POLICY BRIEF

Health Technology Assessment in India (HTAIn)
Department of Health Research, Ministry of Health & Family Welfare
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Health Technology Assessment on Positron Emission Tomography and Computed Tomography (PET-CT) for Cancer care in India

Introduction

Every year, new cancer patients registered in India are over 11,57,294 lakhs. The risk of developing cancer before the age of 75 years in males is 9.81% and in females it is 9.42 %. The top five cancers in men and women account for 47.2% of all cancers; these cancers can be prevented, screened for and/or detected early and treated at an early stage. This could significantly reduce the death rate from these cancers.

The concept of PET imaging which originated in the mid-1970s as a research tool in cardiology and neurology has in the past four decades evolved into the most sophisticated medical imaging system with its largest application in oncology. India is one of the largest markets for the fast-growing sector of medical devices. The medical device industry in India is presently valued at USD 5.2 Billion and is growing at 15.8% CAGR. Due to the rising costs associated with introducing of new medical devices and procedures into the healthcare system, payers have started to pay more attention to the clinical and cost effectiveness of such technologies in advance.

Objective

In this context, health technology assessment of positron emission tomography and computed tomography (PET-CT) for cancer care in India healthcare system was given by Govt. of Kerala, as they wanted to know the evidence-based indications for PET–CT in support of facilities planning and to describe a project in which this information can be applied for an investment decision in India. The growth for this imaging modality has been slow owing to issues related to high cost of PET scanner, ready availability of useful biomolecules, and trained technical workforce as well as the cost of establishing and operating PET-CT scan facility is quite substantial.

Recommendations

Discussion on number of PET- CT units

- States having maximum number of PET-CT units are in Maharashtra-48
- States & union territory having only one PET-CT unit- Manipur, Tripura, Uttarakhand, Jharkhand, Puducherry.
- States and union territory not even having one PET-CT unit are-Himachal Pradesh, Arunachal Pradesh, Goa, Mizoram, Meghalaya, Nagaland, Sikkim, Andaman & Nicobar Islands, Dadra and Nagar Haveli, Lakshadweep, and Ladakh.
- In Kerala we have 13 PET-CT units, and is not suggestive of adding another PET-CT unit for Kerala, rather recommend it for states having higher cancer incidence and lesser PET-CT units.

Public Private Partnership Model for Service Delivery only for PET- CT

- PET-CT diagnostic service can be provided in Public Private Partnership model across India following National Free Diagnostic Scheme (section radiology services).
- It will help to - Provide accessible, affordable and quality PET-CT diagnostic service in all public health facilities up to district hospitals. Leading to reduction of direct cost for PET-CT scan causing a remarkable impact on out-of-pocket expenditure by general public.
- Utilizing the capacity of private service providers in supporting government to provide PET+ CT scan. will lead to strengthening PET-CT diagnostic service network across the country.
- Cost of PET-CT PET scans are conducted for around Rs 11,000 - 15,000 in private sector which are suggested to be included free of cost under PMJAY scheme.

Cyclotrons

We suggest cyclotron should be under public sector as –

- If the cost of raw material for PET-CT is maintained the cost for PET-CT scan will also be maintained otherwise if it is under private sector the cost might increase according to market fluctuations.
- Private companies are more interested in installation of PET-CT units as they will get return on investment soon, unlike the case of cyclotron.
- We need to focus on even distribution of cyclotron units across the country, as the shelf life of the radioisotopes used for PET-CT is very less

PET- CT for Cancer Treatment

(a) Early diagnosis-

PET-CT should be used for early diagnosis of cancers as they are treatable and cost effective to treat if diagnosed early and the patient goes back to lead a normal routine life.

(b) Treatment Planning

It also plays an important role in treatment planning for the patient to assess the effectiveness of the treatment and to evaluate the recurrence of the cancer.

Nuclear Medicine infrastructure in India and other countries

Table 4: Installed base of Computerized tomography, magnetic resonance imaging, and Positron emission tomography in India and other countries versus cancer statistics (24)						
Country	Australia	France	New Zealand	United States	India	Japan
Total CT units	1782	1222	76	14750	5324	14126
Units per million population	70.25	18.24	15.44	44.94	**3.93**	111.49
Total MRI Units	375	1034	76	13275	1800	6996
Units per million population	14.78	15.43	15.44	40.44	**0.69**	55.21
Total PET Units	102	167	5	1790	279	586
Units per million population	4.02	2.49	1.02	5.45	**0.20**	4.62
Total Population in Millions	25.0	66.9	4.9	327.2	1354.1	126.4
New cancer cases	197876	455618	35897	2129118	1157294	883395
Units per thousand cancer cases	0.51	0.36	0.13	0.84	**0.24**	0.66
5-year prevalent cases	755062	1390878	133716	7279710	2258208	2127559
Units per/thousand 5-year cancer prevalent cases	0.13	0.12	0.037	0.24	**0.12**	0.27

Findings

Clinical Effectiveness

A Systematic Review and Meta Analysis was conducted to evaluate the diagnostic accuracy of positron emission tomography and computed tomography (PET-CT) in oncology (Head and neck, breast, lung, gastric and cervical cancer) compared to positron emission tomography (PET), computed tomography (CT) and magnetic resonance imaging (MRI).

