

**Project title:** CareWave - Revolutionizing Post-Operative Patient Care with Arm-Wearable Technology

**Short description:** CareWave - Revolutionizing Post-Op Care with Wearable Tech. Continuous monitoring of vital signs for early infection detection. Specifically designed for high-risk post-op patients. Empowers healthcare professionals with real-time data and instant notifications.

**Team:** Matrix Medics

**Project Number:** 17

**Team Members (3):**

- Mustafa Al Yagoub
- Dr. Fares Saad
- Ashwaq Al Otaibi



Welcome to the world of CareWave, an innovative solution developed by Matrix Medics, revolutionizing post-operative patient care through advanced wearable technology. With a focus on early infection detection, CareWave introduces a new era of monitoring patient health and well-being, specifically designed for high-risk post-operative patients, such as those undergoing heart or orthopedic surgeries. By seamlessly integrating cutting-edge sensors and algorithms, CareWave empowers healthcare professionals to monitor vital signs, including temperature, for early indications of infections in a non-invasive and continuous manner.

### **What was the inspiration behind the idea of CareWave?**

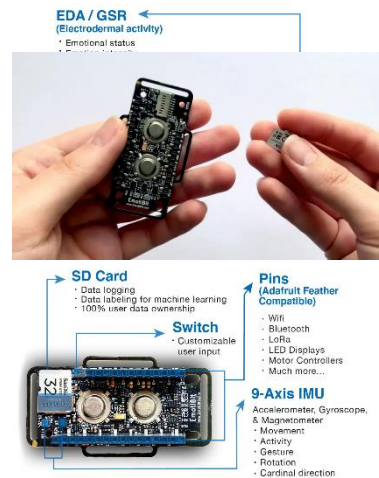
After a surgical procedure, patients are carefully monitored for possible infections for a period of 30 days. However, in situations where high-risk procedures such as implants have been performed, the time frame for monitoring may be extended up to 90 days. To ensure optimal health management, it is recommended that patients be discharged promptly, despite the lengthy healing process. This will allow them to move away from our monitoring and surveillance tools. If an individual contracts an infection following a surgical procedure, they may defer seeking medical attention because they may not recognize the symptoms until they are severe. This delay can result in a higher likelihood of complications, mortality, and hospital readmission, all of which translate to a longer hospital stay and higher treatment expenses. The National Health Safety Network has reported that Surgical Site Infection (SSI) is the most expensive type of Healthcare-Associated Infection (HAI) in the US, costing approximately \$3.3 billion per year. This infection is also responsible for prolonging hospital stays by almost 10 days, leading to an increase in hospitalization costs of more than \$20,000 per admission. A study on risk of infection following elective cardiac surgeries was conducted and published in 2022 (PMID: 33882295), findings show that out of the 444,165 patients who underwent the procedure, 8% developed an infection due to the operation. This led to an increased mortality rate with an odds ratio of 4.02 (95% confidence interval [CI], 3.67 to 4.40), non-home discharge with an odds ratio of 3.48 (95% CI, 3.21 to 3.78), and an average cost increase of \$23,000 (95%



CI, \$20,900 to \$25,200). After 90 days of operation, a higher risk of being readmitted (1.29; 95% CI, 1.24 to 1.35) was observed in cases where there was an infection after the surgery. The author arrived at the insight that there is still a significant occurrence of post-surgery infections related to heart operations. These infections have a negative impact on the results of the surgery and lead to increased use of resources. Interhospital variation in this contemporary cohort emphasizes the continued necessity for structured methods in their prevention and Management.

