

## AUTOMATED MEDICATION SUPPLY SYSTEM AT REMOTE AREAS USING GSM

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**Abstract:** *Information technology and telecommunications are advancing rapidly, especially in the field of wireless and mobile communication, and are the reason behind the arrival of new forms of information infrastructure having the capability of serving many new services in healthcare. The implementation of Automated Medication Supply Systems (AMSS) using GSM, can serve weakly served or un-served parts of the country. Automatic Medical Dispense Devices are drug storage devices or cabinets that electronically dispense medications in a controlled fashion and track medication use. Telemedicine is another concept which can be defined as 'rapid access to remote medical expertise through telecommunication and information technology'. AMSS based on GSM will allow merging advantages of both concepts, and affordable and quick prescription can be made available when required. This kind of system can help the patients or person in emergency case with quick doctor's prescription & medication, and will make possible the availability of such services at rural places or remotely located places in India. Controlling of medication can be done by the available doctor remotely. At the time of emergency, the person can be able to talk directly with doctor located far away, with a single press of a button. This can be done by the GSM module over the cellular communication. After knowing the symptoms of the patient, the doctor will do a diagnosis and give proper prescription. Using an on-call provider client app running on a doctor's handheld; he will prescribe the medicines and will unlock the corresponding medicines' storage box on the AMSS device. Thus, it can be predicted that such kind of efforts and the combined advantages of developing mobile technologies will results in the development of further more applications, yielding necessary and better services to the citizen of India.*

**Keywords:** *Telematics, Telemedicine, GSM, Cellular communication, Automatic Medical Dispense Device, On-call service.*

### I. INTRODUCTION

Reliable connectivity of sufficient data rate capability at affordable cost is a major requirement for low cost rural mobile telemedicine projects. In developing countries, the infrastructure which connects doctor and patients has not been developed properly, mainly in rural areas. There is only one doctor per 1,700 citizens in India; the World Health Organization stipulates a minimum ratio of 1:1,000. Health ministry declares that there are about 6 to 6.5 lakh doctors available in India. But India would need about four lakh more

by 2020 to maintain the required ratio of 1 doctor per 1,000 people. If shortage of doctors is one problem, while another problem is that they even don't prefer to work in the rural areas, creating artificial scarcity in the area and high concentration in another. Worse still, many doctors posted in the hospitals in the rural areas remain absent for long periods. And when the doctor is not present, patients visiting the healthcare centers are treated by stand-ins—pharmacists and even nurses.

Surveys of rural healthcare facilities have revealed bad infrastructure, unavailability of medicines, equipment and even the basic needs.[2] There are PHCs in villages, rural areas, they have to cover particular population, but if that much of population comes under large radius of about 50 km, then this much of distance in emergency will be of major problem. PHCs located near developed cities may at least have necessary equipment and facilities, but those located in rural areas, far away from the developed areas, lack even the general required facilities. India has 0.7 physicians per 1,000 people — BRIC peers Russia (5), Brazil (1.5) and China (1.5) have better ratios — and most Indians travel about 20 kilometers to reach a hospital, according to a 2012 report by accounting firm PricewaterhouseCoopers (Pwc)[3]. Though a lot of policies and programs are being run by the Government but the success and effectiveness of these programs is questionable due to gaps in the implementation. In rural India, where the number of Primary health care centers (PHCs) is limited, 8% of the centers do not have doctors or medical staff, 39% do not have lab technicians and 18% PHCs do not even have a pharmacist[2].

The reasons for absence of complete rural health care can be listed as follows: 1) Rural backwardness; 2) Long duration of medical education; 3) High cost of medical education; 4) Offers and attractions of urban life.[4] One of the major issues in rural India is the shortage of qualified physicians / healthcare workers and requisite drugs within the proximity of remote villages. Rural villagers have to reach out to the Sub Centre, only to receive very basic primary healthcare.

