

Smart Vending Machine for Collecting Blood Smears

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Abstract: *Vending machine is about dealing with patients. After pressing a single button blood smear will be taken. After a few days, it provides report and if required then medicine. This gives time saving phenomena, such as patient should not wait in long queue, MPWs (Multipurpose worker) are not to go in remote places. This resolves the problem of old system. In older system blood smears would be collected by MPWs by going door to door. Now this problem will get solved.*

Keywords: vending machine, automate, MPW, MRC, enhancement, diagnosis, enhancement

1. Introduction

Now a day's malaria office uses manual system for reporting and data management. To strengthen research on malaria and to meet the threat posed by resurgence of malaria, the Indian Council of Medical Research (ICMR) established Malaria Research Centre (MRC) in the year 1977. Malaria offices have been established in the year of 1958 throughout India. In this department, diagnosis of Malaria and Filaria can be done. On a single press of system button, blood smears are taken and tablets will be given. No need to see doctor.

2. Literature Survey

Initially, malaria feels like the flu with high fever and body aches, with hot and cold stages. Signs and symptoms in children might be nonspecific, leading to delays in diagnosis. People also may have headache, nausea, rigors (i.e. shaking chills), sweating, and weakness. Pregnant women are more likely than women who are not pregnant to become infected with malaria and to have high infection. The effects of malaria at the time of pregnancy include spontaneous abortion, preterm delivery, stillbirth, congenital infection, maternal death, and low birth weight. Malaria is caused due to the four species of the protozoa of the genus Plasmodium, which is caused by the bite of the female Anopheles mosquito, congenitally, or through exposure to infected blood products. Interventions to prevent malaria include management of malaria infection and anemia, insecticide-treated nets, and intermittent preventive treatment case.

2.1 Details of Malaria: (Diagnosis and Treatment of Malaria in the Malaria-Endemic World)

Malaria must be diagnosed and treated soon with a recommended anti-malarial drug to keep away the illness from progressing and to prevent further spread of infection in the community.

In the malaria-endemic world, diagnosis of malaria can be difficult for several reasons:

Malaria's clinical symptoms are joined with other diseases and conditions, and many malaria-endemic countries lack resources, such as microscopes and rapid diagnostic tests, to make a definitive diagnosis.

Health personnel in these areas are usually undertrained, underpaid and under-equipped.

Health personnel in the malaria world usually face more patient loads, and must divide their attention between malaria and other equally highly infectious diseases such as pneumonia, diarrhea, tuberculosis, and HIV/AIDS.

Malaria may be "uncomplicated" or "highly severe."

Uncomplicated malaria: Symptoms can be included with fever, chills, sweats, headaches, muscle pains, nausea and vomiting.

Severe malaria: Symptoms may include confusion, coma, focal neurologic signs, severe anemia, and difficulties in respiration. A patient with symptoms of highly severe malaria should be assessed quickly and treated immediately. Dangerous parasite, Plasmodium falciparum causes severe malaria is most often.

Diagnosis of Malaria: When a patient with fever is brought to a health centre in the malaria-endemic world, a health worker may recognise that the patient has malaria on basis of the patient's symptoms, although these symptoms are not specific to malaria. For many of years, national malaria control programs recommended treating children under the age of 5 years with fever for malaria, based on symptoms, because most health facilities do not had working microscopes, a well trained microscopist, and necessary things (e.g., slides, stains) for a laboratory test. Malaria was extremely common and potentially fatal, and providing treatment on the basis of clinical diagnosis alone could save the child's life. However, if the child had an illness other than malaria, it would not get treated.

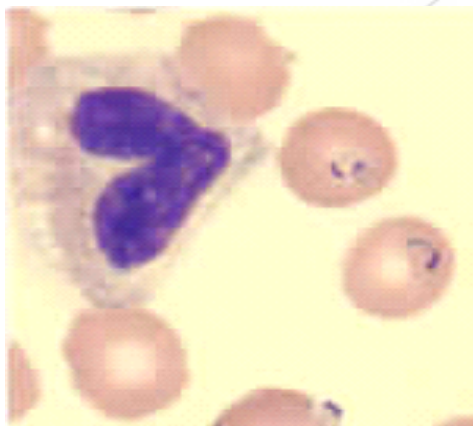
So far malaria interventions have been scaled up in sub-Saharan Africa in the last decade, rapid diagnostic tests for malaria have become available at health facilities,

microscopes have been provided, and technicians are well trained.