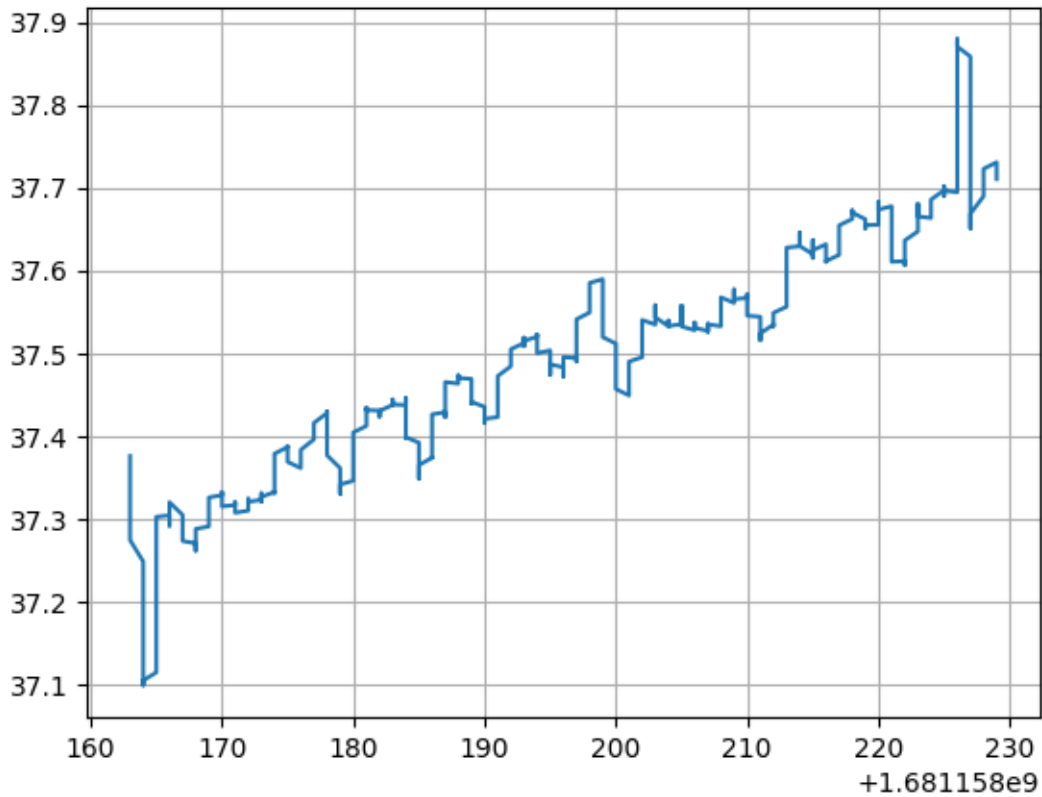
### More to know about Matrix Medics!

At Matrix Medics, our dedicated team of researchers, engineers, and healthcare experts have collaborated tirelessly to develop CareWave, an arm wearable device, as a groundbreaking solution tailored to the needs of high-risk post-operative patients. The device integrates advanced technology into everyday accessories, revolutionizing patient monitoring and empowering patients to recover comfortably. CareWave continuously tracks temperature and vital signs, providing real-time and accurate data to healthcare professionals for prompt intervention and appropriate treatments. When a patient's temperature exceeds 38 degrees Celsius, CareWave triggers an SMS alert system to notify the hospital representative team and the patient or their relative, facilitating early medical advice and reducing complications mortality and readmissions as well as reducing loss or resources. This comprehensive solution enhances patient safety, improves healthcare efficiency, and enables early interventions. CareWave represents a paradigm shift in post-operative patient care, aiming to swiftly identify infections, provide targeted treatments, and expedite recovery. Patient confidentiality is upheld through the use of SD memory cards, storing data within the device rather than on a cloud-based system. Matrix Medics is dedicated to improving patient outcomes and empowering healthcare professionals through advanced technology and expertise.



