

## Annexure 1: Medical equipment use pattern in the public and private sectors in India: Policy implications

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### Medical equipment: Present status

MEDICAL EQUIPMENT CONSTITUTES A MAJOR PART OF THE INVESTMENT IN the health care sector. It adds up to more than 60% of the capital cost. Dependence on medical equipment for diagnosis and management is increasing day by day. With rapidly advancing technology, digitalization, increasing computing powers, technological devices, equipment and non-equipment technology is becoming a necessity for early diagnosis, intervention, and prolonging and improving the quality of life.

Studies conducted by WHO showed that 25%-50% of all health equipment in developing countries cannot be used for one reason or another, seriously impeding efforts to improve health services to the people. The main reasons for this are (i) difficulty in acquiring consumables and spare parts, (ii) lack of trained operators and service technicians, (iii) inadequate infrastructure for installation and operations, (iv) excessive amount of sophisticated equipment and insufficient basic equipment, and (v) obsolete and unsafe equipment.

The above reasons are mainly due to inadequate management, which is result of lack/deficiency of policies and procedures for comprehensive technology management in the health system, both in the public and the private sectors, involving planning, acquisition, operations, maintenance and retirement. Decision-makers are seldom trained or have the awareness/knowledge of modern technology. Equipment are typically specified by department or doctors more for prestige, craze for the latest and best. These persons may not be responsible for its eventual operation and maintenance. There is a lack of coordination among agencies involved in various processes, from demand generation to procurement, finance and maintenance. Investment and recurring costs are non-sustainable. Manufacturers are only keen to sell the latest and the 'greatest'.

Equipment selection is not done as per the morbidity pattern or skills available to make the best use of the equipment.

The total cost concept termed TCO (total cost of ownership) is not evaluated in both the public and the private sectors; only the purchase price is taken into account while making financial projections. Thus, the cost of installation, operations, maintenance, human resources, training, spares, support furnishings, calibration instruments, end-user costs, patient costs (charges + other expenses) and return on investment (ROI) are rarely given consideration, while these indirect or invisible costs constitute more than the purchase price, up to 80%-90% of the TCO.

### Utilization rates

Both quantitatively and qualitatively, medical equipment is better utilized in private sector diagnostic centres as compared to the public sector and private hospitals. Utilization per machine is high in the private sector as to compared public sector hospitals; this is in spite of the fact that the latter have more manpower and a higher patient load.

Qualitatively, in terms of early investigation, early reports and minimum patient visits, the private sector shows better utilization. Also, private sector doctors and technicians do more number of investigations per machine in a year than in the public sector.

At the district level, utilization in both the public and the private sector is less, due to fewer requests, and a lower morbidity pattern as compared to Delhi hospitals

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which are referral hospitals. Utilization of ultrasound in the public sector (district studied) is nil due to non-availability of a radiologist in the hospital. Utilization of other equipment in public hospitals, especially surgical departments, is better than in the private sector.

### Misuse and overuse

Despite the existence of the Pre-natal Sex Determination Test Act, ultrasound machines are being used clandestinely for sex determination, driven by the demand from seekers and greed for money. Most insured patients are over-investigated and a similar trend is seen in large corporate hospitals. This trend is comparatively less in general practice.

### Medical equipment market

The sale of medical equipment in India is worth approximately Rs 1500 crore annually. Fifty per cent of this is purchased from Indian manufacturers; 70% of the imported equipment is electronic medical equipment. Most high-end medical equipment are installed in cities with tertiary care hospitals. Concentration of equipment in a particular area has resulted in price competitiveness and the practice of incentives. Most of the equipment costing above Rs 10 lakh are installed in the metropolitan and large cities. Medium-level equipment is there at the district level for secondary care in both the public and the private sector. At the subdistrict level public sector equipment has poor installation and poor functioning as compared to the private sector.

Servicing of and spares for medical equipment are major issues in terms of poor services, non-availability of trained technicians at district and subdistrict levels, planned redundancy by companies, non-availability of an annual maintenance contract (AMC) after 5 years by the companies, non-availability of spares and their high cost, and monopoly of companies with respect to spares.

### Procurement, maintenance, down-time and consumables

Procurement of medical equipment is faster and more efficient in the private sector, averaging 3 months from demand to commissioning; in the public sector it takes 18 months. Breakdown of medical equipment is very low in the private sector, averaging 3 days in 5 years per equipment, due to proper handling and better maintenance practices. The number of unusable equipment is also low in the private sector.

Consumables are managed at minimum inventory carrying cost. Consumable supplies are faster (within 24 hours) due to better vendor compliance, as they are paid in time and regularly.

