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National
Skill Development
Corporation

Human Resource and Skill Requirements for the

Healthcare Services Industry Sector (2022)

– A Report

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Human Resource and Skill Requirements for the Healthcare Services Industry

Study on mapping of human resource skill gaps in India till 2022

Table of Contents

List of Figures

List of Tables

1. Environment Scanning and Competitiveness of the Healthcare Services sector

1.1. Overview of the Healthcare Services Sector[1]

As per the United Nations Development Programme (UNDP) Global Human Development Report (HDR) 2007, in spite of the absolute value of the Human Development Index (HDI) for India improving from 0.577 in 2000 to 0.611 in 2004 and further to 0.619 in 2005, the relative ranking of India has not changed much. India ranks at 128 among the countries with medium human development out of 177 countries of the world as against 126 in the previous year.

India ranks 4th in the pharmaceutical sector by volume and 8th in terms of its value. However we are yet to achieve a lot in terms of our health indices. In the statistics covered in the World Health Organization's (WHO) "World Health Report 2006", differences in the healthcare indices between India, developing and developed countries are seen in the table below:

Table 1: Comparison of basic indicators, health expenditure ratios and distribution of medical personnel between India and other countries

Parameter	India	China	USA	UK
BASIC INDICATORS				
Total fertility rate	3.0	1.7	2.0	1.7
Under-5 mortality rate (probability of dying per 1,000)	85	31	8	6
Life expectancy at birth (years)	62	72	78	79
HEALTH EXPENDITURE RATIOS				
Total expenditure on health as % of gross domestic product	4.8%	5.6%	15.2%	8%
Private expenditure on health as % of total expenditure on health	75.2%	63.8%	55.4%	14.3%
General government expenditure on health as % of total government expenditure	3.9%	9.7%	18.5%	15.8%
Out-of-pocket expenditure as % of private expenditure on health	97%	87.6%	24.3%	76.7%
Per capita total expenditure on health at average exchange rate (US$)	27	61	5711	2428
DISTRIBUTION OF MEDICAL PERSONNEL				

[1] Central Bureau of Health Intelligence – National Health Profile 2008, National Family Health Survey 3, Economic Survey 2007-08, MoHFW Annual Report 07-08

Parameter	India	China	USA	UK
Physicians per 1,000 population	0.6	1.06	2.56	2.3
Nurses per 1,000 population	0.8	1.05	9.37	12.12
Midwives per 1,000 population	0.47	0.03	-	0.63
Dentists per 1,000 population	0.06	0.11	1.63	1.01
Pharmacists per 1,000 population	0.56	0.28	0.88	0.51
Lab technicians per 1,000 population	0.02	0.16	2.15	0.34

Source: World Health Organization's "World Health Report 2006"

At the same time, the increasing trend of expenditure on social services by the Indian government (Centre and States combined) in recent years reflects the high priority attached to these sectors. Expenditure on social sectors as a proportion of total expenditure, after decreasing from 20.4% in 2002-03 to 19.5% in 2003-04, increased steadily to 22.3% in 2006-07 and 22.5% in 2007-08[2]. The Health Infrastructure in the country now includes[3]:

- 266 medical colleges, 268 Colleges for BDS courses and 104 colleges conduct MDS courses with total admission of 30,290, 20,080 and 2,069 respectively during 2007-08;
- 1,597 Institutions for General Nurse Midwives with admission capacity of 59,138;
- 461 colleges for Pharmacy (diploma) with an intake capacity of 27,735 during 2006-07;
- 9,923 hospitals having 4,80,306 beds;
- 1,44,988 Sub Centres, 22,669 Primary Health Centres and 3,910 Community Health Centres as on March 2006;
- 21,351 & 3,203 Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) dispensaries & hospitals during 2007;
- 903 Government licensed blood banks, 358 voluntary blood banks, 666 Private hospital blood banks; and,
- 483 other private commercial centres as of 2007.

Some of the important initiatives undertaken by the Government to address the requirements of healthcare include: the National Rural Health Mission (NRHM), funding for support mechanisms of Accredited Social Health Activist (ASHA) for every village, strengthening of primary health infrastructure and improving service delivery, implementation of the state-based surveillance program

[2] Economic Survey 2007-08
[3] Central Bureau of Health Intelligence – National Health Profile 2008

in the country, i.e. the Integrated Disease Surveillance Project (IDSP), focusing on AYUSH, family planning program for achieving Millennium Development Goals, etc.

For the users of healthcare services, the choice is increasing and the ability to afford the best is rising. Consumers are migrating from the single doctor nursing homes to a more organised hospital delivery format, analogous to the retail sector. There are benchmarks and brands of multi-locational providers across industry. Owing to information explosion, the Indian healthcare consumer is engaging in 'comparison shopping' - looking at quality healthcare not only in urban but also the rural areas and tier II cities.

1.2. Industry size and Growth of the Healthcare Services Sector

The size of the Healthcare Industry was about Rs. 2,93,555 crore in 2007-08, with about 95% being contributed by the Healthcare Delivery Segment. The industry is seen to grow at a 3 year CAGR (2004-05 to 2007-08) of about 12%. The size of the Healthcare Industry in India is as below:

Table 2: Size of Healthcare Industry in India

	2005	2006	2007	2008	CAGR (%)
Healthcare Delivery Segment	2,02,000	2,28,500	2,60,500	2,80,000	11%
Medical Equipment Segment	6,704	7,240	7,820	8,455	8%
Health Insurance Segment	1,739	2,359	3,200	5,100	43%

Source: Espicom, IRDA, IMaCS analysis

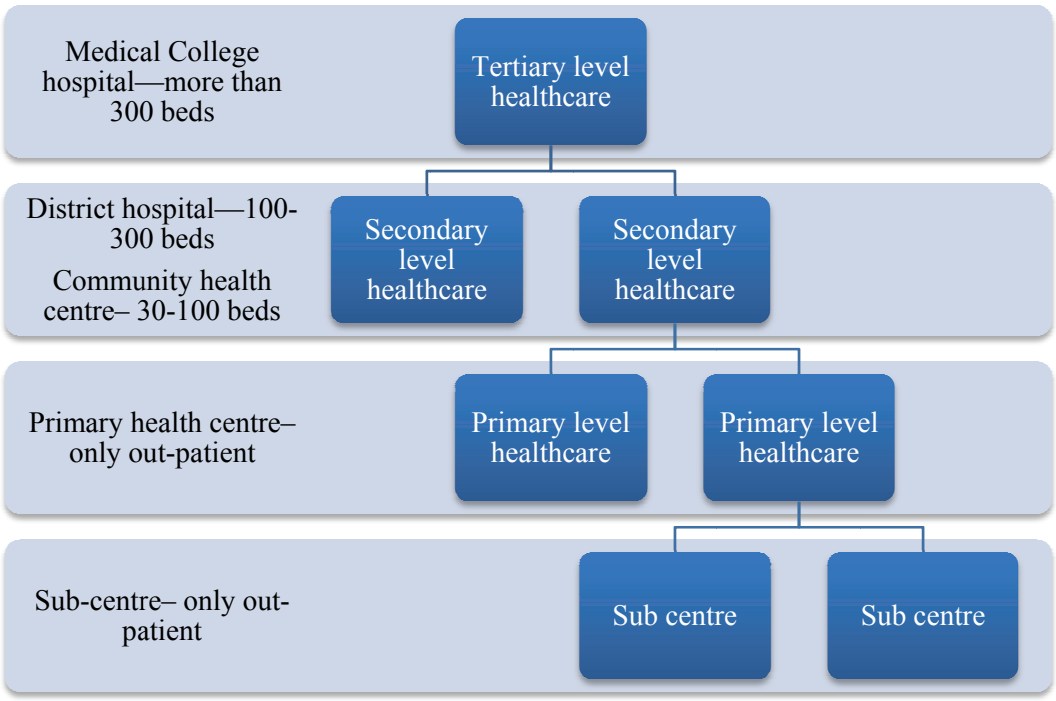
1.2.1. Various segments of the Healthcare Services sector

The segments of the Healthcare Services sector can be broadly classified into the Healthcare Delivery Segment, the Medical Devices Segment, and the Medical Insurance Segment.

- ***Healthcare Delivery Segment:*** The healthcare delivery segment comprises of healthcare providers. A Healthcare provider is generally defined to include health practitioners such as doctors, nurses, midwives and other therapists who deliver healthcare within the scope defined for their individual qualifications by law. In the current context, it would include the organisation/individual that delivers healthcare. Healthcare in India is delivered through public and private sector infrastructure. Hospitals are units wherein preventive, promotive, curative and rehabilitative healthcare services are offered to the masses for the complete physical, mental and social wellbeing. Health being a state subject, is delivered through the state health machinery of district hospitals, community health centres, primary healthcare centre and the sub-centres (public healthcare delivery system). Each hospital at the different levels operate as an independent unit for the level of care it delivers and for the rest makes suitable referral to the next higher tier and back for follow-up.

The Healthcare Delivery Segment in India can be represented as below:

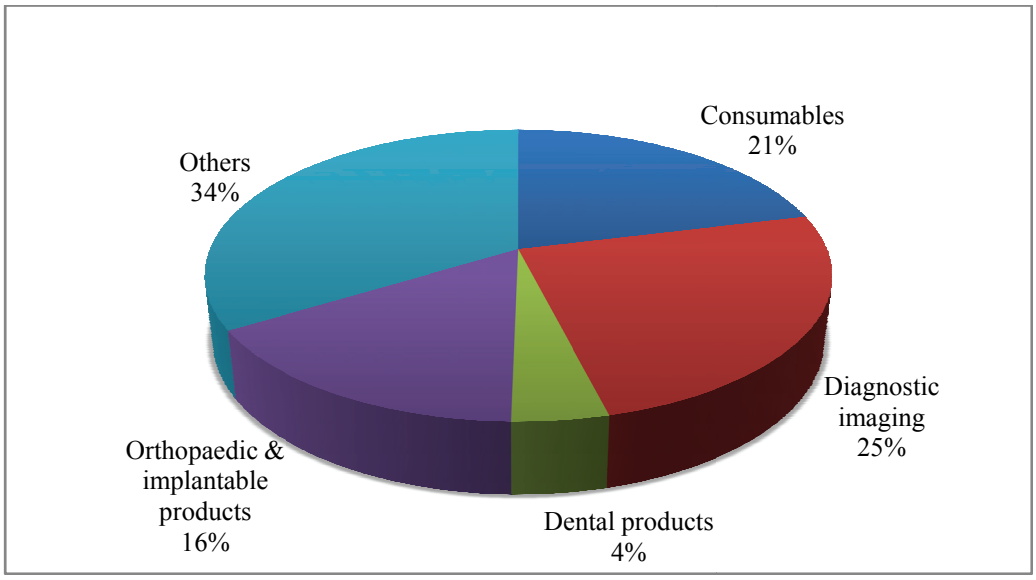
Figure 1: Healthcare Delivery Segment in India



Source: IMaCS analysis

- ***Medical Devices Segment:*** The role of complicated medical equipment in the diagnosis and treatment of illnesses such as cancer and coronary artery disease is very important, especially considering the emergence of specialty tertiary care centres in the private healthcare delivery sector. The medical equipment market is dominated by imports with 65-70% share of the medical equipment market. Imports primarily consists of the high-end equipment market e.g. MRI. The Indian manufacturers are generally concentrated in low-end electro-medical equipments. Broadly, the market for Medical devices in India can be split into: Consumables, Diagnostic imaging, Dental products, Orthopaedic products and implants and Others, as seen below:

Figure 2: Medical Equipment Segment in India



Source: Espicom

- ***Medical Insurance Segment:*** Medical insurance is a relatively new Industry in India, with General Insurance Corporation (GIC) and its four subsidiary companies and Life Insurance Corporation (LIC) of India offering health insurance packages, with very little in terms of marketing campaigns until 2000. The IRDA in 2000 opened up the Health insurance sector to private players, and since then there has been a flurry of activity, resulting in total premium collection rising from Rs. 761 crore in 2000 to around Rs. 5,152 crore in 2008. In the government's Rashtriya Swasthya Bima Yojana, the government pays the premium and insurance companies administer the claims through their empanelled hospitals. Medical insurance companies are generally involved only in selling the insurance policies and to some extent, handling of claims not made to Third Party administrators.

The growth rates of the three segments mentioned above are as below:

Table 3: Growth rates of various segments of the Healthcare Services Sector

Segment	Growth rate (CAGR%)
Healthcare Delivery Segment	11%
Medical Equipment Segment	8-10%
Medical Insurance Segment	35-40%

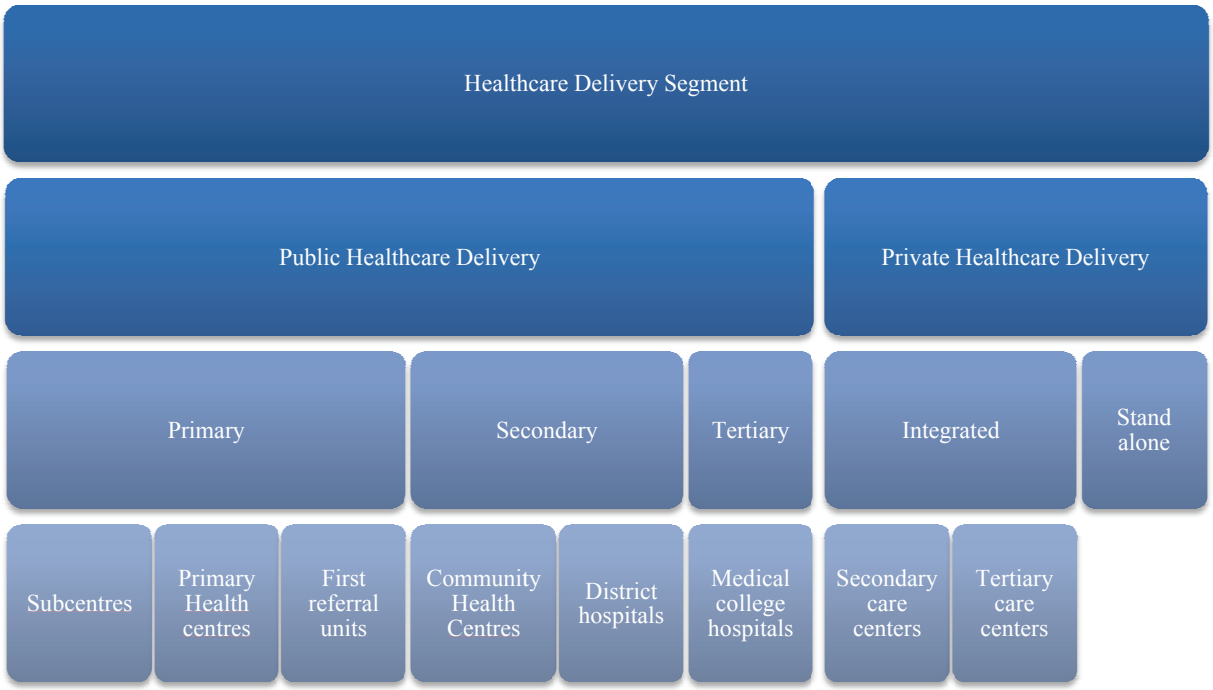
1.3. Value chain of the Healthcare Services sector

The value chains of the Healthcare Delivery segment, the Medical Devices Segment, and the Medical Insurance Segment are covered separately as below.

1.3.1. Value Chain of the Healthcare Delivery Segment

The value chain/structure of the Healthcare Delivery segment can be depicted as below:

Figure 3: Value chain / structure of the Healthcare Delivery Segment



Source: IMaCS analysis

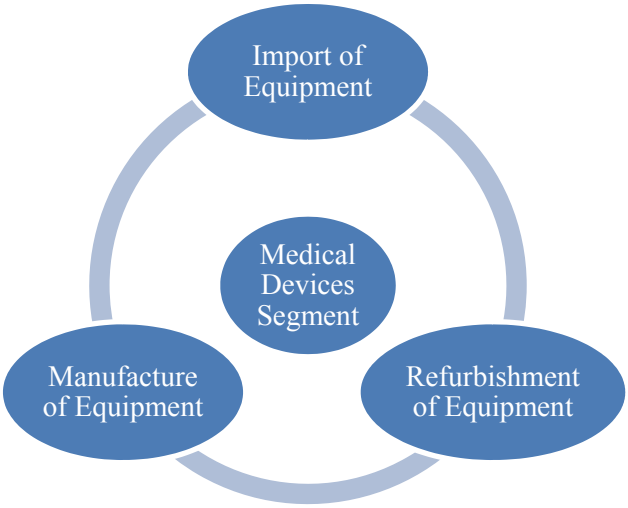
- ***Public Healthcare Delivery:*** The public healthcare delivery system in India is built in to cater to the minimum accessibility of healthcare for the people in the rural areas. Wherever there is a demand for additional healthcare, private healthcare delivery fills in. The public healthcare infrastructure consists mainly of Sub Centres (majority of the responsibilities relate to maternal and child welfare and prevention of diseases under the national health programs), Primary Health Centres (PHCs - cater to the primary level of preventive and curative care besides supervising the activities of subcentres), Community Health Centres (referral centre for PHCs) and District Hospitals.

- ***Private Healthcare Delivery:*** Private healthcare providers have come over to perform an increasingly important role in the last few decades. The private healthcare providers are classified on the basis of the number of beds and the complexity of care provided. Usually, the number of beds increases with the level of complexity, with a few exceptions in the form of some tertiary care setups that cater to only a single type of specialty. The integrated setup is an emerging business model which includes quaternary and ambulatory care services. Stand alone centres concentrate on a single aspect, and include private allopathic setups, private radiology and pathology diagnostic labs and blood banks.

