

FACTORS AFFECTING MRI UTILIZATION IN MEDANTA – THE MEDICITY



Submitted by : Rashi Sinha

CORE VALUES OF MEDANTA



Leadership and excellence



Integrity & courage



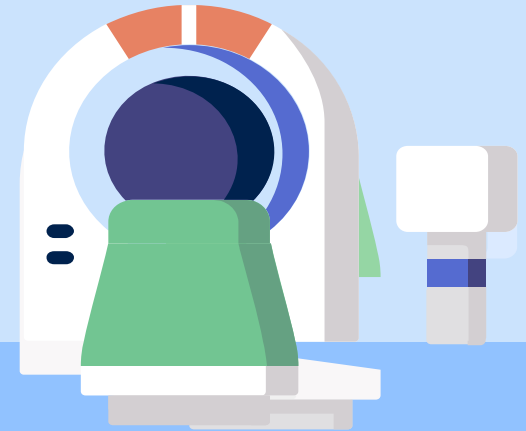
Compassion & service



Collaboration, learning & innovation

CONTENTS

- 1 Introduction
- 2 Patient flow in MRI
- 3 Methodology
- 4 Review of literature
- 5 Factors affecting MRI utilization
- 6 Observations
- 7 Challenges
- 8 Recommendations



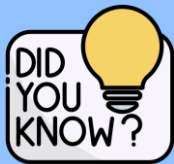
Objectives

- To identify and examine the factors that affect MRI machine utilization rates in the hospital.
- To explore how hospital management can improve MRI machine utilization rates.
- To suggest strategies for optimal utilization of MRI machines in hospitals, thereby improving patient care.

Introduction



Magnetic Resonance Imaging (MRI) is a noninvasive and painless medical imaging technique that has revolutionized the field of diagnostic imaging. It provides high-resolution images of the body's internal structures, including bones and soft tissues, without using ionizing radiation. Instead, it **relies on the interaction between a strong magnetic field and the hydrogen atoms in the body.**



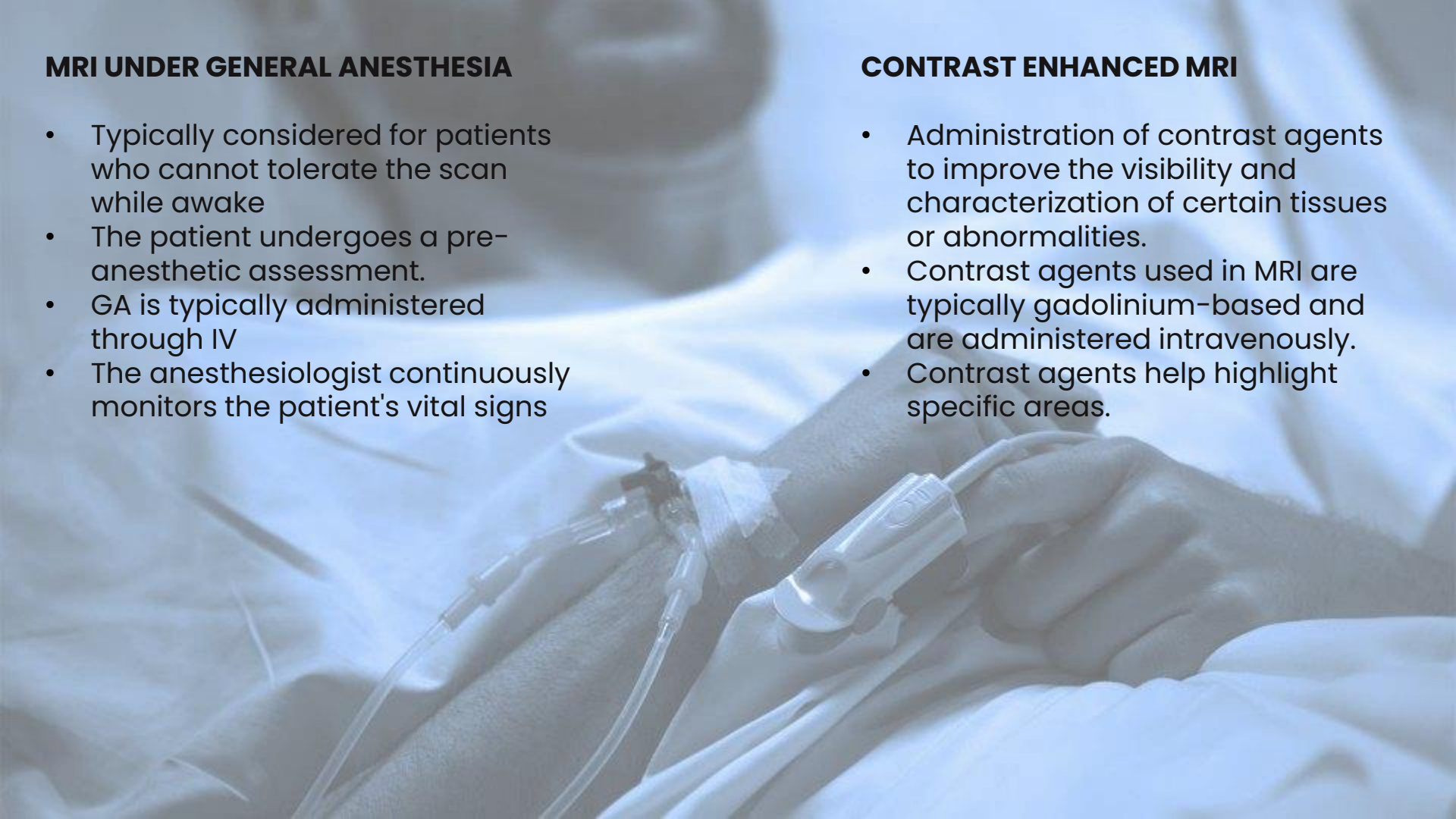
MRI was originally called Nuclear Magnetic Resonance (NMR), but the name was changed to MRI to alleviate public concerns about the word "nuclear."