### Unit cost of diagnostic services

The unit cost (cost to establishment) of the investigation of CT scan and MRI in a private sector diagnostic centre is lower than the cost in public and private hospitals. The cost of ultra-

sound is barely at break-even point in private diagnostic centres, lower in private hospitals and high in public hospitals. The unit cost of ultrasound in a private hospital is 60% that of a public hospital and 70% that of private diagnostic centres. The price of an MRI is extremely high in public hospitals as compared to private ones (twelve times high).

Unit costs for biochemistry are low in private diagnostic centres as compared to both private and public hospitals.

Costs in the private sector are high due to interest, rentals and other establishment costs, as well as return on investment. Costs in the public sector are high due to human resources. As the unit cost is high, more investigations are required to achieve the break-even number in both sectors. For biochemistry services the unit costs are low in both the sectors as compared to the patient price, and the volumes of investigations are high.

Public hospitals provide a subsidy (cost to hospital less patient price) of Rs 439 on ultrasound, Rs 1203 on CT scan, and Rs 46,750 on MRI to the public, and 100% subsidy in biochemistry tests (calculated for blood sugar). In private sector diagnostic centres there is no subsidy thus they break even at a high volume load. In private hospitals, there is a marginal element of subsidy of Rs 333 for CT scan. Patient charges are more flexible in private diagnostic centres as compared to private hospitals. Private diagnostic centres with a low patient load do not recover their costs at the present patient price; centres continue to provide these services, hoping to become viable in 4-5 years. Their income is augmented by laboratory medicine services.

The percentage utilization in relation to break-even numbers (number of investigations required to recover fixed costs at the current patient price) are as follows:

- for ultrasound, it is 90%-120% in the private sector, 20% in the public sector
- for CT scan, it is 53% in public hospitals, 90% in private hospitals, 190% in private diagnostic centres
- for MRI, it is 7% in public and 120% in private diagnostic centres
- for auto-analyser (calculated for sugar-biochemistry test) it is 360% in a private laboratory, 150% in a private hospital, since it is free in the public sector, a break-even point is never reached. (Breakeven number is the number of investigations required to recover the yearly fixed cost of establishment at the existing price to the patient.)
- At the district level, break-even numbers are not reached in both sectors in biochemistry. Ultrasound is cost-effective in the private sector.

### Financing operation cost, tax benefits and incentives

Approximately 25%-30% of public hospital patients get their investigations done from private diagnostic centres. The investigation load in private diagnostic centres is 20% from public hospitals, 10% from private hospitals, and 70% from private practitioners. The price in the private sector is driven by what the market can bear as well as public sector prices. Cost calculations in the private sector are on an ad hoc basis. Operation costs in the private sector are borne by collections

from patients, loans, depreciation funds, and instalment amounts (rescheduling bank payments).

The only tax benefit available to the private sector is low custom duties on imported medical and life-saving equipment. The other sops for private players (large hospitals) are land at subsidized rates (so a lower rental value). Private diagnostic centres pay commercial rentals, property tax and commercial charges for electricity and water.

Incentives play a key part in referrals to diagnostic centres initially. The expenditure on these incentives accounts for 10% of the expenses of diagnostic centres, which is lower than the electricity bills, rental and depreciation. Incentives are received by 40% of private sector and public sector doctors alike. However, only 30% of diagnostic centres (owned by doctors) are forced into this incentive-based referral network by competition from businessmen-owned centres where this practice is 100%. Old and established centres do not indulge in this practice. The code of medical ethics on splitting fees applies to doctors and not to business houses.

The private sector, said to be highly priced relative to the public sector, is patronized by the upper- and middle-income groups, and insurance patients. This leaves the poor socioeconomic group to patronize public health facilities that are already overburdened resulting in poor quality and long waiting times.

## Policy steps needed

### Misuse

The demand for pre-natal sex determination needs to be curbed through change of mindset, incentives for the girl child, counselling centres for parental education and social-cultural-behavioural changes. This should be managed by women's organizations and heavy penalties should be levied on persons seeking foeticide. It is also recommended that adequate records be maintained at the diagnostic centre and strict surveillance done of centres with 'Medical termination of pregnancy' facilities.

### Overuse

This should be controlled through medical audit by the insurance companies as well as internal audit by the hospitals, and a grievance redressal cell for patients should be set up in the State medical councils.

### Regulation of diagnostic facilities

Just like the National Accreditation Body for Laboratories (NABL) (voluntary) for registration and accreditation of Pathology and Biochemistry services, a similar body should be created for Radiology and Imaging, by the IRIA/IMA /PRSF and other professional bodies.

Standards should be implemented by States (health being a State subject) for diagnostic centres, after categorization by size, type and range of services provided. The Central Government should provide the standard guidelines and this

should be developed in collaboration with professional bodies. The WHO publication medical device overview and guiding principles provides suggestions for standards.

