Internship Training

at

TELERADIOLOGY SOLUTIONS

Demand Projection and analysis of elective volumes due to COVID-19 Pandemic

by

Shagun Parasher

PG/18/103

Under the guidance of

Ms. Divya Aggarwal

Post Graduate Diploma in Hospital and Health Management

2018-20

International Institute of Health Management Research
New Delhi

Internship Training

at

Teleradiology Solutions, Bangalore

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TRS®
SOLUTIONS LLP

(Completion of Dissertation from respective organization)

The certificate is awarded to

SHAGUN PARASHER

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

OPERATIONS

and has successfully completed his/her Project on

Demand Projection and analysis of elective volumes due to COVID-19 Pandemic

Date :-26-June-2020

TELERADIOLOGY SOLUTIONS, BANGALORE

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

We wish her all the best for future endeavors.

K. Akram Pervez

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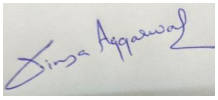
TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Shagun Parasher**, student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at Teleradiology Solutions, from 5th February 2020 to 26th June 2020.

The Candidate has successfully carried out the study designated to him during internship training and his/her 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 Pradeep K Panda
Dean, Academics and Student Affairs
IIHMR, New Delhi

Ms. Divya Aggarwal
Mentor
IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **"Demand Projection and analysis of elective volumes due to COVID-19 Pandemic"** at **"Teleradiology Solutions"** 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 **Post Graduate Diploma in Health and Hospital 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.

Name Signature

Dr. Manish Priyadarshi

Dr. Sumeet Swain

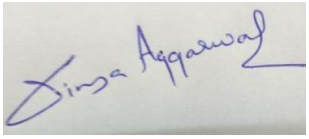
Ms. Nikita Sabherwal

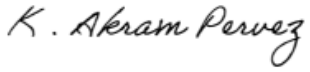
Dr. Ajay Sood

Certificate from Dissertation Advisory Committee

This is to certify that **Ms. Shagun Parasher,** a graduate student of the **Post- Graduate Diploma in Health and Hospital Management** has worked under our guidance and supervision. She is submitting this dissertation titled "**Demand Projection and analysis of elective volumes due to COVID-19 Pandemic"** at, "**Teleradiology Solutions**" in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital 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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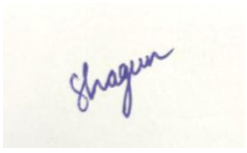
INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Demand Projection and analysis of elective volumes due to COVID-19 Pandemic** and submitted by **Shagun Parasher, PG/18/103** under the supervision of **Ms. Divya Aggarwal**, for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from 5th February to 26th June 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.



SHAGUN PARASHER

PG/18/103

FEEDBACK FORM

Name of the Student: Ms. Shagun Parasher

Dissertation Organisation: Teleradiology Solutions, Bangalore

Area of Dissertation: Operations Department

Attendance: She has been very regular and punctual in terms of attendance.

Objectives achieved:

1. Assisted to analyse manpower analysis for FY 2020- 21.
2. Assisted to analyse how COVID-19 has affected the business and taking further actions to reduce organizational costs.

Deliverables:
During COVID -19 situation, assisted to put below things in place. Instead of getting the reads done by Part Time Radiologists (who are paid on per click basis), the reads were done by our own In-house radiologists who are paid on monthly basis due to less volume. This helped to save additional cost during this pandemic situation and were able to utilize the existing resources optimally.

Strengths: Integrity, Focused, Taking initiatives, dedication.

Suggestions for Improvement: Need to develop more self-confidence, attention to detail, thinking out of the box, and improve on analytical skills.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni): Need to include in the course curriculum on practical training on data management and analytical skills.

K. Akram Pervez

Mr. Akram Pervez

Sr. Manager- Operations
Teleradiology Solutions

ACKNOWLEDGEMENTS

I believe, nothing really can be accomplished alone. It's the direction, guidance, involvement, support and prayers of more than one people around you which results into realization.

The Dissertation opportunity, I got at Teleradiology Solutions Pvt. Ltd. was a great chance of learning and professional development.

My Institute – International Institute of Health Management and Research, Delhi deserves the foremost appreciation for providing me a platform for my professional career.

I convey my deep and sincere thanks to Dr. Sunita Maheshwari (Co founder, Chief Dreamer) and Dr. Arjun Kalyanpur (Founder) for constantly encouraging me.

I am highly indebted to my mentor Mr. Akram Pervez (Sr. Manager, Operations) for his guidance, constant supervision, clarifying all my doubts, appreciating questions and for keeping me occupied throughout the training period.

My gratitude also goes to Dr. Anjali Khashempur and Ms. Margi for their constant guidance.

I am immensely grateful to and Ms. Divya Aggarwal, my mentor at IIHMR, Delhi for constantly encouraging me and guiding me in all the best possible ways.

Finally my thanks to all the people who have supported me directly or indirectly completing my dissertation project.

Thankyou

Table of Contents

ABBREVIATIONS AND TERMINOLOGIES

1. JCI- Joint Commission International
2. CT- Computed Tomography
3. MRI- Medical Resonance and Imaging
4. PET- CT- Positron Emission Tomography/Computed Tomography
5. TRS- Teleradiology Solutions
6. RXDX- Prescription and Diagnosis
7. IR- Inhouse radiologists
8. PTR- Part time Radiologists
9. Rad- Radiologist
10. A-Volume- Actual Volume
11. P-Volume- Predicted Volume
12. FY- Financial Year
13. Ureach-
14. TRS RIS- Radiology information system
15. PACS- Picture Archival and Communication system.
16. FRCR- Fellow of the Royal College of Radiology
17. MD- Doctor of Medicine
18. ABR- American Board of Radiology

International Institute of Health Management Research

Shagun Parasher

Demand Projection and analysis of elective volumes due to COVID-19 Pandemic

ABSTRACT: A study was done to analyse how COVID-19, a global disease that hit India in 2020, affected the teleradiology business. In this project, step 1, volume analysis for Q3 was performed and predicted the volume for Q4. For this the actual Q3 data and its 5% were added together, this gave us Q4 predicted volumes. Later in step 2, comparison between predicted vs actual volume was made, and the causes behind failure in target setting was analysed. To perform the root cause analysis, all the priority clients were called and information was gained from them for not sending cases. The RCA was done through Why-Why Analysis. It was found that the major reason behind drop in volumes was COVID-19. Upon analysis we found that the tele-radiology business was affected significantly with a 26% drop in volumes in the third quarter for financial year 19-20 and by 50% in the first quarter of 20-21. Appropriate counter measures were taken to prevent losses to the company in this pandemic. To save costs, it was suggested to have the cases reported by the inhouse salaried radiologists instead of the part time radiologists who are paid on per click basis. This helped save 65% -70% of our costs. Secondly, the option of leave encashment was revoked from the eligible staff and instead leaves were given to them. This also helped us save on the overtime costs that the company had to pay to the employees. Thirdly, it was suggested to let the people eligible to work from home, not attend office until very urgent. This would not only help reduce the cost but also reduce the chances of COVID infection, hence promoting safe working environment for all.

Keywords: COVID-19, Teleradiology, Emergency, Healthcare, Tele-reporting, Why-Why Analysis, Prediction.

ABOUT THE ORGANISATION

Teleradiology Solutions is a JCI accredited Tele-radiology services provider which provide Dayhawk and Nighthawk services to hospitals across various parts of the globe, majorly the hospitals in United States, Middle east and parts of India. (1)

It was established in 2002 by two Yale University physicians Dr. Arjun Kalyanpur and Dr. Sunita Maheshwari. The services provided by TRS are, reporting of imaging modalities including radiographs, ultrasound, CT, MRI, PET- CT, X-Rays. Services are provided across the globe with the focus on rapid turnaround reporting in the emergency/acute settings to meet the concept of Golden hour in patient care.

The TRS team of experienced and highly qualified radiologists can be located internationally (Israel, United States and Europe) as well as in metropolises, Tier 1and Tier 2 cities of India (Bangalore, Delhi, Mumbai, Hyderabad).

TRS as an organization has a strong academic focus with daily teaching sessions and weekly live e-lectures by both its own as well as external faculty using a comprehensive e-learning platform. It provides valuable online teaching resources to radiologists globally.

Vision

To excel in the field of International Teleradiology and become the role model for the industry.

Mission

To offer superior International Teleradiology services clients in underserved sector of the market worldwide.

Values

To conduct the practice of International Teleradiology in an ethical manner with patient care, patient safety and patient privacy at the core

Goals

- To focus on technology, innovation, research and operational efficiencies in order to always remain ahead of the competitors to provide the best value to clients.

- To provide a fulfilling, satisfying, work environment for our employees, without discriminations.

-To educate and train physicians, technologist and support staff and to use innovative technologies to maximize the reach of such training resources to the community at large.