In the year 2010, the World Health Organization suggested that all suspected cases of malaria be confirmed with a diagnostic test before giving treatment. The Roll Back Malaria Partnership has set new targets of global access to malaria diagnostic testing in public and private sectors as well as in the community level. In many of the countries, community health workers (CHWs) have been well trained on integrated community case management of common childhood illnesses, including malaria, pneumonia, and diarrhea. Many CHWs are being trained to use rapid diagnostic tests for children and to treat them with recommended antimalarials if positive found in them. The diagnosis can be done

2.2 Laboratory Methods for Diagnosis

Microscopy and rapid diagnostic tests can be used to make an exact diagnosis of malaria.



Blood smear stained with Giemsa which shows a white blood cell (on left side) and several red blood cells, some of them are infected with Plasmodium falciparum (on right side).

2.3 Microscopy

Examining a drop of the patient's blood under the microscope Malaria parasites can be identified. The drop is spread out as a "blood smear" on a microscope slide. Before the slide is tested, the blood specimen is stained (most often with the Giemsa stain) to give the parasites a differential appearance. This technique is the golden standard for laboratory confirmation of malaria. However, it depends on the reagents quality, of the microscope, and on the experience of the lab technician.

3. Rapid Diagnostic Tests

Before a decade, test kits have become available that can detect antigens derived from malaria parasites in a person's blood. The immunochromatographic tests are referred to as rapid diagnostic tests (RDTs) and provide results quicker---depending on tests, within about 20 minutes.

In situations where reliable microscopic diagnosis is not available, RDTs offer a useful alternative to microscopy.

Many clinical settings and programs are using Malaria RDTs are currently in many countries where malaria is transmitted. Some CDC and others are conducting operational research to help optimize their use.

The WHO Malaria RDT Product Testing Programme coordinated by WHO/TDR and the Foundation for Innovative New Diagnostics (FIND) and executed in collaboration with CDC. It provides comparative data on the performance of various RDTs available in the market to assist in procurement. Since the year 2008, 120 products have been evaluated over three rounds of WHO Malaria RDT Product Testing Programme. An interactive guide is available to help to select malaria RDTs. These are with the specific performance characteristics. It is required by national malaria control programs and on the basis of results of the testing program.

4. Treatments to Patients

The WHO suggests that patients in malaria-endemic areas be treated within 24 hours as their first symptoms appear. The country's national guidelines provide treatment of a patient with malaria, which typically take the following consideration as: Type of species of the parasite of infection, status of the patients who are hospitalised, any accompanying illnesses or conditions, pregnancy, drug allergies, or other medications given to the patient. The infection was acquired here and the presence of antimalarial drug resistance there.

Uncomplicated Malaria: Pregnant women should not take Primaquine or by people who are suffering from deficient in G6PD (glucose-6-phosphate dehydrogenase). Primaquine should not be taken by patients till a screening test has excluded G6PD deficiency or unless the risk of deficiency found in the surrounding population is low, because primaquine taken by people with G6PD deficiency. It may cause hemolytic anemia. In some of the countries, use of primaquine is a single dose that prevents secondary transmission. In some of the country areas Counterfeit and substandard drugs are being sold.

Patients who have uncomplicated malaria can be treated on an outpatient basis; however, patients with severe malaria should be hospitalized. Most drugs recommended for treatment of uncomplicated malaria cases in the malaria-endemic world are active against the parasite forms in the blood (the form that causes disease).

Severe Malaria: Severe malaria occurs when infections are complicated by serious organ failures or abnormalities in the patient's blood or metabolism.

Patients who have severe P. falciparum malaria or who cannot take oral medications should be given treatment by continuous parenteral infusion in a hospital. The World Health Organization now recommends parenteral artesunate for treatment of severe P. falciparum malaria in both adults and children. However, if artesunate is not available, parenteral artemether and quinine are acceptable alternatives for treatment of severe malaria. Some malaria-endemic countries recommend pre-referral drugs be given by

suppository or injection before a severely ill patient is referred to a hospital for definitive care.