Norms for high-end medical equipment may be developed, based on the population or morbidity load. This will reduce excessive installation, which results in blocked investments both in the public and private sectors (e.g. 1 MRI 3 CT scan units in a population of 10 lakh).

### Public-private cooperation

There exists an opportunity to develop public-private partnerships that will benefit all sections of society. There are different kinds of partnerships, from investment to maintenance and management. However, outsourcing all public sector investigations to the private sector seems to be the best option. This will reduce the burden on public hospitals, and enable the Government to reallocate funds for drugs, improve the quality of existing health services and strengthen delivery. Patients will also benefit from the quality of private sector services, and investigation time will be reduced with early diagnosis and treatment. Currently, public-private experiments are in a nascent stage and private service providers do not seem to benefit much from this relationship.

### Regulating the equipment market

Setting up a Medical Equipment Devices Regulatory Authority, on the lines suggested by WHO should be done so as to ensure quality equipment with adequate spare parts, and prioritize installations in undeserved areas as per needs.

Procurement in Government hospitals needs to improve and various options should be evaluated to minimize the time. WHO's Essential healthcare technology package (EHTP software) should be utilized.

Hospital and biomedical engineering should be promoted further as a specialty, to ensure the availability of trained technical experts for good quality repairs and maintenance of equipment. Long-term equipment management programmes should be initiated in all healthcare institutions for proper functioning of the equipment.

There is an urgent need to make sure that equipment must be able to serve at least 15 years and companies should provide spares and AMC for the period. Third-party training of engineers who can handle various equipment needs to be encouraged and sourcing of spares from original subvendors should be initiated for equipment that are not attended to by the manufacturing companies.

Local production of more sophisticated medical equipment needs to be given a priority, by way of limiting imports and imposing a manufacture in India clause in medical device regulation.

### Equipment invoicing

Manufacturers should regularly update themselves on the latest developments in medical equipment technology, and provide pricing lists in trade journals.

Table 1

## Summary of utilization and costs in Delhi

Particulars	US private	US public	US private hospital	CT private	CT public 1	CT private hospital	MRI private	MRI public	Auto-analyser private	Auto-analyser Public	Auto-analyser private hospital
No. of machines	1	3	2	1	1	1	1	1	3	5	2
Cost of equipment(in lakh)	30	62	15	180	213	145	750	810	25	80	40
Number of investigations/ year	9000	26,784	18,438	10,000	7392	4000	12,000	742	500,000	800,000	300,000
Number of Investigations/ machine/year	9000	8928	9219	10,000	7392	4000	12000	742	166,667	160,000	150,000
Number of doctors or professionals/ modality	2	8	5(pt)	2	7	4(pt)	3	3	2	3	2
Number of investigations/ professional/ year	4500	3348	3688	5000	1056	1000	4000	247	250000	266667	150000
Number of investigations to break even fixed costs	9070	13,3674	15,486	5080	14,030	4518	10,083	11,286	136,682	Infinity	198,816
Percentage utilization compared to break even point	99	20	119	197	53	89	119	7	366	-61	151
Fixed cost per investigation (in Rs)	403	549	265	1549	2543	2903	3739	50040	9	18	29
Consumable costs/ investigation(in Rs)	100	40	85	450	160	430	550	210	17	11	16
Cost per investigation (fixed + consumable)	503	589	350	1999	2703	3333	4289	50250	26	29	45
Patient charges(in Rs)	500	150	400	3500	1500	3000	5000	3500	50	0	60
Collection received to offset fixed costs/ investigation(in Rs)	397	110	315	3050	1340	2070	4450	3290	33	0	44
Subsidy in real terms (in Rs)	3	439	Nil	Nil	1203	333	nil	50,250	Nil	29	nil
Booking time	Same day	2 month	Same day	Same day	1 month	Same day	Same day	3 days	Same day	3 days	Same day
Reports delivered	Same day	Same day	Same day	Same day	3 days	Same day	Same day	2 days	Same day	3 days	same day

## Conclusions

Medical equipment is essential for optimal healthcare at all levels of the health services. Their judicious installation and maintenance is the key to ideal healthcare delivery. Medical equipment are better utilized in the private sector as compared to the public sector in terms of number of investigations per machine, number of investigations per doctor and staff, unit cost per investigation, which are lower than that in the public sector despite the high interest rate and ROI. This is achieved by employing an optimal number of staff, more working hours and better quality in terms of early and timely delivery of reports.

Since medical equipment constitutes a major part of the investment in any hospital, it would be advisable to outsource the high-end diagnostic services to the private sector managed by professionals, at charges that are lower but financially viable to the establishment. The capital money thus saved in the public sector could be utilized for improving the quality of services, and supplies of medicines and injectables.

Installation of costly medical equipment in the private sector should also be regulated by encouraging group practice

(professionally owned), lower interest rates on the lines of housing loans, and encouragement to practise in underserved areas.