1.3.2. Value Chain of the Medical Devices Segment

The Medical Devices Segment supports the Healthcare Delivery Segment. Medical equipment in India is manufactured domestically, imported or refurbished.

Figure 4: Value chain / structure of the Medical Devices Segment



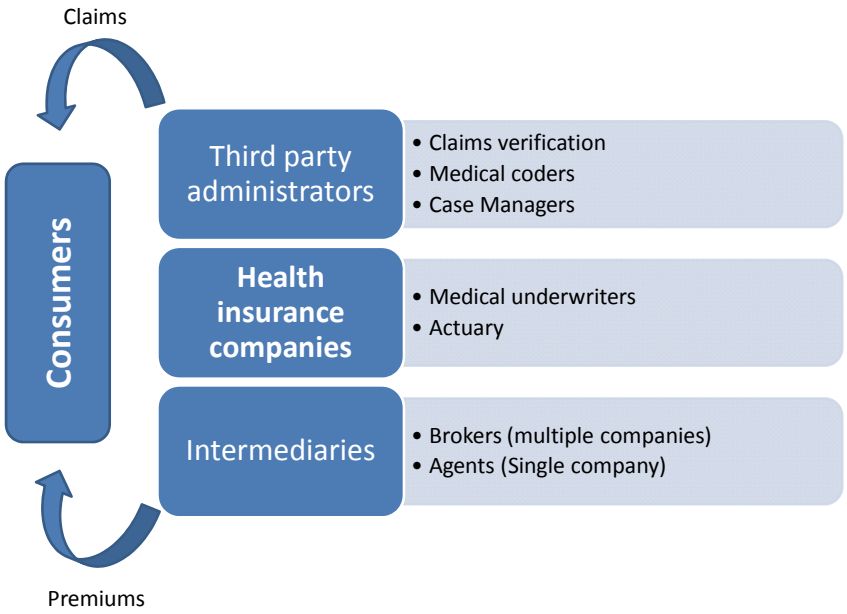
Source: Espicom, IRDA, IMaCS analysis

Imports constitute a major portion of this segment, especially for high-end equipment. Indian manufacturers generally manufacture low-end electro-medical equipment. Equipment may also be refurbished as required. As mentioned earlier, the market for Medical devices in India can be segmented as Consumables, Diagnostic imaging, Dental products, Orthopaedic products and implants and others, with Diagnostic Imaging accounting for the largest share of the pie.

1.3.1. Value Chain of the Medical Insurance Segment

The value chain / structure of the Medical Insurance Segment can be depicted as below:

Figure 5: Value chain / structure of the Medical Insurance Segment



Source: IMaCS analysis

- ***Health insurance companies:*** The health insurance companies are generally involved only in selling the insurance policies and to some extent handling of claims not made to third party administrators. Within these companies, medical underwriting pertains to the selection of customers to insure and assigning them to specific risk pools for which insurance premiums can be specifically determined. Once the underwriting is done, the actuaries perform the role of understanding the various kinds of financial risks associated with the policy, and use statistical methods to arrive at a suitable premium.

- ***Third Party Administrators:*** Third party administrators serve as facilitators in claims processing between the insurers and patients. The primary role of a TPA in India is to enable cashless hospitalisation for the patient. TPAs get a fixed commission of 5.5% for handling claims. Some of the claims in India are still handled by the insurers themselves.

- ***Intermediaries:*** Intermediaries can be brokers or agents. While agents are individuals who work on a commission basis for a single insurance company, insurance brokers may form a

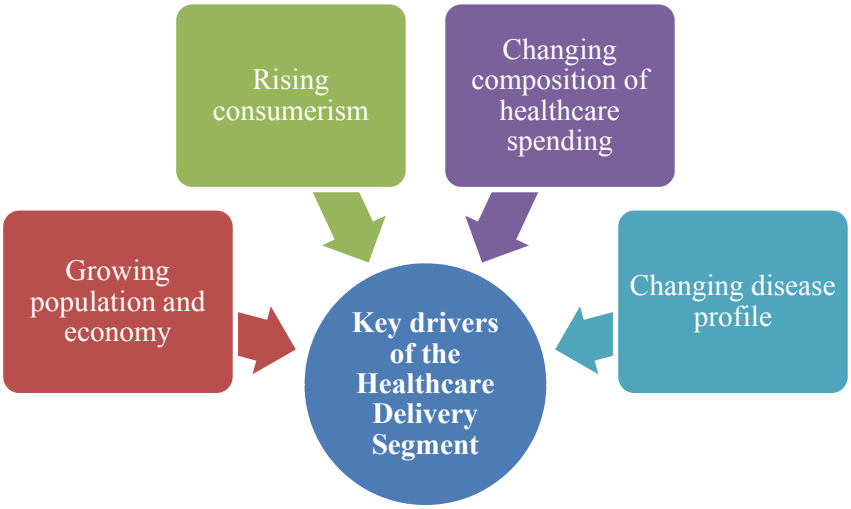
group and sell products belonging to different companies. The insurance brokers and agents are like salesmen for the insurance company, and are required to pass the licentiate exam by the Insurance Regulatory and Development Authority. More than the knowledge of medical terminology, they need to know about the terms and conditions governing any insurance policies

1.4. Demand Drivers of the Healthcare Services sector

1.4.1. Demand Drivers of the Healthcare Delivery Segment

The demand drivers for the Healthcare Delivery Segment are as below:

Figure 6: Demand drivers for the Healthcare Delivery Segment



Source: IMaCS analysis

- ***Growing population and economy:*** The population of India, which currently stood at 1.1 billion approximately and is increasing at an annual rate of 2%, is one of the major drivers of growth in the healthcare sector. India is expected to overtake China as the world's most populous nation by 2030 and the population of India is expected to cross the 1.6 billion mark by 2050. This increase in the population is primarily driven by decline in infant mortality, better healthcare facilities, Government emphasis on eradicating diseases like polio, hepatitis etc. and increasing life expectancy. It is estimated that by 2025, over 180 million Indians will be at-least 60 years of age i.e. triple the number exiting in 2004. The growing aged population is expected to place a massive burden on India's healthcare infrastructure and thus increase the need for further provision of healthcare facilities.

- ***Rising consumerism:*** Economic liberalisation in India has increased emphasis on prudent management, focusing on controlling healthcare costs. The new healthcare consumer, who is predominantly out-of-pocket payer is increasingly according importance to health, and is opting for 'comparison shopping'. The consumer of today is well informed and quality conscious and is migrating from the single doctor nursing home set up to a more organised hospital delivery format, analogous to retail sector, is more able to afford the best, has benchmarks across industry to depend on and is looking at quality healthcare not only in

urban but also the rural areas, which is a huge opportunity for existing players to diversify and the new entrants to secure a toe hold. Currently urban middle class constitute about 52.5% of the total share of households leading to higher demand for tertiary care.

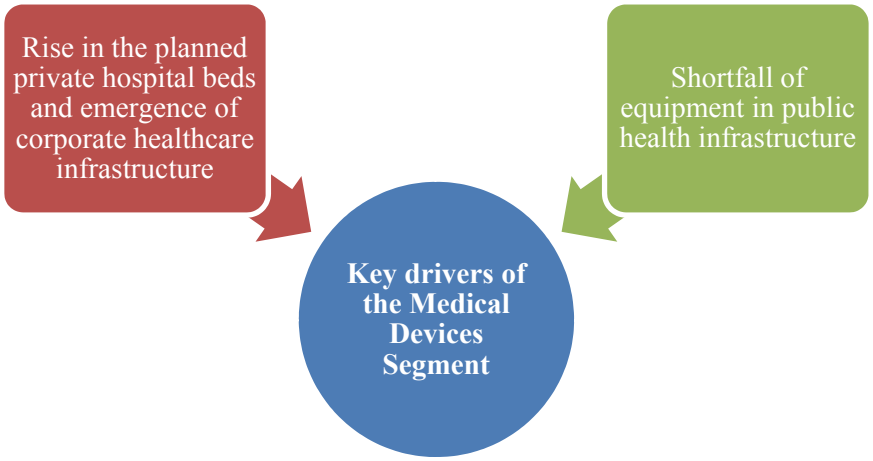
- ***Changing composition of healthcare spending:*** Currently, 61% of the total spending on healthcare in India is on outpatient services, out of which maximum is on chronic/acute infections like gastrointestinal, fever and diarrhoea. The remaining spend of 39% on the inpatient services is concentrated on diseases such as heart diseases, accidents, acute injuries and cancer. The divide of the total healthcare spend between the outpatient and the inpatient services is expected to change in future and the inpatient spend is expected to increase to 47% of the total, driven by rise in diseases especially cardiovascular and cancer. Currently the bed volume in India is 1,050,000, which is about 0.7 beds /1,000 persons; India needs 3.1 million additional beds by 2016, which is about 4 beds /1,000 persons.

- ***Changing disease profile:*** Change in demographics, socio economic mix and the changing lifestyle pattern has led to a change in the disease profile prevalent in the country. India is experiencing a rising share of the lifestyle related disease such as hypertension, cancer, diabetes, and cardio-vascular diseases. This shift is opening up opportunities for both the preventive and curative care and also driving the demand for multispecialty and super-specialty healthcare services, covering key therapeutic areas like cardiology, nephrology, oncology, and orthopaedics, and geriatrics, maternity and critical care. Also according to the WHO, the share of the non-communicable diseases is expected to increase to 57% in 2020 as compared to 29% in 1990. While cardiac, oncology and diabetes collectively accounted for 13% of the hospitalised cases in 2006 (36% of inpatient (IP) revenues in values), it would account for 20% of the hospitalised cases and 52.5% of the IP market size by 2016. Gastrointestinal, fever and others (communicable diseases, nutritional deficiency diseases) would continue to contribute to more than 50% of disease burden in India.

1.4.1. Demand Drivers of the Medical Devices Segment

The demand drivers for the Medical Devices Segment are as below:

Figure 7: Demand drivers for the Medical Devices Segment



Source: IMaCS analysis

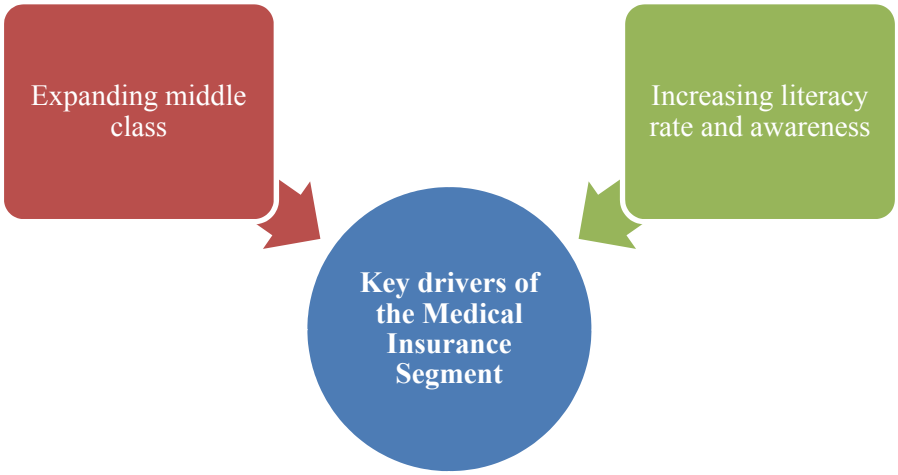
- ***Rise in the planned private hospital beds and emergence of corporate healthcare infrastructure:*** The Indian healthcare sector has seen the entry of several corporate players in the recent past. However, India requires more hospital beds in the future owing to burgeoning population and changing demographics. In 2007, the approximate number of hospital beds in India was 10,50,000 and the current shortage of beds is estimated to be in the range of 0.125 - 0.15 million beds. Investment is required to meet the target of 0.333 million beds in India. The bulk of new bed capacities being planned are by the private sector – this planned addition of hospital beds would result in increased demand for medical equipment.

- ***Shortfall of equipment in public health infrastructure:*** Government spend in health and family welfare has grown at a Compounded Annual Growth Rate (CAGR) of 19% during the last 3 years. The National Rural Health Mission (NRHM) expenditure is the highest accounting for 76-78% of the total expenditure that has been envisaged for capacity building (in terms of infrastructure, equipment and process improvement) of the Public healthcare facilities This, combined with the current shortage of medical equipment in public health facilities, provides a potential demand opportunity for medical equipment.

1.4.2. Demand Drivers of the Medical Insurance Segment

The demand drivers for the Medical Insurance Segment are as below:

Figure 8: Demand drivers for Medical Insurance



Source: IMaCS analysis

- ***Expanding middle class:*** The expanding middle class is an important factor driving the growth of the healthcare sector and especially the medical insurance segment. India has traditionally been a rural and agrarian economy with around 75% of the population still living in rural areas. However, the boom in the Indian economy is driving urbanisation and creating an expanding middle class. This has resulted in population having higher disposable income to spend on healthcare. The purchasing power of the Indian households is further boosted by the large number of women entering the workforce. According to 2001 census, 26% of the total workforce was constituted by women as compared to 22% in 1991, i.e. an increase of 400 basis points. The Indian market for the western pharmaceutical products is close to around 80% of that of the U.K. market; this has been majorly driven by the rising disposable income of households.

- ***Increasing literacy rate and awareness:*** The literacy rate of the country has increased from 52.2% in 1991 to 65.4% in 2001, driving the attention of the people towards healthcare services and leading to an increased spending on the healthcare services. People in India, especially in urban areas, have greater access to means of information such as the internet. Currently, the level of penetration of insurance into the Indian population is low, but is expected to grow going ahead. For example, Healthcare Insurance Premium collection in 2005-06 grew at 35% over 2004-05, with the Private Sector contributing to 77% growth over

2004-05, and Public Sector contributing to 25% growth over 2004-05. Private health insurance is estimated to grow to 160 million people by 2010.

1.5. Key Success Factors and Risk Factors of the Healthcare Services sector

1.5.1. Key Success Factors

- ***Brand of the medical institution:*** Once a medical institution establishes itself and is in operation for about 5 years, the brand of the hospital plays a large role in the selection of the multi-speciality hospital than the team of doctors. The brand may be established by publicity, free clinics, success rate of procedures carried out in the hospital, referral by other people, accreditation, etc.

- ***Medical practitioners:*** In India, typically most people seek medical care in the neighbourhood clinics for minor ailments and in multi-speciality settings for major ailments. For minor ailments, healthcare industry in India is still doctor centric rather than being clinic centric. The team of medical practitioners plays a large role in the selection of the multi-speciality hospital when it is newly established.

- ***Location of the medical institution:*** The impact of location of a medical institution is more critical in the case of rural centres. In urban centres, brand and team of medical practitioners play a larger role. Location is also important in terms of availability for emergencies. Location also defines the price that can be charged for a procedure – hence it is seen that urban centres like Mumbai have a greater concentration of tertiary care/super speciality medical institutions.

1.5.2. Key Risk Factors

- ***Shortage of Medical and Para-medical Staff:*** India has over 600,000 physicians with a density of 0.60 physicians per 1000 population. However, there is a shortage of qualified specialist nurses and paramedical professionals as also qualified hospital administrators. As per the World Health Report 2006 by the WHO, India is one of the countries with the greatest shortage of health service providers; also, there are large discrepancies between states in terms of the number of medical personnel available in the country.

- ***Lack of standardisation / accreditation:*** India is gaining the advantage of being the low cost destination for healthcare services. However, the healthcare industry needs to prove that the

low cost services offered by them are in real terms and the quality of services offered is comparable with developed nations. One of the ways to prove our quality consciousness is to get international accreditation of healthcare facilities, where there is room for improvement.

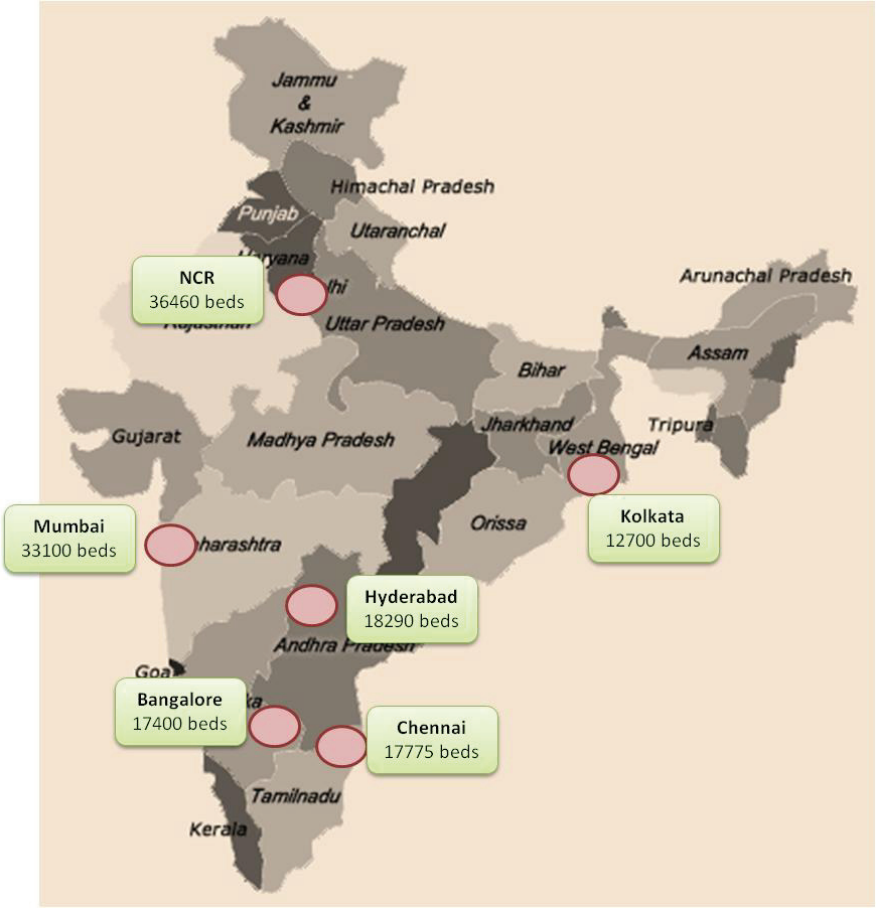
- ***Quality of in-country healthcare:*** While under-funding is the prime reason for the current state of the in-country healthcare scenario, many experts have opined that healthcare management practices in the public healthcare delivery system has scope for improvement.