MRI UNDER GENERAL ANESTHESIA

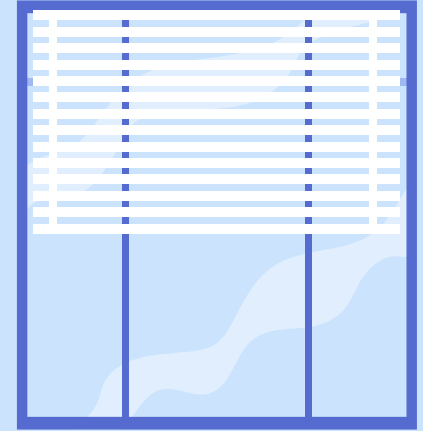
- Typically considered for patients who cannot tolerate the scan while awake
- The patient undergoes a pre-anesthetic assessment.
- GA is typically administered through IV
- The anesthesiologist continuously monitors the patient's vital signs

CONTRAST ENHANCED MRI

- Administration of contrast agents to improve the visibility and characterization of certain tissues or abnormalities.
- Contrast agents used in MRI are typically gadolinium-based and are administered intravenously.
- Contrast agents help highlight specific areas.



PATIENT FLOW IN MRI



ZONE 1

Reception : Appointment confirmation, provide requisition form for outpatients, send for preparation

ZONE 2

Preparation area : Pre scan procedures and consent signed by patients

ZONE 3

Security check : Verify patient, and ask for any metal implants in the body using a metal detector

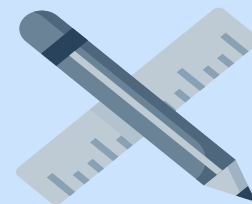
ZONE 4

Redline area : magnetic area, patient is shifted to the machine



MRI can be used to study the effects of microgravity on the human body by conducting scans on astronauts before and after space missions.

METHODOLOGY



STUDY DESIGN

Mixed method research

DATA COLLECTION

Primary data collection and observer based tracking

STUDY POPULATION

Patients visiting the radiology department to avail of the MRI services

SAMPLING METHOD

Census

TOOLS

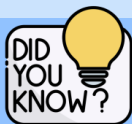
MS Excel

INCLUSION CRITERIA

All outpatients, IPD & Emergency Patients who underwent MRI scan

LIMITATIONS

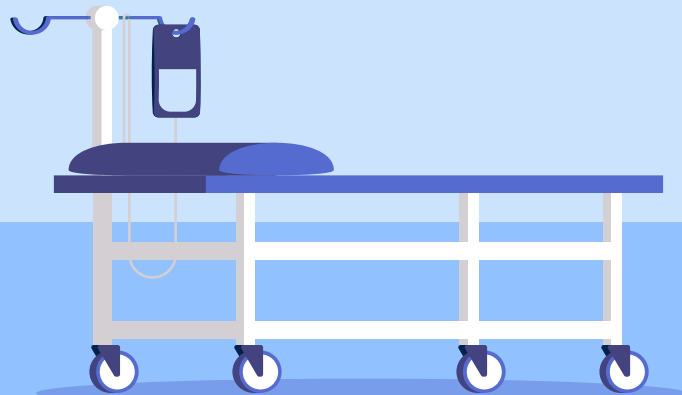
Fixed Duration of study and only around 100 patients were observed , the result cannot be generalized to the whole population



MRI scans have been performed on ancient Egyptian mummies to reveal details about their anatomy and causes of death.



REVIEW OF LITERATURE

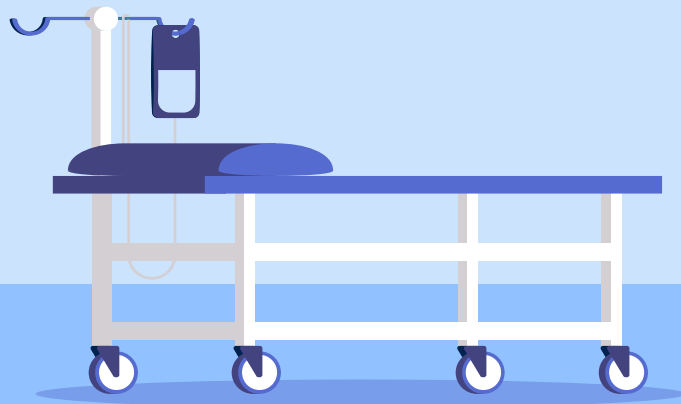
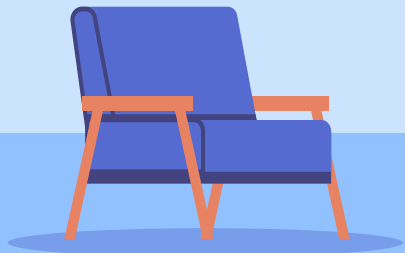


