

IOT An Emerging Technology In Healthcare

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OVERVIEW

IoT can automate patient care workflow with the help healthcare mobility solution and other new technologies, and next-gen healthcare facilities. **IoT in healthcare** enables interoperability, machine-to-machine communication, information exchange, and data movement that makes healthcare service delivery effective.

The study is being conducted in Bangalore city for my dissertation project. As it will be a qualitative study, the focus will be on the patients of Tier 1 and Tier 2 cities suffering from any pre-existing conditions (diabetic, hypertension/hypotension) and patients of DTDHI and record their perception of adopting IOT devices for their vital tracking. General patients having Diabetes /Hyper/Hypotension along with some of the patients of DTDHI will be the focus of the study.

The important two parameters which will be used for selection of the respondent will be based on-

1. Those respondents who are general patients suffering from diabetes and blood pressure.
2. Those respondents who are critical patients, example gone under any surgical procedure (CABH/TKR)

Background

After doing a lot of literature review, we identified certain challenges in the adoption of IOT devices in Indian market. These challenges includes social, economic, demographic and geographical factors.

Thus, we planned a survey to analyse the exact need of IOT device as a product for DayToDay.

Rationale

The aim of the study is to analyze IOT in healthcare from the viewpoint of the product planning, implementation and evaluation in the project. DayToDay patients are expected to track their vitals daily for effective outcome. Having said so, some patients do not record their vitals daily, hence vital inform is not always shared. DayToDay Patients are added to a monitoring care plan who have been assigned to the DayToDay Nurses (Certified and experienced). These nurses track patients' vitals by manually capturing them under progress note or by calls.

This leads to:

- A. Manual Capturing of such information's for every patient, hence not scalable.
- B. Incorrect Transfer of patient data that can potentially hamper overall patient outcome if not addressed in time.

Research Question

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How do DayToDay Patient track and manage their vitals along with the challenges faced by the Patient & Nurses in recording them - Can these issues be addressed adopting IOT devices as a product?

What was the research objective?

Broad Objective

- To study the the perspective of Patients, Doctors and Caregivers on vital monitoring.

Specific Objective

- To identify the need for IOT as a product for vitals tracking.
- To study the existing market scenario of IOT devices.

Methodology

- Study Design: Non-Experimental Study
- Sample Area: India
- Sampling Method: Non-Probability Sampling
- Data Type: Primary Data
- Data Collection Interval : 10-22nd March,2020
- Study Tool: Set of questionnaires for patients, doctors, caregivers and care coaches.

Who did we speak to?

