

Research Project

ESOR RESEARCH FELLOWSHIP 2027 HOST TRAINING CENTRE ENROLMENT FORM RESEARCH PROPOSAL

Program applied for

- ☒ Bracco Research Fellowships 2027
 - ☒ ESOR Advanced Imaging Mentorship China Program, where eligible
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Host Training Center

Institution:

Sapienza University of Rome / Policlinico Umberto I University Hospital

Department:

Department of Radiological, Oncological and Pathological Sciences
Sapienza University of Rome
Rome, Italy

Clinical setting:

Head and Neck Imaging / Oncologic Imaging activity within the institutional
multidisciplinary Head and Neck Tumor Board

Address:

Viale del Policlinico 155
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Italy

City and Country:

Rome, Italy

Website: <https://droap.web.uniroma1.it/en>
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Contact Person / Principal Supervisor

Name:

Dr. Daniela Messineo

Position:

Radiologist / Head and Neck Imaging and Oncologic Imaging
Department of Radiological, Oncological and Pathological Sciences
Sapienza University of Rome / Policlinico Umberto I University Hospital

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[TO BE COMPLETED]

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Co-supervisors and Collaborating Units

The fellowship will be carried out within the Department of Radiological, Oncological and Pathological Sciences, in close collaboration with the institutional multidisciplinary Head and Neck Tumor Board.

Radiology / Head and Neck Imaging:

Dr. Daniela Messineo
Department of Radiological, Oncological and Pathological Sciences
Sapienza University of Rome / Policlinico Umberto I University Hospital

RESEARCH PROPOSAL

Project Title

Feasibility of CT/MRI Radiomics for Laryngeal Squamous Cell Carcinoma within a Multidisciplinary Head and Neck Tumor Board

Research Area / Subspecialty

Head and Neck Imaging; Oncologic Imaging; Laryngeal Cancer; Radiomics; Imaging Biomarkers; Multidisciplinary Tumor Board.

Project Type

Retrospective observational pilot study with a structured research-training component.

The project is designed as a feasibility and exploratory research fellowship. It will not be used to guide real-time clinical decisions during the fellowship period. Radiomics results will be analyzed for research purposes only and interpreted within an approved methodological and ethical framework.

Duration

3 months, to be completed between January and June 2027.

Brief Description and Objectives

Laryngeal squamous cell carcinoma requires accurate imaging assessment for staging, treatment planning, and follow-up. Contrast-enhanced CT and MRI are essential for evaluating local tumor extension, cartilage involvement, invasion of the paraglottic and pre-epiglottic spaces, nodal disease, and post-treatment changes. Imaging findings are central to multidisciplinary decision-making, particularly when discussing surgery, organ preservation strategies, radiotherapy, chemotherapy, or combined treatment approaches.

Despite its established clinical value, conventional imaging interpretation may not fully capture tumor heterogeneity and may be influenced by reader experience and inter-reader variability. Radiomics enables the extraction of quantitative features from standard-of-care imaging examinations and may provide additional information on tumor phenotype, tissue heterogeneity, and biological behavior. In laryngeal cancer, radiomics may therefore represent a promising research tool for improving patient stratification and for supporting future multidisciplinary imaging research.

This fellowship project aims to develop and test a structured CT/MRI radiomics workflow for patients with histologically proven laryngeal squamous cell carcinoma, as discussed within the institutional multidisciplinary Head and Neck Tumor Board of Sapienza University of Rome / Policlinico Umberto I University Hospital.

The project builds on the Department's clinical and scientific expertise in head and neck oncologic imaging and on previous peer-reviewed work by Daniela Messineo and colleagues in this field. This background provides a strong basis for a focused, feasible, and methodologically sound research fellowship dedicated to imaging biomarkers and radiomics in laryngeal cancer.

The fellow will contribute to the creation of an anonymized imaging-clinical database including baseline CT and/or MRI examinations, tumor subsite, TNM stage, cartilage

invasion, nodal status, tumor board recommendation, treatment strategy, and available follow-up data.

The primary imaging analysis will focus on pre-treatment contrast-enhanced CT, where available and suitable for segmentation. MRI will be included in predefined secondary or complementary analyses only when image quality, acquisition consistency, and data availability are adequate. This approach is intended to reduce methodological heterogeneity and avoid overinterpretation of radiomics findings.

