CHAPTER 7
PURCHASERS AND PROVIDERS OF MEDICAL TECHNOLOGY IN INDIA

In Chapter 6 we saw that there has been a tremendous growth in the medical equipment market in India, and equipment manufacturer and importers are devising strategies and ways to tap this huge and flourishing market for all kinds of medical instruments, equipment, and devices. This chapter presents information on the purchasers and providers of these technologies. As we have seen in the review of healthcare in India (Chapter 3), historically, India has both public and private medical care providers, which in turn includes individual practitioners, nursing homes and hospitals. Furthermore, there has been growth of hospitals in the private sector. This Chapter examines the current developments in both the private and public sector medical services that bear relation to consumption of medical technologies. We begin with the private providers.

7.1: PRIVATE MEDICAL CARE FACILITIES
7.1.1 Tertiary and Secondary Hospitals

The growing numbers of private hospitals offering a range of services and diagnostic tests are major consumers of the high-tech medical equipment. We find that these hospitals are now regarded as businesses that need to turn in profits. As businesses, they are subject to the same risk, opportunity cost and growth considerations as any other sector would be. Accordingly, the modes of financing have changed. Funds may be raised through initial public offerings (IPOs) or they may come in the form of a placement with a venture capitalist or a private equity fund. Indian hospitals are also adopting many of the management practices and tools used by their counterparts in the West. We also find that government policies are encouraging growth of the private hospitals and diagnostic services directly by offering various tax subsidies and benefits, and indirectly through the policy of public-private partnership.

Growth of private tertiary level and specialty hospitals

Since the early years of this decade, when healthcare was seen as a 'sunrise industry', three big corporate houses, Fortis Healthcare (promoted by Ranbaxy Labs), Wockhardt Hospitals and Max Healthcare announced their plans to set up hospital chains across the country. In addition to the bigger hospital chains, healthcare facilities such as the Mumbai-based Asian Heart Hospital, and Global Hospitals and CARE Hospital in Hyderabad sprung up, which specialized in niche areas such as cardiac care, eye care, orthodontics and laparoscopy.
Yet another development is that the International Finance Corporation (IFC), a member of the World Bank Group, is also providing loans to private hospitals for their expansion plans, and to set up hospitals in smaller cities and towns in the country. IFC looks upon such projects as demonstration of its commitment to social sector development and part of its strategy to invest in health care and promote private sector involvement in healthcare in India.

Listed below is an indicative set of such developments:

a) **Apollo Healthcare Group**, now an Indian multinational, introduced the concept of corporate medical care delivery in India. Apollo Hospitals Enterprises (AHEL) was incorporated as a public limited company in 1979 and is listed on the Bombay Stock Exchange. It is reported to be the largest in Asia, with over 8000 beds, and owns and manages a network of 41 specialty hospitals and clinics, and a chain of 130 pharmacy retail outlets across the country. It is also into a range of other medical care related services: nursing and hospital management-colleges, pharmacies and diagnostic clinics, medical transcription services, telemedicine, clinical trials, and consulting. The Group includes six companies. Among them is an Online Hospital Equipment Services Private Ltd (Equipment World), an electronic equipment exchange for medical equipment and high-end medical technology. It sources and selects high-end medical equipment, catalogues and provides expert advice and services on technology and techno-commercial issues. The Apollo Healthcare Consulting Services manages more than 30 hospitals in India, Dhaka, Colombo, Kuwait, Nigeria and Yemen. All such managed hospitals become part of the network for central marketing and purchase programme. The Apollo Education and Research Federation was started in 2002 to develop and maintain medical educational programmes and institutions in medicine, nursing, radiology, cardiology, physiology, physiotherapy, laboratory services and other allied medical and non-medical courses. **Apollo-GlenEagles** is a joint venture between Apollo and Parkway Group of Singapore to cater to eastern and north-eastern India, Bangladesh, Bhutan, Myanmar and Nepal (http://www.apollohospitals.com). The Apollo Health Street provides IT services to US healthcare companies. In mid-June 2008 Apollo announced plans to move into Tier II cities in India, and was setting hospitals jointly with financial companies such as JP Morgan and Birla. Ending March 2008 it reported an income of Rs 1,150 crore, a 28% increase, and a net profit of Rs 101.8 crore, a 51% increase over the previous year (The Hindu June 25 2008).

b) The **Wockhardt Hospitals**, is an associate of Harvard Medical International, USA, promoted by the pharma company Wockhardt. It had established a chain of state-of-the-art super specialty hospitals at Mumbai, Bangalore, Hyderabad, Kolkata and Nagpur, equipped with multi-
disciplinary capability, and had committed several hundred crore rupees for this purpose (Economic Times 14 December 2004). The group, which planned to double its chain of hospitals by 2012, opened its second hospital at Bangalore — a new 400-bed multispeciality hospital offering the whole range of cardiac, orthopaedic, neurosciences, minimal access surgery, and women and child services. Wockhardt Hospitals (Business Standard July 13 2007).

c) General Electric (GE), as part of its plans to increase its presence in India, was investing $250 mn in infrastructure and healthcare projects in the country. In the National Capital Region of Gurgaon a ‘Medicity’ was coming up with an investment of $250 mn. MediCity was being planned as a world-class integrated Healthcare Facility spread over 43 acres, with high-end diagnostic tools, clinical research and development, and utility services like power generation and distribution, lighting and water treatment. When completed it would be a 1,800 bed, multidisciplinary, high-tech medical institute, clinically modeled after global centres of excellence such as Johns Hopkins and Mayo Clinic in the US. It was expected to be operational by 2007. This facility was being set up by a number of equity partners. GE HealthCare was providing the latest healthcare technologies for this project, such as advanced diagnostic and monitoring systems, cathlabs, anaesthesia systems. It was also a partner in clinical research and education programmes. According to the CEO of Medicity, "The vision for MediCity is of a campus that is the epicentre for cutting-edge medical research and innovation in Asia..... With the state-of-the-art facilities we have planned and the coming together of the finest medical intelligentsia, we will bring to the people of India global healthcare delivery standards at affordable prices" (Chronicle Pharmabiz June 2 2005)

d) In 2007 Max Healthcare Company received a loan from the International Finance Corporation (part of the World Bank – see section 2.3) for expanding by 2010 its network of secondary and tertiary facilities as well construction of new hospitals in the National Capital Region (comprising Delhi and neighbouring townships), Dehradun. Max planned to set up 16 primary care centers, 5 nursing homes (30-40 bedded), and 2 tertiary level hospitals. The total budget was around Rs 3 billion (http://www.ifc.org). The expansion project was expected to create about 4500 jobs during the construction phase. Max Healthcare collaborates with Harvard Medical International, an arm of the Harvard Medical School, USA.

e) In mid-2008 another corporate hospital, the Delhi-based Rockland Hospital, received a $14mn loan from the International Finance Corporation to fund expansion of its current facilities and build the first phase of a new 250-bed hospital at Manesar, in neighbouring Haryana (The
f) Hindu August 5 2008). IFC was to provide $10mn through equity investments and another $4 mn in convertible preferred shares.

g) **Aditya Birla Group**, another business house had also entered the healthcare business and set up a specialty hospital at Pune.

h) **Artemis Hospitals, promoted by Apollo Tyres**, was setting up a Rs 500 crore medical education ‘hub’ on the Baroda-Ahmedabad highway in Gujarat. (The Economic Times August 31 2007). The Company was planning to acquire around 95 acres for the project, which was to have a 500-bedded hospital, a medical college, nursing college, pharma college, and a medical administration college.

i) The **Fortis Group (of Ranbaxy)**, incorporated in 1996, which planned to set up ten medicities, was engaged in talks with the Gujarat government for setting up one such project in that state (The Economic Times August 31 2007). It was also planning a Rs 500 crore health city in Gurgaon, in the National Capital Region of Delhi (Chronicle PharmaBiz August 30 2007).

j) Several new and existing corporate hospitals were planning to set up big hospitals in Gujarat, and it was estimated that total investment in the health sector in Gujarat was more than Rs 7000 crore as of August 2007 (The Economic Times August 4 2007). This included **Bombay Hospital Trust, Clinical Islet Transplant Group, Manipal Education and Medical Group, Apollo, and Sterling**; apart from Artemis and Fortis mentioned earlier.

k) The Paras group had launched Paras Hospitals, a state-of-the-art 250-bed, multi-specialty tertiary care facility with super specialty in neuro-surgery, trauma, orthopaedics, and mother and child care, in Gurgaon, in suburban Delhi. The seven-storey complex is spread over 250,000 sq ft and is estimated to cost over Rs 100 crore. The hospital is equipped with six state-of-the-art operation theatres, 48 critical care beds, special ICUs and NICUs, sophisticated diagnostics including a 1.5 Tesla MRI (Business Standard July 13 2007).

l) The **Asian Institute of Gastroenterology**, a Rs 30-crore, 200 bedded Gastroenterology and Liver Diseases Hospital and Research Centre, was started in Hyderabad in 2004, with equity participation from Matrix Laboratories and donations from VisualSoft and Zen Securities. The Asian Institute of Gastroenterology, originally started in 1994, is reported to have developed expertise in treatment of a range of gastroenterology diseases, developed equipment (such as the endoscopic sewing machine and some accessories) and trained professionals. The new venture was to have treatment services, research & patenting, training, & drug trials as its focus areas. It has already tied up with the Centre for Cellular and Molecular Biology for genetic research, the Northwestern University, Chicago for proteomics, and Erasme Hospital in Brussels for pancreatic research. The Asian Institute has been chosen as one of the five centres in the world for a multi-country trial of a new capsule endoscope; Italy, Belgium, the US and France being the other countries. The US Federal Drug Authority has recognized the capabilities of the institute
for undertaking drug trials, which the latter plans to capitalize. In the patents and new
development area, the institute has tied up with Boston Scientific and Wilson Cook of US. These
companies will do the final refining, help in US patents and marketing if necessary. Outsourcing
of clinical drug trials was expected to be a big opportunity for which the institute is well placed
in the gastroenterology area. It has constituted an internal review board, an ethics committee and
all the requisite expertise to attract global companies that are looking for clinical trials in India.
Similarly, in training also the institute has so far trained about 150 persons from the US in
gastroenterology (Business Line December 25 2003).

m) In 1997-1999 the Ma Amritanandmayi Trust, a charitable trust, set up the Amrita
Institute of Medical Sciences in Kochi, Kerala, at a cost of Rs 300-350 crores. The entire range
of medical equipment was imported duty free, from the US and Germany. At that time the
Institute had procured equipment worth $ 12-15 million (about Rs 66 crores @ Rs 44 to a dollar)
(Economic Times November 7 1997).

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<tr>
<th>New hospital</th>
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<td>Artemis</td>
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<td>Medicity</td>
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<td>Emaar MGF</td>
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<td>Pacific Healthcare</td>
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<td>Parkway group</td>
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<td>Columbia Asia</td>
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<td>Prexus Health, USA</td>
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Source: Business Standard July 13 2007

Several foreign companies have also entered the Indian market. Leading healthcare providers
such as Harvard Medical International and Cleveland Clinic have entered the country through
joint ventures. Pacific Healthcare Holding and Parkway (both from Singapore), Emaar from the
Middle East, Prexus Health Partners from the US and Columbia Asia from Malaysia have all
announced plans. While Prexus was planning three facilities in Delhi and its neighbourhood,
Columbia Asia planned three 100-bed hospitals in Mumbai, Delhi and Calcutta (Business
Standard July 13 2007).

Corporate hospitals were also being invited to manage government hospitals. For example:
the Government of Gujarat has a public-private partnership with Wockhardt Hospitals Group
(WHG), India’s leading super-specialty hospital chain, to conduct and manage the 275-bed Palanpur Civil General Hospital in Gujarat (Express Healthcare July 2007). The agreement to establish this association was made in the presence of the erstwhile state Chief Minister. Under the agreement, Wockhardt would run the hospital efficiently within the allocated annual budget, besides providing to patients medical treatment and facilities at tariffs fixed by the Government of Gujarat. For this, a Special Purpose Vehicle (SPV) known as Rogi Kalyan Samiti had been created, which would have three nominees from the Government of Gujarat. The agreement was initially for a period of 10 years, to be renewed for another 10 years by mutual consent.

Hospitals in smaller cities and towns

It is not just that the big/corporate hospitals that are investing in expensive, high-tech equipment. They are also opening up such facilities in cities outside the metropolises. In addition, hospitals in smaller cities and towns are also adopting new technology, and going in for accreditation. (Business Line June 7, 2004). To give an example: in Tamil Nadu, the Nagercoil-based Sushrushah Hospital, established in 1992, is the first in India where Siemens Ltd has installed the Siremobil Iso-C 3D - a mobile three-dimensional C-arm system with imaging capability - globally reputed as being a revolution in orthopaedic surgery. It was priced at Rs 80-lakhs. That Siemens' first 3D C-arm in India has been installed at a small-town hospital in Nagercoil is seen as endorsing a pattern increasingly perceived by company officials - of small-town hospitals adapting to new technologies faster than their hi-profile big-city counterparts. Sushrushah Hospital is only the seventh in Asia where the equipment has been installed, according to officials of Medical Solutions Division, Siemens Ltd. According to officials of Siemens,

'About 10 top hospitals in the country seemed to be in no urgency for new technology. Small towns took to top-end technology, since it was a good differentiator among hospitals. It stemmed the outward flow of people to cities in search of good medical treatment. Whereas, branded hospitals in cities relied on their reputation to attract patients. New medical technology from Siemens has found takers in cities such as Jalandhar, Amritsar, Surat, Baroda and Meeraj'.”

