

Strengthening Community Clinics of Bangladesh through Telemedicine & Interconnected Medical Facilities

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Abstract

Our main aims to strengthen community clinics and improve healthcare services in rural areas of Bangladesh. Within a 20 to 30-minute walk, a person will receive primary health care, and no one will be deprived of access to services and this was the clinic's primary purpose [1]. The community clinic has gained a reputation as a model, but its purpose has not been fully satisfied. Various domestic and foreign studies have identified the successes and limitations of community clinics. Efforts are being made to remove the limitations gradually.

We proposed a model of community clinics for improving the health care system of these clinics. This model can provide a concept for establishing community clinics under an integrated Upazila health system and District health system besides ensuring quality primary health care to the rural population of Bangladesh, especially the poor, marginalized, and destitute people. Demonstrating an effective linkage of community clinics with healthcare structures at Union, Upazila and district levels in need of exceptional health problem management.

Keywords: E-Service; Telemedicine; ECG; Ultrasound; Basic Analyzer; Community clinics

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Introduction

There are three service staff in a clinic. The community health care provider (CHCP) shows the primary responsibility. Community clinics offer 32 free types of medicines as well as health, family planning, and nutrition counseling. These include antenatal, perinatal, and postnatal services under comprehensive reproductive health care for pregnant women [2]. Symptom-based first aid is also provided for wounds, fever, pain, cuts, burns, stings, poisoning, asthma, dermatitis, worms, and common diseases of the eyes, teeth, and ears. Timely immunizations such as tuberculosis, diphtheria, whooping cough, polio, tetanus, measles, hepatitis B, and pneumonia are also provided. Community health care providers quickly refer complex health and family planning service recipients to higher levels by providing the necessary services. The service workers need to be efficient through proper training in the short term at a low cost. Integrating some portable devices like ECG, Ultrasound, Basic Analyzer, and Microscope in the community clinics, it is possible to reduce the time and hassle of the rural people and improve the quality of life in the field of treatment.

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Also, refer complex cases of healthcare recipients to district-level general hospitals or higher levels if required. Harassment can be alleviated by bringing the rural population under E-Service by directly submitting the reports received in the above checkups to specialist doctors in the online process.

Literature Review

Health is a fundamental human right. The Government of the People's Republic of Bangladesh is constitutionally committed to providing quality universal healthcare to every citizen of Bangladesh. In this context, the government's grassroots-level health care structure includes Upazila Health Complex, Union

Health Complex, Family Welfare Center, and Community Clinics to bring the country's people, especially the citizens of rural and backward areas, under universal health care. In addition to providing health care at the grassroots level, community clinics play a role in planning, monitoring, coordinating and ensuring accountability in health, population and nutrition activities and achieving the stated goals (health, population, nutrition sector development programs) of government development plans in the health sector [3]. Through community clinics and satellite clinics, people in char, coastal and hilly areas will get health services. Good governance of the health sector will be ensured through public participation in the management of community clinics. Telemedicine and interconnected medical facilities in different remote and marginal areas of the country will further strengthen community clinics and help to reduce inequality between urban and rural people in the service sector.

Background of community clinics in Bangladesh

Bangladesh is one signatory to the 1976 "Alma Ata" Declaration, which promises to ensure 'health for all' by providing primary health care by 2000 [4]. The Government of Bangladesh took the initiative to set up community clinics (1 community clinic for every 6000 people) in 1996 to ensure access to primary health care for the country's rural population. The construction of community clinics started in 1996. In the Health and Population Sector Program of the Government of Bangladesh for the period 1996 to 2003, healthcare has been expanded at every level to ensure the provision of healthcare and to ensure the necessary healthcare for the poor, especially women (pregnant and lactating women) and children (including adolescents). The objective is to bring healthcare to the doorsteps of the people.

In this context, an Essential Service Package is set, and the goal is to provide healthcare to the poor, destitute and marginalized through community clinics. Between 1998-2001 10,723 community clinics and service delivery activities started in about 8000. The clinic is empowered to provide primary health care by training on the 'Essential Service Package' to the service providers. After the government change stopped the activities of community clinics from 2001 to 2008, this program was later re-launched in 2009 under the title 'Revitalization of Community Health Initiatives in Bangladesh'. Under the project, 13,500 community clinics are proposed to be set up so that each of these community clinics, as a one-stop service center, will provide primary health care to about 6,000 people [5]. Each clinic has three staff members. Community Health Care Provider (CHCP) has the primary responsibility among them. CHCP is supposed to stay in the clinic six days a week. He is assisted by a field worker from the Department of Health, known to all as a health assistant. He works from the clinic for three days. In addition, the field worker or family welfare assistant of the family planning department provides services to the clinic for three days. There is no post doctor in the clinic. Basically, the community clinic was an example of the government's "Public-Private Partnership" (Figure 1).

