

Meddy Beddy's Smart Bandage

We Keep Watch. You Heal

Innovation Plan

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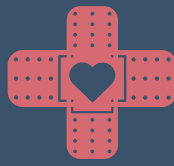
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I.

EXECUTIVE SUMMARY



Company Overview

Meddy Beddy's smart bandage seeks to improve wound healing and infection control. Using a microchip, sensors, and pH readings, the smart bandage helps identify wound infections much easier, allowing for more personalized and effective treatment.



Problem

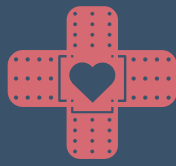
As wound healing is an extremely complex process where inflammation, proliferation, and remodeling occur, the potential for complications is extremely prominent. Complications can lead to infections, delayed healing, excessive scarring, and chronic

inflammation. These factors lead to discomfort, expensive medical treatment, and a higher volume of individuals seeking serious medical attention.

1. Risk of infection in a hospital setting: After receiving a significant surgery, it is not uncommon for patients to develop surgical site infections. Because these sites are often covered with traditional bandages, they are often not identified until the infection has become serious, extending patients' stays in the hospital by **up to 11 days**. The smart bandage will help reduce the length of these stays, bringing the cost of these stays down with it.

2. High cost of chronic wound care: Nearly **1 in 5 people** in the United States find themselves regularly visiting doctors and relying on prescription medications due to chronic wounds. These wounds commonly affect patients with diabetes and venous disease, adding an additional financial burden for individuals already grappling with the costs of their respective conditions. The smart bandage can help better manage these wounds, mitigating the costs associated with treating them.

3. Limitations of traditional bandages: There is currently no product on the market that allows one to track the status of their wound healing. Patients are left guessing if their wound is healing properly based on visual cues and pain levels. Using biofeedback sensors, the smart bandage monitors key metrics such as the pH of blood, temperature, and cell metabolism. Monitoring these metrics can ensure healing is occurring properly, and the proper adjustments to the healing process can be made.



Customer Segments

As the wound care market is one that will continue to persist across populations, the smart bandage can expand into numerous healthcare and consumer sectors. The smart bandage does not target those of a specific gender, ethnicity, or income level. The primary market of the smart bandage consists of hospital patients going through post-surgical recovery. The secondary market of smart bandages is patients in nursing homes. The tertiary market is patients among the general population.



Unique Value

Wound recovery is extremely essential for people's overall health and quality of life. The smart bandage is designed to enhance the precision and effectiveness of wound infection testing. These bandages can provide a patient a more personalized treatment, leading to better patient outcomes. The smart bandage provides patients numerous advantages by allowing them to see their blood composition readings in real time.

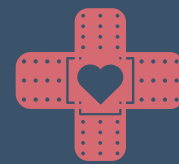
Solutions

The smart bandage has cutting edge technology that allows the detection of infections to be easier than ever before. Using advanced technology, and data metrics such as a sensor array, pH strip, and thermal detectors, the Meddy Teddy's Smart Bandage can help increase people's overall health. By utilizing many capabilities such as artificial intelligence integration and smartphone connectivity, the smart bandage stays with the technological times.



II.

PROBLEM



Wound healing is a complex biological process that can often go wrong, causing chronic, stalled, or infected wounds. This impedes recovery and costs patients and healthcare systems billions of dollars each year. Conventional gauze and bandages provide basic protection but no insight into healing progress. Currently, no products on the market offer real-time monitoring of wound status or interventions to optimize healing. Patients are often left guessing if their wound is healing normally or requires medical attention based on periodic visual checks by removing and reapplying bandages. This strenuous process is inefficient and inaccurate in checking for infections.

Increased Risk of Infection in Hospital

Setting:

Studies have shown that **1-3% of patients** who undergo major surgeries, such as hip replacements, end up developing a Surgical Site Infection (SSI) (John Hopkins Medicine, 2024). If left untreated, SSIs can progress to systemic infections or septicemia, leading to **7-11 extra days in the hospital** on average and even **death in 3% of cases** (CDC, 2024). The **risk tends to be higher for surgeries over 2 hours**, elderly patients, those who are overweight or have compromised immune systems, diabetics, and smokers. After surgery, signs of a SSI may include **increased skin redness, warmth, and purulent drainage around the wound**. However, with the wound covered by a bandage post-surgery, potential visual signs are obscured. A new "smart bandage" technology aims to detect SSIs earlier by continuously monitoring wound pH levels, an indicator of infection. By early detection of biometric changes, the smart bandages may **help prevent many SSIs from advancing to septicemia or death**. The smart bandage providing continuous pH monitoring could become an important tool for surgical infection prevention and prompt treatment. In addition, the smart bandage technology has the potential to help patients save on costly medical bills by reducing extended hospital stays that result from severe SSIs.

