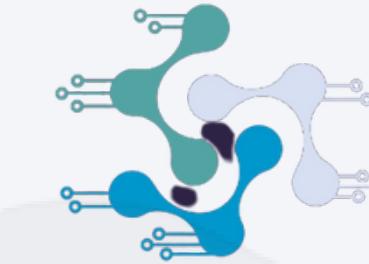




SOCIAL ENTREPRENEURSHIP  
CHALLENGE



INTER IIT TECHMEET 10.0



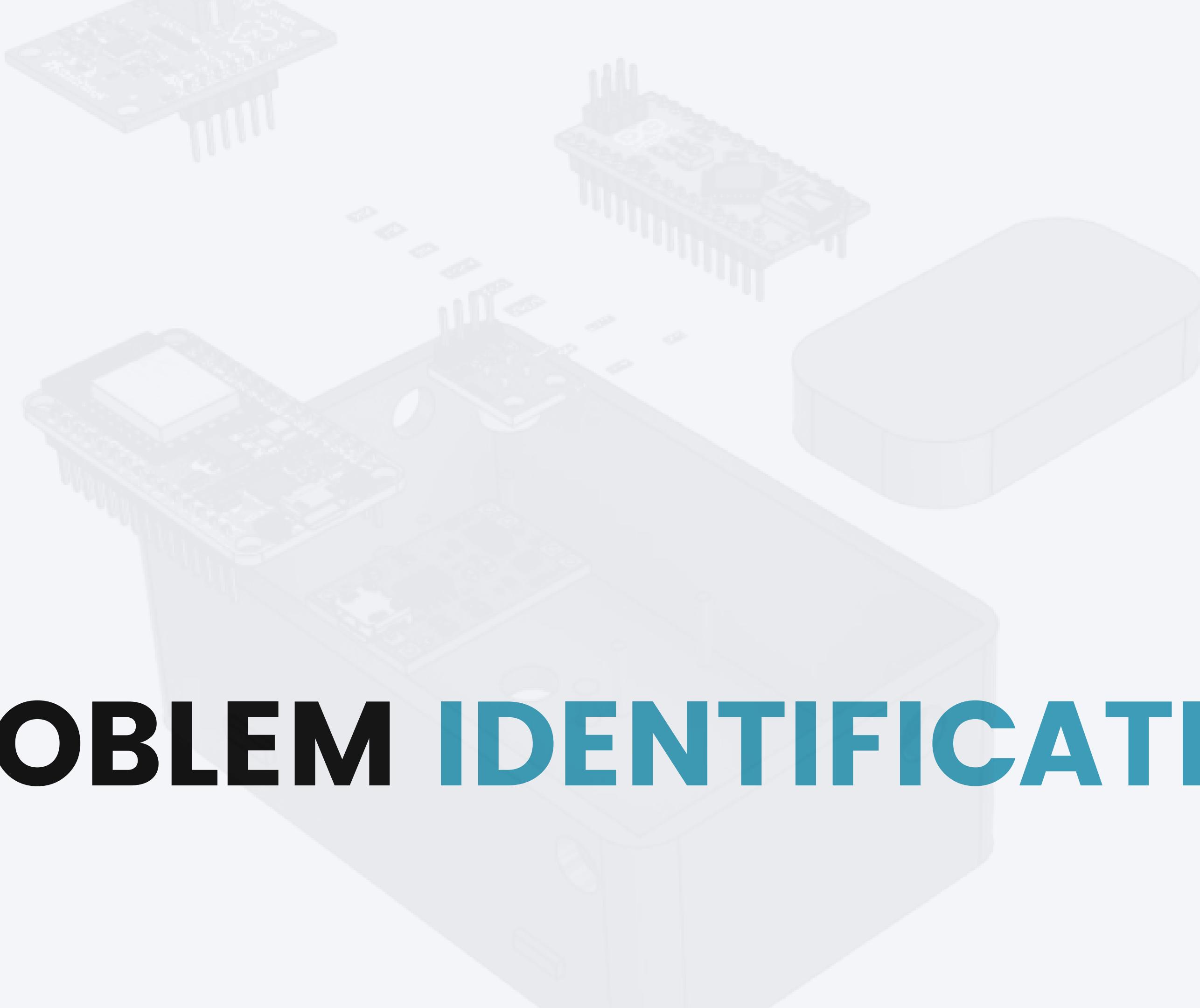
# BRAHMA

Biometric Rapid Automatic Health Monitoring Assistant

TEAM 10



# PROBLEM IDENTIFICATION



The patient was admitted to the hospital but left unattended due to the shortage of nurses.



Due to lack of a proper monitoring system, deterioration in patient's health goes unnoticed



The patient gets attention after his condition goes out of control.



Had there been a better monitoring system and enough number of nurses, a life could have been saved



This story is not just a hypothetical story,  
but the **reality** of Indian healthcare system



# SIX IN TEN PREVENTABLE DEATHS ARE CAUSED BY POOR HEALTHCARE SYSTEMS: STUDY



Poor healthcare kills 16 lakh in India every year, finds study

Illions cost the global economy some \$6 trillion in 2015 alone.

LATEST VI

AGENCE FRANCE-PRESSE SEP 06, 2016

## Hospitals told to shed staff as NHS funding crisis deepens

Nurses most at risk despite new

Mid Staffordshire care scandal in 2015 saw

Poor care quality leads to nearly twice as many deaths as due to non-utilisation of healthcare services (838,000 persons)

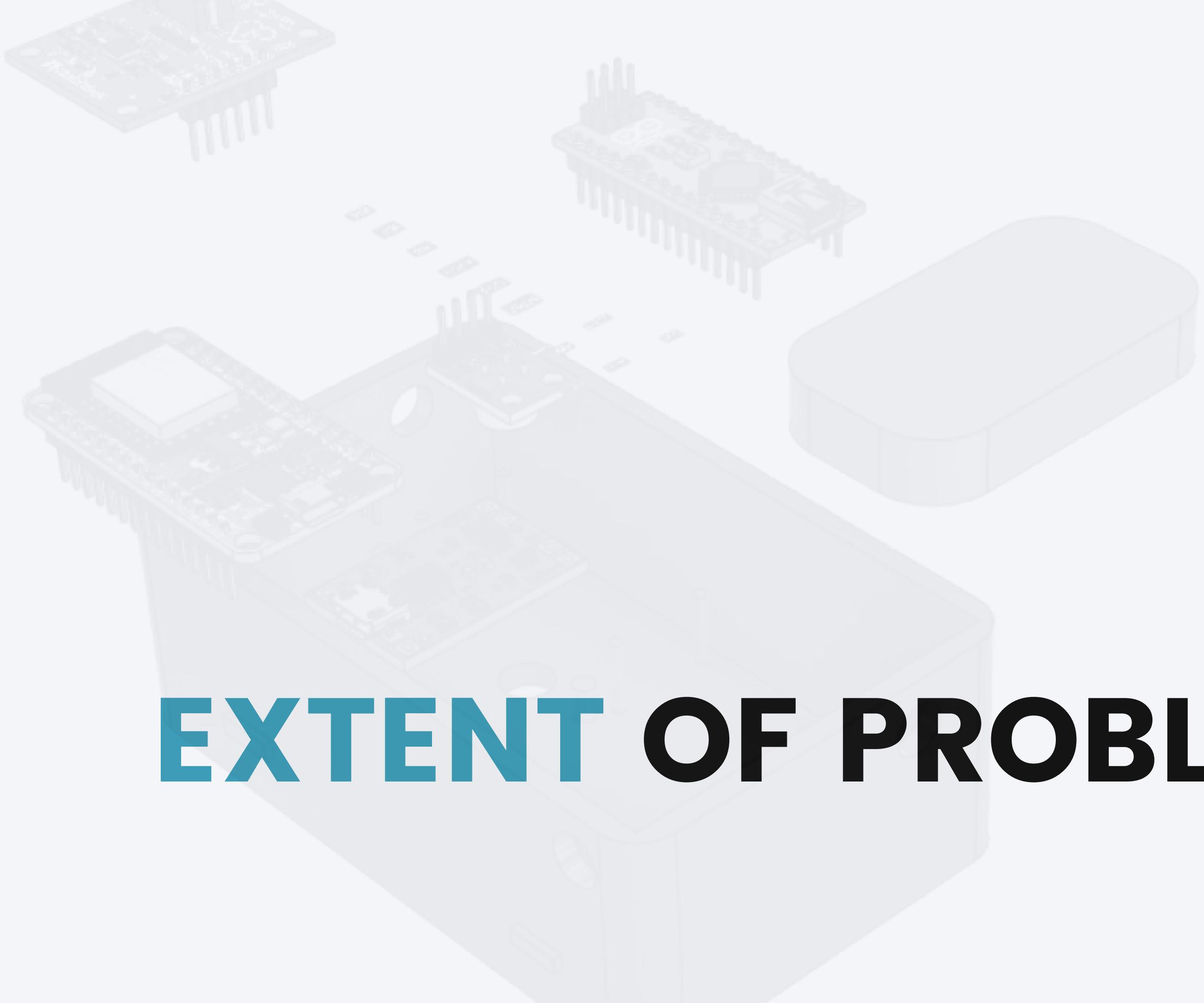
hospitals are being told to shed staff to relieve the NHS from an acute funding crisis, leaving nurses and other frontline medical staff overstretched. St George's in London is expected to record a deficit of about £45.2m. To save £3m, a trust would have to lose 25 nurses, according to the King's Fund thinktank.

The decision to settle the

£60m

impact would be swift, through either

almost all the foundation trusts regulated by Monitor are deemed "financially challenged" and 21 overspent by so much that they are facing government bailouts to help pay bills. The cost of expensive agencies set to be £4bn this year, is the single largest increase in the NHS budget.



# **EXTENT OF PROBLEM**

# NEED OF A CONTINUOUS MONITORING SYSTEM

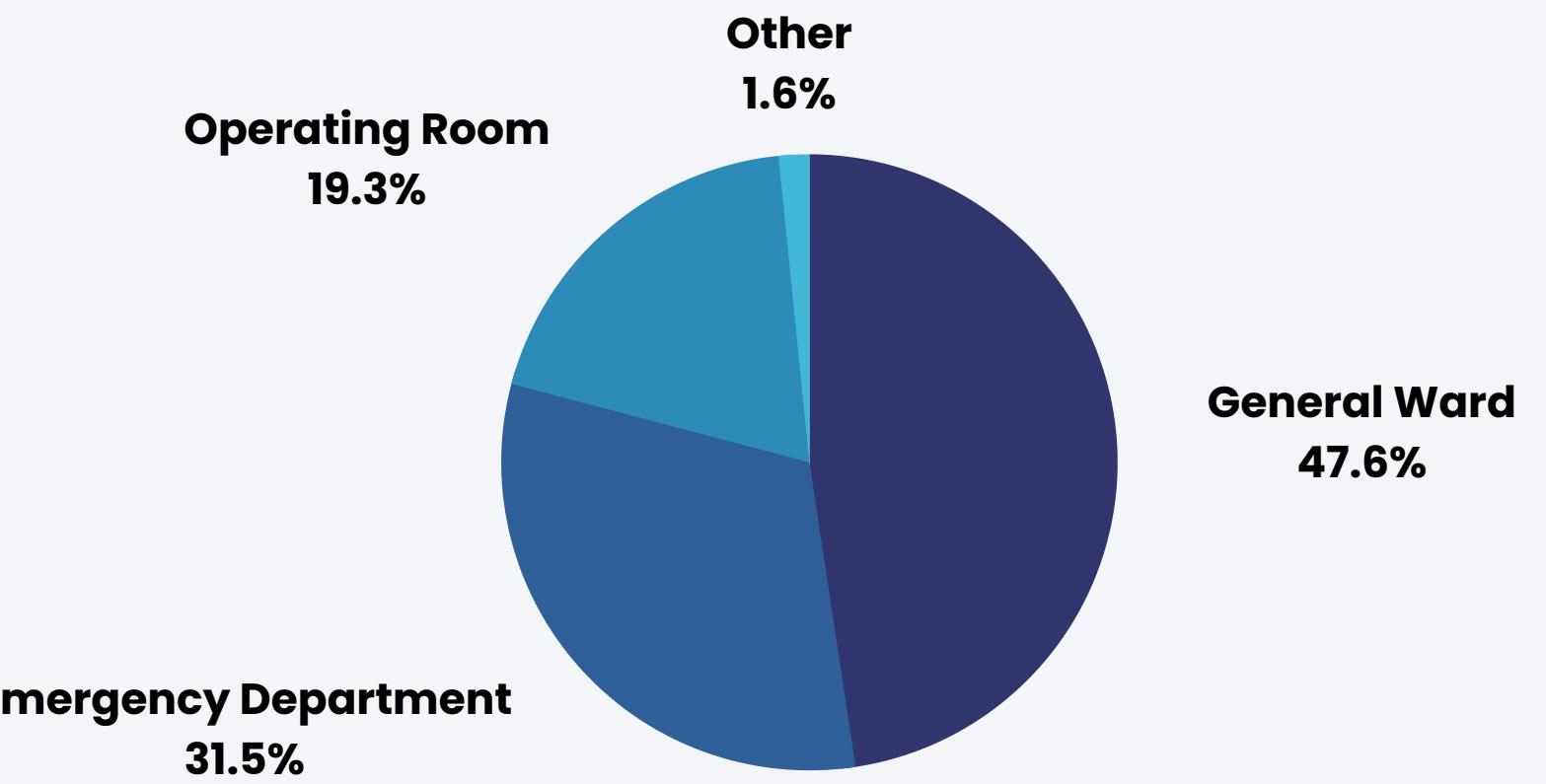
- General wards are the **most vulnerable** ones.
- Compared to other sections, general wards are **more prone to higher death** rates.
- This is due to the **lack of a continuous monitoring** system.