AUTHOR	TITLE	METHODOLOGY	FINDINGS
Kenneth K. Agwu et al, 2021	Improving Patient Flow: – Case Study of Radiology at Miyoshi Hospital	Improving Patient Flow: – Case Study of Radiology at Miyoshi Hospital	“The arrival times of patients exhibited an unpredictable and uncertain pattern. On average, there were 7 +- 5.4 patients per hour per day. Between 7 am and 10 am, the number of patients arriving reached its peak at 12 per hour. The average duration of each patient's service was 15 minutes. The average cumulative waiting time for patients was 116 minutes. It was observed that the waiting time had a significant positive correlation with the rate of patient arrivals (P <0.05).”
L. Hofman,2014	Capacity Management in Isala's Radiology Management of Planned and Unplanned Patient Arrival Variability	Cross-sectional study	“By modifying the planning process, it is possible to mitigate the adverse effects of bottlenecks that hinder performance and introduce variability. The volatile nature of demand makes it extremely challenging to accurately forecast future needs. However, enhancing performance in terms of access time, latency, utilization, workload, and cost can be achieved by eliminating bottlenecks.”

AUTHOR	TITLE	METHODOLOGY	FINDINGS
V. Rema, and K Sikdar	Optimizing waiting time in the outpatient department of a multi-speciality Indian hospital	Introduction of technology and model based on Queue Monte Carlo simulation, snowball sampling technique using questionnaire was used to collect the data.	Key performance indicators have been calculated to enable the management of patient flows and improve the operational efficiency of the service by identifying ways to reduce delays
Sabina Nuti, Milena Vainieri	To analyze variation in the delivery of diagnostic services in order to suggest possible solutions to reduce waiting time and increase quality of service and decrease financial cost	Waiting time measured per day was compared on the basis of the utilization rate of CT and MRI imaging in Tuscany	Significant differences were found in domains related to age, gender, and mortality, suggesting that radiology services were suboptimal and that services are underused or overused and need improvement”

