Problem Definition

Globally, skilled health workers and medical resources are critical in delivering effective treatment to improve the health of individuals and populations. However, health providers in developing countries often have limited or non-existing access to medical services, as physician-to-patient ratios average 0.2 physicians per 1,000 people (2010)[[1]](#endnote-1) and estimates of out of service medical equipment range from 70-96%.[[2]](#endnote-2) Further, the gap between the life expectancy of developed and high-mortality developing countries has continued to widen since the 1950s, largely due to the increase of medical innovation targeted towards the developed world.[[3]](#endnote-3) [[4]](#endnote-4)

As an immense volume of patients seek treatment from an minute number of health workers, dwindling access to functional medical devices only compound the health crises in developing countries. Health workers are left overwhelmed, with essential practices– such as making consistent rounds to check on each patient– near impossible. In these low-resource settings, hiring more personnel is impractical.

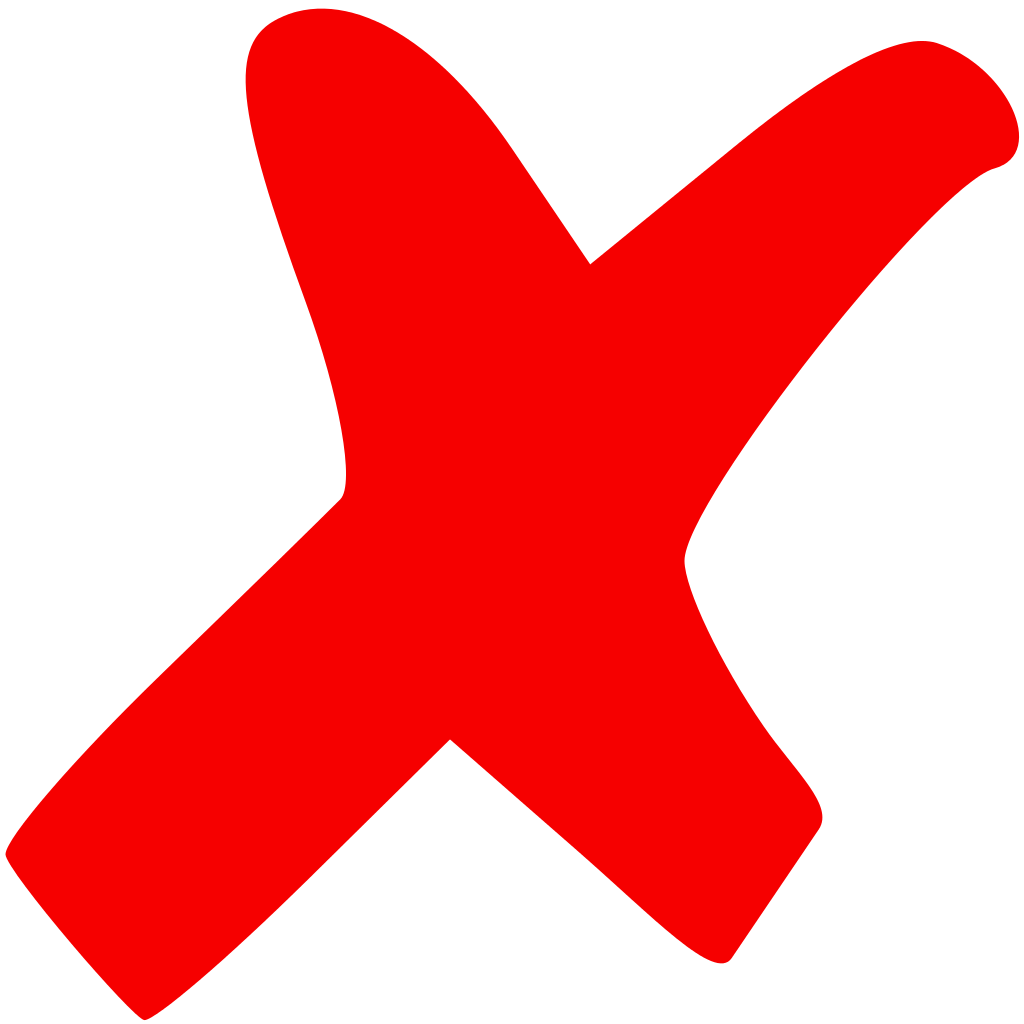
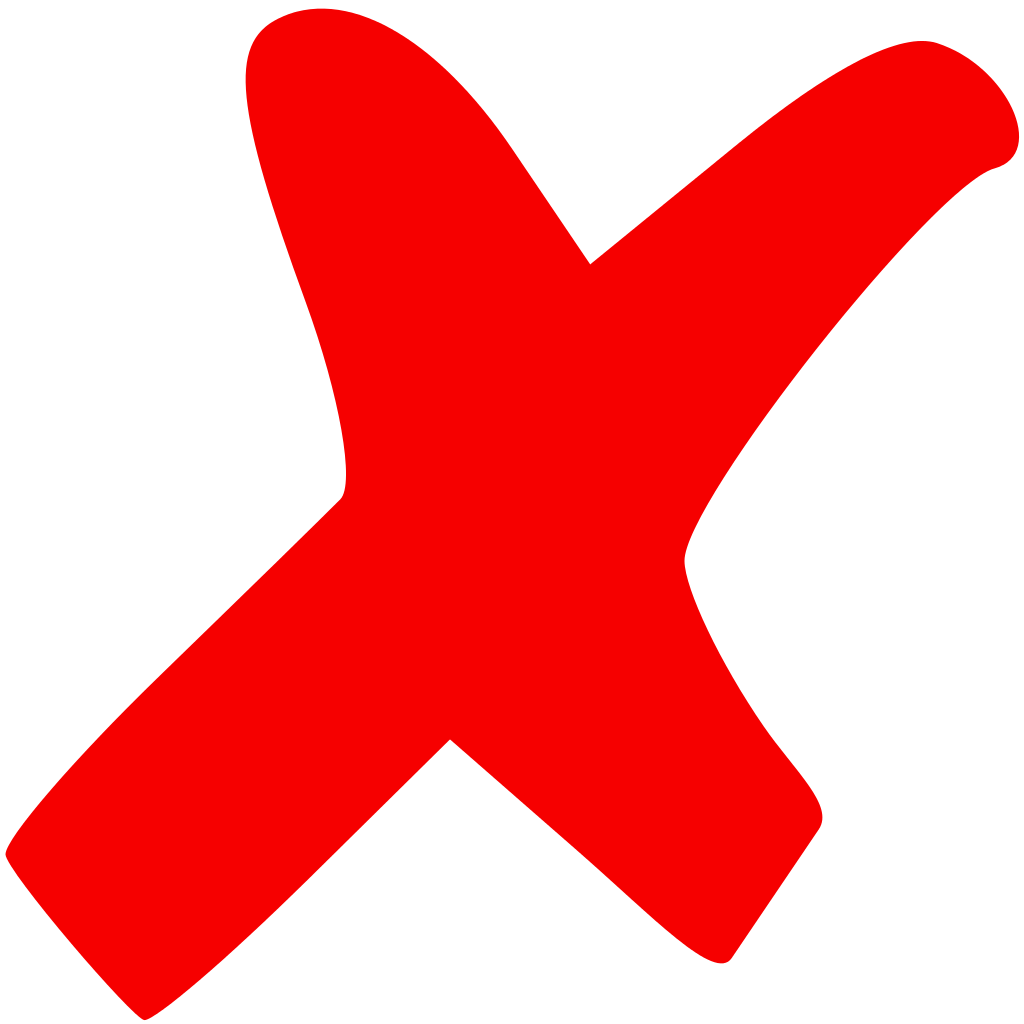
Vital signs monitors have enabled workers to give basic treatment to a broader span of patients and have become standard equipment in health care settings. However, reliable devices often range from $2,000 to $10,000, which is difficult for low- and middle- resource settings to afford. Additionally, majority of these devices are catered towards high-resource countries and are unable to tolerate common problems in developing environments–such as erratic power supplies, limited training capacity, difficulties in getting spare parts, and poor or inadequate maintenance.[[5]](#endnote-5) As the lack of focus on low-resource medical devices continues, the disparity between developed developing health care quality only increases.

