Internship Training

at

Venkateshwar Hospital, Dwarka

Understanding OT Utilization and Impact on Major Surgeries due to Covid-19

by

Lt Col Naveen Kumar Singh

PG/20/039

Under the guidance of

Dr Nikita Sabherwal

Associate Professor, IIHMR, Dwarka, New Delhi

PGDM (Hospital & Health Management) 2020-22

International Institute of Health Management Research, New Delhi

The certificate is awarded to

Lt Col Naveen Kumar Singh

in recognition of having successfully completed his Internship in the department of

Operation Theatre (OT)

and has successfully completed his Project on

Understanding OT Utilization and Impact on Major Surgeries due to Covid-19 being conducted in Venkateshwar Hospital, Dwarka

15 Mar 2022 to 14 Jun 2022

at

Venkateshwar Hospital, Dwarka

He comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning.

We wish him all the best for future endeavors.

Mr Sanjay Saxena
Sr GM, HR
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Sanjay Saxena
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Certificate from Dissertation Advisory Committee

This is to certify that **Lt Col Naveen Kumar Singh,** a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. He is submitting this dissertation titled "**Understanding OT Utilization and Impact on Major Surgeries due to Covid-19" at**

Venkateshwar Hospital, Dwarka

In partial fulfillment of the requirements for the award of the **PGDM (Hospital & Health Management).**

This dissertation has the requisite standard and to the best of our knowledge, no part of it has been reproduced from any other dissertation, monograph, report or book.

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Lt Col Naveen Kumar Singh** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **Venkateshwar Hospital, Dwarka** from **15 Mar 2022** to **14 Jun 2022**.

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements. I wish him all success in all his/her future endeavors.

Dr. Sumesh Kumar
Associate Dean, Academic and Student Affairs
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Certificate of Approval

The following dissertation titled **"Understanding OT Utilization and Impact on Major Surgeries due to Covid-19** at **"Venkateshwar Hospital, Dwarka"** by Lt Col Naveen Kumar Singh (PG/20/039) is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health Management)** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

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Name of the Student : **Lt Col Naveen Kumar Singh**

Name of the Organization : **Venkateshwar Hospital, Dwarka, New Delhi**

Area of Dissertation : **Operation Theatre Utilization and efficiency during pre and post Covid-19 period.**

Attendance : **Adequate**

Objectives achieved : **Yes**

Deliverables : **Adequate and in depth analysis of Operation Theatre utilization in pre and post Covid period at Venkateshwar Hospital supported by statistical data and detailed analysis.**

Strengths : **A committed, sincere, diligent, cooperative and positive natured individual with strong drive and zeal for mutual learning.**

Suggestions for Improvement : **Nil**

Date : 14 **Jun 2022**

Place : **Dwarka, New Delhi**

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This is to certify that the dissertation titled

Understanding OT Utilization and Impact on Major Surgeries due to Covid-19 being conducted at Venkateshwar Hospital, Dwarka

Submitted by

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Under the supervision of **Dr Nikita Sabherwal, Associate Professor, IIHMR, Dwarka, New Delhi** for award of PGDM (Hospital & Health Management) of the Institute carried out during the period from 15 Mar 2022 to 14 Jun 2022 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature

NAVEEN KUMAR SINGH
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EXECUTIVE SUMMARY

The operation theatre of any level of health care, hospital is considered to be the main source for generation of revenue. Its contribution towards the total revenue is about 50-60% for the Hospital. Whereas there are other departments like IPD, OPD, Pathology, Radiology etc. which also generate the revenue for the hospital having lesser contribution. This revenue-generating component becomes much more prominent in hospitals with several operating facilities. Any hospital's Operation Theatre complex necessitates a significant financial investment from the hospital's budget, both in terms of construction and day-to-day operations. As a result, it is critical for any hospital's management to guarantee that a high-cost facility like OT is used to its full potential so that the hospital may produce the most income possible. According to several studies, hospitals that are considered to be the finest in their industries are unable to fully utilize the OT and are only able to generate 30 to 35 percent of revenue on weekdays. Hospitals were rapidly altering for better and more efficient use of OTs before the Covid-19 pandemic broke out, and they were simplifying important areas such as design, layout, surgical scheduling, manpower use, and so on.

The current COVID-19 epidemic and ensuing lockdown have had different degrees of negative impact on worldwide health care services. Emergency services were also impacted, as were elective surgeries, which were postponed to help the healthcare systems cope with the additional strain of Covid-19 patients. With over 53 crore cases and over 63 lakh deaths so far, the pandemic has been a major challenge for the entire world. During this crisis, all specialties have made advice for how to cope, which has had a significant impact on surgical practice. All authorities have had to emphasize the importance of their daily surgical procedures and pursue non-surgical therapy options to ease out the burden on OTs. The pandemic has had an impact on working methods, surgical techniques, theatre workflow, patient and safety of staff, training and education, and so on. During the pandemic, surgeons were needed to continue to deliver best possible surgeries within the existing constraints, based on specialty-specific guidelines that were created and followed.

These difficulties have also put the hospitals and health systems under exceptional monetary issues and threats. The treatments which were not considered must were cancelled in hospitals, and few health-care systems have postponed elective surgery to prevent the virus from spreading to other patients or personnel. The treatment for patients who were Covid positive has resulted in increase in demand for some equipment and materials, due to the sudden demand for these medicines, raising the price of medical expenditure. The pandemic has also increased enormous un-employment which has left many people without their jobs. The medical staff including the doctors and other have faced the pandemic with full dedication and were also helping the people in their daily needs by providing them with food, water, clothes, medicines etc. so that they can survive these harsh times.

To evaluate the OT in terms of utilization and efficiency of Venkateshwar Hospital, we have taken a cross sectional study, the surgery cases which were scheduled in the OT department over a period of three years. The data for the research has been taken from the Hospital records including the Medical Record Department of the Hospital. The study is retrospective and the secondary data of three years from 2019 to 2021 along with data for Jan to Mar 2022 has been utilized. The entire number of surgeries which have been done in the hospital were considered in the study hence no sampling was used. However, the major specializations in which the Hospital carries out surgeries have been taken separately and the data has been analyzed to establish the relationship between Pre-Covid and Post-Covid periods. The data on the number of hours the OT has been utilized at different periods of time at the peak of pandemic and during normal time has been carried out to analyze the relationship between availability and utilization of OT rooms.

The OT utilization and efficiency of Venkateshwar Hospital is of highest level. Scheduling of surgery cases is done judiciously and the schedule are strictly followed. It has been found that there has been reduction in number of surgical procedures which were being done during the pre Covid period in the year 2019 as compared to year 2020 and 2021. However, the number of surgeries has increased in year 2021 as compared to year 2020 as the procedures have been streamlined. The gap has reduced considerably with the beginning of Year 2022 which indicates that the OT utilization and efficiency is going back to the previous period of pre-Covid days. The specializations which were least effected in carrying

out surgeries during both the periods were Obstetrics & Gynecological Surgery, Cardiothoracic and Vascular Surgery, Surgical Oncology and Urology and renal transplant. However, the surgeries which had the maximum impact in the Hospital due to the outbreak of pandemic were ENT and Cochlear Implant Surgery, General Surgery, Ophthalmology and Plastic Surgery. Staffing of operation rooms like anesthetists and other supporting staff is at par with medical activity and is not normally subjected to multitasking as it can affect efficiency or performance satisfaction of specific tasks. The workflow of the OT is streamlined and standardization of surgical procedure equipment is in place.

According to the findings of the study, the Venkateshwar Hospital has been performing surgical procedures with caution and effective usage of OTs, with all precautions and appropriate mechanisms in place to ensure that the virus does not spread to other patients or OT employees.

INTRODUCTION

The use and efficiency of the hospital's OT, like satisfaction and quality, is a multi-dimensional notion. The utilization and efficiency of OT in any multi-healthcare facility hospital is dependent on a number of factors. It is based on other aspects of the hospital, such as marketing, HR, finance, IPD, OPD, pharmacy, and public relations, among others. As a result, it's also known as a measure of overall hospital performance.

Creating an OT facility in any hospital takes a lot of financial burden, so hospitals must make the most use of their resources. Rules and regulations surrounding the setup of an operating room, effective adherence and correct enforcement of all policies and procedures, and monitoring of the same are all vital components for any efficient OT. Operating time is valued as money in any OT, which is why management places a premium on efficient room utilization. As a result, each hospital's effective operation theatre utilization must be determined, and all efforts must be taken to reduce idle operation theatre hours.

The operating room of any level of health care, the hospital, is regarded as the primary source of revenue generation. It accounts for around 50-60% of total revenue. Other departments, such as IPD, OPD, pathology, radiology, and others, create revenue for the hospital although with a smaller contribution. This revenue-generating component becomes much more prominent in hospitals with several operating facilities. Any hospital's operation theatre complex necessitates a significant financial investment from the hospital's budget, both in terms of construction and day-to-day operations. As a result, it is critical for any hospital's management to guarantee that a cost effective facility like OT is used to its full potential in order to maximize revenue. According to several studies, even the top hospitals in the industry are unable to employ the OT to full capacity with maximum up to 30 to 35 percent on weekdays. Hospitals were rapidly altering for better and more efficient use of OTs before the Covid-19 pandemic broke out, and they were simplifying important areas such as design, layout, surgical scheduling, manpower use, and so on.

Earning profits by any organization is a necessary in the world of capitalism, and this is a universal truth. The importance of profit is strongly tied to customer, employee, and

stakeholder satisfaction. It also supports the organization's efficient operation by providing top-notch facilities and dependable services. The usage and efficiency of OT play a critical influence in a hospital's ability to meet these requirements.

Although the demand for surgical services is increasing, the margins are not increasing at the same rate. If we see from the top we may feel that the OTs in the Hospital are being fully utilized, however in case we collect the data and analyze it deeply, we may see that there are issues which should have been known and highlighted. It can be seen that the resources including the manpower may not been judiciously utilized that may be resulting in not maintaining the standards and improper planning of surgeries. This can have a detrimental impact on the bottom line. Shortage of an inventiveness-wide care delivery system which is used to align the data available and the functional processes that is required in OT is directly responsible for the majority of these challenges.

To successfully integrate a system with the OT, it is required to first investigate obligation for the same, then describe the solution, and finally demonstrate its benefits. The firm gains various benefits by integrating all the stakeholders which are directly or indirectly associated with the organization.

The following are key elements for effective OT use:

(a) The Operation Theatre's operational layout and equipment.

(b) OT staff who are well-trained.

(c) Implementation of an effective OT management system, appropriate communication and facilities are required.

(d) Effective use of available OT personnel and resources.

