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**PROJECTION OF HUMAN RESOURCE IN HEALTH (HRH)
FOR MEDICAL TECHNOLOGISTS**

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ACRONYMS

| | |
|--------|--|
| BBS | Bangladesh Bureau of Statistics |
| CLS | Clinical Laboratory Scientists |
| CLT | Clinical Laboratory Technicians |
| CRP | Center for Rehabilitation of the Paralyzed |
| CSF | Cerebrospinal fluid |
| DGHS | Directorate General of Health Services |
| GOB | Government of Bangladesh |
| HNP | Health, Nutrition and Population |
| HRH | Human Resource for Health |
| MLT | Medical Laboratory Technicians |
| MoH&FW | Ministry of Health and Family Welfare |
| QA | Quality Analysis |
| TOR | Terms of Reference |
| UHC | Upazila Health Complex |
| WHO | World Health Organization |

EXECUTIVE SUMMARY

In Bangladesh, a gradual development of paramedical health services (synonymously called allied health services) over past 15 years has resulted in a system with some well developed categories. Attention has been paid to the grass root-level workers based on the ideals of Primary Health Care (PHC). With the emphasis on Sector Wide Approach (SWAP) to HNP sector, viz. Health and Population Sector Program (HPSP) and Health, Nutrition and Population Sector Program (HNPS), there has been considerable movement in in-service training for some existing categories of health technologists at the Upazila (Thana) level. However, there is an acute shortage of most categories of qualified health technologists e.g. pharmacy assistants, radiographers and laboratory technicians. Moreover, a large number of untrained workers are practicing in diagnostic centers and laboratories in different cities and towns.

Bangladesh has lower than world standard number of health human resources in case of nurses, doctors and health technologists. This country has fewer hospital beds for population than global standard. Its doctor to nurse ratio is undesirable because the WHO standard is 1:3:6 (doctor: nurse: health technologists). In Bangladesh, it shows opposite directions 3: 3: 1 or less.

The objective of this report is to understand the current situation of health technologists in the country and forecast the need for health technologists for the period up to 2021. This report used both primary and secondary data for need assessment. Primary data were collected through a field survey on public and private medical care establishments. Sources of secondary data are MOH&FW and directorates under this ministry, World Health Organization (WHO) and research papers and reports available from different sources.

The supply of trained health technologists depends on existing of training institutes. Gonobiswabidyalaya and Center for Rehabilitation of the Paralyzed (CRP) offer M.Sc in Health Technology, and 3 public and 13 private health technology institutes offer 4years undergraduate program. The existing capacities of those institutes are 1210. There are 51 health technology institutes in the public and private sectors who offer 3 years diploma courses. The existing capacities of those institutes are 6956. The State Medical Faculty and Board of Technical Education have the responsibility to approve and monitor private health technology institutes. The production of health technologists in the country has many weaknesses:

- lack of subject-wise teachers;
- dearth of specialized teachers;
- teacher-student ratio is high; and
- shortage of laboratory facilities, books and equipments.

The Government of Bangladesh (GOB) is the primary employer of the health technologists in the country. The Directorate General of Health Services (DGHS) under the Ministry of Health and Family Welfare (MOHFW) is responsible for delivery of health technologists' education and services. . There are different categories of jobs in the public health sector in Bangladesh. In case of physiotherapist, about 83 percent was vacant. In case of pharmacists, lab technicians and radiographers/therapists vacancy were 21 to 22 percent.

Several experts expressed that our course curriculum just like regional standard. Because we adopt different course curriculum introduced by Indian and Thai health technology institutes. We needed to revise our course curriculum. It should be of global standard. Revision should be based on need, time and demand.

Health technologists start their job as a third class employee and get retirement from that post. It is considered as ill paid job. Because of very low salary and absence of career ladder and opportunity in this field, the demand to study remains low. There is also limited scope in the private sector and people are not aware of the actual market value of this profession. Limited opportunity detracts meritorious students to pursue this study. Most of the diagnostic center and private clinics appoint unqualified non-degree holders. Even in the public sector, numerous posts are vacant.

Scarcity of qualified teachers, books, laboratory and equipments are the major barriers to produce qualified health technologists. It is not profit oriented. That's why private entrepreneurs are not interested to invest in this field. GOB just goes for approval or recognition in the case of establishing private health technology institute. GOB does not allocate any fund to establish HT institutes in the private sector. Private health technology Institutes charge more. Most of the students are unable to afford the cost attaining a degree. GOB can introduce scholarship for poor and meritorious students.

Due to shortage of manpower, State Medical Faculty (SMF) is unable to monitor properly the private health technology institutes and as such there is no quality assurance. On the other hand technologists produced by institutes under Board of Technical Education are of poor quality. It should also be monitored properly.

GOB has established 3 new health technology institutes. Due to shortage of qualified teachers, Barisal Health Technology institute is unable to go for operation. Another 3 will be established within a short period.

Students of private HT institutes can use labs run by public hospitals. It is applicable for State Medical Faculty approved or nominated private HT institutes. It is not applicable for private HT institutes under Board of Technical Education.

It is estimated that about 62,392 health technologists will be required to establish effective doctor health technologists' ratio in the country in 2021. If we consider WHO standard 1:6 (doctor: health technologists) then 374,355 health technologists will be required in 2021. However, the supply of health technologists will be 16,289 by the year 2021.

There is a huge demand for health technologists in developed countries like Middle Eastern countries. A skilled and qualified health technologist has definite chance to get a respectable job in many foreign countries than a person with general education. Remittance from Bangladeshi workers is the primary source foreign currency earnings for this country. By producing high standard health technologists, this country may increase export of skilled manpower and increase its foreign exchange earnings.

The study has made the following recommendations for improvement of HR for the medical technologist:

1. Create job market for health technologists in the country because job potential will encourage more people to join this profession. Government may play role in job market by increasing the size of health technologists in public sector at par the global minimum standard.
2. Vacant posts in the public sector should be filled up through recruitments. The government may play another role in the job market as regulator. It is necessary to formulate rules and regulations and impose those strictly on the private sector so that sufficient numbers of qualified health technologists are appointed.
3. Upgrade the health technology education system in the country. It should be of global standard.
4. There are many short-trained or untrained health technologists in the private sector. . Training programmes may be arranged for these experienced but unqualified health technologists. Some form of formal certificates and recognitions may be arranged for these people. It will give them professional identity and may improve their skills and quality of services.

