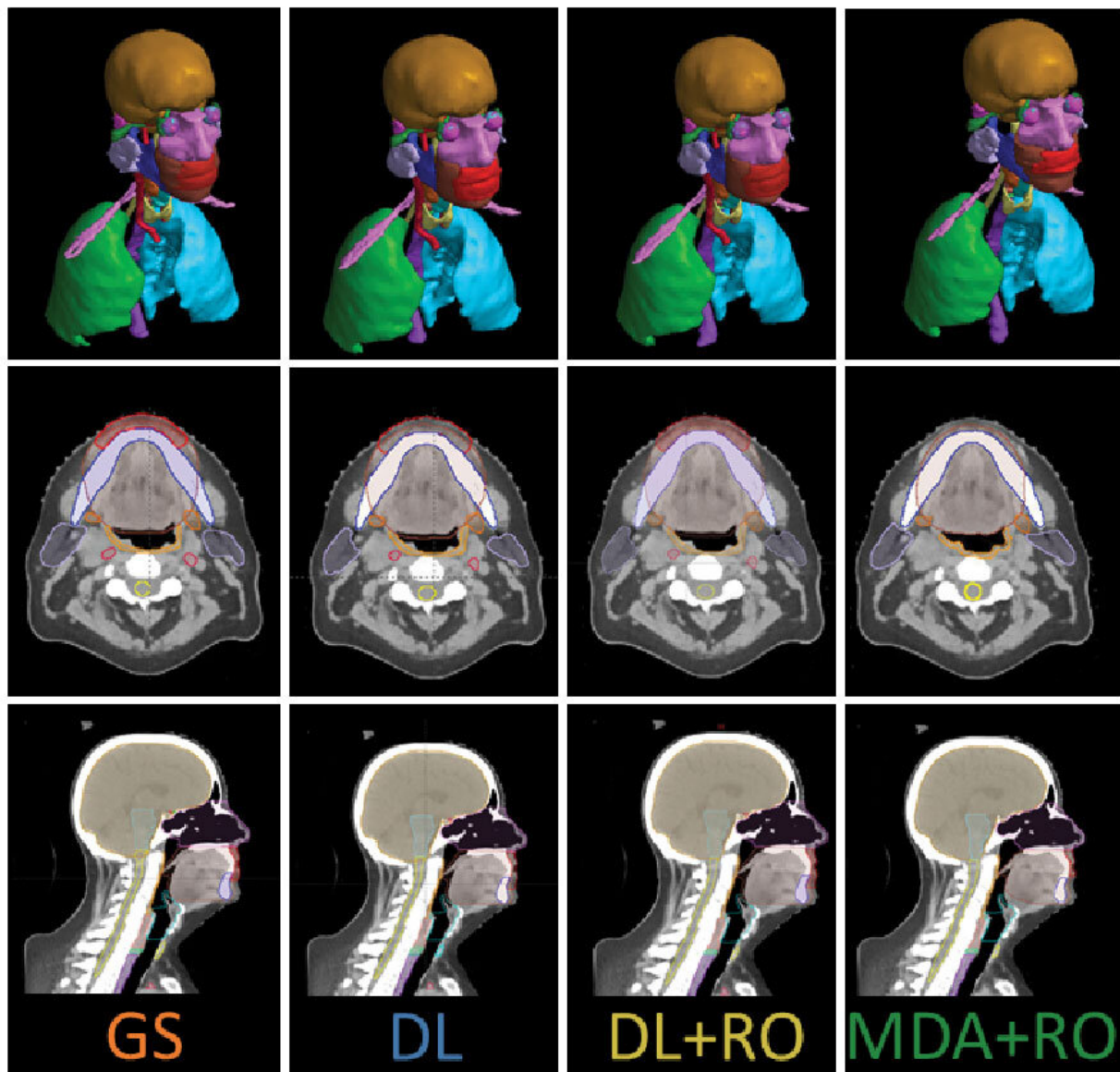# Study suggests improved time efficiency, accuracy with AI-automated head and neck radiotherapy model

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3D visualization, and an axial and sagittal slice of the CT with the contours from the gold standard (GS) dataset, as well as the DL, DL+RO, and MDA+RO contours for a representative patient. Credit: *Frontiers in Oncology* (2023). DOI: 10.3389/fonc.2023.1137803

A study conducted by Mayo Clinic suggests artificial intelligence could potentially improve time efficiency and standardization for radiation therapy planning in patients with head and neck cancers. The validation study, published in *Frontiers in Oncology*, evaluated the efficiency of an algorithm trained by Mayo Clinic and developed in collaboration with Google Health.

Radiation therapy planning for head and neck cancers requires a heavy time investment from multiple specialty areas due to the many organs and structures in close proximity to each other and the anatomical variations of each patient. Experts from the Department of Radiation Oncology at Mayo Clinic investigated whether the algorithm could reduce the time it takes to plan treatment for head and neck cancers and improve the quality of radiation plans and patient outcomes.

In the study, radiation oncologists revised manually drawn head and neck contours, which outline organs at risk of radiation exposure, and contours automatically segmented by the deep-learning model. According to survey data collected after each review case, the deep-learning model produced contours that were ready for clinical use with minor to no revisions 90% of the time, compared to 53% of the time for manual contours, and reduced the overall contouring and process time by 76%.

"Head and neck radiation treatment planning is resource-intensive and

cumbersome," says Samir Patel, M.D., a radiation oncologist at Mayo Clinic and co-principal investigator of the study. "This auto-contouring algorithm saved time in the cases we analyzed."

The model was trained using 445 de-identified CT scan contours from previously treated Mayo Clinic patients with head and neck cancer. To further refine the dataset, each contour was re-created by two Mayo Clinic head and neck radiation oncologists to meet the gold-standard criteria for radiation therapy.

This initiative is the first research collaboration in a broader initiative between Mayo Clinic and Google Health, announced in 2019, which aims to improve the delivery of care for serious and complex conditions. This strategic partnership harnesses knowledge and data to create digital tools available on innovative health care platforms that may reach patients worldwide.

"By leveraging the expertise of Mayo Clinic and Google Health, this algorithm has the potential to increase the reach of Mayo Clinic expert radiation oncologists to the global radiation oncology community," says Dr. Patel.

"This joint research demonstrates the power of Mayo Clinic and Google's collaboration, bringing together world-class radiation oncologists and medical physicists at Mayo Clinic with software engineers and researchers from Google to tackle an important issue for patients with cancer," says Cían Hughes, M.B., Ch.B., informatics lead at Google Health. "This is early-stage work, and further clinical research will be required to see how this can be safely integrated into practice."

The next phase of research will investigate the efficiency of the algorithm outside of Mayo Clinic.

"Mayo Clinic is planning future collaborations with other institutions to demonstrate that the model performs efficiently in their environments," says Joseph (John) Lucido III, Ph.D., co-principal investigator of the study.

  More information: J. John Lucido et al, Validation of clinical acceptability of deep-learning-based automated segmentation of organs-at-risk for head-and-neck radiotherapy treatment planning, *Frontiers in Oncology* (2023). DOI: 10.3389/fonc.2023.1137803

Provided by Mayo Clinic