Percentage of people having life-threatening antecedent factor 8hrs before admitting to ICU [1]

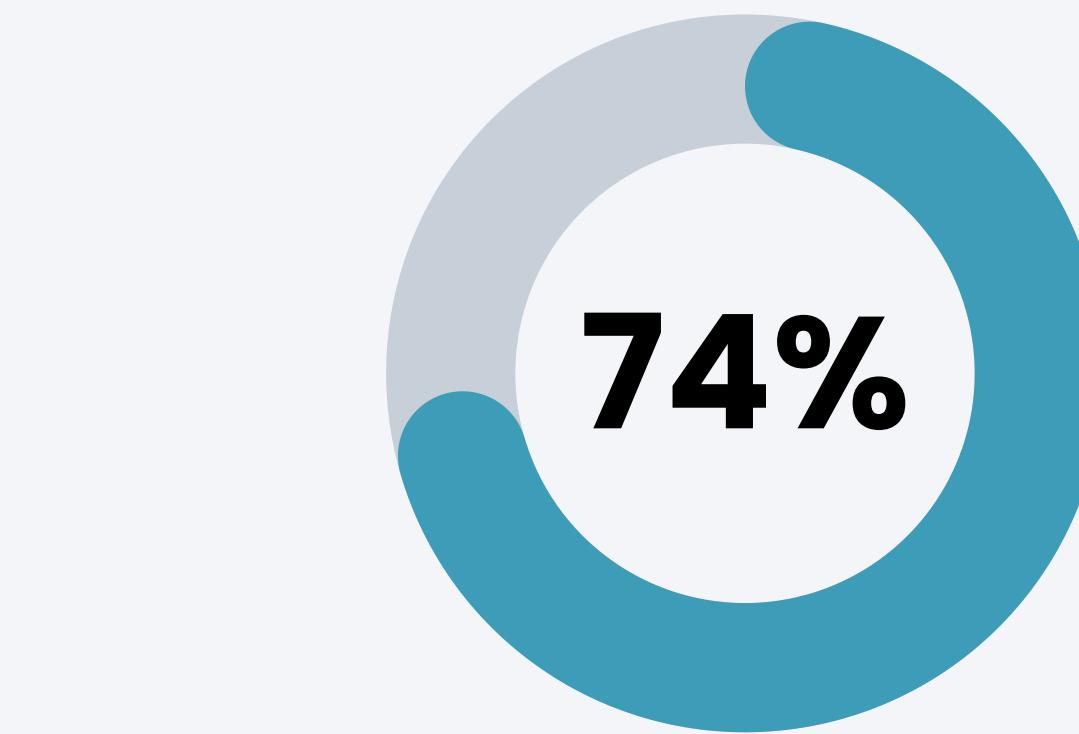
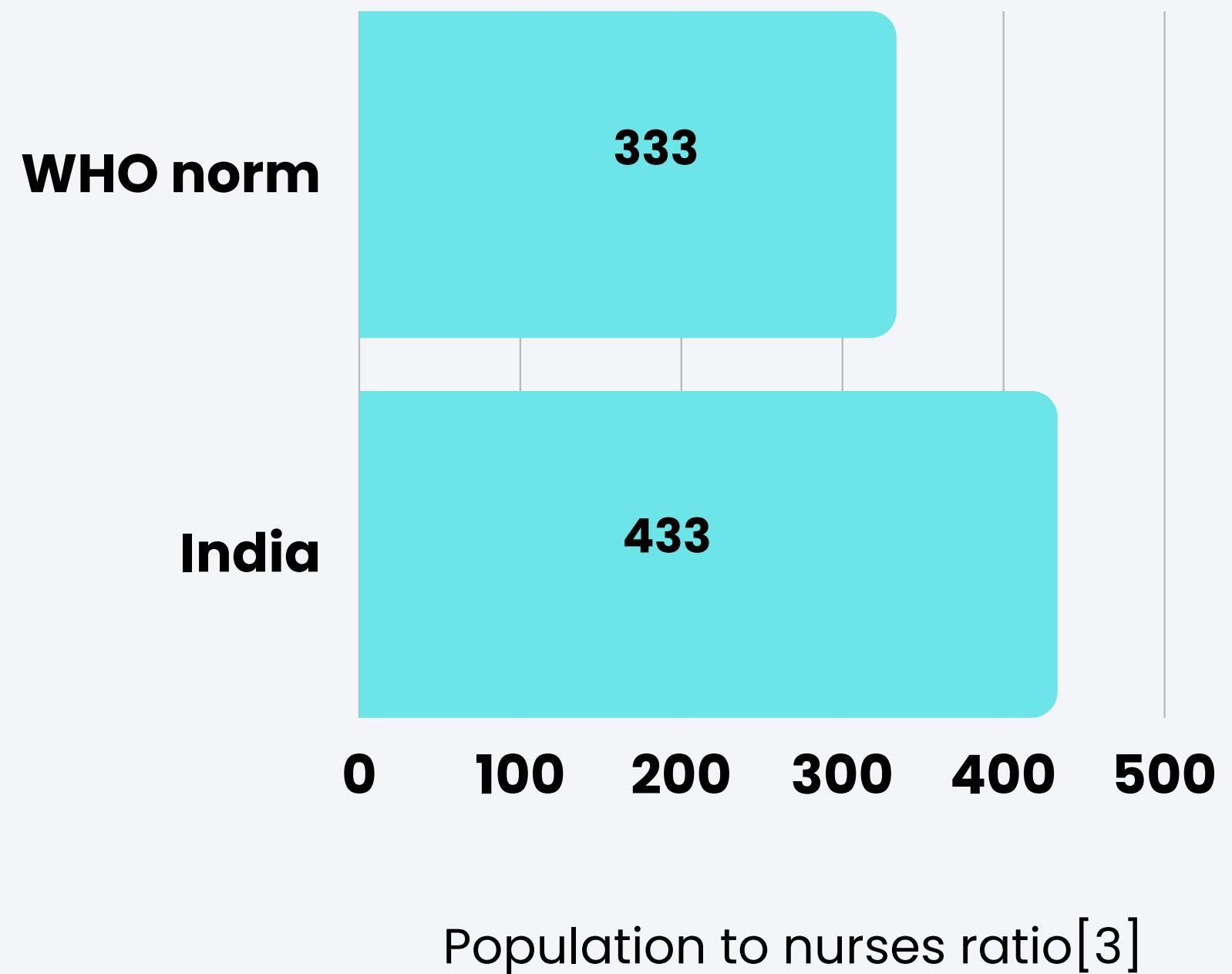
# FATALITIES STATISTICS IN DIFFERENT HOSPITAL WARDS

- Non-continuous monitoring causes patients lead to a **life-threatening** condition.
- This leads to a condition where people reach **ICUs** in **critical** conditions.



Percentage of Death in different wards [1]

# WHY IS THE CURRENT MONITORING SYSTEM INEFFICIENT?



Percentage of nurses who well-received the idea of continuous patient monitoring system [2]

Population to nurses ratio[3]



# TESTIMONIALS



*"By continuous monitoring of pulse, blood pressure and oxygen saturation, assessment of the vitals of the patient become easy. Sudden haemodynamic abnormalities of the patient can be found out and one can interact immediately to check the abnormalities with prompt measures. This minimises any unwanted complications of the patient."*

**-Dr. P. Nagaraju, MS(AY)**  
(SASA Ayurvedic Medical College)

*"Due to lack of continuous monitoring, we may not predict the complications in a patient particularly if he is under shock in which the patient's condition may become worsen leading from moderate to severe shock. So, always there should be continuous monitoring of the patient not only in ICU but also in General wards to early detection of any complications to interact immediately to save the patient."*