(e) OT staff's responsiveness, positive attitude, and ethical procedures.

(f) CSSD/TSSU capacity, pre-operative planning, and OT personnel levels.

(g) Proper planning and scheduling system of surgeries in the OT including emergency cases be carried at reasonable time.

(h) Increase earnings by making better decisions and lowering costs.

(j) Excess to real-time, enterprise-wide data for performance management and improvement.

(k) Increase resource usage by eliminating scheduling gaps and delays.

(l) Elimination of duplicate and manual operations to streamline workflow.

(m) Lowering supply costs by standardizing product usage and selections, enhancing contract compliance, and maximizing rebate opportunities.

(n) Improved patient care delivery through better data integration and availability.

Impact of Covid-19

On 11 March 2020, the World Health Organization (WHO) declared the Covid-19 as a pandemic which has affected the whole world. This epidemic put unprecedented strain on our healthcare systems, necessitating a quick re-allocation of resources and staff to deal with the influx of COVID-19 patients. The pandemic's impact on surgical procedures has been so significant and widespread that elective surgeries have been postponed around the world. All efforts were made to prioritize cases that required surgery, limit the time spent in the hospital, lower the risk of COVID-19 infection among healthcare personnel, and avoid hospital-acquired COVID-19 infection.

India, a country with a population of over 1.35 billion people, has been badly impacted by the rising incidence of COVID-19 cases. It has put a great strain on the country's already-scarce health-care infrastructure. For the population who required surgical care, resources were limited. According to the International Research Consortium, the lockdown to prevent the spread of Covid-19 has caused more than 5.8 lakh elective procedures in India to be delayed or cancelled. Normal surgical procedures must immediately resume at a normal rate, with necessary measures used to remove the building backlog. Because the country has been affected by the pandemic for more than two years, procedures cannot be postponed any longer because a patient's disease may progress to an advanced state. Before performing the surgery, each case had to be weighed individually and the required safeguards had to be taken. In the event that a patient is asymptomatic and a test cannot be performed due to an emergency scenario, the healthcare sector must realign itself such that surgeons and OT personnel proceed with procedures while taking all measures and supposing the patient is Covid-19 positive.

HOSPITAL PROFILE

The Venkateshwar hospital is a Venkateshwar group enterprise in the heart of Dwarka, New Delhi. It boasts cutting-edge technology and a team of dedicated medical professionals who have been working for the same cause to provide best available medical care. The practitioners work together to provide the best possible treatment to the patients, utilizing the most cutting-edge equipment and information technology.

After pioneering work in the education field for an extensive period, Venkateshwar Hospital has launched another project that promises superior medical facilities and uncompromising care par excellence. Its goal is to attain worldwide healthcare excellence through scientifically proved, clinical techniques that are morally correct with a group of highly qualified individuals'. The hospital is committed to providing uncompromised medical care to all patients. Venkateshwar hospitals is dedicated and ensures that all patients receive world-class health treatment and are with state-of-the-art infrastructure and medical services, including 325 patients' beds, 100 acute care beds, covering 32 medical fields, and 10 state-of-art OT's.

This multi-specialty hospital opened in January 2017 and has now reached full occupancy with 325 beds over a five-year span.

Apart from the middle-income group, the hospital has empanelment with government organizations such as CGHS, ECHS, and EWS categories, among others.

VISION

To position in the lead role on the global healthcare map.

MISSION

To achieve global excellence in healthcare with evidence based ethical clinical practices by the team of highly skilled professionals by using cutting edge technology.

VALUES

- Ethical Health care.
- Commitment to quality.
- Respect for individual.
- Trust.
- Integrity.
- Compassion.
- Equality.
- Innovation.
- Social Responsibility.
- Human Dignity.
- Excellence.
- Transparency.

Specialties of the Venkateshwar Hospital

a) 14 - Centres of Excellence.
b) 34 - Specialties.
c) 100 - ICU Beds.
d) 325 - Beds.
e) 10 - Modular OT's.
f) 24*7 Pharmacy.
g) 24*7 Blood Bank.
h) 24*7 Emergency.
i) 24*7 Trauma Centre.

VENKATESHWAR HOSPITAL LAYOUT & ITS DEPARTMENTS

Floors	Departments
Basement – 1	IPD Pharmacy, Store, Blood bank, ECHS, Preventive Health Checkups, Security Department, Ipd Billing Department, Administrative Block.
Basement - 2	CSSD, Bio Medical Waste, Laundry, IT, Staff Cafeteria.
Basement - 3	Nuclear/ Radiation Department, Brachy Room, Mold Room, Gas Manifold, AC Plant, Maintenance, Medical Record Department.
Ground Floor	Lobby and Main reception and Information Desk, Food Court, OP Pharmacy, Sample Collection, Emergency Department, USG, Mernrnography and X- Ray Room, International Patient Services, CT and MRI room, TPA, Diagnostics, Phlebotomy, Emergency OP Pharmacy.
First Floor	Obs and Gynae, Pediatric OPD, Physiotherapy, NICU, EEG/EMG Room, NST Room
Second Floor	EYE OPD, Dialysis Department, MICU, Neuro ICU, Isolation, Urodynamic and Uroflometry, Audiometry.
Third Floor	Respiratory, Medicine, Cardio, Thora and Vascular Surgery OPD, CTVS/SICU, Oncology Chemo Daycare, ECHO/TMT Room.
Fourth Floor	Operation Theater, Cath Lab Care Unit, Cardiac,
Fifth Floor	Gastrology op, Urology OPD In-Patient Department, Endoscopy, Day Care, Bronchoscope Thoracoscopy and PFT Room.

Sixth Floor	In Patient Department, Microbiology, Histopathology, Biochemistry and Hematology Department, Digital Marketing Office, Dental and Skin OPD.
Seventh Floor	In Patient Department, IPD Nursing Station, Duty Doctors Room.
Eighth Floor	IPD, Clinical Pharmacology Department, Guest Relation Department.
Ninth Floor	IPD, Doctors Lounge, Infection Control Department,

LITERATURE REVIEW

The COVID-19 pandemic's impact on surgical practice

1. Paper published in **International Journal of Surgery**, Volume 79 in Jul 2020. *With almost 500 million cases and over six million deaths so far, the Coronavirus (COVID-19) Pandemic which a Human healthcare faces once-in-a-generation. During this crisis, all specializations have published advice for how to deal with the situation, which has had a considerable influence on clinical practice. All medical practitioners have issued guidelines which should place a higher priority on their daily medical interventions and, when possible, to investigate non-surgical treatment methods. Working methods, medical procedures, theatre workflow, patient and staff wellbeing, as well as teaching and learning, have all been impacted by the pandemic. Specialists must constantly improve to offer their patients with safe and quality care till the time specific protocols for each specialty are created and followed. Changes to working methods must be implemented via the lens of each surgical specialty, according to the detailed and up-to-date evaluation. The COVID-19 epidemic has touched all surgical specialties. Every department has had to deal with this, emphasize the significance of their everyday medical procedures and pursue non-surgical therapy choices whenever possible. To remain offering important urgent surgery within their fields, surgeons must adapt to new COVID-19 rules. Specialists have to innovate new ideas to offer secured and best possible treatment to patients throughout the pandemic till the time specific protocols for each specialty are created and followed.*

Too long to wait: the impact of COVID-19 on elective surgery

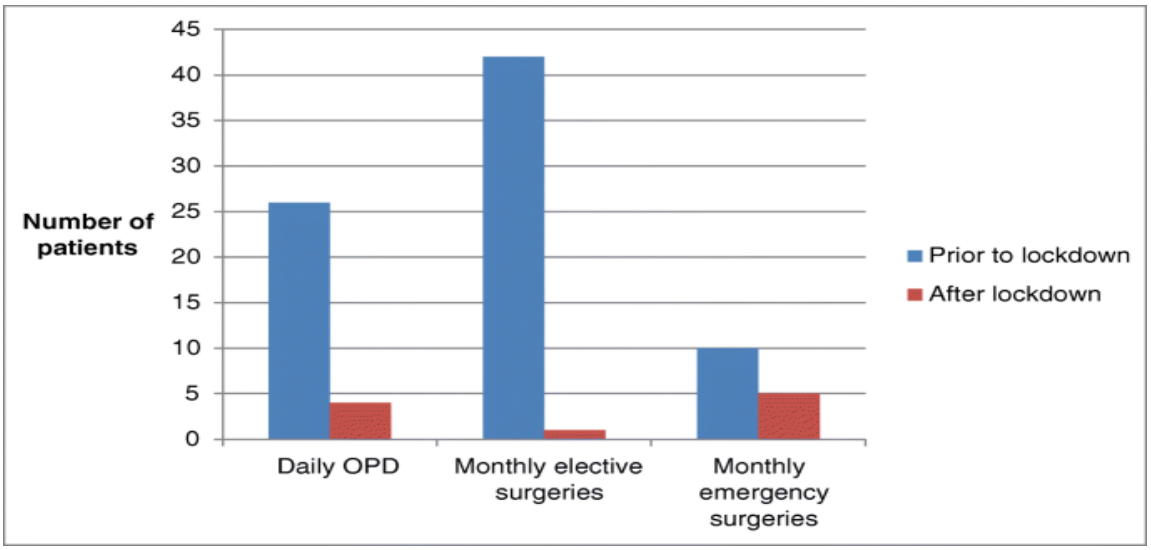
2. An article published in The Lancet Rheumatology on 01 Feb 2021 highlights the issue of increase in waiting period for the elective surgery in the entire world. *As health-care systems around the world struggled to handle the first wave of pandemic, many governments decided to restrict surgeries which can be delayed so that the maximum medical practitioners are available to look after the patents who have reported Covid positive. As per the data, more than 1o million patients in UK were awaiting surgery, up from four million before the*

outbreak. More than one Lakh patients who required to undergo joint replacement surgery were cancelled in the initial days of pandemic leaving many of them unable to carry out daily tasks due to acute pain and limited mobility. A research from the United States predicted that more than one million joint replacement and spinal surgeries will be pending by end of year 2022. To clear these backlogs, drastic measures will be required.

Although elective procedures restarted in many countries by mid of year 2020 but the capacity has gone down considerably, which in the long run will increase the pending cases. As per the data, more than two Lakh people in UK were waiting for their procedures as of September 2020—100 times the number in 2019. Patients were to face even lengthier waits with new variant of corona virus which have come in London and there is a possibility of another lockdown in the country.