Core values

-Greatness lies in getting it right every single time

- Always learning and improving

- Always helping community

- Work is fun, more work is more fun

- Positive energy and passion

- Client satisfaction is our satisfaction

- Every minute counts

ORGANIZATIONAL CHART

Rxdx branches

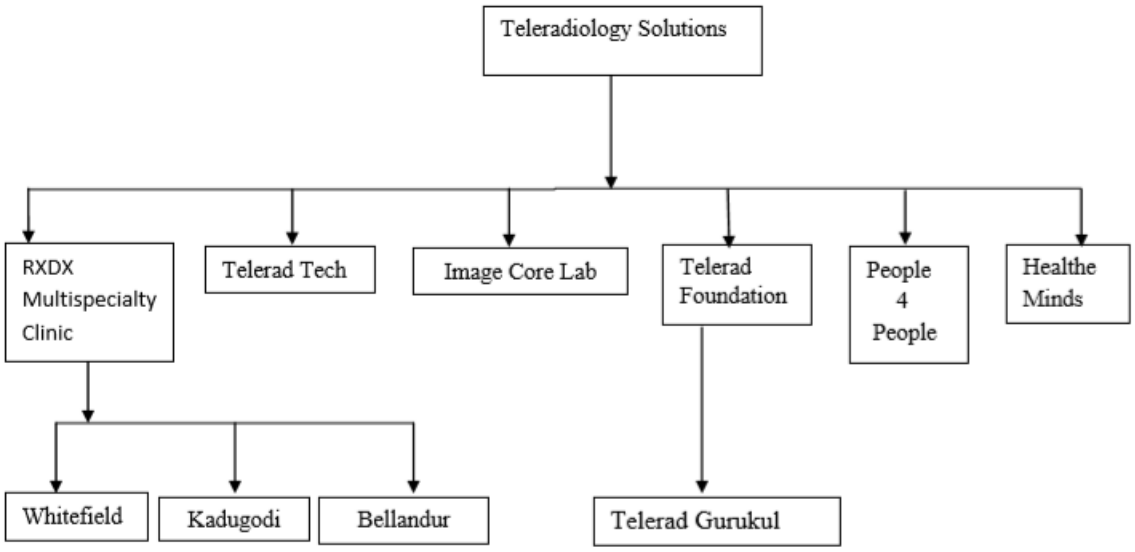


Figure 1: RxDx Branches

Telerad Tech: TRS subsidiary technology company has developed a cutting edge radiology workflow platform RADSpaTM which optimizes the efficiency and productivity of radiologists by delivering images anywhere at any time.

Image core Lab: TRS has joint research partnerships with major technology vendors and with biotechnology majors for clinical trials radiology via its specialized Image Core Lab

Telerad Foundation: Through Telerad Foundation, TRS provides high Tele - diagnostics to remote parts of Asia and Africa to the poor sections where there are patients and scanners but no doctor to interpret the images

People for people: Its is a trust fund for free playgrounds, set up in 2002 an aim to make the world around it, especially for children, a little happier. Till the date People 4 people has installed more than 250+ playgrounds for Government schools in Karnataka

RXDX multispecialty clinic: (Prescription Diagnosis) Telerad RxDx is presently operating a state of the art multispecialty and acute health care in 3 centers.

Health-e- minds: Health-e- minds is a startup focusing on providing mental health therapy and wellness advice through an innovative, easy to use and engaging online platform. The app allows for individuals to access a panel of experts such as physiatrists, Psychologist, counselors and life coaches scheduling and booking of sessions and online real time consultations and follow ups.

WORKFLOW AT TELERADIOLOGY SOLUTIONS

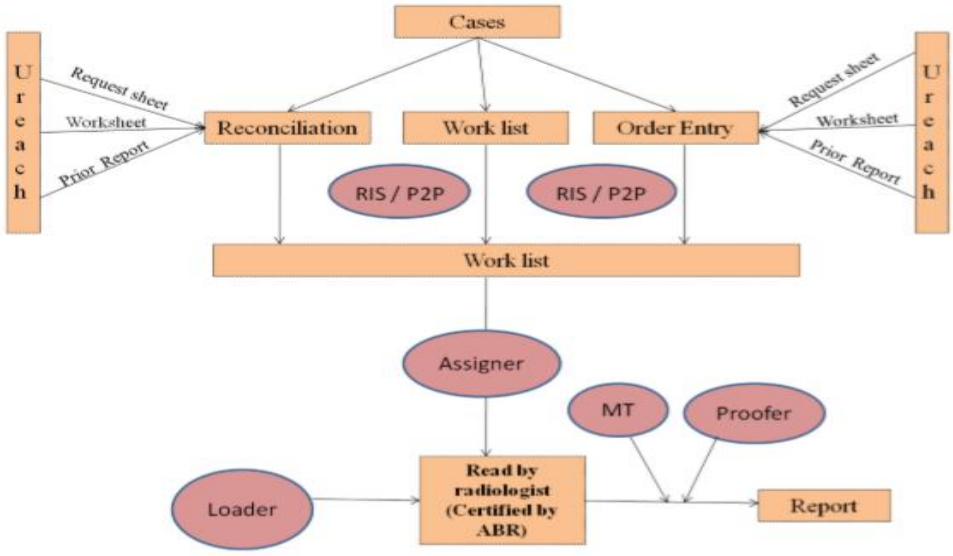


Figure 1: Workflow of TRS

TRS provides services based on two types of cases:

Emergency Cases (Emergency Nighthawk): Teleradiology providing cost effective and reliable out of hours reporting can lessen the pressure that normally comes with emergencies and providing reports are with high quality comprehensive, detailed and delivered at a rapid turnaround.

Features:

- Working for Nighthawk
- 70+ Hospital coverage (In US)
- Daily average 600+ cases

TAT

✓ Stroke cases: 15 minutes

- ✓ Emergency cases: 30 minutes
- ✓ STAT cases: 45 minutes
- ✓ Inpatient/outpatient: 60 minutes

Elective cases: Provide final reporting through teleradiology to the clients who have reporting capacity issue, overflow coverage, subspecialty, second opinion, quality audits or vacation coverage on 24*7 bases.

Features:

- Working for 24*7
- 100+ Hospital coverage in (With US, Non US/Indian, Indian Hospital)
- Daily average 600+ cases

TAT

- ✓ Stroke cases: 30 minutes
- ✓ Emergency cases (STAT): 60 minutes
- ✓ Routine cases: 240 minutes or 360 minutes or 720 minutes or 1440 minutes depends on agreement with hospital
- ✓

Technology used for reporting incidents:

- *RADSpa*: It is the cloud based software on which clients send their cases and the radiologist do the reporting. It also provides interface to operations and other teams to understand the TAT time for particular case

- *eRAD*: It is the outsourced software where hospitals/clients send the images for the cases.

- *Ureach*: It is the outsourced software where hospitals send the request sheet, worksheet and prior reports.

MAJOR CLIENTELE

Teleradiology clients includes care providers both in private and government and Diagnostic centers in India and across the world includes United states, Singapore, Canada, Puerto Rico, Europe, Nigeria, Zimbabwe, Cameroon, Ethiopia, Uganda, Tanzania, Thailand, Nepal, Maldives.

SWOT ANALYSIS OF TELERADIOLOGY SOLUTIONS:

SWOT ANALYSIS	
STRENGTHS	**WEAKNESS**
• Highly qualified and experienced Radiologists • JCI accredited • Strong QA process • Strong Credentials • Privately owned and physician led • Using self-designed internal software - RADSpa • Decade of experience in technology • 24 x 7 services • Quick turnaround time	• Dependency on other platform like eRAD, Ureach
OPPURTUNITIES	**THREATS**
• Collaboration with Ministry of health • Booming sector • Service for underserved area • Global access • Overcome the problem of lack of radiologist in particular time zone	• Competitors: VRad, Prabhat Telesolutions

ROLE OF DIFFERENT TEAMS INVOLVED IN PROCESS:

RADSpa (software) support team:

The radspa support team deals with any issues that are related to the radspa software. These issues can vary from usage issues, downloading issues, picture archival issues, issues faced in opening the prior images, issues with reporting etc. A ticket is generated everytime a user shares the problem with the support team. Support, then works on it and resolves within 30 minutes. The support team helps everyone who uses radspa software on their daily basis such as the case coordinators, P2P team, radiologists, senior management etc.

IT team

The IT team usually deals with any hardware and software related issues in the company systems. They work hand in hand with the radspa support to fix the issues that users face on their daily basis. IT also maintains the user details, is responsible for system maintenance, updates and internet issues.

Quality assurance team

The QA team helps in analyzing radiologist's proficiency, whether the radiologist is performing to the quality standards. Also, the QA team perfoms quality tests from time to time for the part time radiologists and convey the feedback in order to improve their quality of reporting. The QA is also responsible to verify that the peer review process is being followed for the reports already sent out. This is done to ensure that there are no errors whatsoever in the report and the client is satisfied. If an error is found, the QA maintain a log of the grade of the error and discusses with the radiologists to decrease the chances of such errors in future.