**-Dr. Sushil Goenka, MD**  
(Govt. Hospital, Raiganj)

# What do we need from a solution?

Real time  
Monitoring

Workload  
Reducing

Cost  
Effective

Portable

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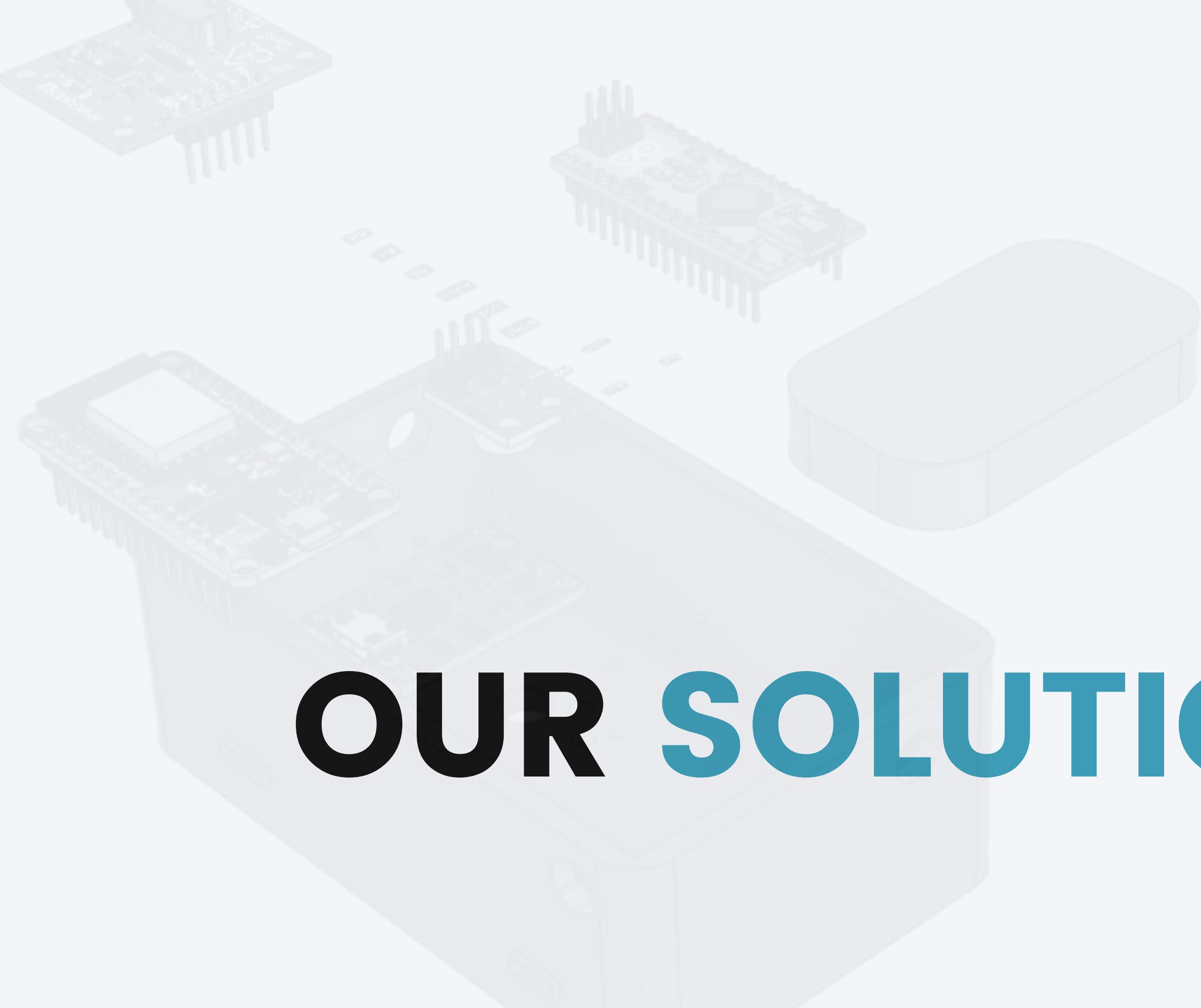
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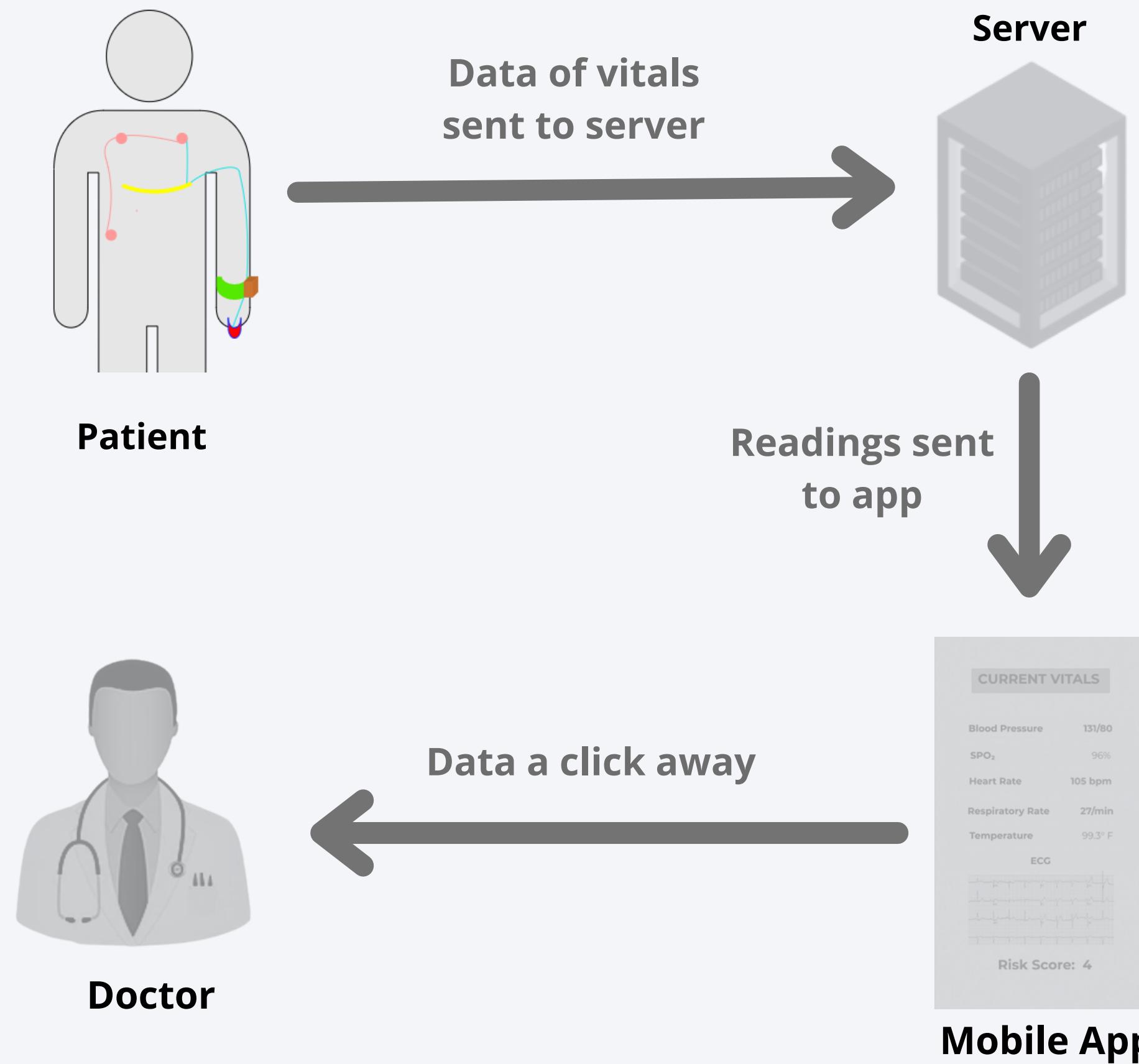
# OUR SOLUTION

# BRAHMA

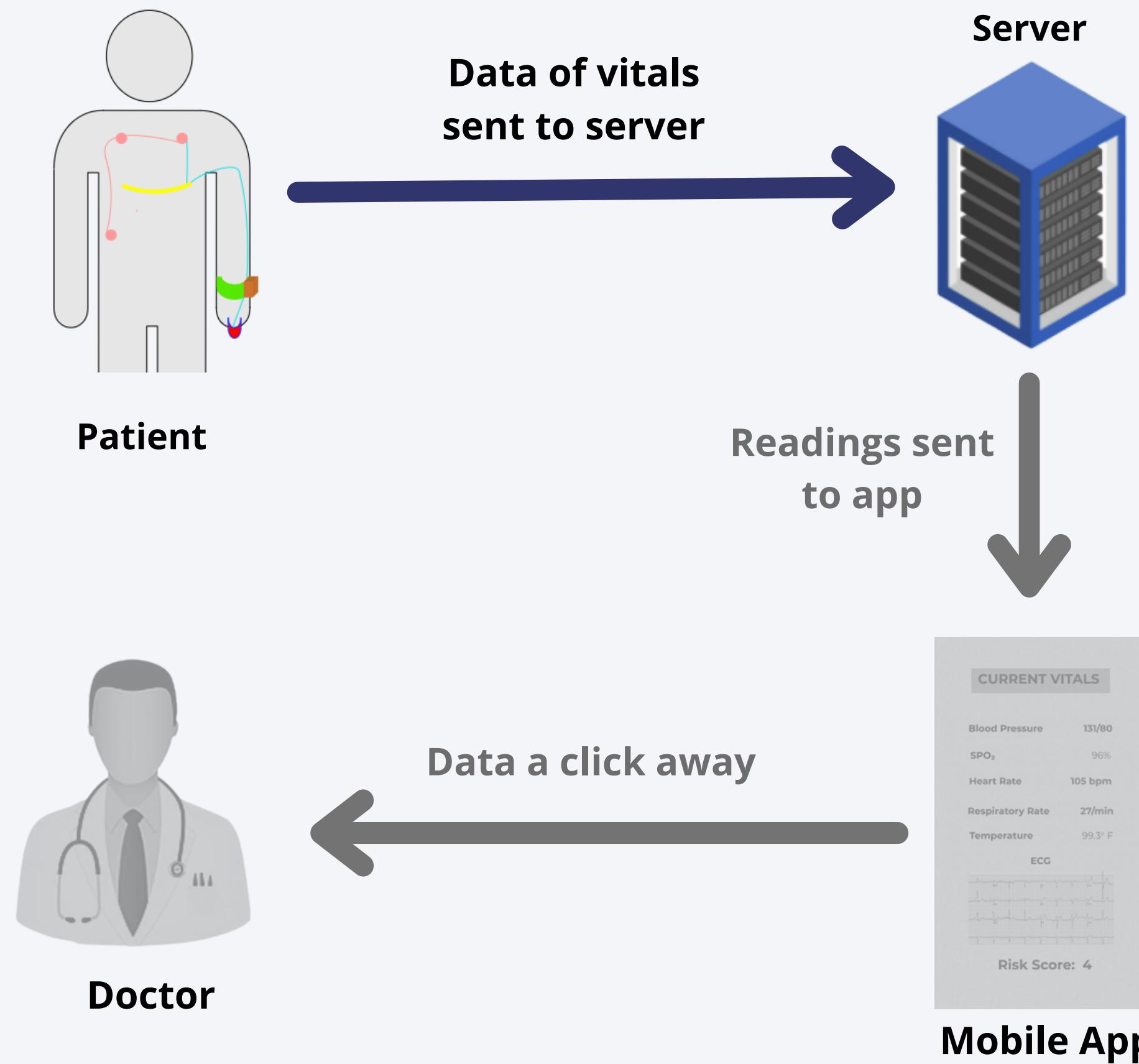
Biometric Rapid Automatic Health Monitoring Assistant

**BRAHMA** continuously **reads** the vitals of patients which can be **monitored** by the medical staff in **real-time**. In case a patient's health deteriorates, **automated alerts** are sent to the doctors.

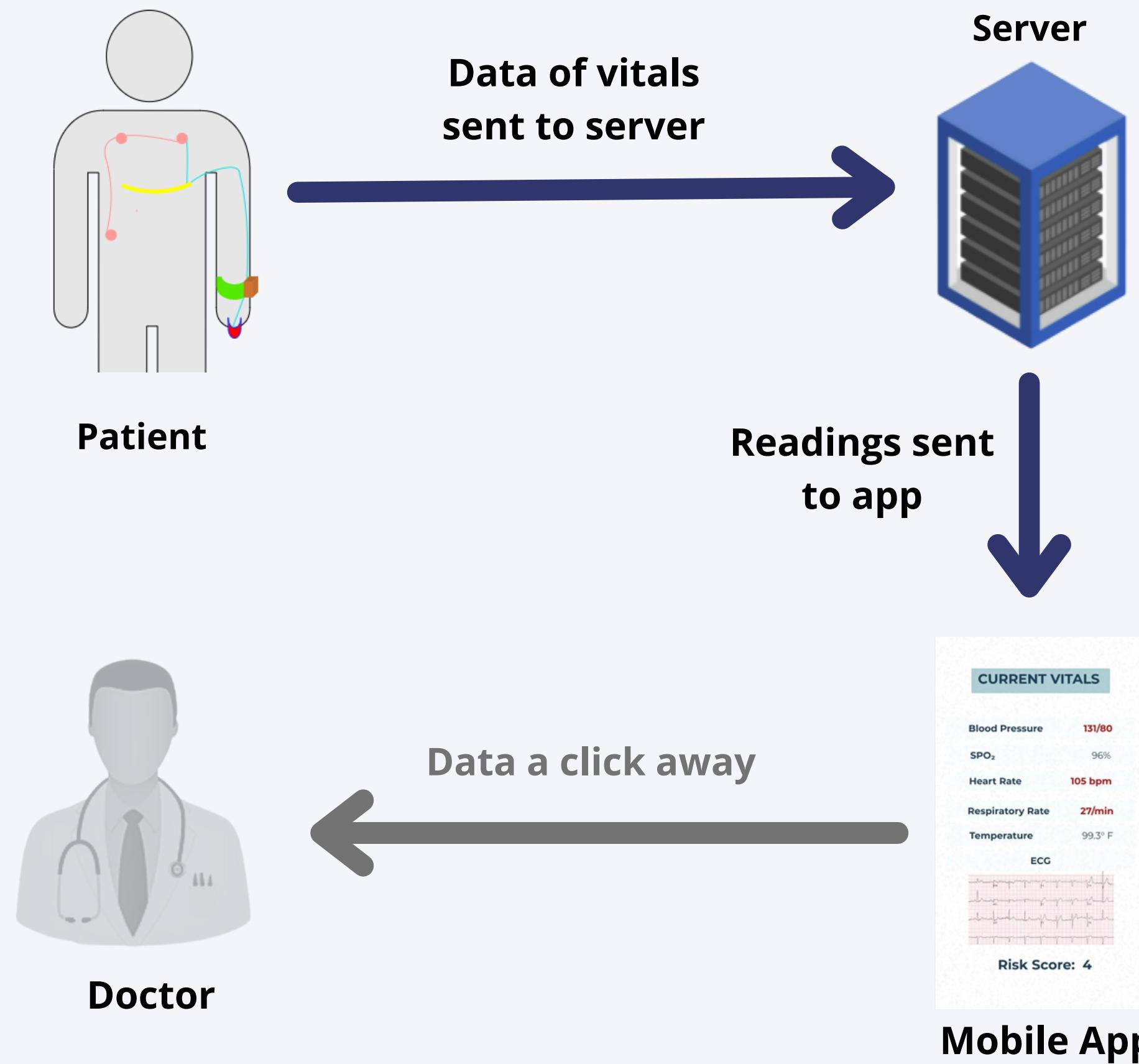
# In case of normal condition of patient



