Hospital Waste Management System

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Abstract: Healthcare is one among the fastest growing sectors in both developed and emerging economies. The need for a proper hospital waste management system is of prime importance and is an essential component of quality assurance in hospitals. Nowadays, it is one of the major issues in under developed and developing countries. The proposed system tracks and notifies reuse of medical equipment and medicines that cannot be reused. Therefore, this system provides safe treatment to patients.

Keywords: E-healthcare, RFID tag, RFID reader, Arduino.

INTRODUCTION

Hospital Waste Management means that the management of waste created by hospitals mistreatment such techniques which will facilitate the unfold of diseases through. The necessity of a correct hospital waste management system is of prime importance and is a vital element of quality assurance in hospitals. Nowadays, it's one amongst the foremost problems underneath developed and developing countries. The waste generated from medical activities represents a true downside of living nature and the human world. Improper management of waste generated in health care facilities causes an immediate health impact on the community, the health care employees and on the surroundings.

Purpose: The proposed system prevents re usage of medical equipment and medicines that cannot be reused. The use of the proposed system allows increased flexibility, both in the ability to read data without contact and the opportunity to make data reading conditional on other factors.

PROBLEM STATEMENT:

In under developed and developing counties, the malpractice of reusing medical waste is observed. The application intends to track and notify reuse of medical waste like expired medicines, glassware, needles.

LITERATURE SURVEY:

The advancements of science and technology within the field of aid has improved the standard of people's life. This issue becomes additional important once numerous kinds of risky waste gets demanded with general waste. One such risky waste is aid waste; this waste is generated in hospitals throughout completely different aid activities like pathological diagnostic, surgery, etc. Therefore, to require Associate in Nursing account on the problem of aid waste management the review of literature has been

dispensed on the idea of the classification. This criticism provides various future analysis directions together with the need of additional in-depth application of operations management tools and techniques. Healthcare is important for our well-being and survival, but healthcare activities produce great deal of infectious and unsafe waste which poses an outsized threat to its environment. The Medical Waste Tracking Act (MWTA) was passed in 1988 after improper dealt with medical wastes were regularly discovered on beaches, then America Environmental Protection Agency developed technology to securely deal with clinical wastes. Incineration has come to be the foremost commonplace method of last disposal of medical wastes and stricter emission standards are implemented. The projected system concentrates on characteristic medical instrumentation on whether or not they are being reused if they're not alleged to be reused. There are several malpractices of reusing medical instrumentation in below developed and developing countries.

OBJECTIVES:

The different objectives of this project are as follows:

1. To check and track all the medical device information for reusage.
2. To check the device used count.
3. To alert on reutilization of medical waste.

1. To check and track all the medical device information for reusage:
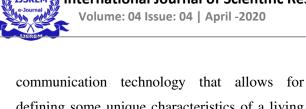
A medical device is any instrument, machine, apparatus, appliance, software material to be used for human beings for the following purposes:

● Diagnosis, prevention, monitoring, treatment of disease or compensation for an injury

● Investigation, replacement, support or modification of the anatomy or of a physiological process

● Sustaining or supporting life

● Control of conception

● Disinfection of medical devices

All reusable medical devices can be grouped into the following categories according to the degree of risk of infection associated with the use of the device:

● Critical devices, such as surgical forceps that come in contact with blood or normally sterile tissue.

● Semi-critical devices, such as endoscopes that come in contact with mucus membranes.

● Non-critical devices, such as stethoscopes that come in contact with unbroken skin.

The application tries to track all such information and decides whether the medical device can be reused or not. We are going to track this information by using RFID. Radio Frequency Identification (RFID) is a

communication technology that allows for defining some unique characteristics of a living being or an object, usually its identification information, by relating it to a numeric serial number within a tag, and ensures that this number is conveyed through radio waves.