1.6. Market Structure of the Healthcare Services sector

1.6.1. Major Clusters

A large portion of the current private healthcare infrastructure is in the metros – this is being expanded further by many leading corporate healthcare players. A geographical map of the Healthcare Services clusters (providers) in India is as below:

Figure 9: Geographical Map of Healthcare Service Providers in India



Source: Various secondary sources, IMaCS analysis

1.6.2. Major Players[4]

A brief profile of major players in the Indian Healthcare Services Industry is as below:

- ***Apollo Hospitals Enterprises Ltd:*** Apollo Hospitals Enterprises Ltd (AHEL) was incorporated as a public limited company in 1979. Jointly promoted by Dr. Prathap Reddy and Mr. Obul Reddy in 1979, it started as a 150 bed hospital in Chennai in 1983. It is the first group of hospitals that pioneered the concept of corporate healthcare delivery in India and today is the leading private sector healthcare provider in Asia. The group currently includes over 10,000 beds across 43 hospitals in India and overseas and is an integrated player - involves hospitals, clinics, pharmacy, hospital project consultancy, medical business process outsourcing, education and research, telemedicine and health insurance. Apollo's leadership extends to all aspects of the healthcare spectrum. It has formed joint ventures to establish hospitals in Tier II and Tier III cities. The consultancy division of AHEL offers project and operations management consultancy services to clients varying from to commissioning of a wide range of healthcare models.. Apollo has planned expansion of facilities across India and abroad which would take shape in the next five years. The group also plans to increase beds under managed category over the next few years.

- ***Max Healthcare Institute Limited:*** Max Healthcare Institute Limited is a subsidiary of Max India Limited. It started operations in 2001 - initially with primary level clinics, and further established secondary care hospitals and then advanced to tertiary care hospitals in 2005. It operates around 17 healthcare facilities under a three-tier network comprising of Dr. Max primary health centres, secondary health centres, and tertiary care hospitals. Max Health has tie-ups with Singapore General Hospital and Harvard Medical International. Healthcare services offered range from consultation to diagnosis and from surgery to pharmacy. It offers medical services in various areas, including anaesthesia, arthritis, audiology and speech therapy, autism and child development, and cardiology. The company also operates specialty centres that offer various services, including nuclear medicine and cardiac imaging, labs, scans, interventional cardiology, cardiac pacing and electrophysiology, neurosciences, orthopaedics, gynaecology and obstetrics, paediatrics, maternity services, diagnostic services, paediatric ophthalmology, neurophthalmology, internal medicine, general surgery etc.

- ***Fortis Healthcare Limited:*** The company was founded in 1996 and is based in New Delhi, India. Fortis Healthcare Limited is a subsidiary of Fortis Healthcare Holdings Limited and is promoted by the pharma company Ranbaxy Laboratories. It operates a network of 12

[4] Company Websites, and other secondary sources

hospitals primarily in north India, 15 satellite and heart command centres in its hospitals, and one heart command centre in Afghanistan. The company has been expanding aggressively through green-field projects, acquisitions and management. Fortis Healthcare Limited provides medical care to patients with various ailments and medical conditions in India. The company operates multi-specialty hospitals, which provide secondary and tertiary healthcare to patients. Its hospitals also include 'centres of excellence' providing quaternary healthcare in various areas, such as cardiac care, orthopaedics, neurosciences, oncology, renal care, gastroenterology, and mother and child care. In addition, the company operates 'Fortis La Femme', a boutique style hospital that focuses on women's health and maternity care.

- ***Wockhardt Hospitals:*** WHL is promoted by Wockhardt Ltd. Wockhardt Hospital and Heart Institute was commissioned in 1989. It has grown from three hospitals to a network of 15 super-specialty hospitals and five regional specialty ICU hospitals and focuses on core areas such as cardiology and cardiac surgery, orthopaedics, neurology and neurosurgery, urology and nephrology and critical care, with specialisation in minimally invasive surgery. Other than owned and managed hospitals, WHL also shares its technical and medical expertise with other hospitals, for e.g.:- intensive coronary care unit (ICCU) at Garden City hospital. It has foreign tie-ups with eight companies and plans to expand by establishing greenfield and brownfield hospitals at various locations across India. Wockhardt regional specialty ICU hospitals act as referral centres and the first point of critical care the larger super-specialty hospitals, but are also self-sustaining as they are strategically located to fulfil demand for basic tertiary care and higher secondary care. The Wockhardt super specialty hospital in Mumbai is one of the first hospitals in South Asia to have received international accreditation from Joint Commission International.

- ***Manipal Group:*** The Manipal Group has education and healthcare as its core business. It offers integrated healthcare services. Bengaluru's Manipal hospital is the flagship of MHS which has a strong presence in Karnataka. The MHS runs a three-tier network with 15 owned hospitals and six associate hospitals. Besides this, the group manages two clinics, and seven rural maternity and child welfare homes of the Government. The group has tie-ups with countries such as Mauritius, Tanzania and the Middle East. Medical facilities under the Manipal Brand include: Manipal Hospitals (Manipal Hospitals, Airport Road, Bengaluru – Tertiary Care – Owned, Manipal Northside Hospital – Malleswaram, Bengaluru – Secondary – Owned, Manipal Hospital –Mangalore – Tertiary – Leased, Manipal Goa Hospital, Goa – Secondary – Leased, teaching hospitals, etc.), *Manipal Clinics* (three clinics in Bengaluru; all

these clinics have been transferred to Manipal Cure and Care), and Manipal Wellness Formats (seven Manipal Cure and Care centers)

- ***Care Hospitals:*** The CARE group was launched in 1997 by cardiologists and started with a tertiary cardiac care venture in Hyderabad in 1997. The group also offers cardiac and research programmes for graduate, post-graduate and post doctoral courses, and also has a chain of pharmacy outlets and diagnostic centres. From a 100-bed single specialty Heart Institute facility focusing on cardiac care in Nampally (Hyderabad), CARE has become a multi-specialty hospital chain comprising of 1,400 beds across 12 hospitals. Group has two primary care, three secondary care and 10 tertiary care units.

1.6.3. Major Markets

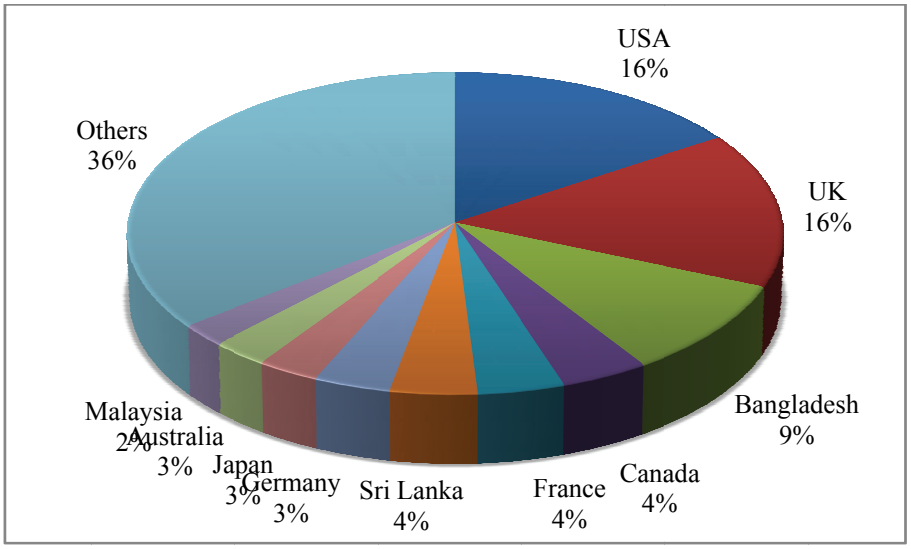
The markets catered to by India in the Healthcare industry can be analysed in terms of Healthcare Tourism / Medical Tourism promoted by the Indian Government.

India holds competitive advantage in delivering healthcare services to international patients – be it in terms of low cost, abundance in availability of healthcare professionals, reputation of skilled personnel in advanced healthcare segments such as cardio-vascular surgery, organ transplants, and eye surgery, increasing popularity of India's traditional wellness systems, strengths in information technology, multi-language skills and low-cost healthcare solutions with high success rate. At the same time, the arrival of tourists in India for healthcare reasons can also be attributed to factors such as increase in ageing population and cost of healthcare in developed countries and long waiting time in developed countries. In either way, the future outlook of medical tourism in India looks positive.

The International Passenger Survey (2003) conducted by the Ministry of Tourism, Government of India estimates that about 2.2% of foreign travellers visited India with the objective of healthcare and treatment; this works out to about 97,000 foreigners visiting India with healthcare related objectives. Further, the International Passenger Survey – 2003 has estimated that about 2 million non-resident Indians (NRIs) visit India every year, of which about 10% seek health related treatments; this works out to about 200,000 NRI patients visiting India to undergo various treatments. Put together, the visitors to India with healthcare objective could be estimated at around 300,000 patients. In addition, there are a large number of international visitors, including NRIs who come for other purposes, but use wellness systems, such as Ayurveda/Yoga or Spiritual Healing. Assuming 5% of foreign travellers access such wellness systems in India, the estimated number of travellers under this category would be 200,000. Thus, it may be quantified that the healthcare visitors to India will easily be in the range of around 500,000.

The top 10 source countries accounting for foreign tourist arrivals in India is shown below. It may be assumed that the healthcare visitors are also in the same proportion.

Figure 10: Foreign Tourist Arrivals (FTAs) in India



Source: Incredible India – Tourism Statistics 2007, IMaCS analysis

1.7. Drivers of competitiveness of the Healthcare Services sector

The drivers of competitiveness of the Healthcare Services Sector are as below:

- ***Government Policies:*** The Government has supported the Healthcare Services industry with policies that enable it to function better. For example, liberalisation of entry norms in the healthcare industry for private players in the 1980s, opening of the health insurance market in 2000 enabling both general and life insurance companies to offer health insurance, tariff and non-tariff measures to further stimulate market development in the healthcare sector by allowing more hospitals to offer critical care services, provision in the National Health Policy (2002) to increase health spending to 6%of GDP by 2010, etc.

- ***Multi-language skills:*** Multi-language skill is another advantage in favour of India. In addition to high proficiency in English, Indians are proficient in speaking Hindi, Urdu, Bangla, Arabic, Tamil, which are widely spoken in neighbouring countries of West Asia, South and South East Asia.

- ***Low-cost healthcare solutions with high success rate:*** Another reason for India emerging as a major destination for healthcare is the low cost of treatment in India. Indian hospitals are

cost effective even when compared to other South- East Asian countries, such as Thailand and Singapore, and also as compared to developed nations such as the USA – on an average a medical procedure in India is six times cheaper in India than in the USA. At the same time, the low cost scenario is not at the expense of quality. The success rate of Indian hospitals is also comparable with international standards.

- ***Availability of skilled and experienced medical professionals:*** India is one of the countries with highly skilled medical professionals and with advanced healthcare solutions. Indian doctors have been serving in developed countries such as USA, UK and Canada and have gained high reputation; annually around 25,000 – 30,000 doctors are added to the system.

2. Human Resource and Skill Requirements in the Healthcare Services Sector

2.1. Current Employment in the Healthcare Services Sector in India

The Healthcare Industry, by its very nature, is dependant on qualified healthcare personnel, and the health workforce is central to advancing the healthcare facilities of any nation. One of the major problems for nearly all countries is an overall human resource shortage, which leaves gaps within the existing infrastructure and services, both within and outside the public sector. This problem is also very pertinent to India.

As per the World Health Report 2006 by the WHO, India is one of the countries with the greatest shortage of health service providers (doctors, nurses and midwives), the others being Bangladesh and Indonesia. As seen earlier and in the table below, India mostly have a low proportion of physicians, nurses, midwives, dentists and pharmacists as compared to China, USA and UK.

Table 4: Comparison of Medical Personnel per 1000 population between India and other countries

Parameter	India	China	USA	UK
Physicians per 1000 population	0.6	1.06	2.56	2.3
Nurses per 1000 population	0.8	1.05	9.37	12.12
Midwives per 1000 population	0.47	0.03	-	0.63
Dentists per 1000 population	0.06	0.11	1.63	1.01
Pharmacists per 1000 population	0.56	0.28	0.88	0.51
Lab technicians per 1000 population	0.02	0.16	2.15	0.34

Source: World Health Organization's "World Health Report 2006"

In terms of absolute numbers, estimates of the number of medical personnel currently available in India are as below:

Table 5: Number of Medical Personnel in India

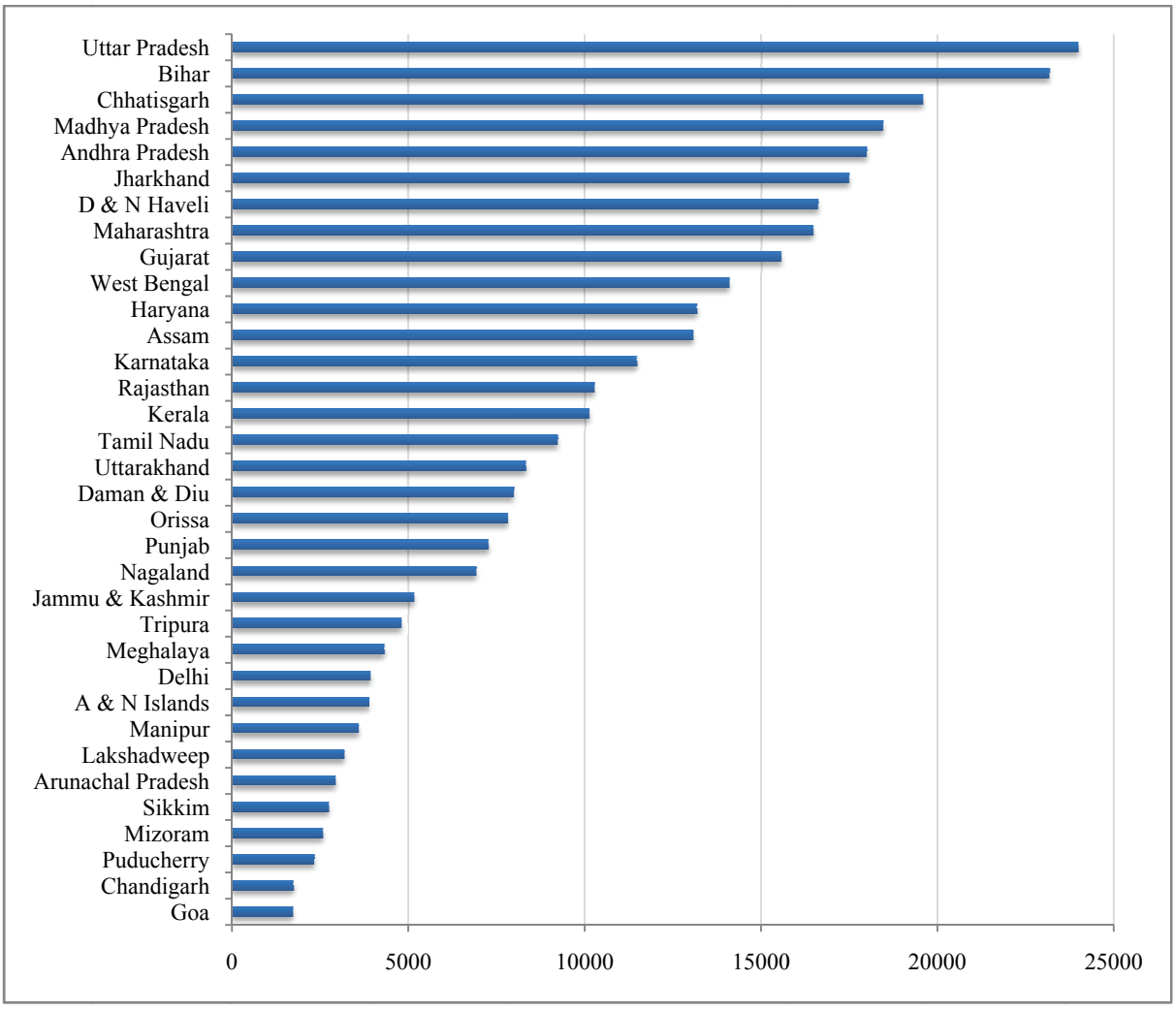
Parameter	Employment	Comment
Number of Allopathic Doctors registered with State Medical Councils	725,190	As of 2008
Number of Dental Surgeons registered with Central/State Dental Councils	73,057	Upto 31.12.2007

Parameter	Employment	Comment
Number of Registered AYUSH Doctors	751,926	As on 1.1.2008
Number of Registered Nurses in India	1,572,363	As on 31.12.2007
Number of Registered Pharmacists In India	681,692	As on 31.12.2008

Source: Central Bureau of Health Intelligence – National Health Profile 2008

The Healthcare sector, by its very nature, ideally requires equitable distribution of service providers and thus personnel employed in the sector across the country. At the same time, wide variations in the employment of medical personnel are seen across the country. In terms of the number of medical personnel available in the country per unit population, there are large discrepancies between states – for example, the population served per doctor varies from 1,718 and 1,727 in Goa and Chandigarh respectively, to 23,174 and 23,986 in Bihar and Uttar Pradesh respectively, as below:

Figure 11: Population served per doctor - Comparison across states



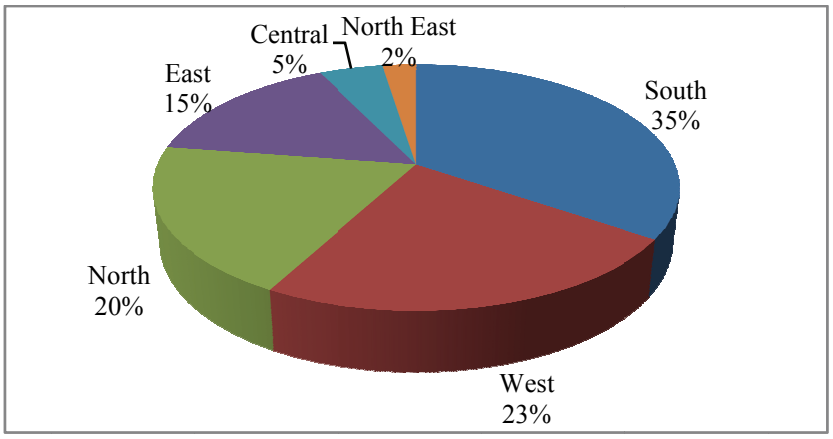
Source: Central Bureau of Health Intelligence – National Health Profile 2008

2.2. Major Regions of Employment Concentration

The distribution of various medical personnel across zones and States is analysed below. In most cases it is seen that 4-5 States make up for about 50% of the total human resources in the healthcare sector in the country.

