AITRIS

Automated imagery tool results for diagnostics and standardisation

A digital assistant that helps the radiologist in oncology analyse advanced imaging (CT, MRI, Mammography, Sonography), interpret them and write standardised radiology results.

Challenger

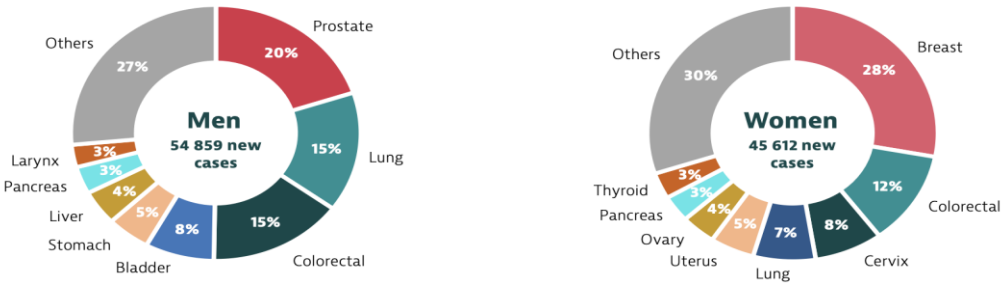
Medisprof Cancer Center is a private outpatient oncological hospital with two locations in Romania: Cluj-Napoca and Piatra Neamț. The clinic offers diagnostic and treatment services for all oncological localizations, in contract with the National Insurance Home. Founded in 2010 by Dr. Carolina Udrea, Medisprof started offering chemotherapy treatments in Cluj-Napoca, expanding its services in 2018. It is offering similar services in Cluj-Napoca and Piatra Neamț (2024), except for radiotherapy. With personnel of over 200, Medisprof offers laboratory tests, advanced imaging (CT, MRI, Mammography, Sonography), pulmonology, endoscopy, colonoscopy, radiotherapy, and chemotherapy treatments.

Medisprof is the only oncology healthcare provider in Romania with QOPI (Quality in Oncology Practice Initiative) certification from ASCO (American Society of Clinical Oncology) and strives to have a holistic approach, investing annually all its profit into developing quality services in Transylvania and Moldova. The group has a turnover of 10 million euros as of 2023.

Challenge description

According to estimates from the Joint Research Centre based on incidence trends from previous years, more than 100 000 new cancer cases were expected in Romania in 2022. Cancer incidence rates were expected to be lower than the EU averaged for both men and women. The main cancer sites expected among men were prostate expected in Romania in 2022. Cancer incidence rates were expected to be lower than the EU (20 %), lung (15 %) and colorectal (15 %) cancer, while among women breast cancer was expected to be the leading cancer site (28 %), followed by colorectal (12 %) and cervical (8 %). (source: Romania: Country Health Profile 2023).

Figure 5. More than 100 000 cancer cases in Romania were expected to be diagnosed in 2022



Age-standardised rate (all cancer): 674 per 100 000 population
EU average: 684 per 100 000 population

Age-standardised rate (all cancer): 428 per 100 000 population
EU average: 488 per 100 000 population

Notes: Non-melanoma skin cancer is excluded; uterus cancer does not include cancer of the cervix.
Source: ECIS – European Cancer Information System.

Cancer patients require periodic scans during their treatment to be able to adapt and monitor the therapy. Radiologists perform 4-5 imaging evaluations in a day, spending a lot of time interpreting the results, writing them in a descriptive/narrative way.

The RECIST (Response Evaluation Criteria in Solid Tumours) way of interpreting the results provides a simple and pragmatic methodology to evaluate the activity and efficacy of new cancer therapeutics in solid tumours, using validated and consistent criteria to assess changes in tumours. RECIST[1] is used in trials and considered insufficient in practice.

Only a few radiologists write the result in RECIST, and especially in clinical trials, the results interpreted in this way are not accepted by the surgeons and are hard to interpret by other doctors as well as by the patient.

The evaluation from one scan to another is more difficult to compare in the descriptive/narrative way.

Having the image interpretation in both ways native and RECIST would be considered as double the work for radiologists.

In conclusion, RECIST is insufficient, narrative is harder to build and follow-on (after 3 months).

By having a digital assistant that would help the radiologist analyse scans, interpret images and write standardised radiology results containing both RECIST and narrative, the clinic will:

- give radiologist support in interpreting the results
- decrease burnout in radiologists
- create an easier case follow-up/transfer between radiologists
- empower the patient, they will be able to see the progress of the treatment by themselves
- help oncologists get a clearer understanding to maintain/adjust treatment

Why we need to solve this problem:

- Insufficiently structured imaging interpretations in oncology patients, leading to suboptimal oncologist/radiotherapist decisions and quality of care
- Increased patient scrutiny on oncology quality of care (second opinion, AI usage)
- Increased number of investigations due to the increased number of patients and availability of equipment.