CHAPTER 1: INTRODUCTION

1.1 Background

Human resources play a critical role in delivering health services to the population. Health planners and decision makers have to ensure that the right number of people, with the right skills, is at the right place at the right time to deliver health services for the population needs, at an affordable cost.¹ Planning the health workforce is not only a technical process, but also a political one, as decisions on the number, types and distribution of health workers depend on the political choices and values enshrined in the organization of national health systems². Therefore, the methods chosen to estimate human resources requirements reflect the political and economic choices and social values that underlie a particular health care system.³ For a number of reasons many countries lack adequate human resources needed to deliver essential health interventions, including limited production capacity, emigration of health workers, poor mix of skills and demographic imbalances. It is increasingly recognized that the effective mobilization of the health work force is the single most important obstacle to improving the performance of health systems and achieving key health objectives, particularly in developing countries like Bangladesh⁴. In Bangladesh, a gradual development of paramedical health services (synonymously called allied health services) over past 15 years has resulted in a system with some well developed categories. Attention has been paid to the grass root-level workers based on the ideals of Primary Health Care (PHC). With the emphasis on Sector Wide Approach (SWAP) in the HNP sector, viz. Health and Population Sector Program (HPSP) and Health, Nutrition and Population Sector Program (HNPS), there has been considerable movement in in-service training for some existing categories of health technologists at the Upazila (Sub-district) level. However, there is an acute shortage of most categories of qualified health technologists e.g. pharmacy assistants, radiographers and laboratory technicians. Moreover, a large number of untrained workers are practicing in diagnostic centers and laboratories in different cities.⁵

It is observed that currently there are no adequate statistics⁶ about how many health technologists are required at different clinics, diagnostic centers and hospitals of the country. Again the Government of Bangladesh (GOB) is not fully aware of the number of health technologists required for different specialties at home and abroad. Without a comprehensive situation analysis on the workforce of health technologists, improvements of career and promotion of images of health technologists will be difficult. Hence, a need assessment study is now essential to arrive at a realistic and reliable projection of demand for health technologists in Bangladesh. In this context, this study is an attempt to evaluate the existing situation of health technologists in

¹ Dreesch et al (2005), "An approach to estimating human resource requirements to achieve the Millennium Development Goals", *Health Policy and Planning*, 20(5),267.

² Fulop T and Roemer MI (1987), "Reviewing health manpower development. A method of improving national health systems," *Public Health Papers*, 83.

³ Dreesch et al (2005), " An approach to estimating human resource requirements to achieve the Millennium Development Goals", *Health Policy and Planning*, 20(5),267

⁴ World Health Organization(2010), *Models and tools for health workforce planning and projections*, Geneva.

⁵ Health Economics Unit(HEU), Ministry of Health and Family Welfare(MOHFW), Bangladesh.

⁶ Hasan, Abu Hena Reza (2008), *Need Assessment Study on Nurses in Private and Public Sectors*, KATALYST and RTM International.

Bangladesh. This needs assessment study analyses demand and supply of health technologist's labor force up to 2021. It evaluates expected imbalances in demand and supply of health technologists in Bangladesh for the specified period and provides strategic suggestion to improve the situation in the country.

Medical technology

Medical technology refers to the diagnostic or therapeutic application of science and technology to improve the management of health conditions. Technologists may encompass any means of identifying the nature of conditions to allow intervention with devices, pharmacological, biological or other methods to increase life span and /or improve the quality of life.⁷ Medical technology is any intervention that may be used to promote health, to prevent, diagnose or treat disease or for rehabilitation or long-term care. This includes the pharmaceuticals, devices, procedures and organizational systems used in health care. Medical technology is a part of the health technology which encompasses a wide range of health care products and, in one form or another, is used to diagnose, monitor or treat every disease or condition that affects humans.⁸ Medical technology extends and improves life. It alleviates pain, injury and handicap. Its role in health care is essential. Incessant medical technology innovation enhances the quality and effectiveness of care. Billions of patients worldwide depend on medical technology at home, at the doctor's, at hospital and in nursing homes.⁹

Medical technologists

Medical technologists is a health care professional who performs chemical, hematological , immunologic , microscopic and bacteriological diagnostic analyses on body fluids such as blood, urine, sputum, stool, cerebrospinal fluid (CSF), peritoneal fluid, pericardial fluid, and synovial fluid, as well as other specimens. These professionals may be referred to as Medical Laboratory Technicians (MLT) or as Clinical Laboratory Scientists (CLS) and Clinical Laboratory Technicians (CLT) depending on education, certification and /or licensure.¹⁰ Medical technologists perform complex chemical, biological, hematological, immunologic, microscopic, and bacteriological analyses, including:

- Microscopically examine blood and other body fluids.
- Make cultures of body fluid and tissue samples to determine the presence of bacteria, fungi, parasites, or other microorganisms.
- Analyze samples for chemical content or chemical reaction and determine concentrations of compounds such as blood glucose and cholesterol levels.
- Type and cross-match blood samples for transfusions.
- Evaluate test results, develop and modify procedures, and establish and monitor programs to ensure the accuracy of tests.
- Some supervise others in the laboratory.¹¹

⁷ Dictionary.babylon.com

⁸ Wikipedia, the free encyclopedia

⁹ Wikipedia, the free encyclopedia

¹⁰ Wikipedia, the free encyclopedia

¹¹ American Medical Technologists, Available at: www.amt1.com

1.2 Importance of Health Technologists in Health Care

The human resource for health (HRH) consists of five groups of people – doctors, nurses, technologists, managers and auxiliary services employees. The doctors and nurses dominate the health system because the visibility of their activities to people who take medical care from health organizations. Without undermining the role of doctors and nurses, the critical role of the health technologists may be emphasized. The operations of health systems are dependent on large number of medical procedures and process those are technology intensive. Improved medical technologies enhance effectiveness of medical procedures and help doctors and nurses providing better medical care. Availability of trained and skilled health technologists may ensure successful use of medical technologies in the health organizations. The laboratory technicians, pharmacists, radiographers, physiotherapists and electric technicians play vital supporting role for doctors and nurses. They perform functions like blood transfusion, diagnostics and laboratory tests, diagnostic imaging, emergency and essential surgical care, operate medical devices, ensures injection safety etc. Without health technologists people, many medical care procedures and devices remain inoperative.