RIS team

The job of RIS team is to accept the request sheets received from the hospital and raise the order as per the details mentioned in those sheets. It is the initial step and therefore RIS team plays a very important role in the whole process. If the order is raised wrong, it might consume extra efforts and time of the next team.

P2P

P2P stands for Print to PACS. This team's role is to retrieve the images from external websites such as U-reach that some of the hospitals use, and attach these images with the correct request sheet, worksheet and prior report with the order. They also check for the image counts and cross-check the orders raised by the RIS team.

Case- Coordinator

The case coordinators are also called as assigners. They play a major role in the daily operations of TRS. They are responsible for assigning cases as per the hospital specific protocols, act as a mediator between the hospital and radiologist in electives and in case of emergency, coordinate between the call center and the radiologist. They also are responsible for assigning peer reviews in a timely manner. The case coordinators must also take care of all the "call for" messages. They have to be continuously be in contact with radiologist for issue resolution. They are also responsible for Scheduling of part time and in-house radiologist on the radspa website.

Radiologist

A radiologist is somebody who reads the case and reports it. They have to understand the study assigned to them and do the final reporting. They can ask for opinion, take help from senior radiologists and even share their query with the hospital directly (in certain emergency situations) or convey the same to the assigner. They have to put a suitable call code for the case which will indicate the assigner to look after the issue and try to sort it out.

Medical Transcriptionist

Medical Transcriptionists are responsible for transcribing and proofing emergency and elective radiology reports with the radiologists within the specified SLA with 100% quality. They have to final read the report to ensure no errors are present.

Call Center

Call center is required when there is something urgent related to the case that needs to be communicated to the hospital. They majorly look after the calls for non-Indian clients. They take queries from the radiologist, assigners etc. and discuss the same through call, email or fax with the hospital overseas. They also attend to the call codes to fetch or deliver the information to complete the report.

Proofer

A Proofer is responsible to proof the report before sending out the case to the hospital. They check for grammatical errors, check whether the radiologist has picked the right template for reporting or not. This is the last and final step before sending out the case and important one, as reports with errors leaves a wrong impression on the client.

PROCESS FLOW OF EMERGENCY AND ELECTIVE CASES

Cases are added to RADSpa via three ways:

Work list: This is where the cases can be seen. We can see the status of the report, the report itself whatever the radiologist has typed in it, the call codes, patient details and clinical history of the patient.

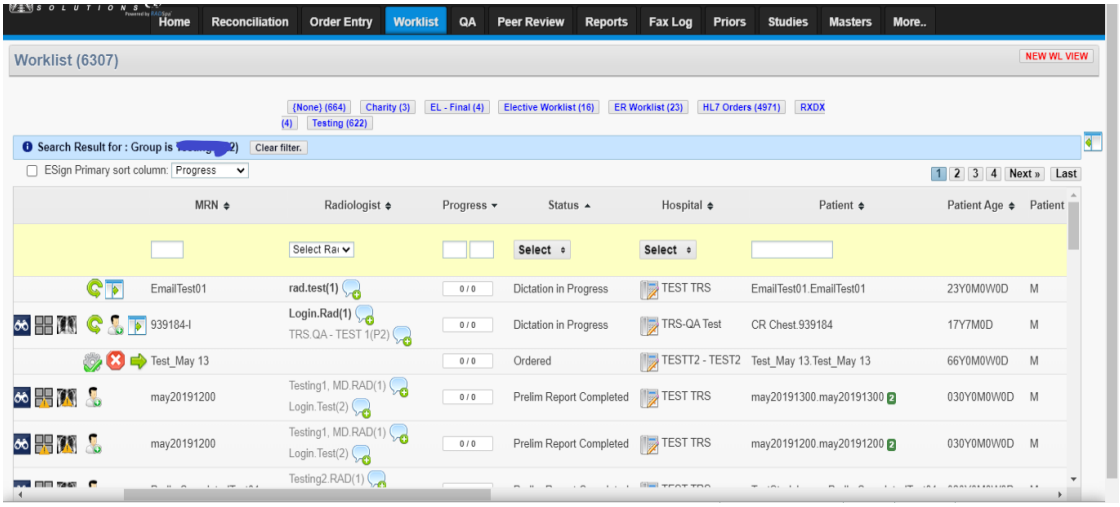


Figure 2: Sample Worklist

Reconciliation: Patient demographic information are added by the hospital, rest all information is added by RIS staff at TRS.

Ureach: Ureach is the platform where staff receives the request sheet, worksheet, and prior report. From Ureach, staff will add remaining information in order to complete the order raised by the hospital.

TRS RIS staff will add rest patient information from order Entry: Whole patient information is added by the RIS staff at TRS from the request sheet.

Finally, all the cases are added to the work list.

- Then P2P staff checks the image count on eRAD and cross check the patient information.
- After cross checking, assigner team assigns the cases to ABR.
- As per assignment, Loader loads the images for the ABR in order to complete the reporting faster.
- Radiologist sees the images and dictates the report which is typed by MT's.
- If Radiologist is typing the report themselves, then the radiologist sends the report for proofing.
- Proofer proof reads the report in terms of spelling mistake or missing information or grammar.
- Finally Radiologist, who is certified by ABR only, can send the report to the hospital.

Assigning protocol:

- Hospital specific protocol: Certain hospitals have their own protocols to have the cases reported by us. For eg, certain hospitals do not want a particular radiologist to be reporting for them because of some issues, some hospitals have a protocol of having the cases reported by only an ABR, or FRCR or MD radiologist.
- Radiologist specific protocol: Specialization of radiologist for particular body part with modality like CT, MRI. The type of specialization a radiologist has can help in good quality reporting.
- Peer review protocol: We have a 100 % peer review assigning protocol for certain radiologists and hospitals. This depends on the client and the quality of a radiologist. For emergency cases, the TAT for Peer review is 30 minutes whereas for elective cases it is 60 minutes.

INTRODUCTION TO THE PROJECT

Project Title: Demand Projection and analysis of elective volumes due to COVID-19 Pandemic

INTRODUCTION

In Tele reporting, the volumes that we receive for reporting depends on various factors such as the season, the environmental factors, disease spread etc. The volumes increase or decrease with time to time depending on these factors. So, it becomes important for us project demands and analyse at the end of each quarter to predict for the next. This helps us in planning our manpower well and ensure that the reports are sent to the client within the service level agreement as well as quality of each report is maintained.

The volumes are analysed for the purpose of delivering high quality reports on time. I chose this project since its forms a crucial base of our operations workflow and helps us decide the next course of action. Based on the results of this analysis, the radiologist's schedule, case coordinators schedule is prepared by the scheduling team. If the analysis is not done rightly, there will be gaps in schedules, which will ultimately affect the day to day operations of the team.

Also, covid being a pandemic that had hit the world in December 2019, would have affected our business as well and therefore, close monitoring of the volumes had to be done to be prepared for the adversities of this world wide disease that was going to affect India as well.

LITERATURE REVIEW

Business demand projection system and method, (2)

A business request based control framework and strategy stores past business request information during past time stretches for use with other information to figure business requests in such way that the past business request information is utilized to extend the business demands in present and not so distant future. The framework measures and stores the business request which is a continuation of items or errands, and activities the business interest for a majority of items or assignments for not so distant future time stretches utilizing rate based demand curves. The framework permits the formation of various interest bends for the things to decide not so distant future interest, utilizing characterized capacities and factors. Business request projections for present and not so distant future time stretches are overhauled for a majority of business things in light of changes in genuine interest information in time spans only before the present time stretch. (3) (2)

Demand Forecasting, unquestionably, is the absolute most significant segment of any association's Supply Chain. It decides the assessed demands for the future and sets the degree of readiness that is required on the supply side to coordinate the demands. It's a given fact that if an association doesn't get its predictions exact to a sensible level, the entire supply chain gets influenced. Naturally, Over/Under estimating has disintegrating sway on any association's Supply Chain and accordingly on P and L. Having found out the significance of Demand Forecasting, it is quite reasonable to talk about the anticipating strategies which are utilized to foresee the future estimations of interest. The info that goes in and the displaying motor which it experiences are similarly significant in producing the right forecasts and deciding the Forecast Accuracy. Here, we present an exceptionally one

of a kind model that pre-forms the information, yet in addition gatherings the yield of two equal propelled estimating motors which uses best in class Machine Learning calculations and Time-Series calculations to produce future forecasts. Our strategy utilizes information driven measurable strategies to clean the information of any potential mistakes or exceptions and attribute missing qualities assuming any. When the figure is produced, it is post handled with Seasonality and Trend amendments, if required. Since the last final prediction is the after effect of measurably pre-approved group of different models, the conjectures are steady and accuracy variety is exceptionally negligible across periods and estimate horizons. Hence, it is best to estimate the future demand than the conventional methods. (4)

