Dissertation

On

Perception of Doctors and Patients regarding ICT enabled follow-up after Bariatric Surgery

At

MUTELCOR

(2nd February – 30th April, 2018)

By

Dr Jyotika

Enrol No PG/16/019

Post-Graduate Diploma in Hospital and Health Management

2016-2018

IIHMR DELHI

International Institute of Health Management Research, New Delhi

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Acknowledgement

I am using this opportunity to express my gratitude to everyone who supported me throughout the course of my Dissertation project. I am thankful for their aspiring guidance, invaluably constructive criticism and friendly advice during the project work. I am sincerely grateful to them for sharing their truthful and illuminating views on a number of issues related to the project.

It is my immense pleasure and honour that I take this opportunity to express my heartfelt gratitude and deep appreciation to my esteemed Professor and Mentor **Dr S.N.Sarbadhikari** without whom this project would have been a distant reality. I really appreciate all the pain he took for guiding me when needed. His tireless pursuit for perfection and professional insight were a source of constant inspiration for me.

I would like to extend my deepest gratitude to **Mr. Y.K.Gauba** for his immense guidance and constant training in providing necessary information regarding the project despite his preoccupation and busy schedule.

Also I would also like to express my gratitude towards **Mr. Tarish Goyal** and **Ms. Shweta Moudgil** for being helpful and guiding me throughout my training and answering the queries that came along the way.

A special note of thanks and appreciation to the entire team of Mutelcor GmbH for supporting me directly and indirectly all throughout project.

B.A. Solutions India Private Limited

(MUTELCOR GmbH Germany's India Alliance Partner)

Dated: 07.05.2018

To,

Dr Jyotika Maggo
Employee Code: 014
Mobile 9990386535
Address: 19/36 A Tilak Nagar, New Delhi – 110018

Subject: **Successful Completion of Three Months of Internship**

Dear Dr Jyotika,

With reference to the Appointment Letter dated 02.02.2018, we are pleased to inform that you have successfully completed your Internship of 3 months on the project :
"The Role of ICT in increasing Effectiveness of Patient follow-up after Bariatric Surgery"
on 30th, Apr 2018, in the Department of Digital Health.

During your internship period, your positive attitude with high commitment and professional competence exhibited is highly appreciable. With your sincere efforts, openness to learn, you have been able to establish sound basics for Digital Health Growth for Mutelcor projects in India and overseas.

On behalf of BA Solutions India as well as Mutelcor Germany, we congratulate you and feel confident that with your proactive initiative you will continue to create high level impact within the company and outside.

Yours Sincerely,

(YK Gauba)
Director & Authorized Signatory

B.A. Solutions India Pvt. Ltd.	Registration	Domestic Bank Account	International Bank Account
Address: 54, Deepak Building, Nehru Place, New Delhi-19, India **Tel:** +91 11 2467 3082 **Fax:** +91 11 2647 3084	**CIN:** U74999DL2006PTC155492 **TAN:** DELB12384B **VAT:** 07316995376	**Name:** ICICI Bank Limited **Branch:** Panchsheel Park, Delhi-17 **Account No.:** 022405002118 **RTGS / NEFT / IFSC:** ICIC0000224	**Name:** ICICI Bank Limited **Branch:** Panchsheel Park, Delhi-17 **Account No.:** 022406000059 **SWIFT/BIC:** ICICINBBCTS

To Whomsoever It May Concern

This is to certify that **Dr Jyotika,** a 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 **Mutelcor, India** from **02/02/2018 to 30/04/2018.**

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

The Internship is in fulfilment of the course requirements.

I wish her all success in all her future endeavours.

Susubadhikari

Dr S.N.Sarbadhikari

Dean, Academics and Student Affairs and Mentor

IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **"Perception of Doctors and Patients regarding ICT enabled follow-up after Bariatric Surgery"** at **"Mutelcor"** 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 this dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name:	Signature:
Dr. Pradeep K Panda	PK Panda
Dr. Preetha GS	
Dr. VINAY TRIPATHI	
Prof. M. BHATTACHARYA	

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Jyotika**, 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 **"Perception of Doctors and Patients regarding ICT enabled follow-up after Bariatric Surgery"** at "Mutelcor" 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.

Dr S.N.Sarbadhikari
Dean, Academics and Student Affairs
IIHMR, New Delhi

Mr. Y.K.Gauba
Director
Mutelcor, India

International Institute of Health Management Research,

New Delhi

Certificate by Scholar

This is to certify that the dissertation titled **"Perception of Doctors and Patients regarding ICT enabled follow-up after Bariatric Surgery"** and submitted by **Dr Jyotika,** Enrolment No. **PG/16/019** under the supervision of **Dr S.N.Sarbadhikari** for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from 02/02/2018 to 30/04/2018 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

Feedback Form

Name of the Student: Dr. JYOTIKA

Summer Training Institution: Mutelcor GmbH – India

Area of Summer Training: Digital Health.

Attendance: Regular

Objectives met: 1. Initiated Customer Contacts for Implementation of Bariatric Post Surgery Remote Patient Monitoring Solution. 2. Developed user Manual for Surgeons and Patients.

Deliverables:

Strengths: Highly Committed and Competent.

Suggestions for Improvement: Need to go deep into the technology of Health IT Solutions for other super specialities.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):

- Would like the institute to devote more time in Health IT areas like - Design, Architecture & HTML
- Internship period should be atleast one semester.
- Industry interaction should start during 1st yr itself to enable students understand industry needs.

Mr. Y.K.Gauba

Director

Mutelcor, India

B.A. Solutions India Pvt. Ltd. New Delhi

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ACRONYMS AND ABBREVIATIONS

WHO	World Health Organisation
NCD	Non Communicable Disease
CVD	Cardiovascular Disease
BMI	Body Mass Index
DM	Diabetes Mellitus
ICT	Information and Communications Technologies
RPM	Remote Patient Monitoring
EWL	Excess Weight Loss

ORGANIZATION PROFILE

Mutelcor is a well-known Telecom consulting group headquartered in Germany having regional offices in New Delhi and Amsterdam. It's a supplier independent consultancy group with a legacy of success across Europe, Africa, North America and Asia for the last 18 years and has implemented services for various mobile network operators across the globe and holds expertise in the field of Telecommunication, Internet of things and Digital health.

PHILOSOPHY

"Innovative Solutions, Global Approach"

The company has a core team of telecom experts who firmly believes that 'Change is the only constant' principle and therefore invests a significant time and effort to predict, research, innovate, develop and test technologies that are not only ahead of time but have all the right variables to leave a significant impression on how we see the world in future.

MISSION

"Solution that makes an impact"

Help the customers to build innovative products with latest technology.

KEY EXPERTISE

- **Telecommunication**
- **Internet of Things (IoT)**
- **Digital Health**

Telecommunication

The unprecedented consulting expertise, unique market understanding and knowledge of best international practices has helped many mobile network operators to implement turnkey solutions in the areas of:

- Strategy and technology
- Network evolution planning
- Network consolidation and implementation
- Project management
- Risk and mitigation assessment

Some of the key technologies implemented are Messaging, IVR, Data and Content, IN, Core Network, and Roaming.

Internet of Things (IoT)

Mutelcor offers industrial enterprises best in class suite of IoT solutions that connect smart devices and sensors enabling the businesses enhance efficiency and productivity by gaining access to data – based insights.

These IoT solutions benefit many industries such as Digital Health, Industrial Automation, Smart Homes, Smart City, Agriculture, Retail, Hospitality and Utilities.