There are three steps of the health care system in Bangladesh (Figure 2). They are (i) Primary, (ii) Secondary (iii) Tertiary. Community clinics in the village serve primary services. Each



Figure 1 Purba charkauya community clinic.

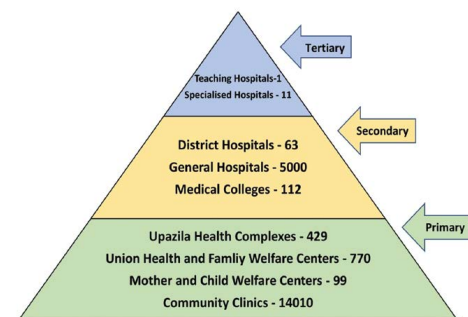


Figure 2 Healthcare system in Bangladesh [6].

union also has one health and family welfare center and a child welfare clinic. For higher levels of care, each sub-district has a health complex. The highest level of care is the district hospital, which delivers care in significant specialty areas. Many people bypass lower tiers of the health system to seek initial care from the district hospitals, where they are more likely to be seen by a medical doctor and where drugs and supplies are more available. A tertiary hospital is where patients are referred by primary care and secondary care. Tertiary hospitals serve major operations, sub-specialists and when sophisticated intensive care facilities are required.

Methodology

In order to ensure primary healthcare to the general public, grassroots include Upazila Health Complex, Union Health Complex, Family Welfare Center and Community Clinic. Community health center provide care for low income and underserved populations, these individuals are at greater risk of preventable chronic disease and often report higher rates of chronic conditions, such as hypertension and diabetes (Figure 3). So, we visited the East Charkaua Community Clinic. It is a community clinic located in Charkaua union of Barishal district. Its activities are established and run-in partnership with the local people and the government. Purba Charkaua Community Clinic is located about 6 km away from Barishal city. There is no other healthcare center nearby to ensure healthcare to the people of Charkaua Union. It has been providing healthcare to the people of the area since 1998. It does not have the ability to diagnose any major disease except the treatment of some very common

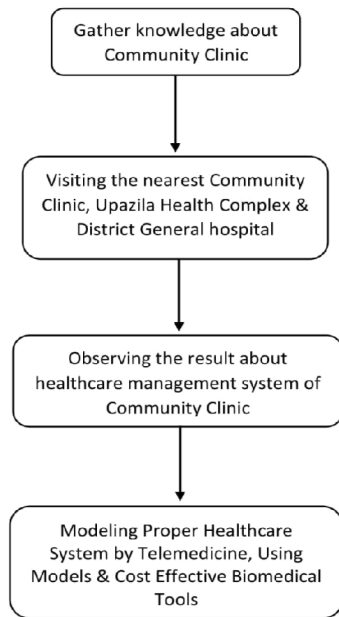


Figure 3 Block diagram of methodology.

diseases. It has a Community Health Care Provider (CHCP), a Health Assistant (HA) and a Family Welfare Assistant (FWA). Due to its remoteness from the city, it is not possible to have a full-time doctor here. The community clinic is served by CHCP 6 days a week and HA, FWA from 9am to 3pm on weekdays. It Provides services to mothers during pregnancy and postpartum. The community clinic provides primary health care to newborns, children, adolescents, young men and women and the elderly and also provides treatment of common ailments (fever, cold-cough, common wounds, diarrhea, pneumonia, etc.) and limited healing services. Besides, health education is provided on nutrition, breastfeeding, hygiene etc. Necessary information is provided, collected and stored, including the provision of family planning services to able-bodied couples. These services are useful and very necessary for the general public. But the government has a huge plan for community clinics, which has not been implemented yet. Our telemedicine services will be helpful in implementing this plan of the government.

Biomedical Laboratory Equipment

Portable Electrocardiogram (ECG):

ECG is one kind of test to check and record the different electrical activity of the heart. Willem Einthoven developed the ECG method in the early 1900s. The origin of the electrical signals measured by ECG is in the muscle fibers of individual parts of the heart. Sensors attached to the skin are used to measure the electrical activity produced by the heart each time it beats. These activities are recorded by a machine and are checked by a doctor to see if they're unusual (**Figure 4**). Portable ECG machines are widely available, yet there are limited data on their accuracy, physician and patient perceptions, and ease of use[7].

An ECG may be requested by a heart specialist (cardiologist) or any doctor who thinks there is a heart problem, including a general practitioner. The test can be carried out by a specially

trained healthcare professional at a hospital, a clinic or general practitioner surgery. An ECG is often used alongside other tests to help diagnose and monitor conditions affecting the heart.