The fellow will perform image review, tumor segmentation, and radiomic feature extraction under the supervision of experienced head and neck radiologists. Extracted features will be analyzed in collaboration with clinicians, medical physicists, data scientists, and/or statisticians. The analysis will be exploratory and hypothesis-generating, with particular attention to reproducibility, bias reduction, and appropriate interpretation of results.

The main objective of the project is to assess the feasibility of integrating a reproducible radiomics workflow into a multidisciplinary head and neck oncology research environment.

Secondary objectives include exploring whether baseline imaging features are associated with clinically relevant variables, such as tumor stage, cartilage invasion, nodal disease, treatment recommendation, and selected outcomes, depending on data availability and sample size.

Specific Objectives

1. To establish a structured anonymized imaging-clinical database of patients with histologically proven laryngeal squamous cell carcinoma discussed at the institutional Head and Neck Tumor Board.
2. To define clear inclusion and exclusion criteria for radiomics analysis, with particular attention to pre-treatment imaging quality, timing, acquisition parameters, and suitability for segmentation.
3. To standardize image selection, anonymization, tumor segmentation, quality control, and radiomic feature extraction.
4. To train the fellow in a reproducible radiomics workflow, including image pre-processing, segmentation principles, feature extraction, feature stability, and bias awareness.
5. To evaluate associations between radiomic features and conventional imaging variables, including tumor subsite, T stage, cartilage invasion, paraglottic space involvement, pre-epiglottic space involvement, and nodal status.
6. To explore the relationship between imaging biomarkers and multidisciplinary tumor board recommendations, including surgery, organ preservation strategies, radiotherapy, chemotherapy, and combined treatment approaches.
7. To investigate, only if data quality and sample size are adequate, exploratory associations between radiomic features and available clinical outcomes such as treatment response, recurrence, disease progression, or laryngectomy-free survival.
8. To promote collaboration between radiologists, ENT surgeons, radiation oncologists, medical oncologists, pathologists, medical physicists, nuclear medicine physicians, and statisticians.

9. To generate a realistic scientific output, including a final departmental presentation and, where feasible, an abstract and/or manuscript draft.
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Duties of the Fellow

During the 3-month fellowship, the fellow will be actively involved in all phases of the research workflow under the supervision of Dr. Daniela Messineo and the host radiology team, in collaboration with the multidisciplinary Head and Neck Tumor Board.

The fellow's duties will include:

- reviewing the relevant literature on laryngeal cancer imaging, head and neck radiomics, and imaging biomarkers;
- reviewing the Department's previous scientific work in head and neck oncologic imaging, including publications by Daniela Messineo and colleagues;
- contributing to the refinement of the study protocol, research questions, inclusion criteria, imaging variables, and clinical endpoints;
- identifying eligible patients from the institutional Head and Neck Tumor Board database or other approved institutional clinical databases;
- collecting anonymized or pseudonymized clinical, pathological, imaging, and follow-up data according to local data protection rules;
- retrieving baseline CT and/or MRI examinations from the institutional PACS in an approved anonymized format;
- reviewing CT/MRI examinations together with expert head and neck radiologists;
- assessing conventional imaging features, including tumor subsite, local extension, cartilage involvement, paraglottic and pre-epiglottic space invasion, and nodal disease;
- performing manual or semi-automatic segmentation of the primary laryngeal tumor and, where appropriate, selected pathological lymph nodes;
- participating in segmentation quality control under expert radiological supervision;
- extracting radiomic features using validated or widely adopted radiomics tools, such as 3D Slicer, PyRadiomics, or equivalent platforms available at the host institution;
- learning the principles of radiomics reproducibility, including image pre-processing, voxel resampling, grey-level discretization, feature stability, and reduction of redundant variables;
- learning how to identify and minimize common sources of bias in retrospective imaging studies;
- collaborating with medical physicists, data scientists, and/or statisticians for exploratory analysis;
- attending multidisciplinary Head and Neck Tumor Board meetings for educational and research purposes;
- understanding how imaging findings contribute to multidisciplinary clinical decision-making;
- preparing preliminary results, tables, and figures;
- presenting the project results to the host Department;

- contributing to a congress abstract, poster/oral presentation, and/or manuscript draft, depending on the maturity of the results.