Some of the IoT Solutions are:

- IoT Reflection – Panic Button Security Solution
- IoT Reflection – Children Security and Tracking Solution
- IoT Reflection – Restroom Feedback Solution

Digital Health

To address the existing gaps in healthcare delivery across the globe, the group forayed into digital health space in 2013 by forming strategic alliance partnerships across Europe, Asia and United States with several Healthcare Providers, Technology Partners and Surgeons with a sole aim to develop robust 'Digital Health' solutions utilizing some of the world class IoT capabilities and technologies.

Digital Health Products:

- Remote Patient Data Analytics
- Bariatric Patient Data Analytics
- Cardiac Patient Data Analytics
- Chronic Kidney Disease Patient Data Analytics
- Diabetes Patient Data Analytics
- Hypertension Patient Data Analytics
- Mutelcor e-OPD
- Mutelcor Rural Digital Health

OBSERVATIONAL LEARNING

INTRODUCTION:

Digital Health can be defined as "the cultural transformation of how disruptive technologies that provide digital and objective data accessible to both caregivers and patients leads to an equal level doctor-patient relationship with shared decision-making and the democratization of care" (Meskó et al, 2017). It holds enormous potential to propel the healthcare system to higher quality. It is a good means to address the existing gaps in healthcare delivery across the globe. Specifically, it is helpful in closing the quality gap, by promoting care that is safe, effective, patient- centred, timely, efficient and equitable. Health care payers and providers alike are looking at Information Technology Solutions not only to improve quality, but also to reduce costs and time with efforts well under way to integrate it into the healthcare system.

Remote Patient Monitoring (RPM) play an important role in improving a patient's quality of life. It enables monitoring of patients outside the conventional clinical settings. It is useful in improving access to healthcare and reducing the healthcare delivery cost and time. Application of Remote patient monitoring is essential in improving the quality of life in patients suffering with chronic medical conditions (Coye et al, 2009).

Benefits of RPM:

- **Allows sharing of data from patients to doctors in real time.** An essential advantage of RPM is that it allows a patient to use a medical device to perform routine tests and share test results to a doctor in real-time without visiting a medical institution. This advantage is of great importance for patients with chronic illnesses, who have to communicate with doctors more often.
- **Improves lifestyle of patients.** Incorporating RPM can significantly improve a patient's quality of life and reduce the risks and complications.
- **Makes healthcare more available.** RPM has the potential to increase the reach of doctors to potential patients.

- **Saves cost and time.** Patients can save cost and time due to RPM. With RPM, it's not necessary to visit a clinic for prescription or communicate with your physician about tests results.
- **Increases capacity of hospitals and doctors to deliver services to more number of patients.** Due to reduced number of unnecessary hospital visits, medical institutions can become less crowded and can utilize their resources for those who need an emergency help.

MUTELCOR DIGITAL HEALTH - Enabling Healthcare beyond the clinical settings:

Mutelcor Digital Health is a cloud based Remote Patient Monitoring Platform designed for post-op follow up of patients and long term remote care management beyond clinical settings.

Mutelcor Digital Health platform is effective in remote monitoring of the following patient groups:

- Bariatric Post Op Patients
- Diabetes Patients
- Hypertension Patients
- Chronic Heart Failure (CHF) Patients
- Chronic Kidney Disease (CKD) Patients
- Chronic Obstructive Pulmonary Disease (COPD) Patients

- **Clinical Workflow:**

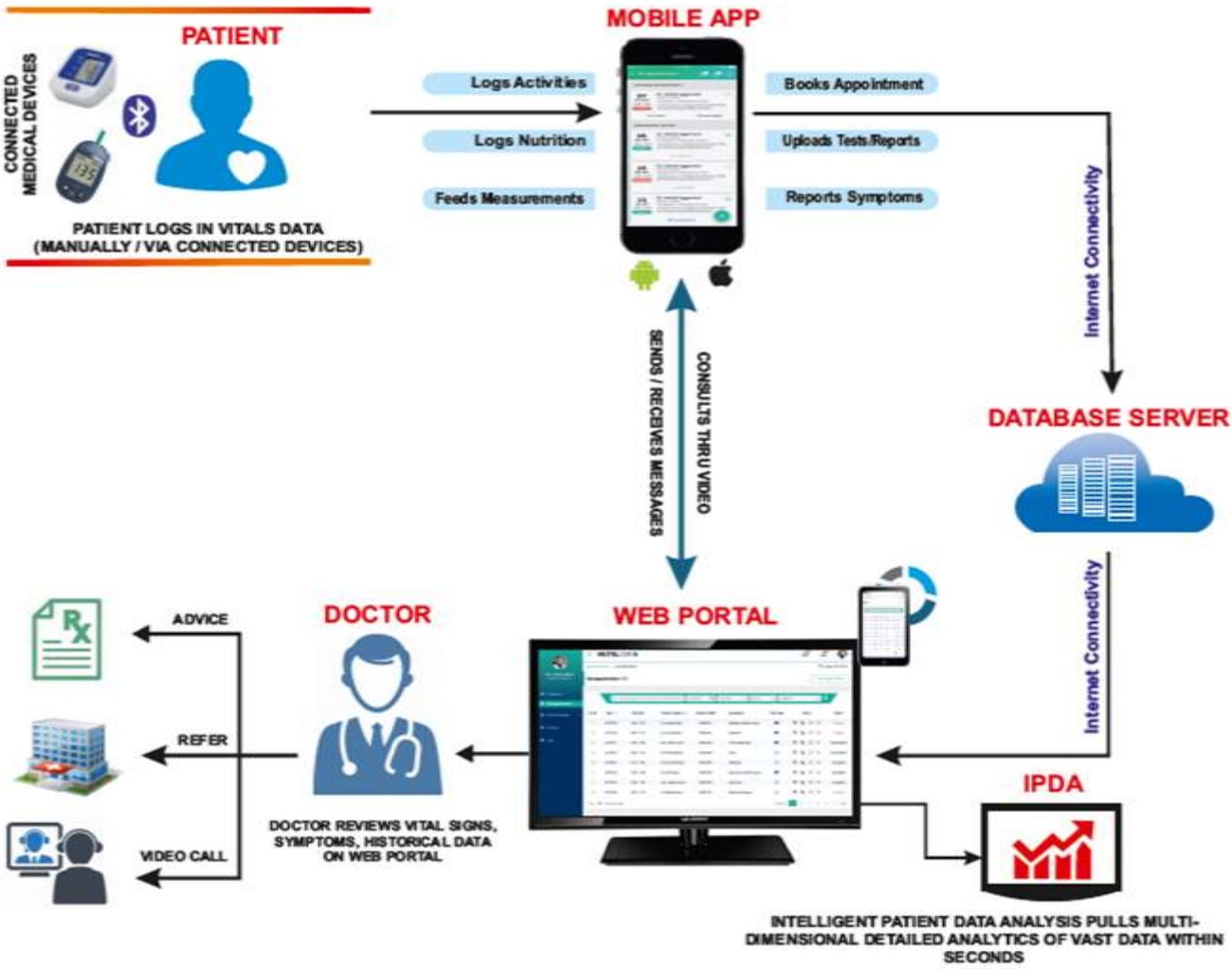

Figure 1: Clinical Workflow of Mutelcor Digital Health Solution

(Mutelcor BPDA Brochure- https://mutelcor.com/wp-content/uploads/2018/01/Mutelcor_DigitalHealth_BPDA_2017.pdf)

- **Advantages:**

Advantages to Surgeon/Doctor/Clinician:

- ✓ 360 degree view of health performance of all patients on single dashboard.
- ✓ Quick overview of critical, stable and unstable patient's data.
- ✓ Register Patients with Biometric Authentication.
- ✓ Share medical records at any clinic/hospital.
- ✓ Video consultation for priority critical care patient with abnormal data values.
- ✓ Reminders/Notifications for follow up of patients.
- ✓ Review of vital signs and health trend data (daily/weekly/monthly/yearly).
- ✓ View/Share/Print predefined live patient data analysis.