11 Doctors

15 DTD Patients

→ 8 CABG

→ 3 TKR

→ 2 PTCA

→ 1 CRIF

→ 1 ORIF

11 Non DTD Patients

→ 1 Renal transplantation

→ 8 Diabetic and Hypertensive

→ 1 Hypotensive

→ 1 Dyspnoea

14 DTD Caregivers

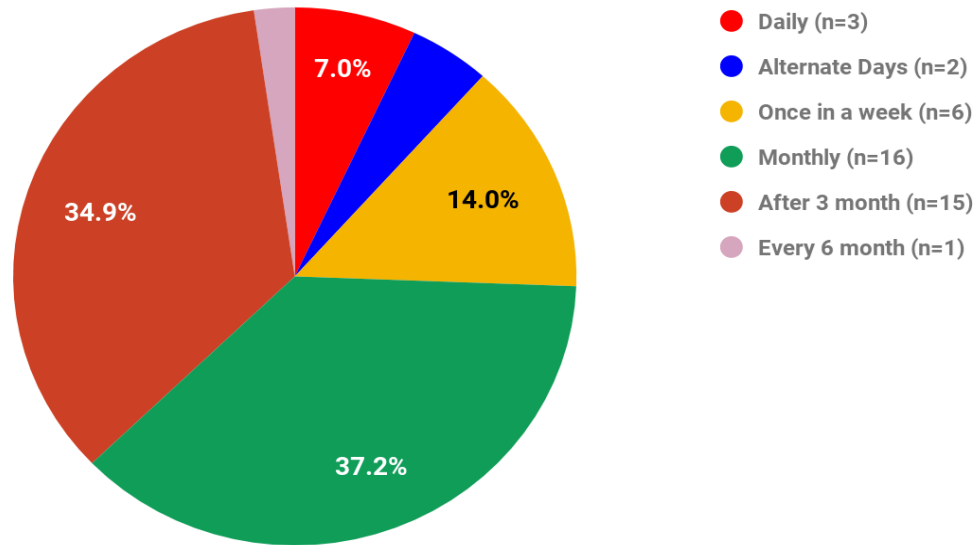
33 Non DTD Caregivers

6 Care Coaches

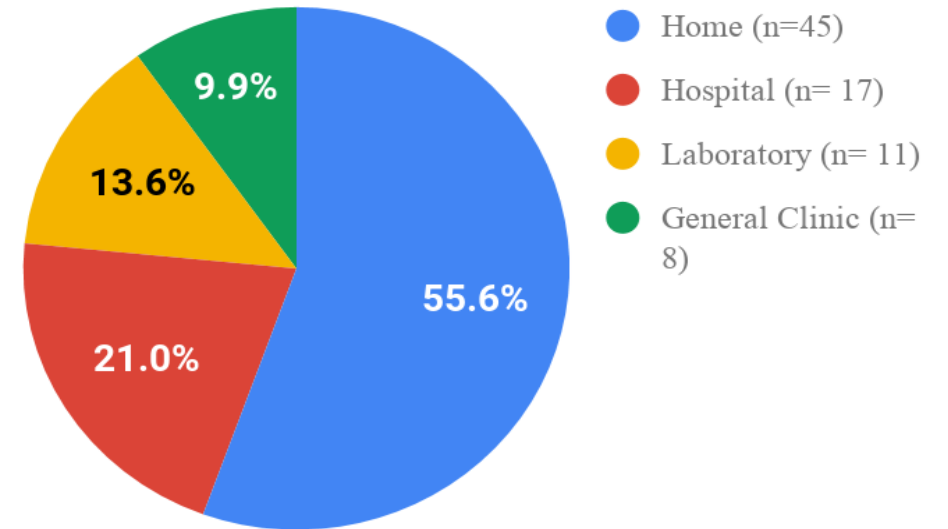
OBSERVATION AND RESULTS

A. Vital Tracking of Non DTD Patients

Frequency of checking vitals

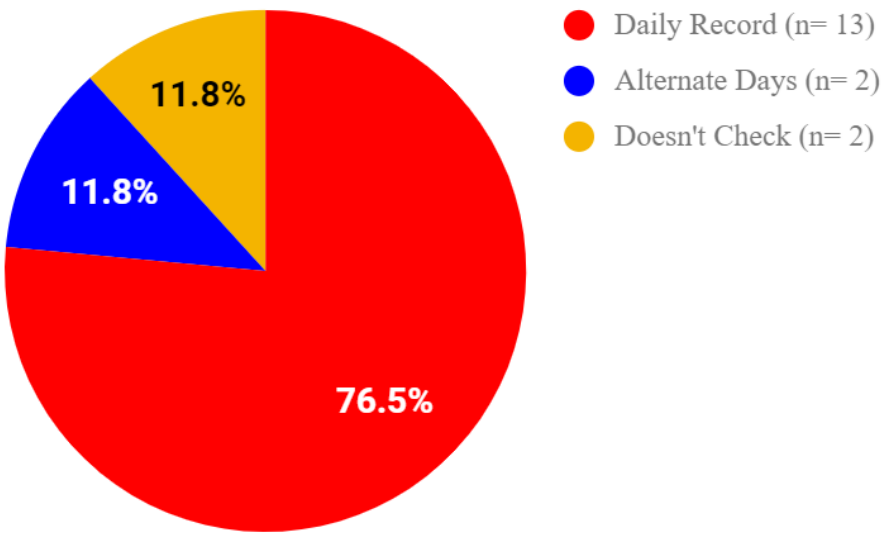