The medical equipment market needs regulation on the lines suggested by WHO (Medical device regulation to safeguard professional and patient interest).

Overuse of diagnostics needs to be curtailed through medical audit in large corporate hospitals and through internal and external audit by insurance companies/professional agencies.

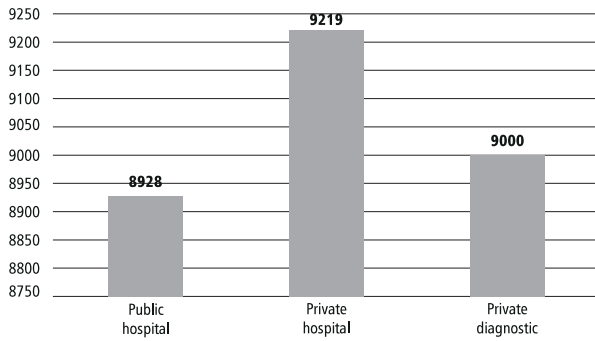
Research and analysis on essential health technology should be given priority and encouraged so that limited resources can be better utilized, by way of appropriate technology for the level and type of health care services being rendered at any institution. Equipment selection must be done in a scientific manner by looking at the total cost of ownership (TCO) rather than the purchase price alone.

To get the best out of equipment, a management programme must be initiated in all institutions in both the public and the private sectors. This will increase the life and performance of the equipment and have less down-time.

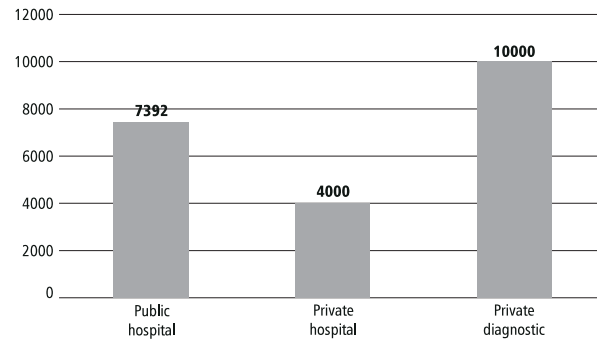
**Fig 1**

**Investigation per machine per year in each category of institution studied**

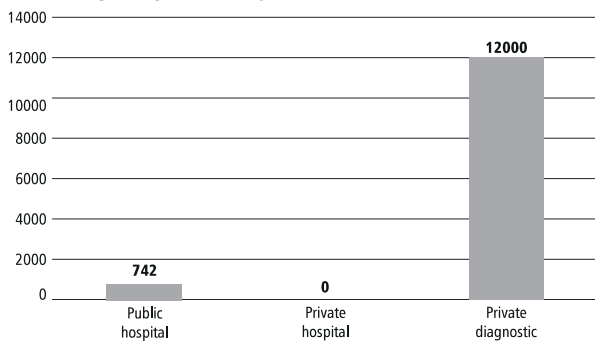
**Ultrasound investigation per machine/year US**



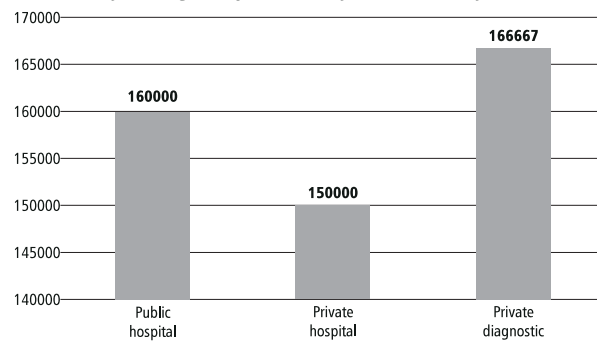
**CT investigation per machine/year CT**



**MRI investigation per machine/year MRI**



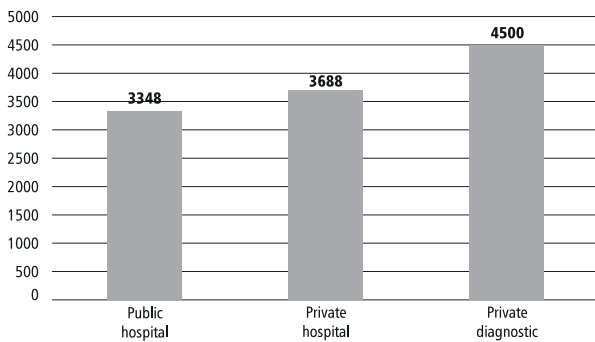
**Biochemistry investigation per machine/year Biochemistry**