Advantages to Patient:

- ✓ 24 x 7 online support, guidance and feedback from the Nurse/Doctor.
- ✓ Medical Data confidentiality and security.
- ✓ Store/Share own medical records with Biometric in any clinic/hospital.
- ✓ Access complete medical record on mobile app.
- ✓ Generate Health Report anytime, anywhere on mobile app.
- ✓ Consult the doctor via video or chat messaging.
- ✓ Receive diet and activity plan and prescription online.
- ✓ Self-track activities, diet and medication.
- ✓ Self-care and manage vital signs.
- ✓ Save time and cost.

(Mutelcor BPDA Brochure-

https://mutelcor.com/wp-content/uploads/2018/01/Mutelcor_DigitalHealth_BPDA_2017.pdf)

Perception of Doctors and Patients regarding ICT enabled follow-up after Bariatric Surgery

INTRODUCTION:

Obesity is abnormal or excessive accumulation of fat in the body. WHO defines obesity to be a condition with Body Mass Index (BMI) greater than or equal to 30. It is a common and serious health problem whose prevalence in the society is increasing daily towards epidemic proportions. According to media centre report of WHO, the prevalence of obesity worldwide has almost tripled between 1975 and 2016. In 1975, nearly 4% of children and adolescents aged 5-19 years were overweight and obese whereas this prevalence has increased to over 18% in 2016. Overall, about 340 million children and adolescent aged 5-19 years were found to be overweight or obese in 2016 and nearly 13% of world's adult population were reported to be obese in the year 2016.

Obesity is a condition that has both morbidity and mortality associated health consequences. These consequences vary from rise in the risk of premature death to several debilitating health situations that are non-fatal but contribute to adverse effects on quality of life. Obesity has been found to have association with many chronic diseases, endocrine and metabolic disturbances, debilitating health problems, psychological problems as well as severe adverse health consequences in children and adolescents. Obesity is one of the key risk factors for many Non communicable diseases (NCD) including cardiovascular diseases (CVD), Diabetes Mellitus (DM), cancer, hypertension and Gall bladder diseases. Debilitating health problems like pulmonary diseases, osteoarthritis and gout have been evidenced to be amongst the co-morbid conditions associated with obesity. Many studies have elaborated the strong relation between adult obesity and premature death from all-cause mortality. It has been found to reduce the life expectancy by 7 years in females and 6 years in males. In addition to the potential impact on mortality, the overall morbidity seen in the growing patient population remains a key issue contributing to decreased quality of life in overweight and obese patients. Even before the chronic, life threatening diseases develop; various debilitating conditions appear that have adverse effects on quality of life and are often mechanical in nature.

Management of obesity involve both weight control as well as reducing the excess amount of body weight and maintenance of the lost weight along with initiation of other required measures to control associated risk factors. Treatment options for obesity include modification of diet, increased physical activity, behavioural therapy, weight loss medication and surgery. The type of treatment is determined by the classified category of obesity. The obesity type involving BMI equal to or more than 40 Kg/m2 is usually unresponsive to common weight loss measures and medical treatments and Bariatric surgery is the most accepted current treatment for it.

Although Bariatric surgery alone is not an appropriate treatment, lifetime follow-up after surgery has been found to be the key to long term success. The process of follow up after Bariatric surgery has been shown to be an effective factor in long term excess weight loss (EWL). This post-op follow-up process has been classified into short term, medium term, long and very long term follow-up based on the duration of follow-up after bariatric surgery. The follow-up involving duration of 5-10 years is defined to be long term follow-up (Kamal K Mahawar, 2018). This long-term follow-up involves extensive follow-up of patients for Nutrition, Activity, Vitals and other parameters, which impose a major challenge in management of the process of follow-up.

Evolving Technology can act as a helpful medium for this process of follow-up post bariatric surgery and thus can make it more effective. Use of Information communication and Technology (ICT) allows the doctor to remotely monitor their patients at predefined periodic intervals. This remote patient monitoring (RPM) allows the patient to share the real time data related to nutrition, activity, vitals and other routine laboratory investigations with the doctor without visiting a medical institution which may ease the process of follow-up and contribute towards improved person's quality of life post bariatric surgery.

REVIEW OF LITERATURE:

Obesity has been a leading concern for public health with current worldwide prevalence of more than half a billion people and this prevalence rate is continuously rising. This rise in the prevalence is not only limited to developed nations, but to developing countries as well. Many studies have been conducted to collect the detailed information on Worldwide Obesity trend. One such study was conducted by Trishnee Bhurosy and Rajesh Jeewon to have comparative trends of mean Body mass Index (BMI) in regions categorised by World Health Organisation (WHO) since 1980 to 2008 and to appraise the differences in obesity and physical activity level due to socioeconomic disparities across developing countries. After considering both current and past BMI trends, it was anticipated that that obesity will continue to take a significant climb, as seen from 1998 to 2008. Females were observed to have a higher BMI trend than men and this Gender differences in BMI is expected to continue to take a significant ascent. It has been estimated that with advancement of economic transition, the current mean BMI trends of developing countries will become more than the maximum mean BMI values of developed nations. This rise in obesity was found to have association with socioeconomic influences related significant alterations in dietary habits and level of physical activity. Scientific evidence indicated that instead of considering obesity as an individual behavioural chronic state, it should be focused upon with a multidisciplinary approach with consideration on the immediate environment of the obese individual (Bhurosy and Jeewon, 2014). A study on Obesity and Associated Comorbidities in People and Companion Animals has reviewed the prevalence of obesity and associated risks with obesity in both humans and companion animals, and has explored the relation of obesity with type 2 diabetes mellitus and cancer across these species. Obesity is a leading healthcare problem with utmost concern in both human and veterinary medicine and this prevalence of obesity in people and pets is increasing day by day. Obesity is a complex disease involving diet intake, physical activity level, behavioural factors, socioeconomic factors, environment factors, genetics, metabolism and the microbiome. Obesity-related comorbidities exist in both people as well as animals. Obesity has been identified as a major risk factor for type 2 DM in people and in cats, but this association has not been recognized in dogs. Obesity has

also been found to be a risk factor for a number of human cancers, but sufficient data is not available for describing this association with canine neoplastic disease. 'One Health' perspective is an effective approach to address the problem of obesity. One Health perspective includes collaborations between practitioners and researchers working in human and veterinary healthcare. These One Health programmes can be helpful in addressing obesity with simple interventions at the community level by involving human healthcare professionals and veterinarians (M. Chandler, S. Cunningham, E. M. Lund, C. Khannax, R. Naramore, 2017).