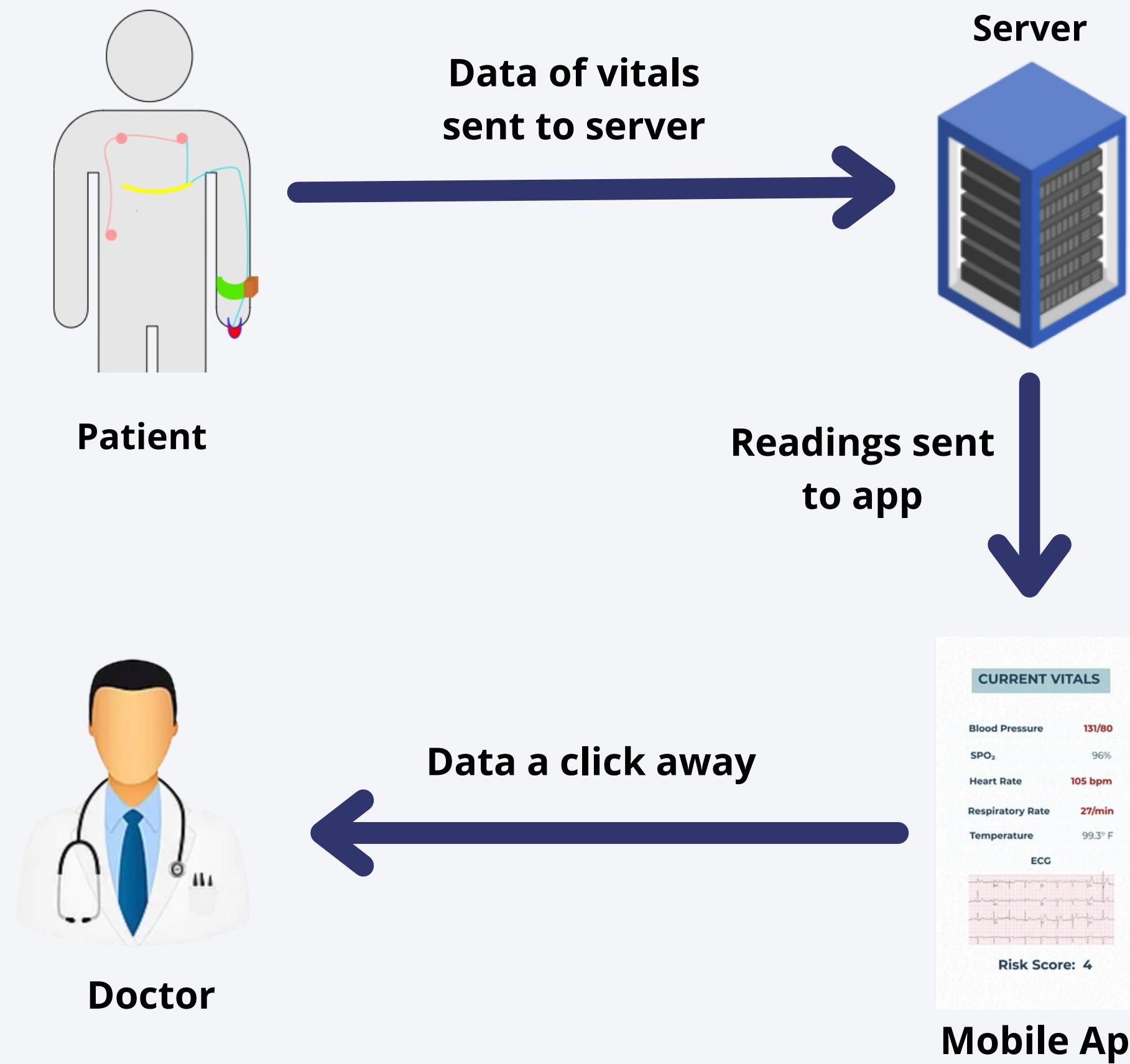
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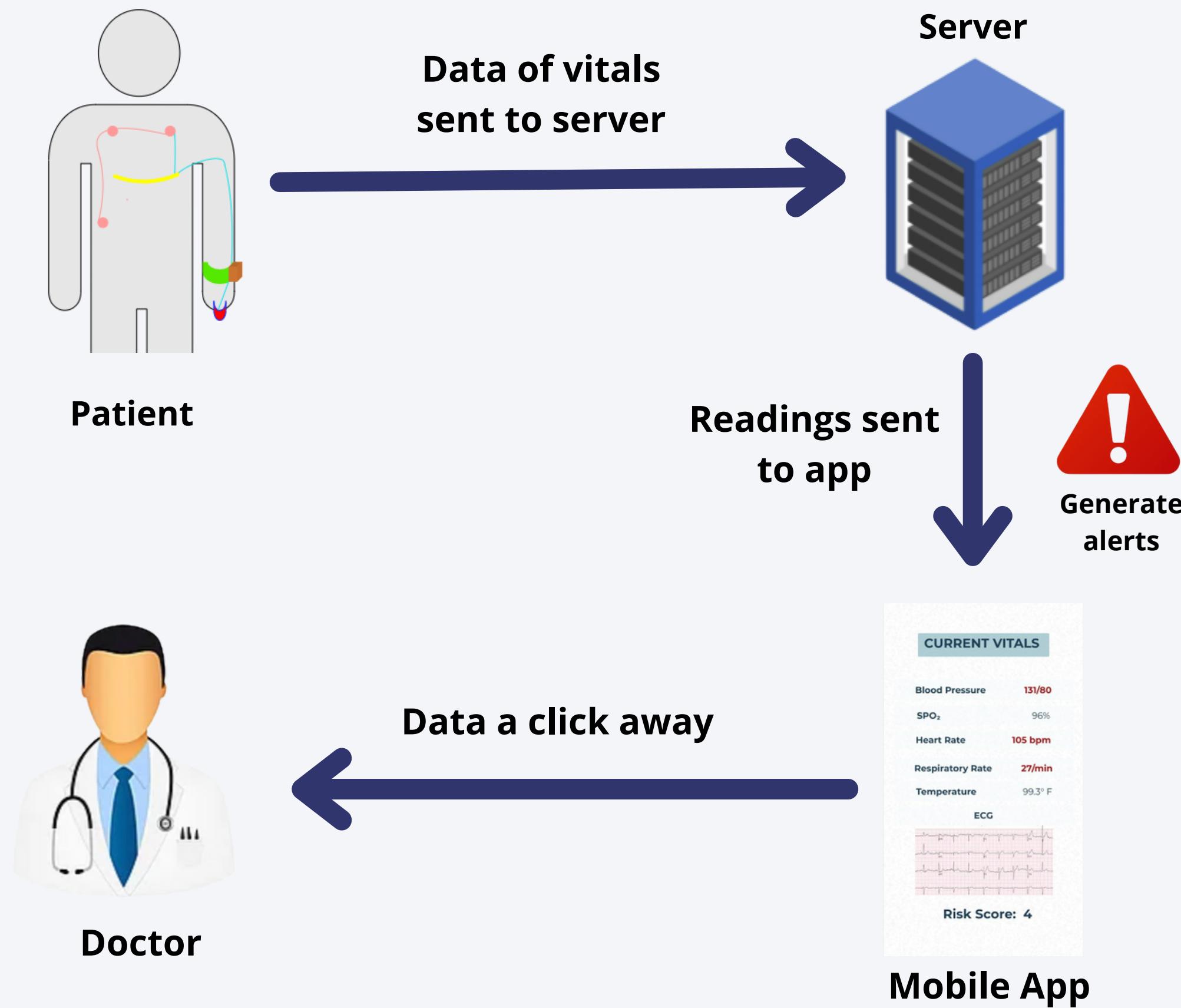
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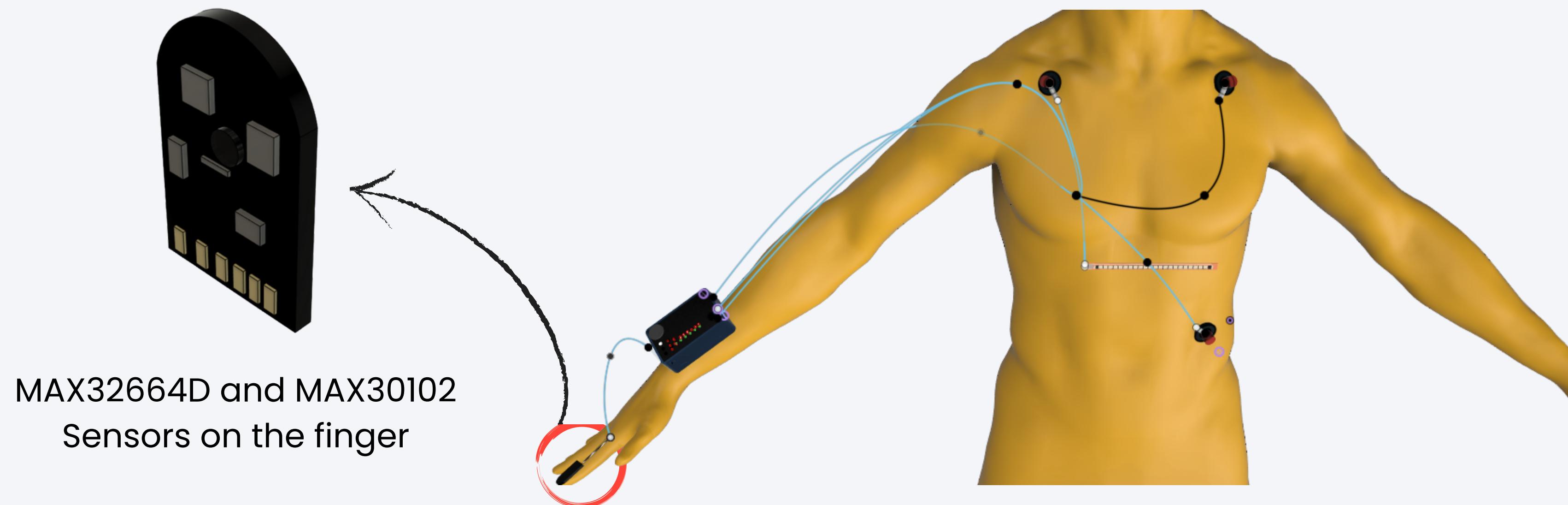
# In case the condition of the patient deteriorates