Diagnostic ECG used to:

1. Inspect causes of chest pain or suspected myocardial infarction (heart attack).
2. Check Electrolyte abnormalities, such as hyperkalemia.
3. Used to test Cardiac stress.
4. Check symptoms such as shortness of breath, murmurs, fainting, seizures, funny turns, or arrhythmias.
5. Find out Clinical cardiac electrophysiology.
6. Examine irregular heart rhythms (arrhythmias).

Portable ultrasound:

Ultrasound is a widely used medical imaging method that uses sound waves to create a picture (also known as a sonogram) of organs, tissues, and other structures inside the human body [8]. It can also show the uterus and ovaries during pregnancy and monitor the developing baby's health and parts of the body in motion, such as a heart beating or blood flowing through blood vessels. An ultrasound can be used in different ways, depending on the type of ultrasound and which part of the body is being checked (**Figure 5**). Ultrasounds cannot create any ionizing radiation. It does not require any additional personnel and is relatively easy to use, and can be portable and operated with rechargeable batteries [9].



Figure 4 Portable ECG.



Figure 5 Portable ultrasound.

Diagnostic ultrasound used to:

1. Confirmation of pregnancy.
2. Check the health of the unborn baby.
3. Examine abnormalities in the abdomen and kidneys.
4. Investigate the cause of abnormal menstrual bleeding.
5. Check the thyroid gland for cancer or non-cancerous growths.
6. Inspect a breast lump to see if it might be cancer.
7. Examine if the blood is flowing at a normal rate and level.

Portable analyzer:

Hematology analyzers (HA) or automated blood cell counters are analytically and technically highly complex automated analyzers. These analyzers measure the complete blood count (CBC, also known as total blood count). The CBC consists of several parameters that are measured simultaneously. All concern the number, concentration (in the case of hemoglobin), and some additional (descriptive) parameters of the different blood cells. The CBC is measured daily virtually in all medical laboratories worldwide to screen for disease or abnormalities and follow-up of all kinds of medical therapies (surgery, transfusion, drugs, etcetera) [10].

Therefore, the analytical results generated by HA are on the basis of numerous medical interventions, and it is of paramount importance that these results are analytically valid (Figure 6). Thus, while implementing a new HA in a clinical laboratory, a verification process must ensure that the analytical performance is up to standard. Which standard should be met or which criteria should be used is at the discretion of the laboratory specialist [11].

Diagnostic blood analyzer used to:

1. Discover a wide range of conditions such as anemia, diabetes, autoimmune deficiencies, infections, and cancers.
2. Find out genetic information, viruses, and organ deficiencies.
3. Count the number of different types of red and white blood cells, blood platelets, hemoglobin, and haematocrit levels in a blood sample.
4. Check mean corpuscular hemoglobin concentrations.



Figure 6 Portable blood analyser.

Modeling Proper Healthcare System by Telemedicine & Cost-Effective Biomedical Tools

By implementing this model, we can further enhance the quality of health care in community clinics. Community Clinic is the earliest institution of healthcare in Bangladesh. There are community clinics in remote areas of the country. However, due to the fact that they were built in 1998, their condition is almost dilapidated. Community clinics need to be improved so that the rural people can get adequate health care. It is not possible for a doctor to be present there all the time as the community clinic is far away from the city [12]. We have used various digital services to solve this problem. We will use a room in the community clinic as a medical laboratory. There will be some portable testing equipment such as ECG, ultrasound, analyzer. Internet connected devices such as computers, laptops will be provided to each community clinic. With which a secondary hospital will be contacted through telemedicine services. Medical test reports will also go there through telemedicine. A doctor will provide treatment by looking at the patient's reports and observing him through telemedicine [13]. Necessary medicines will be provided from the community clinic. As a result, a doctor can provide medical services to a patient in a remote village while sitting in the hospital. The entire process will be completed by the presence of a Community Health Care Provider (CHCP). An ambulance will come to pick up the patient from the secondary hospital in case of emergency (Figure 7). In this way, the rural population can get quality health care from the community clinic without going to the Upazila Health Complex or Secondary Hospital.

Result and Discussion

Different types of patients can come to the community clinic such as children, pregnant mothers, the elderly and others. They will seek refuge with a Community Health Care Provider (CHCP) as soon as they arrive. CHCP will initially examine the patient's health. If he sees that it is not possible to provide medical services to the patient then he can refer the patient to the nearest secondary hospital. Otherwise, the patient will be referred to the medical laboratory of the community clinic on the advice of a doctor through telemedicine with the help of CHCP. A medical technician there will perform some basic medical tests in the lab under his charge. The Doctor will tell what kind of medical tests will be done, such as: ultrasound for the pregnant mother, ECG for the elderly. Test reports will be stored on the telemedicine server. Then the secondary hospital will be connected through telemedicine with an internet connected device like computer/laptop [14]. The medical technician will send the test reports there through telemedicine. Then a doctor will observe the patient and look at the reports. CHCP will help the patient while observing. The government needs to develop a telemedicine management system to manage the entire process. It will require skilled engineers from the IT sector to manage it.