The fellow will not independently make clinical decisions, and radiomics results generated during the fellowship will not be used to determine patient management.

Anticipated Benefits for the Fellow

The fellow will gain practical experience in modern oncologic imaging research, with a specific focus on head and neck cancer, laryngeal squamous cell carcinoma, and radiomics. The fellowship will provide hands-on training in imaging database creation, anonymized data management, CT/MRI interpretation, tumor segmentation, quantitative feature extraction, and exploratory data analysis.

By working within the multidisciplinary Head and Neck Tumor Board at Sapienza University of Rome / Policlinico Umberto I University Hospital, the fellow will understand how imaging findings influence real-world therapeutic discussions for patients with laryngeal cancer. This includes multidisciplinary assessment of surgery, organ preservation protocols, radiotherapy, chemotherapy, combined treatments, and follow-up strategies.

The fellow will learn how to collaborate effectively with radiologists, ENT surgeons, radiation oncologists, medical oncologists, pathologists, nuclear medicine physicians, medical physicists, and statisticians. This will provide direct exposure to multidisciplinary oncologic care and translational imaging research.

The fellowship will strengthen the fellow's skills in:

- research methodology;
- imaging data acquisition and management;
- anonymization and data protection;
- CT/MRI assessment of laryngeal cancer;
- tumor segmentation;
- radiomic feature extraction;
- radiomics quality control;
- identification and minimization of bias;
- collaboration with statisticians and clinical scientists;
- multidisciplinary communication;
- scientific writing;
- preparation of oral and written scientific presentations.

At the end of the fellowship, the fellow is expected to have contributed to an anonymized imaging-clinical research database, a structured segmentation protocol, a reproducible radiomics workflow, preliminary exploratory analysis, and a scientific output suitable for further development after the fellowship.

Proposed Work Plan

Month 1 – Study Setup, Literature Review, and Data Collection

During the first month, the fellow will be introduced to the Department of Radiological, Oncological and Pathological Sciences, the Head and Neck Imaging activity, and the multidisciplinary Head and Neck Tumor Board.

The fellow will review the literature on laryngeal cancer imaging, head-and-neck radiomics, and quantitative imaging biomarkers. Particular attention will be dedicated to previous work by Daniela Messineo and colleagues and to methodological standards for reproducible radiomics research.

The study protocol will be finalized together with the supervisor and the multidisciplinary research team. Inclusion and exclusion criteria, imaging variables, clinical endpoints, anonymization procedures, and data collection methods will be defined.

Eligible patients with histologically proven laryngeal squamous cell carcinoma will be identified from approved institutional data sources. Baseline CT and/or MRI examinations will be retrieved from the institutional PACS in anonymized or pseudonymized form in accordance with local rules. Clinical and pathological variables will be collected, including tumor subsite, TNM stage, cartilage invasion, nodal status, treatment recommendation, and available follow-up data.

Month 2 – Imaging Review, Segmentation, and Radiomics Extraction

During the second month, the fellow will review baseline CT and/or MRI examinations under the supervision of expert head and neck radiologists.

Conventional imaging features will be assessed, including tumor subsite, local tumor extension, cartilage involvement, paraglottic space invasion, pre-epiglottic space invasion, and nodal disease.

The fellow will perform segmentation of the primary laryngeal tumor and, where appropriate, selected pathological lymph nodes. Segmentations will be reviewed for quality control by the supervising radiologist. When feasible, a subset of cases will be assessed for inter-reader or intra-reader consistency to strengthen reproducibility.

Radiomic features will be extracted using validated or widely adopted software tools available at the host institution. The fellow will be trained in image preprocessing, segmentation quality control, feature extraction, feature stability, and the reduction of methodological bias.

Preliminary data will be discussed with the radiology supervisor and, where appropriate, with the medical physicist, data scientist, or statistician involved in the project.

Month 3 – Data Analysis, Interpretation, and Scientific Output

During the third month, the fellow will collaborate with the supervisors and the statistician/data scientist to conduct exploratory analyses.