Limitations of traditional bandages:

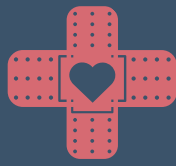
One drawback of conventional bandages is that they don't provide any information about the status of the underlying wound as it heals. Patients may not know if their wound is progressing well or has stalled/ been infected without visual inspection during bandage changes. Smart bandages with biofeedback sensors could help address this issue by **monitoring key biomarkers** like **temperature, pH, and cell metabolism**. The bandages transmit this physiological data to patients and medical teams to identify any perturbations in normal healing. For example, a **temperature spike may indicate infection**, while **reduced cell activity could signify tissue death**. With this information, steps can be taken to **correct the healing trajectory**, like adjusting medication dosages and treatment. Furthermore, smart bandages employ **electrical stimulation to the wound** based on the biofeedback. Low levels of electrical current have been shown to **enhance the migration and proliferation of healing cells**. This could help get patients back on their feet faster and more efficiently, saving them not only thousands of dollars, but keeping them healthy.

High Costs of Chronic Wound Care:

Currently, chronic wounds affect **nearly 6.5 million people** in the United States alone. These are especially prevalent in the elderly and in patients with diabetes and venous disease (Järbrink, 2016). These wounds often stall at the inflammatory stage, **failing to form new tissue for months or years**. Patients require frequent check-ups, medications and dressings to prevent life-threatening infections. These wounds rack up **enormous costs**. It is estimated that caring for these wounds racks up nearly over **50 billion dollars annually**, and costing patients themselves **tens of thousands of dollars** (Fife, 2012) Approximately **30% of these untreated chronic wounds will result in amputations**, and 5 years post amputation, the **mortality rate is nearly 50%** (LoganSport Memorial Hospital, n.d). Amputations have a mean **cost of \$47,000 dollars**, putting patients at an even higher financial burden. By expediting wound closure earlier in treatment, the biofeedback smart bandages could help prevent many acute wounds from becoming chronic. The continuous sensing informs timely interventions to steer wounds away from the inflammatory phase "roadblock". Patients spend less time in treatment overall and avoid amputation risks and lost work wages. In turn, healthcare systems greatly cut back the runaway costs associated with chronic wound management. Reduced spending benefits patients and providers.



CUSTOMER SEGMENTS



The global market value for bandages is large and in continual growth. The total global bandage market was valued at around \$7.1 billion in 2022, and is projected to be valued at \$8.6 billion by 2026, making it one of the highest valued items in the medical sector (MarketsandMarkets, n.d.). Bandages serve their purpose of acting as a protecting barrier over cuts, scrapes, or burns. Even as medical technology advances, the need for the convenience of a bandage will not fade. The smart bandage provides the convenience of a bandage, while providing the user essential information about the status of their wound. Users of the smart bandage like being in control of their healing, and seeing their progress at every step. Every consumer is looking for the optimal healing process, which can be attained using the smart bandage. Because the need for bandages will never fade, the smart bandage has a large market to expand into.

Primary Market

Demographics: The smart bandage is aimed to be administered to patients undergoing post-surgery recovery. Its effectiveness remains consistent regardless of the patients' age, gender, ethnicity, or income level.

Geographics: Our goal is to initially deploy these bandages in hospitals through the United States, then expand into international markets.

Psychographics: The patients making the most intensive usage of the smart bandage will be those who are very health aware, data driven, and financially conscious, looking to shorten their hospital stay.

According to the CDC, on any given day, about 1 in 31 hospital patients has at least one infection contracted during their hospital stay (CDC, 2024). With prevalence rates this high, hospitals would greatly benefit from employing smart bandages. Specifically, the Centers for Medicare & Medicaid Services (CMS) requires hospitals to report surgical site infections (SSIs) following major procedures such as hip/knee replacements, cardiac surgeries, and more. CMS estimates roughly 157,500 SSIs occur annually in surgeries across hospitals in the United States, costing billions in added hospital days, readmission, and treatment. SSIs pose a major financial burden to hospitals via increased length of stay (average 7-11 extra days to treat these infections) in addition to significant patient mortality risk. The smart bandage offers hospitals continuous monitoring of wound pH and other markers to detect bio metric changes suggestive of infection onset very early. The technology facilitates more frequent analysis than periodic checks done by most hospitals. By identification at early stages, providers can efficiently prescribe antibiotics/drugs before infections escalate or progress. Thereby, hospitals can achieve far better SSI outcomes, fewer readmission, much shorter stays, and major cost savings.