All patient information will be stored on the telemedicine server. An account will be created for each patient against his NID. All his medical history will be preserved there. Birth certificates can be used for those who do not have NID. Later the telemedicine management system will be able to use this information for their needs. An ambulance will rush to the community clinic from the

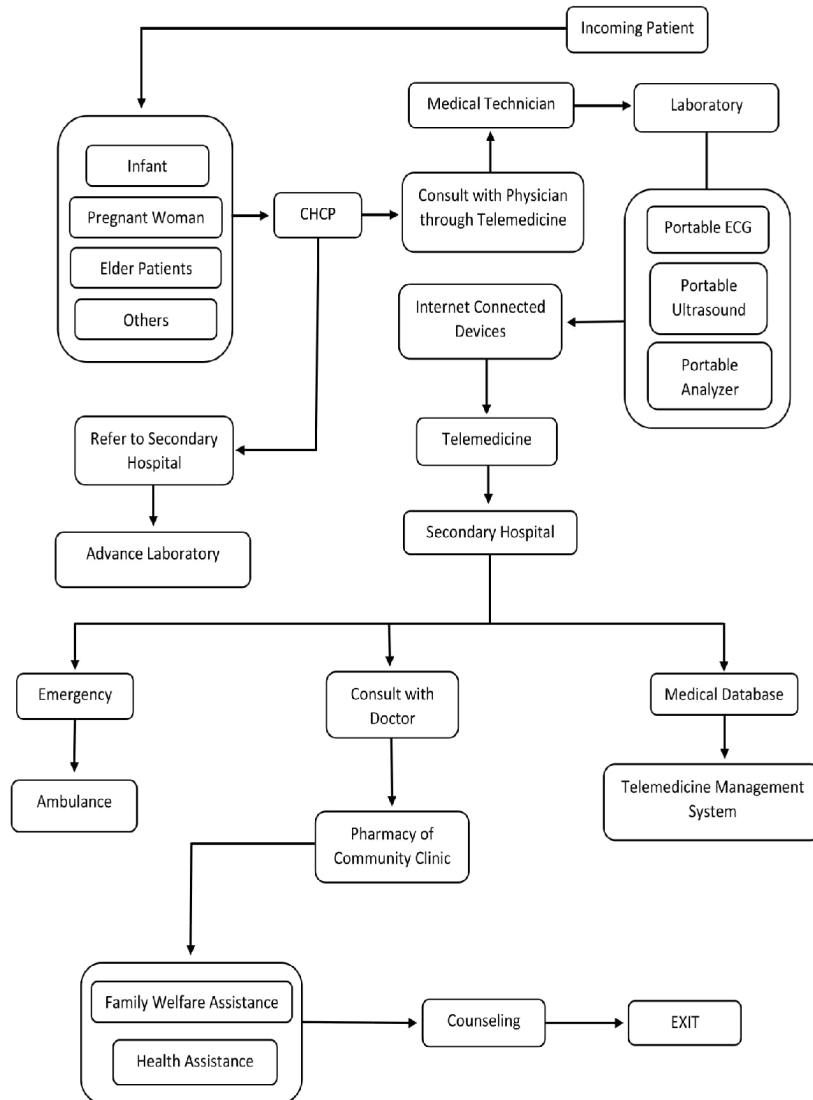


Figure 7 Schematic model of patient flow in community clinic.

hospital as soon as the doctor can diagnose a patient's emergency. The medicine prescribed by the doctor can be collected from the pharmacy of the community clinic. At present the community clinic is given 32 types of medicines but its number can be gradually increased. Family Welfare Assistance (FWA) and Health Assistance (HA) will provide various guidance and counseling to the patient to take medication and maintain good health. After all, an ordinary citizen can get the health care he / she deserves by visiting a community clinic.

In adverse environments such as storms or floods when it is not possible to go to a distant secondary hospital, the community clinic in one's area can be a breath of fresh air for the rural population. CHCP or HA can be retained as Medical Technician through training without appointing any other person as Medical Technician.

Limitations

Overall, we could not predict the expenditure and establishment

cost of the proposed model of the healthcare system due to the lack of funds and time scale of our research. Further researchers may be able to do further works based upon our proposed model of the healthcare system of community clinics.

Conclusion

In this work, we develop a healthcare management system model of community clinics for rural areas of Bangladesh. Our outcomes indicate the interconnected medical facilities through E-services. People's out-of-pocket expenditure increases due to the lack of a proper healthcare system, and families go broke because of higher medical expenses (Drugs, Treatment, Therapy).

Our paper provides a real concept about the connection of primary health care service to the secondary level district hospitals through telemedicine. This concept will make people's lives safer and more accessible.

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