In order to overcome the financial limitations of small hospitals Siemens had reached an agreement with the State Bank of India to finance purchase of its equipment (see earlier).

7.11.2 Private Diagnostic Centers

Private laboratories for clinical and pathological tests are not a new phenomenon. Small medical laboratories have always been around in India. Although it is difficult to estimate their numbers, as to date there are no regulations and laws in any part of India governing the setting up of diagnostic/pathological laboratories, yet our research reveals a couple of interesting trends in the over the past several years in diagnostic segment.
One is the growth of independent diagnostic centers and their corporatization like the hospitals.

The other is the increasing number of independent imaging centers that are being set up in many cities.

Large path labs are now reported to be growing at an impressive rate. While no exact figures are available, however, the pathlabs market in India is estimated to be growing at a CAGR of 20 per cent annually (www.nicholaspiramal.com/subs_pathlabs.htm, accessed on 25 October 2005). The market is said to be highly fragmented, with very few large players. For example, it is estimated that at present there are over there are over 25,000 path labs in the country, and that most are either ill-equipped or are not professionally manned (Business Line 29 September 2005). It is estimated that there are 3,000 path labs in Mumbai, with less than 400 run by qualified pathologists (Business Line September 2005).

Several business houses were drawing up plans to exploit the market potential in pathological laboratories. According to people in the diagnostics segment, it is predicted that this fragmented path-lab market would witness some consolidation in a regulated environment within the next five years. According to the management of the Metropolis Health Services Private Limited,

"..... this was the growth model in the US. Ten years ago, the US market was as fragmented as the one in India today. But over the years, four major chains have emerged to control 90 per cent of the market in the US. The market in India will also evolve in a similar way" (Business Line September 2005).

In the diagnostics segment there are companies such as SRL-Ranbaxy, the Mumbai-based Metropolis, and Delhi-based Dr Lal's Pathlabs and the Agarwal Imaging Centre. Pharma companies, including Dr Reddy's Laboratories (DRL) and Nicholas Piramal, also have a finger in the path-lab pie, supporting such ventures directly or indirectly.

Several factors can be identified for this phenomenon of increasing number of private diagnostic facilities:

- The growth of such independent diagnostic facilities is being perceived as being able to take the load off conventional hospitals and give rise to new kinds of entrepreneurship.

- Specialized diagnostic labs are also looking at Hospital Lab Management (HLM) - ways by which they can take over the maintenance and operation of lab facilities of big hospitals.
• This is seen as an avenue for those who do not want to open a new lab or buy one outright (Business Line April 15 2006).

• Another development is the policy of the government to encourage/promote public-private partnerships in the healthcare. Under this laboratory services are being outsourced by government and other public sector hospitals and institutions, such as the Railways, Defense, and Employees' State Insurance Corporation.

• Laboratory testing and diagnostic services outsourcing from hospitals outside India is also set to become a big business in India. "For hospitals in the UK and the US, it is cheaper to outsource laboratory and diagnostic tests to India. The prevailing rates there are ten times more compared to our charges. The situation is the same in West Asia too," according to the Managing Director of Metropolis Health Services (India) Private Ltd.

Profile and Activities of the major companies in the diagnostics facility segment
Use of state-of-the-art equipment is the major selling point for all these facilities, and acquisition of any new gadget/equipment is given wide publicity in the media and highlighted by all laboratories without exception. The following section lists the developments in the country in the pathological laboratories segment of the healthcare industry.

§ Metropolis Health Services (India) Private Limited is a Mumbai-based company which runs a chain of clinical diagnostic centers across the country. Metropolis claims to have a referral centre for a wide range of medical specialty tests, catering to over 1,000 laboratories and hospitals in the country. It has three levels of labs — a Centre of Excellence (high-end), secondary labs and primary labs or collection centres, established on the basis of a market survey. Metropolis is reported to be India's largest chain of pathology laboratories, and has over the years established a chain of 8 diagnostic clinical laboratories, across the country at Mumbai, Chennai, Bangalore, Jaipur, Thrissur, Kochi, Delhi, Ahmedabad and a contact centre at Dubai. The Mumbai centre is said to be the largest in the country, offering over 1,200 specialized tests, ranging from oncology to genetics, immunoassays to molecular biology (Business Line April 9 2005). The founder-chairman of Metropolis had functioned as Executive Director, DRL-diagnostic division and Director on the board of Zydus Cadila, before he founded the Metropolis Laboratory, Mumbai, in 1981. According to newspaper reports the revenue of Metropolis increased from Rs 8 crore in 2002 to Rs 70 crore in 2006 (Business Line April 15 2006). It had also acquired several existing labs and was reported to have spent Rs 25 crore on acquisitions. In 2001 it acquired Sudharma Laboratory of Kerala and Lister Laboratory in Chennai, Tamil Nadu, in 2002 (Lister Metropolis Laboratory). Aiming to have one Metropolis lab in every State in two
years, Metropolis Health Services has partnered with its joint venture partner in Chennai, Lister Laboratories, to fuel growth across the country and set up a national network of laboratories (Business Line April 14 2004). While the centres at Mumbai and Chennai are referral centres or main diagnostic hubs, other labs would fall into the primary or secondary category, doing routine and high-end tests respectively. Investments ranged between Rs 70 lakh-Rs 1.5 crore to Rs 10 crore for a diagnostic centre. Metropolis expected at least 100 samples for testing from each partner every day.

According to its Director expansions done till date had been funded through resources generated internally or through bank borrowings. Plans were on for acquiring funds from local and international funding agencies. Metropolis Health Services was contemplating private placement of equity to expand and grow. It planned a Rs 40-crore private equity placement in 2006 and an IPO later to fund acquisitions in South East Asia (Business Line April 15 2006).

Metropolis runs ten of its labs under Hospital Lab Management (HLM), including in Sri Lanka and Seychelles. It manages the laboratory at Chennai's Malar Hospital and Ramaiah Hospital in Bangalore. Talks were on for more HLM tie-ups with 500-1000 bed hospitals in the Gulf, South East Asia, Africa as well as within the country. Metropolis has a referral centre in Dubai and a second line of growth was through international expansion. It was exploring proposals for Tanzania and Sri Lanka. According to its Chairman, the target was to achieve a turnover of Rs 100 crore by 2006, of which 20 per cent would be from the international units that it now plans to set up, in the SAARC region, West Asia, Africa and UK. The company was setting up the Dubai unit as the referral laboratory for the entire west Asian market, and the Tanzania unit for east and sub-saharan Africa. Plans for Sri Lanka and Nepal were at an advanced stage (Economic Times March 14 2004). Metropolis had also tied-up with Gulf Medical College Hospital in the UAE. It was reported to be having talks with a consortium of hospitals in the US, the NHS (National Health Services) in the UK, and in India, too (Business Line 29 September 2005).

Metropolis also had plans of a tie-up with Chennai's Sri Ramachandra Medical College and Bangalore's Ramaiah Hospital to offer complete clinical trial solutions. *It planned to set up a joint company or have a loose alliance to work with contract research organisations to bring clinical trials and offer patients, lab services, hospital beds, disease profiles.*

Lister Metropolis Laboratory & Research Centre Pvt Ltd expanded its business beyond pathology to radiology, and completed a Rs 30-crore expansion project in early 2005. With this, Lister Metropolis planned to move into all branches of diagnostics—pathology, radiology (X-ray, CT scan, MRI scan, ultrasound and mammography) and molecular imaging. Lister Metropolis has launched several 'novel' services. One was 'home service' where X-ray and ECG could be done at homes. Another was on-site testing services for companies, where the testing is
done at its offices. This service has particularly been found useful at recruitments, as the candidates successful in interviews could undergo a medical examination "in the next room" (Business Line 4 March 2005).

A key part of this expansion was the setting up of a PET-scan facility, considered to be 'the cutting edge technology' in diagnostics. The Rs 20-crore PET scan centre was being set up by a company called DCA Metropolis India Pvt Ltd, a joint venture between Metropolis Health Services and DCA Molecular Imaging, Delhi. DCA Molecular Imaging in turn is a joint venture between Diwan Chand Agarwal Group of Delhi and Molecular Imaging of the US. The company has entered into a 50:50 joint venture with the Delhi-based Diwan Chand Satyapal Aggarwal (DCA) Imaging Research Centre, to foray into this segment. (Business Line August 22 2004). Called DCA Metropolis, the company aims at offering complete diagnostics solutions. They planned to initially operate in Delhi, through three centers, and later extend to other centres such as Mumbai, Chennai and Bangalore. Opportunities in the NCR regions of Noida and Gurgaon would also be explored. An initial investment of Rs 12 crore had been made.

The joint venture also planned to expand into other markets in the South Asian, South East Asia and West Asian regions. ("Currently Metropolis has presence in Dubai and we will look at aggressively expanding in the international market where we could either set up labs for hospitals or manage their existing facilities for them"). Another focus area for DCA Metropolis was tele-radiology, wherein it would try to get hospitals in the US and the UK to outsource their radiological reports to India.

The third segment that the venture planned to target was the home services segment – namely to provide services for those who are unable to visit a diagnostic centre for pathological needs.

§ Nicholas Piramal India Limited (NPIL) the pharmaceutical manufacturer is also in the diagnostic laboratories business, and in which its turnover is estimated to be Rs 35 crores. NPIL in turn is the flagship company of the Rs 2500 crore Piramal Enterprises Limited, one of India’s largest diversified business houses (www.nicholaspiramal.com). NPIL has several joint ventures/alliances in the pharma business with Roche (Switzerland), Boots plc (UK), Aventis (France), Allergan (USA) and Chiesi (Italy). It owns a hospital in Mumbai (Wellspring Hospital). The diagnostic laboratory division expected to double its revenues by 2006, by expanding this business to smaller metros and semi-urban areas. The company plans to exploit the potential in the diagnostics laboratory market by activities such as: According to the company, the group of companies like NPIL Laboratories and Diagnostics Pvt. Ltd has been clumped together into Piramal Diagnostic Services Pvt. Ltd,
acquisition of established reputed laboratories in the metro cities;

expansion of these by increasing the range of services;

enhancing coverage through branches and collection centers;

setting up its own clinical labs;

or have franchising arrangements with existing laboratories and pathologists;

accreditation through NABL and *establishing a brand in the diagnostic laboratory business.*

As of 2004 it had about 10 franchised laboratories, and planned to increase the number to about 30 by 2006, mostly in Rajasthan, Orissa, Maharashtra, and West Bengal. These include: Drs. Tribedi and Roy Diagnostic Labs Private Ltd, Kolkata; NPIL-Dr Phadke Pathological Lab & Infertility Centre Private Ltd, Mumbai, and Dr Golwilkar's Labs, Pune. According to the company, working with local established pathologists would bring in goodwill and expertise, while Nicholas Piramal would bring in the equity, standardization and the information technology (Economic Times December 11 2004).

§ Specialty-Ranbaxy Laboratories (SRL)

Ranbaxy, another pharmaceutical manufacturer, is also in the clinical laboratories business, and operates a chain of Specialty-Ranbaxy Laboratories. SRL is reported to operate in 275 towns through its clinical reference labs in New Delhi, Mumbai, Bangalore and Mohali. It claims to have over 500 collection centres and a nation-wide specimen pick-up system. The Kolkata laboratory was started in 2003 with 20 collection centres. SRL is reported to offer more than 1,000 value-added tests. It has obtained the College of American Pathologists accreditation, and has drawn up plans for tie-ups with leading hospital systems in the UK and West Asia. By 2006 it planned to invest around Rs 25 crore in expansion of laboratory operations. It was reported to be talking to three countrywide hospital systems in the UK for off-site diagnostic tests. It was also planning to begin its off-site operation in Abu Dhabi, Dubai and Kuwait (Business Line November 9 2003).

§ Diwan Chand Satya Pal Aggarwal Imaging Research Centre is a unit of Diwan Chand Integral Health Services Limited. It is the oldest and largest radiology centre in India. Established in 1924 by Dr Diwan Chand Agarwal in Lahore, now in Pakistan, the clinic describes itself as 'the leader in using modern technology and most up-to-date equipment throughout its history'. In the 1930s, the clinic was the first to acquire the Coolidge tube, rotating anode tube, full rectification through valves, and then selenium rectifiers, which were the latest developments in Radiology in those days. (Some of these old equipment were on display in the Centre premises on Kasturba Gandhi Marg, Delhi) (from www.dcaimaging.org, accessed on Dec. 18 2004 and June 3 2008).
After suffering a temporary setback due to India's partition, in 1947, Dr Diwan Chand Aggarwal moved from Lahore to Delhi, and re-established the clinic. It is the declared philosophy of this clinic to 'develop the centre as a leading institute using state-of-the-art technology'. The clinic was one of the earliest users of image intensifiers and ultrasound in the country, as also one of the first centres in private practice to install a whole body CT scan. Over the last decade, the centre has added to its 'diagnostic armamentarium'. It has a 1.5 Tesla and 1 Tesla whole body MRI system from Siemens (Germany), for routine and specialized MR imaging. It was one of the first private centers to have a CT scanner in India in 1986. It now has several scanners, including a spiral CT. The conventional radiology department has the latest high-powered x-ray units with image intensifiers, OPG machines and digital x-ray equipment, with facilities for DSA and cine radiography. This centre introduced ultrasonography in the early 1980s and the ultrasonography department now has several high-level equipment, including whole body color doppler machines. It also 'boasts' of two dedicated mammography units. The centre performs about 300 mammograms annually, including screening and in high-risk groups. Its nuclear medicine department has a gamma camera for nuclear medicine studies. The centre also gives radiotherapy.

