Okussa Medical

Okussa Medical is a dedicated team striving to build a low cost respiratory rate monitor for use in paediatric units of low resource settings with the goal of improving patient care by alerting healthcare personnel of changes in respiratory rate.

Team members
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1. Executive Summary

The ultimate goal of our project is to develop a low cost device to improve the quality of care and respiratory rate monitoring of pediatric patients in low resource settings, particularly health care centers in Uganda and Kenya. Currently, no devices are accessible or have been implemented in these regions to monitor respiration. Due to the limited personnel, respiratory rate is typically not measured manually as often as is needed to identify patients in dangerous respiratory conditions. Our monitor will aim to provide constant readings of the patient's respiratory rate, as well as the capabilities to alert a nearby physician of concerning changes in the patient's condition.

2. Market Analysis

2.1. Problem

Low resource countries do not have access to a respiratory rate monitor for use in the paediatric unit due to high costs of purchasing a device, a lack of tech support for maintenance, inadequate training required to use the devices, and lack of technological transferability of existing devices for their infrastructure. Hospitals, healthcare personnel, and patients and their families need a respiratory rate monitor catered toward the constraints of low resource settings such as a low cost device built using robust materials that can be sourced locally and a simple interface designed for users with minimal technical knowledge to operate. Our device will help improve efficiency within the hospitals by automatically monitoring and alerting healthcare personnel of changes in the patients respiratory rate so that they can attend to patients immediately to prevent further deterioration in health which may lead to death; therefore, providing better care and peace of mind for patients and their families that their child is being constantly monitored.

2.2. Market Need

The key customers identified that would benefit from our device are hospitals, healthcare personnel, and patients and their families living in low resource countries. Our target customers would be the hospitals who would purchase our device and healthcare personnel would be the main users operating the device. The end users would be patients and their families who will receive better care. According to the World Factbook as of 2016, Uganda has one of the highest fertility rates of 5.80 children per woman and Kenya has a fertility rate of 3.14 which are both substantially higher than the average fertility rate in developed countries which is under 2. In addition, Uganda and Kenya infant mortality rates are 57.6 deaths and 38.3 deaths per 1,000 births respectively. As a result of high fertility rates and corresponding mortality rates, our device primarily targets the paediatric units because children under 5 years of age in developing countries are the most susceptible to death from respiratory illnesses such as birth asphyxia (lack of oxygen) and pneumonia. Our device is intended to provide a cost-efficient solution for the hospital while improving the efficiency of healthcare personnel who currently cannot attend to this issue due to all the barriers of entry described above in the problem section regarding existing respiratory rate monitors.

2.3. Market Size

The Population Reference Bureau estimates that the accumulated total population of developing countries will double to 1.9 billion by 2050. According to Kalorama Information, the market size for the total worldwide respiratory measurement device market in 2016 is estimated to be $1.8 billion and roughly $14.4 million after removing the US, Europe, and Asia; and there is an increasing trend projected for the next few years. As healthcare tries to keep up with the rate of population growth in developing countries, there is great potential to tap into a market for medical devices as we are still in the growth stage of the product life cycle. Specifically in Uganda and Kenya, there are approximately 13,084 hospital beds and roughly 69% of these beds are occupied in the paediatric ward based on a survey conducted by the World Health Organization in 2014. Thus, there can be up to approximately 9,000 patients that would benefit from this device between the two countries.

3. Competition

3.1. How are Customer Needs Addressed Today

Although there are many respiratory rate monitors in the industry, there are no devices accessible or designed specifically for paediatric use in low resource countries. As a result, nurses would have to manually monitor a patient’s respiratory rate by counting the number of breaths in a minute which can be inaccurate. However, due

to an inadequate ratio of nurses to patients, nurses are unable to monitor a patient's respiratory rate every 4 hours or even every hour depending on the severity of the case as recommended by doctors. Thus, this vital sign is often ignored which would have been valuable information for earlier detection of respiration issues which may be life threatening.

3.2. Environmental Scan

There are four main competitors in this industry specific for paediatric units including manual monitoring and three existing products planning to enter the market such as the Pelican (MIT), Philips respiratory rate counter for pneumonia diagnosis, and mobile phone pulse oximeter which has a function to measure respiratory rate developed by Dr. Mark Ansermino (UBC). Manual monitoring tends to be inefficient if there is a large number of patients, requires professional training, and can be inaccurate if it is difficult to determine the number of breaths. Both the Pelican and Philips respiratory rate monitors are both used as tools to diagnose pneumonia and are easy to use. It is unsure whether or not these devices can be used to continuously monitor respiratory rate on a long term basis. The Pelican device can also measure oxygen levels and collect blood samples but the price of their device is currently unknown. The Philips device became commercially available near the end of 2016 and is currently priced at $39CAD. The mobile phone pulse oximeter is mainly used during anesthesia in hospital settings and requires being hooked up to a smartphone or laptop which may not be affordable for more rural hospital settings.