Current perspectives and treatment options of Obesity have been analysed and it was found that it is a multi-factorial disease, which is usually associated with many other significant conditions like diabetes, hypertension and other CVDs, osteoarthritis and certain cancers. So a comprehensive range of strategies are required for management of obesity focusing on existing weight problems and also on those who are at high risk of developing obesity. Hence, the prevention of obesity during childhood should be taken into consideration due to the risk of persistence to adulthood. Multiple preventive aspects and treatment options of obesity have been highlighted by this study. These treatment options may include diet modifications, increased physical activity, behavioural therapy, and in some cases weight loss medication and surgery (Srinivas Nammi, Saisudha Koka, Krishna M Chinnala and Krishna M Boini, 2004). Bariatric surgery is becoming common, and most physicians have contact with patients with bariatric concern. Many aspects to post-op patient follow-up are generally unknown. A study was performed by William S. Richardson, Amber M. Plaisance, Laura Periou, Jennifer Buquoi, and Deanna Tillery to help other physicians gain information about what follow-up entails to assist them with the care of these patients. Post-op Follow-up after bariatric surgery is essential and requires a team approach. Mostly, the benefits greatly outweigh the risks, and bariatric patients are likely to have better and longer lives after surgery. Patients require knowing and understanding that the surgery is a tool and that excess weight loss needs some efforts on their part particularly with respect to diet and exercise. It is expected that the bariatric team follow-up with the patients for a lifetime, as care is complex and lifetime follow-up is the key to long-term success (William S. Richardson, Amber M. Plaisance, Laura Periou, Jennifer Buquoi, and Deanna Tillery, 2009**)**.

Rapid rise in use of the Internet has made it a viable mode for public health intervention. A study was conducted to compare and interpret the initial loss of weight and changes in waist circumference through a structured Internet behavioral weight loss program and a weight loss internet education. Analysis of repeated measurements highlighted that the weight loss group following internet behavior therapy lost more weight than the internet education group. Waist circumference changes were also found to be greater in the behavior therapy group than in the internet education group. Participants who were made to follow a structured behavioral treatment program with regular contact and individualized feedback had better weight loss results compared with those given links to educational Web sites. Therefore, the Internet and e-mail can be stated to be viable methods for delivery of structured behavioral weight loss programs program (Deborah F. Tate, Rena R. Wing, and Richard A. Winett, 2001).

Technology has been demonstrated to have the potential to assist for self-monitoring adherence and dietary changes in weight loss treatment. One of the studies conducted to explore the effect of electronic self-monitoring on Weight loss aimed to explore whether the use of a personal digital assistant (PDA) with exercise and dietary software, with and without a feedback message can result in greater weight loss and improved self-monitoring adherence as compared to using a paper diary/record (PR). These three self-monitoring approaches were used in healthy adults with a mean BMI of 34.01 kg/m2. Standard behavioral treatment was received by all study participants. The study findings suggested that the use of an electronic diary facilitated the improved self-monitoring; however, the use of an electronic diary with a daily feedback message that was tailored to what had been entered in the diary showed the best weight loss results (TrialLora E. Burke1, Molly B. Conroy, Susan M. Sereika, Okan U. Elci, Mindi A. Styn1, Sushama D. Acharya, Mary A. Sevick, Linda J. Ewing and Karen Glanz, 2011**)**. One of the major challenges in intensive obesity treatment is to make the care scalable. A trial was conducted by Bonnie Spring, Jennifer M. Duncan, E. Amy Janke and other associates to test whether an integrated mobile technology system, telephone coaching, and the standard-of-care obesity treatment can improve weight loss results as compared with standard-of-care group obesity treatment alone. The research revealed the role of a mobile technology system as a scalable, cost-effective means to increase the effectiveness of physician-directed weight loss treatment. Technology can be used as a medium to

reconfigure the effective components of behavioral weight loss treatment including lifestyle counseling, self-monitoring and goal setting and in-person sessions,. A hand held tool that provides decision support for self-monitoring increase the patient-centered care by helping patients with management of their own behavior change. Connective technology systems can be helpful in reducing the burden on strained care systems by enabling highly personalized remote treatment by trained paraprofessionals, at reduced cost and participant burden (B. Spring, Jennifer M. Duncan, E. Amy Janke et al, 2013).

OBJECTIVES:

General Objective:

To study the need for long term follow-up with patients after Bariatric surgery and to assess the perception of Doctors and Patients regarding ICT enabled follow-up after Bariatric Surgery

.

Specific Objectives:

- To understand the perception of doctors and patients regarding the role of technology in making the process of follow-up after Bariatric surgery more efficient and hassle free.
- To explore the need of long term patient follow-up after Bariatric surgery.
- To identify benefits of extensive follow-up of patients after Bariatric surgery.

METHODOLOGY:

Study Area:

Hospitals of Mumbai.

Study Period:

The Study was conducted in 1 month time from 1st April, 2018 to 30th April, 2018.

Study Design:

The Study was conducted using Exploratory and Descriptive Research design.

Study Population:

The Study included two different types of participants:

- Bariatric Surgeons from hospitals of Mumbai.
- Patients who have undergone Bariatric surgery.

The inclusion criteria were:

- All the included doctors are Bariatric surgeons and the patients included in the study have undergone Bariatric surgery ;
- All were willing to take part in the study.

The exclusion criteria were:

- Participants who did not complete the questionnaire or were not willing to take part in the study.

Sampling Technique:

Convenient type of Non Probability Sampling technique was used for selection of samples.

Sample Size:

The Study included five bariatric surgeons from hospitals of Mumbai and five patients who have undergone bariatric surgery as Study Participants.

Tools and Techniques:

- This study is a cross sectional study conducted using Questionnaire, Informal Interviews at various hospitals of Mumbai.
- The questionnaire for Bariatric surgeons consisted of 9 questions and for patients included 8 questions pertaining to their perception on the quality of service provided by Remote patient monitoring, feasibility and effectiveness of follow-up process with and without Remote patient monitoring and problems related to it. All the questions were closed ended.
- Data for the questionnaire was collected through e-mail and direct contact with the participants.
- Participants were explained in detail about the purpose of the study, Informed written consent was taken from all study participants and all the necessary steps were taken to maintain the confidentiality.

STUDY FINDINGS:

A total of five Bariatric surgeons and five Bariatric patients were part of this survey. The profiles of these surgeons and patients have been summarized in Table 1 and 2 respectively.

The Questionnaire used for data collection from both bariatric surgeons and patients and the findings revealed by analysis of collected data based on structured questionnaire and interviews reveals following Findings:

DOCTORS: **Table 1: Questionnaire for Bariatric surgeon**

Questions		
Is regular post-op follow-up required to achieve desirable results in your patient's weight loss journey?	Yes	5 (100%)
Are you satisfied with Remote Patient Monitoring and remote health data tracking?	Yes	4 (80%)
Do patients share health data based on predefined protocol using the digital application?	Yes	3 (60%)
After you adopted Remote Patient Monitoring and health data tracking, Has the frequency of post-op follow-up increased?	Yes	4 (80%)
Is digital method of post-op follow-up beneficial for your practice?	Yes	4 (80%)
Have the predefined digital bariatric practice management templates made the process of post-op patient follow-up easy for you?	Yes	5 (100%)
Were you able to identify high risk patients in real time through remote patient monitoring solution?	Yes	5 (100%)
Did you face significant challenges while convincing your patients for digital process of post-op follow-up?	Yes	4 (80%)
Would you like to recommend your colleagues towards remote patient monitoring practice?	Yes	5 (100%)

Findings:

