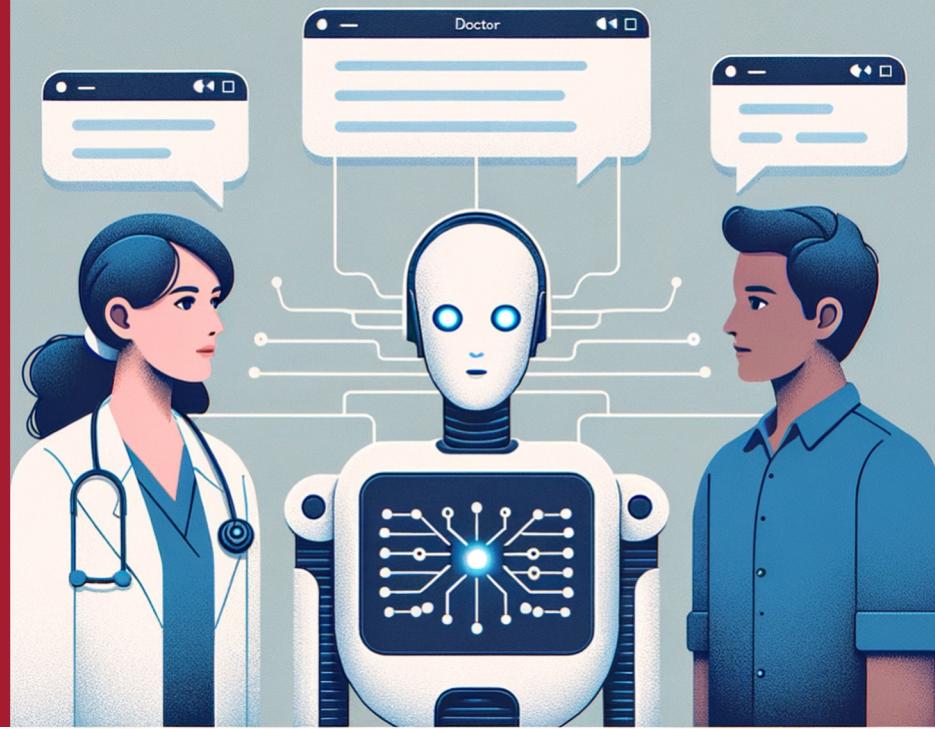


ReXplain: Translating Radiology into Patient-Friendly Video Reports



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Post-doctoral Fellow

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Harvard Medical School



Radiology Workflow after Imaging Acquisition

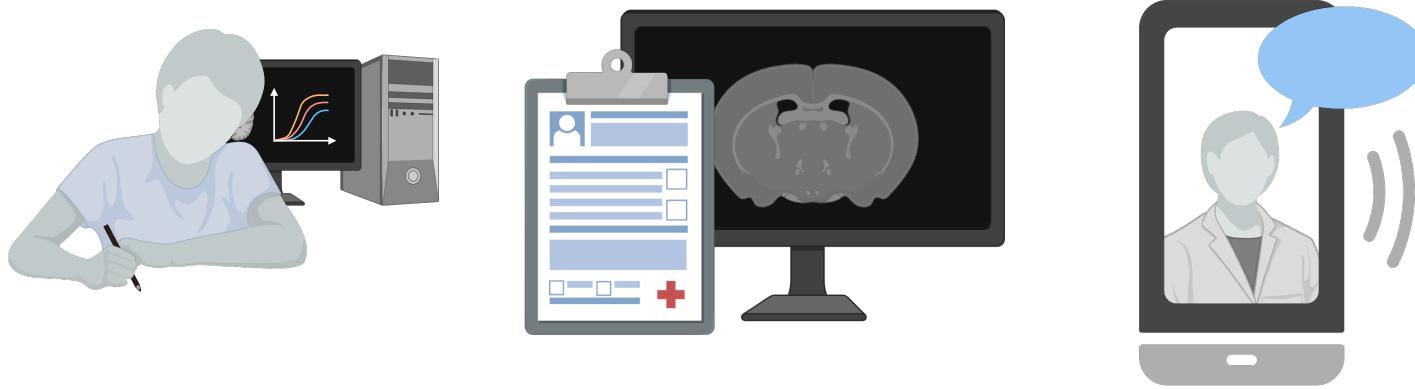


Image &
Data
Interpretation

Reporting

Follow-up
Care

Report to receive before 2025

Trachea and both main bronchi are open. No occlusive pathology was detected in the trachea and both main bronchi. In the left lung lower lobe superior segment, lateral consolidation and ground-glass appearance are observed in the peripheral area. Since the described lesion is a single lesion, optimal evaluation cannot be made. However, it was thought that the appearance described during the pandemic process may be compatible with Covid-19 pneumonia. It is recommended to evaluate the patient together with clinical and laboratory findings. No mass was detected in both lungs.

Mediastinal structures cannot be evaluated optimally because contrast material is not given. As far as can be observed: Heart contour and size are normal. No pleural or pericardial effusion was detected. The widths of the mediastinal main