The World Health Organization has been advocating strengthening of laboratory services (WHA Resolution 27.62, 1974) through the application of appropriate and cost-effective diagnostic and therapeutic procedures that are essential for the provision of quality health care and mitigation of human mortality, morbidity and misery. The need for an effective, responsive, high quality medical laboratory network within a developed and well organized health system is a recognized integral and vital part of patient services, and key to the success of the WHO disease prevention and control programs.¹²

In member countries of the Western Pacific Region, the health laboratories are mostly fragmented and in varying stages of development. Though WHO has been providing normative and technical support to the Member countries, it is observed that laboratories continue to attract low national priority, there is absence of national laboratory policies, they suffer from lack of adequate resources, lack regulatory systems, improper utilization and maintenance of equipment, non-availability of quality diagnostic kits and reagents on continuous basis and operating with weak quality systems.

WHO continued support to Member States in improving the quality and accessibility of clinical laboratories; capacity building in the form of Training of Trainers workshop (Vietnam); training laboratory staff from district health centers (Papua New Guinea); technical support for developing national laboratory policy (Vietnam, Cambodia); to conduct a comprehensive assessment of county-level laboratories (Mongolia); and guidelines and protocols for laboratory specimen transport (Mongolia).¹³

¹² WHO(2010), Available at: <http://www.wpro.who.int/sites/htl/overview.htm>

¹³ WHO(2010), Available at: <http://www.wpro.who.int/sites/htl/overview.htm>

An earlier research study on comparative quality of medical care between Bangladesh and India from the patients' perspective observed that Bangladeshi hospitals are inferior in technical and laboratory supports compared to Indian hospitals and Bangladeshi hospitals have less medical technologists than Indian hospitals as well.¹⁴ Another study on medical clinics in Dhaka showed that on average 8 percent of human resource of the clinics are health technologists and 15 percent of the health work force had qualifications in medical technologies.¹⁵ Another paper observed that lack of adequate technical supports in hospitals is one of determining factor that motivate patients to go to Indian hospitals from Bangladesh.¹⁶ Findings of studies expose shortage and low quality of medical technologists in the medical facilities of Bangladesh. A review of HRH of medical technologists may be useful to formulate future policies and strategies for medical technologists in the country.

1.3 Objectives of the Study

Needs assessment is a systematic study of a problem incorporating data and opinions from varied sources in order to make effective decisions or recommendations about what should happen next¹⁷. Needs assessment is the first step in planning any health promotion initiative. It is the process of identifying and analyzing the priority health problem and the nature of the target group for the purpose of planning any health promotion action¹⁸.

Definitions of needs assessments make the scope of this study very specific. It is intended to analyze the demand and supply of health technologists in the healthcare sector of the country using data from secondary and primary sources. The objective of this need assessment study is to understand the current situation of health technologists in the country and forecast the need for health technologists for the period up to 2021. Hence, objectives of this study are the followings:

1. To analyze the situation on medical technologists in Bangladesh
 - a. Level of availability of medical technologists in medical facilities of Bangladesh
 - b. Comparison of availability of medical technologist in Bangladeshi hospitals and other medical facilities with global standards
 - c. Annual demand for medical technologists in public sector, private sector and foreign countries
 - d. Annual supply of medical technologists of different types
2. To analyze the working situation of medical technologists
 - a. Level of utilization and vacant posts in medical facilities

¹⁴ Hasan, A. H. R., S. R. Howlader and K. Islam (2002). *Cross-border use of health care by Bangladeshi patients in India: A study of determinants*. Research Monograph. Institute of Health Economics, University of Dhaka.

¹⁵ Hasan, A. H. R. and S. A. Rahman (2002). Private Medical Clinics in Dhaka: An Analysis from Management Perspectives. *Dhaka University Journal of Business Studies*, Vol. XXIII, No. 2, December 2002.

¹⁶ Hasan, A H R (2007). Cross Border Trade in Health Services between Bangladesh and India: Implications for Global Health Systems. *Proceedings of 9th South Asian Management Forum*; 24-25 February 2007; Dhaka, Bangladesh.

¹⁷ Rossett, A. (1987) *Training Needs Assessment*. Englewood Cliffs, NJ: Educational Technology Publications.

¹⁸ Hawe, P., D. Degeling, & J. Hall, J. (1990). *Evaluating Health Promotion: A Health Workers Guide*. MacLennan and Petty Publishers, Sydney.

- b. Educational background of medical technologists and gap between Terms of Reference (TOR) and actual practices of recruitments
- c. Quality analysis (QA) of service delivery

3. To estimate demand and supply of medical technologist by 2021

1.4 Limitations of the Study

This study has made extensive use of secondary data from various sources. Availability of good quality secondary data may affect the quality of projections of this study. Especially forecasting demand for medical technologists in private sector may not be very reliable as sufficient relevant data are not available on number of beds in medical facilities and amount of new investments. Moreover, primary data collection of this study was not comprehensive enough to supplement these shortcomings. Many private sector facilities hesitated and sometimes declined to provide relevant data on existing and required technologists. Hence, proxy or alternate data have been used to develop and analyze the specified models.

CHAPTER 2: METHODOLOGY OF THE STUDY

It is mentioned earlier that situation of medical technologists is related to the existing situation of medical technologists in the context of Bangladesh. The status of medical technologists in Bangladesh and their working environment was explored by a field survey through collection of primary data. A cross-sectional survey at public and private health facilities was done using semi-structured interviewer administered questionnaires.

2.1 Demand and Supply of Medical Technologists

The demand for health technologists in the job market is a derived demand and originates from the utilization of health care services. Determinants of demand are the number of health care establishment in the country and quality of medical care provided by those health care providers. The socio-demographic, economic and cultural factors influence the demand for health technologists in the health system¹⁹. In particular, the size of population, prevalence of diseases, level of public expectation about quality of medical care, income level, gender, activities of providers and state of medical technologies affect the demand for medical services and thereby act as determinants of demand for technologist.²⁰ The supply of health technologists depends on three factors – income from the profession, availability of educational institutes to train people as technologists and tendencies to utilize better quality medical services by medical organizations.