1. **Need for Post-op follow-up:**

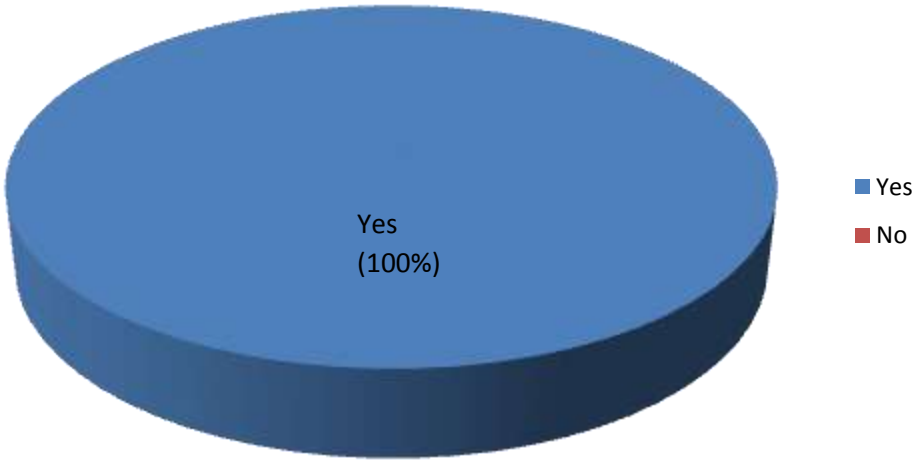

Figure 2:
Requirement of regular post-op follow-up in patients to achieve desirable results

All five surgeons responded that follow-up after bariatric surgery plays an essential role in weight loss journey of patient.

2. **Perception on Remote Patient Monitoring practice:**

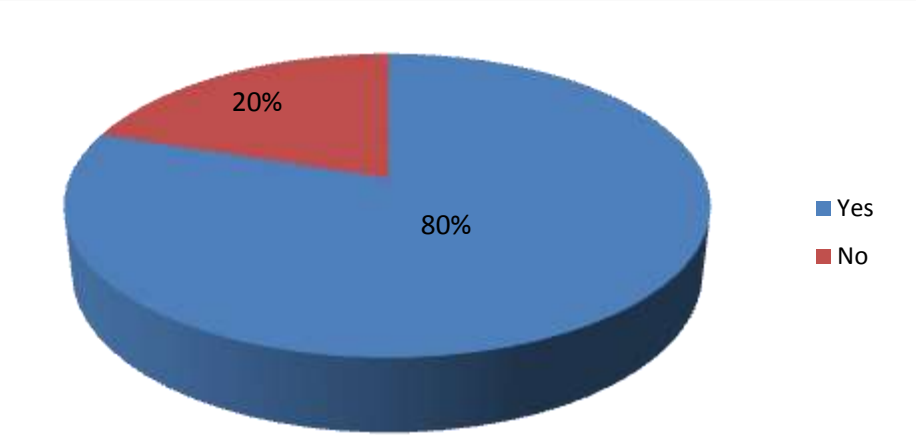

Figure 3:
Satisfaction with Remote patient monitoring and remote health data tracking

80% Doctors were satisfied with the method of remote patient monitoring and remote health data tracking.

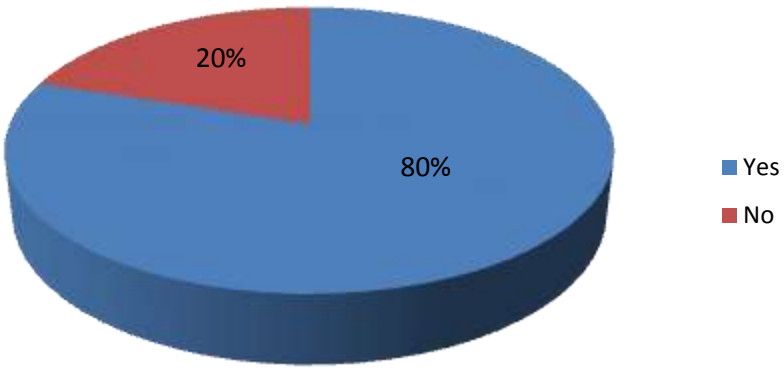

Figure 4:
Digital method of post-op follow-up is beneficial for their practice

80% doctors feel digital method of post-op follow-up is beneficial for their practice.

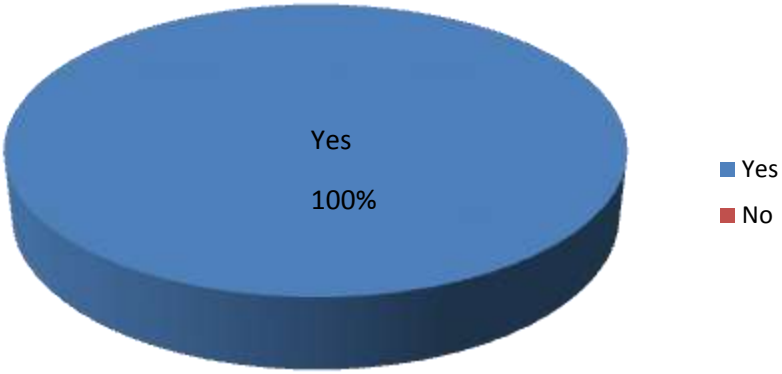

Figure 5:
Readiness of surgeons to recommend colleagues toward Remote patient monitoring practice

All the bariatric surgeons were open to recommend remote patient monitoring practice.

3. **Effectiveness of post-op follow-up process through RPM:**

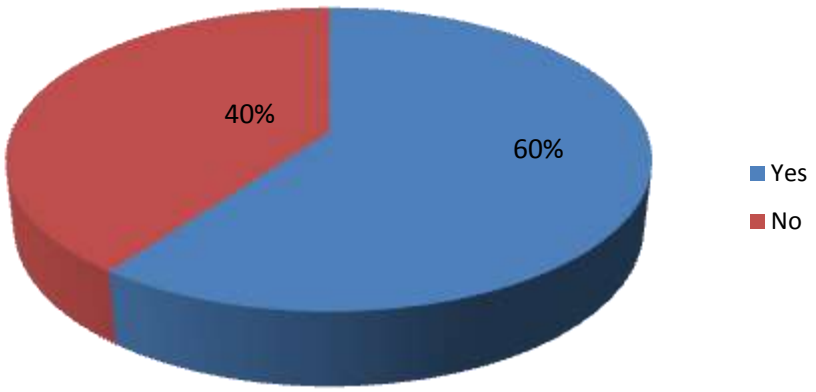

Figure 6:
Patients use digital application for sharing health data based on predefined protocol

Three out of five bariatric surgeons were found to be receiving health data from their patients based on the predefined protocol using the digital application.

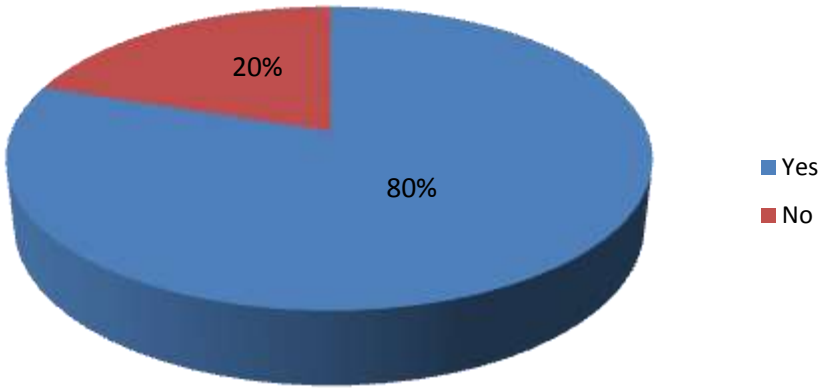

Figure 7:
Increased frequency of post-op follow-up after adoption of remote patient monitoring and health data tracking

80% doctors observed increase in frequency of post-op follow-up after they adopted remote patient monitoring and health data tracking.