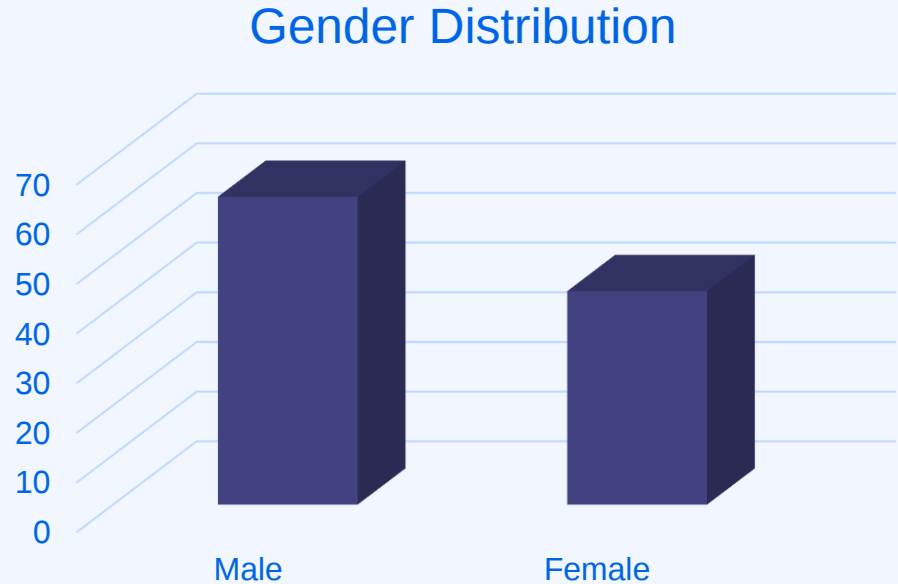


OBSERVATIONS



DEMOGRAPHIC DATA

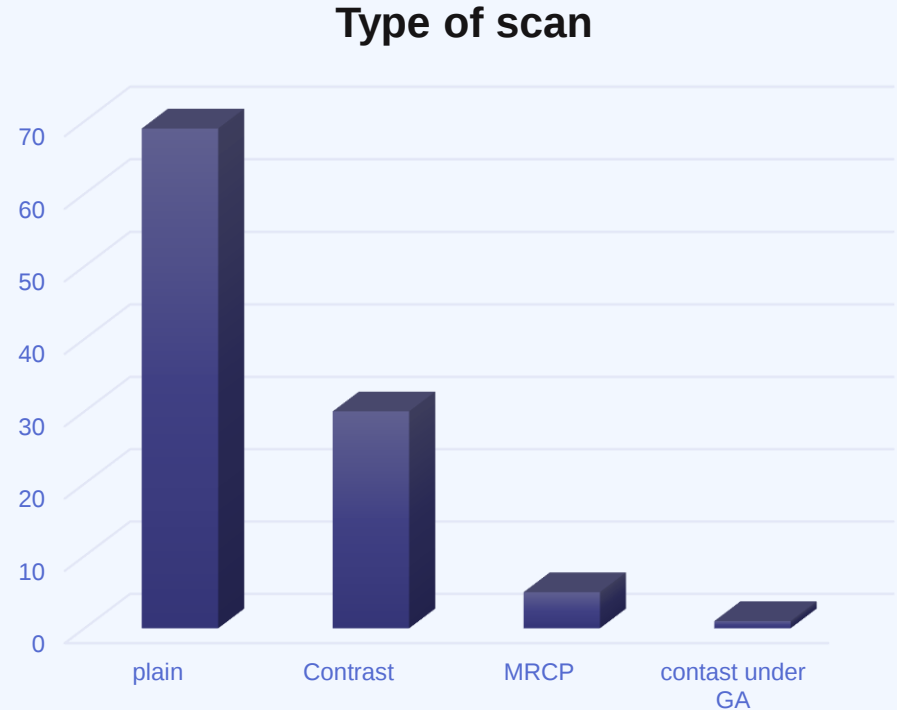
- Out of 105 patients who visited the Radiology department of Medanta for MRI scans :
- Male: 59.05%
- Female : 40.95%.
- The average age of the patients was 51 years



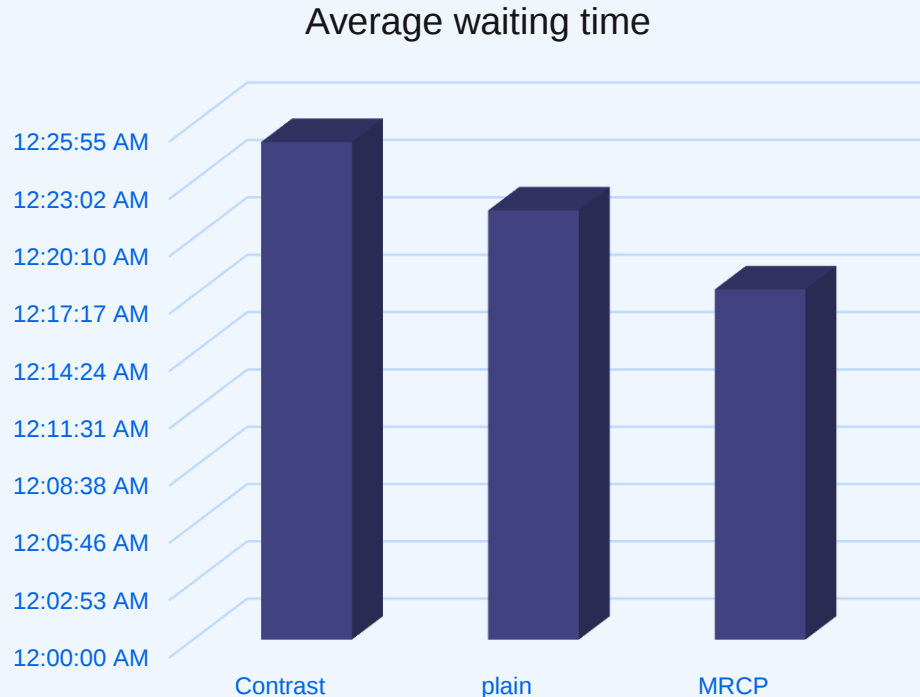
SCAN TYPE

Out of the 105 cases observed

- Plain scans : 65.7%
- Contrast scans : 28.6%
- MRCP : 4.8%
- Under General anaesthesia : 0.9%
- Majority scans were brain (45) and spine (32)