3.3. Competitive Advantage

The competitive advantage our device brings to the market is that our device is competitively priced and allows for long term continuous monitoring of a patients respiratory rate while they are resting to detect unusual fluctuations and alert healthcare personnel. The data will be recorded and can be displayed if it is hooked up to a screen. Our device is not used to help diagnose any specific respiratory illness but for general monitoring. It will be made of robust components that are easily sourced in low resource countries to reduce the chance of deterioration and difficulty of repair and maintenance in the event of breakage while keeping costs low. The simple user interface design will allow any healthcare personnel to easily use it. As unreliable power is a common problem in low resource health care centers, the device will have its own independent power source. Other features of the design will ensure its functionality in hot and humid environments, as well as its durability to withstand repetitive disinfection and wear from the paediatric patients. In addition, this collaboration with Ugandans will help stimulate their local economy by providing jobs as we expand. Although we are still refining and working on our prototype which will take until the beginning of Q1 in 2018 to finalize, there does not appear to be any current competitors posing an immediate threat to our competitive advantage.

4. Commercialization Plan

4.1. Science / Technology Overview

Our accelerometer-based monitor provides health care workers with real-time respiratory rate information. The device is mounted on a small plastic board that is held in place on the patient's chest with elasticated straps. Movement of the chest wall with inspiration is detected by an accelerometer which relays this information to a microcontroller for filtering and data processing. The microcontroller uses a fast fourier transform to compute the respiratory rate which can then be transmitted to a computer. If the respiratory rate changes to outside the normal range, the microcontroller activates an alarm in order to alert nearby health care workers. There is also the possibility of displaying the respiratory rate on a device mounted LCD screen for more severe cases.

4.2. Growth Strategy

Currently, we are in year 2 of product development and are still in the processing of building and refining our prototype for testing to ensure that our device is accurate and performs all the required functions. This process will also include a major partnership with students and doctors in Kampala, Uganda for discussion and feedback on how to improve the product and meet regulations for use in Africa. Upon completion of a working prototype, we would need to obtain an open source license to sell the product. During this time as well, we plan to start the process for the incorporation of a private limited company with the BC Registry Services. We plan on contracting a manufacturer oversees called Seeed Studio to help assemble our custom parts in small batches and then finding a low cost distributor that can ship our device internationally. Since we already have an existing relationship with people in Uganda and Kenya, they will be key in helping us market our device to

hospitals and healthcare centers through meetings with management to pitch our product, word of mouth, and e-commerce. The device will be sold at a 37.5% markup ($40) from the cost to manufacture and distribute the product ($25). In addition, we will provide training and maintenance services. After we secure initial funding, one of our next objectives is to retain services of a patent professional to establish a secure IP protection which would include a patent search and potential patent application. Uganda and Kenya will act as our pilot run so that we can continue to learn and refine our business model before expanding to other countries as a long term stretch goal.

4.3. Milestones

Outlined below is a timeline of key milestones we plan on achieving:

2017				2018				2019				2020		2021	
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1-2	Q3-4	Q1-2	Q3-4
Research/Product Development/Testing					Enter & implement in Uganda										
Partner and recruit Ugandan students/doctors					Start up Ugandan headquarters					Begin expansion into Kenya					
			Patent search and app												
		Obtain license & incorporation													
			Pursue manufacturer and distribution												
Seek government grants			Pursue initial angel investors & VC							Pusue 2nd round VC if needed					

5. Financial Plan

5.1. Financial Needs and Justification

In our early funding stage up to Q4 in 2017, we are seeking $124,350 to help cover operational expenses prior to launching. The initial costs required for operation include raw materials of the parts ($75,000), manufacturing and distribution expense ($25,000, includes fixed tooling cost), incorporation and license fees ($1,350), research and development ($5,000), sales and marketing expenses ($3,000), general & administrative expense ($5,000), and legal fees ($10,000). As our business expands, we will need working capital to cover ongoing operational expenses which can be found on our projected balance sheet, income statement, and cash flow statement. Our projected sales in 2018 range from $80,000 to $150,000.

5.2. Fundraising plan

Our fundraising plan will consist of both non-dilutive and dilutive sources. Non-dilutive sources include applying for government grants and management will pool together our own investment in the company; however, we will also need to pursue dilutive means from angel investors and venture capitalists to fulfill the remaining costs.

5.3. Exit

After we break even, we can start paying out dividends to our investors who own equity in our company as determined by our board of directors. In approximately 5 years we plan on selling the company to a larger corporation. Our management team believes Okussa Medical can be positioned to be acquired by one of the existing giants by then and will need to start seeking buyers. The value of our company lies within the strengths of the team and connections in both the biotech and medical community in Vancouver in addition to the network of students and doctors in Uganda that we have partnered with.

6. Team

Our Vancouver team is composed of about 12 students from a variety of specialties including engineering, science, medicine, and business who have worked at biotech and medical companies. In addition, we have taken on a graduate student mentor specializing in biomedical engineering who has been providing us with guidance in our product development. Since the project's inception, we have expanded our local network and met with medical professionals in this field to gain insight in respiratory rate monitoring and consultation regarding our product. Our main expansion plan is to further develop our existing relationships in Uganda by collaborating with biomedical engineering students and physicians from Makerere University and the National Referral Hospital to start building a team in Kampala, Uganda as a main headquarters in Africa. After we secure adequate funding, we plan on initially hiring two full time employees in Uganda to help manage research, product development, maintenance, training, and distribution of our device.