# “How can bedside remote monitoring be more integrated in different patient settings”


***By***

**Shubham Jain**


*Dissertation submitted for the partial fulfillment of the MBA Management*

***Academic year, 2020-2022***


**The IIHMR University, Jaipur**

1, Prabhu Dayal Marg, Sanganer Airport

Jaipur-302029, Rajasthan

Ph: 0141 3924700, Fax: 3924738

Website: www.iihmr.edu.in

**Dissertation Project**

At

**Dozee HQ, Bangalore**


# "How can bedside remote monitoring be more integrated in different patient settings"

**By**

**Shubham Jain**

Under the guidance of

**Prof. Rahul Sharma**

**MBA Pharmaceutical Management**

**2020-2022**

IIHMR UNIVERSITY

# PREFACE

The projects are where the MBA students' conceptual learning is most clearly demonstrated. Every MBA student is required to complete a dissertation report on a topic that has been given to him or her as part of the curriculum.

As a result, Dozee, Bangalore, has given me the project task of " **How can bedside remote monitoring be more integrated in different patient settings** " The current project offers the ideal opportunity for me to further my grasp of one of the organization's key assets.

The title of the dissertation report is. " **How can bedside remote monitoring be more integrated in different patient settings**".

The goal of the current study was to develop dozee devices that could adapt to various hospital bed kinds and curb the issues that are being faced currently.

Based on the skills I've acquired during my studies at the institute, I've attempted to provide the assignment my best effort. I also hope that my next classes and those who will be interested in this issue will find this report to be useful.

# CERTIFICATE

This is to certify that **Shubham Jain** in partial fulfillment of the requirements for the award of the degree of MBA (Pharmaceutical Management) from the IIHMR University, Jaipur has successfully completed his dissertation at **Dozee, Bangalore** during March 22, 2022 to June 19, 2022.

Place: Bangalore
Date: 6/7/22

ROMIT SHANKAR
HEAD, PRODUCT

Preceptor/~~Head of the Organization~~
Dozee, HQ
Bangalore

## DECLARATION

I Shubham Jain, hereby declare that this dissertation titled "**How can bedside remote monitoring be more integrated in different patient settings**" is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Shubham Jain
(Signature)

Name of Student SHUBHAM JAIN

Date 05-07-2022

# Acknowledgements

On the completion of this project, I would like to extend my sincere and heartfelt obligation towards all the people both in my college as well as my working organization who helped me in this endeavour. Without their help, their active guidance, cooperation and encouragement, it would have been very difficult to complete the project and learn new things from them.

I am extremely thankful to my mentor **Mr. Romit Shankar**, Head of Product team at Dozee, Bangalore. I thank him for being my greatest support and helping me throughout and guiding me towards the right direction.
I am obliged to *Dozee* for providing me the opportunity.

I am extremely thankful and pay my extreme gratitude to my faculty guide, **Mr. Rahul Sharma (professor IIMHR University)** for his valuable guidance and support in completion of this project.

I would like to extend my gratitude and appreciation to my college authorities and whole of the staff.
I also acknowledge with a deep sense of reverence, my gratitude towards my parents, family and friends who supported me morally in accomplishing the task.

Finally, and most importantly, I would like to thank God for allowing me to complete my project, my beloved parents for their blessings and my friends for their help and wishes for the successful completion of this training.

**Thanking You,**
**Shubham Jain**

## Introduction:

In both the Emergency Room and intensive care settings, bedside and patient monitoring is essential to patient care. Electronic Medical Records (EMR) are a vital tool for medical professionals and hospital staff to see and assess a patient's health. Vital healthcare data that is erroneous, lacking, or delayed frequently compromises clinical choices, necessitating the annoyance of manual data collection and adversely affecting a hospital's performance. But not just trauma patients need bedside patient monitoring systems. These are also employed in the long-term vital sign monitoring of patients in order to avoid complications and guarantee full recovery.