Location preference for vital tracking

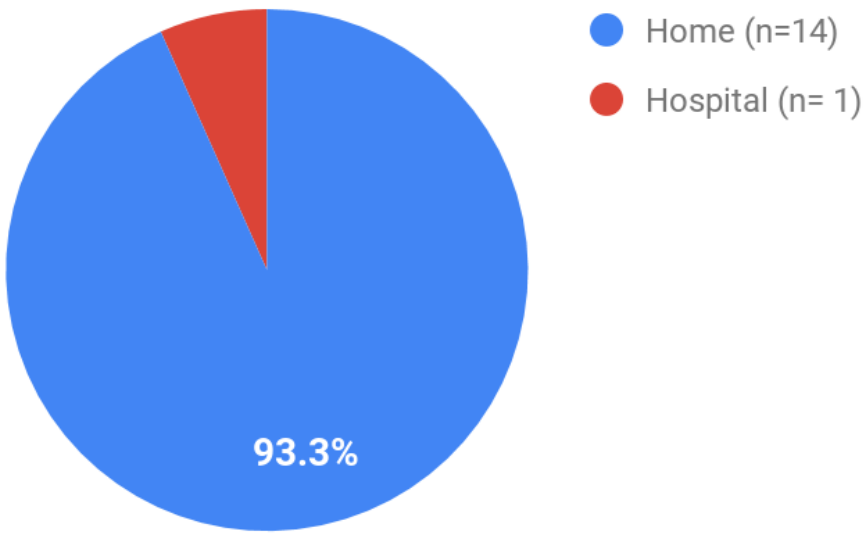


A. Vital Tracking of DTD Patient

Frequency of checking vitals

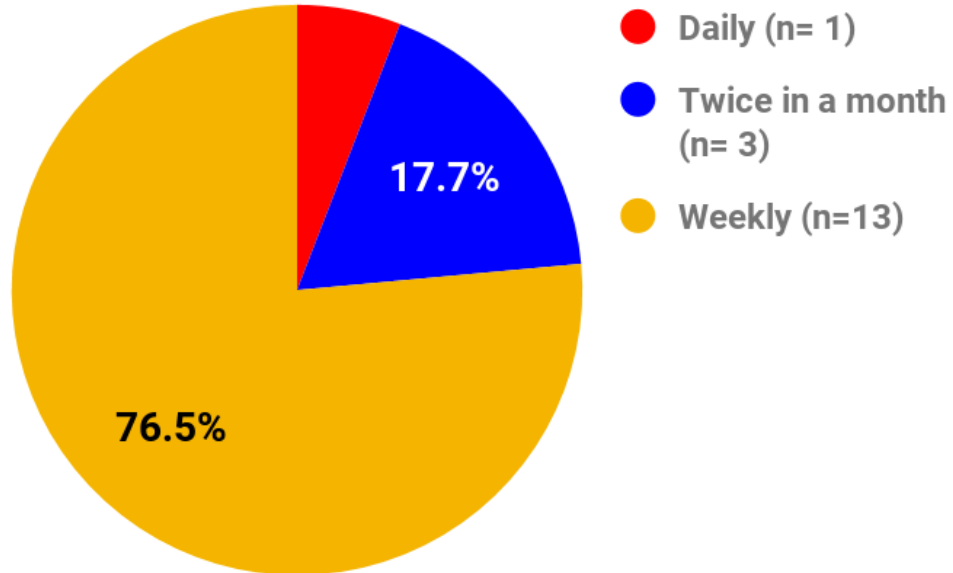


Preference for vital tracking

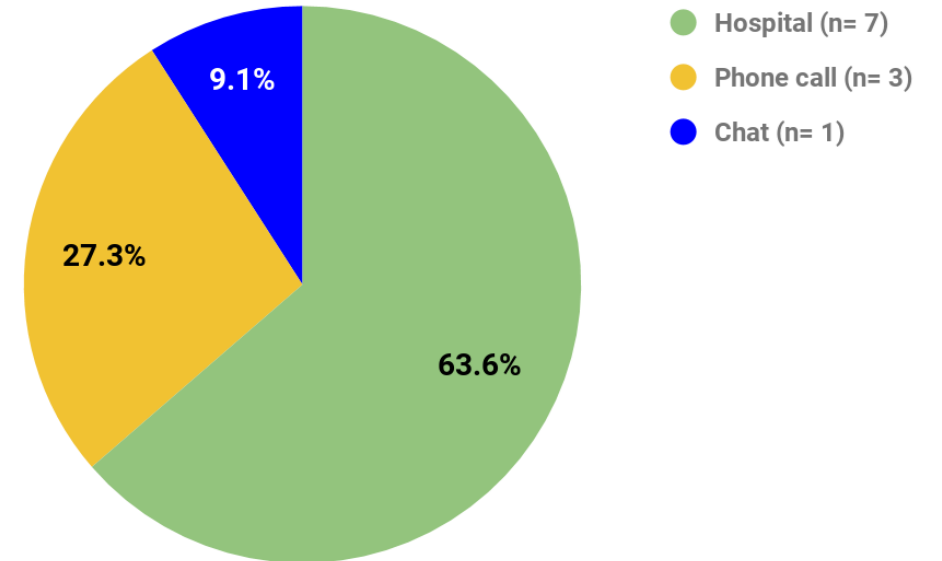


B.Vital Reporting

Frequency of reporting vitals



Preferred method to report vitals



Patient Insights on IoT Devices

Non DTD Patient

X Elders are asked to use the devices, don't have any say.