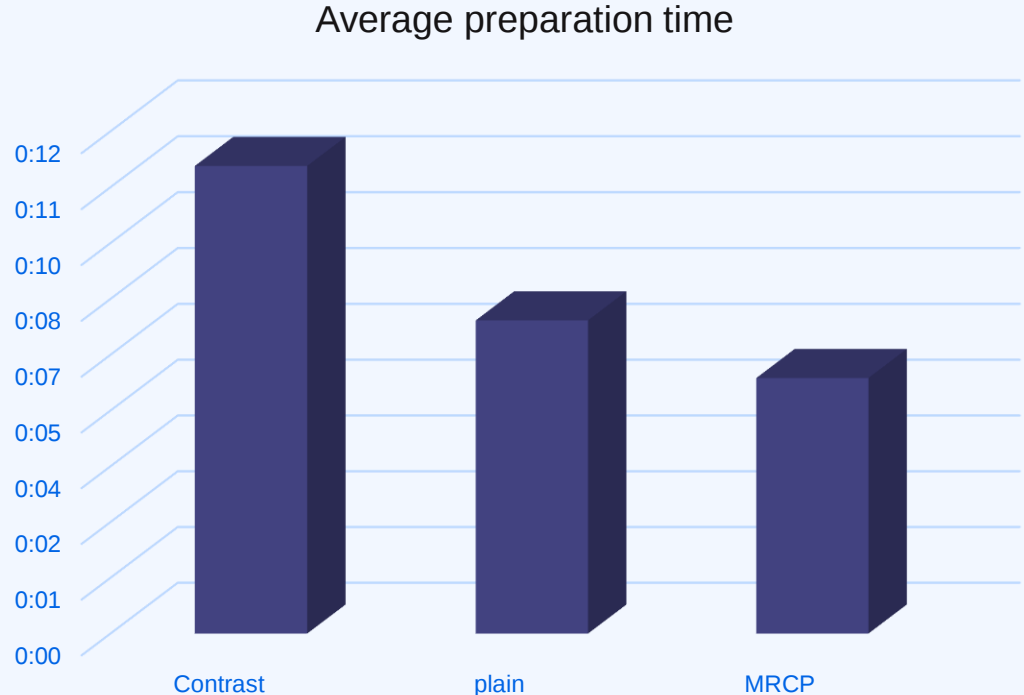
WAITING TIME



- Patients experienced an average waiting time of approximately **23 minutes** before undergoing their MRI scans.
- Contrast scans : 25 mins
- Plain scans : 21 mins
- MRCP : 17mins

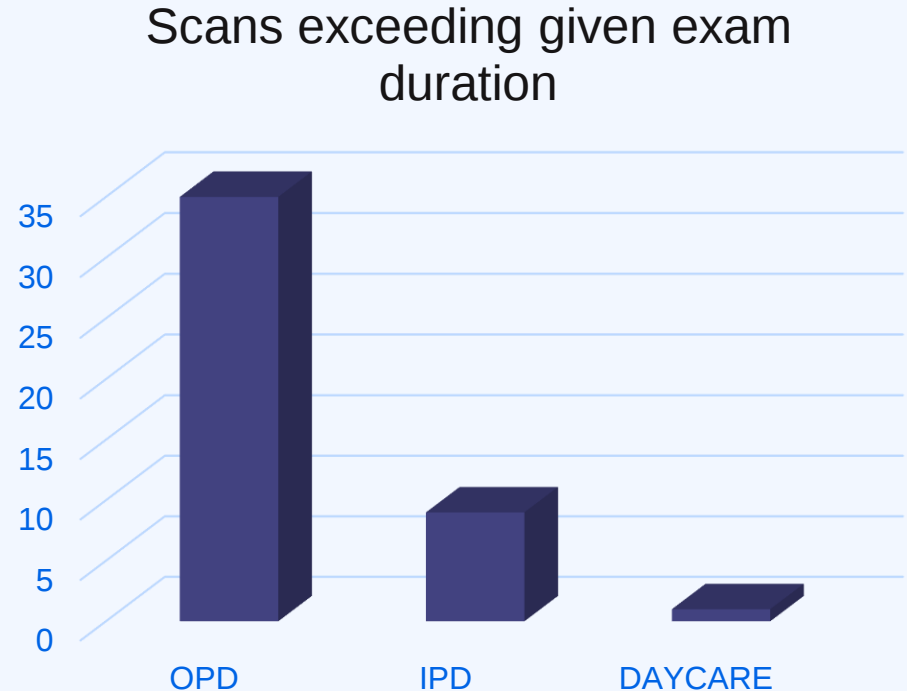
PREPARATION TIME

- For **contrast-enhanced** scans, which require additional preparation and administration of contrast agents, the study found an average preparation time of approximately **12 minutes**.
- For plain scan : **8 mins** of prep time was required