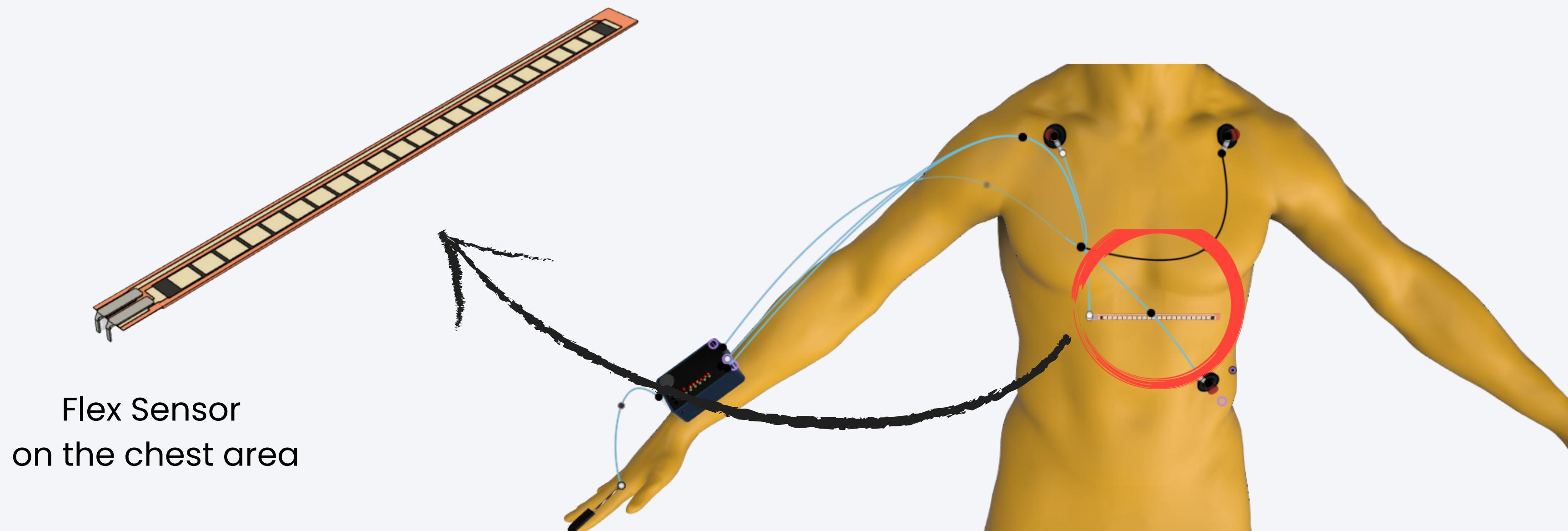


# HARDWARE

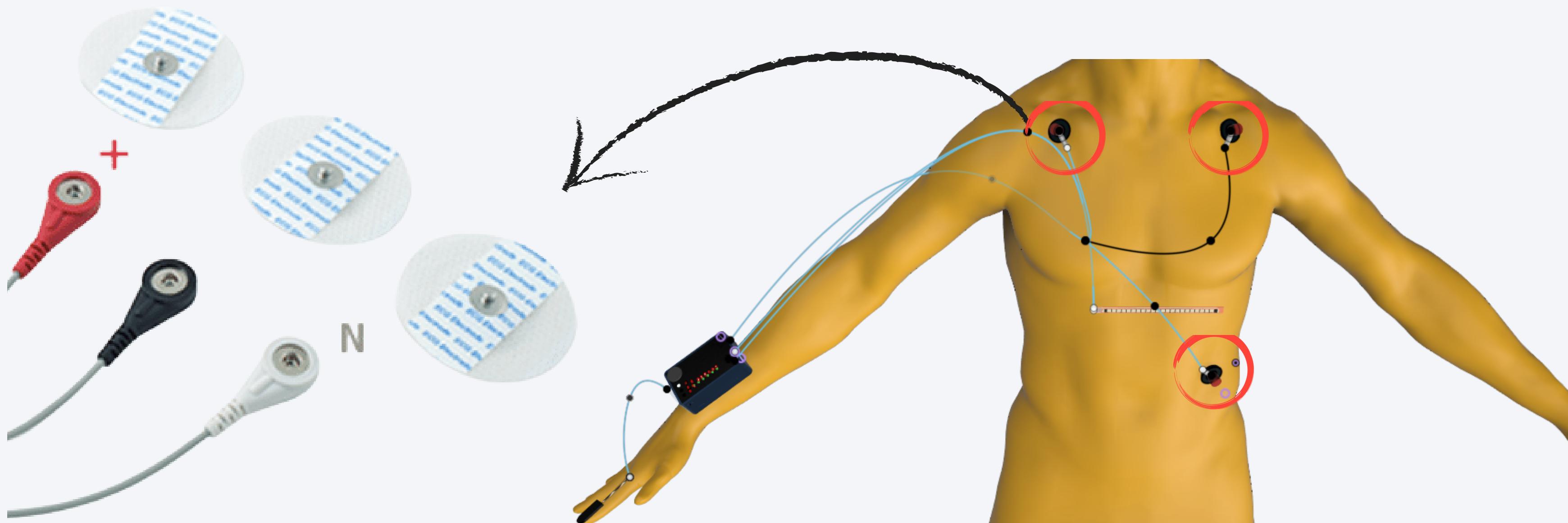
# **SPO<sub>2</sub>, BP, PULSE**



# RESPIRATORY RATE



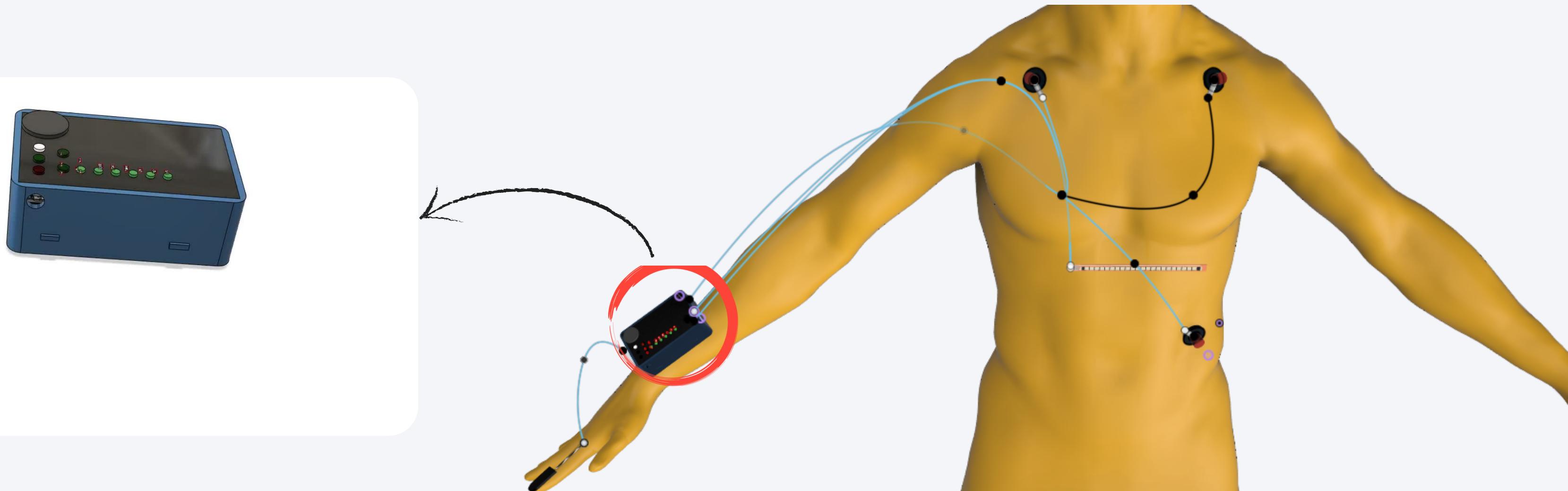
# ELECTROCARDIOGRAM



ECG Electrodes

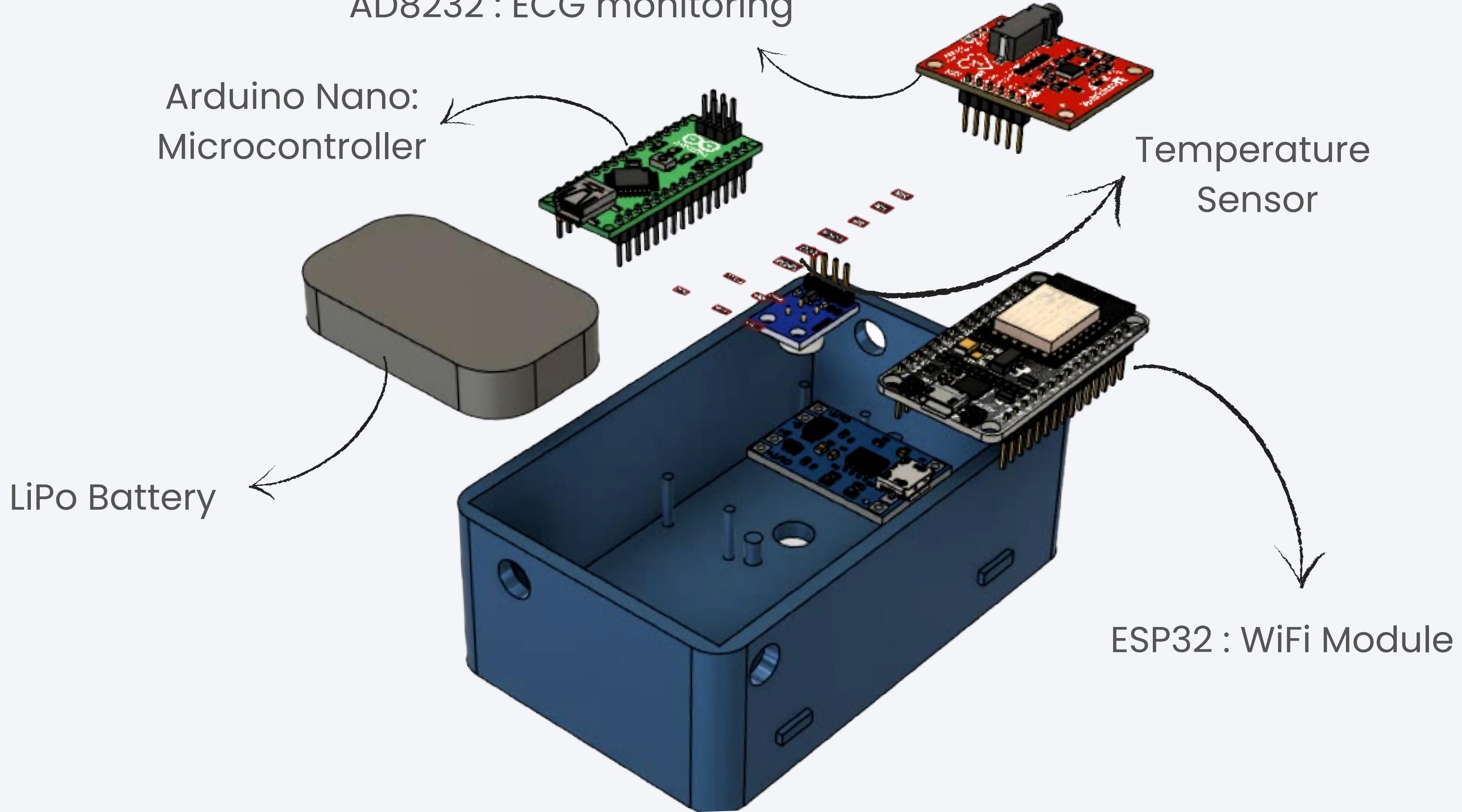
Two adjacent Clavicle bone and one  
adjacent lower left abdomen

# WRIST CASE



Link to the video -[https://drive.google.com/file/d/1KiChZso93ZZ4fAAvzvlSeapeoBzS6E5/view?  
usp=sharing](https://drive.google.com/file/d/1KiChZso93ZZ4fAAvzvlSeapeoBzS6E5/view?usp=sharing)