Demand forecasting solicits how much from a product or service would be purchased, expended, or in any case experienced later on given promoting activities, and industry and economic situations. Request anticipating can include guaging the consequences for request of such changes as item configuration, value, publicizing, or the activities of contenders and controllers. This paper mentioned about improving the accuracy of estimates by drawing out logical information on forecasting accessible to demand forecasters. Precise forecasts are significant for organizations and different associations in making arrangements to fulfill need for their products and ventures (2)

(5) The COVID-19 emergency spread quickly all through the world, in December 2019. Joined with a Saudi Arabia versus Russia oil-value war, in addition to travel bans, this has driven financial exchanges to their most noticeably awful day since 1987. What's more, valuations are presently 30% (or more) underneath their past highs. We are confronting an absolutely new sort of emergency. For this situation, the wellbeing hazard (real mortality and contamination rates) isn't really corresponded with the financial hazard to the

worldwide economy. A worldwide downturn currently appears to be inescapable. Yet, how profound and long the downturn will be relies upon the accomplishment of measures taken to forestall the spread of COVID-19, the impacts of government strategies to mitigate liquidity issues in SMEs, to help families under money related misery, and to make sure about employments. It additionally relies on how organizations respond and to what extent the present lockdowns will last. Gracefully chains are likewise basic. There were activities by national banks. On March 15, the U.S. Central bank brought down its rates to 0-0.25%, as did the Bank of England and others. On March 18, the European Central Bank (ECB), which had just had negative rates for a long time, expanded the sum accessible for the quantitative facilitating program. Governments have additionally been racing to declare liquidity improvement programs. In any case, these legislative and national bank estimates did next to no to quiet markets or simplicity sell-offs. In the base situation, GDP development would endure a shot, going from 3-5% relying upon the nation. In different situations, GDP can fall as much as 10%. By and large, each extra month of emergency costs 2%-2.5% of worldwide GDP. The financial expenses of a downturn are inconsistent dispersed. We definitely know a large number of the most influenced parts. Likewise, in view of earlier emergencies, it appears that more youthful and less instructed laborers will, sadly, be bound to lose their positions. Nobody can precisely foresee the last monetary harm from COVID-19. (6)

This clearly relies upon timing, the seriousness of the pandemic into future weeks/months, and nations' strategy reactions. Likewise, any expectations of a coronavirus antibody mount, which would be welcome news. On the off chance that the continuous emergency goes on until the finish of the late spring, the worldwide economy faces the gravest threatseen over the most recent two centuries.

The COVID-19 pandemic has lead to more than 4 million confirmed cases and more than 290,000 deaths globally. It has also made people fear for the economic crisis and recession that will follow. Social distancing, travel restrictions and self-isolation have resulted to a reduced workforce across all economic sectors and many jobs have been lost. Schools have closed down, and the need for commodities and manufactured products has decreased. Only essential services are open. In contrast, the need for medical supplies has increased significantly. The food sector is also facing increased demand due to panic-buying and stockpiling of food products. In response to this global outbreak, the socio-economic effects of COVID-19 have been summarized on with respect to the world economy. (7)

The outbreak of COVID-19 (the disease caused due to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2)) has had a detrimental effect on global healthcare systems with a ripple effect on every aspect of human life as we know it. COVID-19 outbreak is considered as a global emergency on January 30, 2020. In a response to 'flatten the curve', governments have enforced border shutdowns, travel restrictions and quarantine in countries which constitute the world's largest economies, sparking fears of an impending economic crisis and recession. (8)

Teleradiology Soars During COVID-19 Pandemic(9)

This article talked about how the volumes for reporting are down, but radiologists cited benefits from working remotely from different corners of the world.

When the fast-moving COVID-19 pandemic had hit the United States, in 2020, radiology practices and departments almost overnight began to speed up the usage of teleradiology and other virtual technology tools to maintain their workloads from a remote location.

This came as an effective tool to normalize the usage of tele- techonology over the world and transfer the healthcare centers from on-floor care to tele-care. Not only tele radiology but other healthcare services were benefitted from this too. (10)

OBJECTIVES:

1. To analyse the data for Q3 (FY19-20), predict the volumes for Q4 (FY19-20) as well as Q1 (FY20-21). and observe the gaps in predicted vs actual volumes.
2. To analyse the impact of COVID-19 on business and suggesting strategies to revive revenue loss.

RESEARCH METHODOLOGY:

Study Design: Descriptive

Sources of Data: Secondary (Radspa software)

The study is performed using Predictive analysis. Using MS-excel for predicting the elective volumes for Q4 and Q1.

For the elective cases, since the major clients are Indian, the volumes each month increase by 5-6% each month. I have analysed the data based on 5% increase from the previous quarter to predict the values for next quarter.

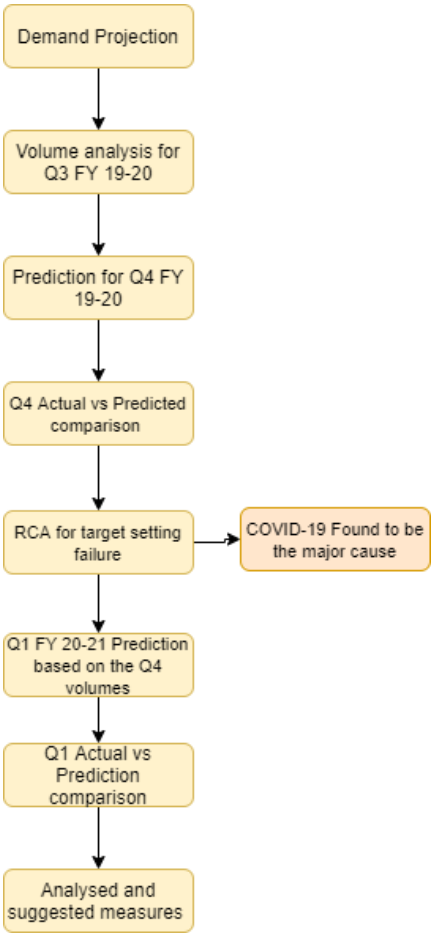


Figure 3: Step by Step Analysis

ANALYSIS

STEP- 1: Volume analysis along with cases read by PTR and IR < Q3 >

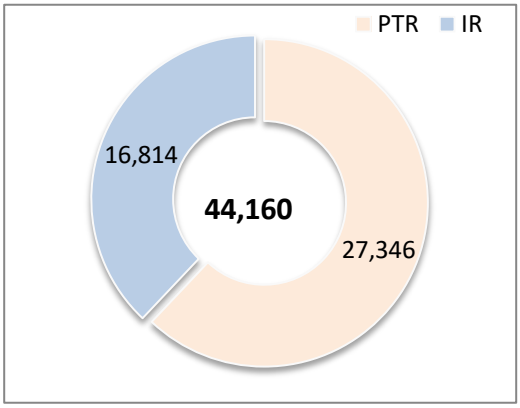


Figure 4: Total Volumes <Q3>

44,394

Total elective volumes reported in Q3

The data on total volumes received was collected and analysed. As we can see, out of 44,394 cases reported in Q3 (FY-10-20), the PTRs read 27,546 cases while IRs reported 16,848 cases.

PTRs play a huge role in Electives. They come as a backup for situations when the emergency volumes are at peak and IRs cannot be relieved.

STEP 2: Prediction and Target setting for < Q4 >

Actual < Q3 >								
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Grand Total
OCT	1914	2385	2737	2677	1884	2197	842	14636
NOV	2359	2068	2076	2001	2158	3009	856	14527
DEC	2853	2600	1877	1986	1845	2500	1336	14997
Total	**7126**	**7053**	**6690**	**6664**	**5887**	**7706**	**3034**	**44160**

Prediction for < Q4 >								
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Grand Total
JAN	2010	2504	2874	2811	1978	2307	884	15368
FEB	2477	2171	2180	2101	2266	3159	899	15253
MAR	2996	2730	1971	2085	1937	2625	1403	15747
Total	**7482**	**7406**	**7025**	**6997**	**6181**	**8091**	**3186**	**46368**

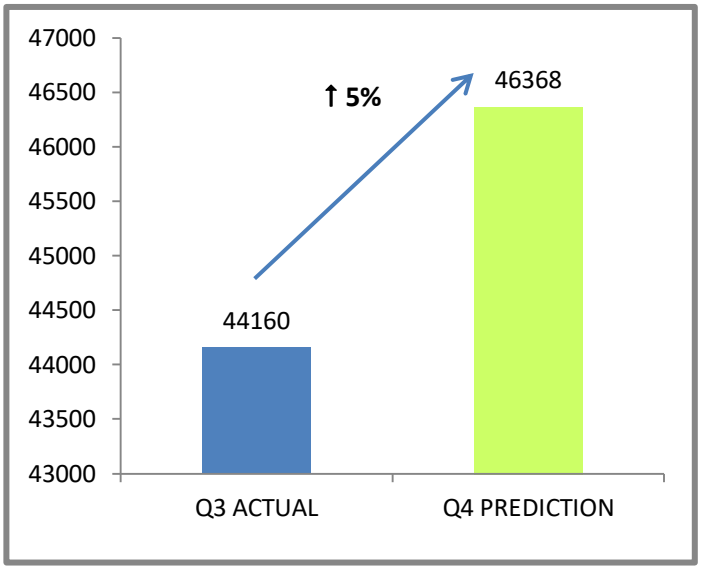


Figure 5: Prediction for <Q4>

Based on the Q3 data, we predicted the volumes for Q4. With a set pattern of prediction, where we take the 5% of previous quarter's A-Volume and add these together, the Q4 volumes were predicted.