Impact of pandemic on Clinical Practices in India

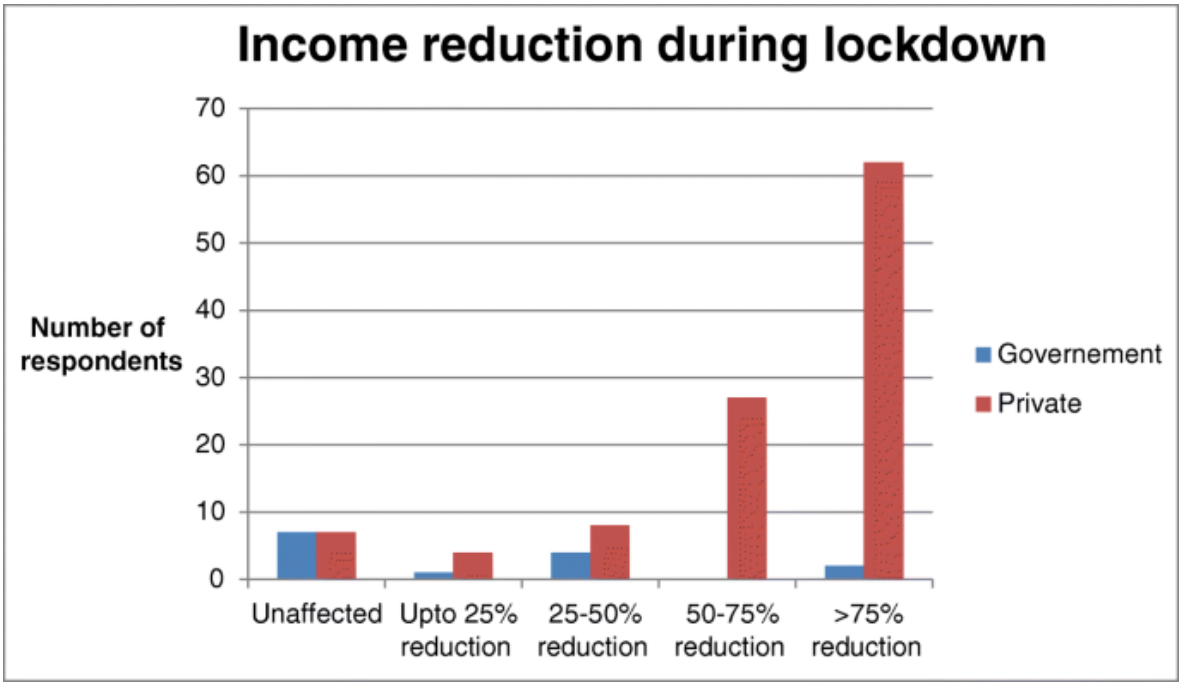
3. A paper published in **Indian Journal of Surgery**, Volume 82 on 26 Jun 2020. *The coronavirus 2019 has engulfed the world, and specialists are at a great risk of catching COVID-19 as a result due to their work. The disease's impact on common operating drill is unknown, which is still evolving. The goal of the study was to determine the effect of pandemic on elective surgeries in India, as well as pandemic's long-term consequences. A questionnaire was created for the survey and distributed on internet among members of the Indian Connotation of Gastro-intestinal Endo-specialists (IAGES), a clinical connotation with nearly 8,000 members from across the country, during April 2022 which was the period of first lockdown during the corona pandemic. Pre-COVID surgical practices, their influence on contemporary preparation, the cost ramifications have all addressed in the survey. The data was gathered and statistically examined.*



https://link.springer.com/article/10.1007/s12262-020-02443-0

Figure 1. Comparison of elective and Emergency Surgeries during pre and post-Covid-19 period.

A total of 153 surgeons responded to the poll, with just 9.2% of them being female. The majority (41%) had been in practice for almost 20 years, with 36.6 percent working in own drill at various clinics. Prior to the lockdown, 41.8 percent of the responders had primarily laparoscopic practice, with an average of 26 outpatient consultations per day and 43 elective procedures per month. Daily casualty refers decreased by four persons on each day after the lockdown, and 78 percent of doctors were unable to conduct a single elective surgery. Chemical chemoprophilaxis with hydroxychloroquine (HCQ) was reported by 53 percent of surgeons. The Personal protection equipment (PPE) was worn in 51 percent of cases, and 72.4 percent of respondents said there was inadequate safety requirements for upcoming clinical preparation.



https://link.springer.com/article/10.1007/s12262-020-02443-0

Figure 2. Evaluation of Financial losses to surgeons in private and government Hospitals

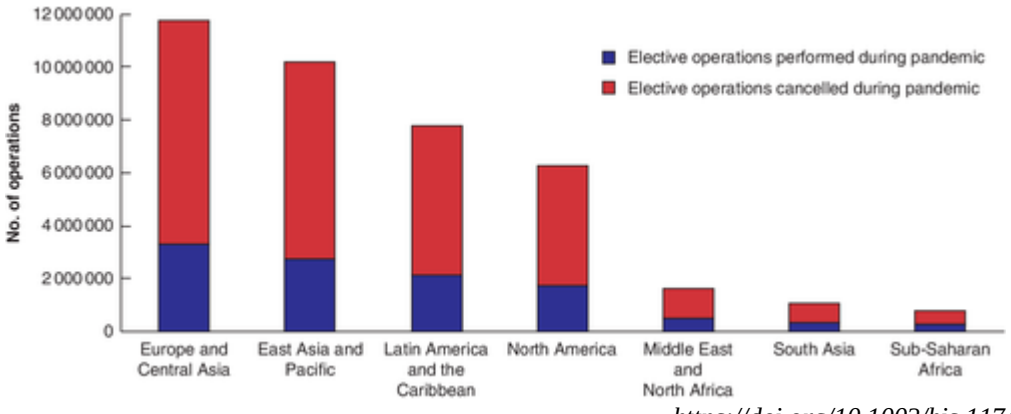
The monthly income has gone down by 76% which was shared by 53% specialists, while 23 % have reported that there was decrease by 51–76% in monthly income. The study discovered that doctors working in private clinics or hospitals had considerably more fall in salary as compared to specialist who were working in government Hospitals. The respondents who were 33% in number and were the owner of any hospital thought that they will have a loss of 2.26 million rupees (31,000 US dollars).

After the pandemic is under control, the level of measures that surgeon and operating room workers will be obliged to follow is unknown. When questioned about future concerns, the majority of surgeons indicated that upcoming procedures to be followed by surgeons in the pandemic era (77 percent), laparoscopic safety (69 percent), and staff safety (69 percent). This necessitates the development of national and international norms for dealing with these problems. The study emphasizes the requirement of greater data on the prospect of clinical techniques in order for keeping operation safe during a pandemic. The current lockdown which resulted in a significant influence to everyone's' clinical procedure and continuation

of the "new normal" in the upcoming requirement of surgery will necessitate concerted measures.

Surgeries which were cancelled due to the Pandemic: Worldwide Prognostic Exhibiting to inform Clinical Retrieval Plans

4. A study has been published in the **British Journal of Surgery** on 12 May 2020. *During the several months of peak interruption, a worldwide skilled survey was piloted to stimulate forecasts for the quantity of normal operations that may be negated or suspended. For 190 nations, a regression model was used to find out the numbers of surgeries which were cancelled. Normal surgical data was determined, evaluated by field and clue. This data was applied to surgery capacities at national level. The number of operations which were cancelled was then calculated through applying the twelve week cancellation rates to these statistics. During the peak weeks of pandemic, interruption caused by COVID-19, the best estimate was that approximately Three Crore operations may have to be cancelled or suspended (2,36,7050 operations per week). The majority of procedures (90.2%) would be for benign diseases. The cancellation rate during a 12-week period would be 72.3%. 81.7 percent of benign operations, 38 percent of cancer operations, and 26 percent of elective caesarean segments would be negated or suspended globally.*



https://doi.org/10.1002/bjs.11746

Figure 3. Data of Elective surgeries cancelled due to pandemic

It would take 46 weeks on average to deal with the influx of procedures caused by pandemic disturbance even if the majority of states increase their surgeries by 25% after the pandemic. Due to the disruption created by COVID-19, a large number of processes will be negated or suspended. Governments should innovate methods and execute ways to restart the surgeries as being done before the pandemic in order to alleviate this significant load on patients. The huge load of negated planned surgeries due to the pandemic was highlighted in this study. It is also imperative that similar number or more surgeries will be cancelled throughout the world whether developed or developing country, topographical locations, upper–middle-income countries will have the highest number of cancellations. In most cases, cancer surgery will take precedence, with the majority of cancellations involving surgery for benign illnesses, most commonly orthopedics.

OPERATION THEATRE

An Operating Theatre which is also known as an Operating Room (OR) or an Operating Suit is a medical facility that performs surgery. It is a facility within a hospital where surgical procedures are performed in a sterile setting.

Operation Theatres (OT) are large, cleanable, and with adequate lighting arrangements, with ceiling operating lights along with viewing displays and monitors. Operating rooms are generally without windows and have temperature and moisture controls. The operating rooms have distinct air filter that is used to keep the pressure slightly raised in the OTs. In case there is a power failure, it has a standby system in the form of generators and Un-interrupted Power Supply (UPS) system. The OTs have also the arrangement for supply of medical gases including Oxygen, Nitrogen, Carbon di-Oxide, etc. The table used for surgical procedures and the anesthesia cart are critical units of equipment. There are additional tables for setting up tools, adequate space for typical clinical supplies, and disposables vessels, among other things. Before the surgery, surgeons and other medical staff to be engaged in the surgery, including nurses are required to use a particular scrubbing area outside the OT. The medical staff required to sanitize the OT after the surgery should be able to readjust the operational table and the tools to be used in such a way that it can be used for further operations in an effective manner.

The operating suite, which is a separate component of a health care center, has several Operational Rooms. It features places for workers to wear the OT clothes, cleaning of hands, relaxation, be ready for next operation, retrieval room(s), and places to keep instruments and housekeeping facilities, offices, separate foyers, and other units in addition to OT and their washrooms. The operation suits are climate-controlled and segregated from other departments in bigger facilities, allowing only authorized employee's access.

OPERATING ROOMS

1. The operating bench is placed at the middle of the room and should be flexible enough so that it can be moved to other places as per the requirement.

2. During surgery, the lights in the OT are placed above main table so that it offer brilliant light and there should be no formation of any shadow.

3. The anesthetic machine is located at the operating table's top. This gadget features established monitors for ease of use for the combination of medical gas in the unit and tubes which are to be used for the patients' to facilitate them and will be utilized during the course of Operations.

4. The anesthetic machine is placed nearby the anesthesia table. This is used for medication, instruments and other supplies that the medical staff will need during operations.