The cause of the problem:

- Lack of standardisation in radiology results presentation (RECIST based or not)
- Lack of recommended structuring of imaging interpretation in oncology

The insufficiently structured imaging interpretations in oncology patients lead to suboptimal oncologist/radiotherapist decisions and quality of care. The first patient profile is the lung cancer patient, to be followed by other patient profiles.

In 2022, Medisprof performed 8K scans out of which 823 investigations for lung cancer patients with an average of 2,4 investigations in a year/patient.

Challenge main objectives

The main objective is to develop a digital solution to reduce the time for radiologist interpretation, increase the satisfaction of oncologists and radiologists for imaging results that

[1] recist.eortc.org

will lead to better follow-up of patient journey for the management and decrease radiology subcontracting costs.

Solution functional requirements

The solution shall use the provided data (CT, MRI, Mammography, Sonography) to interpret images and write standardised radiology results to reduce the time of interpretation and help for a better follow-up.

Compulsory functional requirements

Image Processing: The digital assistant must be able to process advanced imaging data from various modalities including CT, MRI, mammography, and sonography.

Image Interpretation: the solution shall employ machine learning algorithms and advanced image analysis techniques to assist radiologists in interpreting complex oncological images accurately.

Lesion Detection: The digital assistant must be capable of identifying and highlighting suspicious lesions or abnormalities within the images.

Clinical Decision Support: It shall provide relevant clinical decision support based on evidence-based guidelines and best practices in oncological imaging.

Report Generation: It must be able to generate standardised radiology reports that comply with industry standards and include essential information such as lesion characteristics, location, size, and clinical recommendations.

Customization: The digital assistant shall allow radiologists to customise report templates, preferences, and workflow according to their specific needs and preferences.

Quality Assurance: It should include built-in quality assurance mechanisms to ensure the accuracy and reliability of image analysis and interpretation.

Continual Learning: The assistant should continuously learn from user interactions and feedback to improve its performance and accuracy over time.

Compliance and Security: It must adhere to strict data privacy regulations and security standards to protect patient information and maintain confidentiality.

Desirable functional requirements

Automated Segmentation: The assistant should be able to automatically segment different anatomical structures and lesions within the imaging data, reducing manual effort for the radiologist.

Quantitative Analysis: It should offer quantitative analysis tools to measure parameters such as tumour volume, density, and enhancement kinetics, providing additional insights for diagnosis and treatment planning.

Multi-Modal Fusion: The assistant should be capable of fusing information from multiple imaging modalities to provide a comprehensive assessment of the disease, leveraging the strengths of each modality.

Clinical Pathway Guidance: It could provide guidance on appropriate clinical pathways based on imaging findings, helping radiologists recommend further diagnostic tests or treatment options.

Outcome Prediction: Utilising machine learning algorithms, the assistant could assist in predicting patient outcomes based on imaging features and clinical data, aiding in prognostication and personalised treatment planning.

Integration with Clinical Decision Support Systems: It should seamlessly integrate with clinical decision support systems to provide access to relevant guidelines, research articles, and treatment protocols, supporting evidence-based decision-making.

Interactive Education: The assistant could offer interactive educational resources, such as case studies and tutorials, to help radiologists improve their skills in oncological imaging interpretation.

Natural Language Processing (NLP) for Report Generation: It could utilise NLP techniques to assist radiologists in generating comprehensive and structured radiology reports from their findings, enhancing efficiency and standardisation.

Image Annotation Tools: Providing tools for radiologists to annotate and mark regions of interest directly on the images could facilitate collaboration and communication with other healthcare professionals.

Continuous Performance Monitoring: The assistant should include mechanisms for monitoring its performance and soliciting feedback from users, allowing for iterative improvements and optimization.

Pilot scope

Type and number of targeted end-users

End-user type	Role	Number
Radiologist	*They have to provide requirements, use and validate the solution.*	*5*
Oncologist	*They have to provide requirements, use and validate the solution.*	*2*
Management	*Provide the CT scans*	*200*

Table 1. Targeted users

Language

Language Proficiency: Ensure that the digital assistant supports the primary language(s) spoken by the end-users. Use Romanian and English.

Pilot set up conditions

User Training and Support: Provide comprehensive training to radiologists and other healthcare professionals who will be using the digital assistant during the pilot. Offer ongoing

support and troubleshooting resources to address any technical issues or user concerns that may arise.

User Feedback Mechanisms: Establish mechanisms for collecting feedback from pilot participants, including surveys, focus groups, and direct communication channels. Gather insights on usability, effectiveness, and areas for improvement to inform iterative refinement of the digital assistant.