Essentially the forecasting of demand and supply may be possible in two different methods or in combination of the two. In first method, the demand and supply of HRH in health technologists in the country estimated separately. Demand estimated by using the variables that play a role in the demand for health care, for example, population health status, income or economic well-being, access to health care, population demographics and strategy of medical authorities to provide types of medical procedures. The supply estimated on the basis of available data on fresh addition to health technologists stock from training institutes and other organization involved in developing manpower. Also the supply side needs to consider loss of manpower due to change of profession and death or retirement. The second may be an econometric one that may use advanced techniques of statistics like Markov process and manpower cohort analysis techniques. However, due to unavailability of adequate data, sophisticated econometric method is not suitable for this study. So, it considers the first method in general with some use of econometric techniques.

2.1.1 Demand Estimation

This study in fact uses the need assessment approach in order to project demand for health technologists in and from Bangladesh. A two-pronged approach adopted. The first approach estimated the need for health technologists in Bangladesh up to 2021 to support local demand for health technologists taking 2009 as the base year. The second approach estimated the demand for health technologists globally and set an achievable target of the market to be served by health

¹⁹ Zurn, P., M. R. D. Poz, B. Stilwell and O. Adams (2004). Imbalance in the health workforce. *Human Resource for Health*. <http://www.human-resources-health.com/content/2/1/13>.

²⁰ Cesa, F. and S. Larente (2004). Work Force Shortages: A Question of Supply and Demand. *Health Policy Research Bulletin, Health Canada*. Issue 8, May:12-18.

technologists from Bangladesh, thereby calculating an international demand for Bangladeshi health technologists. The demand for health technologists is the following where D is the demand:

$$D = \text{Internal Country Demand } (D_c) + \text{Foreign Country Demand } (D_f)$$

The health technologists provide auxiliary services to the doctors. The number of technologists necessary for each doctor may be a good approximation of demand for health technologists in a country. If P is the number of doctors, K is the number of health technologists of various categories necessary for each doctor, and i is the categories of health technologists, then local demand of health technologists is the following:

$$D_c = \sum_{i=1}^n PK_i$$

In case global ratio of doctor to health technologists is not the standard in Bangladesh, the total demand for health technologists is the function of health technologists required by public health services and present norm of recruitment of health technologists in private health care establishments. Hence, if G is the number of posts of health technologists in public health establishments, N is private sector health establishments and r is average number of health technologists employed in each private health establishments, then local demand of health technologists may be estimated as following:

$$D_c = G + rN$$

The foreign demand for health technologists from Bangladesh is dependent on global demand for migrated health technologists. When total annual flow of global migration of health technologists is M and the expected share of Bangladeshi health technologists in it is s then the foreign demand for health technologists from Bangladesh is given below: $D_f = sM$ $\{s \leq 0.05\}$ This paper assumes a very conservative approach that the contribution of Bangladesh in global migration of health technologists should not be more than five percent of total.

2.1.2 Supply Estimation

The supply of health technologists is dependent on the capacity of schools engaged in training health technologists. However, it is necessary to differentiate between flow and stock of health technologists in the country. The flow of health technologists is the fresh graduates coming out of training institutes (T_f). The stock consists of existing number of technologists (T_s) plus new supply minus people left the profession through retirements or for other reasons (T_r). Hence, the total supply stock of health technologists may be the following:

$$S = T_s + T_f - T_r$$

2.1.3 The Demand-Supply Gap

The demand-supply gap is the difference between demand for health technologists and corresponding supply in terms of stock. The following the equation of demand-supply gap:

$$\text{Gap} = D - S$$

The situation of $S > D$ is surplus of health technologists in the country and $S < D$ is deficit of health technologists.

2.2 Data Sources

Secondary data in the form of national-level statistics on the various regressors collected from the Ministry of Health and Family Welfare (MOHFW), the Directorate General of Health Services (DGHS), Bangladesh Bureau of Statistics (BBS) and World Health Organization (WHO). On the other hand, the planned medical facilities in the pipeline took into account to project the number of medical facilities in the future to predict the number of technologists. The situation analysis of medical technologists and the working situations needs primary surveys on medical facilities, health care managers, doctors, nurses, patients and health technologists. The survey conducted across Bangladesh.

2.3 Sampling Coverage need to say about sampling technique

For the primary data collection, the sampling plan of medical facilities given in the table 1 below. Detailed administrative data on health technologists collected from the medical establishments. In addition to general information on health technologists, the interviewers collected data from health care administrators, doctors, nurses, and the health technologists. Numbers of interviewees are as follows:

| Group | Number |
|-------------------------------------|------------|
| Health care managers/administrators | 95 |
| Doctors | 196 |
| Nurse | 107 |
| Health technologists | 292 |
| Total | 690 |

Table 1.1: Sampling Coverage

| Division | Medical College | District Hospital | UHC | MCWC | Private Hospital/Clinic | NGO Hospital/Clinic | Diagnostic Center | Specialized Hospital |
|------------|-----------------|-------------------|-----|------|-------------------------|---------------------|-------------------|----------------------|
| Barisal | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| Chittagong | 1 | 1 | 1 | - | 1 | 1 | 2 | 1 |
| Dhaka | 1 | 1 | 1 | - | 1 | 1 | 2 | 1 |
| Khulna | 1 | 1 | 1 | - | 1 | 1 | 2 | 1 |
| Rajshahi | 2 | 2 | 2 | - | 2 | 2 | 4 | 2 |
| Sylhet | 1 | 1 | 1 | - | 1 | 1 | 2 | 1 |

CHAPTER 3: ANALYSIS OF THE EXISTING SCENARIO OF MEDICAL TECHNOLOGISTS IN BANGLADESH

The HNP sector of Bangladesh has been suffering from acute shortage of health human resources. Its ratio of health human resource to population is the lowest among other countries.

3.1 Comparison with the Global standard

Using the World Health Statistics 2010, some health systems related statistics of Bangladesh are compared with the world standard. Table 3.1 presents the data. It shows that Bangladesh has lower than world standard number of health human resources in case of nurses, doctors and allied health workers. This country has fewer hospital beds for population than the global standard. Its doctor to nurse ratio is undesirable because the WHO standard is 1:3:6 (doctor: nurse: health technologists). In Bangladesh, it shows an opposite direction 3: 3: 1 or less.