Hospitals and doctors all over the world are benefiting from the innovative solutions offered by critical care and bedside monitoring systems like those provided by Fukuda Denshi. These bedside patient monitoring systems are able to provide comprehensive functionality for patient well-being by integrating technology with patient care in healthcare organisations, and bedside monitor integration solutions guarantee that the data provided through these systems is secure and reliable. Remote patient monitoring offer 3 major benefits which are:

- Less time spent in the hospital
- Less readmission and greater success in preventing medical emergencies in elderly patients
- Greater freedom for patients because they can carry on with daily activities while being monitored by a healthcare professional remotely

Speaking of Dozee, it is the only contactless, 98.4% accurate against clinical grade, and remote health tracker in India that enables us to continuously monitor the health of our loved ones from a distance. It uses non-intrusive contactless technology that is simple to use to track important health metrics like heart rate, respiration rate, sleep quality, stress levels, and sleep apnea index. Dozee's AI-driven Advanced Health Intelligence (AHI) properly tracks respiratory and cardiac health and sends alerts to users when their health starts to decline so that they can take prompt medical action. For remote health

monitoring, family members and medical professionals can access the Dozee health tracker data using a smartphone app.

Market Size of patient monitoring devices market is USD 36.4 billion in 2020 and is projected to reach **USD 55.1 billion by 2025 with** at a CAGR of 8.6% during the forecast period.

The top five market leaders in the market in patient monitoring equipment are:

- **Philips Healthcare** - With products like STEMI Limit MapTM, IntelliVue, and SureSignsTM, they are an industry leader.

- **GE Healthcare -** GE is the second-largest RPM company, with a broad product line that includes the CARESCAPE series and B40 patient monitors.

- **Medtronic** - With its highly lucrative pulse oximetry business, Medtronic maintains the third-leading position. The Nellcor product line is one of them.

- **Masimo** - Masimo's capacity to combine standalone patient monitors with various device boards, which includes Rainbow Pulse CO-Oximetry.

- **Mindray Medical -** Mindray Medical's strength is in providing high-quality products at competitive pricing. Examples include Passport® beside and TD60 telemetry transport monitors.

Coming to the topic,

The Device which is currently used by dozee faces some challenges in the field of logistics, wire management, changing the placement of the device from one place to another and isn't adaptable and/or integrated in the most available types of beds currently present in the hospitals.

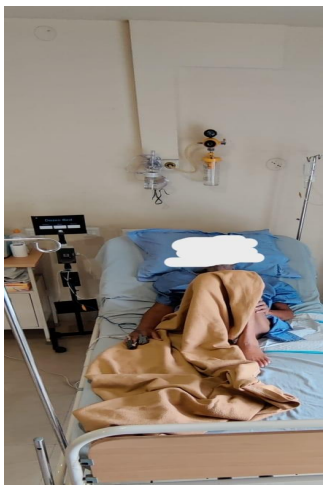
Dozee Remote patient monitoring device can monitor all the major vitals including Heart Rate, Respiration rate, SpO2, Sleep Apnea with an accuracy of 98.4%. Dozee has saved many lives till date by giving early alerts by monitoring more than 104518 patients and has also saved 229939 Nursing hours till date

Dozee devices has been deployed in more than 375 hospitals currently, providing patient monitoring remotely.

The Current version of the dozee device is fixed on a stand which is kept alongside the bed of the patient (as shown in the picture below) which sometimes causes hindrance to

the patients and health care providers. Hence to to find a suitable solution to overcome all these issues, Integration of monitor came into play and hence we took up this project to make remote patient monitoring device more adaptable in the hospital environment.

Here in the photo, Dozee Remote patient monitoring device on a black coloured stand can be seen alongside the bed of the patient



# LITERATURE REVIEW

The practise of remotely monitoring patients' medical and other health data and electronically transmitting such data to healthcare professionals for evaluation and, if necessary, suggestions and instructions is known as remote patient monitoring, also known as remote physiologic monitoring. RPM can also assist enhance quality of life and keep expenses under control by reducing the number of hospitalizations, readmissions, and lengths of stay.