For example, the South zone alone accounts for about 35 percent of the total allopathic doctors with recognised medical qualifications as seen in figure 14.

Figure 12: Zone-wise Distribution of Allopathic Doctors with Recognised Medical Qualifications[5]

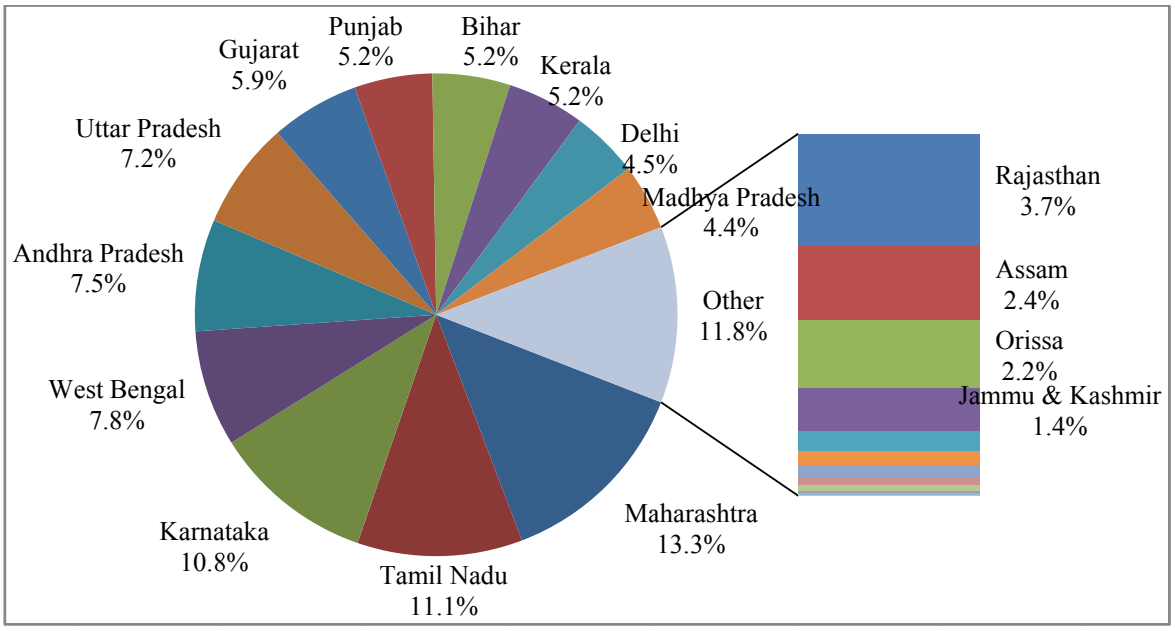


Source: Central Bureau of Health Intelligence – National Health Profile 2008

As regards the distribution of doctors across states, it is seen that Maharashtra, Tamil Nadu, Karnataka, West Bengal and Andhra Pradesh together account for about 50% of the total allopathic doctors.

[5] The zones are defined as:
North: Jammu & Kashmir, Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Delhi
South: Tamil Nadu, Andhra Pradesh, Kerala, Karnataka
East: Bihar, Jharkhand, Orissa, West Bengal, Sikkim
West: Maharashtra, Gujarat, Goa, Rajasthan
Central: Madhya Pradesh, Chhattisgarh
North East: Assam, Mizoram, Manipur, Meghalaya, Tripura, Arunachal Pradesh, Nagaland

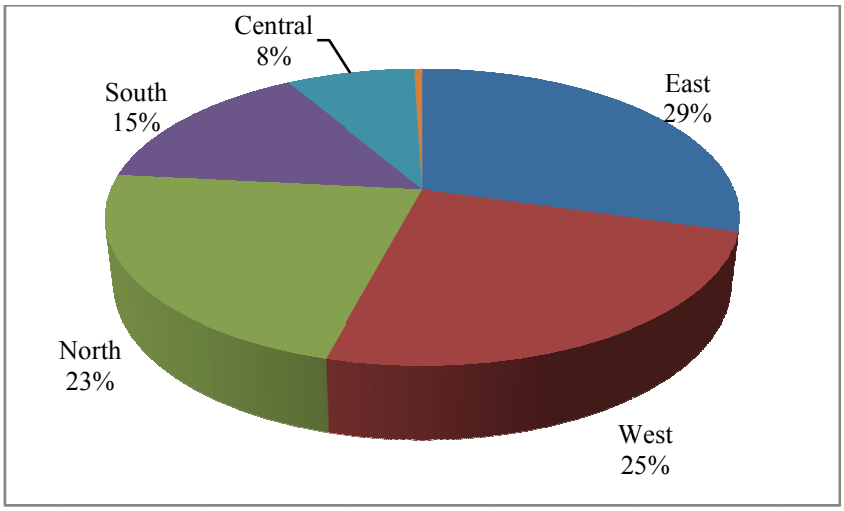
Figure 13: State-wise Distribution of Allopathic Doctors with Recognised Medical Qualifications



Source: Central Bureau of Health Intelligence – National Health Profile 2008

Also, the East zone accounts for about 29% of the total registered AYUSH doctors in the country, as in the figure below.

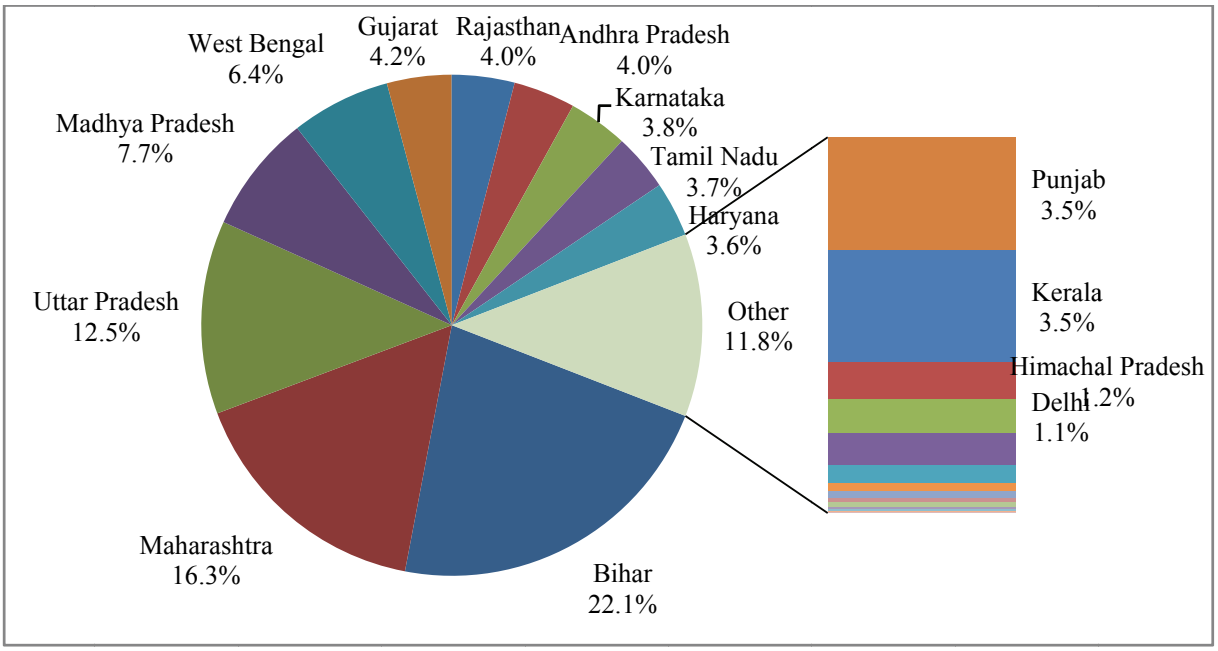
Figure 14: Zone-wise Distribution of Registered AYUSH Doctors



Source: Central Bureau of Health Intelligence – National Health Profile 2008

As regards the distribution across states, it is seen that Bihar, Maharashtra and Uttar Pradesh together account for over 50% of the total registered AYUSH doctors, with Bihar alone accounting for over 22%.

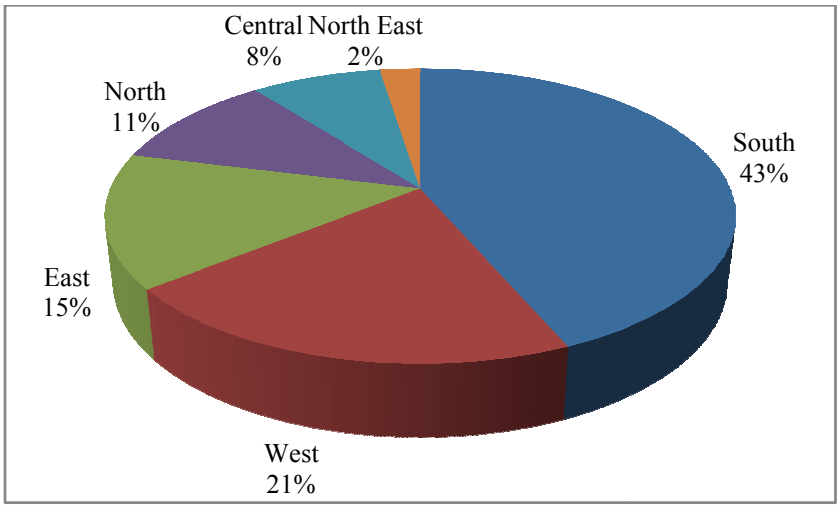
Figure 15: State-wise Distribution of Registered AYUSH Doctors



Source: Central Bureau of Health Intelligence – National Health Profile 2008

As regards nurses it is seen that the South zone alone accounts for about 43% of the total registered nurses in India.

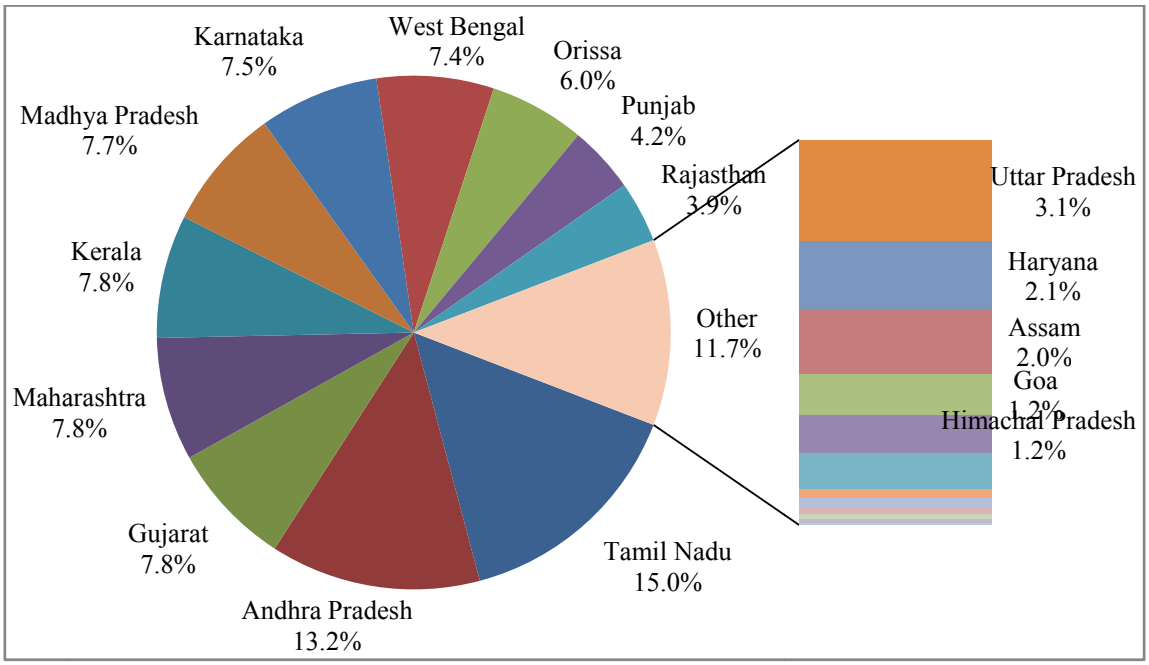
Figure 16: Zone-wise Distribution of Registered Nurses



Source: Central Bureau of Health Intelligence – National Health Profile 2008

As regards the distribution of nurses registered across states, it is seen that Tamil Nadu, Andhra Pradesh, Gujarat, Maharashtra and Kerala together account for over 50% of the total registered nurses.

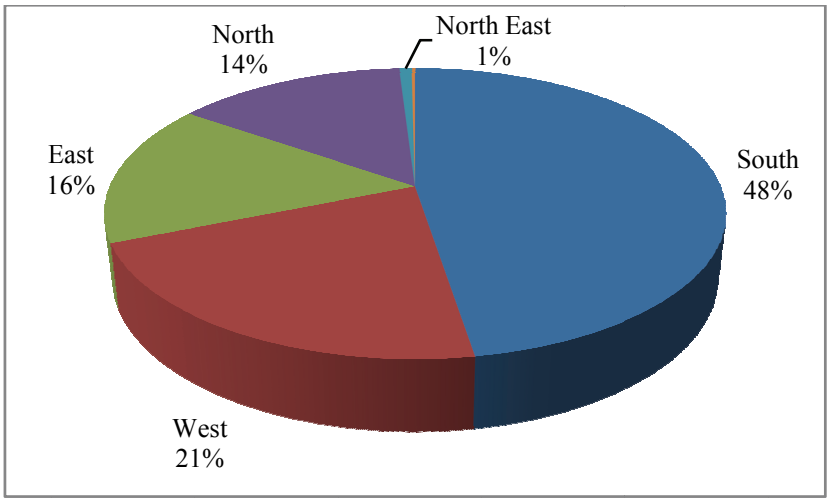
Figure 17: State-wise Distribution of Registered Nurses



Source: Central Bureau of Health Intelligence – National Health Profile 2008

As regards pharmacists it is seen that the South zone again alone accounts for about 48% of the total registered pharmacists in India.

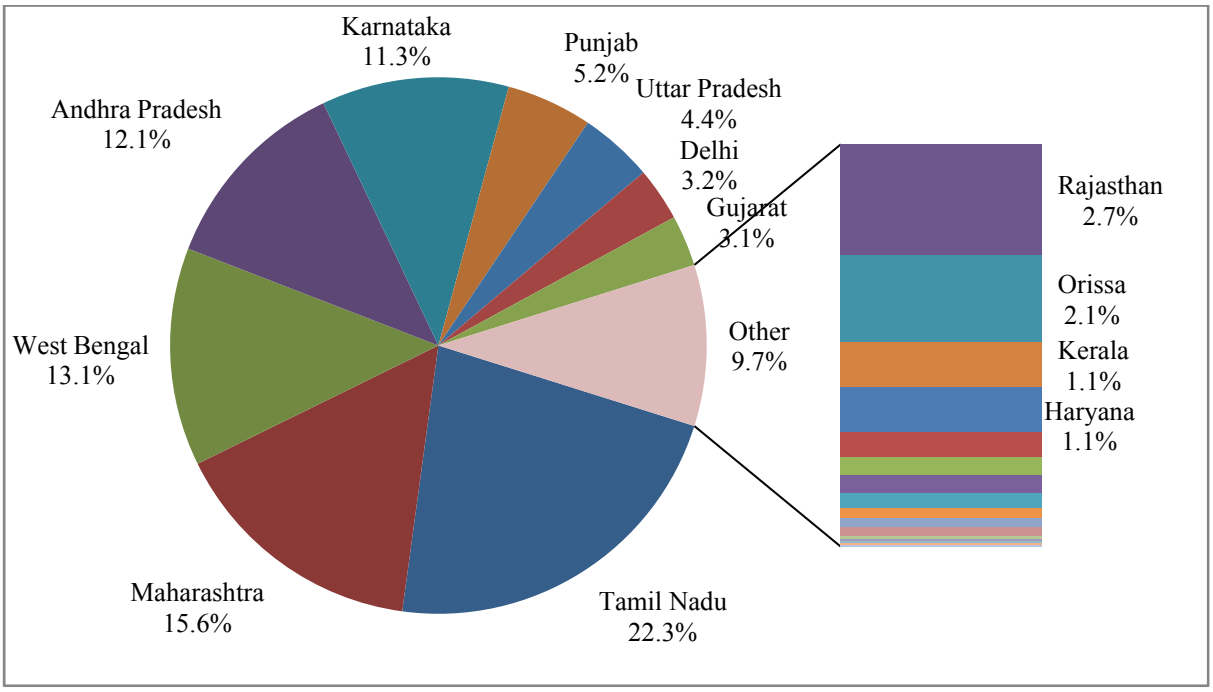
Figure 18: Zone-wise Distribution of Registered Pharmacists



Source: Central Bureau of Health Intelligence – National Health Profile 2008

As regards the distribution of pharmacists registered across states, it is seen that Tamil Nadu, Maharashtra and West Bengal together account for over 50% of the total registered nurses.