Since there is no medical officer at the Sub Centre level, in case of even slightly complicated health issues, they are redirected to the PHC. Both the Sub Centre and the PHC have very limited capabilities of medical expertise, beds and drug stocks to handle the general demand. All critical cases are referred to the CHC. Villagers often have to travel very long distances to find out proper healthcare, bearing not only

travel costs and loss of livelihood, but even, worsening the health condition of the patient in the process. In case of outbreaks of major epidemics or contagious diseases, even the CHCs are ill-equipped to handle the load of patients.

Specialist doctors are overburdened with cases, some even beyond the scope of their expertise, leading to neglect or lack of proper medical consultation. Last but not the least, the average quality of medical specialists available in rural areas is also of inferior quality as compared to that of urban standards, since the urban patient has a higher disposable income allocated for medical expenses compared to the rural patient.

The shortage of healthcare workforce in rural India is evident from the above discussion, but we see this issue as a classic example of supply-demand mismatch, with operational inefficiencies in the supply chain caused by underutilization of capabilities.

II. PROBLEM STATEMENT

The shortage of infrastructure, shortage of doctors, and shortage of trained healthcare work lead to the main problem that was identified as the massive shortage of proper healthcare facilities in rural India. While most research papers look at the shortage of such facilities in India as a whole, they fail to identify and address the fact that the real shortage lies in rural India, and not in urban India which is much better off. To improve the healthcare system in India as a whole, first we need to identify and resolve the problem in the rural India.

III. OBJECTIVE

Our Automated Medication Supply System- using GSM, tries to solve this issue: How do we provide greater access to primary healthcare services at a village level in rural India where there is an acute shortage of doctors, such that people do not have to directly visit hospitals, except only for higher-end services? The answer, according to us, had to exploit the widespread penetration of mobile technology.

In India, there is no such kind of dispense systems connecting city hospitals and doctors with rural ones for medication. Even there is a challenge for the establishment of telemedicine infrastructure in rural areas. This kind of system can help the patients or person in emergency case with quick doctor's prescription and medication. Increasing the chances of timely and appropriate actions. This system provides mobility to the doctor and the patient.

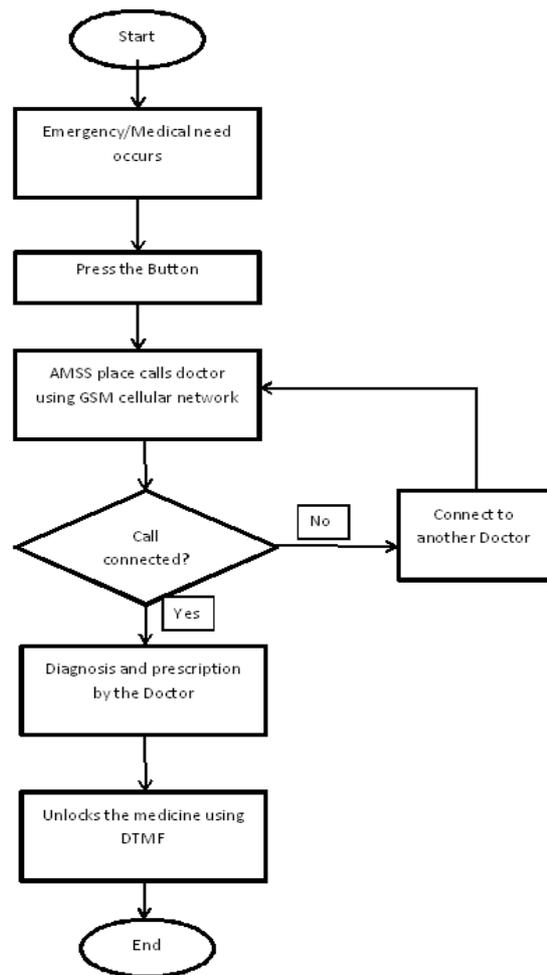


Fig. 1. Operating Algorithm

The operating algorithm will work as follows:

- When emergency or medical need occurs
- The patient or person will press the button on AMSS
- Emergency service starts
- The AMSS places the call to the doctor(GSM)
- If call fails to connect, it again calls to another doctor. Here preference is given to the nearby doctor
- When call connects, 2 way conference started
- The doctor listens to the patient's symptoms and the kind of emergency and accordingly diagnose and prescribes the medicines
- The Doctor unlocks the required medicine so that the person can take it
- Doctor will release medicines by pressing DTMF on his mobile as per the requirement