X Low adoption rate

X Feel that it is not important to track daily

Reasons for not buying IoT devices:

X Lack of information/education so don't buy

X Lack trust on devices hence prefer visiting clinics

DTD Patient

X No time to track

X Don't have the necessary devices to track vitals

X Don't know what to track, when to track - lack of information

X Lack of accuracy

Patient Insights on Monitoring Devices

Non DTD Patient

- ✓ 59% of the diabetic patient use CGM digital monitoring device
- ✓ 39% of the hypertensive patient use digital BP Apparatus
- ✗ 4 out of 11 patients do not use any digital monitoring devices

Reasons for buying Digital Monitoring Devices:

- ✓ Doctor's Recommendation

Reasons for not buying Digital Monitoring Devices:

- ✗ Lack of information
- ✗ Don't know how to use it

DTD Patient

- ✓ 65% of the diabetic patient use CGM digital monitoring devices
- ✓ 36% of the hypertensive patient use digital BP Apparatus
- ✗ 1 out of 15 patient do not use any digital monitoring devices

- ✓ Purchase by caregiver

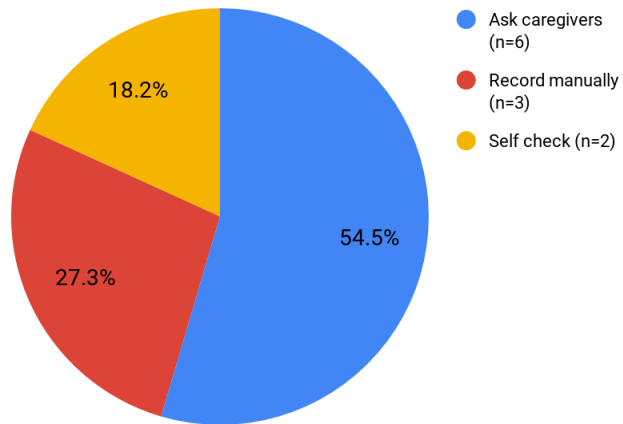
- ✗ Don't know when to use it

Note: % value of patients using monitoring devices is overall patients of the Non DTD and DTD patients