## Objectives:

This study was undertaken with the following objectives:

1. To make remote patient monitoring more efficient by looking for opportunities to integrate the monitoring device
2. To make remote patient monitoring devices more adaptable.

## Research methodology:

**Type of Research:** Primary Research, Survey / Observation

**Data Collection**: To Understand and carry forward research, we visited various hospitals and understood the requirements with the point-of-view of patient as well as a healthcare provider.

The hospitals we visited were located in 2 different locations (Bangalore & Hyderabad) and included Government, Private as well as semi- private hospitals, The Hospitals were as follows:

- Jayanagar General Hospital, Bangalore
- Sparsh Hospital, Bangalore
- DG Hospital, Bangalore
- Shasra Hospital, Bangalore
- Sagar Hospital, Hyderabad
- Apollo Hospital Jubilee Hills, Hyderabad

**Duration:** 3 months

**Data Analysis:** The collected primary data was analysed and discussed by the Product team, Hardware team and Data Science team.

**Study Area**: Hospitals Across Bangalore and Hyderabad

**Inclusion Criteria**:

1. Hospitals availing Dozee monitoring services.
2. Hospitals raising issues related to placement of devices

**Exclusion Criteria:**

1. Hospitals which don't fulfil the inclusion criteria.

**Data Collection Method**:

- Primary Data Collection, Surveys/ Observation-

we visited the hospitals and looked around the operation theatre, General wards, Emergency wards, Male and Female Medicine Wards

## Data Collection Process

we began the primary research by analysing suitable sites to integrate the devices but each site has its Pro's and Con's, mentioned below.

**Suitable Site 1 : Wall mounting of devices**

**Suitable Site 2 : Making device easy to carry (Eg. Monitor of GE/Phillips)**

**Suitable Site 3 : Bed Mounting**

**Suitable site 4 : Fixing Device on each bed.**

**Suitable site 5 : Making a single device for complete ward**

In the study, we observed 5 suitable sites for integrating the patient monitoring device in different patient settings.

To be noted: My base while comparing each site was providing ease to the patient and the healthcare providers making the process of monitoring the patients easy.

**Suitable Site 1: Wall mounting of devices**

Though it seemed to be a perfect placement of the device but after visiting the hospitals, many problems came into foreground.

**Merits**

- Won't hinder in the mobility of patient and healthcare provider
- Device will remain safe i.e., no risk of device being fallen or breakage.

**Demerits**

- Wires have to be attached pinned to the wall, which doesn't look good
- If any issue comes in the device, it has to be taken out and then again attached causing noise in the hospitals and thereby causing littering in the vicinity
- Most of the hospitals weren't ready to make construction-based changes in the hospital.
- Approval for minor constructions require added effort and manpower

**Suitable Site 2: Making device easy to carry (E.g. Monitor of GE/Phillips)**

In the hospital, these days movable monitors are on the rise and can be seen easily hance, we evaluated this site for suitability.

**Merits**

- This concept is on the rise and is widely accepted, hence if we go in this directions acceptability will face lesser challenges
- The monitor being currently offered cost anywhere between 1.5L to 2L hence we can propose our device at much lower cost.
- Won't require much devices in a ward as one device can be caried to monitor multiple patients at different times

**Demerits**

- Continual patient monitoring can't be done
- Presence of brands like GE & Phillips can reduce chances of acceptance as they are considered to be the gold standard in patient monitoring
- Multiple patients can't be monitored at one single time with one single device
- Nurses have to go each time to the patient to get the readings

**Suitable site 3: Fixing Device on each bed.**

The idea was to fix the devices on the beds, probably under the beds to make sure it doesn't cause hinderance.