Radiomic features will be analyzed in relation to clinical and imaging variables, including tumor stage, cartilage invasion, nodal disease, tumor board treatment recommendation, and available outcome data. Outcome-related analyses will be performed only if follow-up completeness and sample size are adequate. Otherwise, the project will be reported as a feasibility and workflow study to avoid unsupported conclusions.

Preliminary results will be discussed within the research team and, where appropriate, in an educational or research context related to the Head and Neck Tumor Board.

The fellow will prepare a final presentation for the host Department and contribute to the preparation of an abstract and/or manuscript draft.

Study Population

The study population will include adult patients with histologically proven laryngeal squamous cell carcinoma who underwent baseline contrast-enhanced CT and/or MRI and were discussed within the institutional multidisciplinary Head and Neck Tumor Board of Sapienza University of Rome / Policlinico Umberto I University Hospital.

Inclusion Criteria

- Adult patients with histologically confirmed laryngeal squamous cell carcinoma.
 - Availability of pre-treatment contrast-enhanced CT and/or MRI.
 - Imaging performed before definitive treatment.
 - Discussion within the institutional multidisciplinary Head and Neck Tumor Board.
 - Available clinical staging and treatment recommendations.
 - Available pathological and/or follow-up data, where applicable.
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Exclusion Criteria

- Imaging quality not suitable for segmentation or radiomics analysis.
 - Incomplete essential clinical documentation.
 - Previous surgery, radiotherapy, or systemic therapy before baseline imaging, unless analyzed separately.
 - Non-squamous histology, unless specifically included in a predefined secondary subgroup.
 - Lack of essential imaging or clinical data.
 - Imaging studies with acquisition parameters that make radiomics extraction unreliable, according to predefined quality-control criteria.
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Imaging Data and Radiomics Workflow

Imaging data will include standard-of-care contrast-enhanced CT and/or MRI examinations performed for staging of laryngeal cancer. Images will be retrieved from the institutional PACS in anonymized or pseudonymized DICOM format.

To reduce methodological heterogeneity, contrast-enhanced CT will be considered the primary imaging modality for the main radiomics workflow whenever available and suitable. MRI data may be used for secondary exploratory analyses if image quality, protocol consistency, and sample size are adequate.

The radiomics workflow will include:

1. patient selection from approved institutional databases;
2. collection of anonymized clinical, pathological, and tumor board data;
3. image selection and quality control;
4. anonymization or pseudonymization of imaging data;
5. Definition of segmentation rules;
6. Segmentation of the primary laryngeal tumor;
7. optional segmentation of selected pathological lymph nodes;
8. Segmentation review by experienced head and neck radiologists.
9. image pre-processing according to predefined parameters;
10. radiomic feature extraction using validated or widely adopted software;
11. feature quality control;
12. reduction of unstable, redundant, or non-informative variables;
13. exploratory statistical analysis;
14. correlation with clinical, imaging, tumor board, and follow-up variables;
15. preparation of preliminary descriptive or exploratory models, if statistically appropriate;
16. preparation of scientific output.

The project will follow principles of transparent and reproducible radiomics research, with particular attention to data quality, image heterogeneity, segmentation variability, the risk of overfitting, bias reduction, and appropriate statistical support.

Endpoints

Primary Endpoint

The primary endpoint is to assess the feasibility of a structured, reproducible CT/MRI radiomics workflow for patients with laryngeal squamous cell carcinoma in a multidisciplinary Head and Neck Tumor Board research setting.

Feasibility will be assessed in terms of:

- availability of suitable baseline imaging;
- completeness of clinical and tumor board data;
- ability to perform reproducible tumor segmentation;
- ability to extract radiomic features using a standardized workflow;
- ability to generate preliminary exploratory analyses within the 3-month fellowship period.

Secondary Endpoints

Secondary endpoints will include exploratory evaluation of the association between radiomic features and:

- tumor subsite;
- T stage;
- cartilage invasion;
- paraglottic space involvement;
- pre-epiglottic space involvement;
- nodal status;
- multidisciplinary tumor board treatment recommendation;
- treatment response, if available;
- recurrence or disease progression, if available;
- laryngectomy-free survival, if available;
- other clinically relevant outcome data, according to follow-up completeness.