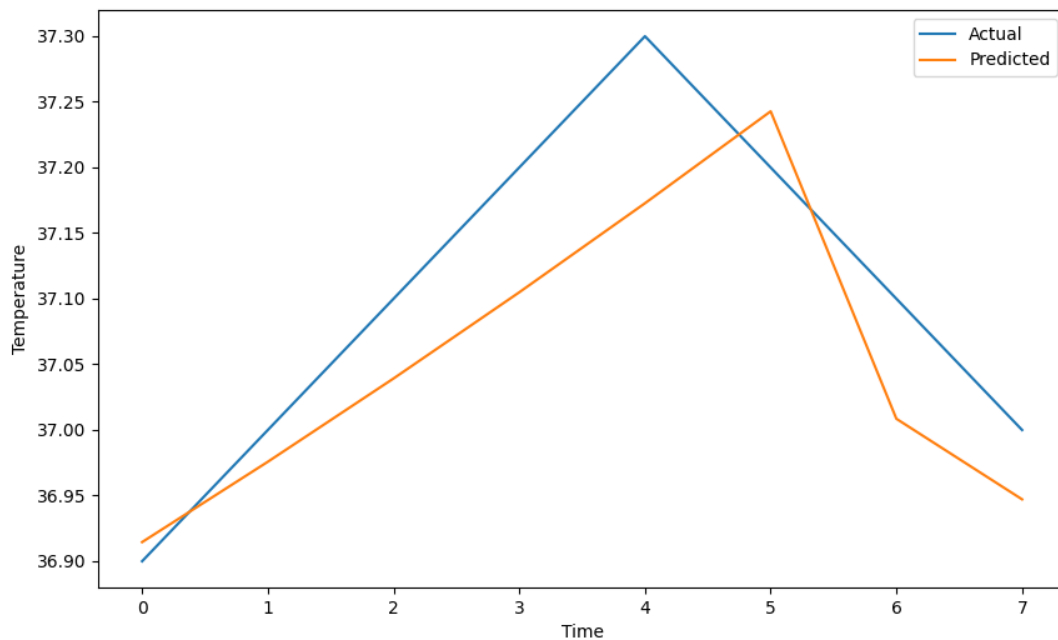
### AI Aspect of CareWave - Your Ultimate AI-Powered Healthcare Companion

Experience the future of healthcare with CareWave, a state-of-the-art system built on cutting-edge sequence-to-sequence transformer models. Our revolutionary technology empowers you to streamline patient care, enhance communication, and revolutionize medical decision-making.



With CareWave, tedious and time-consuming tasks become a breeze. Our intelligent AI system can effortlessly read and summarize medical reports, saving you precious time and energy. Gone are the days of pouring over lengthy documents – CareWave delivers concise, accurate summaries at your fingertips.

But CareWave isn't just about reading and summarizing data; it's your vigilant partner in patient care. Through advanced biometric pattern recognition, our system can identify and predict abnormalities, ensuring early detection of potential health issues.



Real-time monitoring keeps you informed every step of the way, enabling proactive interventions to optimize patient outcomes.

CareWave boasts two powerful agents working in harmony to support your healthcare journey. DoctorPro, your trusted ally, tracks and analyzes patient biometric parameters, flagging any signs of inflammation or abnormalities. In the event of an early sign of inflammation,

DoctorPro promptly alerts the hospital, equipping caregivers with the information they need for immediate action. Our system's accuracy means you can trust the alerts, differentiating between true alarms and false alarms with ease.

# ALerts

This Sections List All The Notifications And Alerts Related To Patients



Urgent Action Required: Immediate Attention for Patient's with ID Well-being.



Infection Alert: Detecting Potential Risk, Ensuring Patient Safety.



Patient's Well-being Confirmed: Reassurance of a Healthy Status.

## 1. Urgent Action Required: Immediate Attention for Patient's Well-being

When it comes to patient care, every second counts. Our alert system urges you to take swift action to ensure the well-being of your patients. In this critical scenario, it is crucial to act promptly and decisively.

The alarm bells are ringing because there is a possibility of infection. The patient's health may be at risk, and it is vital to intervene without delay. By responding urgently, you can provide the necessary care and prevent further complications.

Remember, time is of the essence. By taking immediate action, you can ensure the safety and well-being of the patient. Your prompt response can make all the difference in their recovery journey.

## 2. Infection Alert: Detecting Potential Risk, Ensuring Patient Safety

Your patient's safety is our utmost priority. Our sophisticated alert system has identified a potential risk of infection that requires your attention. By staying vigilant and responding promptly, you can safeguard the well-being of your patients.

Infection prevention is paramount, and early detection is key. This alert serves as a warning to take precautionary measures and initiate appropriate treatments. By acting swiftly, you can minimize the impact on the patient's health and facilitate a faster recovery.