The center has lateralised into a smaller satellite clinic at Defence Colony in New Delhi. This clinic is equipped with a Spiral CT Scan, Digital OPG (orthopantomography) and Digital Radiography using CR Technology. It is connected to the parent centre through dedicated leased lines for tele-radiological consultations. Parallel to this astronomic growth in equipment, the center 'boasts' of a highly qualified, experienced and trained faculty of 14 radiologists.

As of 2006 Diwan Chand Integral Health Services (DCIHS), a Diwan Chand Aggarwal (DCA) group company, was set to expand in Delhi and NCR to create an organised chain of imaging centres. The company has launch six imaging centres in the NCR region and was looking at options in Kolkata, Mumbai, Jaipur, Chennai and Bangalore (Express Healthcare Management November 2006). According to the Director, DCIHS, there was no organised imaging group in the country and hence DCIHS wants to create a niche. An investment of over Rs 150 crore was planned on expansion, with funds to be raised through a mix of private equity and loans. The company would follow a Hub-and-Spoke model, which would have four high-end radiology centres, five mid-range facilities and numerous entry-level radiology centres.

DCA Imaging also sets up and manages hospital based diagnostic imaging centres in Delhi. It has set up such facilities in three big hospitals in Delhi – the Pushpawati Singhaniya Research Institute, Shanti Mukund Hospital, and Sant Parmanand Hospital. Diwan Chand Diagnostic Imaging Services (DCA) has set up a center to cater specifically to needs of women. (women
wellness') in NOIDA, in the National Capital Region of Delhi. It is reported to be a comprehensive one-stop facility designed specifically for the imaging needs of women, as well as a holistic diagnostic and pathology center for everyone. With programs geared to the diagnosis of illnesses of concern to women in mid-life (breast disease, gynecological disease, and osteoporosis), the centre focuses on prevention and early detection. It was planning more such centers in the NCR (http://www.dcaintegralhealthcare.in/home).

Since 1990 the centre has been a recognized teaching institution for post-graduate training in radio-diagnosis, and posts the trainee radiologists in corporate hospitals in Delhi during training. It has a large library of books, journals and other teaching material. Research programs are undertaken free of cost, in collaboration with teaching hospitals where state-of-the art facilities are not available. The clinic also hosts and participates in the monthly meetings of the Chest Physicians and MR users of Delhi. It organized a CME on “Imaging in Women’s Health”, in Delhi in November 2004, in collaboration with the Association of Obstetricians and Gynaecologists of Delhi.

From the time of its founder, the clinic has been patronized by celebrities, like the successive prime ministers of India, and other council of ministers, industrialists, bureaucrats, and members of the diplomatic corps. Most needy patients use the clinic as a tertiary referral centre. The clinic is also on the panel of most of the public sector undertakings like Indian Airlines, Air India, BHEL, SAIL, DVB, NTPC, STC, ESI, CGHS, etc., several embassies and high commissions, and non-governmental organisations like WHO and UNHRC.

Another activity of the centre is that of conducting of clinical trials. It functions as a referral centre for radiological investigations for trials of chemotherapy drugs, undertaken by the Rotary Cancer Hospital (AIIMS) and by companies such as SmithKline Beecham, Pfizer, Quintiles and Novartis (India) Ltd. It has also undertaken trials of contrast media for the US companies Bracco and Nycomed.

§ Dr. Lal Pathlabs Pvt Ltd, Delhi (LPL) Dr Lal Pathlabs, like the Agarwal Imaging Centre described earlier, is a large private pathology laboratory with a centralised facility for testing and 200 sample collection centres spread across the city and in several towns across the northern region. (from www.lalpathlabs.com and Dr Lal Pathlabs - Reference guide, Second Edition, January 2003). LPL provides the widest range of laboratory tests, in the disciplines of endocrinology, Biochemistry, Haematology, Immunohistochemistry, Histopathology, Cytology, Infectious Diseases and Microbiology, Immunopathology, Cytology, Genetics, Nutrition and Metabolism, Oncology and Toxicology. Its Reference guide contains details of 1500 tests that
are and can be undertaken by this laboratory. It has a central reference and research laboratory in Okhla, New Delhi, to conduct highly specialized tests. Apart from this there are 10 other laboratories, of which three are in different parts of Delhi. There are about 85 collection centres spread all over Delhi and the three satellite towns of Faridabad, Gurgaon and Ghaziabad.

This laboratory has a wide range of imported equipment specific for laboratory testing. Such as several auto-analysers – haemotology analysers and chemistry autoanalysers, and other instruments for radio-immunoassay, for chemiluminescence assay, for flow cytometry, atomic absorption spectrophotometry for rare metal toxicity, nephelometer for special protein analysis, fluorescent microscope for antibody analysis, several HPLCs, Fourier Transform InfraRed Spectrophotometer (FTIR) for kidney and gall stones analysis, HLA tissue typing for organ transplants, an IMMULITE system for rare immunoassays, a CENTAUR for hormonal immunoassays, Lipoprint LDL system for assaying lipoprotein subfractions. Furthermore, the labs are completely automated and use computer software specific for Laboratory Medicine. Which means that the instructions are given to the diagnostic instrument to carry out the required tests from a central computer. The test is then conducted by the instrument and the results printed out. The lab has a staff of 11 pathologists and microbiologists, 17 scientists (doctoral and post-graduate), 80 trained medical lab technologists and over 90 supporting personnel.

LalPath Labs has several satellite laboratories, located at Kanpur, Gurgaon, Haryana and parts of Delhi. These are linked to the main laboratory at Okhla via the communication satellite INSAT 3C and ISDN/lease lines. LPL had an arrangement with the Quest Diagnostics Nichols Institute, USA, for carrying out several rare and sophisticated investigations. Samples requiring certain rare tests are sent to this laboratory.

Dr Lal PathLabs, which has 20 pathology labs currently, is planning a network of 50 labs by 2009 across India, which would make it the country's largest company-owned pathology lab chain. It is also mulling a public offer in the future. Apart from the expansions being supported by venture fund Sequoia Capital that has a 26 per cent stake, and internal accruals, the company is also open to acquiring existing labs (Business Line February 22 2007).

LPL also has imaging facilities – x-ray, ultrasound, echocardiograph, colour doppler, and also conducts ECG and TMT. LPL also offers its facilities and services to conduct clinical trials for multinational, pharmaceutical and chemical industries. A large number of trials have been conducted for 20 multinational companies, which has helped in the introduction of newer drugs in the pharmaceutical industry.

LPL is now setting up franchise laboratory and diagnostic centres in other cities and towns. For this it offers marketing support to promote the tests and diagnostic centre to the local medical fraternity and hospitals. It also offers advice on the equipment to be installed, as well as help in
procuring all equipment and instruments at "rock bottom prices". For setting up a franchise diagnostic centre, it quotes an investment of Rs 1.45 crore at the minimum.

Dr Lal's was also looking to enter the outsourcing pathology space to leverage on the $40-billion US pathology market, and the company was reported to be exploring the options from US and was to enter the business in 2007 (Business Line February 22 2007).

RG Stone Urological Institute, Delhi (RGURI) RGURI has also announced its plans to have two more multi-speciality urology branches in the North and East at an investment of 13 crore, making it the largest chain of its kind. In all, this entire group has six urology procedures centres in all four zones of the country — two in Delhi, one each at Mumbai, Chennai, Ludhiana and Kolkata (Business Line February 22 2007). RGURI also has an information centre in Wales, UK, which provides information and assistance to overseas patients who plan their treatment at the hospital.

Gujarat Imaging Centre Gujarat Imaging Centre (GIC), reported to be a leading radiology centre, was set up with an investment of Rs 30 crores, and recently reported 200 per cent growth in its business (Business Line July 9 2008). In July 2008 GIC and GE Healthcare announced the setting up of the first molecular imaging centre for cancer detection and treatment in Gujarat (Business Line July 9 2008). GE Healthcare's 'Discovery Ste', was being installed at GIC. GIC was planning to start this chain of molecular centres in Surat, Rajkot and Udaipur, with position emission tomography/computed tomography (PET/CT) and a medical cyclotron system, available at less than a dozen places in India so far.

Quest Diagnostic Laboratories US based Quest Diagnostics Inc, a leading global player in diagnostic testing with $6.3 billion turnover, has entered the Asian markets through its newly launched Indian subsidiary Quest Diagnostics India. The company is to open one of the country's biggest diagnostic facilities in Gurgaon (Business Standard September 26 2007). It had already entered into an agreement with a private life insurance company for conducting tests on its applicants/customers.

Diagnostic laboratories in Hyderabad In Hyderabad corporate hospitals like the Krishna Institute of Medical Sciences (KIMS), Global Hospitals, CARE, Yashoda and Kamineni, have equipped themselves with sophisticated testing facilities, which they claim as their strengths. Some, such as Apollo and CDR Hospitals, have set up their own separate diagnostic centers.

Independent diagnostic centres also are emerging from the conventional pathological laboratories. Pioneered by Medinova Diagnostics and followed closely by Vijaya Diagnostics, the recent entrant is Elbit Medical Diagnostics Ltd. Metropolis Healthcare, of Mumbai, was planning to set up a unit in Hyderabad, with plans of providing high-end testing. The focus of
these new types of diagnostics facilities was to emerge as referral to big hospitals, undertake independent and reliable testing, and to undertake some research. Started as a 50:50 joint venture with Elbit of Israel a few years ago in Bangalore, the Elbit Medical Diagnostic centre has now set up two units in Bangalore and one in Hyderabad. It has also bought out the stake of the Israeli company, after it decided to exit. Having invested nearly Rs 25 crore in its present ventures in Bangalore and Hyderabad, Elbit is planning to expand to a couple of more cities in the near future. Boasting of a 3 Tesla MRI, which it claims to be the best in the country, Elbit wanted to position itself as a "World-class diagnostics service provider at Indian prices." It was working on a new initiative of Tele-Radiology to ensure affordable imaging services to rural people, at least in major towns. In Hyderabad, through its city centre, it wants to link seven towns. Similar efforts were on in Bangalore as well (Business Line February 6 2004).

§ Bharat Scans, Chennai has four medical imaging centres in the city. Bharat Scans allows itself to be used as a launch vehicle for new technology by GE Medical Systems. Such an arrangement leads to a discount on the purchase of equipment, and the consequent space to offer competitive rates. GE Medical benefits by using Bharat Scans as a referral for potential clients (Business Line June 2 2003). Bharat Scans planned to invest in several advanced diagnostic machines. According to the MD and promoter of this venture, so far Rs 40 crores had been invested: Rs 25-30 crores on equipment, Rs 5 crores on a specialized laboratory and rest on infrastructure. It now wants to focus on 'volume and to aggressively market their diagnostic solutions' (Economic Times 21 February 2004).

§ VHS - Vimta Labs Research Centre, Chennai THE Chennai-based VHS Hospital (The Voluntary Health Services) has collaborated with the Hyderabad-based Vimta Labs to establish a research centre in Chennai, the Vimta VHS Research Centre. A clinical reference lab (for sophisticated diagnostic tests) and a 50-bed pharmacology unit would be established in VHS's Chennai campus as part of the collaborative effort. According to the Chairman and Managing Director, Vimta, the resources and equipment for the lab would be theirs, while VHS would provide the space. VHS was to provide 13,000 sq.ft. for the center, while Vimta was to commit Rs 3 crore initially (Business Line June 27 2003). Through this venture, Vimta hoped to support the expansion of its core business of carrying out pharmaceutical bioequivalence tests. Vimta's decision to collaborate was sparked by its expansion plans. A Vimta media release said that the company had grown at a compound rate of 80 per cent over the last three years. In the financial year 2002-03, the company registered a turnover of Rs 19.79 crore. The Tamil Nadu Government's, TICEL Bio Park, facilitated the collaboration.
§ GAIL (Gas Authority India Ltd), a public sector enterprise, is setting up a large number of Air-pollution Related Disease Diagnostic Centres across the country, under the corporate social responsibility programme. It has set up one at the MNI Institute of Oncology in Hyderabad. 24 more centers are to be set up. Each hospital that hosted the Centre would get Rs 20 lakh each to acquire modern diagnostic equipment, and the concerned hospitals have to provide the requisite technical personnel (Business Line October 7 2005).

§ ALPHA Medical Services Private Ltd, Kolkata had launched a one-stop shop for all healthcare needs in the city. Set up at an investment of Rs 4.5 crore, the Alpha Family Health Mall has a polyclinic, a diagnostic centre offering basic pathological tests and a healthcare store. The diagnostic centre has an advanced pathological laboratory, X-ray facilities, portable ultrasonography, computerized ECG and facilities for microsurgery, and so on. There is a 15-bed day care centre, an operation theatre, an intensive therapy unit, and a neo-natal intensive care unit, among others. The thrust would be on women, childcare and day care. A medical equipment division under the same roof allows healthcare institutions to source their hospital furniture and surgical equipment from there. A hospital consultancy unit would cater to the needs of upcoming healthcare facilities (Business Line 6 October 2005).