Figure 19: State-wise Distribution of Registered Pharmacists



Source: Central Bureau of Health Intelligence – National Health Profile 2008

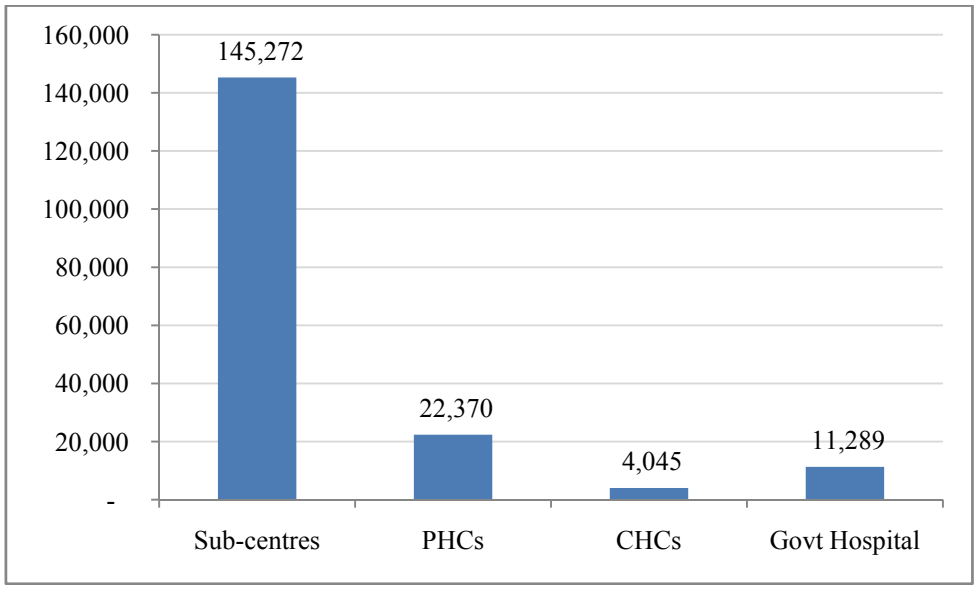
2.3. Health Infrastructure in India

The Health infrastructure in the country is analysed in the context of demand side and supply, the discrepancies across states with respect to the population served per Government Hospital and the population served per Government Hospital bed.

2.3.1. Health Infrastructure – Demand Side

As mentioned earlier, Healthcare in India is delivered through public and private sector infrastructure. The public health infrastructure consists of sub-centres, PHCs, CHCs and Government hospitals. The available infrastructure is shown in the following figure:

Figure 20: Government Health Infrastructure – number of medical institutions



Source: Central Bureau of Health Intelligence – National Health Profile 2008

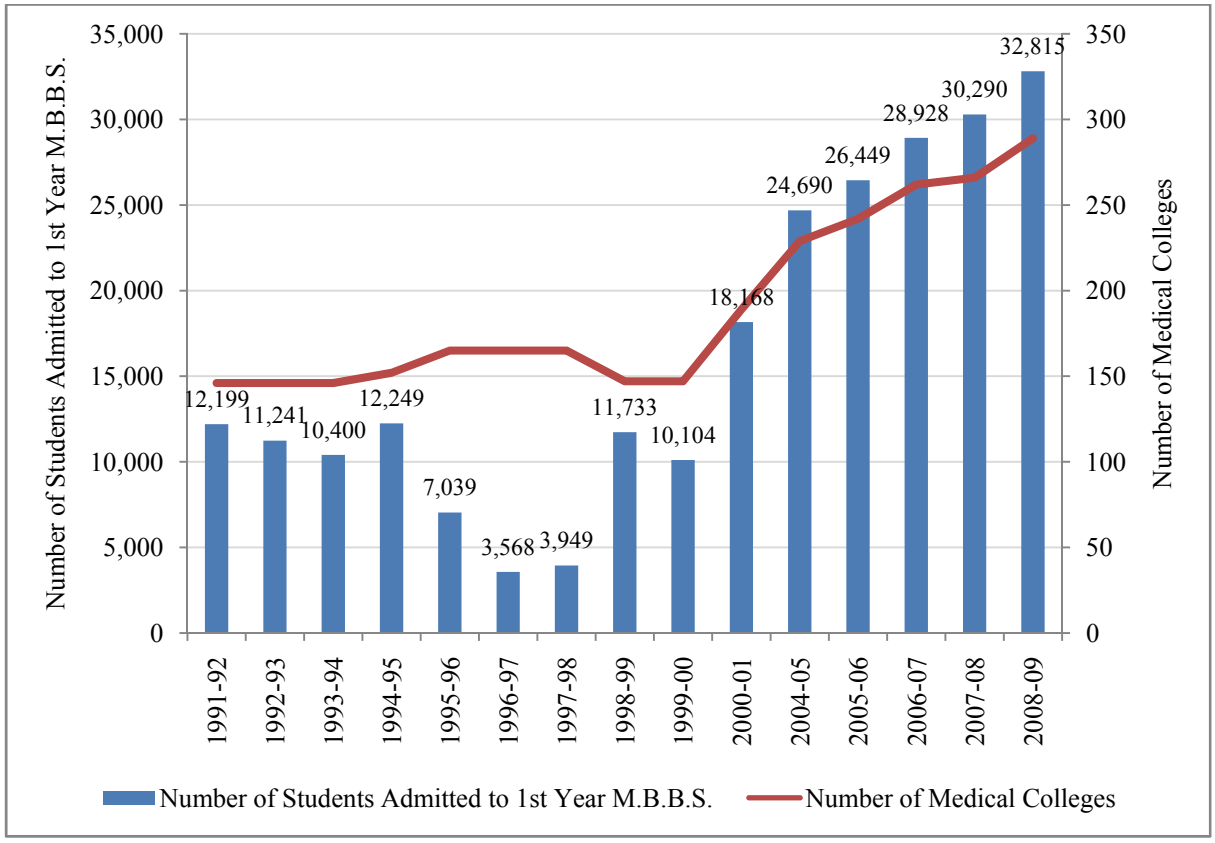
Private healthcare infrastructure is primarily concentrated in the Tier I cities/metros, and can be attributed to several factors. For example, the returns on investment for private players in healthcare is higher in the Tier I cities/metros given the consumers' higher ability to pay. For private players wanting to set up medical institutions in Tier II/Tier III cities, there are factors that are not conducive to the same and private hospitals find it difficult to deploy personnel in Tier II/Tier III cities. Thus, while about 60-70% of the country's population is rural, about 90% of private medical institutions are based in Tier I cities/in the metros[6].

[6] Based on inputs received in the primary research

2.3.2. Health Infrastructure – Supply Side

With regards to the supply, the number of students admitted to 1st year MBBS as well as the number of medical colleges across the country has been increasing, especially over the last seven years. The country currently has 289 medical colleges with the ability to admit 32,815 students in the 1st year of MBBS.

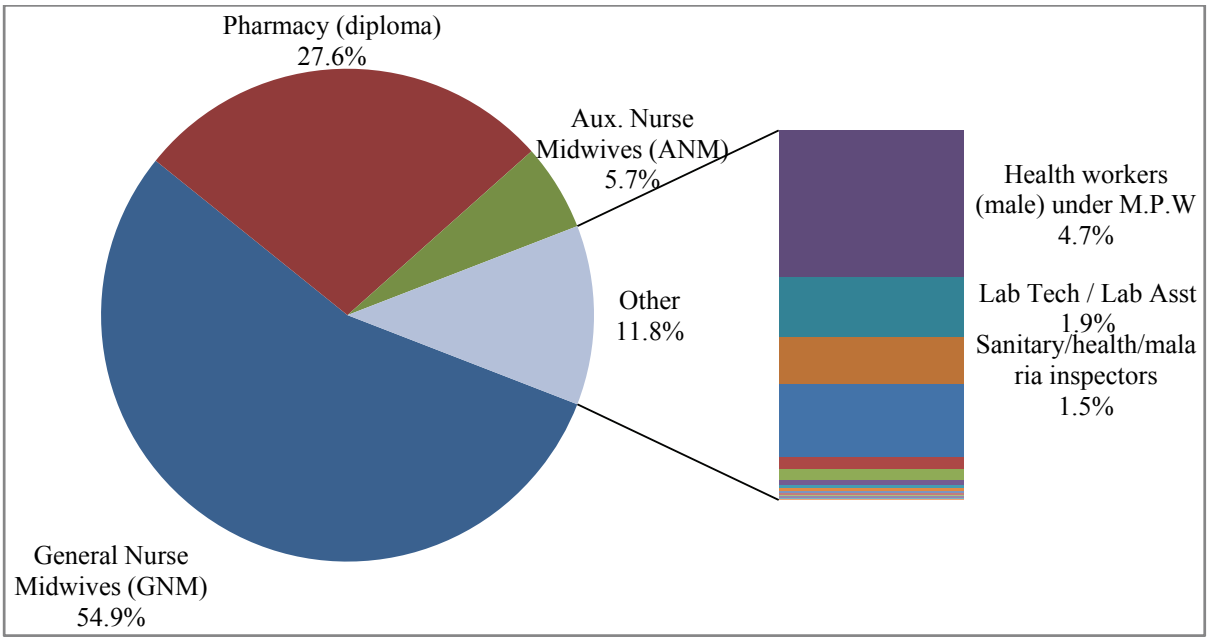
Figure 21: Educational Infrastructure for MBBS



Source: Central Bureau of Health Intelligence – National Health Profile 2008

There are about 2,930 institutions across the country with the ability to admit 1,14,097 students across the nursing and technicians categories.

Figure 22: Educational Infrastructure for Nurses and Technicians



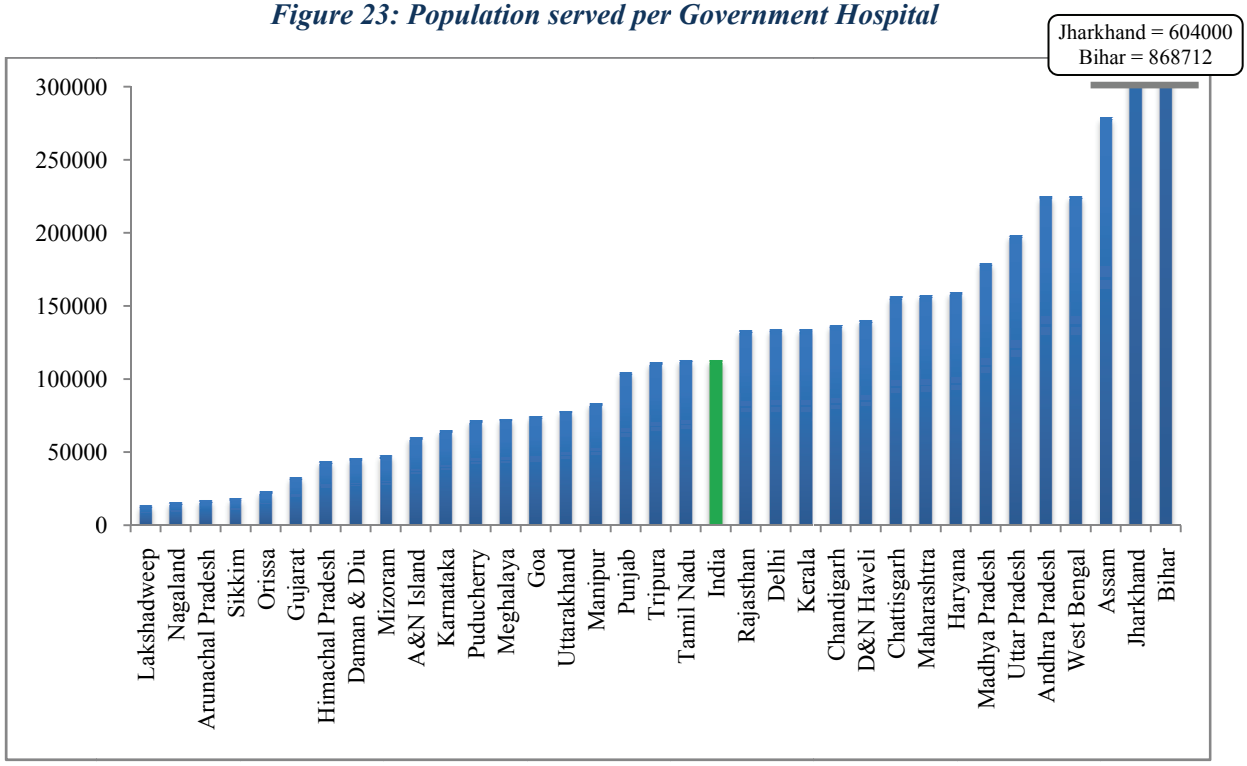
Source: Central Bureau of Health Intelligence – National Health Profile 2008

Other than the courses seen in the figure above, other courses with low admission capacity include those for X-ray technicians, radiographers, physiotherapists, opticians & refractionists, occupational therapists, speech therapists, dental hygienists, operational therapist assistants, B.Sc. (medical lab technicians), dental mechanics, orthopaedists, and ophthalmic assistant among others.

2.3.3. Health Infrastructure – Differences across States

Health is the basic necessity of people and accessible medical facilities need to be available for the entire population. However, differences are observed with respect to the population served per Government hospital as well as the population served per Government hospital bed. A comparison of these parameters across states is shown below:

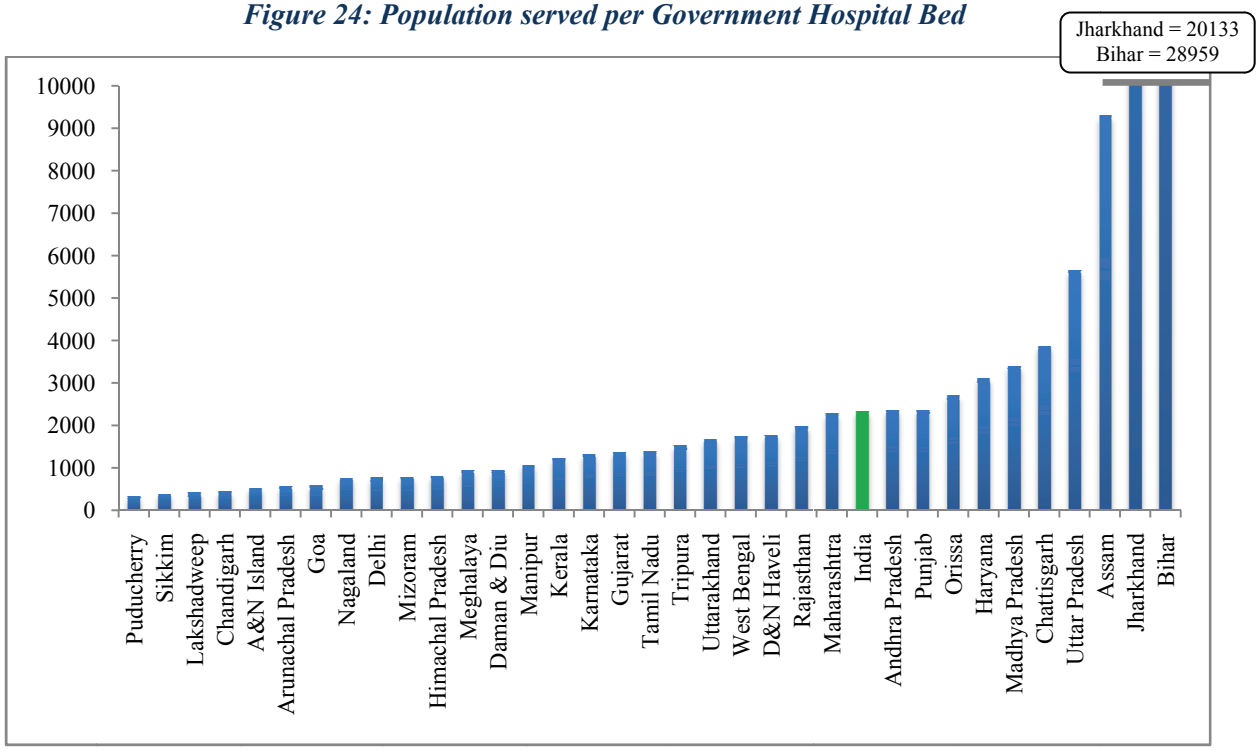
Figure 23: Population served per Government Hospital



Source: Central Bureau of Health Intelligence – National Health Profile 2008

Correspondingly, the population served per Government hospital bed also widely varies across States as seen below:

Figure 24: Population served per Government Hospital Bed



Source: Central Bureau of Health Intelligence – National Health Profile 2008

2.4. Functional Distribution of Human Resources in the Healthcare Services Sector

During our interaction with the industry as part of our Primary Research, we analysed the proportion of workforce at various functional levels across the Healthcare Sector. The inputs received from the industry, supplemented by analysis by IMaCS, are as presented in the following sections.

