A Device for the Tracking of At-Home Medical Equipment during Natural Disasters

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Electrical durable medical equipment (DME), such as dialysis machines, patient monitoring devices, and ventilators, are life-sustaining machines that are used extensively by patients at home. This investigation was aimed to design and implement a prototype system capable of tracking at-home DME and securely reporting the GPS location, status, and patient information to a nearby hospital during power outages. This system designed herein consists of two parts: a hospital Base Station device and multiple User Nodes connected to the DME in each patient's home. The Base Station and User Nodes each consist of a Teensy microcontroller, a GPS receiver module and an Xbee radio implementing the Zigbee protocol. Additionally, each User Node contains a status LED and a lithium battery connected by a charge controller. User Nodes are programmed to obtain the GPS location of the patient, monitor the DME status, relay information, and transmit the data when the power is lost. When a power outage is detected, the User Nodes communicate with other nearby nodes and relay encrypted information about the DME and the patients through an ad hoc network the nodes form, to the Base Station device, which is programmed to receive and convey the information to a hospital computer through a USB connection. This system is independent of infrastructure, such as cell towers, which are unlikely to be operable during natural disasters, and allows hospital personnel to monitor the at-home DME to provide help needed during power outages.

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