All secondary analyses will be interpreted as exploratory and hypothesis-generating.

Expected Scientific Output

The expected outputs of the fellowship include:

- an anonymized imaging-clinical dataset of patients with laryngeal cancer;

- a standardized CT/MRI segmentation protocol;
 - a reproducible radiomics feature extraction workflow;
 - preliminary analysis of radiomic features in relation to clinical and imaging variables;
 - a final presentation by the fellow at the host Department;
 - an abstract for submission to ECR/ESR or another relevant radiology/head and neck oncology meeting, if results are mature enough;
 - a manuscript draft or structured study report for further development after the fellowship.
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Added Value of the Host Center

Sapienza University of Rome / Policlinico Umberto I University Hospital offers a multidisciplinary academic and clinical environment with established expertise in oncologic imaging and head and neck cancer management.

The Department of Radiological, Oncological and Pathological Sciences provides access to CT/MRI imaging, PACS infrastructure, clinical oncologic data, and radiological expertise in head and neck imaging. The institutional Head and Neck Tumor Board provides a structured setting for collaboration among radiology, ENT surgery, radiation oncology, medical oncology, pathology, nuclear medicine, medical physics, and biostatistics.

The project is designed to be feasible within the 3-month fellowship period and to provide the fellow with meaningful exposure to both imaging research methodology and real-world multidisciplinary oncologic discussion.

The fellow will benefit from:

- supervised training in head and neck CT/MRI imaging;
 - exposure to a structured multidisciplinary Head and Neck Tumor Board;
 - hands-on experience in radiomics and imaging biomarker research;
 - access to anonymized clinical and imaging datasets;
 - collaboration with clinicians, physicists, data scientists, and statisticians;
 - training in scientific writing and presentation.
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Ethical and Data Protection Considerations

The project will be conducted in accordance with institutional ethical standards and applicable data protection regulations, including GDPR requirements.

All imaging and clinical data used for research purposes will be anonymized or pseudonymized before analysis, in accordance with institutional procedures. Access to data

will be restricted to authorized members of the research team within the approved institutional environment.

No identifiable patient information will be shared outside the host institution. The fellow will receive appropriate training on confidentiality, data protection, and the responsible use of clinical imaging data.

If required by local regulations, the project will be submitted to the local Ethics Committee or Institutional Review Board before data collection begins. If the project is conducted as a retrospective observational study, a waiver of informed consent may be requested in accordance with local rules, where applicable.

Radiomics results generated during the fellowship will be used for research purposes only and will not be used to guide individual patient management.

Training Fee

The training will be provided pro bono by the host center, in accordance with the ESOR Research Fellowship program requirements.

Availability of Facilities

The fellow will have access to:

- Department of Radiology workstations;
 - institutional PACS;
 - anonymized or pseudonymized CT/MRI datasets;
 - segmentation software;
 - radiomics extraction tools;
 - supervision by expert head and neck radiologists;
 - multidisciplinary Head and Neck Tumor Board meetings;
 - statistical and methodological support;
 - institutional library and scientific resources.
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Final Summary for the Form

This 3-month ESOR research fellowship will focus on the feasibility of a structured CT/MRI radiomics workflow in laryngeal squamous cell carcinoma within the multidisciplinary Head and Neck Tumor Board of Sapienza University of Rome / Policlinico Umberto I University Hospital.

Dr. Daniela Messineo will supervise the project and will build on the Department's expertise in head and neck oncologic imaging and on previous scientific work by Daniela Messineo and colleagues.

The fellow will contribute to the creation of an anonymized imaging-clinical database, perform tumor segmentation, extract radiomic features, and explore associations with staging, imaging findings, tumor board recommendations, and available clinical outcomes.

The project is designed as a feasible, exploratory, and methodologically controlled research fellowship. It will provide hands-on training in imaging data management, research methodology, bias reduction, quantitative imaging, multidisciplinary collaboration, and scientific writing.

Expected outputs include a structured radiomics workflow, preliminary scientific results, a departmental presentation, and, where feasible, an abstract or manuscript draft.