Independent Imaging Centers
Among the private diagnostic institutions that are coming up, there is a distinct trend of opening of independent imaging centers that offer CT-scanning and MRI scanning facilities, apart from some more specialized scanning such at CT-PET. In this sub-section we have estimated the numbers of such imaging units from available data sources, as mentioned below.

A. Diagnostic X-ray units
As mentioned in Section 6.1.6, diagnostic x-ray equipment in India is regulated by the Atomic Energy Regulatory Board. The Atomic Energy Regulatory Board is the Competent Authority in the country for enforcing rules and regulations in respect of safe use of ionizing radiation. As per the Atomic Energy Regulatory Board (AERB), as of 2006 there were around 40,000 diagnostic x-ray institutes in India (Annual Report 2005-2006 Atomic Energy Regulatory Board, downloaded from www.aerb.gov.in) and over 2200 CT scan units (Parthasarathy 2007). In mid-2008 the AERB reported 45,000 x-ray units and over 2500 CT units in the country (Parthasarathy 2008).

This works out to approximately 2.5 CT scanners per million for the country (all-India population of 1028.61 mn as per 2001 census). It is not possible to say anything about the adequacy or otherwise of this number since there are no rational norms yet anywhere for such
technologies, based on epidemiological needs. However, we can compare it with available figures for number of CT scanners per million in some other countries.

The United Nations Scientific Committee on Effects of Atomic Radiation (UNSCEAR) sought information on national facilities for radiological examinations by means of a widely distributed questionnaire, soliciting information for the years 1991-1996. It came up with estimates of numbers of radiological facilities, including CT scanners, which are shown in Table 7.1.

Table 7.1: Number of CT scanners per million in some countries (in 1991-1996)

<table>
<thead>
<tr>
<th>Country</th>
<th>Australia</th>
<th>Canada</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>18.8</td>
<td>2.6</td>
<td>9.7</td>
<td>17.2</td>
<td>9.8</td>
<td>63.7</td>
</tr>
<tr>
<td>Switzerland</td>
<td>26.4</td>
<td>UK</td>
<td>USA</td>
<td>China</td>
<td>Brazil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>26.2</td>
<td>2.3</td>
<td>5.33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: UNSCEAR 2000)

The countries had been categorized by the UNSCEAR into the following four levels for this survey:

Healthcare level I: at least one physician per 1000 population;
Healthcare level II: at least one physician for 1000-3000 population, in which come India, China, Brazil;
Healthcare level III: 1 physician for 3000-10,000 population;
Healthcare level IV: 1 physician for more than 10,000 population.

The average number of CT per million for level II countries was 2.4. We see that as of now India has that average, and this also compares with the availability in countries such as Canada and China. Available figures show that states like Kerala and Delhi have more than that average, and are closer to countries such as UK and Brazil in this respect.

In the state of Kerala, according to the Director, state Directorate of Radiation Safety¹ there were over 2600 x-ray units, 150 CT scanning units, and 182 dental x-ray units (Business Line

¹ Despite repeated requests to the states from the Atomic Energy Regulatory Board (AERB), since 1971, to set up a Directorate of Radiation Safety (DRS) to monitor the safety and efficacy of the X-ray and CT scan centres operating in states, none of State Governments barring Kerala has initiated any steps in this regard. Kerala set up the Directorate of Radiation Safety in 1999.
November 8 2007). This works out to approximately 5 CT scanners per million (population of Kerala 31.84 million as per 2001 census). According to the Directorate a large number of the CT scan machines used in the state were refurbished equipment, and the safety level of such machines could be lower than desirable.

In the National Capital Region of Delhi, as of 2006, there were at least 50 CT scanning units - 35 in private hospitals or diagnostic centers and 15 in government hospitals, and 25 MRI units (18 in private and 7 in government hospitals), as per our estimates. These figures have been put together from: list of CGHS recognized institutions in Delhi available on www.mohfw.nic.in, and from websites of various hospitals/diagnostic centers in the city where available. This works out to approximately 5 CT scanners per million, as in Kerala (population of Delhi ..............as per 2001 census).

Thus we find that there are a significant number of CT-scanning units in the country, although they may be distributed unevenly across the states and within states as well. Available figures for Delhi indicate that there are far more numbers of imaging units in the private sector than in the public sector (see below).

B. Ultrasound Imaging Centers

The Pre-Conception and Pre-natal Diagnostic Techniques (Prohibition of Sex Selection) Act (PCPNDT Act) was made in 1994 to curb sex-selective abortions of the female foetus. This Act requires registration of ultrasonography machines by the owners. We have arrived at estimates of the number of ultrasound machines in the country from the available reports of the implementation of this Act.

As of March 2005 there were at least 15,775 ultrasound clinics/imaging centers; and in March 2006 there were 17,145 such units (registered under the Pre-natal Diagnostic Techniques --PNDT- Division Ministry of Health & Family Welfare) (Government of India 2006 & 2007). States that have 50 or more centers are as follows:
Table 7.2: State-wise spread of ultrasound clinics/imaging centres

<table>
<thead>
<tr>
<th>State</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL INDIA</td>
<td>15,775</td>
<td>17,145</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>340</td>
<td>340</td>
</tr>
<tr>
<td>Assam</td>
<td>266</td>
<td>269</td>
</tr>
<tr>
<td>Bihar</td>
<td>488</td>
<td>531</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>155</td>
<td>-</td>
</tr>
<tr>
<td>Goa</td>
<td>98</td>
<td>100</td>
</tr>
<tr>
<td>Gujarat</td>
<td>265</td>
<td>350</td>
</tr>
<tr>
<td>Haryana</td>
<td>831</td>
<td>875</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>180</td>
<td>193</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>233</td>
<td>328</td>
</tr>
<tr>
<td>Karnataka</td>
<td>1486</td>
<td>1754</td>
</tr>
<tr>
<td>Kerala</td>
<td>999*</td>
<td>1051*</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>894</td>
<td>981</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>4468</td>
<td>4468</td>
</tr>
<tr>
<td>Orissa</td>
<td>321</td>
<td>330</td>
</tr>
<tr>
<td>Punjab</td>
<td>1098</td>
<td>1183</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>1040</td>
<td>1153</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>2693*</td>
<td>2911*</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>284</td>
<td>312</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>2034</td>
<td>2232</td>
</tr>
<tr>
<td>West Bengal</td>
<td>909</td>
<td>1146</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>66</td>
<td>71</td>
</tr>
<tr>
<td>Delhi</td>
<td>159</td>
<td>274</td>
</tr>
</tbody>
</table>


*The units that are required to register under the PCPNDT Act are: genetic counseling center, genetic clinic, genetic laboratory, ultrasound clinics, imaging centers, and joint registrations if a unit provides more than one of these services. For all states except Kerala and TN the above figures denote units that have registered as ultrasound clinics/imaging centers. In these two states the given figures have been shown under joint registrations. Comparison of figures across states shows that number of units registered under ultrasound clinics/imaging centers are several fold higher than those under the other categories. So one can assume that these figures for Kerala and Tamil Nadu are quite close to the actual number of ultrasound clinics.
We find that there is a significantly large number of ultrasound imaging machines in the country, which is also spread unevenly across the states. (The increase in number of ultrasound clinics/imaging centers could be due to both - actual increase; and to an extent due to registration by more owners following improved and more stringent implementation of the law over time). According to the Indian Radiology and Imaging Association (IRIA) estimates there are about 27,000 ultrasound centers were registered in India (Doda 2006).

Following are instances of the kind of arrangements that are taking place in the private sector to set up advanced imaging facilities.

§ **Apollo GlenEagles PET CT Scan Limited** has been set up in Hyderabad. It is a 50:50 joint venture between Apollo Hospitals and the Singapore-based GlenEagles Ltd, that has been set up at a cost of Rs 30 crore. The Centre expects registrations from abroad, and plans to charge $500 for the service (Business Line 31 January 2005). So far the only hospital to have this PET/CT facility is the Tata Memorial Hospital, Mumbai. GE Healthcare, a unit of General Electric Company, UK, installed its PET/CT system Discovery ST in the hospital in December 2004. (More than 350 Discovery PET/CT systems have been installed worldwide by GE Healthcare between 2002-2004).

§ **EKO X-ray and Imaging Institute, Kolkata**, has set up eastern India’s first Fusion Imaging and Echo Imaging Centre, at a cost of Rs 3.5 crore. This Institute is a recognized teaching institute for the DNB Radiodiagnosis course. It also has a joint venture with the West Bengal government to provide diagnostic facilities at affordable rates to the financially weaker sections (Business Line 31 January 2005).

§ **Private Imaging Centres in Delhi**

There is no requirement so far in Delhi regarding registration of private facilities conducting clinical, pathological, radiological and other specialized diagnostic procedures. According to the Directorate of Health Services (DHS), steps had been initiated to institute procedures for the registration of these centres. As there is no centralized registration and monitoring of the activities of diagnostic centres, it is difficult to know how many are there. We have tried to get an idea of their nature and spread from other sources. An estimate of the number of private diagnostic centres has been arrived at from the List of private hospitals and diagnostic centres recognized under the CGHS Delhi, as of January 2006. In all 77 hospitals and 64 diagnostic centers all over Delhi and neighbouring satellite towns were recognized for one or more services.
From this list we find that there are at least 32 CT scanning units, and about 15 MRI units distributed among these private hospitals and diagnostic centers.

Overall, we find that expensive imaging equipment such as CT-scanners and MRI machines are available in the country. A large number of ultrasound scanners are available in most states. As already mentioned, it is difficult to arrive at any definite conclusions regarding their adequacy due to lack of any norms and regulatory mechanisms. What this implies is that such norms and regulations need to be in place before going in for procurement of such expensive technologies. We find that neither the government nor the professional bodies are taking any steps in this direction. On the contrary, the private sector is only making plans for further expansion of such facilities.

Public-Private Partnerships: outsourcing of laboratory and diagnostic services by public hospitals

Laboratory and diagnostic services in public health facilities are being outsourced to private parties in several states. Some instances are as follows:

- In 2003 the Employees' State Insurance-run hospital network invited private sector participation to locate costly lab equipment and laboratories across its chain of hospitals in the country. All the 142 hospitals run by the ESI were to open up facilities for private players to locate research centres and help in diagnostics (Business Line December 21 2003).
- Similarly, under the Central Government Health Services Scheme also, private diagnostic and pathological laboratories have been empanelled in many states, to provide these services.
- The West Bengal government has a joint venture with EKO X-ray and Imaging Institute, Kolkata, to provide diagnostic facilities at affordable rates to the financially weaker sections (Business Line 31 January 2005).
- Hindustan Latex Limited (HLL), a public sector corporation under the Union Ministry of Health & Family Welfare, entered the diagnostic services business in early 2008 and planned to provide high end diagnostic services to health care institutions. For this purpose it invited partners with experience in production, sales, and maintenance of high-end diagnostic equipment such as MRI scanner, CT scanner, x-rays machines, etc, to enter into partnerships to set up diagnostic centres across India (The Hindu Expression of Interest March 2008). HLL launched on 9th February, 2008 at New Delhi, HINDLABS - its first Diagnostic centre in the country, a Public Private Partnership venture with the CGHS (Central Government Health Scheme). This facility which would deliver reliable, accurate and quality diagnostic services to the CGHS beneficiaries at CGHS rates. The same services will be provided to patients outside the CGHS
too at affordable rates. The plan was to establish diagnostic centres for the CGHS, in the National Capital Region (NCR) and in 23 major cities of India covering over 110 hospitals.

- The state Government of Uttarakhand, in early 2008, invited private parties to run and manage mobile diagnostic vans in each of the 13 districts in the state. These vans were specially fabricated and fitted with medical equipment like ultrasound, x-ray, ECG and auto-analyzer (The Hindu May 6 2008 – Expression of Interest).

- The Government of Madhya Pradesh, in January 2008, entered into an arrangement with GE Healthcare and Sanya Hospitals and Diagnostic Centre, Delhi, to establish an advanced, diagnostic imaging facility at the Netaji Subash Chandra Bose Medical College Hospital in Jabalpur (Express Healthcare Management January 2008). The diagnostic center will be equipped with a GE Lightspeed 16-slice computed tomography system (CT) and a Signa HDx1.5T magnetic resonance imaging (MRI) system. Sanya Hospitals and Diagnostic Centre will invest Rs 80 million on equipment and provide trained professionals including doctors, nurses and technicians to the medical college hospital for diagnostic imaging services using CT and MRI. Patients undergoing the tests would be charged at lower than prevailing market rates. The Hospital did not have CT or MRI facilities, forcing patients to go to private clinics while medical students were unable to gain practical exposure of learning new diagnostic modalities. The diagnostic centre set up under this project will also assist medical students at the college to undertake research.

- The Government of Tripura in 2005 had engaged the services of three different private diagnostic laboratories to provide imaging and pathological services at government hospitals: with WinMark Diagnostic Services, Kolkata (of the Kanoria Group), to provide MRI imaging at Agartala Government Medical College & Hospital; with Sethi Diagnostic and Medicare Private Limited, Kolkata, to provide imaging services at the IGM Hospital (spiral CT, ultrasound, colour Doppler and X-ray); and with Dr Lal’s Pathlabs to provide pathological services (Government of Tripura 2005 – Bulletin on Functioning of Health and Family Welfare Department).