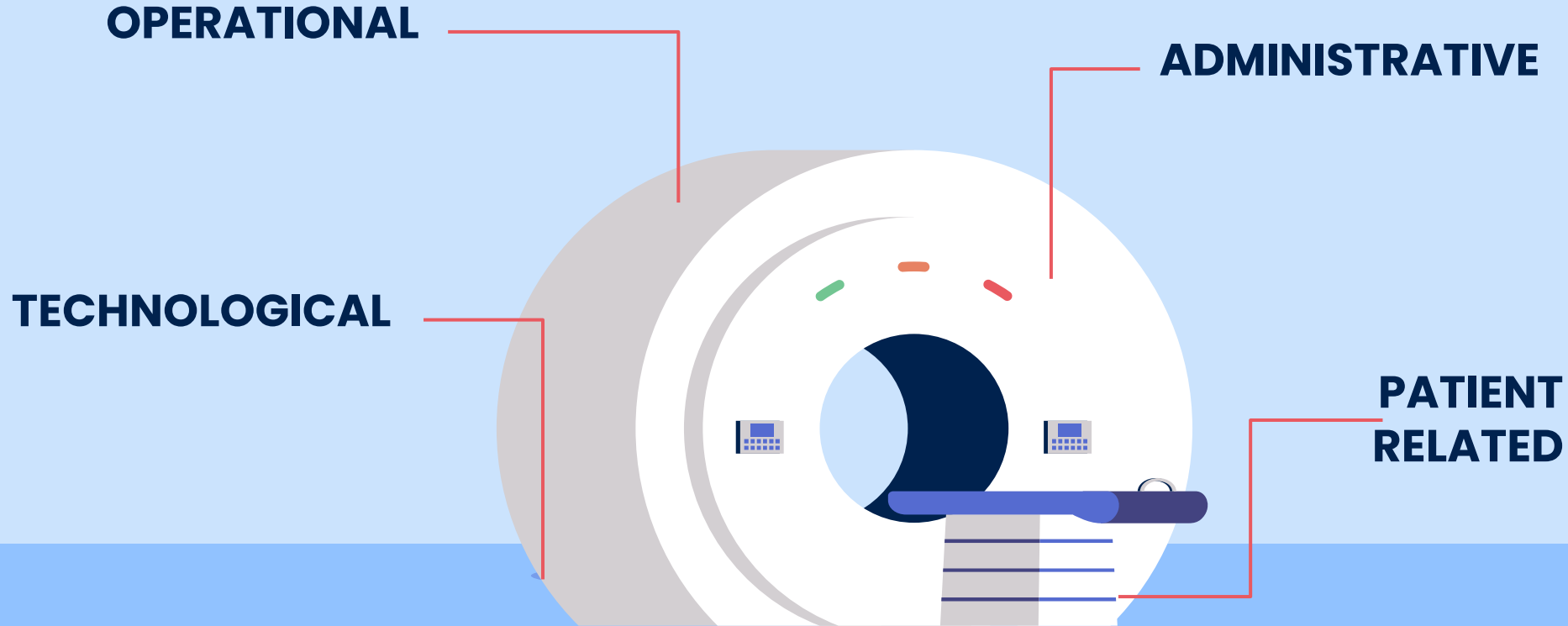


SCANS EXCEEDING ALLOTTED EXAM DURATION

- A total of **73 scans** exceeded the allotted scan time.
- This included :
 - OPD – 63
 - IPD – 9
 - Daycare – 1
- Average extra time taken during scans is 16 mins
 - Plain MRI: 18 minutes
 - Contrast-Enhanced MRI : 11 minutes
 - GA: 9 minutes



FACTORS AFFECTING MRI UTILIZATION



TECHNOLOGICAL FACTORS



UPKEEP MAINTENANCE

- regular inspections
- Cleaning
- Calibration
- Servicing of the equipment



DOWNTIME MAINTENANCE

- scheduled or unscheduled periods during which the MRI machine is unavailable for patient use due to maintenance or repairs



UPGRADES

- hardware upgrades,
- software updates,
- addition of advanced features or imaging techniques



The highest field strength achieved in a clinical MRI scanner is 11.7 Tesla.

PATIENT RELATED FACTORS



**Anxiety, distress
and
claustrophobia**



**Lack of knowledge and
awareness regarding
scan procedures**



**Insurance
coverage and
financial
considerations**



**Medical
condition/physical
limitations**



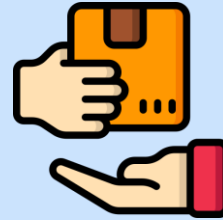
MRI has been used to study the effects of meditation on brain structure and function.



OPERATIONAL FACTORS



Lack of interdepartmental coordination and communication



Patient transfer and handover



Appointment Scheduling procedures



Lack of Staff awareness



The concept behind MRI was first proposed by two scientists, Raymond Damadian and Paul Lauterbur, in the early 1970s.

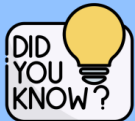
ADMINISTRATIVE FACTORS



**Allocation of
resources like
anesthesia
administration team**



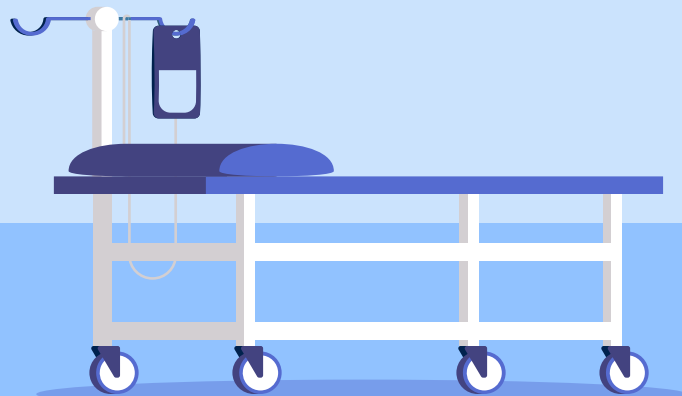
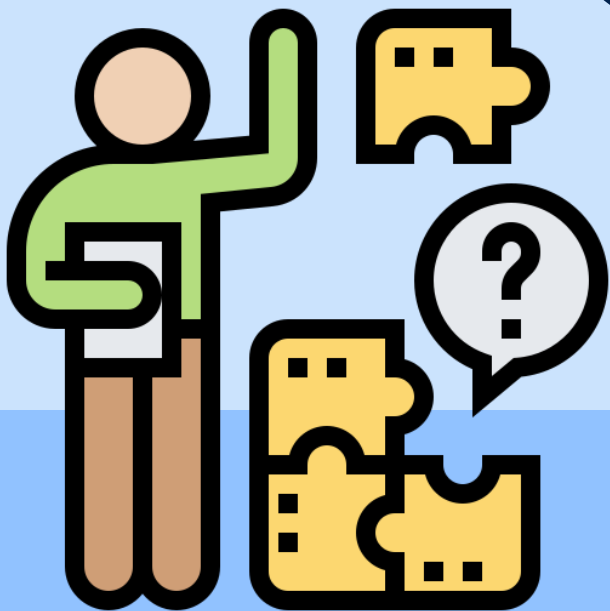
**Information
management and
documentation**



Most MRI scanners used in hospitals and medical research clinics are 1.5 or 3 T. Putting that in to perspective, the earth's magnetic field is around 0.00006 T. A 3 T MRI scanner is around 60,000 times stronger than the earth's magnetic field!