As the graph states, Q3 actual volume was 44,160. We expected the volumes would increase upto 46,368 cases approximately for the Q4.

STEP 3: Actual Volumes for < Q4 >

The prediction was done and later at the end of Q4, the P-Volume was compared with the A-volume of Q4. In this step, the actual volumes after the end of Q4 were collected from the radspa software. This data was analysed.

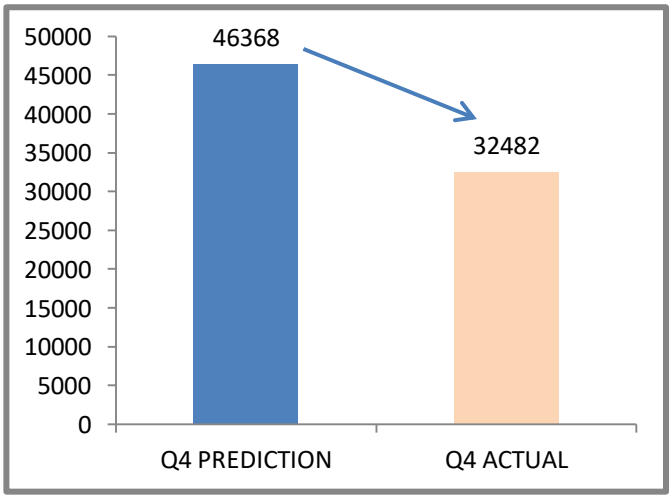


Figure 6: Q4 Vs Q4 Actual Volumes

The expected increase was of 5% in Q4, but instead it decreased by approximately 30% and our target setting had failed due to unexpected, unknown reasons.

STEP 4: Comparison Q3 VS Q4 (A-Volume)

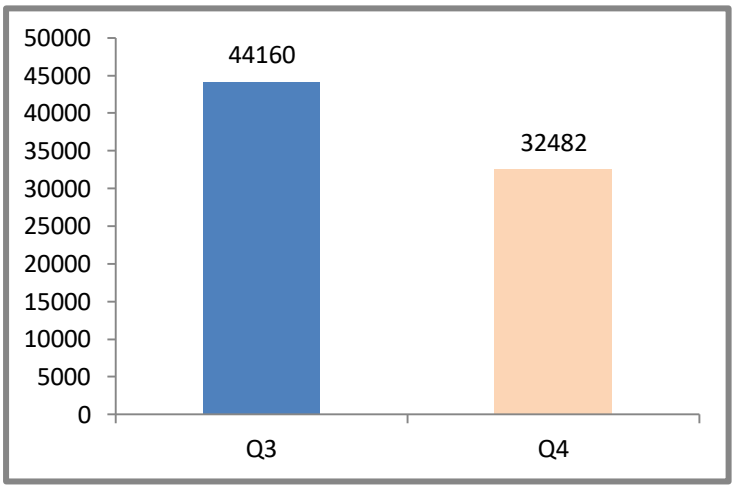


Figure 7: Q3Vs Q4 Actual Volumes

It can be observed that the A-Volume of Q3 differs with Q4 significantly, about 26%. The cases we received in Q4 were even less than what we had reported in Q3. In this cases, our target setting and prediction had not proven to be accurate, and the risk wasn't analysed correctly.

After this, we analysed the exact causes behind the fall in case volume.

STEP 5: Analysis and Improvement Action

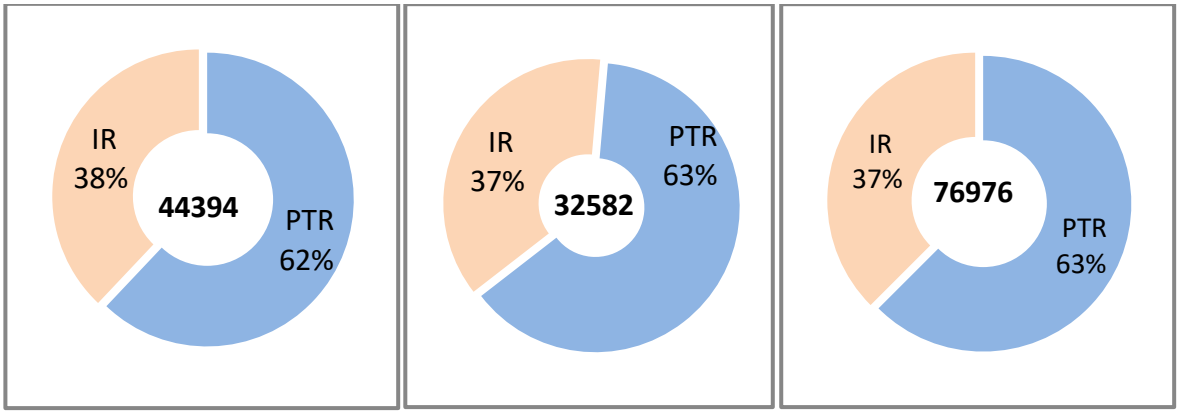
Root cause analysis:

The root cause analysis for the sudden downfall in volumes was done. The best way to deal with the situation at the point of time was to call the priority clients and ask them about the causes of such a downfall. With priority clients here, we refer to clients we receive the maximum business. We discussed the reason behind not sending the cases with them. The results of the analysis are mentioned below:

Why - Why Analysis:

WHY-WHY ANALYSIS						
PROBLEM	**PROBABLE CAUSE**	**WHY 1**	**WHY 2**	**WHY 2**	**WHY 5**	**COUNTER MEASURES**
TARGET SETTING FAILED	Cases were not sent by the hospitals	Walk-in Patients in the hospitals decreased.	Major centers and private hospitals closed , or operating with limited staff	Risk of disease to the hospital staff and infected machines	COVID-19	Schedule to be revised, based on COVID-19 situation and further, close monitoring to be done on monthly basis for the next two quarters.

Counter measures:



Q3 Actual Volumes	Q4 Actual Volumes	Q3+Q4 Actual Volumes

Conclusion:

•Based on the data of 2 QTRS. (Q3, Q4), it was observed that, 37% cases were reported by IRs, and rest 63% were read by PTRs.

Next action:

•As per data analysis, we decided that due to Covid 19 situation, 65% cases will be read by IRs, and 35% cases by PTRs (FRCR, ABR).

•We will monitor the situation for next 3 months (April-June) and further revise the plan based on actual results.

STEP 6: Plan for Apr - 20 (Based on Mar-20 data analysis)

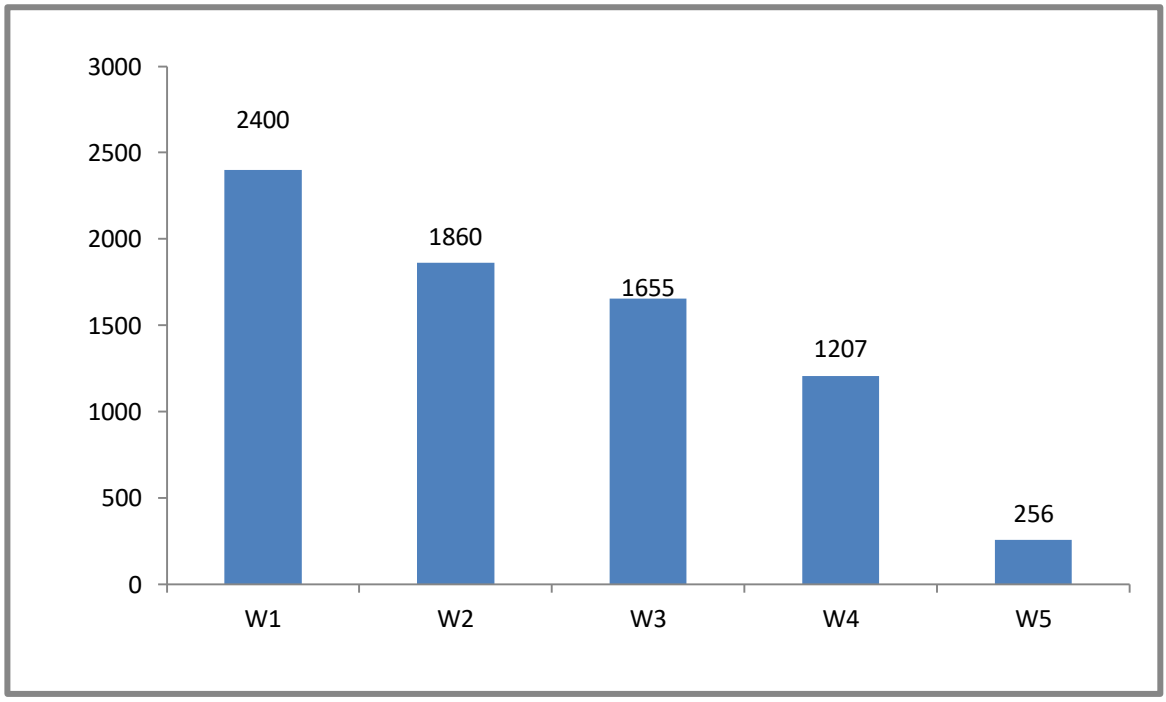


Figure 8: W1-W5 March Total volumes

Next action:

- **Based on Mar'20 week wise trend, the volumes declined by 50% from W1 to W4 due to COVID-19 situation.**
- **For Q1 of FY 2020-2021, we will set out targets with 50% decrease.**
- **Close monitoring to be done based on the results.**

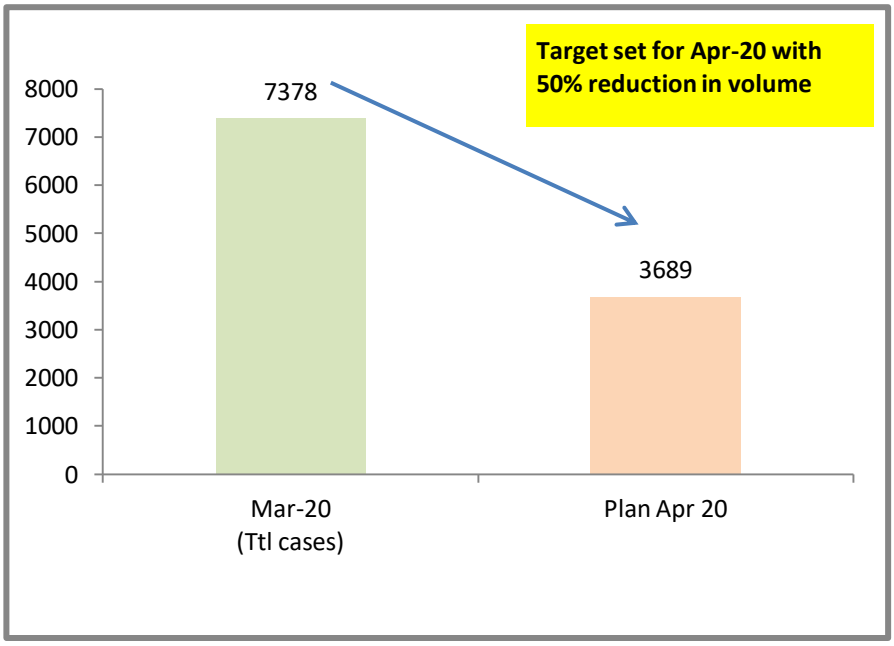


Figure 9: Target Setting for April

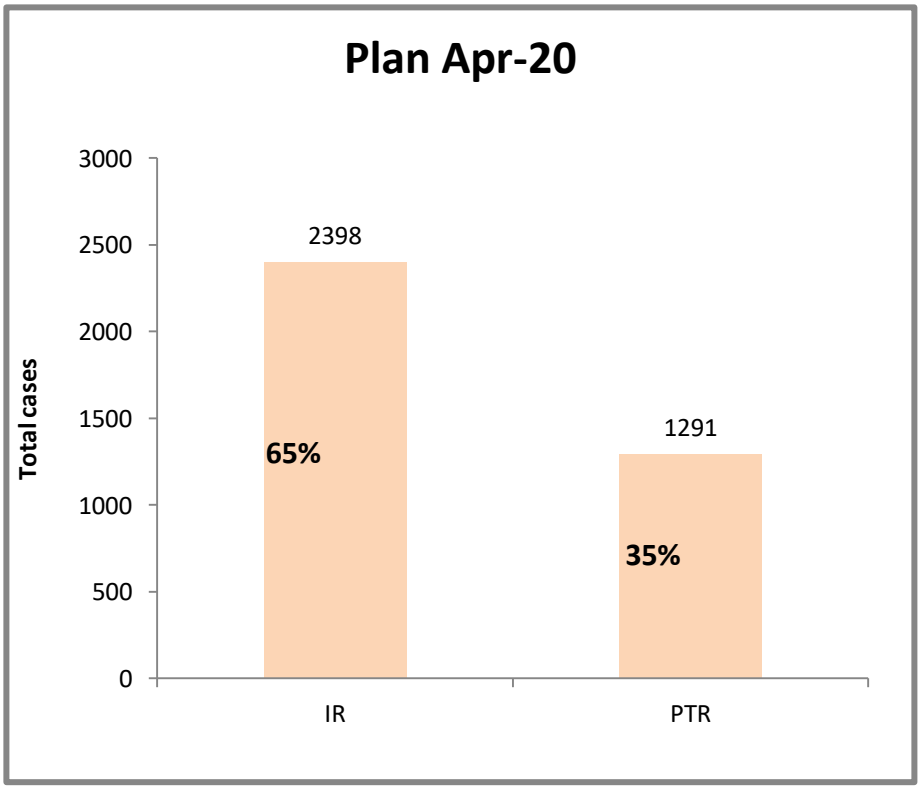


Figure 10: Plan for April

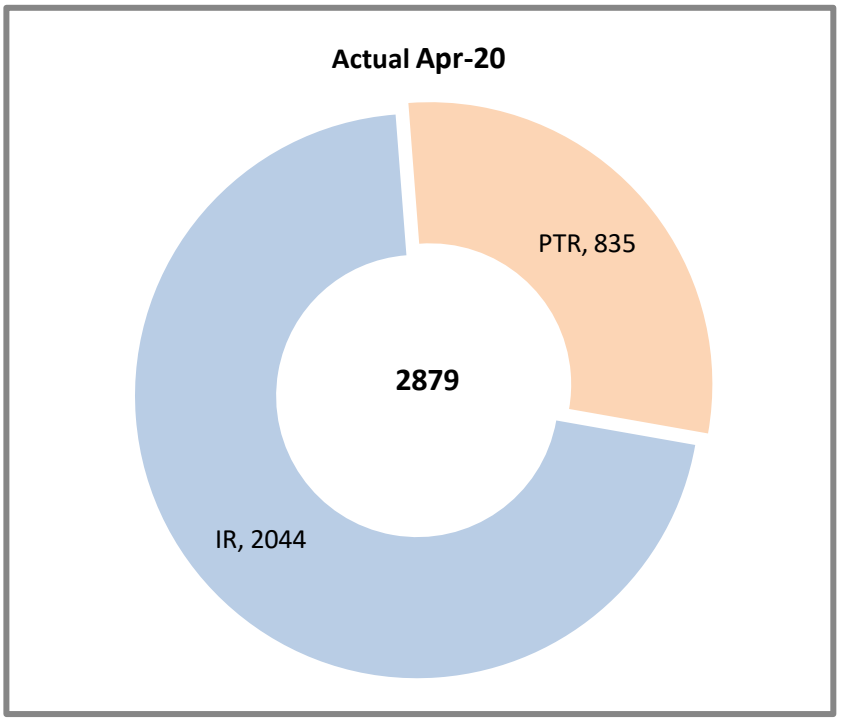


Figure 11: Actual April Volumes

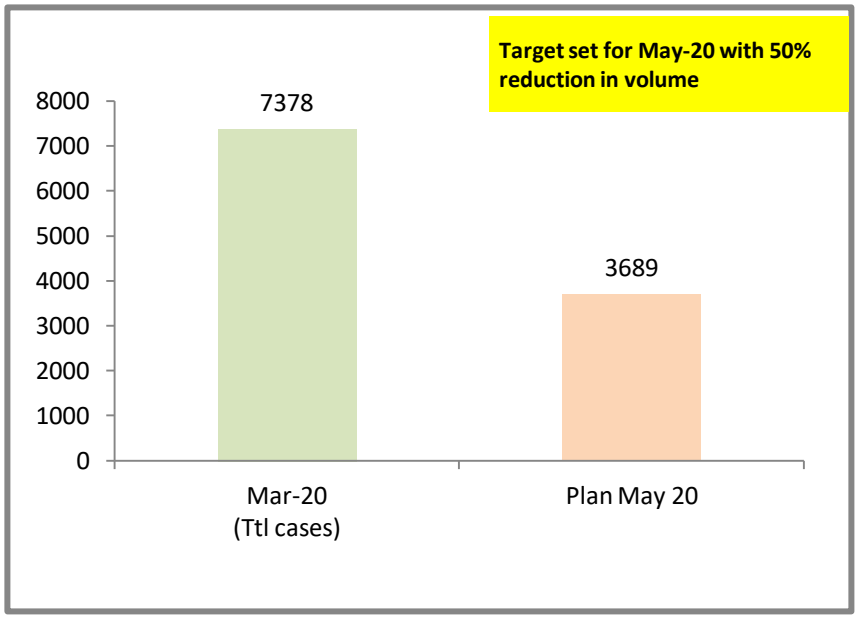


Figure 12: Plan for May

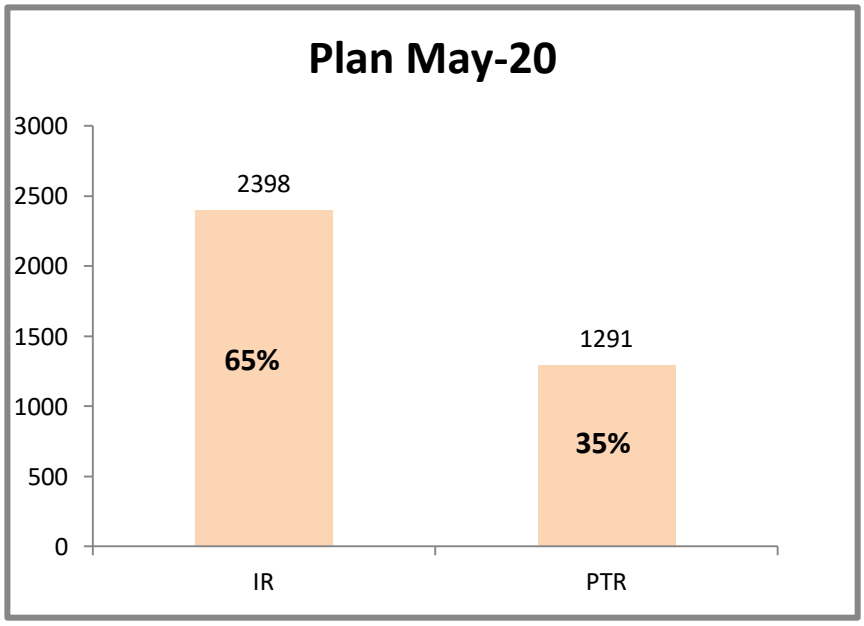


Figure 13: Plan for May

Next action:

- **Based on Mar'20 week wise trend, the volumes declined by 50% from W1 to W4 due to COVID-19 situation.**
- **For Q1 of FY 2020-2021, we will set out targets with 50% decrease.**
- **Close monitoring to be done based on the results.**

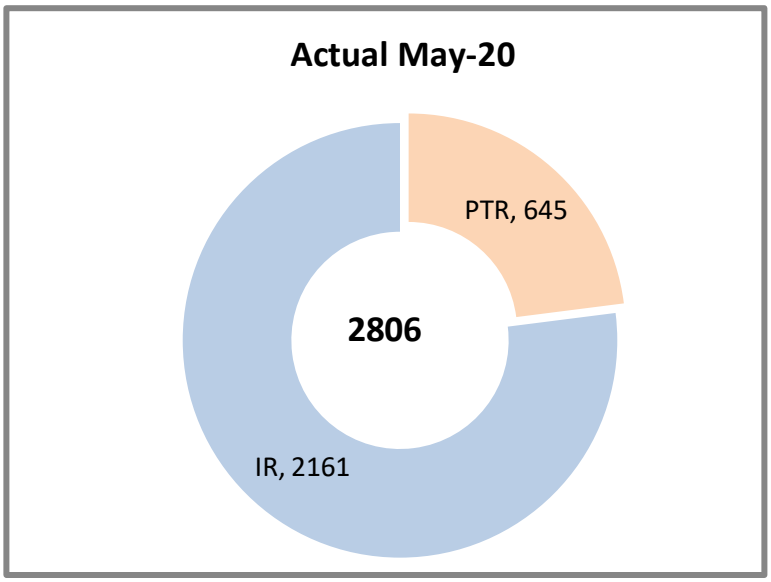


Figure 14: Actual Volumes for May

Plan vs Actual: The situation is under monitoring. The review will be done at the end of the Q1 i.e June.

RESULTS

As we can see, in April our inhouse radiologists read 2879 cases, and part timers read 835 cases. In May the inhouse radiologists read 2161 cases and part timers read 645 cases. These volumes were less than what was predicted. Covid-19 cases started increasing by the end of April and were on peak in May. This is why the case volumes have been lower than expected.

DISCUSSION

Making the inhouse rads read our elective cases, helped us save on the costs.

We can see that in the months of April and May, the case volume had decreased by a significant number. It went below 50%. This strategy proved to be beneficial to the company.

It was observed that, due to COVID-19 the business was hit all over the world. To prevent major affect and damage, the plan was made in such a way to prevent unnecessary cost and improve quality of reporting.

As per what the analysis suggests, it can be observed that the elective volumes have been worst affected in March, the volumes were lower than what was predicted. There was a drop of more than 50% in March and 60% in April. This was something which was unexpected that had happened. The solutions which were suggested were simple and played a crucial role in fighting the global pandemic.

Instead of getting the reads done by Part Time Radiologists, who are paid on per click basis, we got the cases reported by the Inhouse radiologists who are paid on monthly basis. The benefit of doing so was to prevent costs in a pandemic situation, promote quality and make inhouse radiologists who did not read Elective cases, earlier.

Further, in future, since the company is into the teleradiology business which is a booming sector, the company will now expected to have better business as most healthcare organizations over the world are expected to rely on the tele-reporting model of service delivery.

SUGGESTIONS

1. Its suggested to have the inhouse radiologists read until the volumes increase in September November, save costs. This would help us save 70% costs every month.

2. Secondly, it was suggested to let the people eligible to work from home, not attend office until very urgent. This would not only help reduce the everyday running costs of the office but also reduce the chances of COVID infection, hence promoting safe working environment for all.