2.4.1. Functional Distribution of Human Resources in the Healthcare Delivery Segment

The proportions of personnel employed in different functions in the Healthcare Delivery segment differs based on parameters such as:

- *Type of hospital:* i.e. public / private, primary care / secondary care / tertiary care, single speciality / multi-speciality, etc.
- *Size of the hospital:* i.e. based on number of beds
- *Model of employment followed for doctors:* e.g. full time consultants, on-rolls, full-time retainer, etc.
- *Level of outsourcing:* e.g. whether or not support services such as housekeeping, laundry, security, food services, etc. are outsourced to private agencies.

Though the proportions may be slightly varied based on one or more of the above parameters, given below is the typical distribution of personnel employed across functions in hospitals. As seen in the table below, personnel employed in nursing services account for maximum proportion of the workforce.

Table 6: Functional distribution of human resources in the Healthcare Delivery Segment

Function	Distribution
Doctors	15-20%
Nurses	45-55%
Technicians	15-20%
Non-medical / Support functions / Administration / Clerical	3-5%

Source: Primary Research and IMaCS analysis

2.4.2. Functional Distribution of Human Resources in the Medical Equipment Segment

As covered earlier, the medical equipment market in India is dominated by imports that constitute 65-70% of the market share. Indian manufacturers generally work on less complex equipment, but this trend is expected to change given the rise in need for medical equipment in the country. Companies operating in the medical equipment space in India are of two types as below, and the functional distribution of personnel employed in this sector in turn depends on the company type:

- *Companies that import medical equipment and sell them in the Indian market:* At these companies, the maximum proportion of the workforce is employed in the customer support function, followed by employment in the sales function.
- *Companies that manufacture and sell medical equipment in the Indian market:* At these companies, a large proportion of the workforce is employed in the manufacturing / operations function followed by employment in the sales and customer support functions.

The details of functional distribution are as below:

Table 7: Functional distribution of human resources in the Medical Equipment Segment

Function	Distribution at companies that manufacture and sell medical equipment	Distribution at companies that import and sell medical equipment
Manufacturing / Operations	40-45%	-
Sales	10-15%	25-30%
R&D	5-10%	-
Customer Support	40-45%	70-75%
Support functions (HR, Finance, etc.)	5-10%	5-10%

Source: Primary Research and IMaCS analysis

2.4.3. Functional Distribution of Human Resources in the Health Insurance Segment

As is the case with other general insurance sectors, health insurance companies engage most personnel in the sales function, followed by personnel in operations and customer support to an equal extent.

Table 8: Functional distribution of human resources in the Health Insurance Segment

Function	Distribution
Sales	60-65%
Operations	15-20%
Customer Support	15-20%
Underwriting	4-5%
Support functions (HR, Admin, Finance, Accounts)	4-5%

Source: Primary Research and IMaCS analysis

2.5. Distribution of Human Resources by Education Levels in the Healthcare Services Sector

As a part of our Primary Research, we also analysed the education-wise composition of personnel employed in the Healthcare Services sector. The inputs received from the industry, supplemented by analysis by IMaCS, are as presented in the following sections.

2.5.1. Distribution of human resources by education levels in the Healthcare Delivery Segment

Similar to the functional distribution of employees, the distribution by educational qualification of personnel employed in the Healthcare Delivery segment depends on various parameters such as the type of hospital, size of the hospital, model of employment followed for doctors, level of outsourcing, etc. For example, major hospitals in the private sector employ General Nursing and Midwifery (GNM) qualified personnel and BSc Nursing personnel in the nursing cadre and as a policy and do not employ Auxuliary Nursing and Midwifery (ANM) qualified personnel while smaller private hospitals and public hospitals employ ANMs too in the nursing cadre.

Though the proportion may differ based on such parameters, the various educational qualifications of personnel employed in the Healthcare Delivery segment are as below:

Table 9: Indicative list of Educational qualifications of personnel employed in the Healthcare Delivery Segment

Category	Qualification
Doctors	MBBS
	MS / MD
	MCh / DM
	DNB
Nurses	BSc Nursing
	MSc Nursing
	GNM
	ANM
Technicians / Paramed	BSc in Medical Lab Technology
	MSc in Medical Lab Technology

Category	Qualification
	Diploma in Radiology / Medical Lab Technology / the relevant branch of paramedics
Ward boys / ayahs	ANM
	10th / 12th pass
	Uneducated
Pharmacists	BSc
	Diploma in pharmacy science
Support functions	Graduates
	Post Graduates in the relevant discipline
	10th / 12th pass
	Uneducated

Source: Primary Research and IMaCS analysis

2.5.2. Distribution of human resources by education levels in the Medical Equipment Segment

The distribution of educational qualifications of personnel employed in the Medical Equipment segment depend on whether the medical equipment company imports and sells the equipment or also manufactures the equipment. Though the proportions may be different based on this, a considerable number of personnel employed in this segment have an engineering background.

Table 10: Educational qualifications of personnel employed in the Medical Equipment Segment

Function	Distribution at companies that manufacture and sell medical equipment	Distribution at companies that import and sell medical equipment
Ph. D / CA / MBA / MTech etc.	3-5%	3-5%
Graduate Engineers (mechanical, electronics, biomedical)	65-70%	80-85%
Diploma Engineers	20-25%	8-10%
ITI and other vocational courses	5-10%	-
Graduates (BA/BSc/BCom/others)	5-10%	5-10%

Source: Primary Research and IMaCS analysis

2.5.3. Distribution of human resources by education levels in the Health Insurance Segment

As seen in the table below, the maximum proportion of the personnel employed in the Health Insurance segment consists of MBAs, followed by graduates.

Table 11: Educational qualifications of personnel employed in the Health Insurance Segment

Educational Qualification	Distribution
Ph. D / CA / MBA / MTech etc.	55-60%
Graduates (BA/BSc/BCom/others)	40-45%
Doctors	1-2%

Source: Primary Research and IMaCS analysis

2.6. Current Shortages of Medical Personnel

There are certain disciplines in which there exists a scarcity of medical personnel employed in the Healthcare Services Sector. Some of the shortages found are in the following fields:

Table 12: Speacilised areas in which shortage of personnel exists (illustrative only)

Discipline	Specialised areas in demand
Specialist Doctors	- Oncology - Surgery - Critical care - Internal medicine - Anaesthesia - Interventional radiology - Vascular surgery - Non-interventional surgery - Interventional surgery - Cardiology - Infectious diseases
Nurses	There is a general shortage of nurses across the country. This is also directly related to the demand for nurses with such experience, in countries such as UK / USA / Australia / Middle East and the corresponding outflow of nurses with such experience to foreign countries: - Operation Theatre - Critical care (ICU nurse) - Oncology – head and neck, breast, catheter care, etc. - Radiology
Technicians / Paramedical personnel	- Paramedical personnel for pre-hospital care (eg. for ambulances) - Dialysis technicians - Medical physicists - Medical imaging technicians - Personnel for operating the ECG and EEG machines - Perfusion technology technicians - Advanced MRI machines

Source: Primary Research through industry interactions

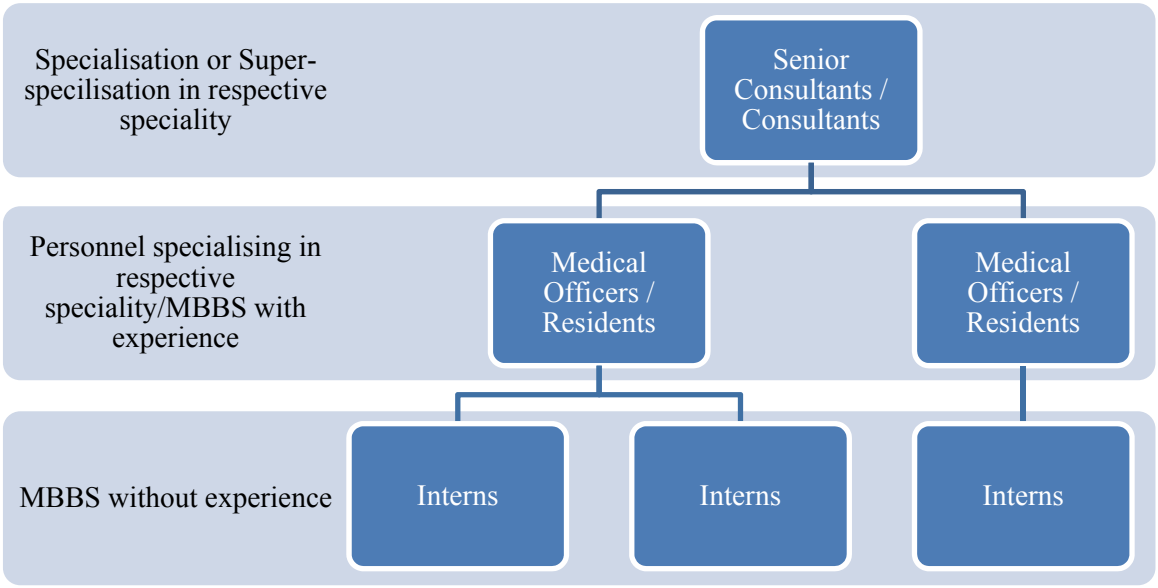
2.7. Skill Requirements and Skill Gaps in the Healthcare Delivery Segment

2.7.1. Profile of people employed

The following figures illustrate the profile of people employed in the Healthcare Delivery Segment across various categories.

Doctors

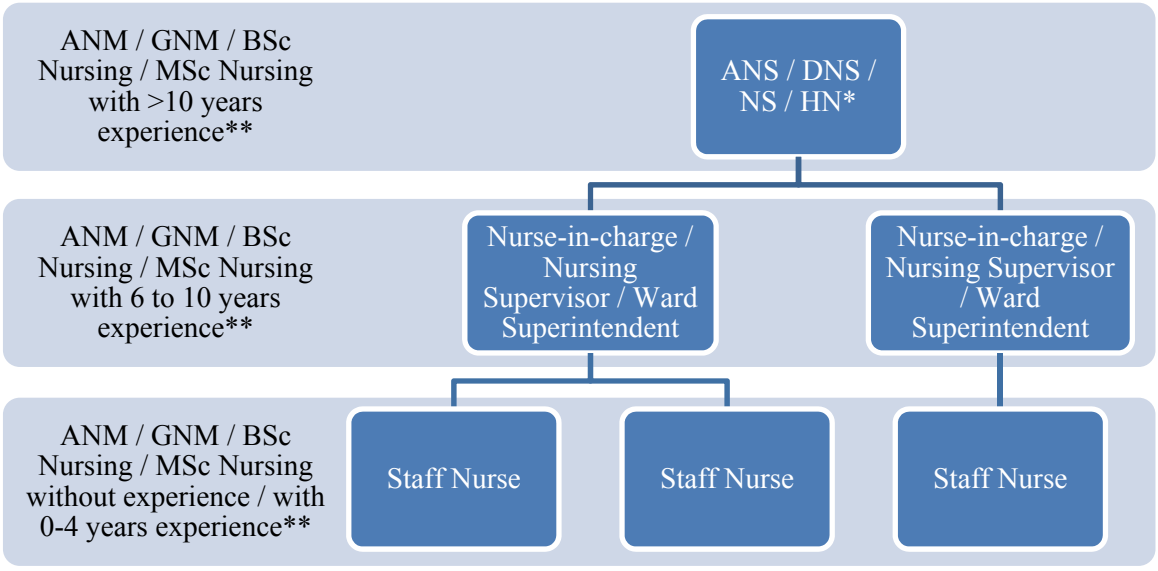
Figure 25: Profile of people employed in the Healthcare Delivery Segment – Doctors



Source: Primary Research and IMaCS analysis

Nurses

Figure 26: Profile of people employed in the Healthcare Delivery Segment – Nurses



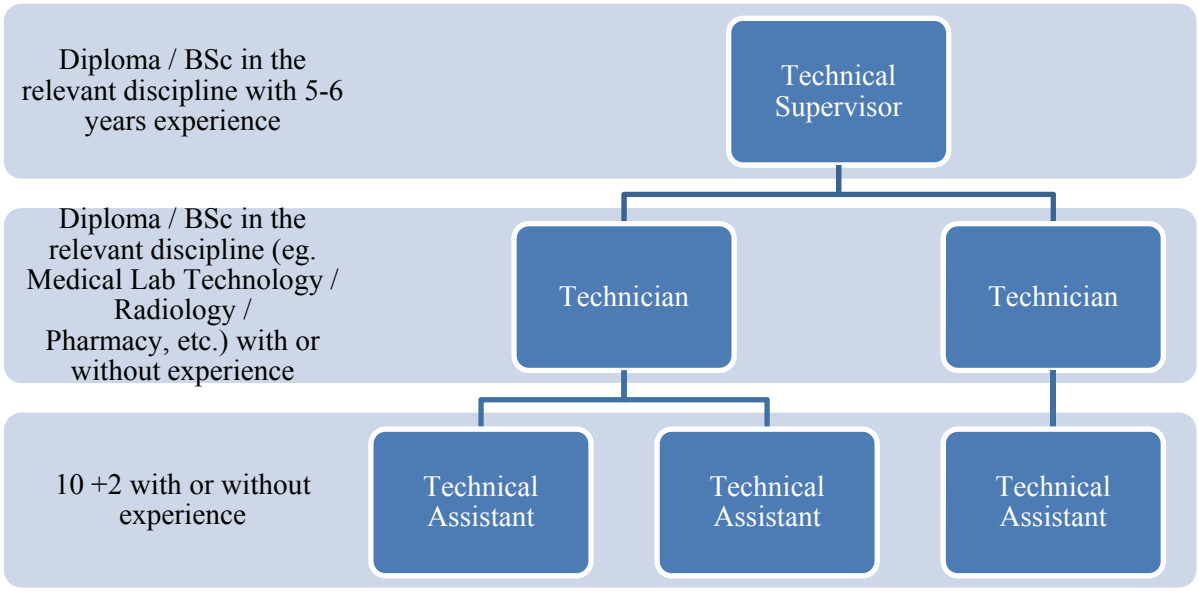
** Assistant Nursing Superintendent / Deputy Nursing Superintendent / Nursing Superintendent / Head Nurse*

*** Experience, qualification criteria, terminology as well as criteria for movement up the ladder differ across medical institutions*

Source: Primary Research and IMaCS analysis

Technicians

Figure 27: Profile of people employed in the Healthcare Delivery Segment – Technicians



Source: Primary Research and IMaCS analysis

2.7.2. Skill requirements and skill gaps

The following table presents the skill requirements and gaps across various functions and hierarchical/reporting 'levels' in the Healthcare Delivery Segment.

Note: that the skill requirements and gaps profiled hereinafter are limited to non-operative/non-medical aspects only

Table 13: Skill requirements and skill gaps in the Healthcare Delivery Segment

Function / Role	Level	Skills required	Skill gaps
Doctors	Head of Departments / Medical Superintendent	▪ Ability to plan the healthcare delivery capability of the department / hospital ▪ Ability to take initiatives for improvement such as training of doctors, purchase of observatory / curative / surgical equipment, addition of new healthcare services, etc. ▪ Ability to provide technical guidance to consultants / medical officers, etc. in the department ▪ Ability to coordinate with other departments / coordinate across departments ▪ Ability to use computers and access hospital information systems	▪ Insufficient ability to manage personnel working across different specialities ▪ Inadequate ability to use computers and access hospital information systems (especially in the context of increasing IT usage)
	Consultants /	▪ Advanced knowledge in	▪ Need for enhanced

Function / Role	Level	Skills required	Skill gaps
	Specialists / Super Specialists	the specialisation domain ▪ Ability to guide medical officers / residents and Interns in their work ▪ Ability to perform preventive, curative and surgical procedures as required ▪ Knowledge of hospital process management and various hospital indices ▪ Ability to use computers and access hospital information systems	caring/empathy for patients ▪ Inadequate skills to work in teams ▪ Inadequate ability to use computers and access hospital information systems
	Medical Officer / Residents	▪ Ability to diagnose and provide curative procedures ▪ Ability to provide preventive and post curative advice ▪ Ability to refer to specialists in the same / in other hospitals for advanced surgical or curative procedures ▪ Ability to prepare patient diagnosis and medical advice reports ▪ Ability to ensure proper usage of antibiotics and laboratory services ▪ Ability to address patient admission and discharge	▪ Inadequate ability to prescribe medicines by the molecular name as against by the brand name Inadequate skills to work in teams ▪ Inadequate knowledge of hospital infection control management and cross infection prevention and control ▪ Inadequate orientation towards emergency management and disaster management

Function / Role	Level	Skills required	Skill gaps
		requirements ▪ Ability to participate in / follow hospital initiatives / regulatory requirements such as biomedical waste management, hospital infection control management, emergency management, disaster management, etc.	
	Interns / House Surgeons	▪ Ability to assist the medical officer in diagnosis ▪ Ability to prepare reports / medical advice ▪ Ability to prepare consolidated reports as required ▪ Skills in the particular domain the candidate is training for	▪ Inadequate skills to work in teams ▪ Inadequate orientation towards emergency management and disaster management
Nursing and Support Staff	Head Nurse	▪ Awareness of standard operating procedures for the hospitals ▪ Ability to coordinate between wards ▪ Ability to lead a team of nurses ▪ Ability to be in regular dialogue with ward superintendents / nurse-in-charge	▪ Inadequate ability to adhere to standard hospital procedures ▪ Inadequate ability to think differently and the tendency to have a limited thought process
	Ward	▪ Ability to manage staff	▪ Inadequate aspiration levels