vascular structures are normal. No enlarged lymph nodes in pathological size and appearance were detected in the mediastinum and hilar regions. No pathological wall thickness increase was observed in the esophagus within the sections. No upper abdominal free fluid-collection was detected in the sections. No pathologically enlarged lymph nodes were observed. In the upper abdominal organs within the sections, there is no mass with distinguishable borders as far as it can be observed within the borders of non-enhanced CT. Thoracic vertebral corpus heights, alignments and densities are normal. Intervertebral disc distances are preserved. The neural foramina are open. No lytic-destructive lesions were detected in the bone structures within the sections.

Reports are Communication between Professionals

Radiology Report

Bilateral adrenal glands were normal and no space-occupying lesion was detected. When examined in the lung parenchyma window....

Osteophytes are also present in the vertebrae...

Thoracic aorta diameter is normal...

Calcific millimetric atheroma plaques are observed in the aortic arch...



Reports are Descriptions of the Imaging

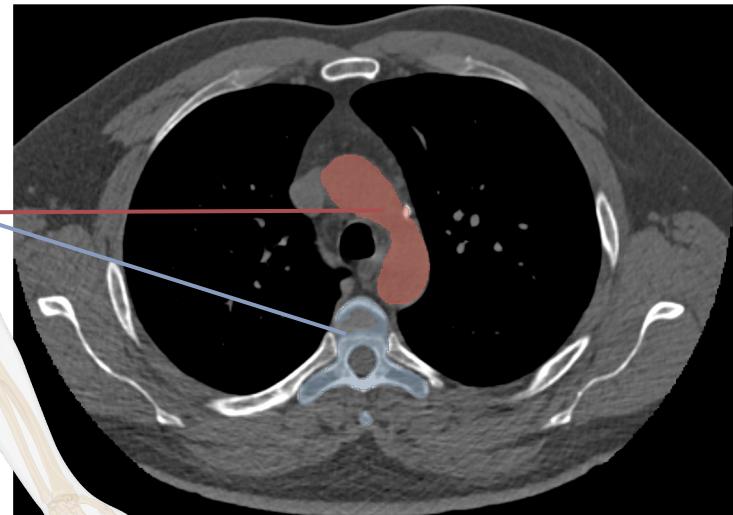
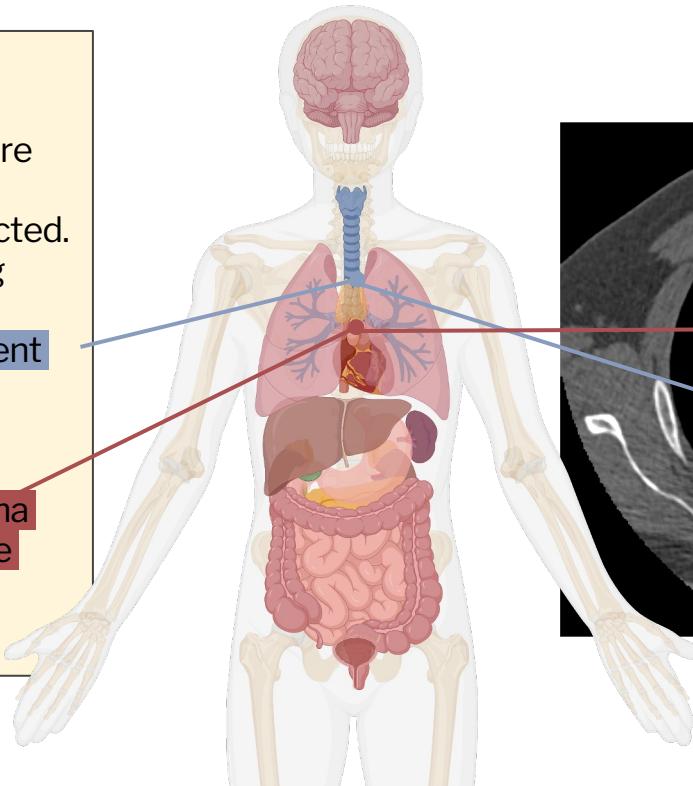
Radiology Report