## AD8232 : ECG monitoring

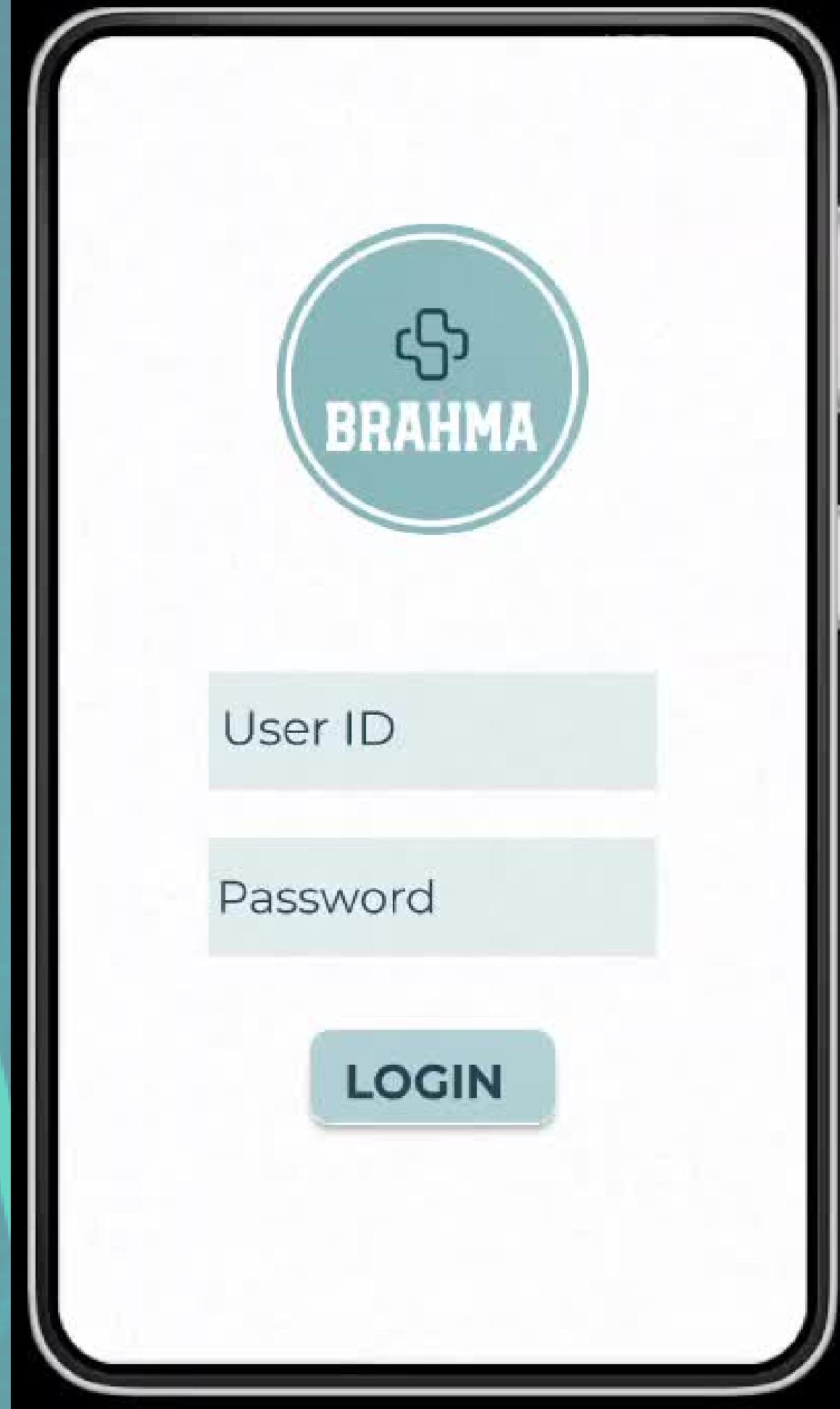


# LIVE DEMONSTRATION

1. [https://drive.google.com/file/d/11-wHksJ1C3C4qqiXTp3Rfv0iftKFbunk/view?  
usp=sharing](https://drive.google.com/file/d/11-wHksJ1C3C4qqiXTp3Rfv0iftKFbunk/view?usp=sharing)
2. [https://drive.google.com/file/d/1PZrXYMM1bVS4M2wBv7k9rqqwKyOvO4e/  
view?usp=sharing](https://drive.google.com/file/d/1PZrXYMM1bVS4M2wBv7k9rqqwKyOvO4e/view?usp=sharing)
3. [https://drive.google.com/file/d/1984eArwAdwkMm7MXP8XMQmNBrn4rr-  
z3/view?usp=sharing](https://drive.google.com/file/d/1984eArwAdwkMm7MXP8XMQmNBrn4rr-z3/view?usp=sharing)
4. [https://drive.google.com/file/d/13hkzqZZYrtB44WNpP8-  
Jjd3dlg3UNYez/view?usp=sharing](https://drive.google.com/file/d/13hkzqZZYrtB44WNpP8-Jjd3dlg3UNYez/view?usp=sharing)



**SOFTWARE**



Link to the video of software UI-<https://drive.google.com/file/d/1vbCkXblIx-OXPsRHJ8OsEGIsTTMVeHaC/view?usp=sharing>

# RISK SCORE CALCULATION

Using the data sent by the sensors, a **risk score** is calculated to quantitatively estimate the health condition of a patient. This can be viewed by the medical staff on the app. If the score is high, then the doctor is alerted.

RISK SCORES	3	2	1	0	1	2	3	TOTAL SCORE	STATUS
SpO2	<91	92-93	94-95	>96				0-3	Normal
BP	<70	71-80	81-100	101-199		>200		0-3	Normal
HR		<40	41-50	51-100	101-110	111-129	>130	4	At Risk
RR		<9		9-14	15-20	21-29	>30	>4	Alert
Temp		<35		35-35.4		>38.5			

# FEATURES

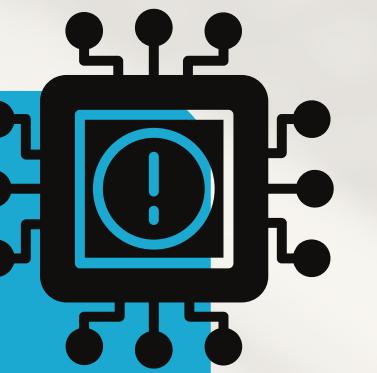


**FAILPROOFS  
EARLY WARNING  
DATA PRIVACY AND SECURITY**



**FAILPROOFS**

## Sensor Malfunction



Machine Learning can be used to detect and flag data abnormalities due to sensor malfunction. Alerts will also be shown on the device and the mobile application.

## Network Issues

On loss of internet connectivity, the data will be stored on the local database on the device and will be uploaded to the remote database as soon as the internet is restored.

## Battery Warning

A LiPo battery acts as backup in case of a power cut. In extreme cases, the battery might drain out, then a warning will be generated, which will be sent to the mobile application.

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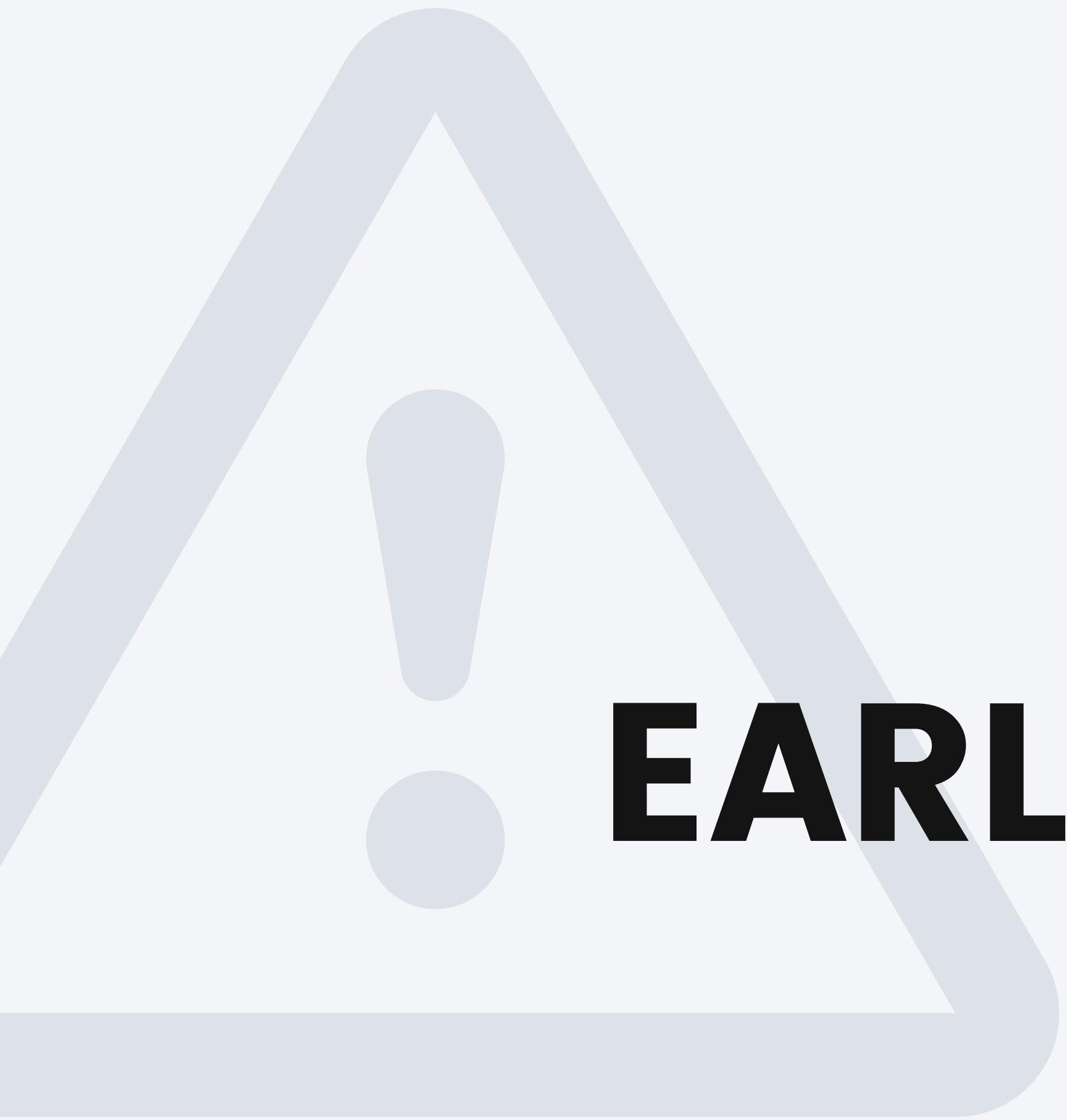


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# **EARLY WARNING**

# EARLY WARNING

## Patient Vitals

Patient Vitals data  
are collected from  
the sensors



## Risk Score

The probable risk score after a  
certain time will be calculated using  
DEWS architecture

## Database

Data of patient's  
vitals in the past  
are being stored

## Patient's Condition

A comment is made on the  
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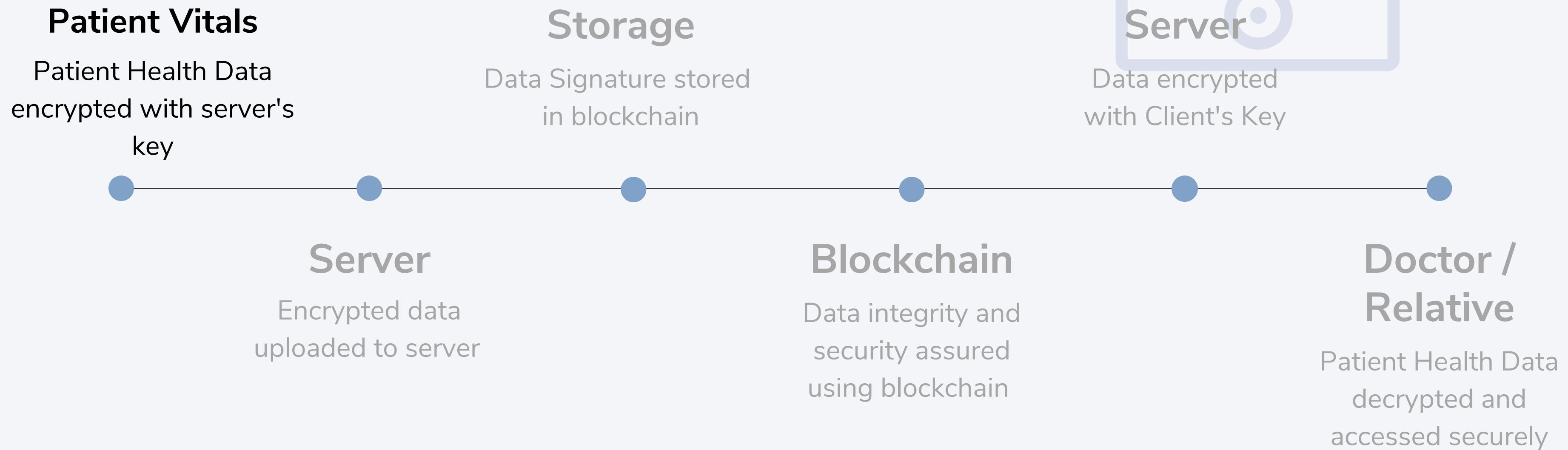
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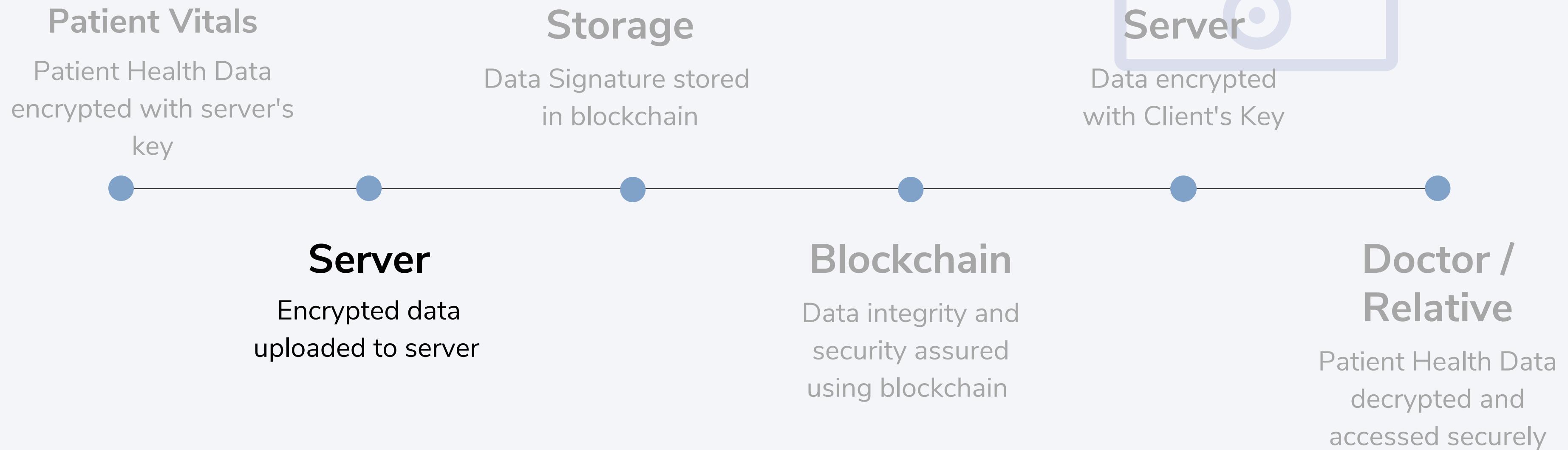