5. On the stainless steel table, sterile tools to be utilized while the surgery is going on are positioned.

6. The monitor is used for adhesive patches on the patient's chest for recording the patient's pulse and breathing level.

7. An elastic strip is used for securing the pulse oximeter machine at the finger of patient. It is responsible for deciding the quantity of oxygen in the blood.

8. A blood pressure measurement system that expands the blood pressure strap on the arm of the patient which does not require manual intervention.

9. The equipment which employs electrical impulses with a particular intensity to cauterize or cap blood vessels, as well as to slash through tissues with negligible bleeding.

10. If required, a cardiovascular machine or other advanced machinery may be brought into the room. During surgery, a cardiovascular machine temporarily takes over control of the heart and lungs, maintaining blood circulation and oxygen levels in the blood.

11. Technological advancements have enabled hybrid operating rooms to be created, which merge into the operating room radiology systems such as MRI and surgical intervention aid surgeons in specific nervous and heart treatments.

RESEARCH METHODOLOGY

Methodology

The Project is a cross sectional study to understand the utilization and efficiency of Operation Theatre (OT) at Venkateshwar Hospital, Dwarka. The impact of Covid-19 pandemic has been seen in the world which has majorly affected the number of elective surgical procedures being done in the Hospital. In the study, the major specialties in which the surgeries have been carried out in the Hospital in the Year 2019, 2020, 2021 and 2022 (up to Mar 2022) have been analyzed and compared. The analysis has been done on the data to find out the variation in number of surgeries carried out pre and post Covid periods. The impact on the revenue generation due to the pandemic in the Hospital has been analyzed using this data. The summary of the research methodology is as under:

(a) **Type of Study** : Retrospective.

(b) **Location of Study** : Venkateshwar Hospital, Dwarka, New Delhi.

(c) **Type of Data** : Secondary (from Hospital Records).

(d) **Study Duration** : 15 Mar 2022 to 14 Jun 2022.

(e) **Data Collection Method** : from the OT register and MRD of the Hospital.

(f) **Sample Size** : Complete data of the major surgeries done in the Hospital for last three years has been considered, hence no sampling method has been used in the study.

(g) **Data Analysis**: Excel along with bar graphs.

Objectives

(a) Analyze the utilization of OT at Venkateshwar Hospital, Dwarka for last three years.

(b) Analyze the change in pattern in each specialization at different durations of Covid-19 waves and during normal times.

Expected Outcome/Deliverables

The expected outcomes/deliverable are as under:-

(a) Whether proper and judicious scheduling of cases and adherence to guidelines have been carried out.

(b) Whether the time taken to carry out OTs were same or reduced during pandemic.

(c) Impact of surge in Covid cases on the availability of staff.

(d) Whether multi-tasking of OT staff affects the efficiency and satisfaction in performance of the specific task.

(e) Whether the cancellation and/or postponing of surgery affects the utilization and efficiency of OT.

(f) The importance of streamlining of work flow and standardization of surgical procedure equipment

(g) Is formal training provided to the OT staff to ensure that adequate precautions are being taken so that the patents admitted in the Hospital does not get affected by the pandemic.

Limitations of the Study

1. The time factor was a major limitation on the scope and extensiveness of the study as the study to be completed in fixed period of time.

2. Some of the results of the study are subjective in nature however, they show utilization of OT in Venketeshwar Hospital.

3. The data has been taken from the records of Hospital which may have some percentage of error while recording.

4. The data regarding cancellation or postponing of surgeries were not available due to the pandemic situations and real time data could not be attained.

5. Exact availability of staff on each day of OT procedures were changing due to spread of Covid-19 and engagement with other tasks. Hence, the availability of staff on each day of OT could not be considered.

DATA ANALYSIS

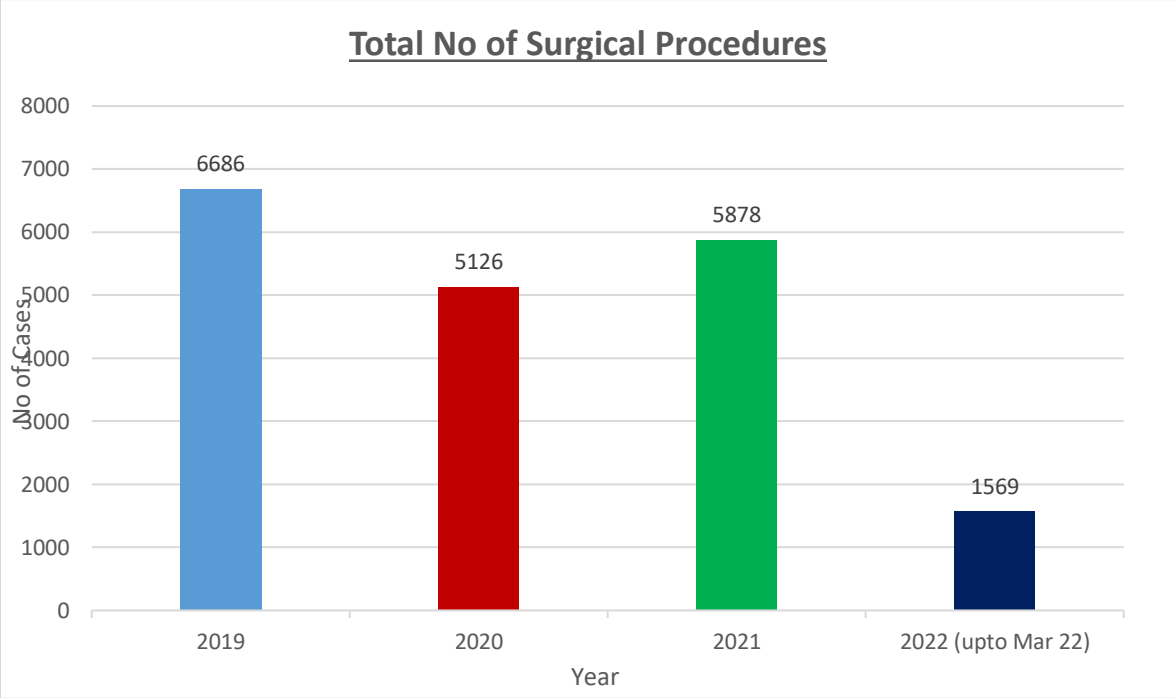


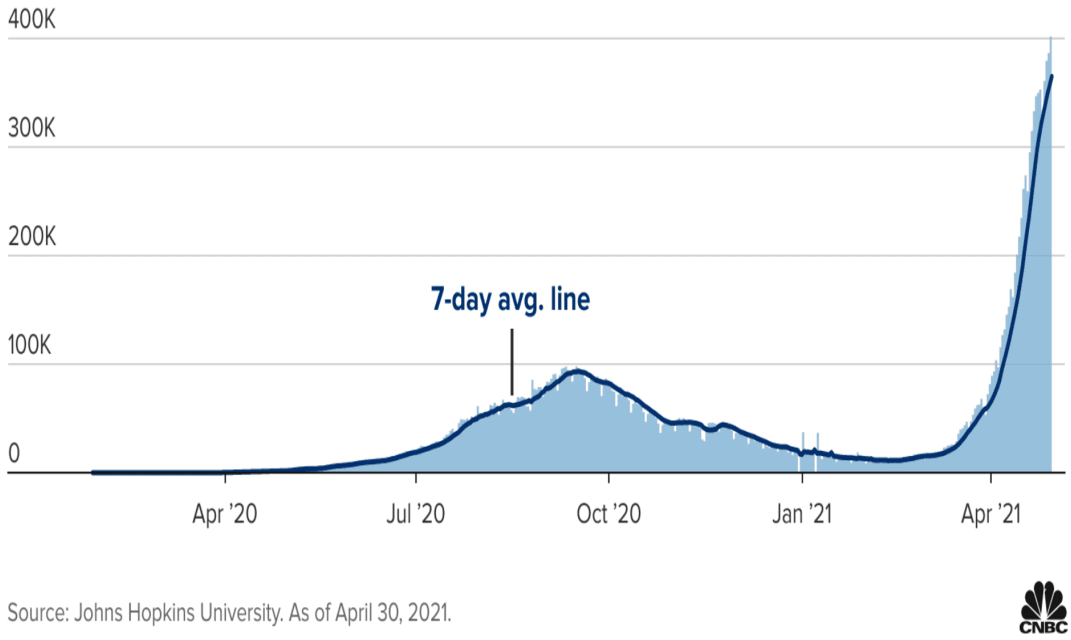
Figure 4. Total No of Surgeries carried out at Venkateshwar Hospital in last three Years

1. The figure 4 above shows the Number of Surgical Procedures carried out by the Hospital in last three years. The year preceding the outbreak of pandemic i.e. year 2019 has been taken to compare the data with the years in which different waves of Covid-19 were encountered in the country.

2. It can be seen from the figure that there was a reduction of 1560 numbers of total surgical procedures in the year 2020 as compared to the year 2019 when the first wave of Covid-19 has reached the country.

3. In the Year 2021, the second wave of Covid-19 has come, which also shows the reduction in total number of surgeries, however the reduction was less as compare to the year 2020. The reduction in Year 2021 is 808 surgeries as compared to Year 2019.

First wave of Covid-19 (Jul to Nov 2020)



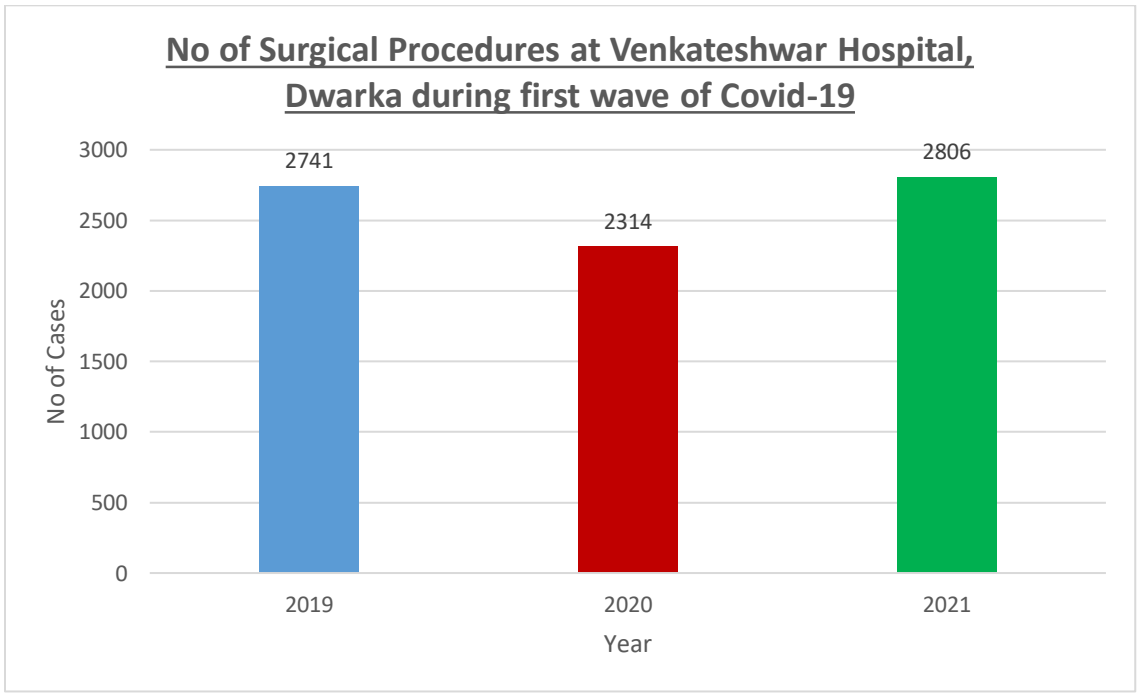


Figure 5. Comparison of Surgeries carried out at Venkateshwar Hospital during first wave of Covid-19 (Jul to Nov 2020)

1. The figure 5 above shows the Number of Surgical procedures carried out by the Hospital during first wave of Covid-19 in the country.