CHALLENGES





**Delay in patient
changing into
hospital gowns**



**Delay in shifting
from IP wards to
MRI**



**Lack of interdepartmental
communication and
coordination**



**Patient related events
like anxiety,
discomfort and
claustrophobia**



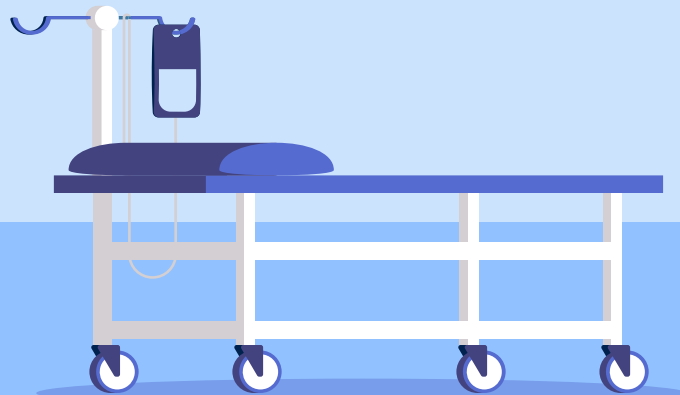
**Technical issues
with the machine**



**Limited availability of
anesthesia doctor**



RECOMMENDATIONS





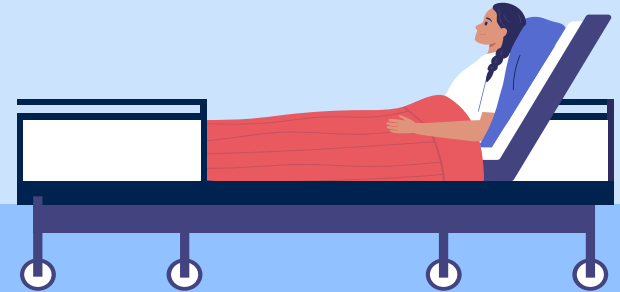
**Effective
Interdepartmental
and intradepartmental
communication**



**Allocated scan
time to be
reconsidered**



**Continuous department
specific training
programs for staff**

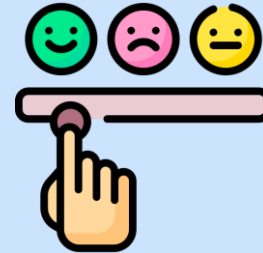




**Using patient counselling
and comfort measures to
reduce anxiety and
discomfort**



**Increase availability
of anesthesia services**



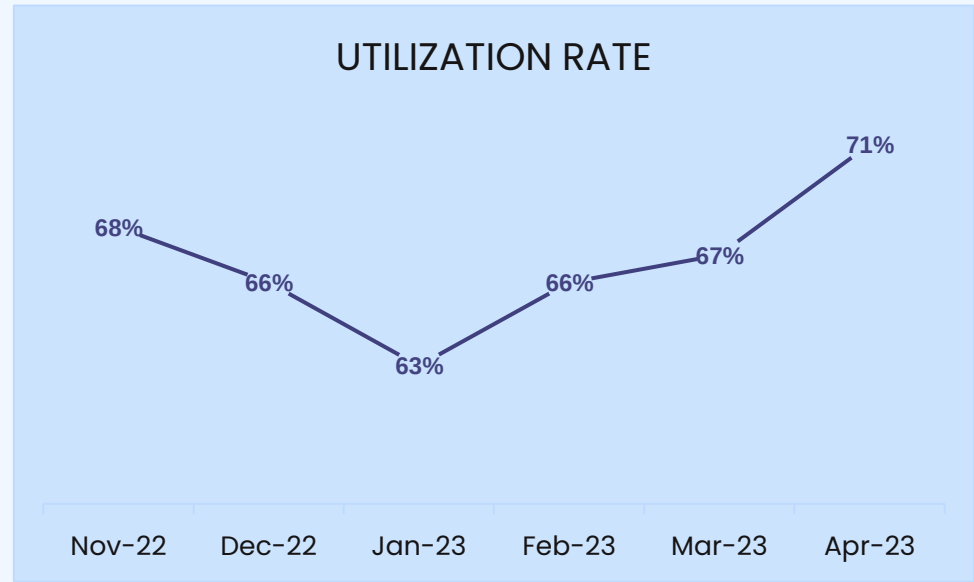
**Collecting patient
feedback right after the
scan**