In today's system people see the doctor and give blood smear. This happens only in cities. At country side area MPW(Multipurpose Worker) collect blood smears of people who is not feeling well.MPW s collect the smears by searching whole village and inspect stagnant water for larvae in. This will take time to do manually. Malaria office also takes population count by using PHC(i.e. Primary Health Centre) data. The better option is a machine.

Limitation of existing system:

- 1)MPW takes time to inspect the whole village for diseases.
- 2)After diagnosis ,if MPW not belongs to village and time taken to provide medicine ,it creates problem.

5. Enhancement of Existing System

Create an automated machine which takes inputs from people and gives better results. This setting reduce time of patients wait to see doctor. This machine takes inputs as only pressing a single button of machine. This is machine has architecture like follows:

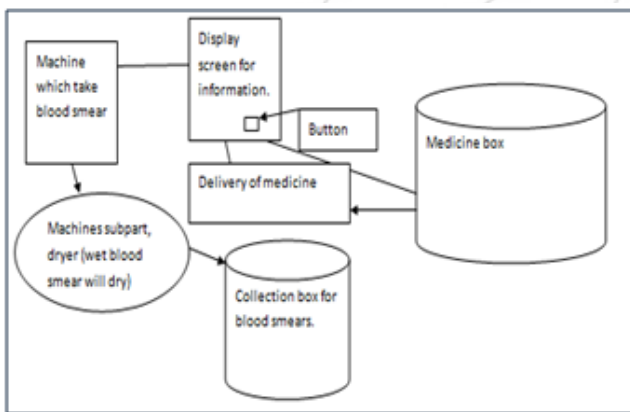


Figure: System Architecture of vending machine

In this machine, input is press of button on screen. That screen will display a number .This number is a patient's id which will be re-entered when patient come again to see results. Pressing a button blood smear testing tray gets out to take blood. After taking blood smear dryer gets on and collected it in collection box. Smear then wrapped with paper and a number will be printed on it. This number is patient's id. On the next morning when MPW reach in the town collect the smears and reduce time to search out in the whole town. If report is positive via internet report will be submitted to our machine, patients will type the id and get the medicine.

This machine also gives instructions and how to s like

- 1) Don't keep water storage open .
- 2) If some larvae found in your water storage ,then cleaning the tank & dry it.

Some ideas are:

As from every town population count occurs, this can be used JanaGanana. Blood smear report management system is

online so blood report of diagnosis will directly send to town machine booth.

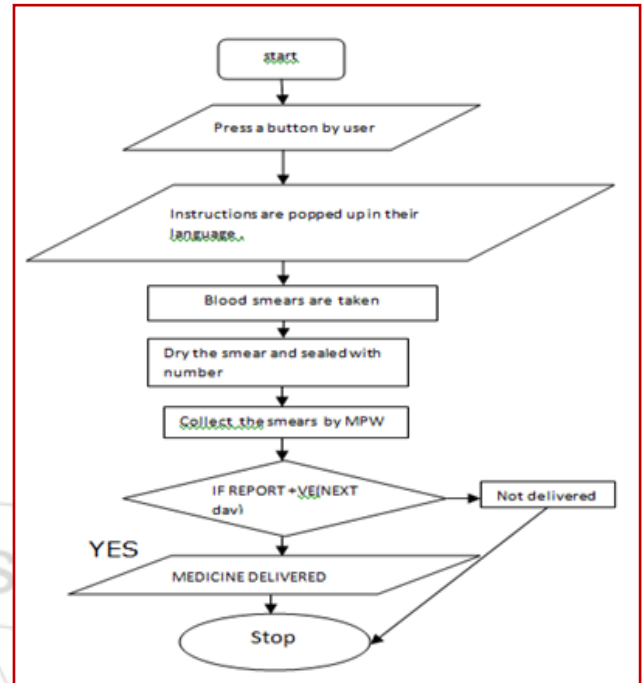


Figure: flow chart of proposed system

6. Conclusion

We can help system to get automated. Time is money. To save time, this system provides efficient way. When person get in the queue and see doctor this is also time consuming. Instead, go to the system and get the results. This means in forth coming years this system get implemented. This will enhance the usability of IT (i.e. Industrial Technology).And now hardwares are getting cheaper and cheaper , so our system fit feasible to requirement.

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