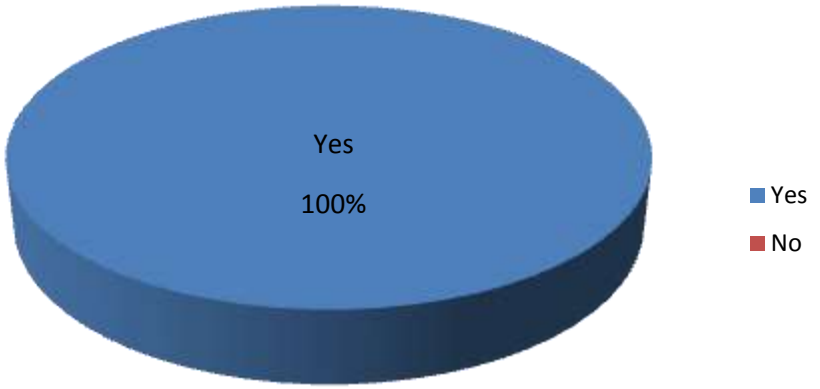

Figure 8:
Predefined digital bariatric practice management templates have made the process of post-op follow-up easy

All bariatric surgeons who participated in the survey felt that the predefined digital bariatric practice management templates have made it easy for them to do post-op follow-up with their patients.

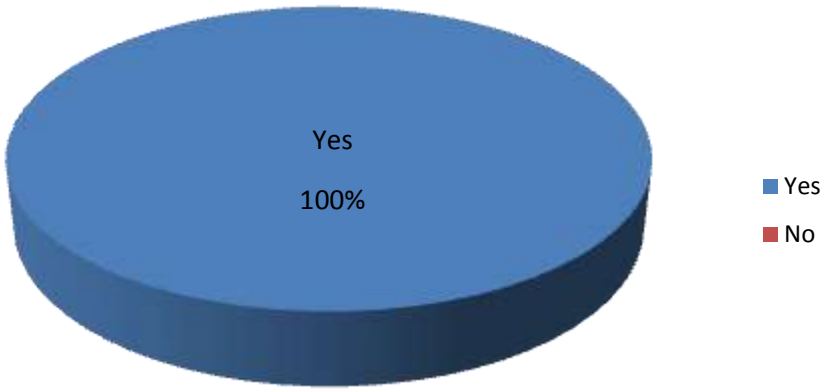

Figure 9:
Remote patient monitoring solution has made it possible to identify high risk patients in real time

All bariatric surgeons reported that they are able to identify their high risk patients in real time through remote patient monitoring solution.

4. **Challenges encountered in RPM:**

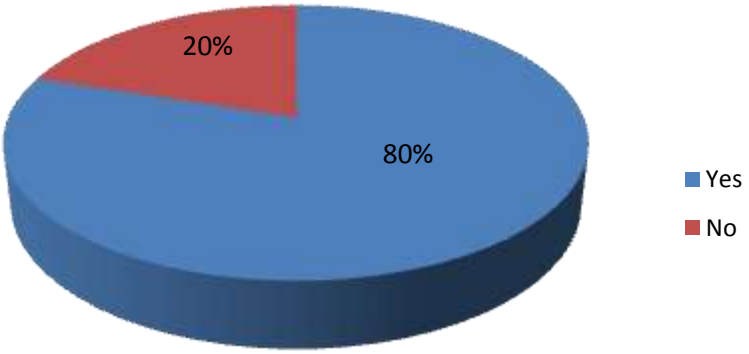

Figure 10:
Significant challenges were encountered by Surgeons while convincing the patients for digital process of post-op follow-up

80% doctors reported to face significant challenges while convincing their patients for using the digital process of post-op follow-up.

PATIENTS:

Table 2: Questionnaire for Patients

Questions		
Has regular health data sharing through digital application helped you to achieve your desirable excess weight loss goals?	Yes	5 (100%)
Are you satisfied with digital health data tracking system?	Yes	4 (80%)
Did you find the digital post-op health tracking process easy to follow and use?	Yes	3 (60%)
Do you share health data through digital system with your doctor as per the predefined protocol?	Yes	3 (60%)
Is remote health data sharing and tracking beneficial for post-op excess weight loss journey?	Yes	5 (100%)
Do you feel digital application has helped you to save time and cost for physical follow-up appointments?	Yes	5 (100%)
Do you feel post-op follow-up has helped you to maintain and achieve desired EWL goals?	Yes	4 (80%)
Was it difficult to understand the digital process of post-op follow-up during the initial phase of follow-up?	Yes	3 (60%)

Findings:

1. **Need for Post-op follow-up:**

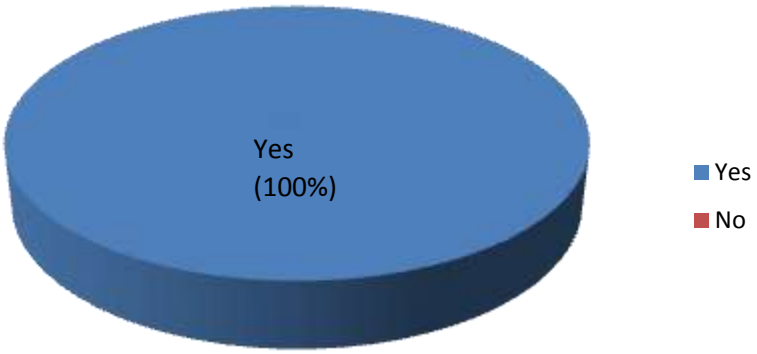

Figure 11:
Remote health data sharing and tracking is beneficial for post-op excess weight loss journey

All bariatric patients experienced that that remote health data sharing and tracking was beneficial for their post-op excess weight loss journey.

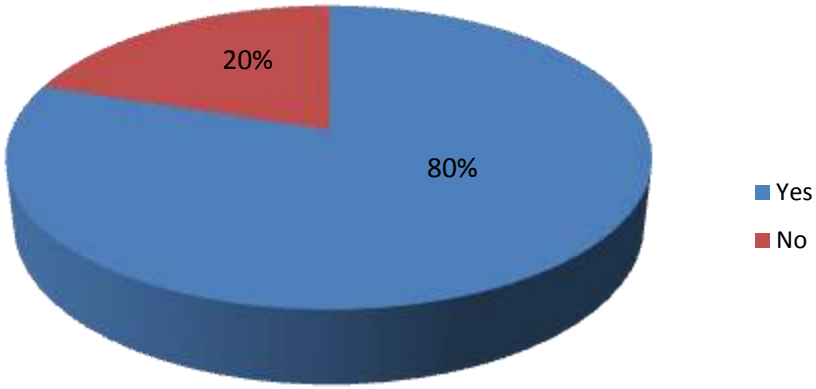

Figure 12:
Post-op follow up has helped to maintain and achieve desired EWL goals

Four out of total five patients experienced that post-op follow-up has helped them to maintain and achieve their desired EWL goals.