3. It was suggested to save money by cutting down costs on bandwith requirements, utilise company's own systems to communicate such as Radspa chat, or Microsoft teams instead of Bigant. The organisation pays a hefty amount of money to the Bigant software organisation. Using what we already have with us and which is free would help us save money and utilise it on other important needs of the organisation.

4. For future, hire more FRCRs so that it decreases the dependency. This is because currently the organisation has only 1 onboarded inhouse FRCR radiologist who is paid on monthly basis. This radiologist can read 14 cases an hour and can also report the cases for Indian hospitals who require MD doctors, at no added cost.

5. Take over smaller organisations that are into tele-reporting such as V4, Prakhar group and have them manage the daily operations. This would ensure less payment and more accountability as these smaller groups would be responsible for running the daily operations of TRS electives and they will be held solely accountable for communicating the

organisation's needs of reporting, the quality of reporting, TAT requirements. They will be also responsible for maintaining the No-Show and leaves of the radiologists. They can themselves decide the payments of each radiologist.

References

1. Teleradiology Solutions | Company for Teleradiology Reporting Services [Internet]. [cited 2020 Jun 26]. Available from: https://telradsol.com/
2. (PDF) An Intelligent Approach to Demand Forecasting [Internet]. [cited 2020 Jun 26]. Available from: https://www.researchgate.net/publication/327225380_An_Intelligent_Approach_to_Demand_Forecasting
3. Green KC, Armstrong JS. Demand Forecasting: Evidence-Based Methods. 2012 [cited 2020 Jun 26]; Available from: https://repository.upenn.edu/marketing_papershttp://dx.doi.org/10.2139/ssrn.3063308
4. Armstrong JS, Green KC. Demand Forecasting II: Evidence-Based Methods and Checklists. 2017.
5. Economic Effects of Coronavirus Outbreak (COVID-19) on the World Economy by Nuno Fernandes :: SSRN [Internet]. [cited 2020 Jun 26]. Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3557504
6. How Pricing Depends on the Demand Curve 9.1 Motives and objectives Broadly.
7. Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, et al. The socio-economic implications of the coronavirus pandemic (COVID-19): A review [Internet]. Vol. 78, International Journal of Surgery. Elsevier Ltd; 2020 [cited 2020 Jun 26]. p. 185–93. Available from: /pmc/articles/PMC7162753/?report=abstract
8. Burute N, Jankharia B. Teleradiology: The Indian perspective [Internet]. Vol. 19, Indian Journal of Radiology and Imaging. Wolters Kluwer -- Medknow Publications; 2009 [cited 2020 Jun 26]. p. 16–8. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2747412/
9. Teleradiology Soars During the COVID-19 Pandemic [Internet]. [cited 2020 Jun 26]. Available from: https://www.rsna.org/news/2020/April/Telehealth-Surge
10. Fernandes N. Economic Effects of Coronavirus Outbreak (COVID-19) on the World Economy. SSRN Electron J [Internet]. 2020 Mar 24 [cited 2020 Jun 26]; Available from: https://papers.ssrn.com/abstract=3557504