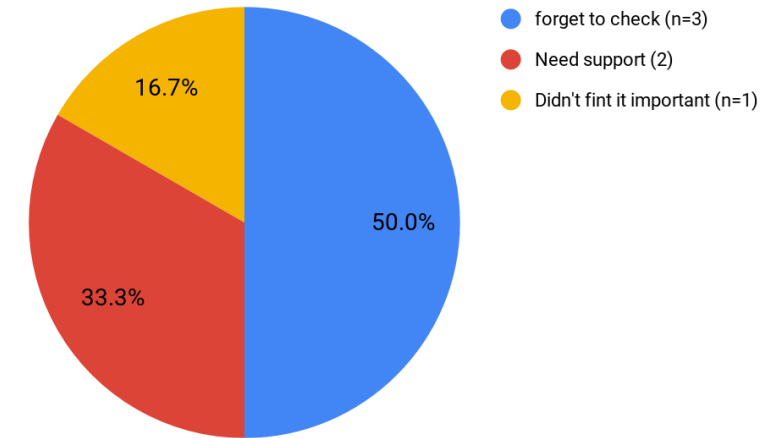
Doctor's Finding

A. Vitals tracking : Doctor's preference

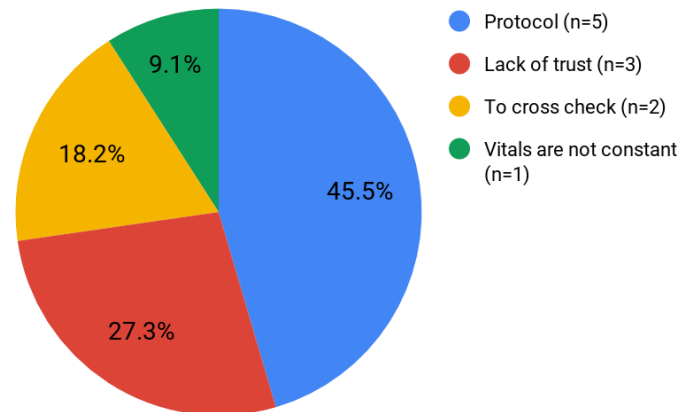
Ways to track vitals by patients



Patients not tracking vitals as per Doc instructions



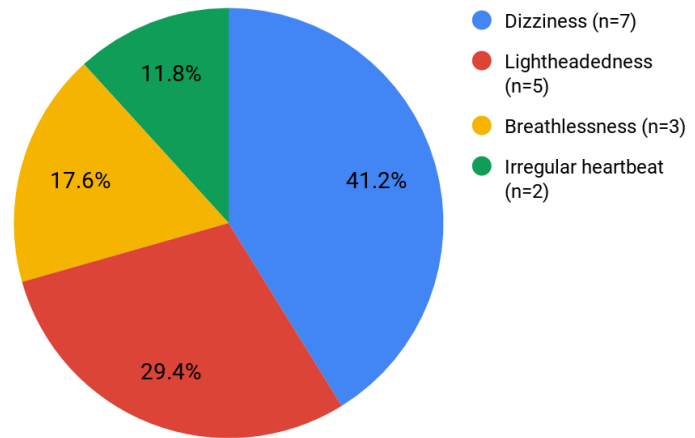
Reason why Doctor's check vitals at follow up



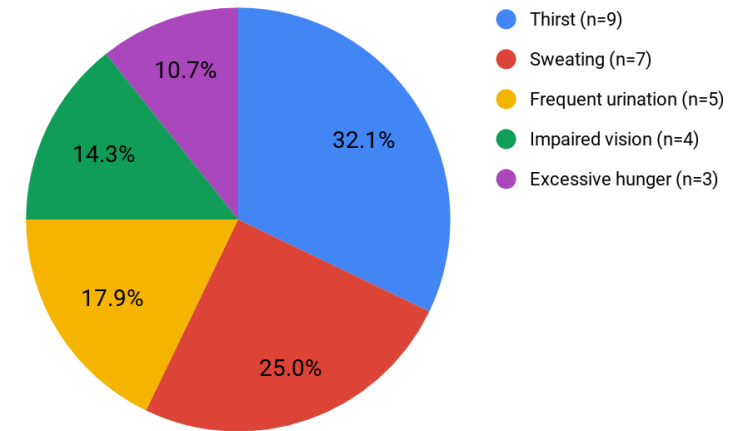
Doctor's Finding

B. Vitals tracking : Additional details

Pre- symptoms for BP patients



Pre- symptoms for Diabetic patients



A. Doctor's suggestion on tracking vitals (Ticks)

- ✓ 50% of the patients forget to check vitals themselves
- ✓ 33% of the patients need support with vitals tracking
- ✓ Doctor's ask **caregivers to record patients vital** at home.

A. Doctor recommendation tracking vitals at home : Use of IOT for vital tracking vs.. manual vital tracking (case)

7 out of 11, Doctors agree, use of IOT devices have challenges, such as lack of accuracy in results thus lacking trust.

But, 7 out of 11, Doctors also agree that, using IOT devices at home, reduces unnecessary visits to the hospitals and clinics. Thus, IOT devices helps in keeping eye on patients daily vitals individually and helps in reducing the risk of adverse event in future.

Doctors also have patients who don't own, any monitoring devices and record vitals manually. They directly visits to the nearby general clinics or hospitals. Also most of the patients are not aware of using IOT devices and are dependent on caregivers.

Overall preference is, only vital tracking is not enough, additional details are required such as diet intake, lifestyle activities of the patients.

Observations on IoT:

After conducting a primary survey and literature review, we have concluded following barriers for IoT integration:

Trackers		Challenges
Xiaomi Mi bands	1200/-	• Low global market share • Data privacy issue • Dependency on sales
Samsung	2490/-	• Low quality • Does not has own OS • Huge competition
Watches		Challenges
Apple watch	20900/-	• Cost is high • Replaced by the substitutes at cheap rates
Fitbit Charge 3	11999/-	• Inaccuracy steps are measured not by a physical step, but by wrist movement. • Smaller competitors and apple treat

→ The study suggests that vitals can be tracked other ways such as CGM, BP Apparatus and patients don't need to have an IoT device.