Demographics: The application of the smart bandage extends to include application in nursing homes, among people aged 65 and up. As stated earlier, it is not aimed at a certain gender, income level, or ethnicity.

Geographics: Similar to the goal with hospitals, we aim to provide these in nursing homes across the United States, then expand into international care facilities.

Psychographics: The smart bandage is most beneficial for elderly patients who aspire to achieve a smooth recovery and maintain an active, youthful lifestyle. Elderly people often want to be active, fit, and spend time with their loved ones, but oftentimes due to complications in surgeries, or other injuries, this goal is unattainable.

Secondary Market

Elderly residents are much more likely to go through surgery. According to the National Health Institute, an SSI was associated with nearly a 4 fold increase in mortality. It has also been shown that the risk for developing an SSI also increases as age increases. By using smart bandages, it is easier to diagnose and look for signs of an SSI, and treat it earlier, which will help decrease the risk of death after surgery in elderly patients. Also, nursing homes are associated with higher instances of falls.

According to Nursing Home Abuse Center, about 1 in 10 falls result in serious injuries in nursing homes.

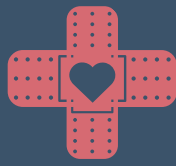
Tertiary Market

Demographics: The general population demographics for smart bandages include people of all ages and backgrounds. Users may range from individuals seeking advanced wound care solutions to those with very specific medical conditions. We aim to target the middle to low class as medical costs can be crippling for many.

Geographics: We aim to hone in on placing our product in urban and smaller suburban areas. We want to target inner cities and the areas on the borders of these.

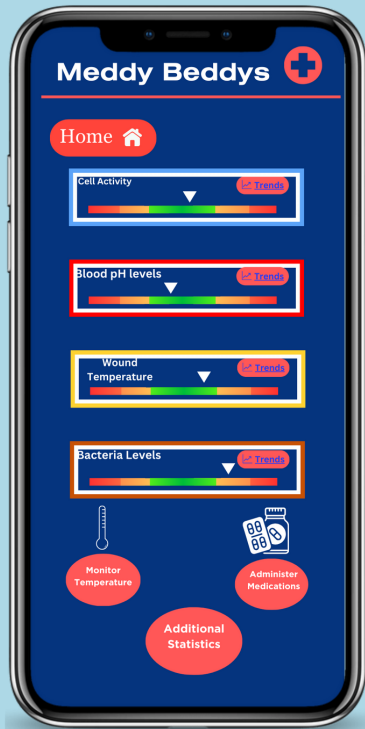
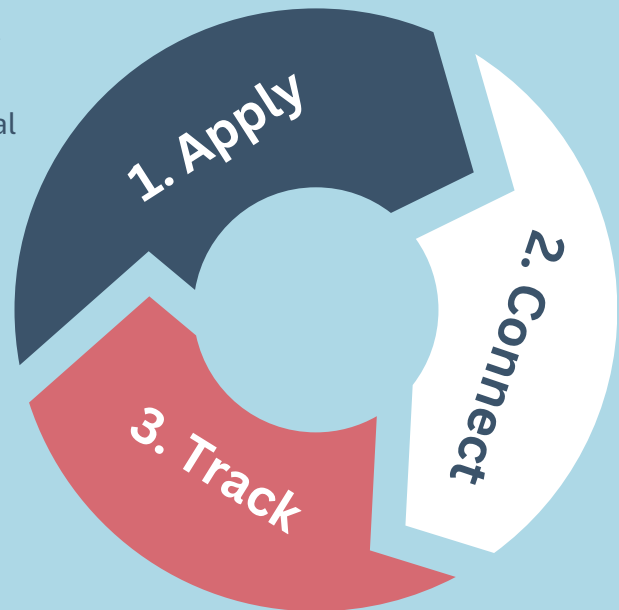
Psychographics: People buying these products will want effective wound healing, prevented complications, reduced doctor visits, and reduced medical costs. They will be willing to pay extra costs for products and services they feel ensures an increase in their health and safety.