Bilateral adrenal glands were normal and no space-occupying lesion was detected. When examined in the lung parenchyma window....

Osteophytes are also present in the vertebrae...

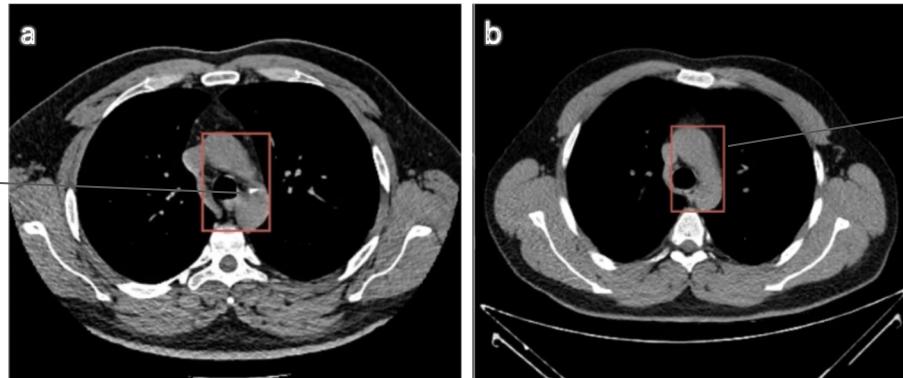
Thoracic aorta diameter is normal...

Calcific millimetric atheroma plaques are observed in the aortic arch...



What if we use AI?

What was found?
What does it
mean?
How it looks like?



How a normal scan
looks like?

How the overview
of the organ looks
like?



Let me explain
these to you!



ReXplain: an End-to-end System



b.

Text to Speech



Input Text



Gaussian Splatting



Avatar Explainer



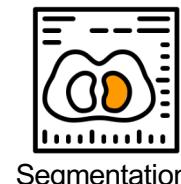
Input Image



Segmentation Model

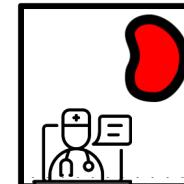
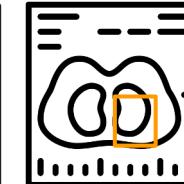
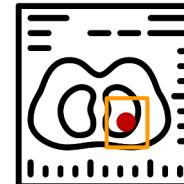


Normal Image



Segmentation

d.



||

Video Report

Report to receive after 2025

ReXplain

Your Scan



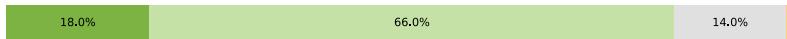
Normal Scan

Organ Rendering

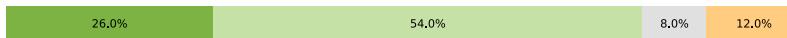


Feedback From Radiologists

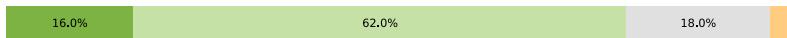
Q9: The comparison with normal CT scan improves understanding of the condition



