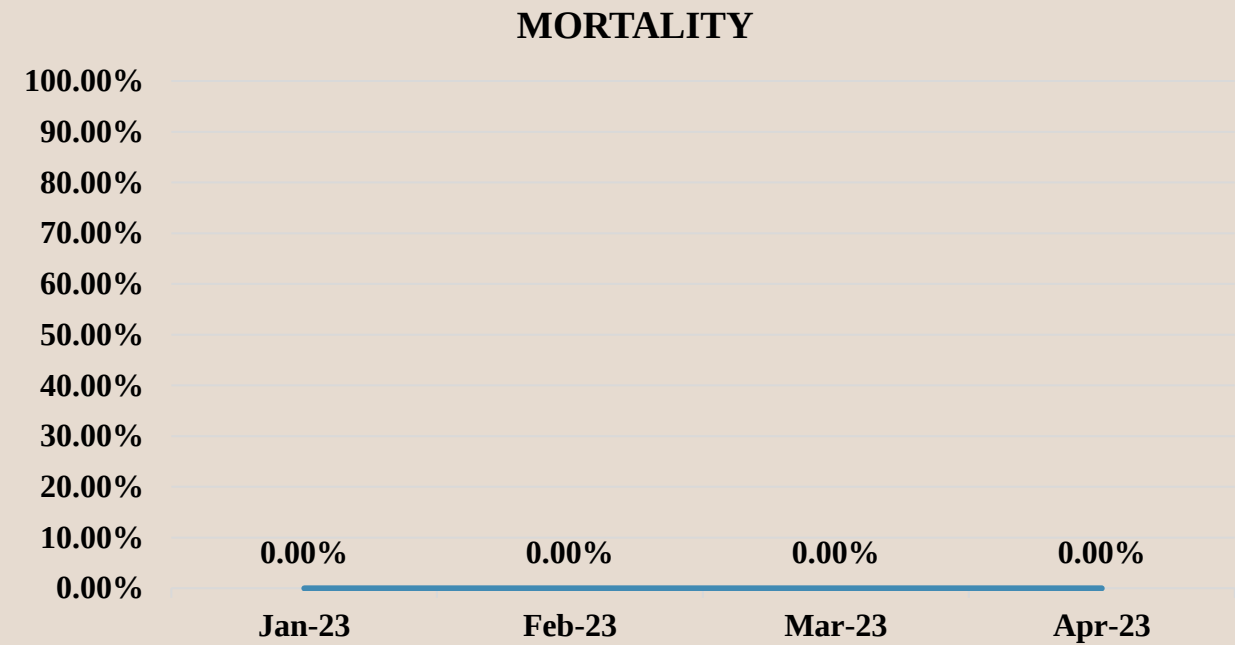


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VARIABLE	FREQUENCY (n)	TOTAL	PERCENTAGE %
January	0	720	0.00%
February	0	670	0.00%
March	0	750	0.00%
April	0	646	0.00%

Percentage of cases starting WITHIN 30 MINS, PRIOR TO 30 MINS, DELAYED BY 30 MINS OR MORE



Table 10.

VARIABLE	Start within 30 mins	Start prior 30 mins	Start after 30 mins
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

RESULTS

In this report from January to April 2023, it is evident that :

The Average Utilization % for **Cardiac 1** is **90.84%** & for **Cardiac 2** is **79%**.

The Average Utilization % for **Neuro OT** is **58.75%**.

The Average Utilization % for **General 3** is **65%** & **General 4** is **74.64%**.

The Average Utilization % for **Ortho 1** is **72.92%** & **Ortho 2** is **53.66%**.

The Average Utilization % for **5th Floor OT** is **70.72%**.

Average % of **Rescheduling of surgeries** is **2.57%**.

Average % of **Cancellation of surgeries** is **1.16%**.

Average % of **Re-exploration** cases is **0.94%**.

Average % of **Unplanned return to OT** is **0.17%**.

Average % of **planned surgery changed intraoperatively** is **0.10%**.

Average % of **Modification of anaesthesia** is **0.14%**.

Average % of **adverse anaesthesia event** is **0.38%**.

Average % of **Unplanned ventilation following anaesthesia** is **0.03%**.

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

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

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

Average % of cases which are **DELAYED** after 30 mins is **46.53%**.

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.

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** (after 30 mins 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.

- 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 show 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.

- 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 cases delayed after 30 mins, prior to 30 mins and within 30 mins of the scheduled time are considered.

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.

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 satisfaction. Hospitals can improve the entire surgical experience for patients while lowering costs and increasing operational effectiveness by carefully monitoring and managing OT utilization. Effective planning, coordination, and timing of surgeries are necessary for maximizing OT utilization.



1. Vinukondaiah K, Ananthakrishnan N, Ravishankar M. Audit of operation theatre utilization in general surgery. *Natl Med J India*. 2000;13:118–21.
2. Donham RT, Mazzei WJ, Jones RL. Columbus (OH): Association of Anaesthesia Clinical Directors; 1996. Association of anaesthesia clinical directors' procedural times glossary: Glossary of times used for scheduling and monitoring of diagnostic and therapeutic procedures.
3. Dacey LJ, Munoz JJ, Baribeau YR, et al. Reexploration for Hemorrhage Following Coronary Artery Bypass Grafting: Incidence and Risk Factors. *Arch Surg*. 1998;133(4):442–447. doi:10.1001/archsurg.133.4.442
4. Birkmeyer JD, Hamby LS, Birkmeyer CM, Decker MV, Karon NM, Dow RW. Is unplanned return to the operating room a useful quality indicator in general surgery? *Arch Surg*. 2001 Apr;136(4):405-11. doi: 10.1001/archsurg.136.4.405. PMID: 11296110.
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The background of the slide is a light gray color. It features several large, organic, abstract shapes. On the left side, there is a large, solid reddish-brown shape. On the right side, there is a large, solid olive-green shape. A thin, white, wavy line outlines a portion of the olive-green shape. In the top left corner, there is a faint, light gray line drawing of a plant with several leaves.

Thank you