ANNEXURES

STEP- 1 : Volume analysis along with cases read by PTR and IR < Q3 >

OCT-DEC (PTR+IR)	Sep	Oct	Nov	Dec	Grand Total
1		31	121		152
2		14	21	6	41
3		45			45
4	3	2183	1734	751	4671
5			1		1
6			8		8
7		6	12	18	36
8		43	9		52
9		2			2
10			3	7	10
11		185	50		235
12		1		6	7
13		19	29	22	70
14	7	94			101
15	13	1186	874	919	2992
16		106	71	203	380
17	10	269	57	46	382
18	1	91	80	109	281
19		158	25		183
20				15	15
21		89	132	73	294
22	12	341	238	177	768
23			15		15
24			227	32	259
25			1		1
26			11		11
27				225	225
28		34	248	207	489
29		106	91	138	335
30				4	4
31		974	821	949	2744
32		862	677	1015	2554
33	11	146	365	140	662
34		474	517	21	1012

35		5	9	4	18
36		9	9	16	34
37		74	484	452	1010
38	11	145			156
39	30	1180	815	1460	3485
40	11	43	151	127	332
41	2	222	74	98	396
42		103	153	183	439
43		75	116	159	350
44			6	206	212
45	5	249	206	124	584
46		7	4		11
47		9			9
48		2	12	15	29
49		153	272	141	566
50	74	956	966	1084	3080
51		3	13	6	22
52		23	7	3	33
53			5	3	8
54		20	3	11	34
55		43	141	95	279
56		44	118	149	311
57		115			115
58		10		5	15
59		19			19
60				24	24
61	1	87	124	164	376
62	7	100	213	688	1008
63		16	6	6	28
64				4	4
65	1	1204	1856	2014	5075
66		11	7	7	25
67	18	351	5		374
68		11	41	82	134
69	1	7			8
70		222	117		339
71		235	600	665	1500
72			1		1
73		154	164	114	432
74		31	58	104	193
75	7	88	209	336	640

76		167	230	192	589
77			15	14	29
78		30	4		34
79		34	8	20	62
80		283	253	514	1050
81		80	82	42	204
82	8	325	350	398	1081
83	1	138	129	146	414
84		1			1
85		93	53	39	185
86	**234**	**14636**	**14527**	**14997**	**44394**

STEP 2: VOLUME ANALYSIS AS PER WEEK DAYS < Q3 >

OCT	Total OCT	Day	NOV	TOTATL NOV	Day	DEC	Total Dec	Day
01-Oct	436	Tue	01-Nov	429	Fri	01-Dec	256	Sun
02-Oct	449	Wed	02-Nov	523	Sat	02-Dec	527	Mon
03-Oct	530	Thu	03-Nov	182	Sun	03-Dec	532	Tue
04-Oct	504	Fri	04-Nov	582	Mon	04-Dec	447	Wed
05-Oct	503	Sat	05-Nov	573	Tue	05-Dec	533	Thu
06-Oct	193	Sun	06-Nov	578	Wed	06-Dec	450	Fri
07-Oct	485	Mon	07-Nov	467	Thu	07-Dec	612	Sat
08-Oct	410	Tue	08-Nov	412	Fri	08-Dec	274	Sun
09-Oct	560	Wed	09-Nov	577	Sat	09-Dec	495	Mon
10-Oct	615	Thu	10-Nov	196	Sun	10-Dec	535	Tue
11-Oct	533	Fri	11-Nov	551	Mon	11-Dec	593	Wed
12-Oct	678	Sat	12-Nov	492	Tue	12-Dec	500	Thu
13-Oct	176	Sun	13-Nov	437	Wed	13-Dec	372	Fri
14-Oct	484	Mon	14-Nov	509	Thu	14-Dec	626	Sat
15-Oct	460	Tue	15-Nov	420	Fri	15-Dec	345	Sun
16-Oct	537	Wed	16-Nov	663	Sat	16-Dec	581	Mon
17-Oct	476	Thu	17-Nov	270	Sun	17-Dec	521	Tue
18-Oct	506	Fri	18-Nov	601	Mon	18-Dec	503	Wed
19-Oct	562	Sat	19-Nov	494	Tue	19-Dec	455	Thu
20-Oct	297	Sun	20-Nov	465	Wed	20-Dec	497	Fri
21-Oct	558	Mon	21-Nov	489	Thu	21-Dec	631	Sat
22-Oct	564	Tue	22-Nov	419	Fri	22-Dec	259	Sun
23-Oct	550	Wed	23-Nov	670	Sat	23-Dec	569	Mon
24-Oct	551	Thu	24-Nov	208	Sun	24-Dec	555	Tue

25-Oct	341	Fri	25-Nov	625	Mon	25-Dec	334	Wed
26-Oct	454	Sat	26-Nov	509	Tue	26-Dec	498	Thu
27-Oct	176	Sun	27-Nov	596	Wed	27-Dec	526	Fri
28-Oct	387	Mon	28-Nov	536	Thu	28-Dec	631	Sat
29-Oct	515	Tue	29-Nov	478	Fri	29-Dec	202	Sun
30-Oct	641	Wed	30-Nov	576	Sat	30-Dec	681	Mon
31-Oct	505	Thu				31-Dec	457	Tue

STEP 3 : PREDICTION AND TARGET SETTING FOR Q4

Actual < Q3 >								
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Grand Total**
OCT	1914	2385	2737	2677	1884	2197	842	14636
NOV	2359	2068	2076	2001	2158	3009	856	14527
DEC	2853	2600	1877	1986	1845	2500	1336	14997
Months Total	**7126**	**7053**	**6690**	**6664**	**5887**	**7706**	**3034**	**44160**

Prediction 5% INCREASE < Q4 >								
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Grand Total**
January	2010	2504	2874	2811	1978	2307	884	15368
Feb	2477	2171	2180	2101	2266	3159	899	15253
March	2996	2730	1971	2085	1937	2625	1403	15747
Total	**7482**	**7406**	**7025**	**6997**	**6181**	**8091**	**3186**	**46368**

STEP 4: Actual DATA Q4

Actual < Q3 >								
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Grand Total**
OCT	1914	2385	2737	2677	1884	2197	842	14636
NOV	2359	2068	2076	2001	2158	3009	856	14527
DEC	2853	2600	1877	1986	1845	2500	1336	14997
TOTAL	7126	7053	6690	6664	5887	7706	3034	44160

Actual < Q4 >								
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Grand Total**
JAN	1842	1863	1788	1872	1975	1941	721	11902
FEB	2098	2049	1930	2074	1611	2604	836	13202
MAR	1397	1113	1048	1165	1369	781	505	7378
TOTAL	**5337**	**5025**	**4766**	**5111**	**4955**	**5326**	**2062**	**32482**

STEP 5: COMPARISON Q3 VS Q4 (ACTUAL VOLUME)

Actual < Q3 >								
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Grand Total**
OCT	1914	2385	2737	2677	1884	2197	842	14636
NOV	2359	2068	2076	2001	2158	3009	856	14527
DEC	2853	2600	1877	1986	1845	2500	1336	14997
TOTAL	7126	7053	6690	6664	5887	7706	3034	44160
							Q3	44160

Actual < Q4 >								
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Grand Total**
JAN	1842	1863	1788	1872	1975	1941	721	11902
FEB	2098	2049	1930	2074	1611	2604	836	13202
MAR	1397	1113	1048	1165	1369	781	505	7378
TOTAL	5337	5025	4766	5111	4955	5326	2062	32482

STEP 5A: Analysis and improvement action

Q4	
PTR	20566
IR	12016

Q3	
PTR	27546
IR	16848

Q3+Q4	
PTR	48112
IR	28864

STEP 6: Plan for Apr- 20 (Based on Mar-20 data analysis)

March	Total 3	Day 3
01-Mar	228	Sun
02-Mar	482	Mon
03-Mar	357	Tue
04-Mar	383	Wed
05-Mar	423	Thu
06-Mar	280	Fri
07-Mar	247	Sat
08-Mar	128	Sun
09-Mar	275	Mon
10-Mar	251	Tue
11-Mar	306	Wed
12-Mar	388	Thu
13-Mar	258	Fri
14-Mar	254	Sat

15-Mar	82	Sun
16-Mar	348	Mon
17-Mar	265	Tue
18-Mar	263	Wed
19-Mar	257	Thu
20-Mar	227	Fri
21-Mar	213	Sat
22-Mar	42	Sun
23-Mar	170	Mon
24-Mar	131	Tue
25-Mar	96	Wed
26-Mar	97	Thu
27-Mar	604	Fri
28-Mar	67	Sat
29-Mar	25	Sun
30-Mar	122	Mon
31-Mar	109	Tue