2. **Perception on Remote Patient Monitoring practice:**

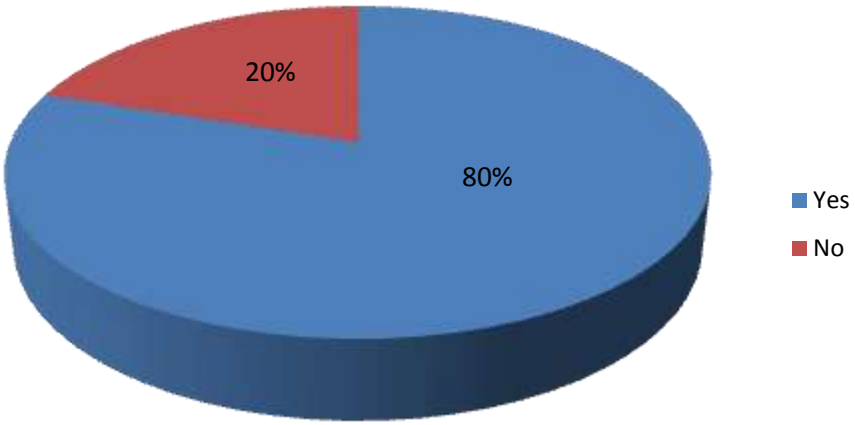

Figure 13:
Satisfaction with digital health data tracking system

80% bariatric patients showed satisfaction with digital post-op follow-up process.

3. **Effectiveness of post-op follow-up process through RPM:**

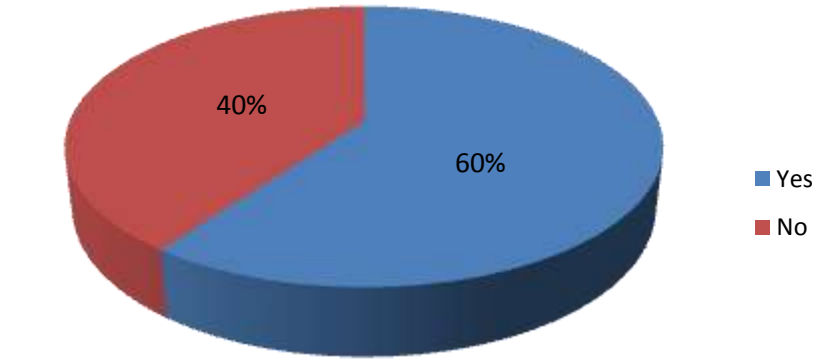

Figure 14:
Health data is being shared by you with your doctor as per predefined protocol

60% patients share their health data through digital applications with their doctors as per the predefined protocol.

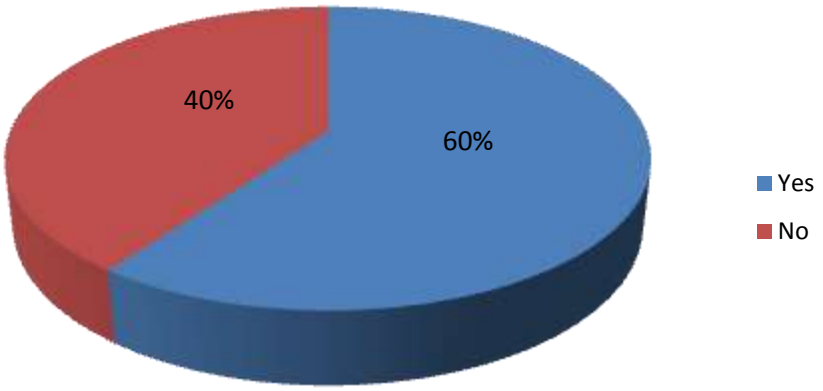

Figure 15:
Digital post-op health tracking process is easy to follow and use

Of all five patient participants, three found the process of digital post-op health tracking process to be easy to follow and use.

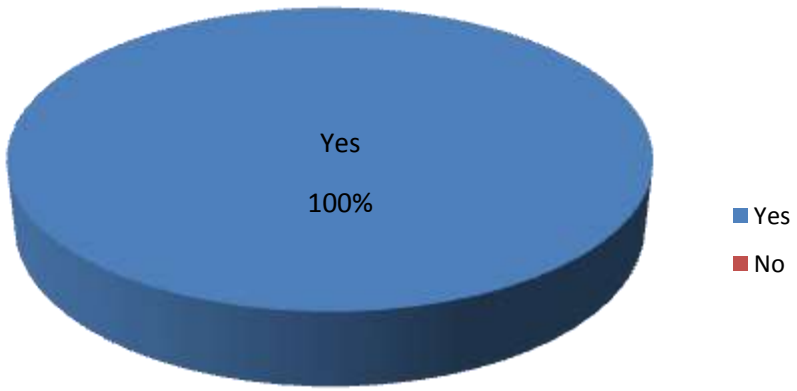

Figure 16:
Regular health data sharing through digital applications has helped to achieve the desirable excess weight loss goals

All patients stated that they have been benefited to achieve their desired weight loss goals by regular health data sharing with their doctors through the digital health applications.

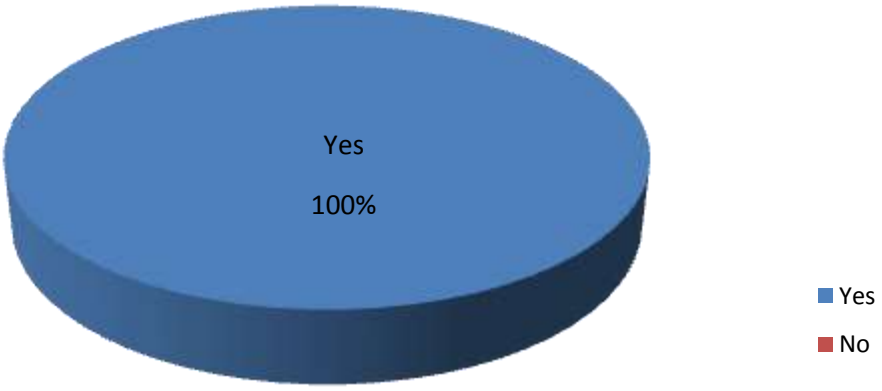

Figure 17:
Digital application has been helpful in saving cost and time for physical follow-up appointments

Digital application has been found by all patients to be helpful in saving resources related to physical follow-up appointments.

4. **Challenges encountered in RPM:**

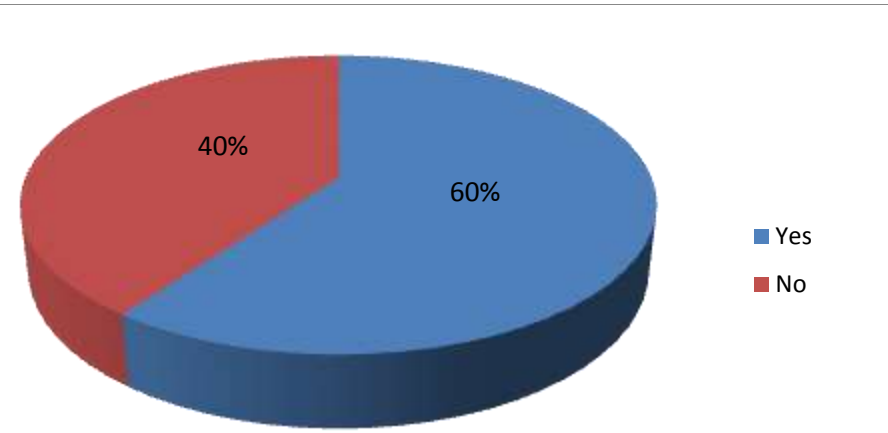

Figure 18:
Difficulties faced in understanding the digital process of post-op follow-up during the initial phase

Out of five patients, three found it difficult to understand the digital process of post-op follow-up during the initial phase.