→ All the information needed to backup the vitals, is not available in one device for example: Smart Trackers in the market

Recommendations

For patients who have devices

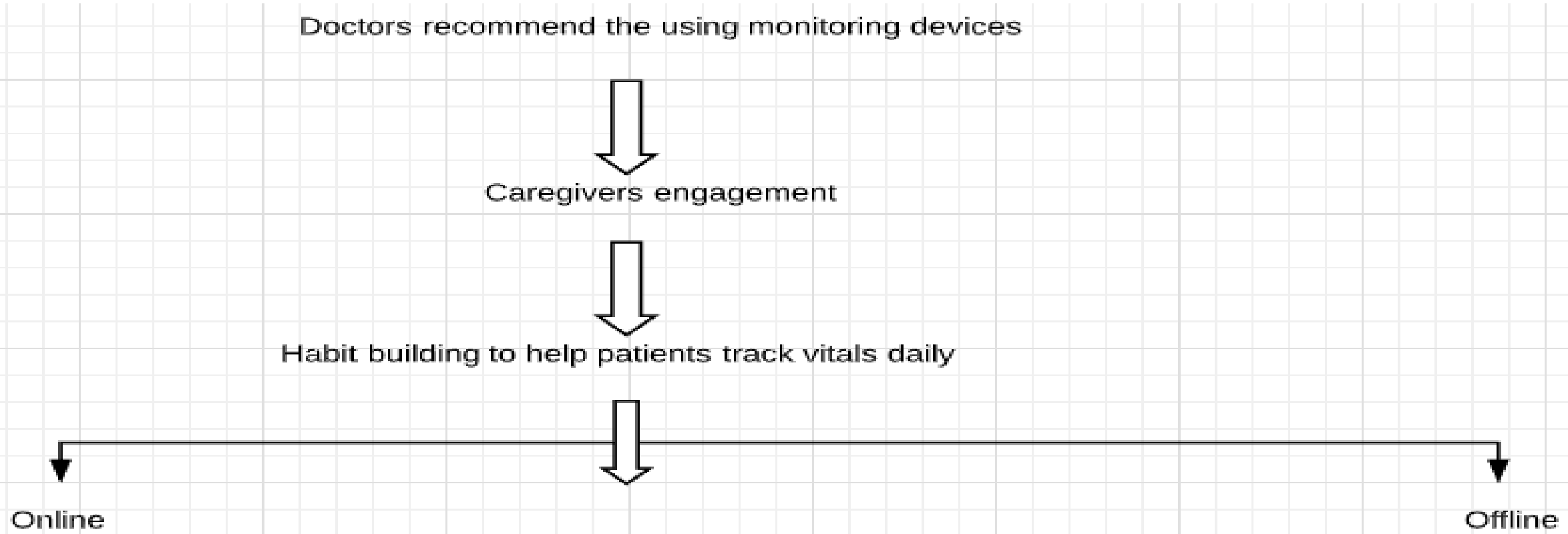
- Increase Patient Engagement around tracking their health vitals on daily basis through our Daytoday App.
- Implement a Smart tracker and monitoring tool that uses vital trends and asks specific questions for determining faster and effective patient outcomes.
 - Building notifications around reminders for caregivers to track and share reports.
 - Add specific assessments around current state of patient vitals

For patient who don't have devices

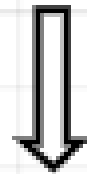
- Build Caregiver's involvement around tracking patient vitals
 - Caregiver education
 - Access to vitals information and reports
 - Reminders to keep a track on vital performance
- Build awareness among patients around tracking vitals regularly -
 - Get patients invested & trained before they leave hospital by providing counselling to the family member for better health outcomes.
 - Help patients with the following during the different care plan stages to create a habit on -
 - What to buy
 - When to use
 - How to use