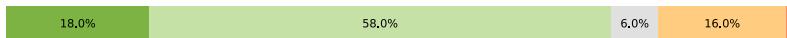
Q7: This video comes across as conversational with a patient



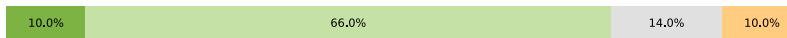
Q10: Connecting the explanation with the image help improve understanding



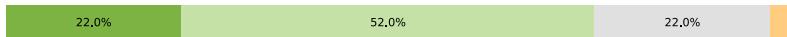
Q8: The explanation of the report is easy to understand



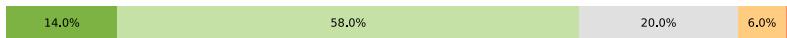
Q3: The video correctly localizes the findings to the appropriate organ



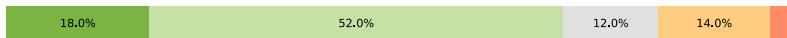
Q12: The avatar is natural and conversational



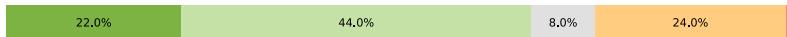
Q2: The video sufficiently reviews the findings with the patient



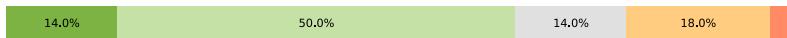
Q4: The video explains the findings in a way that can be understood by a patient (assuming an 8th grade reading level)



Q5: I am comfortable walking my patients through this video to help them understand their findings



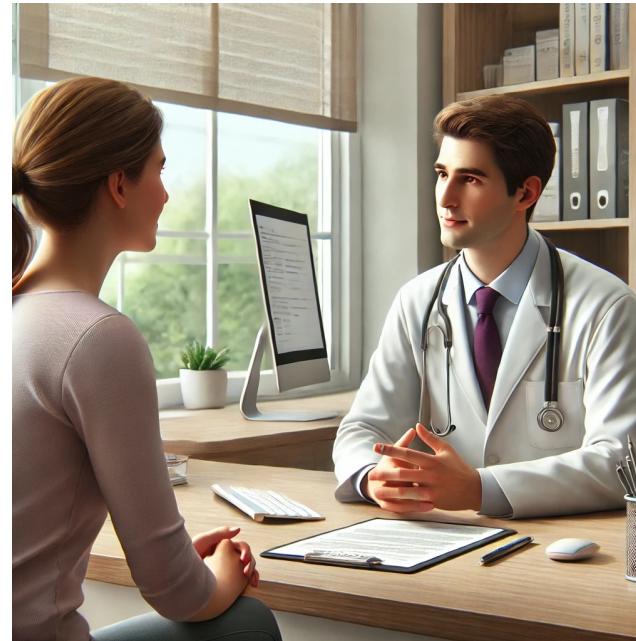
Q1: The video correctly identifies the important findings in the CT



Q6: I am comfortable showing the videos to my patients without my supervision



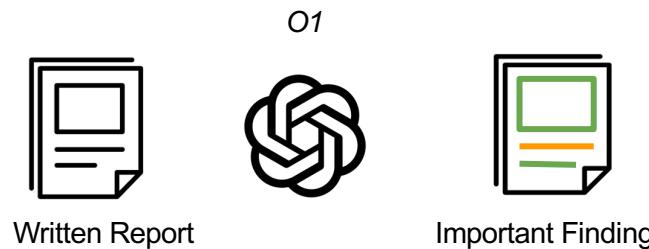
Q11: The rendering of the organ help understand the 3D structure



"Probably immediately before the physician sees them." followed by "in-person review and question-answer session", to secure its usage. These available with every imaging study and look for improvements in patient engagement and follow up, and decreased burden on the referring provider (who ordered the study and typically would have to explain/discuss with the patient)."