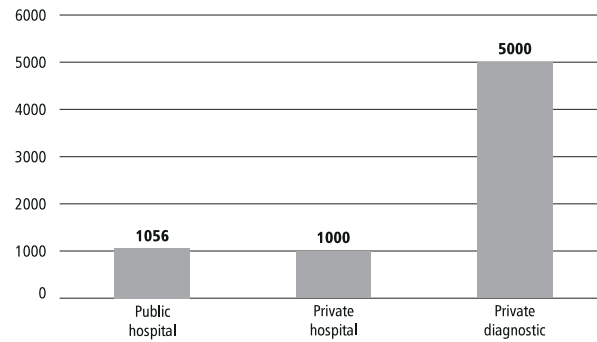
**Fig 2**

**Investigation per doctor per year in each category of institution studied**

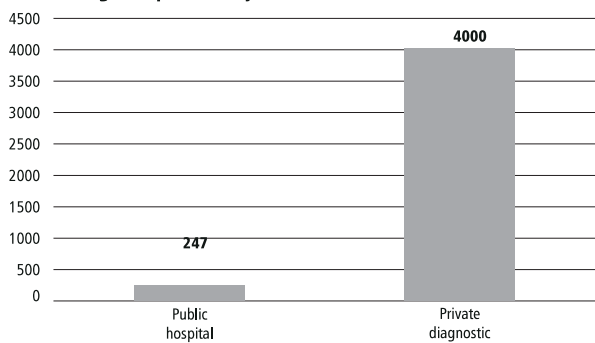
**US investigation per doctor/year US**



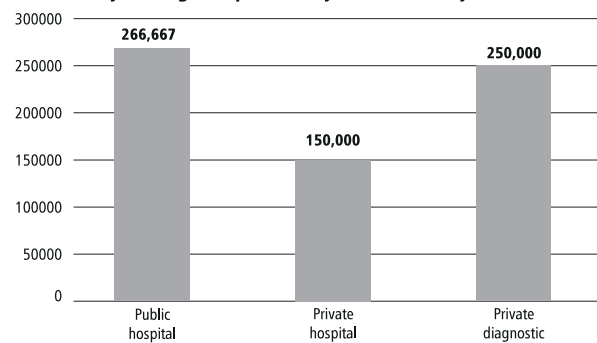
**CT investigation per doctor/year CT**



**MRI investigation per doctor/year