Significant Issues Regarding private tertiary and specialty hospitals, and diagnostic centers

# Curative and diagnostic services in the private sector are being looked upon as part of a growing marketplace in healthcare.

# Provision of these services is getting organized along business lines that have to yield profits. Hospitals and Diagnostic companies are raising funds through venture capital, loans, etc., for setting up laboratories, for activities such as expansion, acquisition, etc.
As in the case of corporate hospitals sector, where Apollo Hospitals talked of setting standards through 'brands', in diagnostics sector also, the companies are planning for creation of 'brand names', and leaders, etc.

A recent development in this area, since the late 1990s onwards, is the setting up of independent, private imaging centers in many urban areas, which offer a range of x-ray, CT, MRI, and ultrasound imaging facilities.

Diagnostic companies from US are beginning to set up centers in India.

Similar to the medical equipment companies, several imaging centers are also getting into provision of training/education in use of specific procedures and technologies.

Diagnostic companies are also entering into arrangements to conduct clinical trials for pharmaceutical companies, for imaging agents.

Corporate hospitals and diagnostic companies are looking at the healthcare market as part of a global marketplace, and hence setting up facilities for 'medical tourism', as well as to cater to US needs of laboratories in US, Europe, Middle East, etc.

7. II Medical technology in the government health services

The association that is often made between privatization and advanced technology/high-tech is rather misleading and misplaced. Medical technology in the private sector is highly visible, in fact is advertised and displayed as the major 'qualification'. In fact, the big private hospitals use their acquisition of advanced technology to create an aura of expertise and knowledge, and of professionalism, efficiency and cleanliness. However, it is not the case that government institutions do not have the 'latest' sophisticated technology, and that they do not acquire 'state-of-the-art' machinery and equipment.

As we have seen in the review of healthcare in India (Chapter 3), most specialized technologies (ultrasonic fetal examination, fiberoptic endoscopy, cardiac catheterization, open heart surgery, etc) were first introduced in government teaching institutions by the mid 1970s, and it is these that used them and provided training in their use. In fact the public sector institutions can be considered to have been the leaders and to have laid the basis for use of high-tech in medical care. Policy documents equate acquisition of technologies for diagnosis and therapy as an essential pre-requisite for improvement in quality of services.

During 1975-1976 under the National Cancer Control Programme Central assistance was given to medical institutions for purchase of cobalt therapy units, and to 10 major institutions recognized as Regional Cancer Centres (RCCs) for improvement of treatment facilities. During the Eighth Five Year Plan Period (1992-1997) assistance was given for development of oncology...
wings of medical colleges/hospitals and for setting up of cobalt therapy units (Government of India 1995a). In the late 1980s to early 1990s 15 whole-body CT scanners costing Rs 17.04 crores were received under the Japanese grant-in-aid programme, and were installed in 15 public institutions across the country, to provide diagnostic tool for early cancer detection and proper treatment planning (Government of India 1995b). Many government institutions are now in the process of being upgraded and equipped, and regional diagnostic centers and tertiary institutions of excellence were being set up in several states. So it is not that the government health services are not well equipped. There is as much technology, if not lesser, in the government healthcare sector, as in the private facilities. It may certainly be more.

7. II.1 Allocation and Procurement of equipment for public hospitals and institutions

The Union Ministry of Health & Family Welfare procures medicines, supplies, machinery and equipment for the various national disease control programmes, for health facilities under the Central Government Health Scheme (CGHS), various central government hospitals, research bodies and institutes under it. Expenditure on purchase of medicines and supplies, and medical equipment constituted 13-16% of the total expenditure of the Ministry during 2002-2007. There has been an increase of 47% in the expenditure on equipment over this period, as shown in the following Table (Government of India 2007).

Table 7.3 Expenditure on machinery & equipment by Ministry of Health & Family Welfare *

(Tables and figures are not translated, as they are not visible in the image.)

* This excludes the expenditures by autonomous institutions under the Ministry, such as AIIMS Delhi, PGIMER Chandigarh, NIMHANS Bangalore, etc.

2 Hospitals under the MoHFW -
The following Table 7.4 gives an idea of the `advanced' equipment in the radiology departments of some of the tertiary level government hospitals in Delhi, which are under the Ministry of Health & Family Welfare.

Table 7.4: Equipment in the Radiology department of some government hospitals (Delhi)

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>Safdarjung (1531 Beds)</th>
<th>Lady Hardinge (877 Beds)</th>
<th>AIIMS (1864 beds)</th>
<th>Dr Ram Manohar Lohia (1000 beds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>1</td>
<td>nil</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>CT</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Color doppler</td>
<td>1</td>
<td>2</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>ultrasound</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Digital x-ray</td>
<td>1</td>
<td>nil</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>x-ray machine</td>
<td>11</td>
<td>8</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Portable x-ray</td>
<td>16</td>
<td>4</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>mammography</td>
<td>1</td>
<td>nil</td>
<td>2</td>
<td>nil</td>
</tr>
</tbody>
</table>

(Source: Government of India 2007)

In Delhi, in addition to these, four tertiary-level hospitals and a Trauma Centre, all under the Delhi government are also equipped with CT-scan equipment, while two have MRI equipment.

We find that since the mid 1990s funds many states have been sanctioned funds for equipping/upgrading government hospitals, and for setting up specialized diagnostic centers. This has been largely through State Health Systems Development Projects, or through grants from the central government. In addition, the Union Ministry of Health and Family Welfare has also sanctioned funds for setting up several tertiary-level teaching hospitals across the country, which are being equipped with the latest equipment.

Under the aegis of health sector reforms, State Health Systems Development Projects, with World Bank assistance have been or are being implemented in several states – Karnataka, W Bengal, Orissa, Tamil Nadu, Maharashtra, Uttar Pradesh, Uttaranchal and Rajasthan. All of them comprised programmes for installation of equipment such as x-ray and ultrasound scanners, etc., and/or up-gradation of health facilities at the district level. In addition, in 2000 the Eleventh Finance Commission sanctioned special purpose grants to many states to set up Regional Diagnostic Centres (RDCs), equipped with CT scanners, ultrasound scanners, pathology
laboratory, etc., to provide diagnostic facilities at the district level. This grant was not to be utilized for improvement or up-gradation of facilities at higher levels. WE list below some of the activities under these two projects.

**Setting up of Regional Diagnostic Centers**

- Haryana was to set up five such centres in the state with the Rs 15 crores that had been allocated by the Central Government under the Eleventh Finance Commission for the setting up of these RDCs. Equipment worth Rs 9.30 crores had already been purchased. Apart from setting up these centres, Rs 3 crores worth of modern equipment was to be provided to various other health institutions in the state. Steps were also being taken for the repair and maintenance of existing equipment (TH June 23 2004). (See Annexure I for the list of equipment that was to be purchased for these centres and their price).

- The Department of Health and Family Welfare, Orissa has also received grants of Rs 24 crores from the eleventh Finance Commission, in the period 2000-2004, for establishment of 8 Regional Diagnostic Centres. By the end of 2003-2004 Rs 20 crores had been provided for purchase of equipment and Rs 4 crores for construction of buildings (www.orissa.gov.in/health/regionaldiagnosticcentre.htm, 14.02.06).

- The Tamil Nadu government also was sanctioned a grant of Rs 21 crore from the Eleventh Finance Commission in February 2002, for setting up 7 Regional Diagnostic Centres (RDCs) in the District Headquarters Hospitals in the state to provide diagnostic facilities. The break up of the amount was as follows: Rs 1.18 crore for buildings; Rs 11.09 crore for purchase of equipment; and Rs 7.83 crore for strengthening and upgrading. Equipment like mammography units (7), haemodialysis units (14), echocardiogram with colour Doppler (7), and 4 CT scanners at a cost of Rs 4.22 crore were all purchased and transferred to several Medical College hospitals in the vicinity of the RDCs (Government of Tamil Nadu 2006). The status of these RDCs is described in the next section.

- Similarly, the Karnataka Government had also received a grant from the Eleventh Finance Commission for the same purpose. Some of the equipment that was to be purchased for each of these RDCs were: mammography units, RIA systems, video endoscopes, 2D-colour doppler system, binocular colposcope, bone densitometry equipment, EMG machine, C-arm unit and generators (TOI Nov 4 2004 – IFB).

- Funds for 18 such RDCs were sanctioned for Uttar Pradesh, one RDC for 4 districts, and Rs 3 crore for each RDC. These diagnostic facilities were to be made functional by 2003-2004. The state Department of Health and Family Welfare spent Rs 54.55 crores during 2001-2006 to set up these facilities.

- The Government of Madhya Pradesh also planned to establish 11 Regional Diagnostic Centers in the Tenth Plan Period (2002-2007).
In 2006-07 the Assam Government also received funds (from the Twelfth Finance Commission) to set up 5 Regional Diagnostic Centres in the state. Apart from this, the state government had also sanctioned purchase of a PETSCAN and 4 MRI machines to be installed in the state medical colleges and a Civil Hospital in the state.

The Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) was approved in March 2006 by the Ministry of Health & Family Welfare. The objective of this scheme is to correct the imbalances in availability of affordable and reliable tertiary level healthcare, and to augment facilities for quality medical education in the under-served states. Under this scheme, 6 AIIMS like institutions are being set up, each at a cost of Rs 332 crores. These institutes are envisaged as centers of excellence for undergraduate and post-graduate medical education, and shall have multiple and super-specialties and a captive hospital each. In addition, 13 existing medical institutions will be upgraded with an outlay of Rs 120 crores per institution. At a total cost thus of Rs 3552 crores, this scheme will be implemented by 2009-2010. The procedure for procurement of radiology and radio-diagnosis equipment required for all these institutions (MRI-CT-US-X-ray) has already been completed.

A specialized Regional Institute of Health and Medical Sciences has already been set up in Shillong for the north-eastern region and is being equipped with state-of-the-art equipment, including those for cancer therapy and oncology, such as several linear accelerators and brachytherapy systems.

In 2002 telecobalt units were procured for three government hospitals in Tamil Nadu under the National Cancer Control Programme. The machines, manufactured in Canada, were supplied by Kirloskar Theratronics at a cost of Rs 4.5 crores, and could treat 150-200 patients a day.

State Health Systems Development Projects

The Karnataka Health Systems Development Project was launched in April 1996 at an estimated cost of Rs 546 crores, with World Bank loan, to strengthen secondary level healthcare by providing diagnostic and treatment facilities not available at the primary level. The Project covered upgrading of services, which included supply of equipment, drugs, ambulances, vehicles, furniture, etc. It was to become operational by 2001-2002. A high-level Working Committee prescribed norms for equipment and furniture for each type of upgraded hospital based on their bed strength, and then a procurement plan was prepared. Equipment worth tens of crores of rupees was purchased, such as ECG machines, dental units, and ultrasound equipment. The status of the equipment purchased is described in the following section.
The Rajasthan Health System Development Project too is currently in the process of constructing and upgrading several district referral hospitals and rural health centres (CHCs and PHCs), with a credit from the IDA (TH Oct. 2004 – IFB).

The Uttarakhand Health Systems Development Project has also received a credit from the IDA in various currencies and is equipping its facilities (TH July 2 2004 – IFB).

The Gujarat government had embarked upon a ten-year programme with assistance from Netherlands, in 1993, to improve, equip and upgrade intermediate level medical services throughout the state. It was a large project worth a total of 140 mn DM (Rs?). While the assistance was covering 40 per cent of the costs, the rest was a commercial loan from a Netherlands bank, repayable over ten years. The money was to be used to finance purchase of medical devices and training of medical staff. *A health care consortium, consisting of seventeen Indian companies and twenty foreign companies, under supervision of Philips Medical Systems, had been formed to equip 36 CHCs, 23 district hospitals, 6 referral hospitals and 6 ophthalmic mobiles.* For instance: One of these companies supplying equipment worth 9 mn DM was the German Drager Group, through its subsidiary Drager Electronik. In all 625 devices relating to critical care were being supplied by this company and in India this job was being executed by Usha-Drager, a joint venture.

Since 2000 the Delhi government has set up 9 tertiary level hospitals, which are still being equipped. Most of these hospitals are either 50- or 100-bedded, and are equipped (or will be) with basic laboratory facilities, x-ray, ultrasound, audiometry, ECG and one or more operation theatres. That these hospitals were being equipped can be inferred from the regular appearance of tenders for procurement of hospital equipment, by the Equipment Procurement Cell, Government of NCT of Delhi. For instance: through the year 2004 at least six such notices for procurement of medical equipment appeared. (See Annexure II for an indicative List of the range of equipment being purchased). The specification for most of the equipment was for imported ones.

While procurement of equipment for government health services is conventionally done through government bodies, by a process of competitive bidding or by purchasing from local agents/representatives directly, in the 1990s special arrangements/agencies have been created to execute the process of bidding and purchasing. Such as:

# Hospitals Service Consultancy Corporation (HSCC) was set by the Union Ministry of Health and Family Welfare in 1983. HSCC is a multi-disciplinary consultancy organisation established to provide quality consultancy services in the healthcare sector. Much of its current activities are related to procurement, installation and commissioning of equipment for various government
hospitals and medical research institutions across the country. HSCC also undertakes projects also in neighbouring south Asian countries, in Africa and in the Middle-East.

# Hindustan Latex Limited is another public sector corporation that is into procurement of medical equipment for government hospitals and health centres.

