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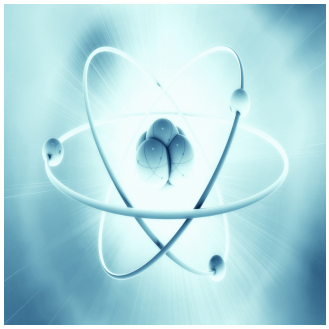
Can Proton Therapy Make Cancer Treatment More Accessible?



Proton therapy, a cutting-edge cancer treatment known for its precision, has traditionally been associated with massive infrastructure and substantial investment costs. The business of proton therapy often requires constructing large gantries and facilities that can run into hundreds of millions of dollars. However, recent developments from various manufacturers are changing the landscape of proton therapy, promising a future with more compact systems that reduce both the physical footprint and the financial burden on healthcare providers. This article explores the latest advancements in proton therapy technology, the potential for cost reduction, and the future of cancer treatment.

Reimagining Proton Therapy: Compact and Efficient Systems

The traditional proton therapy systems that have been in use for years are often large and expensive. Still, new developments are paving the way for more compact and cost-effective solutions. Companies like P-Cure, Mevion, and B dot Medical are leading this transformation. The MEVION S250-FIT cyclotron, developed in partnership with Leo Cancer Care, is a self-shielded system that eliminates the need for massive gantries. Similarly, the P-Cure system requires 50% less shielding than conventional gantry rooms. Although smaller, B dot Medical's Phemto system utilises a much-reduced gantry, making it a more viable option for facilities with space and budget constraints.

A significant innovation in these systems is the ability to treat patients in an upright position, as opposed to the traditional supine position. In these upright systems, the patient rotates in a chair while the proton beam remains stationary, eliminating the need for large magnets and extensive equipment. This not only reduces the overall size of the system but also simplifies the treatment setup. Moreover, treating patients upright can reduce organ movement, potentially offering better clinical outcomes. Despite the need for some structural modifications in existing treatment vaults, the overall reduction in costs and space requirements makes these systems a promising alternative for future proton therapy installations.

Cost Reduction Through Hypofractionation and Workflow Optimisation

While new systems like the MEVION S250-FIT and P-Cure offer upfront cost savings, ongoing operational costs are another critical factor in making proton therapy more accessible. One method being explored to reduce these costs is hypofractionation, a technique that delivers higher doses of radiation over fewer treatment sessions. By treating tumours in a shorter amount of time, proton therapy centres can increase their patient capacity without expanding their facilities. For instance, reducing the number of treatment sessions from 35 to five can potentially allow a centre to treat five times more patients, significantly improving the facility's cost-efficiency.

However, hypofractionation isn't universally applicable. For example, it is challenging to implement in paediatric cases, which are a significant focus of proton therapy due to the technology's ability to minimise damage to surrounding healthy tissues. Therefore, while hypofractionation presents a promising avenue for cost reduction, it must be balanced with clinical considerations, particularly for vulnerable patient populations.

In addition to treatment protocols, optimising the workflow within a proton therapy facility is essential. Facilities can maximise uptime and efficiency by analysing every aspect of the treatment process, from patient setup to system maintenance. Integrating artificial intelligence to monitor patient flow and minimise downtime is an emerging trend that could further improve the economics of proton therapy.

The Future of Proton Therapy: Balancing Research and Industry Needs

The future of proton therapy lies in the convergence of research and industry. Technological advancements are continually being made, with institutions like the European Organisation for Nuclear Research contributing to the development of more affordable devices. However, for these innovations to make a real-world impact, they must be translated into stable, reliable products that meet regulatory standards. This requires collaboration between researchers and manufacturers to ensure that new technologies are both cost-effective and clinically viable.

Moreover, reducing operating costs should remain a priority for existing facilities. As proton therapy becomes more widespread, the focus will increasingly shift from merely reducing upfront costs to improving long-term sustainability. This includes not only technological innovations but

also optimising facility management and reducing energy consumption, which can significantly lower the overall cost of proton therapy.

Conclusion

Proton therapy is on the brink of a significant transformation, with new systems promising to reduce both the size and cost of installations. Innovations such as upright treatment systems and hypofractionation offer exciting possibilities for expanding access to this life-saving technology. However, the future of proton therapy will depend on a collaborative effort between research institutions and industry to create affordable, reliable systems that can be widely adopted. As these advancements continue to evolve, proton therapy has the potential to become a more accessible and sustainable option for cancer treatment worldwide.

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