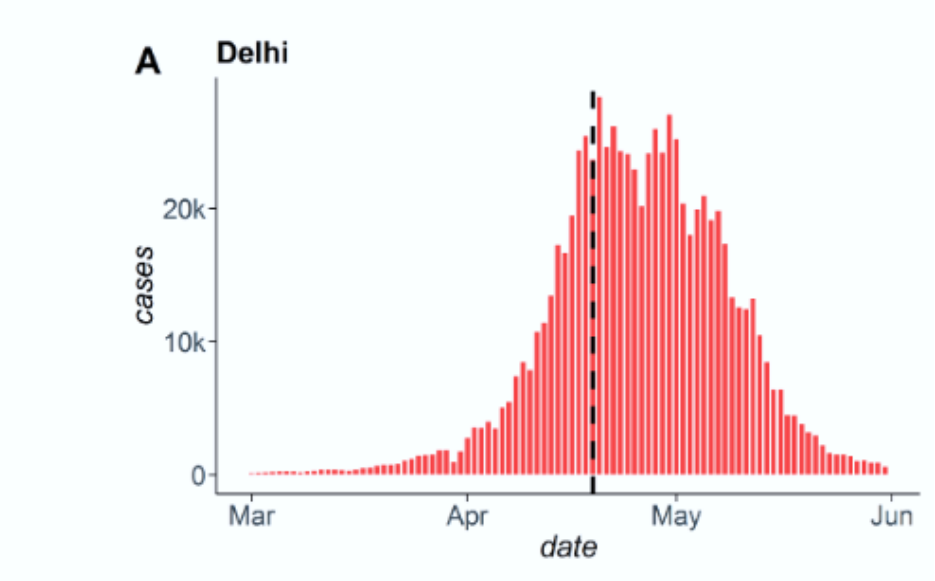
2. The period counted as the first wave when the maximum number of daily cases were being reported in the country. The cases have started to increase in the month of Jul 2020 and have started declining by the end of Oct 2020.

3. The data collected is for the five months from Jul 2020 to Nov 2020 and compared with similar data for the year 2019 and 2021.

4. This figures indicates that there is reduction of approx. 14% of surgical procedures being carried out in the year 2020 as compared to year 2019. However, in the year 2021, the procedures has again increased in that period when the second wave of Covid-19 has started to decline. The procedures have increased which may be the result of backlog which was created due to the additional precautions being taken and restriction in number of surgeries during surge in cases.

5. It can be concluded that there was not any major impact in the total Number of surgeries due to Covid wave during this period in the year of first wave.

Second Wave of Covid-19 (April to Jun 2021)



2 Subbaraman R, *et al. BMJ Global Health* 2021;6:e006614. doi:10.1136/bmjgh-2021-006614

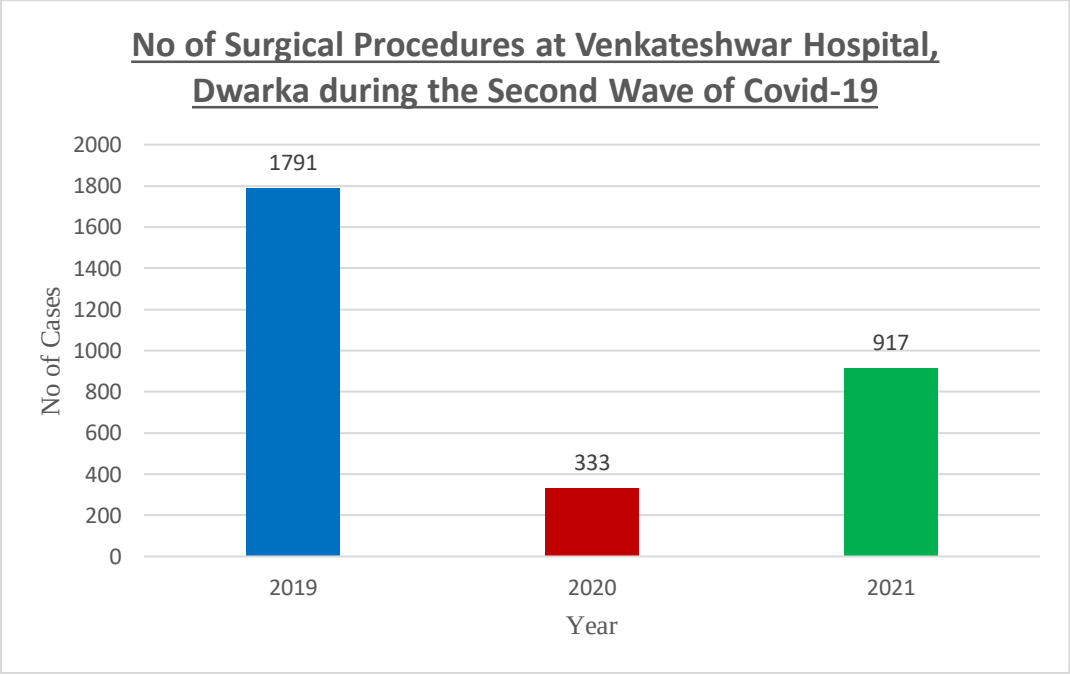


Figure 6. Comparison of Surgeries carried out at Venkateshwar during Second Wave of Covid-19

1. The figure 6 above shows the number of surgical procedures carried out by Venkateshwar Hospital, Dwarka during the second wave of Covid-19 in the country.

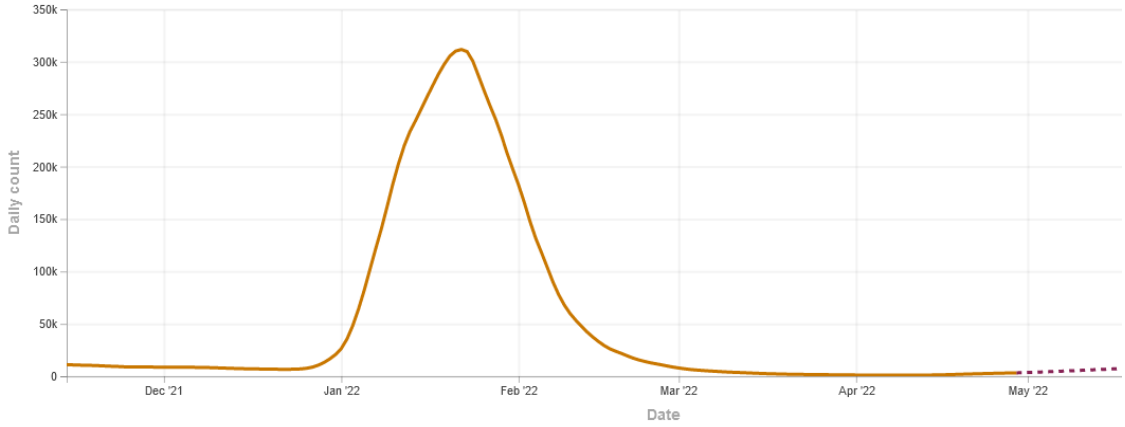
2. The period counted as second wave when the maximum number of cases were being reported in the State. The cases have started rising by the end of Mar 2021 and started declining by first week of Jun 2021.

3. The data collected for the total number of surgeries carried out from April 2021 to Jun 2021 and compared with the data for the year 2019 and 2020.

4. As compare to Year 2019, 874 surgical procedures were performed less in the year 2021 when the second wave was at its peak. This amounts to 50% lesser number of surgeries during the second wave.

5. However, in the year 2020, during the same period only 333 surgeries were performed in the Hospital. This was due to the lockdown announce in the entire country with effect from 25 Mar 2020. This has resulted in performing only 20% of surgeries as compared to the previous year 2019 when the pandemic has not entered the country.

Third Wave of Covid-19 in India



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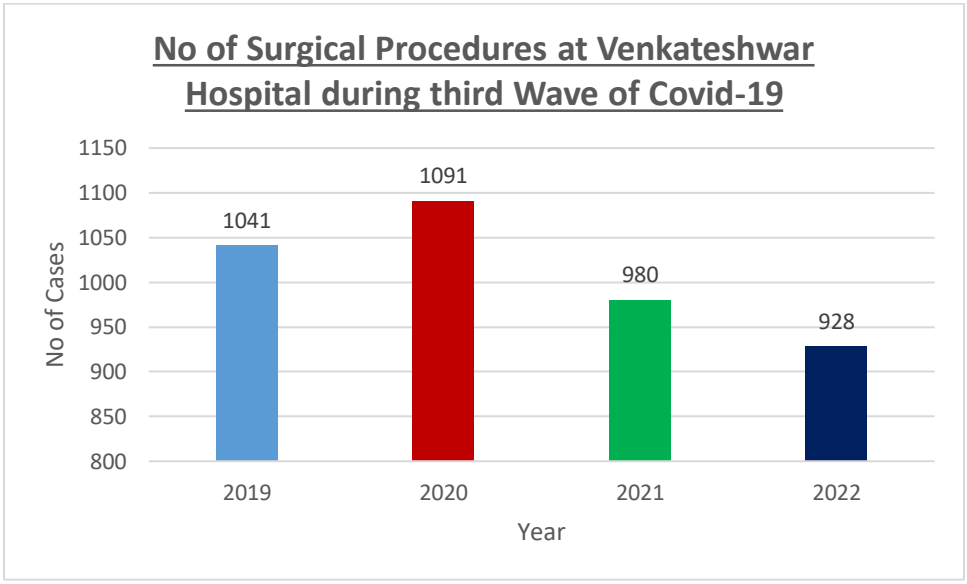

Figure 7. Comparison of Surgeries carried out at Venkateshwar during Third Wave of Covid-19

1. The figure 7 above shows the Number of Surgical procedures carried out at Venkateshwar Hospital, Dwarka during the peak of third wave of Covid-19. The period commenced from end of Dec 2021 and ended in first week of Mar 2022.

