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Establishing a Proton Therapy Unit at AIIMS Delhi: A Public-Private Partnership Model for Advanced Cancer Care in India

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ABSTRACT
This paper explores the feasibility and advantages of establishing a Proton Therapy Unit at the All India Institute of Medical Sciences (AIIMS), Delhi, under a Public-Private Partnership (PPP) model. Proton therapy, a cutting-edge cancer treatment, offers significant benefits, especially in treating pediatric and complex cancers. Given the high capital and operational costs, a PPP model is ideal for ensuring long-term sustainability, reducing financial risk, and leveraging expertise from both the public and private sectors. The paper outlines the technical, financial, and regulatory requirements for implementing this project and assesses its potential impact on cancer care in India.

Keywords
Proton Therapy, Public-Private Partnership, Cancer Treatment, AIIMS Delhi, Healthcare Infrastructure, Radiation Oncology

1. Introduction

Cancer remains one of India's leading health concerns, with an estimated 1.39 million new cases in 2022 alone (Globocan 2022). While radiation therapy is a critical component of cancer treatment, conventional radiation therapy often affects healthy tissues, leading to long-term complications. Proton therapy, an advanced form of radiation therapy, minimizes this risk by delivering a precise dose of radiation directly to the tumor, reducing damage to surrounding tissues. However, proton therapy facilities are expensive to establish and operate, making it difficult for public hospitals to fund them independently.

This paper proposes a Public-Private Partnership (PPP) model as a sustainable solution to establish a Proton Therapy Unit at AIIMS Delhi, a premier public healthcare institution in India.

2. Proton Therapy: Overview and Benefits

Proton therapy is an advanced form of radiation therapy that uses protons instead of X-rays. Protons can be controlled to stop at the tumor site, delivering higher doses of radiation to cancer cells while sparing surrounding healthy tissues.

• Clinical Benefits: Proton therapy is particularly beneficial for pediatric cancers, brain tumors, and head-and-neck cancers, where the risk of damage to vital organs is high. Studies from the National Cancer Institute (NCI) report that proton therapy reduces the risk of secondary cancers by up to 30% in pediatric patients (NCI, 2022).

• Technological Advantage: Proton therapy delivers up to 60% less radiation to surrounding healthy tissues compared to conventional radiation therapy (American Society for Radiation Oncology, ASTRO).

3. The Case for AIIMS Delhi

AIIMS Delhi treats over 30,000 cancer patients annually, with a significant proportion requiring advanced radiation treatments. Despite its stature as a leading healthcare institution, AIIMS lacks proton therapy facilities. Establishing a Proton Therapy Unit at AIIMS would significantly enhance cancer treatment capabilities, allowing the hospital to serve both domestic and international patients.

The gap in access to advanced cancer treatment is evident, with only two operational proton therapy centers in India—Apollo Proton Cancer Centre (Chennai) and Tata Memorial Centre (Mumbai). The addition of a facility in AIIMS would not only improve regional access but also reduce patient load at these existing centers.

4. Public-Private Partnership Model for Proton Therapy

A PPP model is proposed for the establishment of the Proton Therapy Unit, where the private sector will invest in setting up the infrastructure, while AIIMS will provide space and patient care services. The PPP structure ensures that the high capital costs (estimated between ₹350-500 crore) and operational costs (₹50 crore annually) are shared between stakeholders, reducing financial risks for AIIMS.

• Financial Benefits: The private partner can recover investment through a revenue-sharing model, which will include patient charges, insurance coverage, and government health

schemes like Ayushman Bharat.
• Risk Mitigation: The PPP model spreads the financial and operational risks between the public and private sectors. Delays in approvals or underestimation of costs, typical risks in healthcare PPP projects, are mitigated by clearly defined contracts and timelines.

5. Technology and Infrastructure Requirements

Proton therapy requires advanced infrastructure, including a cyclotron to generate the protons and a gantry system to deliver them. The space requirements, power supply, and radiation safety measures are stringent, which makes the project complex.
• Estimated Cost: The total cost of setting up a single-room proton therapy facility is estimated to be ₹350-500 crore, depending on the specifications (Apollo Proton Cancer Centre, Chennai).
• Project Timeline: The expected timeline for setting up the Proton Therapy Unit is around 3 years from the date of approval, which includes design, procurement, construction, and commissioning phases (Tata Memorial Centre report, 2022).

6. Regulatory and Legal Considerations

The Proton Therapy Unit will need to comply with Indian regulatory standards for medical equipment and radiation safety, governed by the Atomic Energy Regulatory Board (AERB). AIIMS and the private partner must obtain licenses for equipment import and operation. Furthermore, contractual obligations under the PPP framework must be clearly defined to ensure smooth project execution.

7. Case Studies of PPP in Healthcare

There are successful precedents for PPPs in healthcare in India and globally. Tata Memorial Centre, Mumbai, has pioneered several PPP initiatives in oncology. Internationally, the NHS in the UK has also used PPP models to expand access to advanced treatments like proton therapy.

8. Challenges and Risk Mitigation

• Financial Risks: High capital costs and uncertain patient volumes pose financial risks. However, a phased implementation approach and careful cost estimation can mitigate these risks.
• Operational Risks: Operating such advanced technology requires skilled personnel. Collaborating with the private sector, which may have global expertise, will help mitigate operational risks.

9. Sustainability and Future Growth

The demand for proton therapy is expected to grow at a CAGR of 6.2% globally (Grand View Research, 2023). A well-planned PPP model will allow AIIMS to continually upgrade the technology and expand its capacity to meet future demand. As India moves towards universal health coverage, having a proton therapy facility at AIIMS will contribute to the long-term sustainability of cancer care.

10. Conclusion

The establishment of a Proton Therapy Unit at AIIMS Delhi under a PPP model presents a feasible and sustainable solution to advance cancer treatment in India. The collaboration between AIIMS and private sector expertise will allow for the delivery of cutting-edge cancer care while minimizing financial risk and ensuring long-term viability.
The PPP model also opens the possibility of further technological upgrades, expanded services, and increased access to proton therapy for a broader patient base, contributing significantly to India's healthcare infrastructure.

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