Implementation Plan

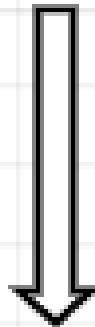
A. Habit Building Process



Offline



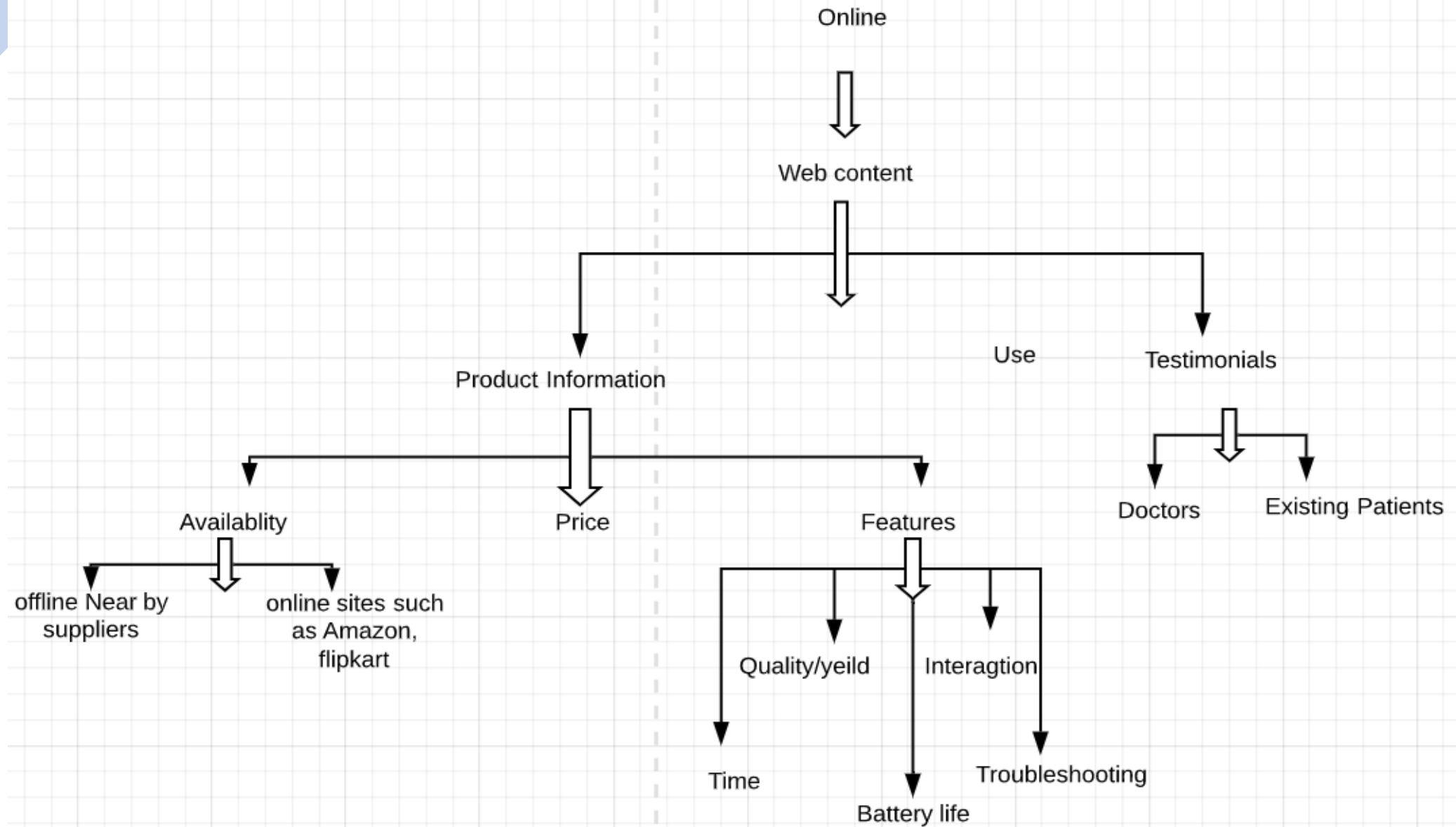
Awareness among patients and caregivers



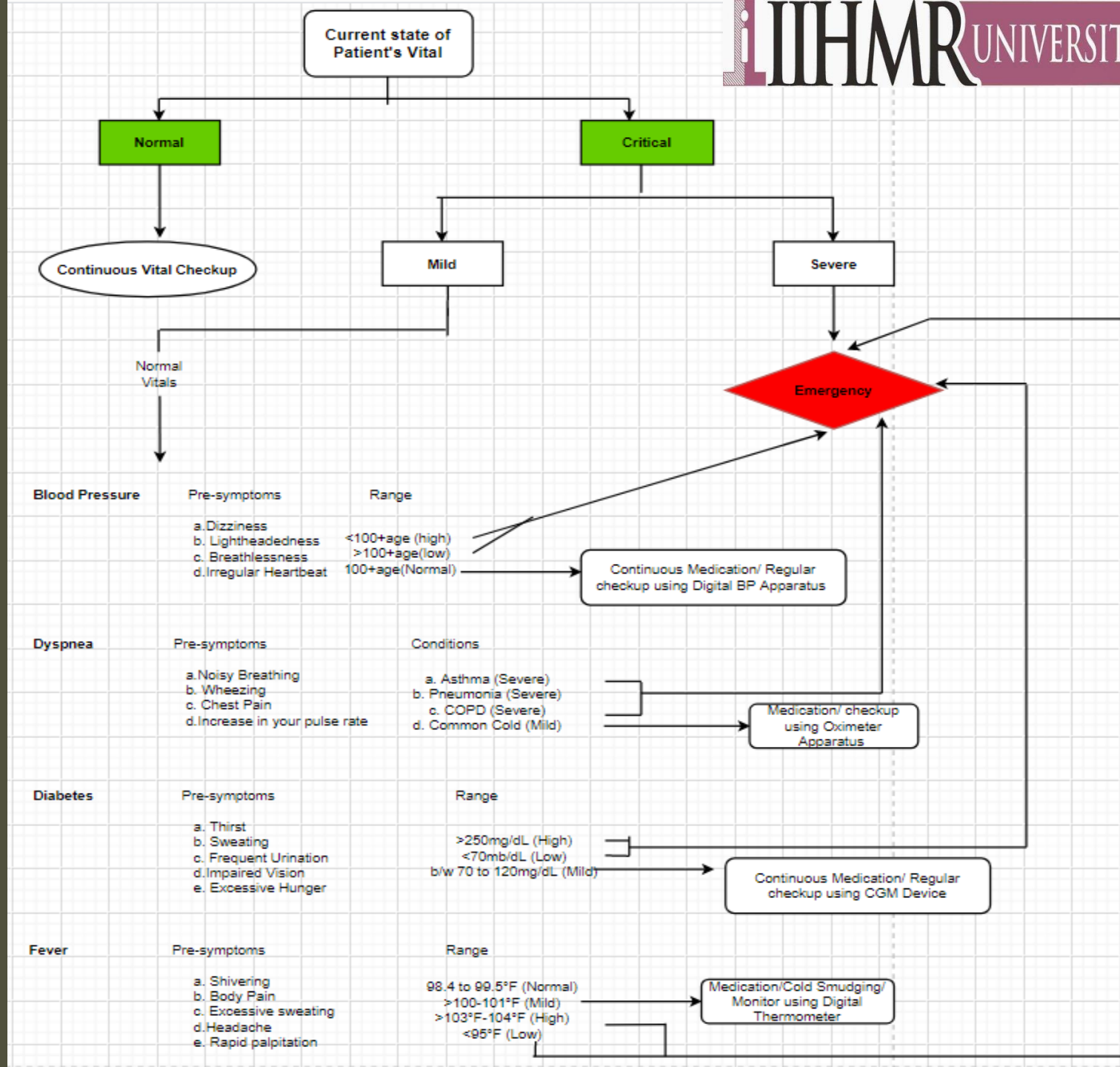
Discharge

Onboarding

On followup call



B. Escalation Workflow



C. Vital Assessment Tool

VITAL TRACKING

Q1. Have you been having fever or chills?

- ☐ 1 – not likely
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 – extreme likely

Q2. Have you been having racing heart beats?

- ☐ 1 – not likely
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 – extreme likely

Q3. Have you had any trouble breathing today?

- ☐ 1 – not likely
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 – extreme likely

Q4. How often are you doing your breathing exercises and spirometry?

- ☐ 1 – not likely
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 – extreme likely

ASSESSMENT TOOL

Based on Co-Morbidity

Q1. Did you check your temperature?

- ☐ Yes
- ☐ No

Q2. Are you following your diet as per instructions?

- ☐ Yes
- ☐ No

Q3. Are you checking your BP as per doctors' instructions?

- ☐ Yes
- ☐ No

Q4. Are you feeling Dizziness/Lightheadedness?

- ☐ Yes
- ☐ No

Q5. Are you feeling any anxiety?

- ☐ Yes
- ☐ No

Q6. Is your insulin level in normal state?

- ☐ Yes
- ☐ No

Q7. Is there any change in your urine frequency?

- ☐ Yes
- ☐ No

Q8. Are you feeling any increase in your appetite?

- ☐ Yes
- ☐ No

Conclusion:

- IoT, for patient use at home, is not the preferred choice by patients or their families. Due to very low adoption rate of almost 10-15%, IoT as an integration in DayToDay is not a MUST-HAVE.
- Having said so, digital medical devices such as BP Apparatus, Continuous Glucose Monitoring Devices, Pulse Oximeter, ECG, etc, are being used by most of the target population.
- With respect to patient adherence for vitals, our findings suggested that Doctors play in adoption and acceptance of digital medical devices is very high. Despite this, the discoverability of how to track vitals remain an issue.
- Patient's family members play an important role when it comes to decision making. Talking about how family members get devices, data says 24% of the patient take decision by themselves i.e., Self-Discovery and 50% dependents on Word of mouth by their Friends, Family and Other Sources.
- Education and awareness around vitals tracking for patients at home are key to capturing reliable health data and in decreasing the possibilities of red alerts in time. Since the audience at home are patients themselves along with their families, they must be educated first with little support from Doctors. This way we ensure that everyone -is involved in patient care by helping patients and their families become active contributors in the patient's care.



**THANK
YOU!**