Diagnosis and detection of different cancers by PET-CT, PET, CT and MRI varies based on the region, recurrence and different stages of cancer.

The forest plot was plotted for all five different cancers with a total of 345 studies and their sensitivity and specificity was calculated. It is concluded that PET-CT as a diagnostic tool is highly sensitive and specific in all fields of diagnosis, staging, and treatment in oncology. PET-CT intervention during staging, restaging, may lead to timely changes in the treatment of the patient. .

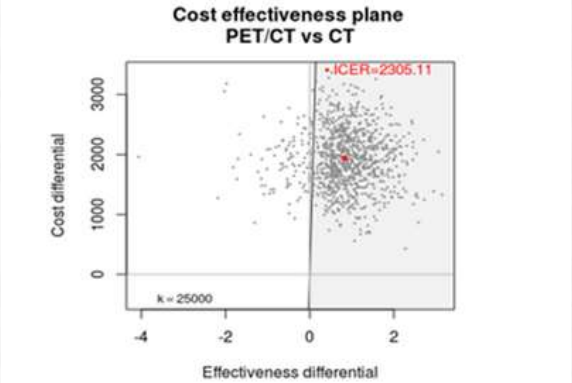
Cost Effectiveness

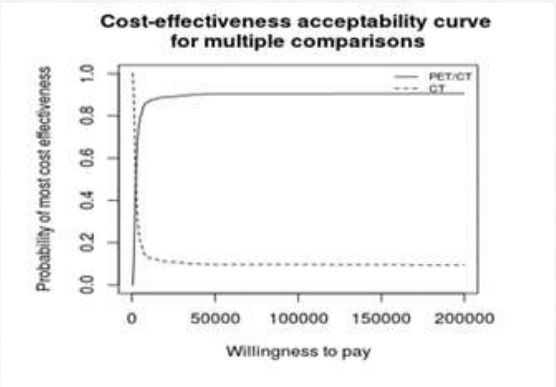
To evaluate the cost effectiveness of positron emission tomography and computed tomography (PET-CT) in oncology, cost and Quality Adjusted Life Years (QALYs) were chosen as outcomes and individuals with high risk aged between 30 and 80 are considered to be eligible for diagnosis.

The base-case results of model analyses, which revealed that PET-CT as diagnostic modality gains 4.19, 6.42 and 6.99 QALYs, in the time horizon of 5 years, 10 years and lifetime respectively.

A deterministic and probabilistic Markov model was developed with a cohort of 1,000 patients. We chose a cycle length of one year and ran the model for 50 cycles (i.e., 50 years). Cost effectiveness of PET-CT was assessed from societal perspective with time horizon of 5 years, 10 years and lifetime. Direct medical cost, Direct Non-Medical cost and Indirect cost were calculated and depicted as mean along with its standard error and distribution type. Costs are presented in IN Rupees. The costs and Quality Adjusted Life Years (QALYs) were discounted by 3% per year.