**Merits**

- The device won't hinder as it will be attached to the bed
- The chances of breakage of devices will significantly reduce

**Demerits**

- Servicing and issue resolution in the devices will be a problem
- If one has to look at the status of the device, which is displayed on the device, he/she has to go beneath the bed which can be troublesome task
- More number of devices will be required as each bed has to have its own device

**Suitable site 4: Making a single device for complete ward**

Idea was to place sensor sheets on each bed and have one single monitoring device for one ward.

**Merits:**

- Less hassle as one monitor will show vitals of all the patients

**Demerits**

- To make this possible one needs Excellent internet connectivity at all times which is not possible for remote areas.
- One should have full power backup, which is not available at all the hospitals in all the wards.
- Connectivity between sensor sheet and monitor will be done through wires casing cluttering and thereby causing hindrance.

**Suitable Site 5: Bed Mounting**

Idea was to look for ideas where the devices can be mounted on the bed to reduce the clutter and increase the adaptability of the devices.

**Merits**

- Easy to install, easy to remove
- Provides ease in servicing the device whenever its required
- Clear depiction that this bed is monitored by a device
- Doesn't cause hindrance in the mobility of patient

**Demerits**

- Since beds and bed brand vary from hospital to hospital, different mount has to be created for each bed brand.

# Result

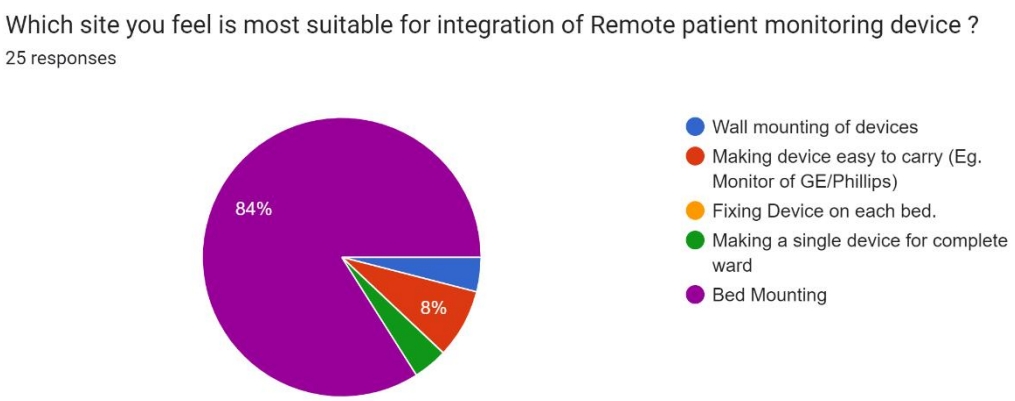
Upon analysing all the pros and cons of the sites and taking a poll from all the team members, Bedside mounting of Remote patient monitoring device seemed a good way

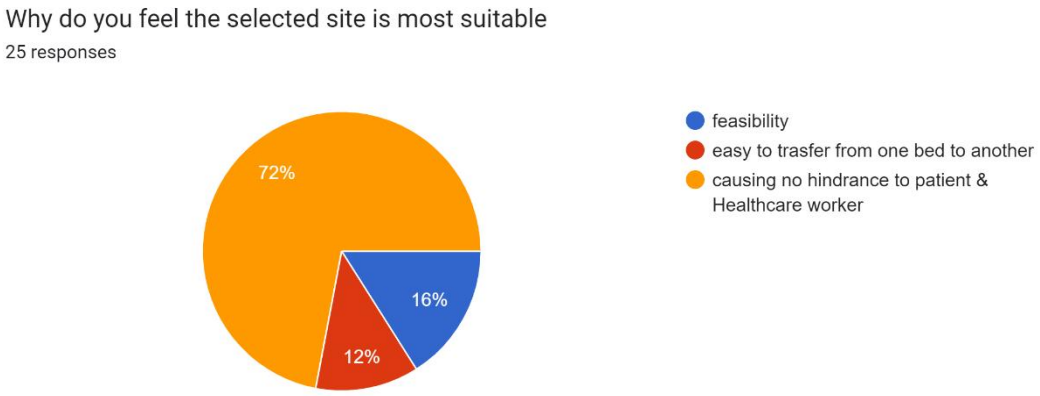
forward and as result we looked the types and brands of beds available in the hospital, gathered information of all the bed brands available.