# **DATA PRIVACY & SECURITY**

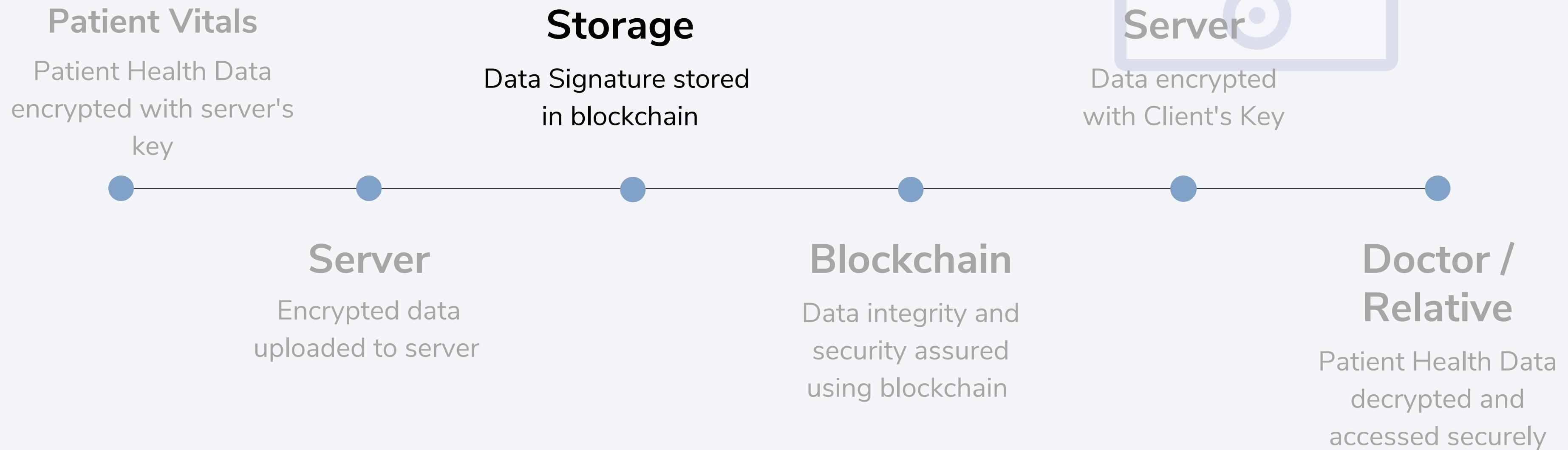
# END TO END ENCRYPTION



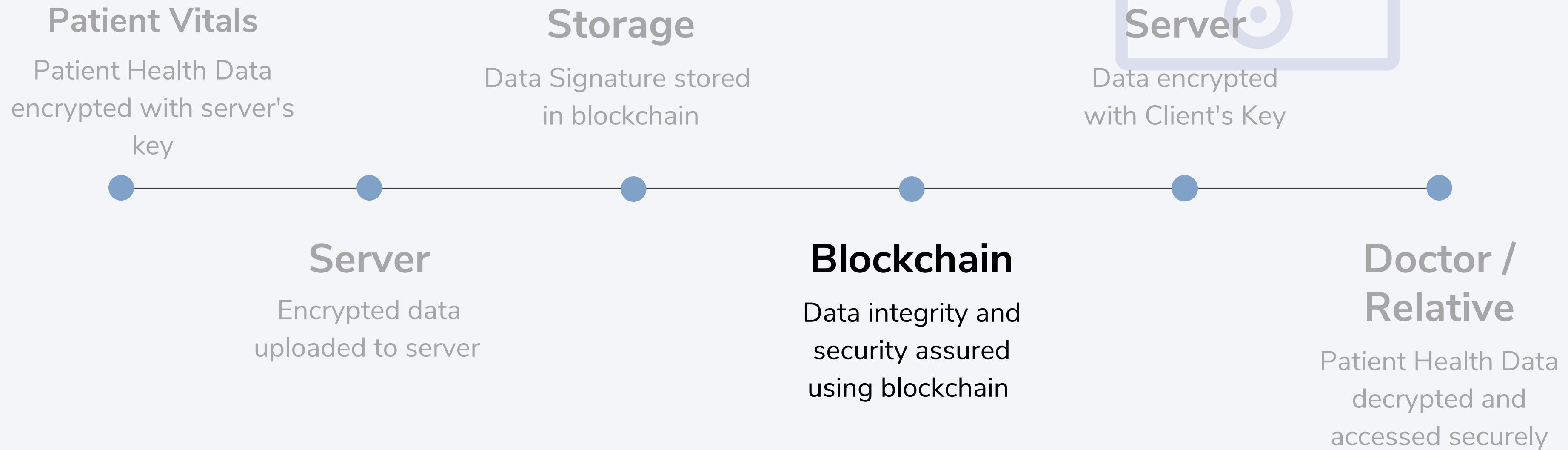
# END TO END ENCRYPTION



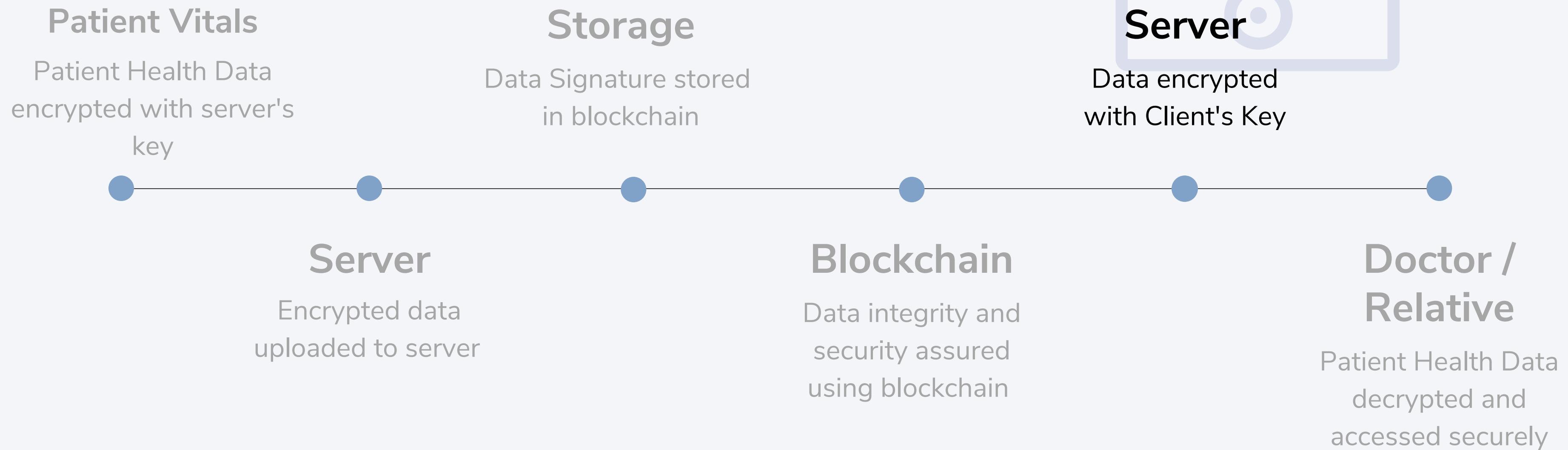
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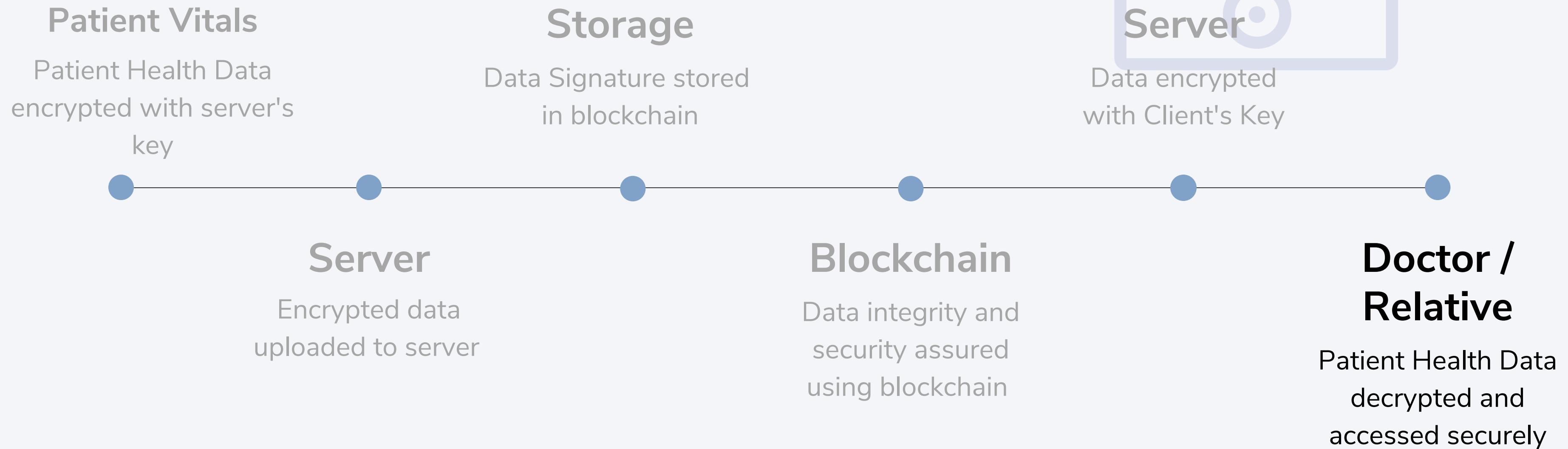
# END TO END ENCRYPTION



# END TO END ENCRYPTION



# END TO END ENCRYPTION



# Why choose **BRAHMA** ?

A major objective of a hospital is to provide good quality health-care system to its patients along with earning profit.

The utilities provided will help monitor vitals & predict deterioration of patient's condition & provide details to doctors on a easy-to-use user friendly app.



Patients and their families will also prefer hospitals which advertise continuous monitoring, and so this will also increase the profit of hospitals.

Liabilities and deaths in Hospitals due to human negligence and improper monitoring will be greatly reduced.



# **BUSINESS PLAN**

# BUSINESS PLAN

We'll offer our product to the customers on a **Fee-for-service** basis

Our Customers :  
**Hospitals,  
Clinics**

Key Partnerships :  
**Multi-specialty Hospital chains,**  
**Government ABHA plan**

# COST ANALYSIS

₹2875

Prototype Cost

₹2000

Estimated Manufacturing Cost

₹2.58

Cloud Service Subscription  
(per device per month)

PART	PRICE (in rupees)
MAX32664D+ IC	₹ 310
MAX30102	₹ 100
ECG Module - AD8232	₹ 549
ECG Electrodes	₹ 30
Temperature sensor - SI7051	₹ 533
Flex Sensor	₹ 200
Buzzer	₹ 69
ESP32 WiFi Module	₹ 100
Arduino Nano	₹ 385
2-cell Li-Po Battery	₹ 99
Manufacturing Cost	₹ 500
TOTAL	₹2875

# REVENUE MODEL

₹2000

One Time Setup Fee

## Subscription Fees (per device)

Daily

₹5

Monthly

₹90

Annual

₹900

₹50

Patient registration fee

# STAKEHOLDERS

01

## Hospitals

Liabilities and death due to human negligence and improper monitoring will be reduced.