# The West Bengal Electronics Industry Development Corporation had a tie-up with Wipro-GE to ensure supply of its medical equipment to 200-odd state hospitals and major health establishments. Besides supplies, the former was to also provide services such as maintenance and servicing of equipment, as and when required. Wipro-GE was to also repair/restore to original condition valuable equipment that was lying unutilized in government hospitals for years. It was hoped that this arrangement would minimize the trouble involved in selling medical equipment by an outside company to government hospitals, and that hospitals would get quality products.

# Wipro-GE had also tied up with Karnataka State Electronics Development Corporation (KEONICS) for exclusively marketing their medical equipment in Karnataka and Andhra Pradesh.

# A centralized Equipment Procurement Cell was set up by the Delhi government in 1999-2000, consisting of technical experts, government and private doctors, and other functionaries, to tackle losses of crores of rupees annually on purchase of medical equipment.

# The Department of Electronics had financed 12 repair and maintenance centres with state government undertakings, such as Uptron, Meltron, Beltron, and others. These centres were to undertake such activities as training of medical experts and technicians in maintenance and repair of medical equipment, technical consultancy during purchase of equipment, annual maintenance contracts, and so on. Some of these centres, such as Uptron and Elcot, were successfully running these repair and maintenance centres, since 1989. A large number of equipment that were lying un-repaired in various government hospitals, medical colleges, private clinics and research organizations were reported to have been repaired (Government of India 1992).

7. 11.2 State of equipment in government hospitals

A widespread problem with equipment in government hospitals seems to be that of non-operation of expensive and advanced equipment. According to government's own estimates, about 40-60 per cent of the equipment in government facilities was non-operational due to inadequate maintenance service (Government of India 1999). Lack of trained personnel contributed directly to breakdown and reduction in operating life of equipment. Another major problem was that of unplanned procurement, leading to non-utilization, delays in installation or commissioning by the suppliers, or due to incomplete infrastructure, or due to lack of accessories and/or trained personnel.
Government audit reports shed light on the dismal state of expensive medical equipment and related infrastructure in government institutions. The most recent Comptroller Auditor General (CAG) report on performance audit of the procurement policies, procedures and practices, for medical equipment in central government hospitals under the Ministry of Health & Family Welfare for the period 2002-2007 arrived at the following conclusions (Government of India 2007).

(i) A long term and well documented plan for procurement of equipment had not been prepared either centrally at the level of the Ministry or at the level of the individual institutions.

(ii) Good procurement practices were by and large not followed; procurement processes were characterized by ad-hoc decisions.

(iii) The procedure for acquisition of medical equipment suffered from improper planning, non-evaluation of full life-time costs of equipment before procurement, excessive provision or under provision of equipment across hospitals, and absence of medical equipment libraries in hospitals.

(iv) There was no policy on standardization and no benchmarks for holding of equipment by each hospital based on size, patient load, case mix, etc. As a result there was wide variation in the number of makes and models of equipment in various hospitals. Standardization could lead to considerable savings and benefits in terms of services, spares and training, if a single model could be used throughout various units/hospitals.

(v) There was no monitoring and information system for tracking demand and supply, for planning and managing procurement.

The following cases are illustrative of these and other kinds of problems regarding medical equipment in government facilities, as documented by the government audit process.

- As mentioned in the previous section, during the Eighth Five Year Plan period assistance of several crores of rupees was provided under the National Cancer Control Programme, to many medical institutions and Regional Cancer Centers (RCCs) across the country for developing oncology wings and setting up cobalt therapy units. The audit of the implementation of the programme during 1985-1994 came up with a host of findings on the status and inadequate or no utilization of the facilities (Government of India 1995a). A few of the findings are as follows: (a) Against 900 cobalt therapy units required (1 per million), only 180 units had been installed, which were quite inadequate and not evenly distributed in the country (para 9.1.5.1). (b) in 7 states 11 cobalt therapy units and other related equipment, acquired at a cost of Rs 6.32 crores, were commissioned after delays ranging from 3 months to 8-1/2 years, mainly due to non-availability of funds for construction of special buildings, incomplete infrastructure and staff not being posted (para 9.1.5.1a). (c) 7 cobalt units, one gamma camera and one fluoroscopic
microscope, costing Rs 5.48 crores, were not commissioned by 5 states – Assam, Karnataka, Orissa, Rajasthan, and MP (para 9.1.5.1c). (d) No training for medical and paramedical personnel was arranged in 7 states mainly due to non-provision of funds and staff (para 9.1.7.4). (e) In the RCCs of Assam, MP and West Bengal equipment purchased with central assistance were not put to use for 16 to 61 months, due to delay in installation/completion of buildings, etc (para 9.1.8). (f) A brachytherapy unit in Cuttack (that cost about Rs 90 lakhs), purchased under the National Cancer Control Programme, worked for only ten months and treated 136 patients between 1992-1994 (para 9.1.5b). (g) A linear accelerator, costing Rs 1.75 crores, procured under the Japanese grant-in-aid programme during 1988-1989, by Sanjay Gandhi Post Graduate Institute of Medical Science, Lucknow was only partly functional for want of spare parts; a radiation field analyzer procured during 1989 (cost Rs 16 lakhs) and installed in 1991 could not be calibrated due to faults in software (para 9.1.5d).

- 15 whole-body CT scanners, valuing Rs 17.04 crores, were received under the Japanese grant-in-aid programme in late 1980s to early 1990s, and were installed in 15 institutions in different states and union territories. Test check showed that, in seven cases the equipment remained idle for 2-10 months due to their late commissioning. Checks in a few states revealed that the equipment was not utilized optimally – underutilization ranged from 15.27% to as much 98%. In Rajasthan between 1989 and 1994 the CT scanner did not function on 9 occasions, for 162 days (Government of India 1995b).

- In September 1992 the National Chittaranjan Cancer Institute imported a brachytherapy unit for cancer therapy for Rs 90.68 lakhs. The Institute needed a no-objection-certificate (NOC) from the AERB (Atomic Energy Regulatory Board) to use Iridium-192 to use this machine. It had not obtained this NOC till May 1995. In November 1995 the Ministry informed the CAG that steps had been initiated to obtain the NOC (Government of India 1996a).

- This same institute, in June 1992, established an ICU for cancer patients. While civil and other expenses amounted to Rs 3.91 lakhs, machinery and equipment for the unit was purchased at Rs 19.54 lakhs. The unit was not used till October 1995 as there were no personnel. In December 1995 the CAG was informed that necessary steps would be taken in this regard. Meanwhile, the guarantee period of the machinery had expired in June 1993 (Government of India 1996b).

- The status of the infrastructure set up under the World Bank aided Karnataka Health Systems Development Project was as follows. (a) It was found that there was deviation from the original procurement plan, wherein equipment worth Rs 1.06 crore was procured in excess of the assessed requirements. Further, a number of essential items (such as X-ray machines, autoclaves, ventilators, emergency resuscitation kits, ophthalmoscopes) were either not procured or were short of the assessments made, despite adequate allocation of funds. (b) Of the 50 hospitals
checked, it was found that in 4 of these major surgeries could not be performed due to short supply/non-supply of essential equipment. (c) ECGs, ultrasound scanners, dental units worth Rs 1.65 crore procured between 1998-2002 were lying unutilized for 2-5 years due to lack of either trained staff or doctors or specialists, or incomplete infrastructure. In some cases equipment had not even been unpacked as of June 2003. Rs 18.26 crore was spent of procurement of equipment even before providing basic infrastructure. Equipment worth Rs 94 lakhs had been diverted to other major hospitals not covered under the project. (d) The Project Steering Committee has suggested that the annual maintenance contracts (AMC) be done away with, and instead the technical staff in the central equipment maintenance workshop at Bangalore – set up at a cost of Rs 65 lakhs – be involved. However, this was not done. (e) Lack of adequate training to staff to handle sophisticated equipment had resulted in non-utilization of equipment. In other cases, physicians and managers trained abroad on teaching skills were not utilized for the work (Government of Karnataka 2003).

• The status of the Regional Diagnostic Centers set up in Tamil Nadu during 2002-2005 is as follows. They were not functional as of March 2006. As described in the previous section, the equipment purchased for the RDCs had been transferred to Government Teaching Hospitals. The buildings constructed had been handed over; however no staff had been posted, no training had been imparted to existing staff in the hospitals for operating the equipment. No Certificate had been issued for commencement of the RDCs as envisaged. Funds for equipment upto several crores were left unutilized or had lapsed. Thus, medical diagnostic facilities were not being made available, despite large investments (Government of Tamil Nadu 2006).

• The government of Tamil Nadu sanctioned a telemedicine project in November 1999, for interlinking Government Hospital, Wallajah, with Madras Medical College and Research Institute, Chennai, at a cost of Rs 87 lakhs. ELCOT (Electronics Corporation of Tamil Nadu) procured and installed the equipment. BEL (Bharat Electronics Corporation) supplied and commissioned the project in December 2000. 184 patients at the Wallajah government hospital benefited from consultations through the project up till November 2001, till which period connectivity charges had been paid for the ISDN (Integrated Services Digital Network) line installed for the project. In December 2001 the Director (Medical and Rural Health Services) estimated that the annual recurring cost in the project was Rs 2.23 lakhs (including Rs 90,000 for payment of ISDN charges). The state government felt that this was on the higher side. Till the time of writing of the CAG report (May 2003) nothing had been done and the entire infrastructure had been lying unutilized (Government of Tamil Nadu 2004a).

• Several equipment (heart-lung machines, arthoscope and 9 x-ray equipment) had been kept idle in the Government General Hospital, Chennai, for long periods ranging from two to seven years, due to lack of repairs (Government of Tamil Nadu 2004b). To give one illustrative
example: A 1000 mA DSA system (x-ray equipment), procured in 1986 at a cost of Rs 68.14 lakhs was installed in July 1990 and put to regular use since September 1991, due to delay in civil and electrical works. It went out of order in May 1994. The government sanctioned in May 1995 Rs 33 lakh for AMC (annual maintenance contract) with a firm for one year. The system was re-commissioned in November 1996, but went out of order again in January 1999. The concerned firm had refused to extend the AMC beyond 1998 since the model had become obsolete. In November 2003 only one x-ray equipment had been repaired, while the others waited condemnation.

- In January 1994 the Government of Maharashtra sanctioned purchase of an imported argon laser photo-coagulation unit for ophthalmic diagnosis and operations in the Government Medical College Hospital, Nanded. The order for procurement of the equipment costing Rs 15.83 lakhs was placed in March 1994 by the Dean with a Mumbai-based firm. Scrutiny of the records revealed that the equipment was installed in August 1995, commissioned in November 1995, went out of order in February 1996. It was repaired in September 1996, again went out of order in September 1997 and remained so till December 2000. The Dean’s reply was that the firm had not responded, in spite of repeatedly being asked to undertake repairs. However, in reality, the Dean had not taken any action on the plea that the contract was not available with him, which again was not true (Government of Maharashtra 2001a).

- In order to computerize the medical history and records of patients in the super specialty hospital, Nagpur, the government approved in March 1997, procurement of computer hardware (Rs 69.68 lakhs), customized application software (Rs 10.00 lakhs) and licensed software (Rs 5.70 lakhs), from M/s HCL Infosystem Ltd., Calcutta. HCL supplied the hardware between March-April 1998. As per the agreement 90 per cent of the cost was to be paid on delivery of hardware. There was no penalty in the agreement for delay or failure to deliver software. The local firm appointed by the company, to supply software did not do so, citing non-receipt of payments due to them from HCL as the reason. The hospital had not taken any action till March 2000 (Government of Maharashtra 2001b).

- In Maharashtra a CT scanner, costing Rs 1.41 crore, remained unutilized for more than 22 months for want of an operator. In March 2004 a CT scanner was ordered for the General Hospital, Osmanabad; simultaneously the Civil Surgeon of the hospital was directed to arrange training of at least two officers to handle and utilize the scanner. It was installed in April 2005. Scrutiny of records in September 2006 and February 2007 showed that the unit was only being warmed up daily – no scans had been made till February 2007. The x-ray technicians operating the unit were trained only for switching on and off the machine. According to the Civil Surgeon it could not be used due to non-posting of a radiologist. No reply was received from the state government till August 2007 (Government of Maharashtra 2007).
A test-check of records of two hospitals in Rajasthan, between May 1990 and January 1993, showed that machines valued at Rs 48.25 lakhs had been lying idle for want of repairs, spare parts, for period ranging from 3-9 years. No progress had been made till November 1994 (Government of Rajasthan 1995).

In Punjab 12 supply orders placed between March 1988 and March 1995, for 82 items of machinery and equipment, valued at Rs 2.60 crore were scrutinized. It was found that 33 items valued at Rs 92.53 lakhs, which were received and installed in 10 hospitals and 14 PHCs between April 1989 and October 1995, were lying idle as of December 1996. The reasons ranged from want of: doctors (18 items); to repairs (6 items); to consumables/short supply (8 items) and radiographer/dark room (1 item) (Government of Punjab 1998). Though a system of internal control existed in the health & family welfare department of the state, it was not effective at all, given the deficiencies in procurement of medical equipment. Further there was no mechanism to monitor the performance of equipment procured and installed (p 154).