Function / Role	Level	Skills required	Skill gaps
	Superintendent	nurses on duty and assign jobs accordingly in the ward ▪ Ability to report ward incidents and prepare weekly/monthly reports ▪ Attendance management of staff nurses ▪ Maintenance of the medicines / equipments in the ward and indenting for required equipments / medicines	with respect to achieving customer satisfaction levels ▪ Inadequate staff management skills
	Staff Nurse	▪ Ability to use IT systems / undertake documentation / paperwork for admission and discharge of patients from the ward / private room ▪ Ability to feed patients who are not mobile / cannot sit up / have limited mobility ▪ Ability to address queries posed by patients / their relatives ▪ Adequate knowledge of technology so as to be able to operate medical equipment ▪ Ability to use computers for administrative work ▪ Ability to effectively converse with international	▪ Inadequate communications skills especially when dealing with international clientele ▪ Inadequate exposure to technology and thus inadequate hands-on experience of operating machines – most of the learning happens on the job ▪ Inadequate ability to administer medicines ▪ Inadequate physiological knowledge ▪ Inadequate knowledge of drugs ▪ Inadequate motivation levels ▪ Inadequate knowledge of basic languages needed to

Function / Role	Level	Skills required	Skill gaps
		clientele ▪ Compassion when dealing with patients and their friends / relatives ▪ Ability to undertake dressing of patients ▪ Maintenance of the diet and fluid and medicinal intake charts of patients ▪ Ability to collect samples for laboratory tests ▪ Maintenance of various documents pertaining to patient treatment and discharge ▪ Ability to identify / report and treat needle stick injuries, cross infection, blood transfusion reactions etc ▪ Ability to properly segregate and manage biomedical waste	converse with multiple set of patients – many nurses are trained in South India and they are unable to converse in English and Hindi / in the local language ▪ Unwillingness / hesitation in interacting with patients ▪ Inadequate ability to handle equipment and instruments appropriately – it takes 5 to 6 months only to orient staff nurses to the working environment ▪ Tendency to treat / behave better with international patients than with domestic patients
	Ward Boy / Ayah / Attendant	▪ Transportation of patients as required within the hospital – e.g. between wards / Operation Theatre (OT) and other diagnostic areas ▪ Ability to maintain good personal hygiene / sanitation levels ▪ Ability to carry samples	▪ Inadequate knowledge of cleaning methodologies ▪ Inadequate verbal communication skills ▪ Inadequate biomedical waste management and proper segregation of waste ▪ Inadequate ability to maintain personal hygiene / sanitation levels

Function / Role	Level	Skills required	Skill gaps
		from wards to the lab as required ▪ Ability to assist nursing staff in treatment / dressing ▪ Cleaning of the ward, knowledge of various cleaning methods / equipments and solutions required for cleaning, if being done by the hospital ▪ Movement of files between departments if required ▪ Preparation of tea and serving food, if being done by the hospital	
Technicians	Technical Supervisor and Medical Records Officer	▪ Ability to guide technicians and technical assistants ▪ Ability to be up-to-date about technological advancements ▪ Collection and collation of data from IPD/OPD/OT and other areas as required ▪ Preparation of various reports as required by statistics department, Health department, NRHM and any other agency ▪ Maintenance and codification of records ▪ Maintenance of special records such as MLC, Death, certain diseases etc	▪ Inadequate statistical knowledge ▪ Inadequate ability to guide technicians / technical assistants due to the lack of keeping up with technological advancements

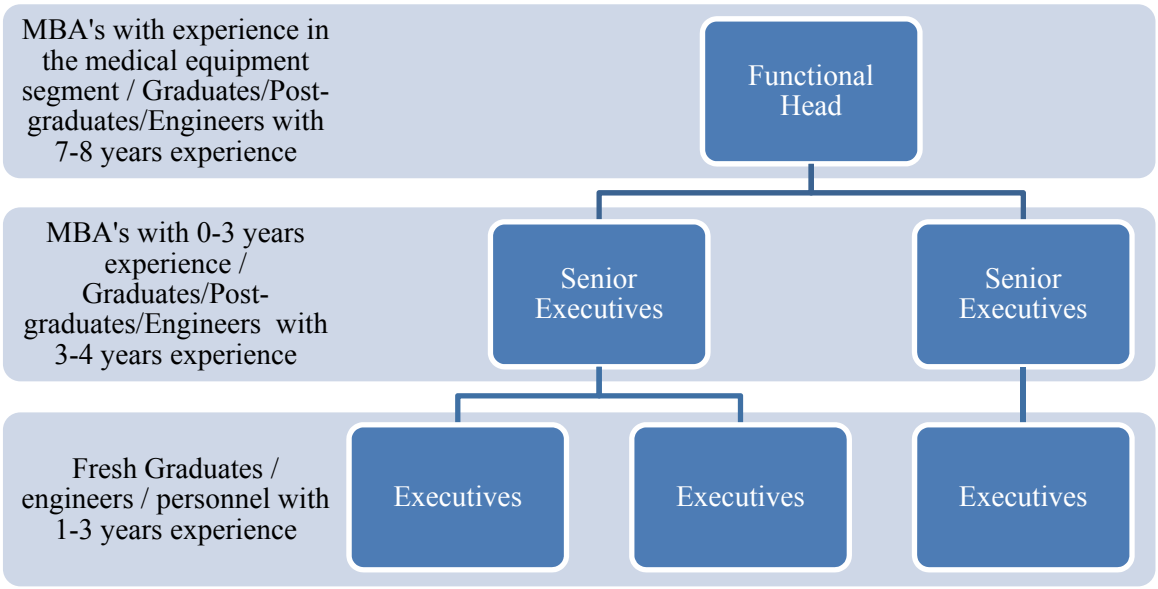
Function / Role	Level	Skills required	Skill gaps
		▪ Physical maintenance of records	
	Technician	▪ Ability to conduct tests and operate medical equipment ▪ Ability to check test results and provide diagnosis ▪ Ability to carry out preventive maintenance of equipments used for diagnosis and tests ▪ Ability to carry out regular quality check on medical equipment ▪ Ability to plan and purchase reagents and other necessary test accessories	▪ Inadequate domain knowledge ▪ Inadequate ability of equipment maintenance management
	Technical assistant	▪ Ability to prepare patients for test/diagnosis ▪ Collection of samples for tests ▪ Proper usage, cleaning and maintenance of the vials/bottles/equipments used for diagnosis and tests ▪ Recording of test results and preparation of reports	▪ Inadequate domain knowledge ▪ Inadequate ability to adhere to hospital procedures

2.8. Skill Requirements and Skill Gaps in the Medical Equipment Segment

2.8.1. Profile of people employed

The following figure illustrates the profile of people employed in the Medical Equipment Segment.

Figure 28: Profile of people employed in the Medical Equipment Segment



Source: Primary Research and IMaCS analysis

2.8.2. Skill requirements and skill gaps

The following table presents the skill requirements and gaps across various functions and hierarchical/reporting 'levels' in the Medical Equipment Segment.

Table 14: Skill requirements and skill gaps in the Medical Equipment Segment

Function / Role	Level	Skills required	Skill gaps
Manufacturing / Operations	Shop Head	▪ Ability to keep abreast of the trends in the healthcare delivery space that will correspondingly influence the need for medical equipment in India ▪ Ability to coordinate with	▪ Inadequate ability to keep complete track of changes / trends in healthcare delivery in India ▪ Inadequate ability to liaison with the various

Function / Role	Level	Skills required	Skill gaps
		counterparts abroad and emulate manufacturing best practices ▪ Ability to clearly communicate with and ensure coordination between various functions, such as R&D, Sales, etc. ▪ Ability to understand the differences in the needs of medical institutions (for example, the needs of a 50 bed hospital will be different from the needs of a 300 bed hospital) and manufacture products that meet specific requirements ▪ Ability to ensure a system-driven approach to manufacturing as against a makeshift approach and ensure that quality systems are in place	functions ▪ Inadequate knowledge across all facets of the company's business and the financial/commercial impact of their decisions on the company's business
	Supervisor	▪ Ability to manufacture low-value products that may be used by smaller medical institutions e.g. to meet the requirements of a Tier II city as compared with a Tier I city which may have the requirement of a more sophisticated equipment ▪ Ability to understand the technology behind the medical equipment, such as how magnetic resonance imaging works ▪ Ability to understand customer	▪ Inadequate interpersonal skills, leading to inadequate ability to resolve conflicts that may arise between workmen – this causes disruption in smooth production and leads to loss of time, increased cost and inadequate quality ▪ Inadequate orientation towards a systems approach and the tendency to adopt a

Function / Role	Level	Skills required	Skill gaps
		requirements and how the work being done helps meet these requirements ▪ Ability to support the manufacture of medical equipment by performing manufacturing engineering, process improvement, production planning, purchasing, and other technical functions which are necessary for the team to meet its customer needs ▪ Ability to coordinate with suppliers for outsourced components ▪ Ability to maintain and troubleshoot vacuum systems, thermal spray equipment, motors, valves, mechanical switches, PLC systems, and software as necessary ▪ Ability to make proposals / recommendations with regards to capital equipment purchases, cost reduction opportunities (insourcing/outsourcing), and vendor selection ▪ Ability to be abreast of latest manufacturing techniques and quality tools such as six sigma	makeshift approach instead ▪ Inadequate ability to understand customer requirements and specifications of the final product
	Workman / Operator	▪ Ability to carry out basic trouble shooting of machines in case of breakdown	▪ Inadequate desire for learning new skills / working on new machines

Function / Role	Level	Skills required	Skill gaps
		▪ Should have basic literacy, analytical ability and the ability to understand and follow shop floor instructions ▪ Ability to understand quality concepts and techniques being followed by the company ▪ Ability to maintain discipline at the shop floor, punctuality and regular attendance at the workplace ▪ Ability to have basic understanding of the end-product and how the work being done by the workman fits into the big picture ▪ Ability to highlight aberrations in daily production processes	/ understanding new products ▪ Insufficient understanding of discipline, industrial rules, work related procedures ▪ Inadequate ability to escalate issues ▪ Inadequate ability to carry out basic trouble shooting of machines in case of breakdown ▪ Inadequate orientation towards quality production, which is very important in case of medical equipment production
Sales	Senior Sales Executive	▪ Ability to coordinate training of hospital personnel to whom the medical equipment is being sold / rented ▪ Ability to work out various use-options with prospective clients – for example, a lease-plan, or a pay-per-use plan etc. ▪ Ability to manage various channels of selling products – e.g. direct selling, selling through medical equipment dealers etc. and work out the best option based on the clients' needs	▪ Inadequate understanding of the Indian healthcare delivery segment ▪ Tendency to push sales without completely understanding the customer's needs ▪ Inadequate ability to determine needs of medical institutions, especially in Tier II and Tier III cities ▪ Inadequate ability to work out solutions for meeting needs of Tier II and Tier

Function / Role	Level	Skills required	Skill gaps
		▪ Ability to coordinate with financing companies and facilitate financing of the medical equipment for the client ▪ Basic understanding of the Indian healthcare delivery segment ▪ Ability to understand the needs of Tier II / Tier III cities and configure the company's offerings accordingly – for example, refurbished equipment may suit the needs of a 30 bedded hospital in a Tier II city ▪ Ability to convince State / Central Government health department officials about the medical equipment being sold ▪ Ability to provide direction and leadership to junior sales executives ▪ Ability to design and manage marketing communication strategies to increase the customer base ▪ Ability to develop accurate sales forecasts and an expense budget to support the forecasts	III cities
	Junior Sales Executive	• Ability to deal with and sell equipment to various kinds of hospitals • Ability to evaluate competitors and provide competitive	▪ Inadequate ability to track competition ▪ Tendency to sell products and not sell solutions that address multiple needs

Function / Role	Level	Skills required	Skill gaps
		differentiation – i.e. the ability to compare own products with competitors products and prove own products to be superior and appropriate to the needs of the hospital • Ability to sell 'solutions' as against individual products • Attend customer product installations • Ability to understand needs of the State Government, keep track of various schemes and participate in the tendering process accordingly • Ability to train hospital personnel for usage of the medical equipment • Ability to manage and coordinate with dealers / distributors	▪ Inadequate ability to deal with Government procedures
R&D	Senior design engineer / technical lead	▪ Ability to act as engineering lead on projects, integrating all aspects of design work from other engineers (mechanical, electrical and software) to complete design and development of equipment ▪ Ability to handle a variety of product development projects, provide technical direction to the team, manage project schedule and project budget	▪ Inadequate ability to conceptualise advanced designs, especially related to electronics design ▪ Inadequate knowledge of medical standards ▪ Inadequate creativity ▪ Insufficient availability of software development skills for medical diagnosis

Function / Role	Level	Skills required	Skill gaps
		▪ Detailed knowledge in advanced electronics, mechatronics etc ▪ Knowledge of medical device standards like IEC 60601 series and FDA regulations ▪ Exposure to ISO 9000, ISO 13485 (Medical devices - Quality Management Systems) ▪ Ability to undertake software development of medical imaging and diagnosis ▪ Paper publishing in peer reviewed journals and conferences	
	Junior design engineer	▪ Ability to conduct functional and empirical analysis related to designing, prototyping, and testing designs for medical equipment ▪ Hands-on knowledge of design and analysis software like Mechanical desktop, Master cam, Autodesk Inventor, Solid works, CATIA, Pro-E, etc ▪ DFMEA, PFMEA, DMR (Device Master Record), DHF (Design History File) etc., specifically for medical device design ▪ Innovative thinking and fast prototyping ▪ Strong programming skills for software development	▪ Inadequate background / exposure to medical equipment design field ▪ Inadequate advanced level software development skills ▪ Inadequate application knowledge of best design practices and processes like DFMEA etc

Function / Role	Level	Skills required	Skill gaps
Customer Support	Senior customer support personnel	▪ Ability to assist sales personnel in client training / re-training on medical equipment ▪ Ability to ensure the availability of replacement parts for medical equipment ▪ Ability to determine and take a decision about whether the installed medical equipment needs to be replaced or repaired ▪ Ability to effectively communicate with clients on a regular basis and ensure resolution and proper follow up of complaints received ▪ Ability to drive customer satisfaction through service excellence ▪ Ability to coordinate with counterparts abroad ▪ Ability to handle multiple service requests simultaneously, prioritise work and assign junior customer support personnel to various jobs accordingly ▪ Ability to evaluate new equipment, accessories and supplies	▪ Inadequate understanding of the technicalities of medical equipment in case of several high end design machines ▪ Inadequate ability to ensure minimum downtime of installed equipment ▪ Inadequate planning and scheduling ability
	Junior customer support personnel	▪ Ability to maintain various kinds of medical equipment such as X-Ray machines, MRI machines, sterilization machines, etc. ▪ Ability to install, troubleshoot,	▪ Inadequate technical ability to troubleshoot ▪ Inadequate ability to apply smart solutions for maintenance jobs

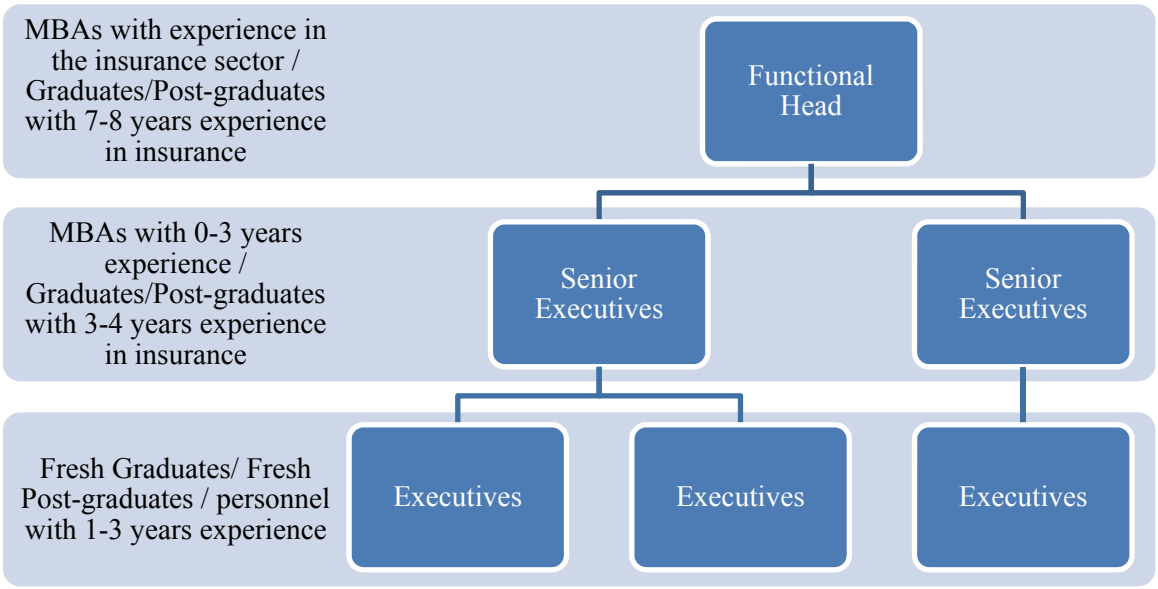
Function / Role	Level	Skills required	Skill gaps
		calibrate and maintain medical equipment at the client's end ▪ Ability to meet the daily service operation needs of clients who have been supplied medical equipment by the company ▪ Ability to conduct safety inspections at the client's end ▪ Ability to effectively conduct preventative maintenance of the equipment so as to ensure minimum machine downtime ▪ Ability to troubleshoot and manage repairs of installed medical equipment as and when they arise ▪ Ability to effectively handle service test equipment	▪ Inadequate ability to maintain standard of service delivered

2.9. Skill Requirements and Skill Gaps in the Health Insurance Segment

2.9.1. Profile of people employed

The following figure illustrates the profile of people employed in the Health Insurance Segment.

Figure 29: Profile of people employed at health insurance companies



Source: Primary Research and IMaCS analysis

2.9.2. Skill requirements and skill gaps

The following table presents the skill requirements and gaps across various functions and hierarchical/reporting 'levels' in the Health Insurance Segment.