ReXplain: An Easy-to-upgrade System

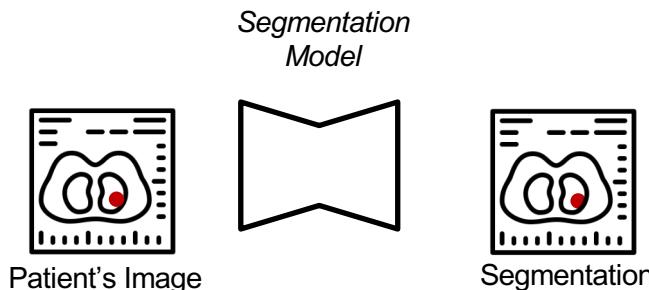
a. Better LLM



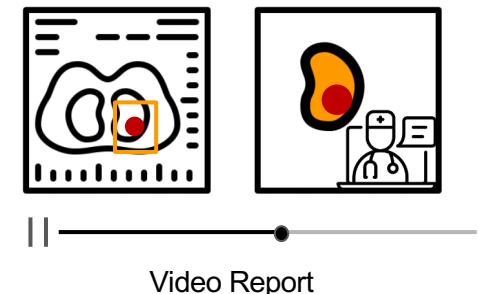
b. More vivid avatar



c. More precise segmentation



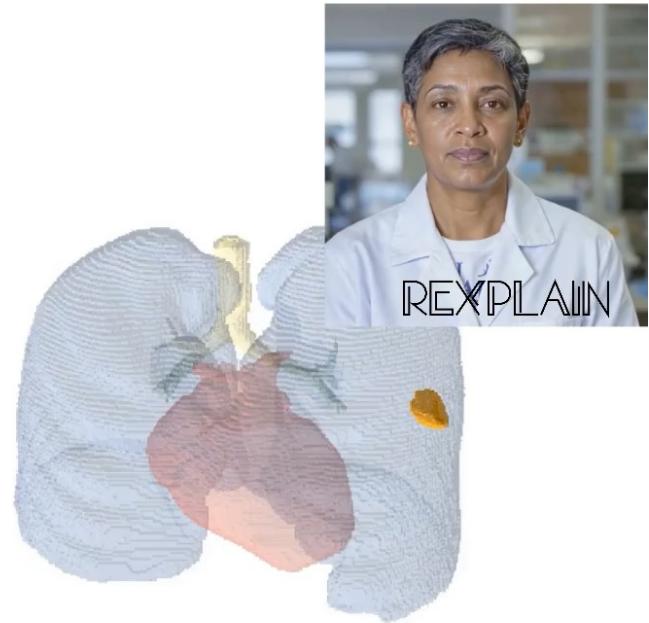
d. Better video



Your CT Scan

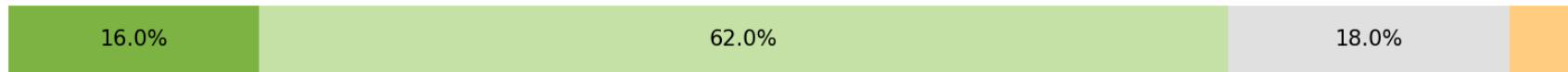


3D Rendering of Your Body

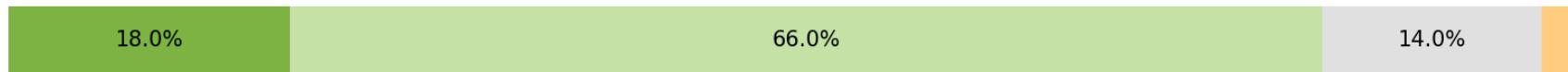


More Accurate

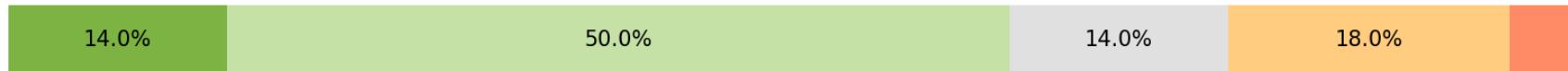
Connecting the explanation with the image help improve understanding