In Punjab during 1990-1991 to 1995-1996 an expenditure of Rs 27.92 crore was incurred on setting up emergency medical care services for victims of accidents/bomb blasts at well equipped emergency centres in 48 selected institutions (Government of Punjab 1998). Some of the findings of a test check were: (i) no case of bomb blast, motor vehicle or railway accidents, or natural calamities had been reported in 6 of the 24 hospitals checked in the above period. Hence, the infrastructure for trauma care that had been set was not utilized at all. (ii) Under this scheme the emergency services were to be provided in places/institutions located in terrorist prone areas, on highways or remote areas where facilities were inadequate and where such provision could be made with minimum additional inputs. In the case of the trauma ward at Majitha most of the above conditions were not kept in view. No emergency case was reported here in the above five-year period. It failed to get emergency cases because it was not located on the main highway and the reputed hospitals of Amritsar, being only 15 kilometers away, were more easily approachable. Majitha was not a good place for setting up the trauma ward. At the same time we find that essential laboratory equipment needed at three drug de-addiction centres set up in the state, up with central government assistance, had not been supplied by the state government (Government of Punjab 1998 p 164).

In July 1999 All India Institute of Medical Sciences (AIIMS), Delhi, placed an order with a foreign firm for an 'inverted microscope with closed circuit television and a micromanipulator system, costing Rs 14.30 lakhs. This equipment was received in October 1999, and handed over to the Department of Obstetrics and Gynaecology in November 2000. It was not installed till July 2004, for lack of space (Government of India 2005).

In March 1996 the Maharashtra government decided to provide Regional Referral Service Centres (RRSC) to provide specialized treatment to rural population. In 1998 such a Centre was
set up at Amaravati. The audit in 2007 showed that: the building completed in July 2007, at a
cost of Rs 7.90 crore, had not been taken over by the Medical Superintendent; machinery and
equipment purchased in March 2006, at a cost of Rs 53.73 lakhs, were lying unused; and out of
319 posts sanctioned in November 2006 only 10 relating to support staff had been filled up
(Government of Maharashtra 2007).
• A cardiac catheterization lab at the King George Hospital, Vishakapatnam, AP, purchased
in December 1998 at Rs 3.16 crore, functioned only partially and intermittently, and no concrete
action was taken to repair it. In March 2003 Rs 29.70 lakh (90% advance against Rs 33 lakh)
was paid to the firm to carry out the necessary repairs. It was not done satisfactorily, and the
Head of the concerned Department did not certify the repair, saying that 16 items were
incomplete. This was not attended to by the concerned firm, and was reported to the Government
in June 2003. The equipment was neither repaired, nor was any action taken against the firm.
The cath lab became non-functional in June 2006, and a decision was taken to install a new one
(Government of Andhra Pradesh 2006).
• In March 2002 the Director, Supplies and Disposal, Haryana, placed an order with an
Italian firm for purchase of a Mobile C-arm image intensifies TV system, at a cost of Rs 21.18
lakh. The equipment was installed at the BD Sharma Post Graduate Institute of Medical
Sciences, Rohtak, in November 2002, with a warranty period of 2 years. Audit in March 2006
showed that the equipment went out of order in April 2004. The firm was asked to repair it,
which it did not do till April 2006. According to the Head of the concerned Department they had
approached the firm several times; it sent an engineer in 2004, who took away two parts to get
them repaired from the main office. It was observed that no correspondence was made by the
Institute after October 2004 to get the equipment repaired (Government of Haryana 2006).
• 39 items of equipment valued at Rs 31.94 crores that were received during 2004-05 to
2006-2007, for institutions under the Union Ministry of Health & Family Welfare, were installed
after delays ranging between 2-23 months. In NIMHANS and NTI, Bangalore, equipment were
installed after delays ranging from 10-54 months. In March 2005 PGIMER, Chandigarh,
procured attachment for a haematology analyzer at a cost of Rs 18.37 lakhs without procuring
custom slides essential for operationalizing the equipment. The equipment installed in March
2007 was lying idle as of May 2007 (Government of India 2007).
• Unplanned purchases – In August 2002 Safdarjung Hospital, Delhi, invited tenders for 10
bedside monitors; in July 2003 the orders were approved; and the equipment was received in
October 2003, at a cost of Rs 34.46 lakhs plus freight, etc. The Head, Cardiology Department,
was requested to indent the equipment. In his note he stated that he was not aware of any such
purchase being requisitioned by the Department; that the files relating to this purchase were
never shown to him. The equipments were installed in the ICCU in October 2004. No
information was provided when the Department was asked about the status of utilization of the equipment (Government of India 2007).

- Machinery and equipment valued at Rs 8.49 crores were purchased between October 2005 and January 2007 for a Trauma Centre at the Ram Manohar Lohia Hospital, Delhi, even though construction of the building and other infrastructure was not complete. While equipment worth Rs 2.10 crores were issued to other departments for testing, the rest were lying idle as of March 2007, awaiting installation (Government of India 2007).

- In December 2003 a decision was taken by the Directors of Regional Cancer Centers to phase out Cobalt therapy machines in the country and go in for Linear Accelerator (LINAC) systems. In May 2004 at a meeting to decide on purchase of a second cobalt machine at Safdarjung Hospital, Delhi, it was recommended that LINAC should be purchased. Yet a second cobalt machine was purchased by the hospital in March at Rs 2.10 crore. Reasons for this decision are not on record (Government of India 2007).

- As per CAG report, Safdarjung Hospital and Ram Manohar Lohia Hospital, both in Delhi, and PGIMER, Chandigarh, made heavy purchase of imported machinery and equipment regularly. These three hospitals together incurred an avoidable expense of Rs 69.86 lakhs between 2002-2007, towards demurrage charges due to failure in releasing the consignment within the stipulated period. This was being done as a matter of routine and reasons for such delay were not being analyzed (Government of India 2007).

- 14 automated external defibrillators, costing Rs 1.90 lakh each, were to be installed in the Parliament House in Delhi, to administer first aid to the MPs in case of a heart attack. The Parliament already had a well-equipped medical centre with 15 specialists, a health check-up unit and 12 computerized ECG machines (TOI November 2004). Given that the Parliament is in session for not more than 150 days a year all these machines would be lying idle for the most part of the year.

- CAG reports also indicate underutilization of equipment in central government hospitals due to lack of skilled personnel (Government of India 2007).

DELHI - Procurement and Utilization of expensive equipment in selected tertiary/specialty hospitals

Institute of Human Behaviour and Allied Sciences In response to a PIL filed in 1983, the Supreme Court directed the Government of India and the Delhi Administration, in January 1991, to develop the erstwhile Hospital for Mental Diseases, (Delhi), on the pattern of National Institute of Mental Health and Neurosciences (NIMHANS), for patient care, teaching and research facilities for neurological (epilepsy, stroke, migraine, etc.) and psychiatric patients. The Institute of Human Behaviour and Allied Sciences (IHBAS) started functioning in December
1993. As of August 2000 the project was still incomplete. In the 7-year period from 1993-1994 to 1999-2000 the Institute received in all Rs 54.73 crores from the Central government as well as Delhi Government. Of this only Rs 31 crores has been spent. There was delay in construction of building facilities. Furthermore - basic investigative facilities – CT-scanning, ultrasonography, multichannel polygraph and doppler - were not made available even in the ICU. Patients needing these were referred to the nearby GTB or Swami Dayanand Hospitals. There were no records of such patients. Even EEG was not provided for long periods. An EEG installed in 1994 remained out of order between August 1996 to July 1998, as no regular AMC (annual maintenance contract) had been made with the manufacturer. There was a long waiting period for EEGs as only one technician had been appointed. Apart from these several basic therapeutic equipment had not been procured. Thus there was inordinate delay in purchase of essential diagnostic and therapeutic equipment (Government of India 2001).

GB Pant Hospital was established in 1964 to provide medical and surgical facilities in various super specialties – namely, cardiology, neurology, gastroenterology, cardio-thoracic surgery and psychiatry. It is equipped with all supportive facilities – pathology, microbiology, radiology and anesthesia, and blood bank. It has separate ICUs for these specialties. It is also a recognized teaching hospital for post-doctoral training. Two audits of the hospital, (for the year 1992 and for the period 1994-1999) indicated that for a long time the situation regarding procurement, installation and utilization of expensive equipment was unsatisfactory. Till 1999 no standard procedures had been put in place in this regard and the process was plagued by several irregularities. Some of the findings were as follows (Government of India 1993):

- The Director did not follow the guidelines set by the government NCT of Delhi, for assessment of needs for equipment that cost more than Rs 2.00 lakhs (p 51).
- After getting the approval of the Technical Advisory Committee in September 1992 for purchase of several pieces of equipment, there was delay in actually acquiring them. The delay ranged from a period of one and a half to as much as six years. The cost of several machines had increased in the intervening period. For instance: two OTs for the neuro-surgery department were obtained only in March 1997, after having been approved in September 1992; while an endoscope for use in neuro-surgery was obtained in October 1998.
- Non-functional and/or unused equipment constituted a significant problem. There was a decline in the number of laboratory tests in the radiology department during 1991-1992 as the CT scanner and ultrasound machine remained out of order for a long period. The 1992 audit found that the CT-scanner, which was purchased in October 1984 at cost of Rs 1.29 crore, had remained out of order since September 1991. Same was the case for the holter machine and analyzer. In 1992 out of a total of 607 pieces of equipment, 116 (19 per cent) had been lying out of order for want of spares or non-maintenance by the suppliers (p 32). Some of these were
beyond repair and were awaiting condemnation. In 1999 the total number had more than doubled, to 1357, of which 450 (about 33 per cent) were out of order. Of these 103 were beyond repair and were awaiting condemnation, while 77 were awaiting installation and commissioning (p 55).

- In 1999 84 machines and equipment, purchased between 1990 and 1996, had not been issued to the respective departments and had been lying unused for several years. 92 pieces, acquired between 1989 to 1998, were lying in the stores in July 1999. Of these 58 machines worth 2.42 crores had been procured between 1989 to 1990, and 3 machines, worth 3.43 crores had been procured between 1995 to 1998. Details regarding the remaining 31 could not be ascertained due to non-availability of records.

- A cathlab, costing Rs 3.42 crore, had been acquired from Germany, in November 1998. The existing two cathlabs were 12 years and 7 years old respectively. The new one became functional only in December 1999, as the necessary civil and electrical work was initiated only in November 1998 and completed a year later. Nearly 3000 patients in all were deprived of the facility for one year.

- In order to strengthen the infection control program a high-speed sterilizer with accessories, worth Rs 26.74 lakhs, was imported from Japan and received in India in June 1990. The delivery could not be taken by the Hospital till May 1992 due to non-availability of certain documents. Demurrage charges of Rs 5.36 lakhs (@ Rs 800 a day) were paid in the meanwhile. In December 1992 the Hospital stated that because of the size and shape of the equipment a special truck was required for its transportation, which caused the delay. Meanwhile the building where it was to be kept was under construction. It was installed in the hospital only in April 1996. However, it had not been commissioned till 1999. The three-year free guarantee had expired by then.

- Reasons for non-utilization of several laboratory equipment: Apart from the unutilized equipment detailed above, 12 imported equipment worth Rs 85.78 lakhs, were lying unused for up to three years, due to lack of accessories and/or reagents. For instance: An equipment imported from USA, for Rs 13.81 lakhs, in October 1990, could not be used till December 1997 due to lack of some identity cards. Of the 8 cards purchased in March 1997, 7 were used to perform 142 tests in all. In July 1999 it was found that the machine had not been used since December 1998. In some cases of non-utilization, the equipment could not be used as critical parts were missing.

- Not only was machinery lying unused. Surgical consumables and devices for cardiothoracic applications, worth Rs 1.23 crore (11,799 in number), were lying unused in the stores for nearly nine years, and had crossed their expiry period.

- There was no record of machines that were under guarantee/warranty, or AMC or needed repairs. Machines needing repairs were lying for as long as five years. Payments had been
made under AMC for several machines needing repairs, but not actually repaired. In one case payment under AMC had been made even when the machine was under guarantee. Several crores of rupees had been paid but the corresponding equipment had not been received.

- **There had been substantial increase in expenditure on machinery and equipment between 1988 and 1991.**

Thus, we see that a sound system for appropriate procurement, proper upkeep, repair and maintenance of hospital equipment had not been evolved or installed in this prestigious hospital for a very long time.

A committee (Chandrashekharan committee) was appointed to look into the issue of non-functional equipment in Delhi hospitals. It was to investigate allegations that in government hospitals equipment are deliberately left un-repaired to enable doctors to get customers for private diagnostic centres owned by them or their relatives, or to get commissions from private diagnostic units\(^3\) (Indian Express 4 April 1999).

Another problem of major concern vis-à-vis medical technology in the government sector is the corruption and misappropriation of funds in procurement and supply of medical equipment, especially of imported ones. One known example is that of irregularities in purchase of equipment by the Medical Superintendent of a Delhi hospital in 1988-1990, causing a loss of nearly Rs 8.74 crores to the central government (Press Trust of India December 1 1999).

### 7. II.3 Telemedicine – Medical Technology and Communications Technology

The government is actively promoting satellite-based technology as an effective mode of healthcare delivery for remote places. It is bringing together hospitals, doctors, NGOs, equipment suppliers, technologists and medical and engineering institutions, to look into issues related to technology, equipment, connectivity, in order to provide satellite-based tele-consultancy for the poor, and to explore delivery models for this purpose. ISRO started its nationwide network in 2001 with 54 hospitals and 14 specialty urban hospitals. The project is reported to link hospitals in remote places such as Lakshadweep, the Andaman, the North-East, Leh and Kargil to tertiary medical centres in Kerala, Tamil Nadu, Kolkata and Delhi.