MRI**

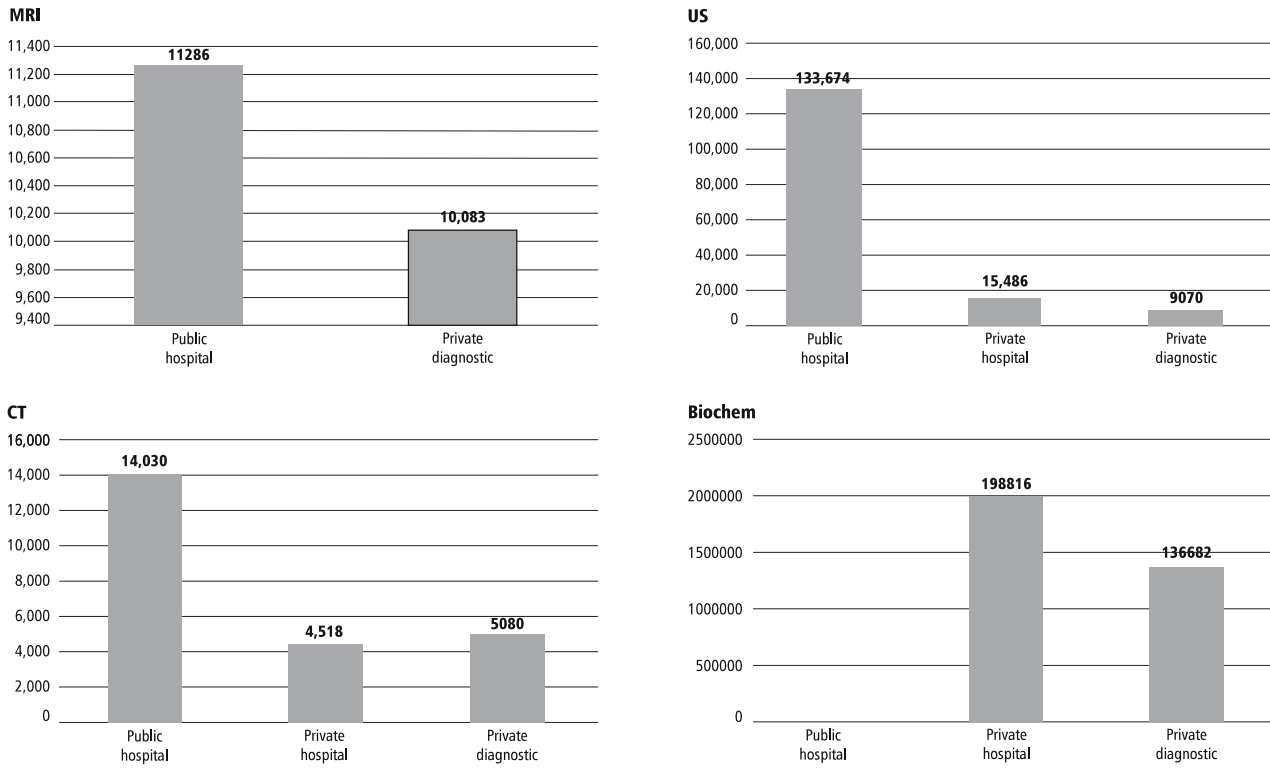


**Biochemistry investigation per doctor/year Biochemistry**



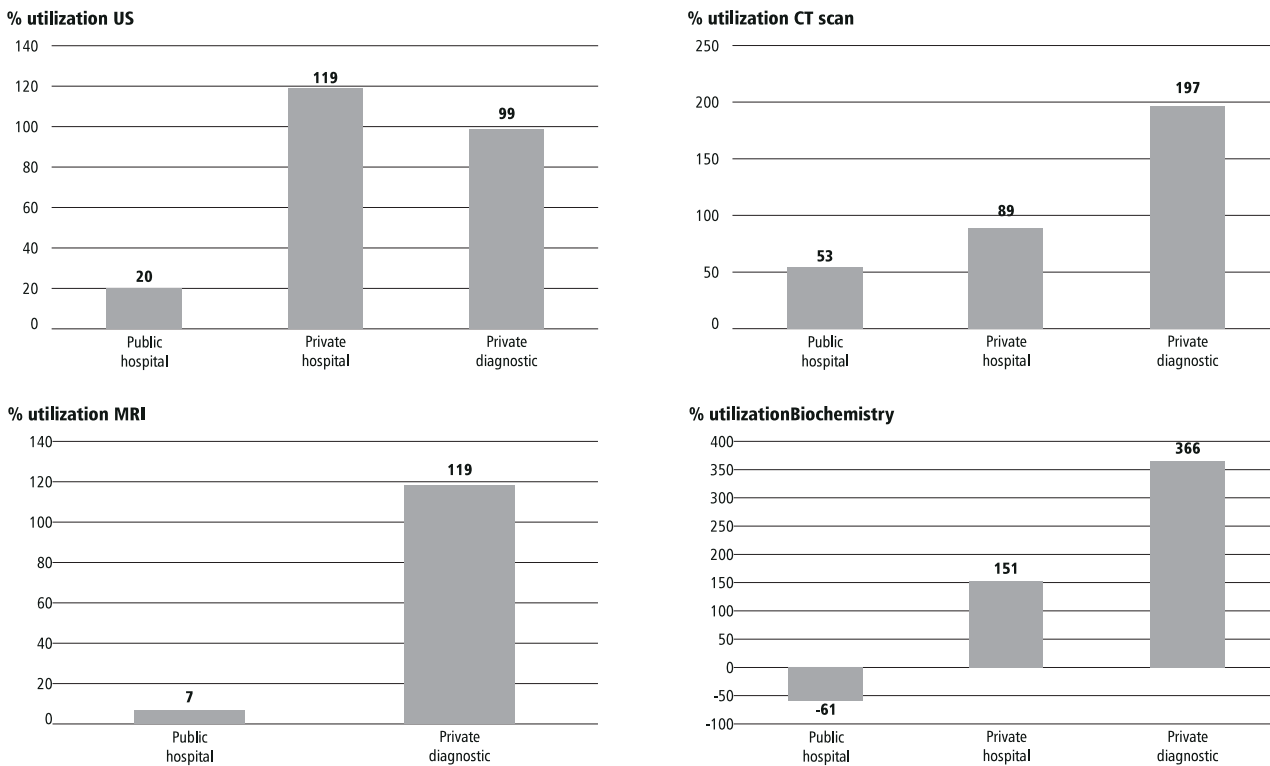
**Fig 3**

**Numbers required to break even at present utilization and patient price**



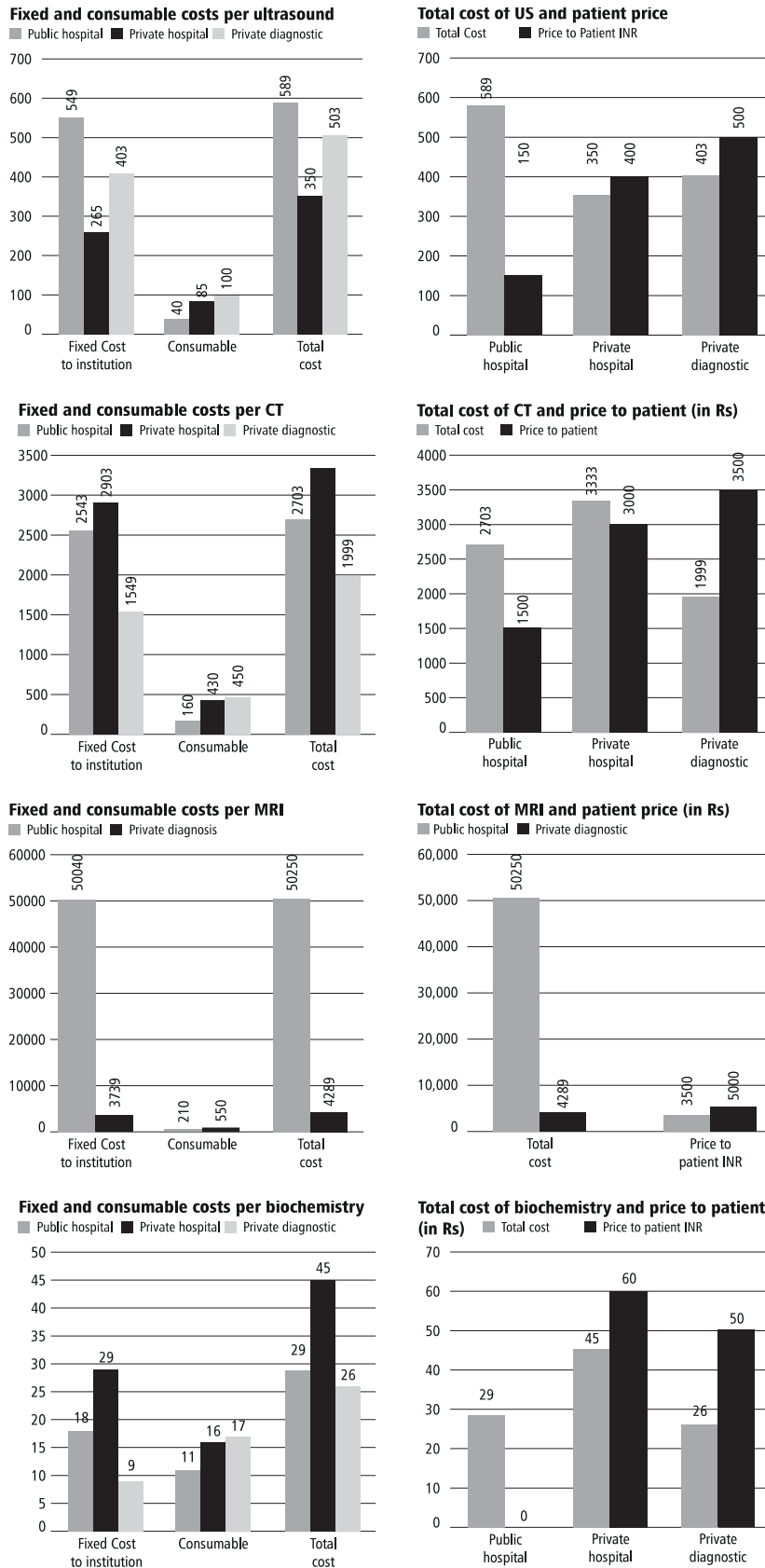