Cost Effectiveness

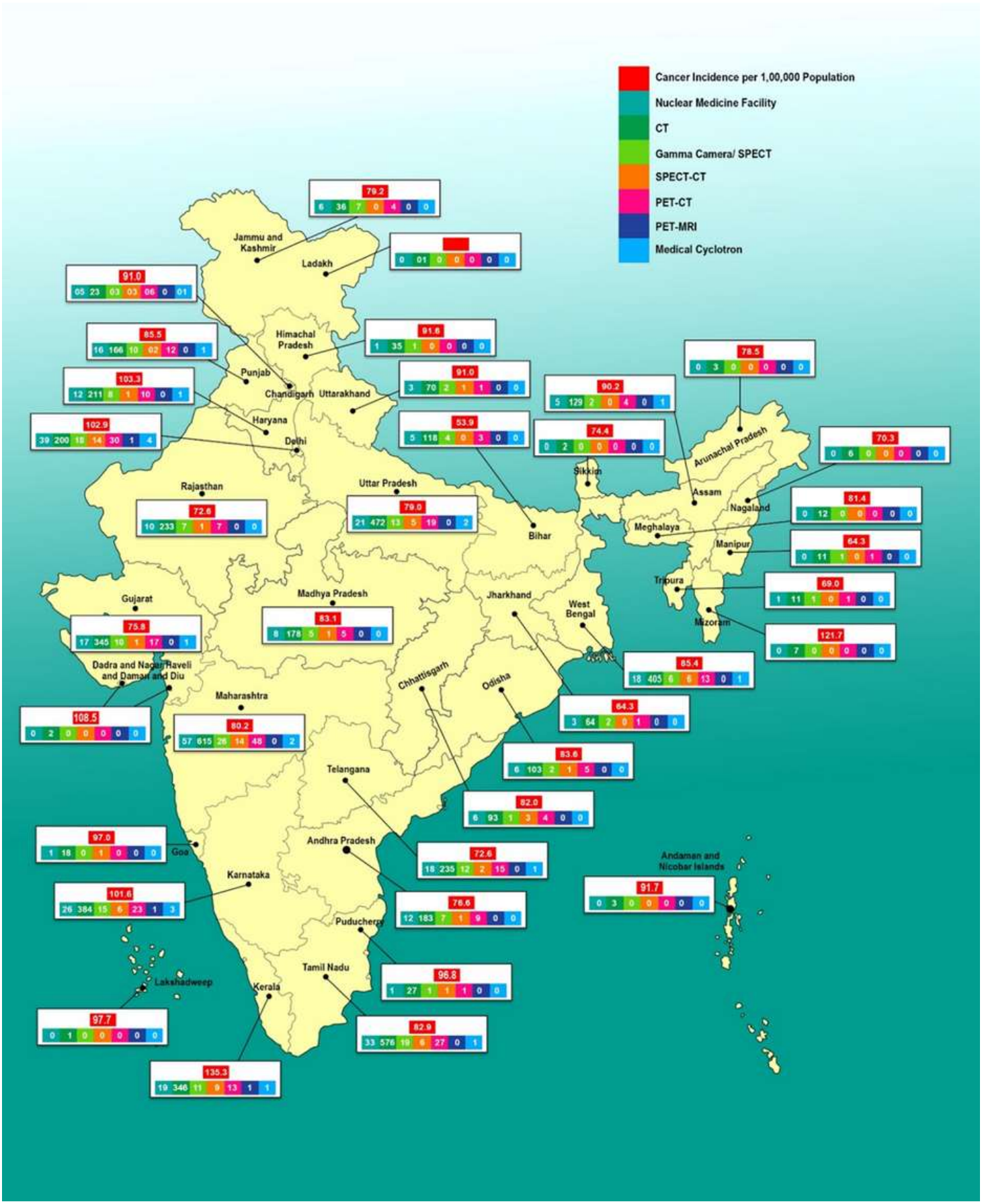




The ICER for PET-CT compared to CT were 617, 1783 and 2337 respectively for different time horizons. The ICER values obtained from PSA are all somewhere close to the base-case lifetime horizon ICER value.

Up to the willingness to pay of ₹9000, CT is cost-effective. When the willingness to pay is high, patients opt for better interventions that give better outcomes. Here, in our study, when the WTP is greater than ₹9000, PET-CT is almost 80% cost-effective.

One-way sensitivity analysis reveals that the uncertainty in the utility of diseased patient, total hospitalization cost with length of stay for PET-CT and CT, total diagnostic cost for PET-CT and CT and utility of health population has the greatest impact on the ICER.



Mapping of Nuclear medicine infrastructure in India vis-a-vis Cancer Incidence

Conclusion

- It has been observed that PET- CT is clinically as well as cost effective in diagnosing cancers. It can actually create an impact as cancer treatment delay is the actual problem, whereas diagnosing them at an earlier stage using the appropriate diagnostic modalities such as PET-CT can help solve the issue at a greater extent.
- Total cost of establishing PET-CT scan facility without cyclotron was calculated to be INR 17.08 Cr (USD 2,339,048.75), we propose additional 13 units of PET-CT, which is still very less than what is required to meet the current demand and the total cost of setting up of cyclotron facility was calculated to be INR 58.63 Cr (USD 8,026,734.1), we propose additional 4 cyclotrons via phase wise implementation to meet the current demand.
- A PPP model is suggested where cyclotron can be provided by the public sector and PET-CT by the private sector.
- Another model that can be implemented is by providing private sectors with land or infrastructure and private sectors investing on equipment's and other facilities required. Services will be provided by the private sector and the bills can be reimbursed by the government.
- Limited availability of the radiotracer FDG currently creates high-cost barriers for cancer-care programs integrating PET technology as there are only 20 cyclotrons producing FDG for oncologic PET imaging across India and FDG loses one-half of its activity every two hours (approximately) from the time it is produced. Much of the difference in cost can be attributed to variable distance from the cyclotron facility to the PET clinics. Addressing this major challenge can be a stepping stone to dealing with the whole issue of meeting the demand across the country.
- Regulation of FDG is viewed as a major hurdle to the efficient use of PET resources, geography also makes it difficult to transport FDG over long distances.
- We also propose an evaluation of the existing SPECT imaging facilities for possible conversion into PET as the only difference is the detector which is possible according to literature.
- India does not have a national approach or national policy for the use of PET/CT as a clinical tool for cancer care or for expansion of PET-CT facilities in India. Coordinated action, based on evidence- based guidelines, is required as a national approach for optimal utilization of the nuclear medicine resources in India.
- It may be time for governments to develop a systematic approach to assess the proper utilization of CT and MRI, rather than limit the expansion, and utilization, of PET technology in clinical care. Governments should consider the merits of PET technology based on its own capabilities, not on the possible overuse of other technologies.

Reference: *HTA on Health Technology Assessment on Positron Emission Tomography and Computed Tomography (PET+ CT) for Cancer care in India by Kalam Institute of Health Technology, Vizag, Andhra Pradesh.*

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