Table 3.1: Comparison of health statistics of Bangladesh with global standard

| Health Workers and Other Components | Global | South-East Asia Region | Bangladesh |
|--|--------|------------------------|------------|
| Physicians or Doctors per 10000 population | 14 | 5 | 3 |
| Nursing and Midwifery personnel per 10000 population | 28 | 11 | 3 |
| Dentistry personnel per 10000 population | 3 | <0.5 | <0.5 |
| Pharmaceutical personnel per 10000 population | 4 | 4 | 1 |
| Environmental and Public Health Workers per 10000 population | | | <0.5 |
| Community Health Workers per 10000 population | | 1 | 1 |
| Hospital Beds per 10000 population | 27 | 11 | 4 |
| Lab Technicians per 10000 population | 2 | | 0.3 |
| Other Health Workers per 10000 population | | | 0.4 |
| Nurse to Doctor Ratio | 2 | 2.2 | 1 |

Source: World Health Statistics 2010 and World Health Report 2006

3.2 Demand for Medical Technologists: Public Sector

The Government of Bangladesh (GOB) is the primary employer of the health technologists in the country. The Directorate General of Health Services (DGHS) under the Ministry of Health and

Family Welfare (MOHFW) is responsible for the delivery of health technologists' education and services. There are different categories of jobs in the Government health sector of Bangladesh. Table 3.2 shows the employment situation of paramedic service related employees in the government sector. In case of the positions of physiotherapists, about 83 percent was vacant. In case of pharmacists, lab technicians and radiotherapists, reported vacancy is 21 - 22 percent.

Table 3.2: Distribution of medical technologists posts by type of responsibilities in public sector

| Category of Posts | Sanctioned Posts | Employed | Vacant Posts | Vacancy as percentage of sanctioned posts |
|--------------------------------------|------------------|----------|--------------|---|
| Pharmacist | 2834 | 2207 | 627 | 22.12 |
| Medical Technologist (Lab) | 1773 | 1408 | 365 | 20.59 |
| Medical Technologist (Dental) | 517 | 475 | 42 | 8.12 |
| Medical Technologist (Radiography) | 695 | 646 | 49 | 7.05 |
| Medical Technologist (Radiotherapy) | 38 | 30 | 8 | 21.05 |
| Medical Technologist (Physiotherapy) | 185 | 32 | 153 | 82.70 |
| Total | 6042 | 4798 | 1244 | 20.59 |

Source: Health Bulletin 2009, DGHS.

3.3 Supply of Medical Technologists

The supply of trained health technologists depends on the existing training institutes. The type of training institutes and number of seats are shown in Table 3.3 below. Gonobiswavidyalaya and Center for Rehabilitation of the Paralyzed (CRP) offer M.Sc in Health Technology, and 3 public and 13 private health technology institutes offer 4-years undergraduate program. The existing capacities of those institutes are 1210.

There are 51 health technology institutes in the public and private sectors who offer 3 years diploma courses. The existing capacities of those institutes are 6956. The State Medical Faculty and Board of Technical Education have the responsibility for approval and monitoring of private health technology institutes. The production process of health technologists in the country has many weaknesses:

- There is a lack of subject-wise teachers;
- There is a dearth of specialized teachers,
- Teacher-student ratio is high; and
- There is a shortage of laboratory facilities, books and equipments.

Table 3.3: Capacity of health technology institutes

| Degrees/Training | Type of Teaching Institute | Number of Institutes | Number of Seats |
|------------------------------|-----------------------------------|-----------------------------|------------------------|
| MSc in Health Technology | Government | - | - |
| | Private | 2 | 65 |
| | Total | 2 | 65 |
| BSc in Health Technology | Government | 3 | 145 |
| | Private | 13 | 1065 |
| | Total | 16 | 1210 |
| Diploma in Health Technology | Government | 3 | 1010 |
| | Private | 48 | 5946 |
| | Total | 51 | 6956 |
| Total Capacity | | | 8234 |

Source: Health Bulletin 2009, DGHS.

CHAPTER 4: FINDINGS FROM THE SURVEY OF HEALTH FACILITIES

As a part of need assessment of human resources for health technologists in the country, this study conducted a survey from April to June 2010 on hospitals and clinics in both public and private sectors to collect primary data. It was a quick review of the health technologists' scenario in the HNP sector of the country rather than an in-depth study. It covered 690 organizations, 299 in public sector and 391 in private sector from all six divisions of the country. The sample includes public sector hospitals from all tiers – Upazila Health Complexes (UHC) to tertiary level hospitals like Medical College Hospitals and Post-graduate Hospitals. . The survey used two formats - A structured questionnaire was administered to collect data directly from the providers in the hospitals. The second method was observation. The field investigators observed the activities in the hospitals and discussed with staffs to find supportive and additional data from the facilities.

4.1 Respondents

Table 4.1 indicates that 42.3 percent respondents were health technologists, 28.4 percent were doctors and only 13.8 percent were managers.

Table 4.1: Respondents by category

| Category | Frequency | Percent |
|---------------------|-----------|---------|
| Manager | 95 | 13.8 |
| Doctor | 196 | 28.4 |
| Health Technologist | 292 | 42.3 |
| Nurse | 107 | 15.5 |
| Total | 690 | 100.0 |

4.2 Educational Background of the Respondents

Table 4.2 depicts that most of the respondents-thirty percent had a Diploma certificate. Twenty seven percent respondents were medical graduates having a MBBS degree. Twenty six percent respondents completed 10 to 12 years education.

Table 4.2: Respondents by level of education

| Education Level | Frequency | Percent |
|-----------------|-----------|---------|
| SSC | 97 | 14.1 |
| HSC | 90 | 13.0 |
| BCom /BA/ BSc | 66 | 9.6 |
| MBBS | 189 | 27.4 |
| Master Degree | 29 | 4.2 |
| BDS | 4 | 0.6 |
| Diploma | 207 | 30.0 |
| FCPS | 8 | 1.2 |

| | | |
|-------|-----|-------|
| Total | 690 | 100.0 |
|-------|-----|-------|

4.3 Perceived Need for Health Technologists

Table 4.3 reveals that 70.7 percent respondents hold the view proper identification of disease is the key to improve the health care of the country. Near about 10 percent respondents emphasize on good treatment. On the other hand, 8.7 percent respondents expressed friendly behavior with the patient is another factor to contribute positively in the health care of the country.