**Fig 4**

**Percentage utilization at present in relation to break-even numbers**

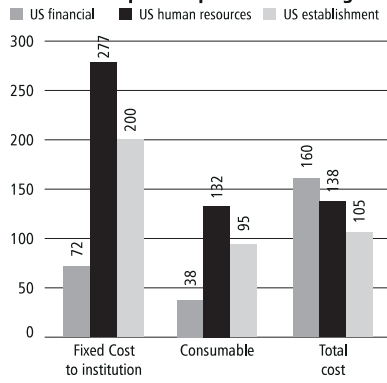


**Fig 5**

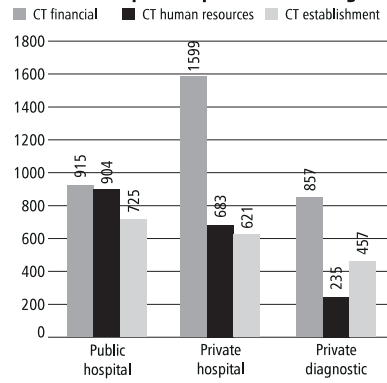
**Fixed and consumable costs per investigation (unitized) and comparison with patient price (in Rs)**



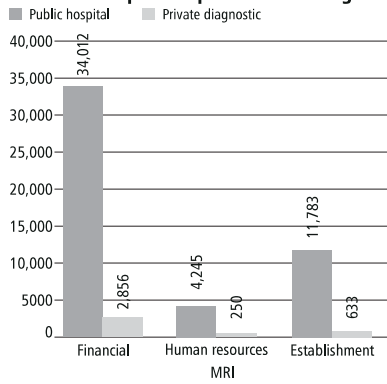
**Fixed cost components per unit of Investigation**