2. The data collected is the total number of surgeries carried out in the Hospital during this period in the Year 2022 from Jan 22 to Feb 22 and compared with the data of the same period in the year 2019, 2020 and 2021.

3. The Number of surgeries carried out during this period in the Year 2019 was 1041 whereas in the Year 2022 the total surgeries carried out were 928. This was 11% lesser in the year when the pandemic has not reached the country. The difference was not much as the duration was shorter and the number of critical cases of Covid-19 was much less as compare to first and second waves.

4. In the Year 2020, the pandemic has still not reached the country during this period (Jan to Feb 2020) hence the number of surgeries were equivalent as on the preceding year of 2019.

5. In the Year 2021, during this period there was no wave of Covid-19 which was prevalent however, the number of surgeries were less as compare to year 2019 and 2020 as the Covid cases were still being reported in the country and adequate measures were being taken to ensure the spread of virus can be restricted.

Data Analysis of Major Specialties

1. The specialties in which the surgical procedures are being carried out at Venkateshwar Hospital, Dwarka are:-

(a) Surgical Oncology.
(b) General Surgery.
(c) Orthopedics Surgery.
(d) Urology and renal transplant.
(e) Obstetrics & Gynecological Surgery.
(f) Gastrointestinal Surgery.
(g) Neuro Surgery.
(h) Ophthalmology.
(i) Cardiothoracic Surgery.
(j) Liver Transplant Surgery.
(k) Dental.
(l) GI Surgery
(m) Geriatric Surgery.
(n) Pediatric and Neonatal Surgery.
(o) ENT and Cochlear Implant Surgery.
(p) Plastic Surgery

2. The important fields of specializations in which the surgeries are being performed in the Hospital are:-

(a) Obstetrics & Gynecological Surgery.
(b) Orthopedics Surgery.
(c) CTVS.
(d) ENT and Cochlear Implant Surgery.
(e) Surgical Oncology.
(f) General Surgery.
(g) Urology and renal transplant.
(h) Ophthalmology.
(j) Gastrointestinal Surgery.
(k) Plastic Surgery

3. The specializations mentioned above have been identified to carry out the study and analyze the impact on the statistics related to figures, duration and the revenue generation which may have affected the utilization and efficiency of the OTs in the Hospital.

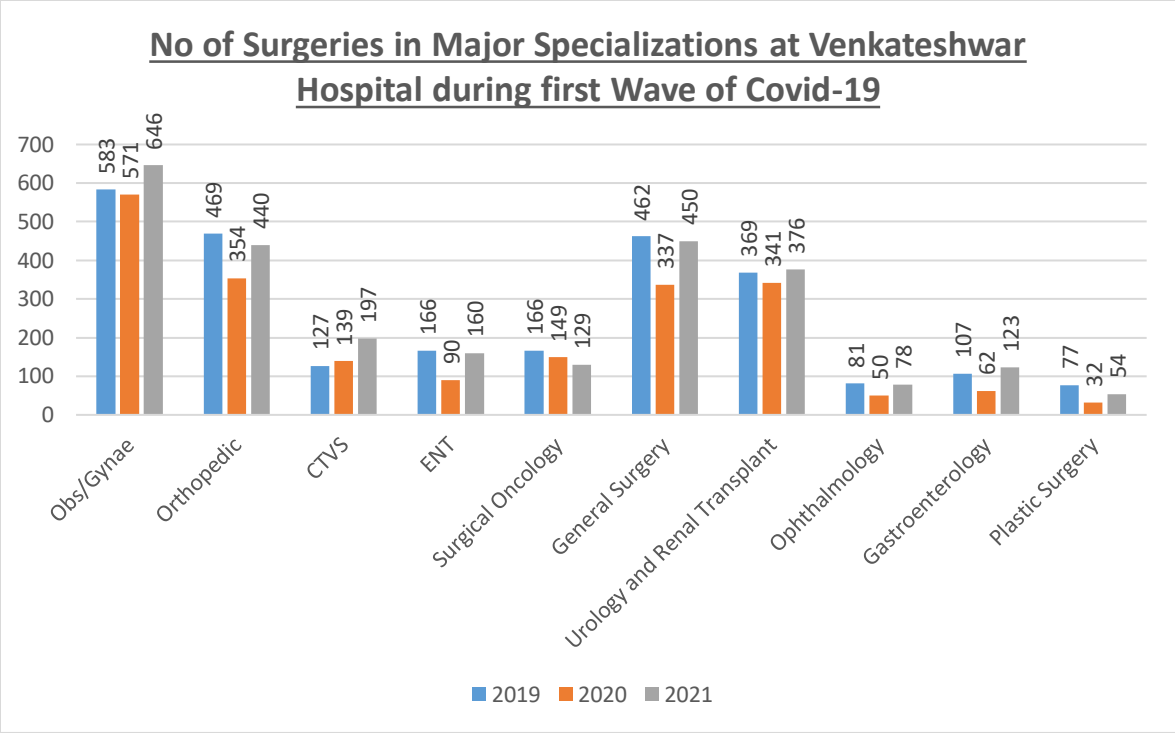

Figure 8. Number of surgeries in major specializations carried out at Venkateshwar during first Wave of Covid-19

4. The figure 8 above shows the number of surgeries carried out in the Hospital in these specializations during the first wave of Covid-19 in the year 2020 (between Jul 2020 to Nov 2020). The data has been compared to the similar data for the period for the year 2019 and 2021.

5. The bar graph indicates that there was no major impact in the number of surgeries carried out in preceding year in Obs & gynae, CTVS, Surgical Oncology and Urology & renal Transplant.

6. The major impact on surgeries which were reduced due to the pandemic were

(a) Plastic Surgery – reduced by 58%.

(b) ENT – reduced by 54%.

(c) Gastrointestinal Surgery – reduced by 42%.

(d) Ophthalmology – reduced by 39%.

(e) Orthopedics Surgery – reduced by 25%.

(f) General Surgery – reduced by 18%.

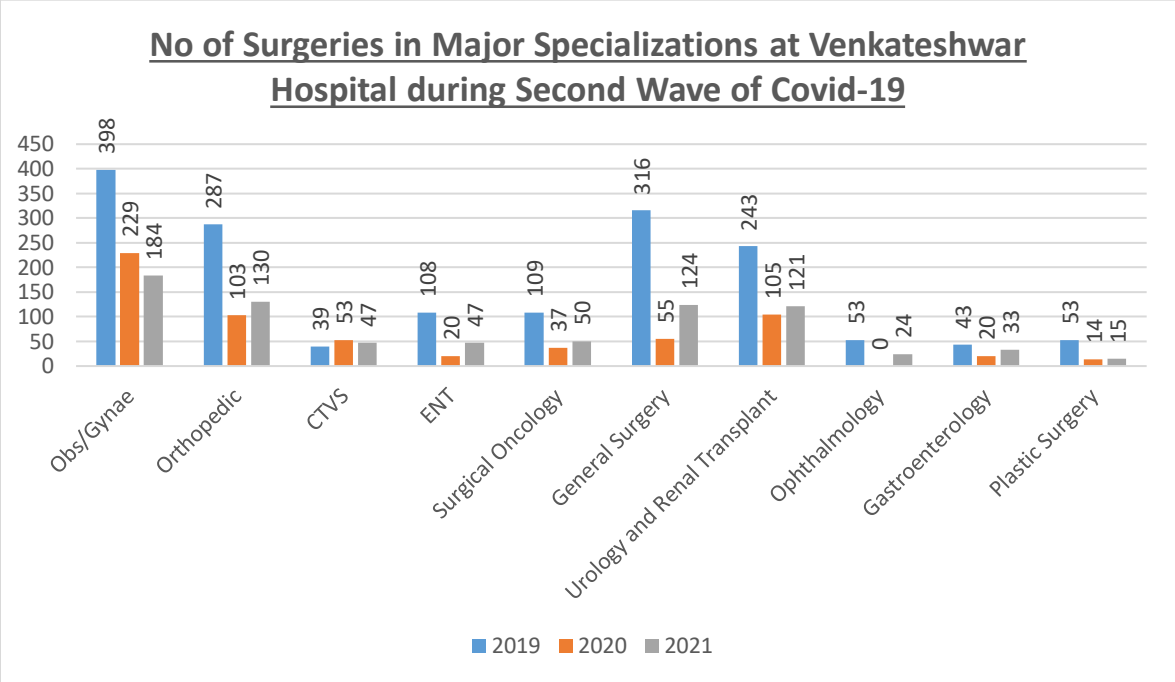

Figure 9. Number of surgeries carried out in major specializations during Second Wave of Covid-19 at Venkateshwar Hospital

1. The figure 9 shows the number of surgeries carried out in the Hospital during the second wave of Covid-19 in the year 2021 (April to Jun 2021).

2. The data of the year 2021 has been compared with the data of year 2019 when there was no pandemic in the country. The data of the year 2020 has also been taken for the same period, however the pandemic has already reached the country during that period so the data cannot give the clear statistic as in the case of pre-Covid phase.

3. The figure above indicates that the specializations which does not have any major impact due to the second wave of Covid-19 as compared to the data of Year 2019 is CTVS.

4. There is an impact on all the other surgeries which have been carried out in the Hospital with major impact on following:-

(a) Obstetrics & Gynecological Surgery – reduced by 25%.
(b) Orthopedics Surgery – reduced by 55%.
(c) ENT and Cochlear Implant Surgery – reduced by 56% .
(d) Surgical Oncology – reduced by 54%.
(e) General Surgery– reduced by 61%.
(f) Urology and renal transplant – reduced by 50%.
(g) Ophthalmology – reduced by 55%.
(h) Gastrointestinal Surgery – reduced by 23%.
(j) Plastic Surgery– reduced by 72%.