02

## Nursing Staffs

No longer require to check on all patient frequently

03

## Patients & their Families

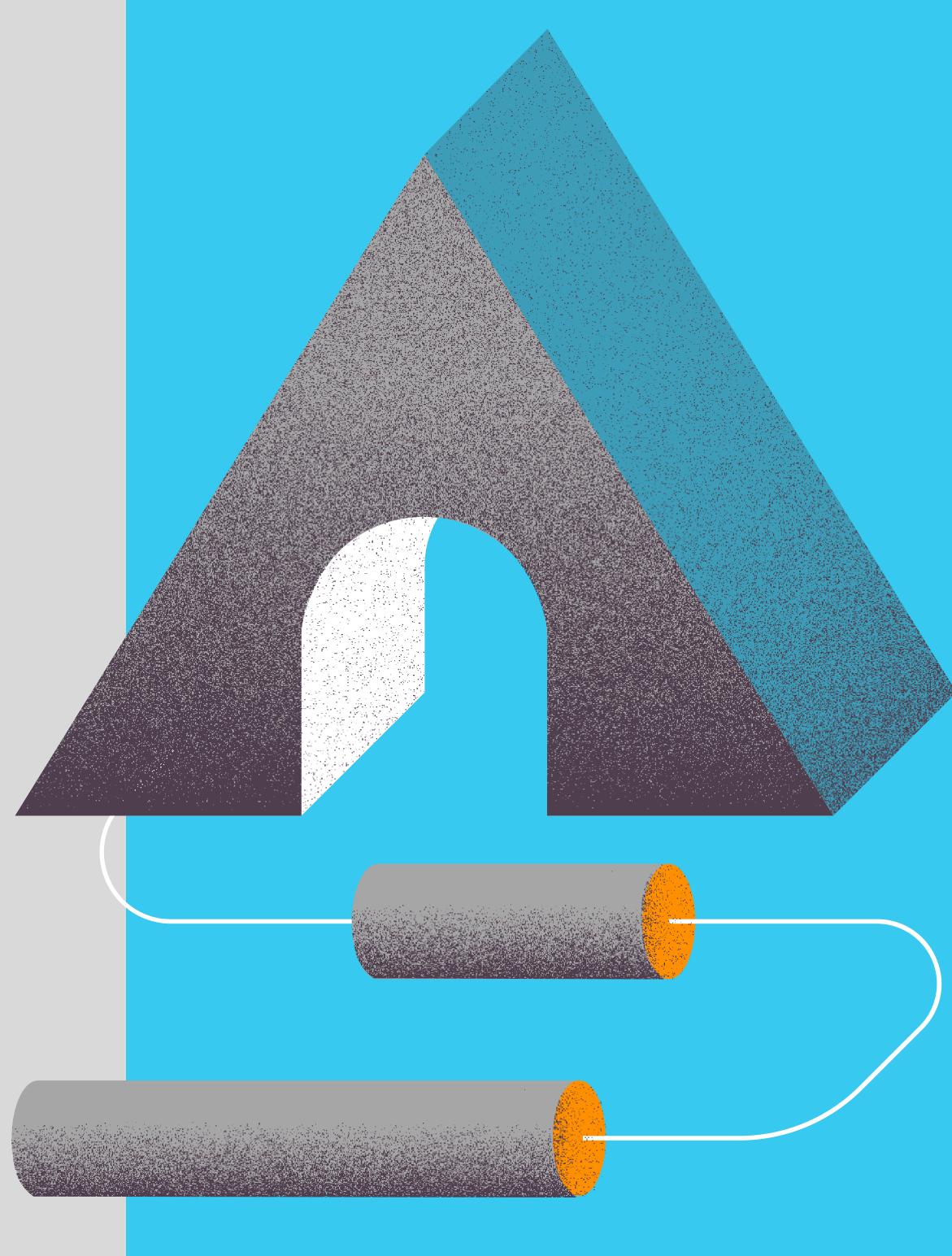
Patient's health will be monitored and discussed with their families on regular basis

04

## Remote Patients

Patient's at home can rest assured that their vitals are being monitored continuously

# Marketing Strategy



01

## Health camps

Conduct health camps targeting doctors and medical professional to increase awareness

02

## Healthcare Innovation Expos

Showcase **BRAHMA** in healthcare innovation symposium and expos to increase reach and scalability

03

## Hospital Visits

Demonstrate effectiveness in constant patient's care and reducing staff workload to encourage investment.

04

## Advertisement via Partner Hospitals

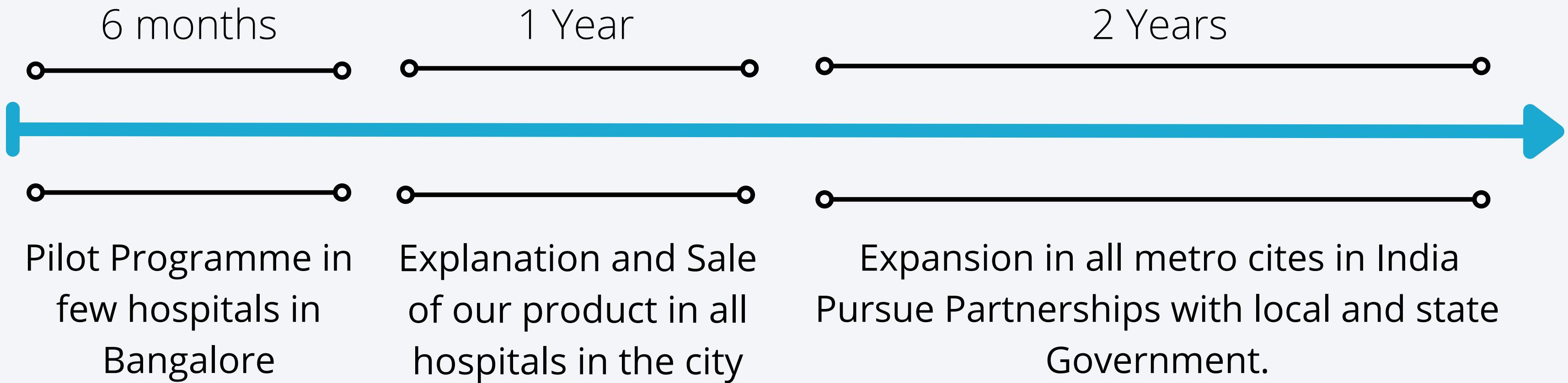
Advertisements via Hospitals availing our services as they can now advertise continuous monitoring of the patients



# Key Targets

- Reach Profitability by end of First Year
- Recover Initial Investment by the end of the second year and achieve a positive balance sheet.
- Expand reach in all Metro Cities.
- Set Deals in place with Local Governments for use of our product in Government Hospitals.

# BUSINESS TIMELINE



# FINANCIAL TARGETS

## Year 1

Sales Target :

- Number of Units sold: 5,000
- Revenue:  $(₹2,000 + 6 * ₹90) \times 5,000 = ₹127 \text{ lacs}$

Costs :

- Manufacturing Costs:  $₹2000 \times 5,000 \text{ units} = ₹100 \text{ lacs}$
- Marketing and Sales Costs: ₹` 10 lacs
- Technical Support Costs: ₹` 15 lacs

Investments:

- Research and Development Costs: ₹` 70 lacs

# FINANCIAL TARGETS

## Year 2

### Sales Target :

- Number of Units sold: 50,000
- Revenue:  $(₹2,000 + ₹900) \times 50,000 = ₹14.5 \text{ Cr}$

### Costs :

- Manufacturing Costs:  $₹2000 \times 50,000 \text{ units} = ₹10 \text{ Cr}$
- Marketing and Sales Costs: ₹` 1 Cr
- Technical Support Costs: ₹` 1 Cr



# USER JOURNEY

## Targeted Customer Segments

Our targeted customer segments consist of :

- Multispeciality hospital chains
- Health centres



## Delivery Channels

Our primary delivery channel comprises the sales agents who will reach out to the hospitals and the clinics.

## User acquisition & retention

We will ensure the customer base retentivity by providing various perks along with the subscription, like complimentary training of nurses .

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# Success Metrics

1

## Number of subscriptions and products sold

Get an idea about the influence and the spread of the products.

2

## Ratio of subscription renewals to total products sold

Direct measure of customer retention and patient trust in our product.

3

## Ratio of products sold to total number of beds occupied in general ward of each hospital

Higher the ratio, higher the hospital dependency on our product, which is a measure of hospital trust.





# **SOCIAL IMPACT**

## Improved working condition for medical staff

BRAHMA will reduce the workload of nurses and related hospital staff allowing them to work more efficiently and provide better care.



## Patients at home are as safe as those in hospital

Patients who are admitted at home can be assured that their vitals are constantly monitored. It will also help in spreading medical aid to remote places.

## Sense of safety among the patient's family

The health of patients will be constantly monitored and will also be shared with their family members. It prevents any delay in sensing the sudden deterioration of patient's health

## Saving lives in rural areas

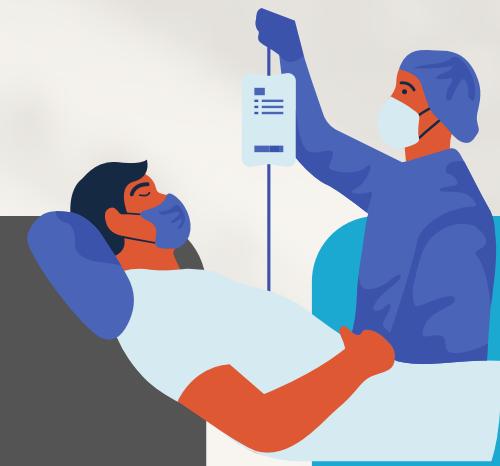
In rural areas in India, where there are only 16613 PHCs there is huge need of devices like BRAHMA, which can continuously monitor patient's vitals and can save their lives by sending warning message to doctors in hospitals.

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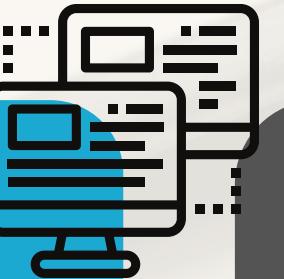
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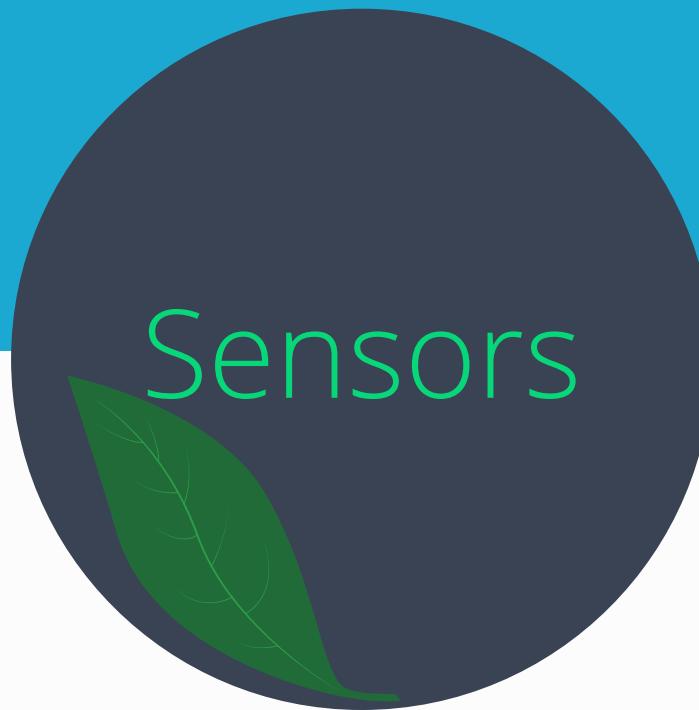
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# Environmental Considerations



The materials used for making all these parts are primarily eco-friendly and positively impact the environment. Most of them are non-hazardous and can be easily recycled. Few components like wrist-wrap and finger wraps can be reused in new devices.

# POTENTIAL COMPETITORS



# UNIQUENESS



# BRAHMA

Biometric Rapid Automatic Health Monitoring Assistant

# UNIQUENESS



# BRAHMA

Biometric Rapid Automatic Health Monitoring Assistant

# UNIQUENESS



# BRAHMA

Biometric Rapid Automatic Health Monitoring Assistant

Early vital analysis

Improved Ease of Use

Early Warning Systems tuned for specific diseases

Addition of other monitoring devices for specific cases like continuous glucose monitoring, maternity care monitoring etc.

# FUTURE PROSPECTS





**THANK YOU**