Table 15: Skill requirements and skill gaps at health insurance companies

Function	Level	Skills required	Skill gaps
Sales	Senior sales executive	▪ Ability to establish a partnership with doctors and generate referral business through relationships ▪ In-depth understanding of healthcare market and products ▪ Ability to seek new customers and	▪ Inadequate aptitude to identify potential markets ▪ Inadequate aptitude to understand the key drivers of sales and inadequate ability to correlate with the

Function	Level	Skills required	Skill gaps
		increase sales ▪ Ability to effectively guide junior sales executives ▪ Knowledge of potential market	sales opportunities ▪ Inadequate ability to make the sales team work effectively ▪ Inadequate knowledge of competition and detailed specifications of its products
	Junior sales executive	▪ Ability to maintain good working relationships with key intermediaries – e.g. brokers, agents, referrals and other intermediaries ▪ Ability to generate sales from multiple channels such as hospitals, medical shops, clinics etc. ▪ Good networking with doctors, chemists, pathology labs etc ▪ Basic understanding of healthcare insurance products ▪ Knowledge of local language for sales negotiation	▪ Insufficient ability to convince the customers about the benefits and importance of health insurance plans (as the current awareness and penetration levels of such products are low) ▪ Inadequate networking with key channel partners ▪ Inadequate ability to convert leads into sales efficiently ▪ Inadequate commitment levels, especially towards understanding the dynamics of the insurance industry
Customer Support	Supervisor – Customer Support	▪ In-depth knowledge of healthcare products and services ▪ Ability to support customer needs, handle and route according to delivery support system ▪ Ability to identify and provide inputs on unique or recurring customer	▪ Inadequate ability to smartly handle escalated issues by appeasing irate customers ▪ Inadequate ability to meet multiple criteria for delivery in terms of

Function	Level	Skills required	Skill gaps
		problems ▪ Ability to ensure that standardised service quality parameters are enforced ▪ Ability to meet SLA productivity ▪ Ability to ensure quality delivery ▪ Expertise in support through voice, e-mail & web-based applications	productivity, quality and customer service by managing given resources ▪ Insufficient commitment towards updating knowledge of new products, features and related customer issues
	Customer Support Executive	▪ Ability to answer client calls and assist customers with immediate response ▪ Ability to provide first level support on health insurance related queries using documented procedures ▪ Ability to quickly and accurately perform multiple-tasks like documenting information, seeking information, problem solving and updating by researching on information ▪ Ability to learn and apply detailed procedures	▪ Inadequate communications skills and confidence in handling customer calls ▪ Inadequate adeptness in working with various systems for customer support including IT, voice and web-based ▪ Inadequate speed of performing tasks adversely affecting productivity ▪ Inadequate alertness, concentration and poor responsiveness in customer interactions
Under-writing	-	▪ Ability to assess the medical tests required for a particular process (This is usually done by doctors employed in the function but may also be automated and built into health insurance policy issuance systems) ▪ Ability to be able to work in an environment in which data is	▪ Shortage of personnel with an actuarial / statistics / insurance science background ▪ Inadequate ability to work in ambiguity ▪ Inadequate ability to relate business requirements with functional requirements of

Function	Level	Skills required	Skill gaps
		minimally available and yet policies need to be defined ▪ Thorough knowledge of risk modeling and the ability to assess risks for the insurance company and design policies so as to minimize the risk ▪ Need to be experts in statistics / actuarial science / insurance science ▪ Detailed knowledge of the dynamics of the insurance sector ▪ In-depth knowledge of the risk factors of the health sector	health insurance policy design
Operations	Operations Supervisor	▪ Ability to design processes and process flows (for example, the set of steps that a customer will need to follow when raising a claim) ▪ Ability to execute all back-office operations (e.g. processing of claims made by customers, making insurance policy documents available to customers, etc.) ▪ Knowledge of audit compliance ▪ Detailed understanding of the company's MIS systems, related trouble shooting	▪ Inadequate ability to deploy resources efficiently to enhance overall productivity ▪ Inadequate knowledge of audit compliance requirements and related processes and documentation ▪ Inadequate ability to manage delivery timelines ▪ Inadequate ability to meet multiple criteria for delivery in terms of productivity, quality and customer service by managing given resources ▪ Insufficient commitment towards updating knowledge of new products, features and

Function	Level	Skills required	Skill gaps
			related customer issues
	Back Office Executive / Personnel	▪ Ability to review requests for issuance and determine if all necessary information is provided. ▪ Knowledge of issuance instructions and issuance system ▪ Ability to check and ensure that transactions are processed as per the procedures while handling policy issuance. ▪ Ability to ensure that the quality of the transactions is in compliance with predefined parameters ▪ Knowledge of the underlying health insurance products to evaluate and analyse the claims ▪ Knowledge of typical medical treatments and ability to assess the correctness of claims in terms of pathological tests, x-rays, CT-scans, MRI, medicines etc (This is done by doctors employed in the function) ▪ Knowledge of the documents required for verification of claims ▪ Ability to determine the liability of the insurance company, i.e. what is payable to the customer, once a claim is submitted and an evaluation has been carried out ▪ Basic understanding of legal terminology used in the policy ▪ Aptitude for documentation and compliance	▪ Inadequate ability to keep up with latest / more advanced processes especially in issuance ▪ Inadequate ability to judge the genuineness of documents ▪ Inadequate background of even the common / simple technical aspects of healthcare sector ▪ Inadequate knowledge of legal aspects related with health insurance policies

Source: Primary Research and IMaCS analysis

2.10. Emerging Trends in Skill Requirements

Some of the emerging trends in human resource and skill requirements in the Healthcare Services Sector in India are as below[7]:

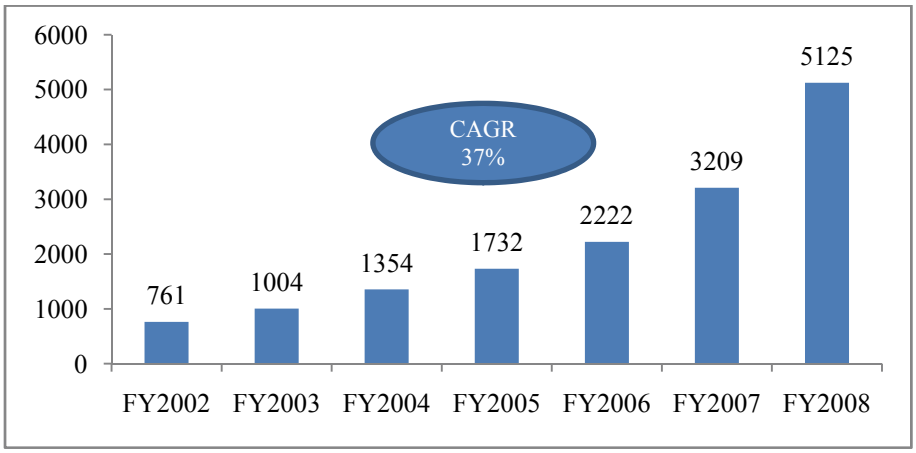
- ***Increasing presence of the private sector:*** Corporate presence in the medical care sector in India started during the 1980s. Prior to this, private institutional presence in the medical care sector was primarily in the form of charitable trusts that established large hospitals such as the Bombay Hospital in Mumbai and Sir Ganga Ram Hospital in New Delhi; besides, there were hundreds of small hospitals and nursing homes across the country. In contrast to this, the activity during the 1990s was led by medium and large sized Indian companies and was concentrated but not limited to for-profit large, tertiary hospitals such as Max, Fortis, Escorts and Wockhardt, among others. The other area that witnessed increasing corporate presence was diagnostic services with players such as SRL-Ranbaxy, Nicholas Piramal and Dr Lal's Laboratories being established. While emergence of corporate hospitals on a larger scale is important for the bed-supply deficit to be bridged, it is even more important for the professionalisation of hospital management. Till recently, modern management systems had not penetrated most healthcare institutions, with some notable exceptions. Most hospitals would organise their resources and manpower within structures that had evolved rather than been designed. The processes would be structured to ensure multiple points of control rather than patient convenience. Information capture would be rudimentary and information rarely integrated beyond that required for reporting purposes, because of which any data-based quality control was not possible. With corporate entities entering the healthcare sector, they are introducing managerial practices and tools, which they had been using for long, in the hospitals that they are promoting. Moreover, these entities are showing a marked preference for professionals, even for non-clinical and clinical support functions. This, in turn, is leading to the expansion of the hospital management education industry. This trend of proliferation of the private sector thus in turn brings about the need for personnel to run these hospitals / medical institutions, thus increasing not only the need for doctors, nurses, technicians, etc. in terms of number of personnel but also the need for a more professional health workforce.

- ***Private players in the health insurance business and the growth of health insurance:*** The health insurance market has been opened to private competition to General Insurance Corporation's Mediclaim since April 2000. According to the rules notified by the Insurance Regulatory and Development Authority (IRDA), both general and life insurance companies

[7] Documented based on inputs received in the Primary Research andIMaCS Research and Analytics

can offer health insurance. The Government insurance schemes currently existing include the Employee State Insurance Scheme (ESIS), the Central Government Health Scheme (CGHS) and Community Health Insurance schemes such as the Aarogyasri in Andhra Pradesh. More and more of the Indian population is taking up insurance which results in increased spending on healthcare. Also, the current penetration levels are of the order of nearly 2%, which promises immense potential for growth in this sector. The growth over the last few years is as below:

Figure 30: Growth of the Health Insurance Sector in India (Rs. Crore)



Source: IRDA and IMaCS analysis

- ***Day Care concept:*** Internationally, managed care organisations attempt to reduce the average length of stay (ALOS) of patients in hospitals as a cost containment measure. This has led to the development of the concept of day care centres with diagnostic and ambulatory care facilities wherein patients need not be admitted for more than one day. This not only helps hospitals increase their revenues by increasing the number of patients who can be treated but also helps them increase the utilisation of operation rooms. For patients, it is less costly, entails a lesser waiting time and is more convenient as they can return home the same day. This concept of home-based treatment as against hospital-based treatment is likely to expand further in India and will thus lead to the requirement of skills to sustain such an arrangement – for example, there will be an increasing need for nurses who can take care of patients at home, personnel employed at hospitals across all functions will need to ensure that patients who have undergone a treatment can be discharged the same day, etc.

- ***Medical Tourism and certification / accreditation of medical institutions:*** As covered earlier, medical tourism is being widely promoted by the Indian Government. Certification / accreditation of medical institutions definitely play a large role in attracting foreign nationals to Indian hospitals for treatment. With healthcare delivery players in the private sector vying

for the share of international medical tourists, there is bound to be an increase in the number of medical institutions being certified / accredited. Once certified / accredited, it will be critical for medical institutions to maintain the quality levels required retain the certification / accreditation and certain skills such as personnel to assist and monitor ISO certification / NABH accreditation will be required to help sustain this.

- ***Continuing shortage of nursing staff:*** In line with the global scarcity of qualified and trained nurses, shortage of nurses is a factor that is affecting hospitals across India. Several nursing schools have been set up across the country, but the quality of nurses who complete their education at these institutes needs standardisation. This, along with the steady outflow of nurses groomed in Indian hospitals to the rest of the world is further leading to an acute nurse shortage in the country. Many hospitals have been responding to this constraint by operating at below-norm nurse to patient ratios, stretching nursing staff working hours, and even recruiting partly skilled nursing personnel. Also, nurse who are available are currently able to perform only basic nursing functions and specialisations are rare. With the proliferation of the private sector in the healthcare delivery segment, the demand is expanding at a much faster than the supply, and nursing colleges are unable to keep up with the demand; the situation is only expected to get worse unless action-oriented measures are put in place.

- ***Increasing role of the private sector in nursing education:*** Given the shortage of nurses currently and in the future, the private sector has started playing an important role in nursing education. Several private hospitals have set up their own nursing schools to train nurses as per the standards required in their own hospitals. This step definitely helps bridge the demand-supply gap and helps hospitals to groom nurses as per their requirements. But an issue being faced by such hospitals is that once such a nurse joins the workforce, there are no means to curb the attrition rate. The foray of the private sector into nursing education in-turn brings about the need for teaching staff for running the training programs / nursing education courses. However, teaching staff are also in short supply.

- ***Trend towards manufacturing of medical equipment:*** Diagnostics is an important element of the healthcare services sector and the increase in the availability of medical institutions drives the need for more medical equipment. As covered earlier, a significant portion of the medical equipment used in India is imported – this is now slated to change with Indian players entering the arena of medical equipment manufacturing and producing much more affordable equipment. At the same time, more complex and varied types of medical equipment will continue to be imported. The segment is also expected to witness consolidation as smaller companies are acquired and optimized and bigger players thus emerge. The export of medical

equipment from India may then also become a reality. The medical equipment manufacturing business is currently in the early stages of development in India and manufacturers produce small batch sizes. The scale of operations is expected to increase to a great extent in the next 5 to 8 years, leading to the need for personnel with the right skill sets – for example, the number of bio-medical engineers needed (especially in the R&D function) is expected to rise.

- ***PPP for core and support functions:*** Public Private Partnerships (PPP) is expected to play a greater role in the running of hospitals and India is already making headway in this direction. Private as well as public hospitals have started tying up with private players for providing support services such as security, housekeeping, laundry and food services.. A larger role of PPP is seen in the tying up of private players with Government hospitals for running the Government hospitals for core operations. At present, the level of PPP in the Healthcare Services Sector in India is low and different models of PPP for activities across the value chain need to be explored. The success of PPP will depend on several factors such as the availability of competitive agencies that support services can be outsourced to, the setting up of contracts such that the private sector has can have monetary gains too, etc.

- ***Developments and newer areas of medicine:*** Several developments are expected to happen, and these are expected to change the way healthcare delivery is currently executed. This in turn will lead to the need for specialised skills. Some of the developments expected are as below:
    - There is expected to be a rise in non-invasive technology / minimal access technology and highly skilled personnel will be required for working on this
    - Targeted therapies are expected to take over / replace chemotherapy going ahead – personnel to work on this will thus be needed across the value chain (doctors, nurses, technicians, etc.)
    - Gene profiling is expected to make headway and personnel with an understanding of the same will thus be required
    - Focus on newer fields such as geriatrics is expected and skills specific to handling older people will be required
    - Medical research has traditionally been limited in India, but there is now an increased emphasis on research – clinicians with a research bent will thus be needed.
    - Clinical trials are expected to rise and medical personnel will need to be trained for this
    - The use of IT in medical diagnostics is expected to increase and skilled personnel will be required for working on this.

2.11. Projected Human Resource Requirements

As seen earlier in this report, the various ratios of medical personnel to population in India are way behind similar ratios in developed countries such as the US or the UK, and are also lower than the ratios in China. Medical personnel, especially doctors, nurses and technicians are critical to the healthcare delivery system of a nation, and their availability in appropriate numbers is critical.

We have analysed the incremental requirement of various medical personnel till 2022 by taking into consideration the expected population growth of India and the following scenarios:

- Current availability is based on the current ratio of medical personnel to population
- Requirement in 2012 is based on the ratio of medical personnel to population improving to that currently existing in other developing countries
- Requirement in 2018 is based on the ratio of medical personnel to population improving to a point intermediate between other developing countries and developed countries
- Requirement in 2022 is based on the ratio of medical personnel to population improving to that close to developed countries.

Based on the above analysis, the expected and incremental employment for various categories of medical personnel is as below:

Table 16: Projected human resource requirements for Medical Personnel in India till 2022 (in '000s)

	2008	2012	2018	2022	Incremental
Doctors	725	1,208	1,947	2,705	1,980
Nurses	1,600	2,416	5,192	10,822	9,222
Technicians, Paramedics and others	27	232	530	812	785
Dentists	80	121	389	676	596
Pharmacists	681	724	779	811	130

Source: IMaCS analysis

For personnel involved in the medical equipment segment, we have analysed the current employment in the sector, the expected growth in the sector till 2022 and the productivity changes expected.

Table 17: Projected human resource requirements for the Medical Equipment Segment in India till 2022 (in '000s)

	2008	2012	2018	2022	Incremental
Medical Equipment Segment	53	70	121	184	131

The human resource projections for the Health Insurance Segment have been covered separately under the Banking and Financial Services Industry report.

2.11.1. Focus areas for skill building

As is evident from the above discussion, combined with the required increase in the density of medical professionals per 1,000 persons, as well as the projected increase in population, significant capacity and skill development is required in the following areas:

- Doctors
- Nurses
- Technicians and Paramedics.

Among the areas outlined above, the requirement of nurses, and technicians and paramedics account for over 75% of the incremental human resource requirement.

This report has been prepared by **ICRA Management Consulting Services Limited (IMaCS).**

IMaCS is a multi-line management and development consulting firm headquartered in India. It has an established track record of over 15 years in consulting across various sectors and countries. IMaCS has completed over 950 consulting assignments and has worked in over 30 countries across the globe. Through the process of carrying out several assignments over the last decade and half, IMaCS has accumulated considerable analytical and consulting expertise, backed by the following capabilities:

- Deep understanding of policy formulation.
- Extensive and organised database on several sectors.
- Knowledge of key factors of success in different projects and programmes.
- Ability to research emerging trends in the economy, as well as in specific sectors.
- Insight into different programmes and organisational processes.
- Ability to carry out economic analysis, build quantitative and financial models to project future performance and identify imperatives.
- Ability to identify the various types of risks and suggest appropriate strategies to mitigate the same.

The Education and Skills practice at IMaCS focusses on identifying skill gaps, mapping future skill requirements, and formulating strategies to address them. Our service offerings encompass diagnosis, design and implementation of education and skill development interventions for government and private sector.

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