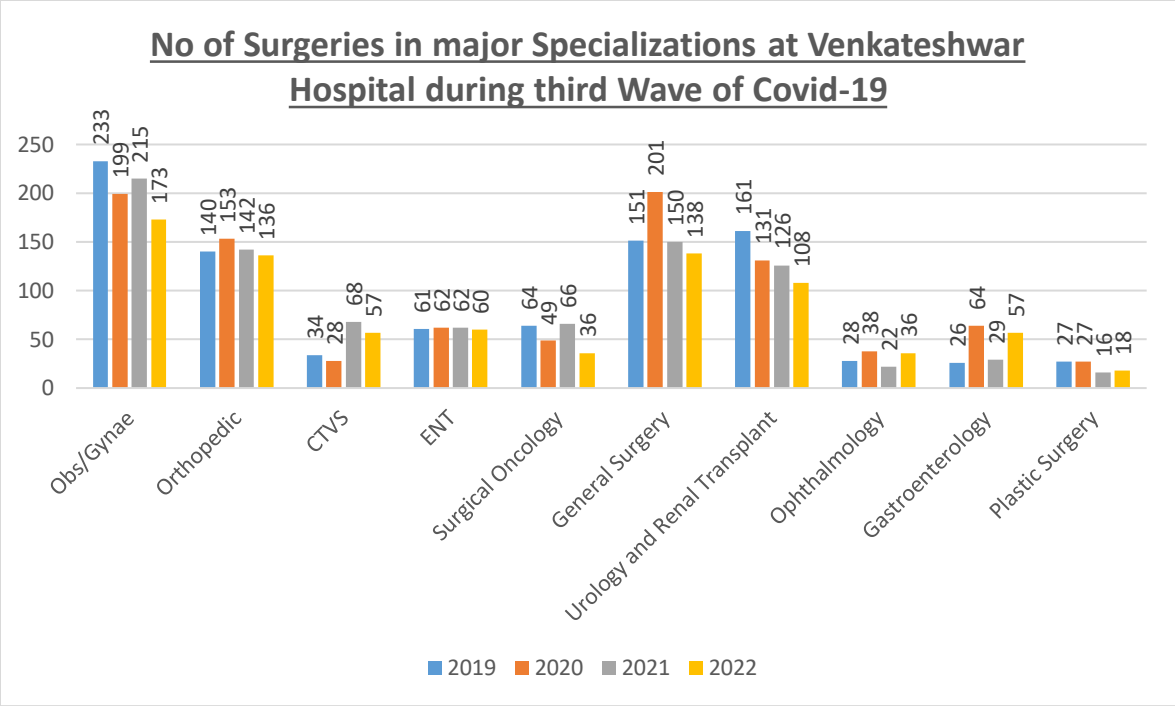

Figure 10. Number of surgeries carried out in major specializations during Third Wave of Covid-19 at Venkateshwar Hospital

1. The figure 10 above shows the number of surgeries carried out in major specializations at the Hospital during the third wave of Covid-19 in the year 2022 (Jan to Feb 2022).

2. The data of the year has been compared with the data for the year 2019 i.e. the pre-Covid period. The data can also be compared and analyzed with the data for the year 2020 as the pandemic has not entered the country during this period.

3. The data above indicates that during the third wave the impact on the number of surgeries being carried out in the Hospital has decreased significantly. The reason for that could be related to the severity of the cases of Covid which were being reported during this period. The patents were less critical and the majority of them could be treated at home and does not required hospital admission. This may have resulted in maintaining the normal routine of carrying out the surgeries in the Hospital.

4. The data given above indicates that the maximum impact on the surgeries which were affected due to the third wave of Covid were:-

(a) Obstetrics & Gynecological Surgery – reduced by 25%.
(b) Surgical Oncology – reduced by 44%.
(c) Urology and renal transplant – reduced by 33%.
(d) Plastic Surgery– reduced by 33%.

Percentage Wise Distribution of Surgeries at Venkateshwar Hospital

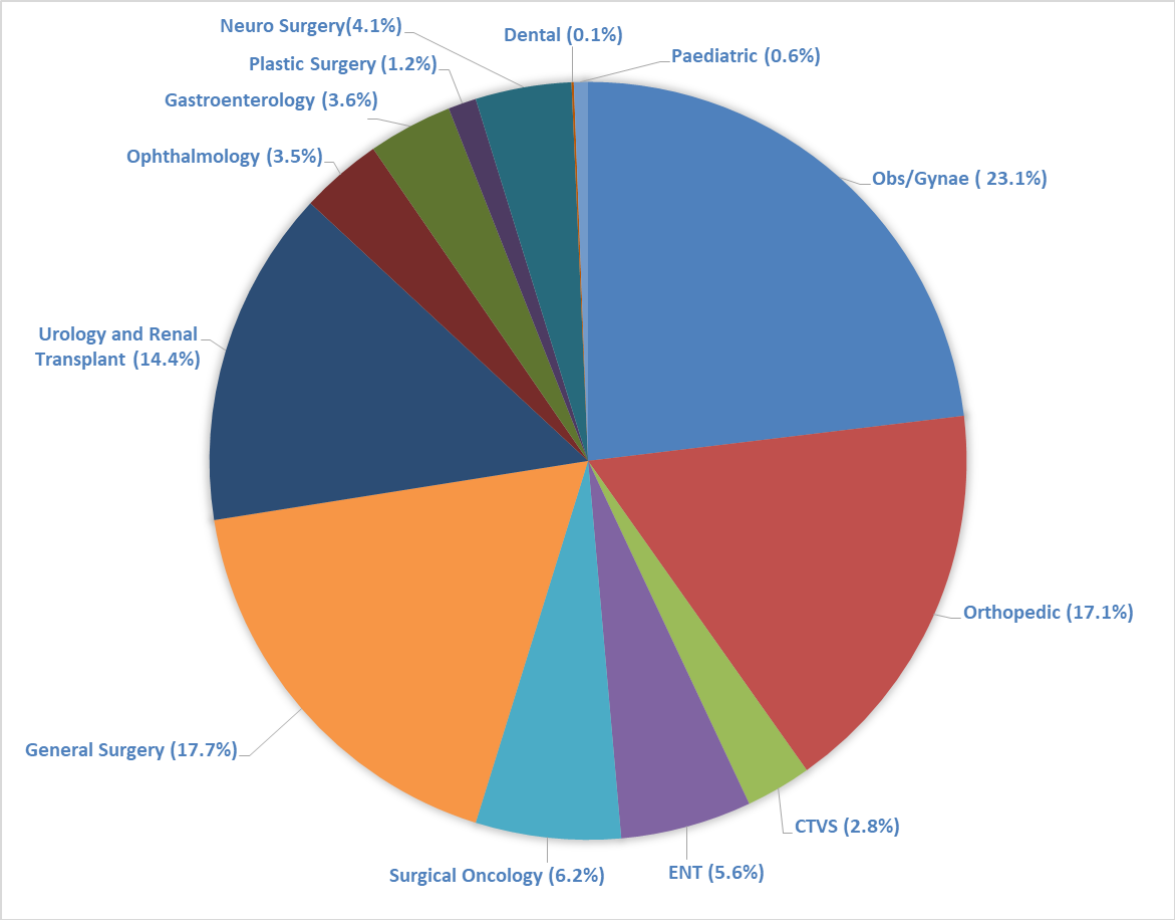

Figure 11. Percentage wise distribution of Surgeries in Major Specialties at Venkateshwar Hospital

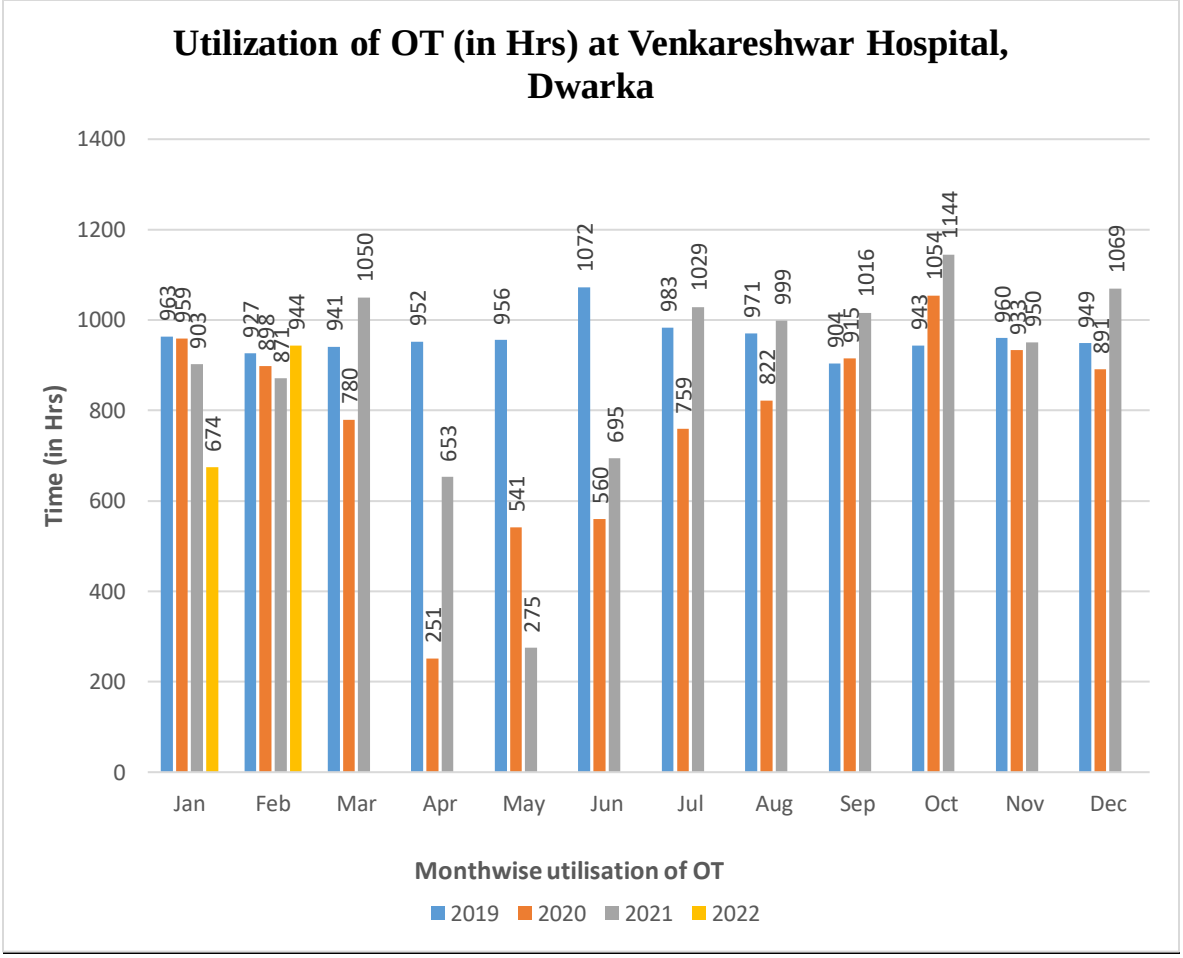

Figure 12. Month wise utilization of OT (in Hrs) at Venkateshwar Hospital in last three Years

1. The figure 12 above shows the utilization of OT (in Hrs) at Venkateshwar Hospital, Dwarka.

2. The OT duration for the year 2022 has been taken for months of Jan and Feb 2022 only which was the period of third wave of Covid-19.