Table 4.3 Perceived role of health technologists to improve health care of the country

| Responses (n=690) | Frequency | Percent |
|---|-----------|---------|
| Proper identification of disease with their skill | 488 | 70.7 |
| Facilitate good treatment through improved skill | 68 | 9.9 |
| Friendly behavior with patients | 60 | 8.7 |
| Use of modern technology | 59 | 8.6 |
| By receiving improved training for providing better service | 47 | 6.8 |
| Can increase people's awareness through health education | 58 | 8.4 |
| Work with honesty | 35 | 5.1 |
| H T with better education can provide good service | 23 | 3.3 |
| By increasing post of health technologist | 22 | 3.2 |
| Recognizing Health technologist's work' | 22 | 3.2 |
| Others | 35 | 5.1 |
| Multiple responses | | |

Perception on the supply of health technologists in Bangladesh

Table 4.4 reveals that 20.7 percent respondents perceived that the current supply of health technologists was adequate. Conversely the vast majority (79.3 percent) perceived that the country was facing a situation where supply of health technologists is inadequate.

Table 4.4: Perception on the adequacy of supply of health technologists in Bangladesh

| Perception on the Supply of health technologists in Bangladesh | Frequency | Percent |
|--|-----------|---------|
| Adequate | 143 | 20.7 |
| Inadequate | 547 | 79.3 |
| Total | 690 | 100.0 |

Reasons for inadequate supply of Health Technologists in Bangladesh

Near about 68 percent respondents cited the reason for inadequate supply of health technologists due to insufficient number of health technology institutes; desired number of health technologists cannot be produced. Twenty percent respondents told that we didn't get recognition from our society. Nineteen percent respondents expressed the reason as limited scope in this field i.e. employment opportunity. Near about 12 percent respondents viewed shortage of qualified teacher as another obstacle to obtain adequate supply of health technologists (Table 4.5).

Table 4.5 Cited reasons for inadequate supply of Health Technologists in Bangladesh

| Responses (n=547) | Frequency | Percent |
|--|-----------|---------|
| Lack of adequate institute or college | 363 | 67.7 |
| No recognition of work | 106 | 19.8 |
| Limited job opportunities | 103 | 19.2 |
| Limited awareness about this profession | 66 | 12.3 |
| Lack of skilled teacher | 62 | 11.6 |
| Lack of proper training facilities | 47 | 8.8 |
| Attaining education at health technology is expensive | 37 | 6.9 |
| Lack of interest among learners to pursue HT education | 30 | 5.6 |
| Inadequate facilities and equipment in working place | 18 | 3.4 |
| Corruption and political problem | 9 | 1.7 |
| Don't know | 8 | 1.5 |

Multiple responses

4.4 Skill and ability of health technologists

Table 4.6 depicts that 23.6 percent respondents think that the health technologists of the country are qualified and capable to meet up the requirements. Conversely, 75.2 percent respondents expressed that the number of health technologists was inadequate and they perceived that many of them were unskilled or semiskilled and not capable enough to meet up the requirements.

Table 4.6: Skill and ability of health technologists

| Responses | Frequency | Percent |
|------------|-----------|---------|
| Yes | 163 | 23.6 |
| No | 519 | 75.2 |
| Don't know | 8 | 1.2 |
| Total | 690 | 100.0 |

Perceived quality of Health Technologists

Forty eight percent respondents hold the view that responsibility is the prime concern to become good quality health technologists. Eighty two percent respondents expressed that diagnostic skill and ability to provide accurate diagnostic report were among other important qualities for good quality health technologists (Table 4.7).

Table 4.7 Perceived good qualities of health technologists

| Responses | Frequency | Percent |
|---|-----------|---------|
| Ability and skill to diagnose properly | 134 | 82.2 |
| Should be responsible | 79 | 48.5 |
| Should gather experience in relevant field | 26 | 16.0 |
| Knowledge on latest technologies | 25 | 15.3 |
| Medical Technologist should be Diploma holders | 18 | 11.0 |
| Up-gradation of degree equivalent to BSC can produce better technologists | 12 | 7.4 |
| Should have foreign training | 6 | 3.7 |

Multiple responses

Up- gradation of Skills

Seventy nine percent of the respondents emphasized on training. More than 25 percent respondents hold the view of updating the health technologists with modern knowledge was essential to upgrade the skill. Near about eighteen percent respondents considered that improving the quality of education or training was pre-requisite for up gradation of their skills (Table 4.8).

Table 4.8: Suggested measures for up-gradation of skills

| Statement | Frequency | Percent |
|--|-----------|---------|
| By providing training | 411 | 79.2 |
| By giving knowledge on modern technology | 131 | 25.2 |
| Quality of education should be improved | 95 | 18.3 |
| Send for training abroad | 66 | 12.7 |
| Up-gradation of degree equivalent to BSC/BA | 45 | 8.7 |
| Giving recognition of work | 30 | 5.8 |
| Should complete diploma course | 30 | 5.8 |
| By employing skilled teacher | 21 | 4.0 |
| Emphasis should be more on practical learning and skilled training | 19 | 3.7 |
| Salary structure should be up-graded | 17 | 3.3 |
| By enhancing facilities and equipment | 14 | 2.7 |
| Recruitment of adequate number of teachers | 9 | 1.7 |
| Encourage learners to study health technology | 9 | 1.7 |
| Others | 9 | 1.7 |

Multiple responses

Availability and requirements of health technologists

Most of the respondents are unable to provide accurate and authentic answer regarding availability and requirements of health technologists. For this reason, we couldn't use the information provided for analysis.

4.5 Key Informants Opinion

Course Curriculum

Course curriculum for health technologists in the country is of regional standard. Because it follows different course curriculum introduced by Indian and Thai health technology institutes. The course curriculum needs revision. It should be upgraded to be of global standard. Revision should be based on need, time and demand.

Employment Opportunity

Health technologists start their job as a third class employee and get retirement from that post. It is a low paid job with almost no opportunity to get progress in professional career. Scope is also limited in the private sector, as most of the diagnostic centers and private clinics recruit non-degree holders. Even in the public sector, large number of posts remain vacant. We should have to create more posts. Due to this limited scope meritorious students are not interested to join this profession.