IV. UNIQUE VALUE PROPOSITION

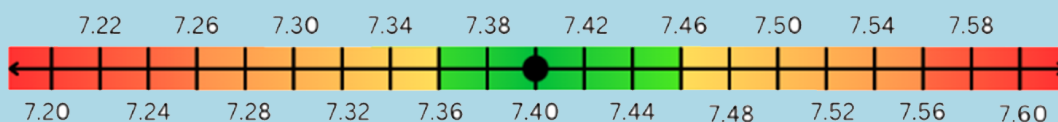


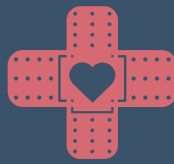
Smart bandages elevate care across populations through continually optimized wound recovery. Our company's bandages aim to increase the efficiency and accuracy of testing wounds for infections. This goal is evident in the mission of our company which is to provide patients with an opportunity to streamline recovery processes, reduce the costs associated with injuries, and accurately detect infections to allow for the proper treatments.

The smart bandage is as easy as apply, connect, and track. Apply the bandage to the wounded area. Place the gauze of the bandage directly over the wound, applying gentle pressure. Ensure the bandage is adhered properly, and then power on the bandage. Access bluetooth settings on your mobile device and view discoverable devices. Select the Meddy Beddy's device, and wait until your device confirms it is connected. Open your Meddy Beddy's app, and see all of your blood data in real time. If any of the tracked values are at concerning levels, contact your physician.

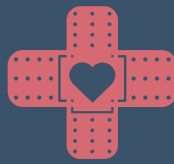


Smart bandages present a revolution in the medical field, and in wound care and recovery. These gadgets provide personalized healing environments tailored to every individual patients' needs. The smart bandage creates significantly better patient outcomes due to earlier and simplified wound infection detection. With real time infection detection, patients can have a wider variety of treatment options, less spread and transmission of the infection, and an increased quality of life. Unlike normal bandages that simply serve as a protective barrier over an injury, using biofeedback sensors, the smart bandage monitors numerous factors including pH levels, body temperature, cell activity, and bacteria levels allowing for signs of infection to be easily identified. Using Bluetooth connectivity with an embedded microchip, patients will be able to see all of their blood composition readings on their mobile phone in real time. This customization, and personal connection is one that is not received without a visit to the physician. These bandages allow for the status of the healing of the wound to be immediately available without needing to see a physician. Instead of simply relying on visual cues or waiting for noticeable symptoms, the smart bandage can ensure complications are reduced in patients' healing processes and can empower faster recovery. By detecting infections at initial formation, treatments become much simpler, and much less of a financial burden. Avoiding this delayed treatment reduces complications, pain, lost time, and risk of lasting effects.

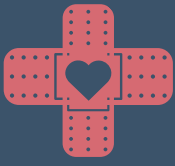




Feature	How the feature works	Decrease Risk of Infection in Hospital	Lower Cost of Chronic Wound Care	Dealing with Traditional Bandage Limitations
Sensor Array to Detect Cell Metabolism	Each bandage will contain a small sensor that touches up right against the wound site. This chip contains biochemical detectors that are designed to grab onto chemicals that cells release when they are working to heal the wound. The chemicals they are designed to detect are various cytokines, which control inflammatory responses, various enzymes such as matrix metalloproteinases (which are involved in tissue remodeling), and metabolites like nitrates and nitrites, which indicate oxygen consumption. All of these are indicators of cell proliferation.	✓		✓
pH Strip	When an infection develops in the bloodstream, bacteria multiplies and releases acidic byproducts that accumulate if not treated, causing an increase in pH. The smart bandage will have a built in microfabricated pH sensor strip layered underneath the adhesive wound material. This would be set up in a similar manner to pH litmus tests. As wound fluid is absorbed, it would come into contact with the sensor strip. The test, being designed for microfluidics, would only require a drop or two of fluid in order to work effectively. In order to differentiate the helpful bacteria from the harmful bacteria, the strip will have an array of sensors to identify the presence of harmful bacteria strains. Specific detectors recognize surface proteins commonly expressed by bacteria commonly found in SSIs such as <i>Staphylococcus aureus</i> and <i>Pseudomonas</i> . Using Bluetooth connectivity with the embedded microchip, one will be able to continually monitor the pH levels of their blood and harmful bacteria levels, ensuring infections are caught at their development.	✓	✓	✓
Advanced Thermal Control	Silicon thermoelectric modules will be used to heat and cool the site of the wound. Temperature sensors will provide feedback for precise thermal control to promote optimal healing temperatures based on the specific wound.	✓	✓	✓