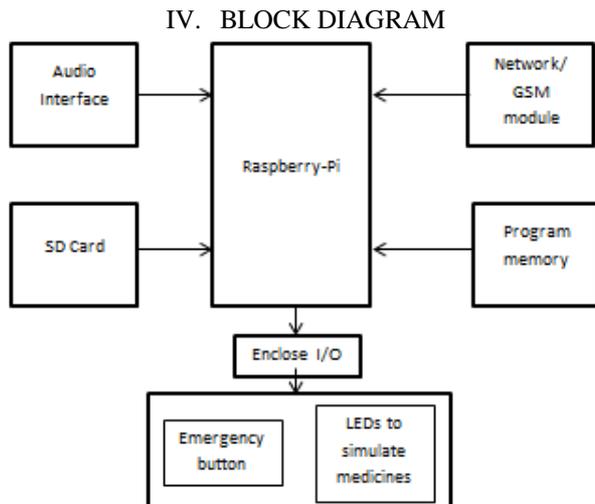


Fig. 2. Block Diagram

The block diagram shows the main unit of micro-processor, with supporting units like SD card, program memory, GSM module, audio interface, emergency button and LEDs to simulate the medicines. The processor used here is ARM1176JZF-S, which is on the development board called Raspberry-pie. The processor is from the family ARM11. The ARM1176 applications processors deployed broadly in devices ranging from smart phones to digital TV's to eReaders, delivering media and browser performance, a secure computing environment, and performance up to 1GHz in low cost designs[5].

#### V. ADVANTAGES & APPLICATIONS

AMSS based on GSM will allow merging advantages of both concepts of telemedicine and AMDS. Hence, affordable and quick prescription can be made available when required. It will serve the areas as follows:

- Schools and other populated bodies located at rural areas.
- Clinics, in case doctor are unavailable.
- To assist the compounder at village clinic.
- To assist the nurses in village hospitals and PHCs.
- Agencies, groups, organizations that are providing services to the rural population in healthcare. A trained person who serves there, can manage AMSS with large amount of medicines. PHC doctors can get assistance to serve rare medicines.

#### VI. CHALLENGES

- a) Perspective of doctors: Doctors yet are not fully aware with tele-medicine.
- b) Patients' fear and unawareness: There is a lack of confidence in patients about the result of telemedicine and also this AMSS proposal is new to them.
- c) Financial problems: The technology and communication expenses are so high, which sometimes make Telemedicine financially unreachable.
- d) Lack of basic facilities: In India, nearly 40% of population lives below the poverty level. Basic necessities like safe

drinking water, electricity, transportation, telecommunication, primary health services, etc. are missing. No technological development can change anything when people have nothing to change.

- e) Literacy and variety in languages: Only 65% of Indian population is literate
- f) Training: If the system is needed to put in highly populated area, it should also need to be managed by trained person to prevent misuse or errors.
- g) Government Support: The government has limitations. Any technology in its primary stage needs care and support. Only the government has the resources, authority and the power to make it survive and grow.
- h) Maintenance: To maintain the system properly at environment of rural remote areas.

#### VII. FUTURE SCOPE

The continuous evolution of telemedicine and healthcare system in India is trying to cope with the problems in both the urban and rural India. The rural India need to be focused more. One must start with the very weak side to successfully remove the main difficulty. The root cause must be improved first. Automated Medication Supply System using GSM in rural areas can be proved as a new hope and a way to contribute to the rural India to solve the major healthcare problem. This will allow public access of rare medicine in weakly served. If appreciated, it can be used in PHCs, rural schools, small clinics, rural hospitals.

#### VIII. CONCLUSION

This paper has suggested the evolution of health related services in remote areas with the help of telemedicine using widespread GSM network technology. This will lead to the access of rare medicines and general medicines, along with the consultation of doctor where there is large concentration of people, kids, and adults alike, like colleges & universities, hotels, restaurants, large day care facilities, theme parks, airports, shopping malls etc. This will solve the medication availability problem in rural areas to many extents.

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