Obstacle to establish health technology institutes

Scarcity of qualified teachers, books, laboratory facility and equipment are the major hindrances to produce qualified health technologists. It is not profit oriented. That's why private entrepreneurs are not interested to invest in this field. GOB just goes for approval or recognition in the case of establishing private health technology institute. GOB does not allocate any fund to establish HT institute in the private sector. Private health technology institutes charge more tuition fees. Most of the students interested in enrollment are unable to afford that cost to obtain a degree. GOB can introduce scholarship for poor and meritorious students. Due to shortage of manpower State Medical Faculty, is unable to monitor properly the private health technology institutes. Basically, poor quality students are being produced by institutes under Board of Technical Education. It should be monitored properly.

Future plan to establish health technology institute

GOB already has established 3 new health technology institutes. Due to shortage of teachers, Barisal health technology institute is unable to go into operation. Establishment 3 more institutes is under process. .

Public-Private Partnership (PPP)

Provision should be made so that students of private HT institutes can use labs run by public hospitals. It is applicable for State Medical Faculty approved private HT institutes. But it is not applicable for institutes under Board of Technical Education.

Moreover, social status and recognition, career ladder or advancement are the major barriers to produce qualified health technologists.

CHAPTER 5: ESTIMATION OF DEMAND AND SUPPLY OF MEDICAL TECHNOLOGISTS BY 2021

Quality of medical care in a country and effectiveness of its health care system are directly dependent on the availability of adequate number of health technologists. Bangladesh has an acute shortage of health technologists. This chapter analyses the demand and supply of health technologists in the country to give a clear picture of health technologists' scenario up to 2021. Here, demand and supply analysis is not same as classical economic analysis. In economics market mechanism determines the demand and supply of any good or service. Here demand analysis is based on the perspective of effective health systems. Demand is basically the requirement of the health system of the country according to standards. Demand is calculated on the basis of doctors induced demand. It is derived from number of doctors existing in the country. Supply of health technologists is the ability of the educational institutes to produce qualified registered health technologists. This analysis is intended to help strategic decision making for improving human resource situation for health technologists in the country.

5.1 Demand Projections for Health Technologists

Demand for health technologists may be estimated on the basis of population size, number of doctors in the country, and number of hospital beds. It is quite difficult to estimate the future demand for health technologists on actual basis, especially in underdeveloped or developing nations, because of absence of long-term strategic plans. The MOHF&W of Bangladesh Government used to adopt five year strategic plans for HNP sector but makes frequent changes in the plan during implementation or often fails to implement properly due to resources constraints.

Table 5.1 Projected Demand of Health technologists/ Health Technologists up to 2021

| Year | Doctors(Actual) | Doctors (Projected) | Health Technologists or Health technologists (Projected)(1:1) | Health Technologists or Health technologists(Projected) (Standard)(1:6) |
|------|-----------------|---------------------|---|---|
| 1984 | 13500 | 11599.08308 | 11599.08308 | 69594.5 |
| 1985 | 14591 | 12971.87615 | 12971.87615 | 77831.26 |
| 1986 | 16090 | 14344.66923 | 14344.66923 | 86068.02 |
| 1987 | 16929 | 15717.46231 | 15717.46231 | 94304.77 |
| 1988 | 18030 | 17090.25538 | 17090.25538 | 102541.5 |
| 1989 | 18917 | 18463.04846 | 18463.04846 | 110778.3 |
| 1990 | 20006 | 19835.84154 | 19835.84154 | 119015 |
| 1991 | 21004 | 21208.63462 | 21208.63462 | 127251.8 |
| 1992 | 21749 | 22581.42769 | 22581.42769 | 135488.6 |
| 1993 | 22400 | 23954.22077 | 23954.22077 | 143725.3 |
| 1994 | 24911 | 25327.01385 | 25327.01385 | 151962.1 |
| 1995 | 26482 | 26699.80692 | 26699.80692 | 160198.8 |
| 1996 | 27,425 | 28072.6 | 28072.6 | 168435.6 |
| 1997 | 27,546 | 29445.39308 | 29445.39308 | 176672.4 |

| Year | Doctors(Actual) | Doctors (Projected) | Health Technologists or Health technologists (Projected)(1:1) | Health Technologists or Health technologists(Projected) (Standard)(1:6) |
|------|-----------------|---------------------|---|---|
| 1998 | 28,312 | 30818.18615 | 30818.18615 | 184909.1 |
| 1999 | 30864 | 32190.97923 | 32190.97923 | 193145.9 |
| 2000 | 30029 | 33563.77231 | 33563.77231 | 201382.6 |
| 2001 | 30,029 | 34936.56538 | 34936.56538 | 209619.4 |
| 2002 | 34,502 | 36309.35846 | 36309.35846 | 217856.2 |
| 2003 | 36,576 | 37682.15154 | 37682.15154 | 226092.9 |
| 2004 | 40,210 | 39054.94462 | 39054.94462 | 234329.7 |
| 2005 | 41,933 | 40427.73769 | 40427.73769 | 242566.4 |
| 2006 | 44632 | 41800.53077 | 41800.53077 | 250803.2 |
| 2007 | 44632 | 43173.32385 | 43173.32385 | 259039.9 |
| 2008 | 50,516 | 44546.11692 | 44546.11692 | 267276.7 |
| 2009 | | 45918.91 | 45918.91 | 275513.5 |
| 2010 | | 47291.70308 | 47291.70308 | 283750.2 |
| 2011 | | 48664.49615 | 48664.49615 | 291987 |
| 2012 | | 50037.28923 | 50037.28923 | 300223.7 |
| 2013 | | 51410.08231 | 51410.08231 | 308460.5 |
| 2014 | | 52782.87538 | 52782.87538 | 316697.3 |
| 2015 | | 54155.66846 | 54155.66846 | 324934 |
| 2016 | | 55528.46154 | 55528.46154 | 333170.8 |
| 2017 | | 56901.25462 | 56901.25462 | 341407.5 |
| 2018 | | 58274.04769 | 58274.04769 | 349644.3 |
| 2019 | | 59646.84077 | 59646.84077 | 357881 |
| 2020 | | 61019.63385 | 61019.63385 | 366117.8 |
| 2021 | | 62392.42692 | 62392.42692 | 374354.6 |

Table 5.1 indicates that doctors based demand is very high. About 62392 health technologists required to establish effective doctor health technologists' ratio in the country in 2021. When we will consider standard ratio 1:6 (doctor: health technologists) then 374,355 health technologists will be required in 2021.