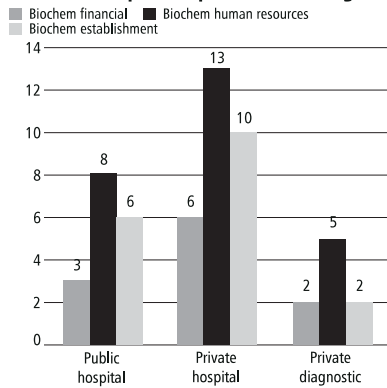
**Fixed cost components per unit of Investigation**



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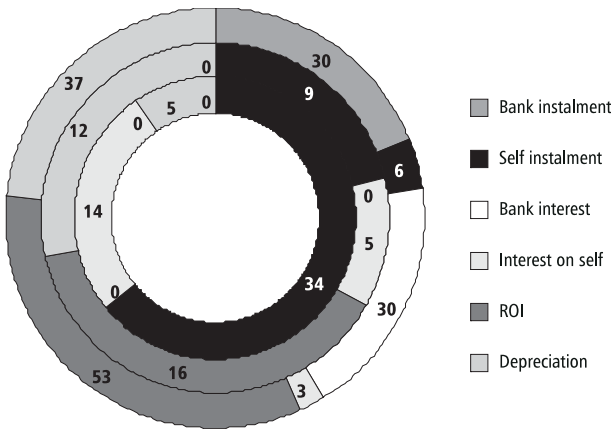


**Fixed cost components per unit of Investigation**



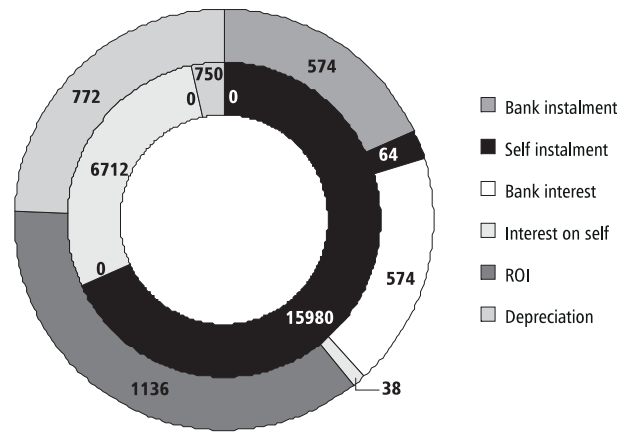
**Fig 6**

**Financial cost components per unit investigation in INR (ultrasound investigation)**



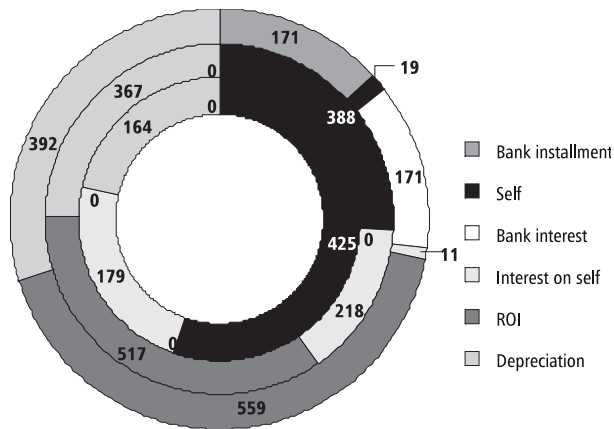
**Fig 7**

**Investigation costs per unit**



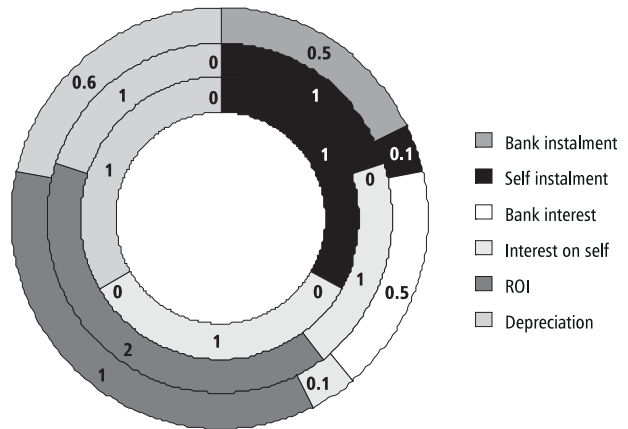
**Fig 8**

**MRI investigation per unit component financial costs**



**Fig 9**

**Biochemistry financial cost component**



Inner Circle – Public Hospital

Middle Circle – Private Hospital

Outer Circle – Private Diagnostic

## References

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