On the basis of the data collected (pictures & dimensions) of IV pole holders, A prototype of Bedside monitoring device has been created. Which provides ease to the patient and the healthcare providers making the process of monitoring the patients easy.

## Analysis

To analyse all 5 suitable sites with their pros and cons, some of the members of each team including Hardware, Software, Data Science & Product Team were made to fill a google from and the answers were as follows:






Hence, analysing the results most of the members found “Bed Mounting” to be the best option as it “is not causing no hindrance to patient & Healthcare workers”.

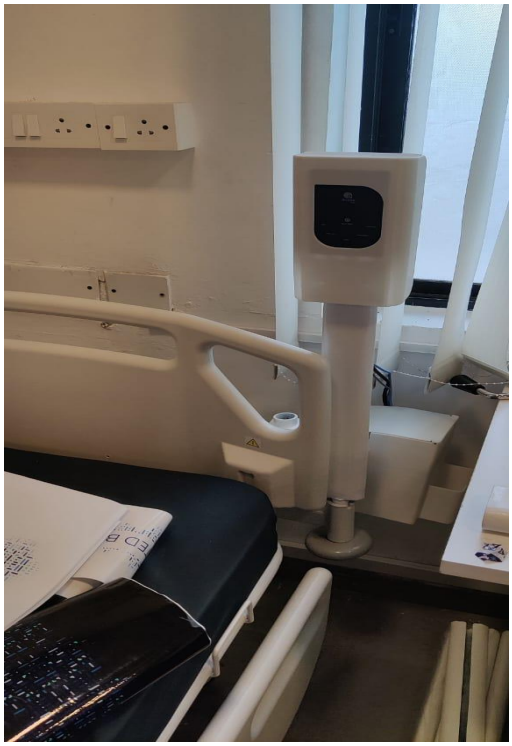
## Conclusion

While on my visit we found out that there are 8-9 types of beds which are majorly available in the hospitals and all them had minimum 3 IV pole holder spaces of which one can be utilized

we gathered all the photos of the beds from different angles showcasing and highlighting the IV pole holders along with their dimensions on the basis of which mounting can be created to mount the continuas patient monitoring device on the bed.

Hence,

we looked for multiple opportunities to integrate the monitoring device and made device more adaptable, user-friendly causing least/no hindrance to the patient and healthcare providers.



On the basis of the research, final prototype was made which can bee seen in the image

# References


1. Dozee Official Website: Contactless patient monitoring & Early Warning System. Available from Dozee | Hospital Care | Transforming Healthcare

2. Prevounce: A Comprehensive Guide to Remote Patient Monitoring. Available from: A Comprehensive Guide to Remote Patient Monitoring (prevounce.com)

3. Folio 3: Enjoy Greater Efficiency with Remote Patient Monitoring Solutions. Available from: Bedside Patient Monitoring - Folio3 Enterprise

4. Remote Patient Monitoring Systems and The Future of Medicine. Available from: Remote Patient Monitoring Systems and The Future of Medicine (atltechnology.com)

5. Patient Monitoring Devices Market by Product (EEG, MEG, TCD, Pulse Oximeter, Spirometer, Fetal Monitor, Temperature Monitoring, MCOT, ECG, ICP, ILRs, Blood Glucose Monitoring, Blood Pressure Monitor), End-User (Hospitals, ASCs) - Global Forecast to 2025. Available From: Patient Monitoring Devices Market - Global Forecast to 2025 | MarketsandMarkets

6. The Top 5 Patient Monitoring Equipment Market Leaders for 2022. Available From: Global Patient Monitoring Market: Top 5 Market Share Leaders in 2022 (idataresearch.com)