Remember, your proactive response is essential in protecting your patient from further harm. Together, let's ensure a safe and healthy environment for everyone under your care

## 3. Patient's Well-being Confirmed: Reassurance of a Healthy Status

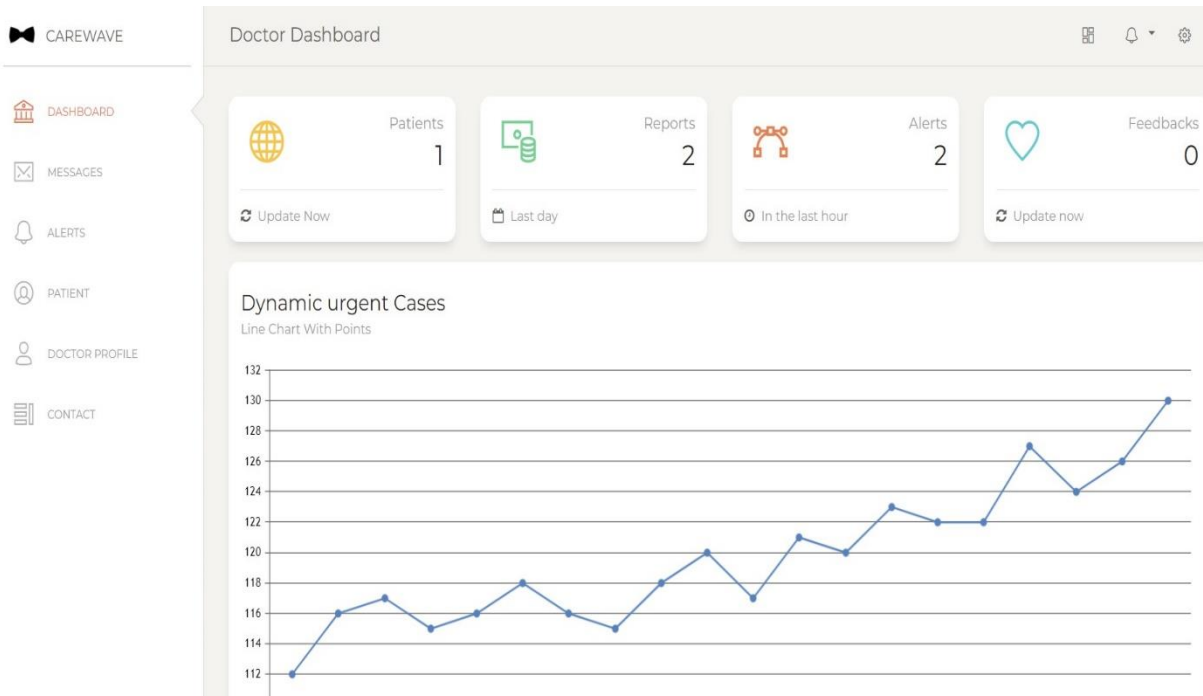
Rejoice! Our alert system brings you fantastic news – the patient is in a stable and healthy condition. Rest assured, their well-being has been confirmed, allowing you to breathe a sigh of relief.

With this reassuring update, you can have peace of mind knowing that the patient is on a positive recovery path. Your diligent care and attention have contributed to their improved health and overall well-being.

Let this be a testament to your commitment and expertise in providing exceptional patient care. Continue your outstanding efforts in delivering top-notch healthcare, ensuring that each patient receives the attention they deserve. Congratulations on the successful management of the patient's health, and may this inspire you to strive for continued excellence in your noble profession.

#### Regenerate response

- NursePro, your dependable assistant, takes care of administrative tasks and patient interaction. It effortlessly reads and provides real-time summaries of medical reports, allowing for efficient decision-making. NursePro engages in conversations with patients, answering their questions and providing essential reminders for medication adherence. Furthermore, it keeps a watchful eye on patients' bracelet usage and generates daily reports to record patient status. Seamless communication with doctors ensures a collaborative approach to care, making CareWave the ultimate bridge between medical professionals.
- CareWave's real-time monitoring dashboard empowers hospitals to stay on top of patient care effortlessly. Dynamic urgent case notifications keep you informed of critical situations requiring immediate attention. The dashboard provides an overview of the number of patients in need of care and those receiving it, offering vital insights for resource allocation. Patient profiles with concise status descriptions are just a click away, providing comprehensive information at a glance. As alerts flood in from the system, you can trust CareWave to deliver accurate and timely updates.



With CareWave, doctors have unparalleled access to patient information. The system enables seamless communication, allowing doctors to inquire about specific cases. By retrieving and summarizing recorded medical reports, CareWave ensures doctors stay up-to-date and well-informed, empowering them to make the best decisions for their patients. And for patients in need, CareWave starts a conversation, providing valuable assistance and feedback for a more personalized healthcare experience.