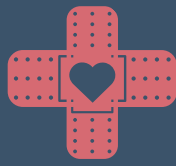
Feature	Description	Decrease Risk of Infection in Hospital	Lower Cost of Chronic Wound Care	Dealing with Traditional Bandage Limitations
Wound Microhaitat Sensors	As bacteria multiply in an infected wound, the immune system rushes in more blood flow to bring immune cells and antibodies to fight off the invasion. This surge in blood to the area causes inflammation and makes the skin red and hot. The immune reaction generates the heat signifying trouble. The smart bandage adhesive contains a ring of micro-sensors, which detect a rise in temperature. Catching the infection temperature rise quickly lets patients start antibiotics sooner before bacteria spreads further. The thermistors provide an early listening post for the first fever signals of infection stirring.	✓	✓	✓
Targeted Medication Delivery	Microfluidic channels are built into the top of the bandage so that personalized medications can be administered. The reason bandages wouldn't have standard medications is to account for the situation and sensitivity for the wound, along with the ability to take into account the allergies the patients have.		✓	✓
Smartphone connectivity	Through these smart bandages, both patients and doctors can utilize an app that shows the pH levels, temperature, and bacteria/cell levels. They can also view these trends over time to see progress, and to monitor if wound progress has stalled or declined. The app will send alerts as well if any signs of infection (such as an increase in temperature, pH, or bacteria levels or a decrease in cell activity/proliferation) are shown so that the wound can be monitored as soon as possible.		✓	✓
Electrical Stimulation Administrators	Studies have shown that the administration of a small electrical current promotes cell proliferation (division of cells) and increased simulation of growth factors (active molecules that affect the growth of cells). The integrated micro-stimulation grids can administer controlled low-level electrical currents that effectively elevate healing factors at the cellular level of a non-healing wound. Multiple research studies have demonstrated that by providing cycles of 80-250 $\mu\text{A}/\text{cm}^2$, key processes related to the healing cascade are positively influenced while also keeping the patient safe at the same time.			✓



Feature	How the features combat the problems
Sensor Array to Detect Cell Metabolism	The sensor array checks for problems with healing cells, letting hospitals start treatment quicker before infections spread. It also detects how well the wound is healing early and prevents wounds from becoming chronic, saving the patients hundreds of dollars. Lastly, this sensor array provides infection monitoring, which is not seen in traditional bandages
pH Strip	The pH strip can spot infections early by monitoring blood pH changes letting hospital staff start treatment before infections spread. The pH strip detects harmful bacteria early and prevents wounds from becoming chronic. Measuring these healing biomarkers is impossible using traditional bandages.
Advanced Thermal Control	Advanced thermal control allows wounds to heal faster through optimized temperature, preventing the wound from becoming chronic, saving patients hundreds of dollars. Although heating and cooling pads are available, this feature is not in any traditional bandages
Wound Microclimate Sensors	By monitoring temperature changes, hospital staff can be aware of abnormalities in healing. By detecting this change in temperature, the right steps can be taken to prevent the wound from becoming chronic. This temperature monitoring is unavailable in traditional bandages.
Targeted Medication Delivery	Wounds heal faster through efficient medication delivery, which can save patients lots of money. Medications can be delivered without needing the bandage to be removed and relying on visual cues.
Smartphone connectivity	The app shows all of the biometric data allowing doctors to assess the wound early on and monitor its progress, allowing for safer and faster healing. Through these alerts and constant monitoring of the wound, doctors will easily be able to see the underlying status of the wound without regular bandage changes.
Electrical Stimulation Administrators	By providing a current to give tiny boosts to elevate certain healing factors, the wound can heal faster. These stimulations are not in traditional bandages.

VI.

CONCLUSION

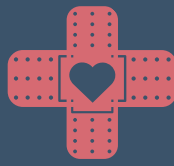


The accessibility and affordability of Meddy Beddy's will expand consumer bases and enable both clinical and at-home users to have quantitative understanding of their healing progression. The continuous feedback will allow early identification and resolution of complications, improving outcomes.

Meddy Beddy's has advantageous long-term viability, with replaceable modular components that extend product lifetimes while reducing environmental impact.

Meddy Beddy's is poised to set the new standard for smart wound care. We are confident its innovations will capture significant market share while also making high-tech, responsive healing solutions accessible to diverse patient populations. We request consideration for \$200,000 in financing to launch this wound care venture.

The Meddy Beddy's smart bandage is aimed to revolutionize the wound care market through its sensing, data analysis, and active treatment capabilities integrated into one intelligent bandage. With adhesive designs and wireless connectivity, this innovation will enhance wound healing by providing real-time status monitoring. The Meddy Beddy's smart bandage is the future of wound care.



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