The comparison with normal CT scan improves understanding of the condition



The video correctly identifies the important findings in the CT



More Accurate

Connecting the explanation with the image help improve understanding



The comparison with normal CT scan improves understanding of the condition

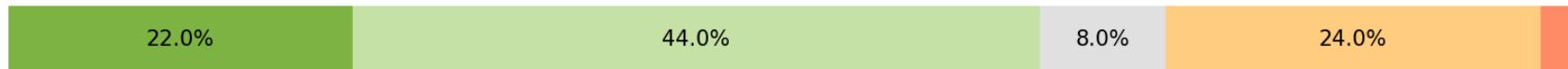


The video correctly identifies the important findings in the CT



More Feasible

I am comfortable walking my patients through this video to help them understand their findings



I am comfortable showing the videos to my patients without my supervision

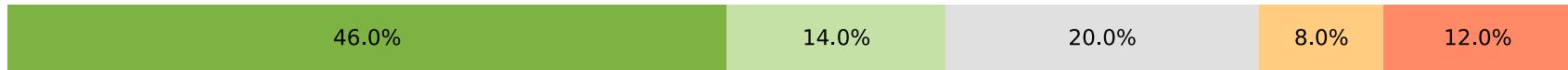


More Feasible

I am comfortable providing this video to a patient to help them understand their findings



I am comfortable providing this video to patients before their visit



Overall Change of Feedback

Connecting the explanation with the image help improve understanding



The comparison with normal CT scan improves understanding of the condition



The video correctly identifies the important findings in the CT



The avatar is natural and conversational



The explanation of the report is easy to understand



The video explains the findings in a way that can be understood by a patient (assuming an 8th grade reading level)



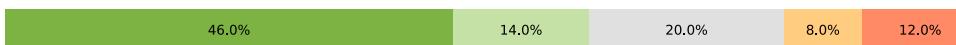
The video sufficiently reviews the findings with the patient



I am comfortable providing this video to a patient to help them understand their findings



I am comfortable providing this video to patients before their visit



The rendering help understand the 3D structure



Building AI to bridge the
communications between
patients and doctors.





ReXplain - Patient-centered AI for Radiology Image Understanding

Challenge: Bridging the Gap in Radiology Communication

Patient-centered radiology prioritizes patients' needs and preferences, encouraging radiologist-patient interaction. Both patients and radiologists have shown a strong desire to provide patients' own radiology reports and images to themselves. However, complex medical terminology often creates barriers to patient comprehension, potentially leading to misunderstandings and increased anxiety. Various approaches have been attempted to enhance patient understanding, including structured reports, additional explanations, increased radiologist-patient interactions, or hand-crafted video reports. However, these methods often require additional effort from already overburdened radiologists.

Solution: Harnessing AI for Patient-Centered Radiology

Recent breakthroughs in artificial intelligence (AI) have opened up exciting new possibilities for revolutionizing patient-centered radiology. By leveraging cutting-edge AI technologies, we can now offer innovative solutions that enhance patient understanding without increasing the workload of radiologists.

The key AI technologies driving innovation in this field include Large Language Models (LLMs), which have demonstrated remarkable capabilities in translating complex medical jargon into easily understandable language, significantly improving patient engagement with radiology reports. Additionally, advanced image segmentation algorithms can now accurately identify and highlight regions of interest within medical images, drawing patients' attention to critical findings. Furthermore, avatar generation technology allows for the creation of photorealistic virtual "radiologist" avatars to deliver personalized explanations, simulating the experience of a one-on-one consultation.

ReXplain: Translating Radiology into Patient-Friendly Video Reports

ReXplain seamlessly integrates intelligent report simplification, accurate radiology image segmentation, and a lifelike virtual radiologist avatar to deliver customizable, multimodal explanations of medical imaging results. By transforming complex reports into accessible language and visually engaging presentations, ReXplain aims to enhance patient understanding and satisfaction. Currently under evaluation by practicing radiologists, this innovative system has the potential to significantly improve health outcomes and strengthen doctor-patient relationships in the field of radiology.