**Dr. Abdullah Al-Harbi**

30 min ago

Good morning NursePro! I have a patient, Mr. Johnson with an ID 2392. Could you please ask him about his vital signs and gather some information about his symptoms during the last two week?



**NursePro**

30 min ago

Good morning, Doctor. Sure, I'll talk to Mr. Johnson right away. I'll summarize his temperature, blood pressure, pulse, and respiratory rate. I'll also ask him about the duration and severity of his symptoms and inform you.



**Abdullah Al-Harbi**

30 min ago

Thank you, Nurse. Additionally, please inquire if Mr. Johnson has any underlying medical conditions or if he has been in contact with someone who tested positive for COVID-19. It's important to assess his risk factors.



CareWave features SurgicalPro, a comprehensive agent that supports your healthcare journey.

- SurgicalPro tracks and analyzes patient biometric parameters, continuously monitoring for signs of inflammation or abnormalities. If an early sign of inflammation is detected, SurgicalPro promptly alerts the hospital, patients and their legal guardian, equipping the medical team with the necessary information for immediate action. Rest assured, SurgicalPro's accuracy ensures reliable alerts by distinguishing between true alarms and false alarms effortlessly.

### **Future of CareWare**

Our plan is to incorporate several features into the device's structure. These features will include the addition of Near-Field Communication (NFC), GPS functionality, Accelerometers, as well as a voice recorder. The purpose is to expand the range of situations in which the device can be used.

The identification of infection and epidemic can be accomplished by analyzing various indicators such as vital signs, NFC technology, and voice recording. The CareWave is designed to be worn by both healthcare providers and patients in long-term care facilities and can detect the early signs of infection. The device transmits its findings to a hospital dashboard, which uses color-coded alerts to identify the affected area based on hospital drawing. Additionally, near-field communication (NFC) technology can be utilized to track individuals who have been in contact with the infected person during their contagious period.



The voice recording device will feature a generative AI algorithm that is designed to recognize cough patterns and determine whether they may be indicative of a respiratory illness, such as COVID-19. This will result in more effective measures to prevent the transmission of illnesses.

Continuing on the previous idea, it has the ability to identify stress and emotions, providing the management with an advantage to develop initiatives that can positively impact the mental state and enhance satisfaction for both patients and employees.

The identification of patient falls is crucial in achieving the sixth international patient safety objective. It is vital because patients can fall unattended at any moment, and they may be unable to request assistance, resulting in a delay in receiving medical care. Additionally, the device can recognize fall incidents earlier by detecting variation in vital signs such as pulse rate, oxygen saturation, and respiratory rate and aim to prevent them.

Patients who suffer from Alzheimer's or dementia can benefit from using GPS and NFC technology to locate them, whether they are inside or outside of the hospital.

MedicalPro, your dependable assistant, takes care of administrative tasks and patient interaction. It effortlessly reads and provides real-time summaries of medical reports, allowing for efficient decision-making. MedicalPro engages in conversations with patients, answering their questions and providing essential reminders for medication adherence. Furthermore, it keeps a watchful eye on patients' bracelet usage and generates daily reports to record patient status. Seamless communication with doctors ensures a collaborative approach to care, making CareWave the ultimate bridge between medical professionals.

Finally, CareWave offers a range of features that streamline medical record-keeping and enhance patient care. The tool is integrated with a voice recognition system, similar to Hi Alexa or OK Google, allowing staff to dictate patient notes directly from the patient's room. These notes are stored in a healthcare information system for later review and submission.

The real-time monitoring dashboard of CareWave keeps hospitals informed and in control. Urgent case notifications ensure prompt attention to critical situations, while the dashboard provides an overview of patient care needs and resource allocation. Patient profiles offer concise status descriptions, providing comprehensive information at a glance. CareWave delivers accurate and timely updates through its alert system.

Doctors benefit from CareWave's seamless communication and access to patient information. They can inquire about specific cases and retrieve summarized medical reports, enabling them to stay well-informed and make informed decisions. CareWave also engages in conversations with patients, providing personalized assistance and feedback for a tailored healthcare experience.

Welcome to the future of healthcare. Welcome to CareWave – your ultimate AI-powered healthcare companion, driving efficiency, improving outcomes, and transforming the way you care for your patients.