2. To check the device used count:-

Initially we keep the device count of all the unused medical devices to 0. As they are used their used count is increased by 1. For example, if a syringe is being used, initially it's used count is 0, after it is used, it's used count becomes 1. Since the value of the maximum used count for a syringe is 1, if this syringe is used again, an alert message in given to prevent it's reusage. We assume that the RFID tags are placed in each medical device, we use these tags to get the device used count, to prevent reutilization of materials that are prohibited in hospitals.

3. To alert on reutilization of medical waste:-

Based on the device used count, we give an alert message so that the same device cannot be used again. We also keep track of the medicines used in the hospital. The expired medicines are not allowed for reusage.
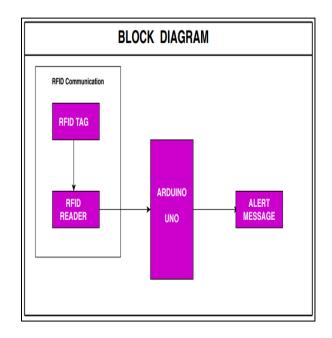
PROPOSED SYSTEM:

The system scans the medical device and fetches it's information. It tracks the reuse of medical device. The system performs a check over expired medicines.

Advantages:

1. Ensures quality assurance in hospitals.
2. Better safety to patients.

METHODOLOGY:

The design of the system mainly consists of the medical device information. We assume that RFID tags is placed in each of the medical device with necessary information (used count, etc). Once the card information is obtained by RFID communication, they can be processed in the information system in the application. RFID reader will read the information of all the medical devices and keeps track of how many times the components have been used. If any of the medical device is already used, it will give alert message; an alert for not using the same component. A check on medicines that have crossed expiry date is done.

BLOCK DIAGRAM

Radio Frequency Identification is abbreviated as RFID . RFID is one of the member in the family of Automatic Identification and Data Capture (AIDC) technologies and is a fast and reliable means of identifying objects. There are two main components:

1. The Interrogator (RFID Reader) which receives and transmits the signal.
2. The Transponder (tag) that is attached to the object (medical device).

RFID leverages electrostatic or electromagnetic coupling in the radio frequency portion of the electromagnetic spectrum to identify objects over a distance of potentially several meters. RFID systems are employed to manage supply-chains and to track shipments and to automate toll collection on highways, and are being deployed for many new application areas (e.g., passports, airline boarding passes, luggage tags, etc.). RFID provides the following advantages:

● RFID technology automates data collection and vastly reduces human error and effort.

● RFID supports tag reading with no line-of-sight or item-by-item scans are required.

 ● RFID readers can read multiple RFID tags simultaneously thus increasing in efficiency.

● All RFID tags within range can be detected instantly and matched with information in the database.

● Assets can be cross-referenced against assigned locations and recorded as missing, present or relocated .

● RFID can be integrated with active scanning and fixed readers for totally automated tracking solution.

● Available scanners support both RFID and barcodes so you can upgrade at your own pace.

SYSTEM ARCHITECTURE:

Overview**:**
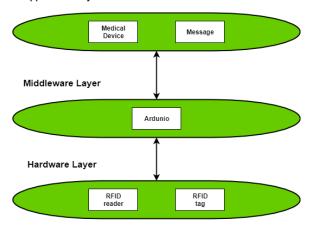
The system can be structured into three layers:
1. Application layer
2. Middlewares
3. Hardware layer

1. Application Layer: The application layer interacts with the end user. It consists of:

● Medical devices: By medical device we mean any instrument,machine,equipment that is used in the hospital to treat the patients.
● Message: An intimation to the concerned person.

2. Middlewares: Arduino is used as the middleware. It is a controller. A controller is a hardware device or software program that manages or directs the flow of data among entities.

3. Hardware Layer: It consists of the hardware devices:
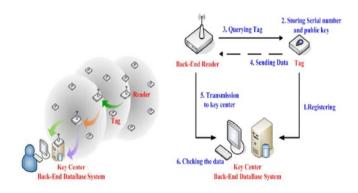
● RFID reader: It scans the RFID tag.