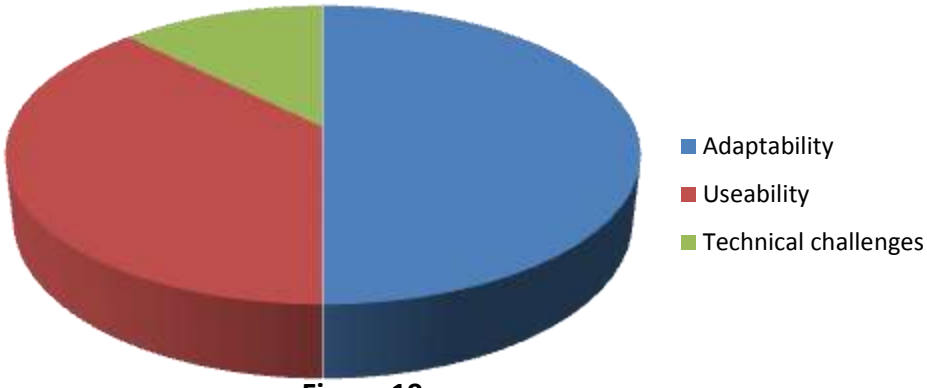

Figure 19:
Challenges faced by patients while using the digital post-op follow-up process

The bariatric patients who participated in the study reported following three types of challenges faced by them:

- Adaptability (80%) –Includes Challenges like Acceptance by end users, Literacy rate of users, technology savviness of users.
- Usability (60%) – Includes Challenging factors like Language barrier, time required to perform various activities on digital applications.
- Technical difficulties (20%) – Includes challenges related to Internet connectivity, availability of devices to use the digital applications, Digital health platform stability.

To summarise the findings of the study, it is found that both bariatric surgeons and their patients feel that long term patient follow-up after bariatric surgery is necessary. Although, the participants encountered few challenges while using RPM for post-op follow-up, they are satisfied with the RPM practice and they feel that RPM can act as an accelerator for post-op follow-up process.

DISCUSSION:

As seen in Review of literature, not much work is available on the role of technology in enhancing the effectiveness of long term post-op follow-up process in bariatric patients. This study has depicted about the readiness and acceptance of healthcare professionals in practicing remote patient monitoring and remote patient health data tracking. It was found that with increasing prevalence of obesity, count of bariatric surgeries is rising and bariatric surgeons feel a strong need for post-op long term follow-up with their patients and ICT has huge potential to act as an accelerator as well as supporter for making the excess weight loss journey of bariatric patients easy and more effective. The application of information technology in healthcare has many associated challenging factors. For facilitating the deployment of technology, appropriate strategies need to be taken into consideration for dealing with these factors. Among these factors, the factors that are of high importance are human related factors like user's knowledge and attitude towards technology. For a smooth and efficient application of technology, healthcare professionals should have good knowledge and positive attitude towards the technological advancements and should be willing to be technology friendly. The study has found that the bariatric surgeons have good knowledge and high sense of satisfaction for digital method of remote post-op follow-up process.

The questions framed in this study were appropriate in demonstrating the strong need of post-op follow-up in bariatric patients and the role of technology in increasing the effectiveness of this post-op follow-up process along with identification of issues linked to digital post-op follow-up process from both surgeon's and patient's perspective. For the collection of data, Self-reporting approach was used and the results of this survey will help to learn and evaluate the facets of RPM. This will improve remote post-op care and make the process more efficient. Remote post-op follow-up can benefit both the doctors as well as the patients with bariatric concerns.

The findings of the study are in line with the conclusions of other studies, in which the role of ICT for better post-op outcomes in bariatric patients have been highlighted. For example, the study of randomised weight loss trial to find the Effect of Electronic Self-Monitoring on Weight Loss and Dietary Intake found that best weight loss results can be achieved using a personal digital assistant with calorie intake and burnt registering software and daily feedback messages. A study conducted to assess the integration of technology with standard weight loss treatment highlighted that mobile connective technology system holds potential to act as a scalable mechanism for increasing the outcomes of doctor-directed weight loss journey. Thus, the current results are in line with the findings of similar studies that have emphasized the positive aspects of the technology for EWL.

The limitations of the study were that it was a time bound study which involved very few participants, the responses of the study participants were prone to respondent bias and the results were limited to a particular group in each phase of the study.

CONCLUSION:

The sample size is too small to generalise the results of the study. However, it was found that long term post-op follow-up is necessary in attaining and maintaining the results of bariatric surgeries. The process of follow-up can be augmented and made more effective through involvement of technological advancements such as provision for remote patient monitoring and health data tracking. Therefore, to attain better results of bariatric surgeries, there is a strong need to integrate digital applications with the standard post-op weight loss journey.

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ANNEXURE:

ANNEXURE 1: Table 3: Details of Bariatric Surgeons

Characteristics	Number	Number
Gender	Male	Female
Total Number (5)	4(80%)	1(20%)
Age in years (mean)		
30-50	3	1
>50	1	0
Years of experience		
10-20	3	1
>20	1	0
How many surgeries do you perform per year		
50-100	2	0
101-125	1	1
>125	1	0
How many hours do you dedicate daily for post-op follow-up		
<1	0	0
1-2	2	1
>2	2	0
How many revision bariatric surgeries do you perform every year		

<5	3	1
5-10	1	0
>10	0	0

ANNEXURE 2: Table 4: Details of Patients

Characteristics	Number	Number
Gender	Male	Female
Total Number (5)	3	2
Age in years (mean)		
< 20	0	0
20-60	2	2
> 60	1	0
BMI		
25-29.9	0	0
30-39.9	1	1
>=40	2	1
Reason for Surgery		
Weight loss	1	1
Medical Problems	2	1
How many months back did you undergo Bariatric surgery		
< 6	1	0
6 – 12	1	2
>12	1	0
Which health data do you share with your doctor on daily basis		

Nutrition and Activity data	2	2
Vital Measurements	0	0
Both	1	0

ANNEXURE 3: Informed Consent form

I, the undersigned, confirm that (please tick box as appropriate):

1.	I have read and understood the information about the project, as provided in the Information Sheet dated _____.	☐
2.	I have been given the opportunity to ask questions about the project and my participation.	☐
3.	I voluntarily agree to participate in the project.	☐
4.	I understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.	☐
5.	The procedures regarding confidentiality have been clearly explained (e.g. use of names, pseudonyms, anonymization of data, etc.) to me.	☐
6.	If applicable, separate terms of consent for interviews, audio, video or other forms of data collection have been explained and provided to me.	☐
7.	The use of the data in research, publications, sharing and archiving has been explained to me.	☐
8.	I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the data and if they agree to the terms I have specified in this form.	☐

9.	Select only **one** of the following: • I would like my name used and understand what I have said or written as part of this study will be used in reports, publications and other research outputs so that anything I have contributed to this project can be recognised. • I do not want my name used in this project.	☐ ☐
10.	I, along with the Researcher, agree to sign and date this informed consent form.	☐

Participant:

_____ _____ _____

Name of Participant Signature Date

Researcher:

_____ _____ _____

Name of Researcher Signature Date