Problem Solution

To combat the above problems, EWH Cornell has designed a low-cost vitals signs monitor targeted towards low-resource settings. The device’s SMS capability sends real time updates of the patient’s vitals to his/her associated nurse as well as alerts nurses if the patient’s vitals show abnormal changes. The function eliminates the need for continuous nurse ward rounds, allowing health workers to extend focused treatment to a greater population of patients. On average, nurses spend 2.3 minutes per patient consultation[[6]](#endnote-6). In the case of a hospital serving 100 patients per day that takes the vitals of each patient 5 times per day, 19.2 working hours would be saved each day and could be reinvested into treating other individuals. Additionally, we estimate a mass produced vitals signs monitor would cost $200 per device. Hence, low-resource hospitals would not need to rely on medical equipment donations, allowing hospitals to maintain an uniform monitoring system, further streamlining technology management. Note, mobile subscriptions have drastically rose in the developing world– with access to sending text messages increasing over 80% in Kenya, Mexico, and Indonesia[[7]](#endnote-7). Further, for much of the population receiving text messages is free, which allows the device’s SMS system to vastly decrease infrastructure costs. As the device’s audio alarm system remains unaffected in remote or powerless places and estimated battery life of 10-12 hours, the device is ideal for prehospital and disaster settings.

Competitors

Many major companies have addressed developing devices more suited towards low resource environments. Currently, one of the more prominent devices on the market to monitor a patient’s vitals in the developing world is the Dinamap Procare Vitals Monitor by GE. The Dinamap Monitor displays automated BP, predictive temperature, SpO2, and pulse rate with a minimum battery life of two hours. While the device provides leading technology and accuracy, it is still partially catered towards developed regions. The GE device relies mostly on English rather than pictorials– most button descriptions are solely in English. In addition, the device can only measure body temperature in Fahrenheit, while the convention is to measure in Celsius for the majority of developing areas. Further, our device provides a more comprehensive and integrated system due to it’s SMS capabilities, which allows health workers to monitor and care for a higher volume of patients. In terms of price, the Dinamap costs $1000 respectively, significantly more than the $200 cost of our Vitals Signs Monitor. In a broader context, the World Health Organization estimates that as much as 80% of medical equipment is donated or funded through foreign sources to developing areas, but only 10-30% of the donations are ever put into operation due to lack of repair parts, training, and outdated electrical systems.[[8]](#endnote-8)



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| --- | --- | --- | --- | --- | --- | --- |
|  | Price | Weight | Battery Life | SMS Capability | Pulse Rate | Temperature (in •C) |
| Vitals Signs Monitor | <$200 | 2 lbs. |  |  |  |  |
| Dinamap Procare Vitals Monitor | $1000 | 5 lbs. | 2 hrs. |  |  |  |

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2. Perry, L., & Malkin, R. (2011). Effectiveness of medical equipment donations to improve health systems: How much medical equipment is broken in the developing world? *Medical & Biological Engineering & Computing,* 719-722. [↑](#endnote-ref-2)
3. World Health Organization. (2003). The World Health Report. <http://www.who.int/whr/2003/chapter1/en/index1.html>. [↑](#endnote-ref-3)
4. World Health Organization. (2010). Medical devices: managing the mismatch. [↑](#endnote-ref-4)
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6. Creamer, G., Dahl, A., Perumal, D., Tan, G., & Koea, J. (2010). Anatomy of the ward round: The time spent in different activities. *ANZ Journal of Surgery,* 930-932. [↑](#endnote-ref-6)
7. The World Bank. (2011). Maximizing Mobile 2012 Infographic. <http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/IC4D_Infographic-1.png> [↑](#endnote-ref-7)
8. Jones, Andrew. "Medical Equipment Donated to Developing Nations Usually Ends Up on the Junk Heap." Scientific American Global. Scientific American, 6 May 2013. Web. [↑](#endnote-ref-8)