5.2 Projected Supply of Health Technologists or Health technologists

Table 5.2 reveals the number of health technologists that will be available by the year 2021 is 16289. In 1980, number of medical technologists was 724 and projected figure was 1451. In 1990, it was 5211 and projected number of health technologists was 4708. In 2000, the actual number of health technologists was 7764. It has been increased gradually. In 2006, the actual number of health technologists was 10653 and projected number of health technologists was 9921.

Table 5.2: Projected supply of health technologists up to 2021

| Year | Existing No. of Health Technologists | Projected Supply of Health Technologists |
|------|--------------------------------------|--|
| 1980 | 724 | 1451.259 |
| 1981 | 810 | 1777.032 |
| 1982 | 910 | 2102.806 |
| 1983 | 995 | 2428.579 |
| 1984 | 1086 | 2754.353 |
| 1985 | 1137 | 3080.126 |
| 1986 | 2840 | 3405.9 |
| 1987 | 4071 | 3731.673 |
| 1988 | 4581 | 4057.447 |
| 1989 | 4867 | 4383.22 |
| 1990 | 5211 | 4708.994 |
| 1991 | 5298 | 5034.767 |
| 1992 | 5561 | 5360.541 |
| 1993 | 6206 | 5686.314 |
| 1994 | 6414 | 6012.088 |
| 1995 | 6881 | 6337.861 |
| 1996 | 7125 | 6663.634 |
| 1997 | 7195 | 6989.408 |
| 1998 | 7268 | 7315.181 |
| 1999 | 7460 | 7640.955 |
| 2000 | 7764 | 7966.728 |
| 2001 | 8130 | 8292.502 |
| 2002 | 8485 | 8618.275 |
| 2003 | 8794 | 8944.049 |
| 2004 | 9300 | 9269.822 |
| 2005 | 9900 | 9595.596 |
| 2006 | 10653 | 9921.369 |
| 2007 | | 10247.14 |
| 2008 | | 12053.62 |
| 2009 | | 12379.39 |
| 2010 | | 12705.17 |
| 2011 | | 13030.94 |
| 2012 | | 13356.71 |
| 2013 | | 13682.49 |
| 2014 | | 14008.26 |
| 2015 | | 14334.03 |
| 2016 | | 14659.81 |
| 2017 | | 14985.58 |
| 2018 | | 15311.35 |
| 2019 | | 15637.13 |
| 2020 | | 15962.9 |
| 2021 | | 16288.67 |

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

In absence of adequate and effective health technologists, doctors will go for wrong diagnosis and will prescribe wrong medicines. . This country has a acute shortage of qualified health technologists. Quality of medical care is directly dependent on the quality of health technologists. A common complaint of healthcare seekers in Bangladesh is that they do not get authentic report. In this country the ratio of doctor to health technologists is 3:1. Global standard doctor to health technologists' ratio is 1:6. Absence of health technologists devalues the contributions of the doctors and whole health system faces the blame of poor quality care in Bangladesh.

There are thousands of educated but unemployed youths in Bangladesh who may work as health technologists and earn livelihood. Hospitals are suffering from shortages of health technologists and youths in this country are suffering from shortages of jobs. But people are not interested in paramedic jobs because they do not get social recognition.

Low standard of education in health technology institutes is a deterrent to produce high quality health technologists. There is no initiative to modernize health technology education in the country. Again, many profit hungry private sector hospitals/clinics often do not employ qualified health technologists because they are comparatively “expensive”. These hospitals often employ unqualified persons as health technologists. The combined effect of low standard of health technology education and unemployment of qualified health technologists is reducing the standard and ability of paramedic services in hospitals of the country.

There is a huge demand for health technologists in developed countries like Middle Eastern countries. A skilled and qualified health technologist has definite chance to get a respectable job in many foreign countries that a person with general education does not have. Remittance from Bangladeshi workers is the primary source foreign currency earnings for this country. By producing standard health technologists, this country may increase export of skilled manpower and increase its foreign exchange earnings. They accept B.Sc. and M. Sc. degree holders and not diploma holders.

So, the recommendations of this study are the follows.

- Create job market for health technologists in the country because job potential will encourage more people to join this profession. Government may play pivotal role in job market creation by increasing the size of health technologists in public sector at par the global minimum standard. Vacant posts in the public sector should be filled up through recruitments. The government may play another role in the job market as regulator. It is necessary to formulate rules and regulations and impose those strictly on the private sector hospitals/clinics/diagnostic centre so that sufficient numbers of permanent qualified health technologists are appointed. Extensive monitoring is required in this field.
- Upgrade the health technology education system in the country. The course curriculum needs through revision. It should be of global standard. Revision should be based on need, time

and demand. GOB can initiate faculty development program which should include training abroad.

- The data on supply of health technologists is showing upward trend. The private health care institutions are creating hundreds of health technologists every year but the quality of this human resource is now under question. Moreover, the status of their degree is below the status required by foreign health care organizations. There should be public-private cooperation for improving quality and skill of new graduates in health technology from private institutes.
- There are many short-trained or untrained health technologists in the private sector hospitals and clinics. Training programmes may be arranged for these experienced but unqualified health technologists. Some form of formal certification and recognitions may be arranged for these people. It will give them professional identity and may improve their skill and quality of services.
- GOB can provide incentive to establish HT institute/laboratory in the private sector. GOB can introduce scholarship for poor and meritorious students.
- Proper monitoring is required for private health technology institutes basically which are recognized by Board of Technical Education.
- Private health technology institutes can provide scholarship for meritorious students and can charge reduced fees for those from poor family background.

This report has tried to give a description of the existing scenario of health technologists in Bangladesh. Basically supply and demand of health technologists has been projected to guide the policy makers to make their future plan. Other important issues that were discussed include course curriculum, career opportunities and various constraints and barriers to establish health technology institutes in both public and private sector. Public-Private Partnership (PPP) should be given serious consideration for the growth of this sector. Side by side development partners should be negotiated for necessary resource allocation and also for coming forward with other types of technical assistance. Government should identify what other roles various development agencies can play to strengthen both public and private sector for the production of quality medical technologist in the country.