According to the Secretary, Department of Space, since 2002-2003, ISRO was spearheading a satellite-based telemedicine programme in the country. The Indian Space Research Organisation (ISRO) had invested Rs 10 crore so far towards connectivity, basic equipment and

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\(^3\) A doctor from AIIMS expressed concern as to why was it that the CT scanner in Safdarjung Hospital (which is across the road) from AIIMS broke down so often, while the one at AIIMS rarely had problems? This led to a situation when, in emergency situations, patients from the former were sent to the latter and it was not possible to refuse to perform the scanning.
training, and linked early 80 remote district hospitals, including in Leh, the North-East, Port Blair and Chamarajanagar near Mysore, to 21 super-speciality hospitals - among them are Apollo Hospital, Narayana Hrudayalaya, AIIMS, PGI Lucknow, SRMC of Chennai and Amrita Institute of Kochi using connectivity from INSAT satellites. ISRO's condition is that the private hospitals should offer patients free consultation and surgery at Government hospital rates (Business Line February 27 2005).

An international meet on telemedicine 'Telemedicine for global health care' was organised by ISRO in March 2005. Besides the Department of Space and the Aeronautical Society of India, seven Central ministries, departments and agencies were involved in hosting the meet: Health and Family Welfare, Rural Development, IT, Telecommunication, Science and Technology, Atomic Energy and DRDO. ISRO was planning a nation-wide telemedicine loop through Healthsat, a dedicated satellite due to be launched towards the end of 2005. Apart from the public-private tie-up, ISRO was also exploring several delivery models for the telemedicine venture. Some of the telemedicine projects in the country are as follows.

**Karnataka telemedicine project**

The Karnataka Telemedicine Project became operational in February 2004. Through this project about 30 hospitals in district, taluk and remote areas were linked via satellite for tele-consultations with five multi-specialty hospitals. ISRO had installed the Rs 3-crore equipment and had provided the bandwidth free of charge. As the other promoter, the Karnataka government was to provide the infrastructure, doctors, paramedics and the subsequent running cost. A band of major hospitals such as Jayadeva Institute of Cardiology, Narayana Hrudayalaya, NIMHANS, St Johns, Samatvam Institute of Diabetology of Bangalore, and JSS Institute of Medical Sciences, Mysore, were to offer tele-consultancies to the government hospitals in rural areas (Business Line February 11 2004). The hardware and software costs worked out to Rs 10-15 lakh per terminal (in 2004-2005).

**Mobile telemedicine venture of Philips-Apollo-local NGO**

Philips has started a mobile telemedicine project –named Project Disha - at Kadamalaikundu, a remote village in Tamil Nadu's Theni district. The project brings together Philips, in its capacity as medical-equipment company, Apollo Hospitals, Indian Space Research Organsiation (ISRO) and the Dhan Foundation, a local NGO. According to the Chief Executive Officer, Philips, there are tele-medicine projects in the country, but this one was different since it was a mobile, multi-speciality vehicle that had instant connectivity. If they got the pricing right, he indicated that the stakeholders were willing to replicate this experiment at other locations in the country.
Besides two doctors on board, the estimated Rs 75 lakh vehicle has an antenna on its hood and medical equipment - X-ray equipment, an ECG, a defibrillator, an ultra-sound machine and laboratory equipment for blood tests and so on. The van links-up to the outside world through Insat 3A, with support of the antenna and other telecommunications software and computer systems in the vehicle. According to ISRO's Director - Satellite Communication Programme, since the project is mobile, the cost for the facility is about Rs 8 lakh. Though the bandwidth is free of cost, the project is an experiment and will be reviewed to see how it can be made self-sustaining. The idea is to reduce the cost to the patient, even as the facility is provided at their doorstep. According to the Dhan Foundation the van would take about six fixed routes and stop at specific development centres. Patients would be screened at the centres and only those who require medical treatment or further examination will need to come to the mobile unit. The project was expected to cover a population of about one lakh in three months. According to Philips patients at the mobile unit would be given medical support by doctors at Apollo Madurai. The initial screening process helped cut down travel expenses and loss of wages, otherwise incurred by the patient on check-ups (Business Line July 5 2005).

Apollo, Reliance Infocomm tie up for telemedicine

The Apollo Telemedicine Networking Foundation has 80 stations across several towns and villages. People come to these stations and interact with specialist doctors over the Internet. The Apollo hospitals group has also tied up with Reliance Infocomm for providing telemedicine services. The tie-up with Reliance Infocomm adds 240 Reliance WebWorlds to the network. Just as with the stations of Apollo Telemedicine Networking Foundation, these WebWorlds also function as centres from where tele-consultation with specialist doctors is possible. According to the Chairman, Apollo Group, 'India needs telemedicine to take specialized medicare to the patients in smaller towns and cities and the Apollo group has tied up with Reliance Infocomm to address this need'. The cost of each consultation may roughly work out to Rs 1,000-1,100 for a patient (Business Line September 22 2005).

Max tele-medicine centres

Max Healthcare Institute Ltd was to open 30 tele-medicine centres by March 2006, with various private and government hospitals across the nation with a joint investment of about Rs 1.5 crore. The company launched its first Max TeleMed in partnership with Shija Hospitals at Imphal in Manipur. "While a majority of the partnerships will be with private hospitals, we expect to have about 25-30 per cent of it with government hospitals," according to Max officials (Business Line September 13 2005).
Smaller companies are also exploring possibilities in setting up telemedicine units. For example: Televital, a Silicon Valley-based company, offering integrated telemedicine and e-health technology solutions, has a development center in Bangalore. According to the Chairman of TeleVital, the company planned to set up marketing offices in Mumbai, Delhi and Chennai, and planned to provide telemedicine solutions to public-private health care organizations. It was working in close cooperation with the Indian Space Research Organisation and the Government, and having discussions with medical hardware companies to make telemedicine affordable to the rural population (Business Line June 16 2005).

What emerges from the above section on medical technology in the government health services is:

- Right since the 1990s there has been awareness in the government about the status of medical equipment in the government health services – that it was a misutilized and mismanaged resource, etc. Recommendations were also made to devote attention to, and devise mechanisms for planning regarding purchase and procurement, and their proper management and utilization.
- However, no such mechanisms have been instituted, by both the central and state governments.
- Substantial funds have been invested by both, the central and state governments, in purchasing medical equipment, including expensive and the ‘latest’ advanced equipment, for the government health services at the secondary and tertiary levels. In several states this has been done as part of the Health Systems Development Project executed with loans from the World Bank.

- While large amounts of money are being spent on purchasing equipment and machinery, however, a substantial proportion of this capital investment, remains misutilized.

- Non-utilization of expensive equipment appears to be the norm, found across most states, including those with relatively good indicators of development. Such as Tamil Nadu, Maharashtra, Karnataka, Andhra Pradesh, etc.
- It also emerges that, after having supplied the machinery/equipment to hospitals, the supplying firms do not respond promptly to complaints of faulty functioning.
- There is callous indifference to using these for the public good for which they are being purchased.
REFERENCES


Government of India (1962) Lakshmanaswami Mudaliar Committee Report Chapter XI Section 8 and Section 9.


ANNEXURE I

Equipment that was to be purchased to equip the proposed Regional Diagnostic Centers in Haryana between 2002-2007. The unit cost of strengthening one Regional Diagnostic Centre was Rs. 3 crore.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Name of equipment</th>
<th>Approx. Cost (Amount in Rs Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Colour Doppler Ultrasound</td>
<td>28.00 per unit</td>
</tr>
<tr>
<td>2.</td>
<td>Automatic X-ray Film Processor</td>
<td>03.00 one unit</td>
</tr>
<tr>
<td>3.</td>
<td>ECG Machine</td>
<td>0.32 one unit (2 ECGs for each centre)</td>
</tr>
<tr>
<td>4.</td>
<td>TMT Machine</td>
<td>11.00 one unit</td>
</tr>
<tr>
<td>5.</td>
<td>500 MA X-ray Machine</td>
<td>07.00 one unit</td>
</tr>
<tr>
<td>6.</td>
<td>100 MA X-ray Machine</td>
<td>02.00 one unit</td>
</tr>
<tr>
<td>7.</td>
<td>Operation Theatre Light</td>
<td>0.78 one unit</td>
</tr>
<tr>
<td>8.</td>
<td>Operation Table (Hydraulic)</td>
<td>01.00 one unit</td>
</tr>
<tr>
<td>9.</td>
<td>Boyle's Apparatus</td>
<td>02.00 one unit</td>
</tr>
<tr>
<td>10.</td>
<td>Pulse Oximeter</td>
<td>0.40 one unit</td>
</tr>
<tr>
<td>11.</td>
<td>Electric Cautery</td>
<td>0.55 one unit</td>
</tr>
<tr>
<td>12.</td>
<td>Lab Equipment</td>
<td>14.00 one centre</td>
</tr>
<tr>
<td>13.</td>
<td>MCH Equipment</td>
<td>10.00 one unit</td>
</tr>
<tr>
<td>a.</td>
<td>Foetal Monitor</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Incubators etc.</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Mammography</td>
<td>20.00 one unit</td>
</tr>
<tr>
<td>15.</td>
<td>Lap Cholic Sets</td>
<td>11.00 one unit</td>
</tr>
<tr>
<td>16.</td>
<td>TUR Sets</td>
<td>7.00 one unit</td>
</tr>
<tr>
<td>17.</td>
<td>CT Scan</td>
<td>200.00 one unit</td>
</tr>
<tr>
<td>18.</td>
<td>Lithotripter</td>
<td>30.00 one unit</td>
</tr>
<tr>
<td>19.</td>
<td>Defibrillator</td>
<td>2.00 one unit</td>
</tr>
<tr>
<td>20.</td>
<td>Spirometer</td>
<td>1.50 one unit</td>
</tr>
<tr>
<td>21.</td>
<td>Histoscope</td>
<td>7.00 one unit</td>
</tr>
<tr>
<td>22.</td>
<td>Surgical Operating Microscope</td>
<td>4.00 one unit</td>
</tr>
<tr>
<td>23.</td>
<td>Gastroendoscope</td>
<td>4.00 one unit</td>
</tr>
<tr>
<td>24.</td>
<td>Surgical Endoscope</td>
<td>4.50 one unit</td>
</tr>
<tr>
<td>25.</td>
<td>Auto Refractometer</td>
<td>1.50 one unit</td>
</tr>
<tr>
<td>26.</td>
<td>50 KVA Generator Set</td>
<td>2.00 one unit</td>
</tr>
<tr>
<td>27.</td>
<td>Digital PPG Doppler</td>
<td>2.00 one unit</td>
</tr>
<tr>
<td>28.</td>
<td>Electrical Birthing/Delivery bed</td>
<td>1.50 one unit</td>
</tr>
<tr>
<td>29.</td>
<td>Portable handed CTG Monitor etc.</td>
<td>2.00 one unit</td>
</tr>
</tbody>
</table>
ANNEXURE II

Some of the equipment being purchased for various hospitals under Govt. of NCT, Delhi (Compiled from tender notices appearing in newspapers in 2004 – specified that equipment should be imported)

1. Colour echocardiography equipment
2. Holter monitoring system
3. Multi-channel ECG machine
4. Colour doppler/3D & 2D echocardiography
5. Defibrillators/monitors/recorders/pacemakers
6. Cardiac catheterization lab
7. ECG monitor with NIBP capnography
8. Stress test system (TMT)
9. 100 and 500 mA x-ray machines
10. 50 KV x-ray generator
11. Mobile x-ray units
12. C-arm image intensifier
13. Ultrasound (mobile)
14. Ultrasound therapy unit
15. Blood gas, pH and electrolyte analyzers
16. Haemoglobin Analyzer
17. Automatic haematology analyzer
18. GLC and HPLC systems
19. Refrigerated centrifuges
20. ELISA processor
21. Biochemistry analyzer (random access)
22. Mould room work station
23. Automatic clinical chemistry analyzer
24. Equipment for Pathology Laboratory – Automated Tissue Processors, Specialized Microscopes, Ultra-low temperature deep Freezer, Tissue Embedding Station System
25. Range of spectrophotometers
26. Digital video EEG
27. Paediatric videocolonoscopy
28. Upper UGI videoscope
29. Equipment for IVF and reproductive biology
30. EMG machine
31. Haemodialysis machine
32. GI Video endoscope and other equipment for visualizing GI-tract
33. Operative laparoscope with accessories
34. Video colposcope
35. Foetal monitors with central control unit
36. Bronchoscope
37. Power drill and saw system
38. Medical gas pipeline
39. Range of ventilators – such as for ICU, for paediatric use, portable ones and so on.
40. Advanced anaesthesia machine and multi-parameter anaesthesia monitor
41. Air aseptizer
42. OT tables and lights
43. 8-bedded ICU monitor with central station
44. fiber-optic bronchoscope
45. surgical laser systems
46. Infra-red photo-coagulator
47. Excimer Laser
48. Instruments for ophthalmology- refractometers, keratometer, slit lamp
49. Ophthalmic OT Table, and for vitreo-retinal surgery
50. Phaco-emulsification equipment
51. programmable dental chair with optic system
52. Motorized dental chair with accessories
53. A range of equipment for radiotherapy – including radiation isotope storage system