- RFID tag: It is attached to each medical device. It contains medical device information like used count, expiry date, information regarding reusability,etc.
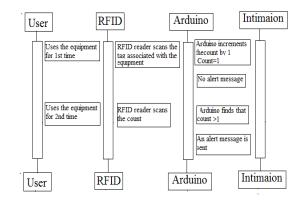

RFID Architecture:

1. Each RFID tag has a unique serial number for identification.
2. The RFID tag contains all the required medical device information.
3. The RFID reader scans the RFID tag attached to each medical device.
4. Then the information like"used count" is sent to the controller, arduino for checking the data.
5. An alert message is sent based on fetched data.

SEQUENCE DIAGRAM

Sequence diagram depicts the interaction between objects in a sequential order i.e. the order in which interaction takes place.

It represents the sequence of events.

In our case, there are two events: One is when the user uses the medical device normally i.e. when the device used count is not exceeding max_count (maximum number of times the device can be used). Other one is when the used count of the device exceeds the max_count.
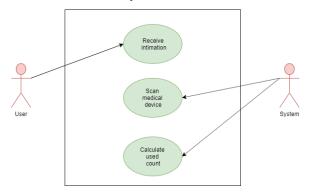
- Used count of the device is included in the RFID tag.
- RFID reader scans the used count from RFID tag.

● Output of which is sent to the controller-Arduino.

● Arduino includes the code to check whether the used count>max_count associated with the device.

● If it is less than or equal o max_count there is no message sent to the user

● Else an alert message is being sent.
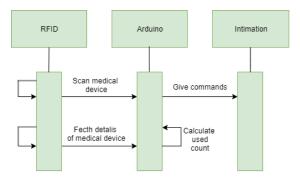
Use case diagram:

A graphical representation that depicts the relationship between user and different use case in the system.

RFID reader will scans the information present on each medical devices which will be sent to arduino for calculating used count of the device and user is given an alert message if the max count of medical device is exceeded.
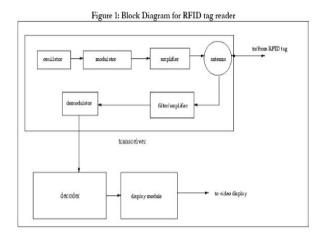
Module flow diagram:

A graphical representation that shows relationship between different elements in the system that identifies, clarifies and organizes different requirement in the system.

● RFID scans and fetches details like expiry date , used count of medical equipment and sends it to Arduino.

● Arduino calculates actual used count

● An alert message will be sent to user if equipment is already used and should not be reused.

HARDWARE AND SOFTWARE SYSTEM REQUIREMENT:

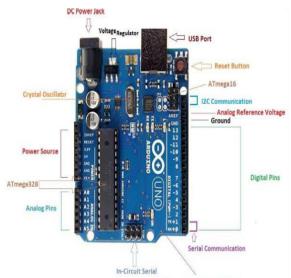**RFID Reader:**

Figure 1: Block Diagram for RFID tag reader

An RFID Reader will browse through most something with the exception of semiconductive materials like water and metal, however with modifications and positioning, even these are often overcome.

Arduino UNO:

Arduino IDE is equally compatible with Windows, mack or UNIX Systems, however, Windows is desirable to use. Programming languages like C and C++ are employed in IDE. Arduino Uno comes with USB interface i.e. USB port is more on the board to develop serial communication with the pc.

GSM/Wi-Fi:

SM (Global System for Mobile communication) may be a digital mobile network that's wide used for network property.

PROJECT OUTCOMES:

1. The application automates the system.
2. It provides better efficiency.
3. The application ensures quality assurance in hospitals.
4. It helps in providing safety to patients.

CONCLUSION:

The system uses RFID mechanism to check the reuse of medical devices. An RFID tag is attached to each medical device, that contains all the medical device information. The system provides a check on expired medicines.

ACKNOWLEDGMENT:

The system is still in the development stage. The contents of the paper contains the current progress of the project. It will be completed soon.

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