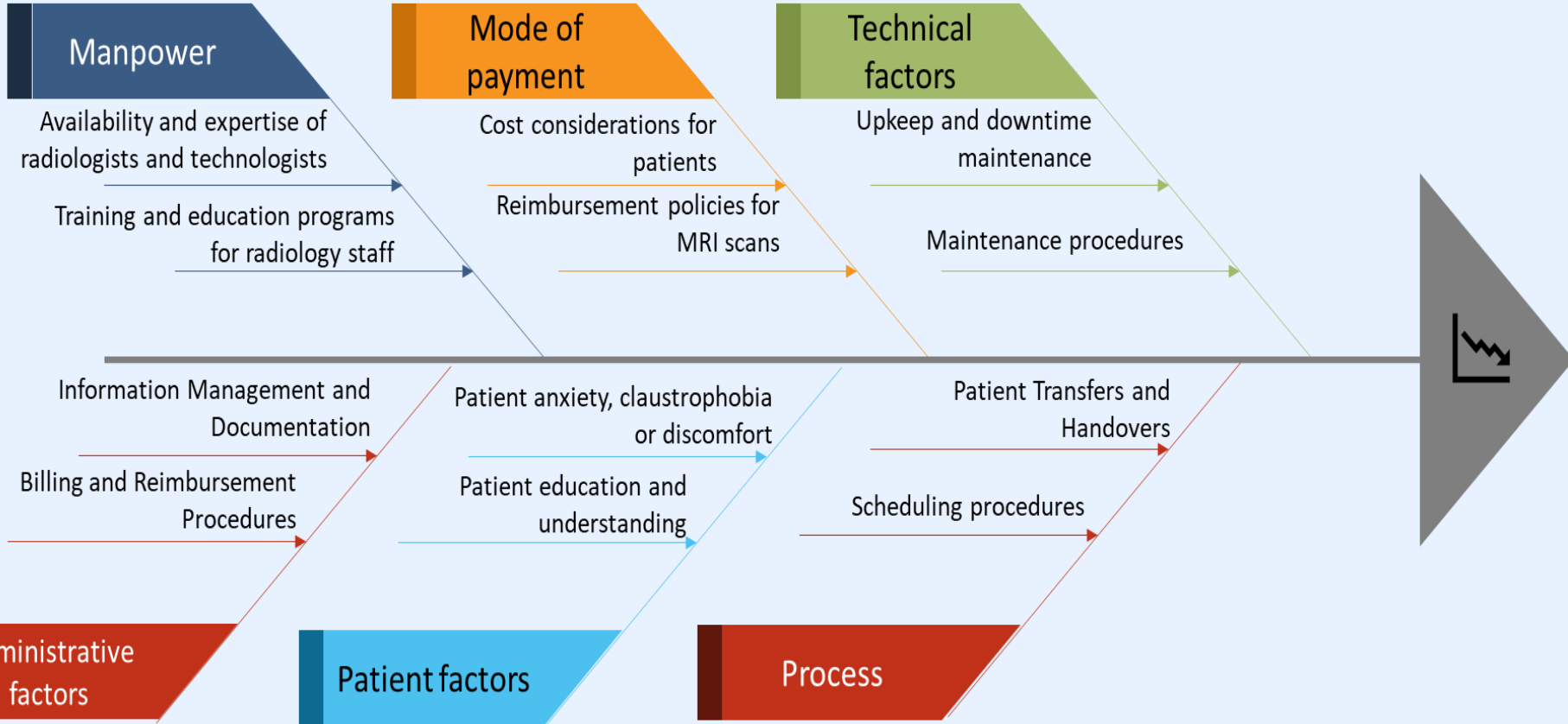
Utilization rate Nov'22 – Apr'23

Overall Utilization:

- The utilization of MRI shows some variation over the six-month period. It starts at 68% in November 2022, and reaches the highest utilization rate of **71% in April 2023**.
- This indicates some fluctuations in the demand and usage of MRI services.

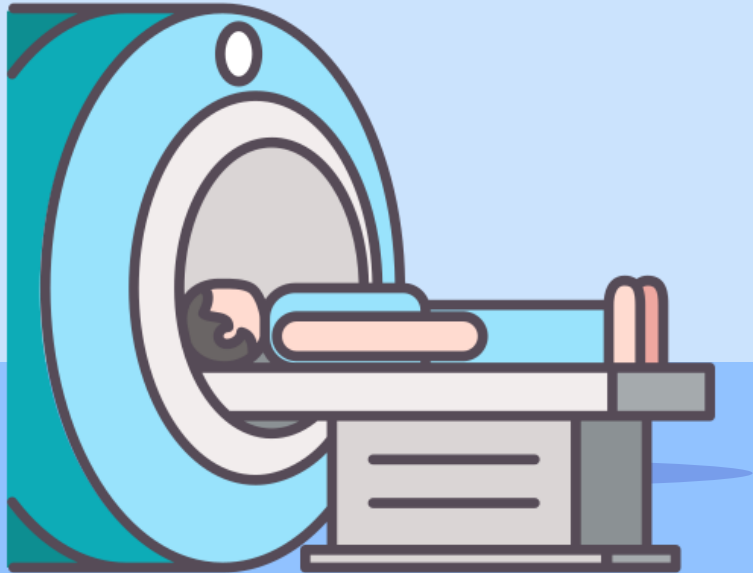


FACTORS AFFECTING UTILIZATION



CONCLUSION

it is important to recognize that MRI utilization is a complex and dynamic process influenced by multiple interrelated factors. Therefore, continuous evaluation of these factors are crucial to adapt to evolving patient needs, technological advancements, and healthcare demands.



**THANK
YOU**