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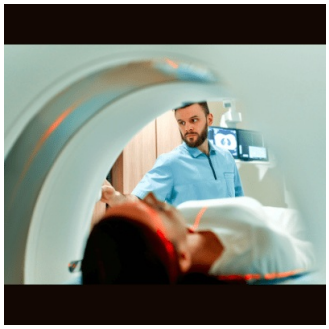
Implementing DLR in MRI Routines Could Lead to Substantial Costs Savings



As of January 2023, Finland's public healthcare sector has restructured its wellbeing services counties, including Northern Ostrobothnia, under stringent financial limits. Authors reported in the *European Journal of Radiology* their experience in their hospital, the largest in this region serving 416,000 residents, faces challenges in optimising its radiology services, particularly MRI scans, which have seen a 15% rise in demand from 2018 to 2021. While Magnetic Resonance Imaging (MRI) is crucial in modern diagnostics, striking a balance between diagnostic information and examination time is crucial. Recently, deep learning reconstruction (DLR) solutions have emerged, promising faster MRI acquisition times and improved image quality. However, there's limited research on their diagnostic efficacy and impact on MRI scanner capacity and costs. By late 2024, authors' hospital will reduce its MRI scanners from six to five due to a hospital reorganisation, and their study aims to measure the enhanced scanner throughput with DLR in selected MRI examinations; predict the overall patient throughput improvement with widespread DLR adoption; determine if the hospital can maintain current patient throughput with fewer scanners, necessitating a 20% capacity increase per scanner and assess the financial feasibility of investing in DLR versus other MRI capacity enhancement methods.

Optimising MRI Examination Efficiency: Analysis of 2022 RIS Data for Enhanced Scanner Throughput

Data was collected from the hospital's Radiology Information System (RIS) archives for the year 2022, detailing current procedural terminology (CPT) codes, average examination times, study priorities, and costs for each MRI examination type across different scanners. The objectives of this data survey were twofold:

- Identify the most frequently conducted MRI examinations to focus on optimising their acquisition time for enhanced scanner throughput.
- Pinpoint examinations with consistent examination times, indicated by low standard deviation and coefficient of variation. Such examinations can be more efficiently scheduled in shorter appointment slots.

In 2022, the hospital performed 21,568 MRI examinations. Seven frequently occurring examination types were chosen for optimisation based on their frequency and the presence of TSE sequences, which can be accelerated using DRB (Deep Learning Reconstruction). A total of 78 patient examinations utilised DRB for the study, encompassing 129 sequences.

Assessing Financial and Operational Impacts of DLR in MRI Diagnostics

The study outlines a systematic approach to evaluate the financial implications and productivity benefits of integrating Deep Learning Reconstruction (DLR) into MRI diagnostics. It provides a framework for facilities to assess DLR's feasibility but emphasises that each facility should consider its unique factors before implementing similar strategies. Key considerations include:

- Revenue and Expenses: The financial impact of increased MRI examinations may vary based on the department's cost structure and national compensation rates. Thus, revenue changes may not directly translate across different settings.
- Stakeholder Engagement: Capacity gains rely on active stakeholder involvement. Radiologists' acceptance and willingness to adapt to altered image quality due to DLR are crucial for its widespread adoption. A coordinated trial is essential.
- Data Distribution: While the trial's sequence time speed-ups didn't follow a normal distribution, a beta distribution closely approximated the results, making the normal distribution a reasonable approximation.
- Training and Education: Proper training of stakeholders is vital. Concerns about potential loss of image details with DLR highlight the need for systematic quality assurance and standardised commissioning of AI-based methods.
- Principal-Agent Relationships: Potential information gaps between departments and hospital management can affect cost-saving benefits. Addressing these agency issues is crucial to ensuring that reduced costs per patient benefit the hospital overall.

Substantial reductions in total operating costs were demonstrated compared to other capacity-enhancing methods. Specifically, the cost of adopting the deep learning technology for the entire scanner fleet is only 11 % compared to procuring an additional scanner and 20 % compared to the weekend utilisation costs of existing devices. Procuring DLR for our existing five-scanner fleet allows to sustain the current MRI service levels without the need for an additional scanner, thereby achieving considerable cost savings, €399,000 annually. These reductions highlight the efficiency and economic viability of DLR in optimising MRI service delivery.

Source: **European Journal of Radiology**

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