3. There are eight OT Rooms in the Hospital and elective surgeries are carried out from 8.00 AM to 8.00 PM on all days except Sundays and Holidays when only emergency OTs are being carried out.

4. The duration of each surgery varies from one Hour to four Hours. The duration is specified by the surgeon carrying out the surgery.

5. The average utilization of OT as seen from the figure varies from 900 hrs to 1000 hrs in a month during the normal times.

6. The figure indicates the utilization of OT was reduced during the peak periods of Covid-19 in the country.

7. Maximum effect on less utilization can be seen in the month of April 2020 when the OT utilization has reduced to 251 Hrs only. This was the period of outbreak of pandemic in the country and nationwide lockdown was announced with effect from 25 Mar 2020 in the country. As compare to the year 2019 in the same month before the pandemic, the utilization has gone down by 74 percent.

8. The second minimum utilization can be seen in the month of May 2021 when the utilization was for 275 Hrs only. This was the period when second phase of Covid-19 was predominant in the nation.

9. During the third wave in Jan and Feb 2022, the OT utilization though reduced as compare to pre-Covid period, however it was much more if compare to the period of first and second wave of pandemic in the state.

10. The OT utilization during the period when the State was not under the wave of Covid-19 in the year 2020 and 2021 was normal.

RESULTS

1. The number of surgical procedures being carried out at Venkateshwar Hospital have reduced significantly in the year 2020 and 2021.

2. The effect of less number of surgeries being carried were seen in the months of first wave from Jul to Nov 2020 and second wave from April to Jun 2021.The remaining periods were not affected considerably.

3. During the third wave of Covid-19 in the year 2022, the effect on number of surgeries being carried out in the hospital was minimal as compare to pre-Covid days.

4. The specializations which does not have major effect on the number of surgeries carried out during the pandemic are:-

(a) Obstetrics & Gynecological Surgery.
(b) CTVS.
(c) Surgical Oncology.
(d) Urology and renal transplant.

5. The specializations which were most effected and the number of surgeries reduced were:-

(c) ENT and Cochlear Implant Surgery.
(e) General Surgery.
(g) Ophthalmology.
(j) Plastic Surgery.

6. The number of hours the OT were utilized were reduce in first and second wave of Covid-19. This was also due to the additional precautions being taken to ensure that the Corona virus does not spread to other patients in the Hospital. During the specific month in which the maximum cases of Covid-19 were being reported has reduced the OT utilization by 74% and 71% respectively.

7. The OT utilization during the third wave of Covid-19 has not any major effect on the hours of utilization and the reduction was by 10 to 15% only.

8. The availability of staff especially the surgeons during Pre-Covid and Covid phase could not be analyzed as the availability and tasking was being done based upon the workload and emergency situations on a daily basis. However, the staff was available to carry out surgical procedures as per the planning and scheduling by the staff during the peak of Covid waves.

RECOMMENDATIONS

1. Surgical service prioritization during a pandemic must be carefully managed between patient demands and resource availability. The following proposals should be taken into consideration: -

(a) The effect of the postponement on primary surgical results.

(b) The feasibility of alternate approaches that do not necessitate the use of an OT.

(c) The presence of co-morbidities, as well as an elevated possibility of problems.

(d) The danger to the patient's life in case the surgery is not done right away. If the surgery is not performed, there is a risk of organ malfunction that lasts forever.

(e) In case surgery is not completed, there is a risk of fast escalating stark signs and disease development.

2. Surgical teams should be encouraged to offer phone or video consultations wherever possible, and to cancel non-essential follow-ups in order to reduce patient contact.

3. Non-operative treatment options must be investigated in order to avoid hospitalization. When confronted with a serious injury, a clinical decision must be made depending on the availability of clinicians and facilities, as well as the potential social consequences.

4. Follow the most recent surgical treatment recommendations to limit the danger of infection for both patients and clinical staff.

5. Trauma meetings are held every day to keep everyone up to date on the difficulties that are being confronted and the logistics of handling them.

6. Dedicated 'clean' (surgeries of Covid negative patients) and 'dirty' (surgeries of patients who have confirmed or suspected Covid-19 virus) Emergency Operating Rooms should be in place to prevent infection in patients who are Covid negative.

7. Surgical consent should be customized to avoid face-to-face contact using online documents.

8. Non-essential people should not be used when dealing with proven or suspected Covid patients for surgery or while anesthesia and intubation are being finished.

9. Creating a coherent leadership team and a frequent communication process to reduce rumors and false information about Covid.

10. A dedicated local record management team to be established to track and assess daily clinical inputs about elective surgery cancellations or postponements.

11. Prior to scheduling the surgery, the patients can be divided into three groups:

(a) Confirmed and suspected patients.

(b) Patients with a high risk of infection who are travelling from a high-risk location.

(c) Low-risk patients with no previous close interaction.

12. Job planning should be done in such a way that administrative jobs for clinicians are reduced, allowing more medical professionals to assist in surgical procedures.

13. The staff should obtain a complete epidemiologic history of the patients, including recent travel and contact with people from the epidemic area.

14. To avoid the spread of virus to patients, visitors, or staff, the staff should adhere to tight procedures for wearing PPE, such as face masks and hand gloves, as well as hand hygiene rules.

15. As per the latest studies, it has been found that the number of deaths have increased in the patients who had a past record of being COVID positive. Hence, it is recommended that the Hospitals should also verify whether the patents undergoing surgery has any previous record of infection with Corona virus. This will provide additional input to the team and may further help in streamlining the surgical guidelines for those patients.

CONCLUSION

The COVID-19 epidemic has touched all surgical specialties. All specialties have had to emphasize the importance of their daily medical interventions and explore non-operational options whenever possible. In case of carrying out important emergency surgery within their preview, surgeons must adapt new COVID-19 rules. Surgeons should be able perform harmless and operative care to the patients throughout the pandemic till specific protocols for each specialty are created and followed.

COVID-19 came with a significant influence on a surgeon's routine practice and clinical teaching. Elective and non-emergent clinical cancellations did have the importance of surgeons known as valuable resource for health care delivery dealing with the pandemic outbreak. During this the specialists are considering safe non-operative replacements to treat their patients.

The scholarly work base is emerging enormously in a regular fashion, indicating that it's a fast-moving epidemic. This study provides a broad summary of the impact on elective procedures that may have been cancelled or postponed as a result of the epidemic. Another component of the research that needs to be done to determine the depth of the pandemic is to look at the difficulties that patients confront and how they overcome them. The amount of deaths or disabilities that may have occurred due to the pandemic can be directly or indirectly attributed to it. These ideas, however, are fluid and prone to alter as new evidences emerge.

Furthermore, because clinical facilities are different around the countries due to native and provincial differences in economic constraints, health care systems, and patients' culture, various study teams may provide different results. Though the cases of Covid-19 positive are still coming, it will make an impact in healthcare around the world. Clinicians will undoubtedly need for adjustment to non-clinical parts in the battle against the pandemic in the future.

After the pandemic is under control, the level of measures that surgeon and operating room workers will be obliged to follow is unknown. This necessitates the development of national and international norms for dealing with these problems. Consider transfusions of

blood products during and after surgery, predicted hospitalization after surgery, length of stay, probable need for extensive breathing facilities and necessity for ICU after surgery while utilizing crucial resources. Despite the fact that different countrywide and global societies for surgeries have issued guidelines, it is not known that which is the best practice which should be used during such crisis.

With cases of the pandemic still being reported around the world, there is a continuing need for contagion deterrence and control. The safety of the patients as well as the medical staff rely on these concepts. Additional data is urgently needed to recognize danger factors for transmission which may happen during the course of surgery or before/after the surgery, in addition to determining the best surgical schedule in these patients.

REFERENCES

1. Effect of COVID-19 pandemic lockdowns on planned : an international, prospective, cohort study, The Lancet Oncology, Volume 22, Issue 11, 2021, Pages 1507-1517, ISSN 1470-2045, https://doi.org/10.1016/S1470-2045(21)00493-9.

2. Al-Jabir A, Kerwan A, Nicola M, Alsafi Z, Khan M, Sohrabi C, O'Neill N, Iosifidis C, Griffin M, Mathew G, Agha R. Impact of the Coronavirus (COVID-19) pandemic on surgical practice - Part 2 (surgical prioritisation). Int J Surg. 2020 Jul;79:233-248. doi: 10.1016/j.ijsu.2020.05.002. Epub 2020 May 12. PMID: 32413502; PMCID: PMC7217115.

3. Ahmed Al-Jabir, Ahmed Kerwan, Maria Nicola, Zaid Alsafi, Mehdi Khan, Catrin Sohrabi, Niamh O'Neill, Christos Iosifidis, Michelle Griffin, Ginimol Mathew, Riaz Agha, Impact of the Coronavirus (COVID-19) pandemic on surgical practice - Part 1, International Journal of Surgery, Volume 79, 2020, Pages 168-179, ISSN 1743-9191, https://doi.org/10.1016/j.ijsu.2020.05.022.

4. Nasta, A.M., Goel, R., Kanagavel, M. et al. Impact of COVID-19 on General Surgical Practice in India. Indian J Surg 82, 259–263 (2020). 26 June 2020 https://doi.org/10.1007/s12262-020-02443-0

5. COVIDSurg Collaborative, Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans, *British Journal of Surgery*, Volume 107, Issue 11, October 2020, Pages 1440–1449, https://doi.org/10.1002/bjs.11746

6. Stoner R. The Impact of COVID-19 on Surgical Practice – A Summary. World J Surg Surgical Res. 2021; 4: 1272.

7. Sharma N, Sharma P, Basu S, et al. (October 24, 2021) Second Wave of the COVID-19 Pandemic in Delhi, India: High Seroprevalence Not a Deterrent?. Cureus 13(10): e19000. doi:10.7759/cureus.19000

8. World health Organization 2021, WHO Coronavirus (Covid-19) Dashboard accessed on 06 Jun2022, <https://covid19.who.int

9. Delhi Government 2022, Corona Dashboard accessed on 31 Mar 2022, < https://coronabeds.jantasamvad.org