Evaluation Metrics: Define key performance indicators (KPIs) and evaluation metrics to assess the impact of the digital assistant on radiologists' workflow efficiency, diagnostic accuracy, report quality, and patient outcomes. Collect quantitative and qualitative data throughout the pilot period to measure progress and identify successes and challenges.

Ethical Considerations: Address ethical considerations related to the use of artificial intelligence in healthcare, such as transparency, accountability, and equitable access. Ensure that the pilot adheres to ethical guidelines and safeguards patient rights and welfare.

Communication and Stakeholder Engagement: Maintain open communication with stakeholders, including radiologists, referring physicians, administrators, and patients, to garner support for the pilot and address any concerns or misconceptions. Engage stakeholders in the planning, implementation, and evaluation processes to foster collaboration and buy-in.

Scalability and Sustainability: Consider the scalability and sustainability of the digital assistant beyond the pilot phase. Assess its potential for broader adoption across multiple healthcare facilities and develop a roadmap for long-term integration into routine clinical practice.

Ethical, legal or regulatory

An Ethics Committee of the Medisprof Cancer Center must previously validate the approach of the pilot. The solutions shall be fully GDPR compliant.

Data Privacy and Security: Implement robust data privacy and security measures to protect patient information and ensure compliance with regulatory requirements, such as GDPR. Encrypt data transmissions, restrict access to unauthorised users, and implement audit trails for accountability.

Technological

The systems and servers needed for running the pilot will be hosted by the Solver. The solution shall be able to exchange information (read and write data) with the systems of the Challenger.

Infrastructure Readiness: Ensure that the pilot site has the necessary infrastructure to support the implementation of the digital assistant, including compatible hardware and software systems, network connectivity, and secure data storage solutions.

Integration with Existing Systems: Integrate the digital assistant with the facility's existing systems, radiology systems, to facilitate seamless data exchange and workflow integration.

Data access

For the AI tool, training anonymised data will be extracted from the Challenger existing IT systems and provided to the Solver. This data will contain CT, MRI from lung cancer patients.

Expected impact and KPIs

Pilot satisfaction:

- Radiologist satisfaction >80%
- Oncologist satisfaction >80%
- Percentage of successful interpretation of radiology results >80%

Improved Efficiency: The digital assistant will streamline the workflow of radiologists by automating repetitive tasks, such as image analysis and report generation. This efficiency gain allows radiologists to focus more on complex cases and reduce burnout.

Enhanced Accuracy: By leveraging advanced machine learning algorithms and image analysis techniques, the digital assistant can assist radiologists in identifying subtle abnormalities and lesions in oncological imaging with higher accuracy. This can lead to earlier detection of cancerous lesions and improved patient outcomes.

Standardised Reporting: The digital assistant will facilitate the creation of standardised radiology reports, ensuring consistency and completeness in reporting across different radiologists and institutions. Standardised reports enable clearer communication with referring physicians and support evidence-based decision-making in patient care.

Advanced Data Analysis: With the capability to perform quantitative analysis and extract valuable insights from imaging data, the digital assistant enables radiologists to provide more comprehensive assessments of tumour characteristics, progression, and response to treatment. This aids in treatment planning and monitoring.

Facilitated Collaboration: The digital assistant fosters collaboration among multidisciplinary healthcare teams involved in oncology care. It provides a platform for sharing imaging data, analysis results, and treatment recommendations, facilitating informed discussions and consensus-building among team members.

Continual Learning and Improvement: Through continuous interaction with users and feedback collection, the digital assistant can adapt and improve its performance over time. It learns from user interactions, refines its algorithms, and incorporates new knowledge and best practices in oncological imaging interpretation.

Increased Accessibility: By providing access to advanced image analysis tools and decision support capabilities, the digital assistant extends the expertise of experienced radiologists to underserved regions or facilities with limited resources. This promotes equitable access to high-quality oncological care.

Patient-Centric Care: Ultimately, the digital assistant contributes to delivering more personalised and patient-centric oncology care. By supporting accurate diagnosis, treatment planning, and monitoring, it helps healthcare providers tailor interventions to individual patient needs, leading to better outcomes and improved quality of life for cancer patients.

Business opportunity

Market size

Internally, at the Medisprof this project would be replicable in 2 centres, with around 10 radiologists. Potential users are estimated at 6313 patients.

- The first target would be the cancer centres at national level (www.cdelacontrol.ro/medici)
- The second target would be the Imaging centres that perform imaging for oncology patients - a few national networks - Affidea, Medima, RMN Diagnostica.

The estimated prevalence rate of lung cancer per 100,000 people is approximately 14.000, for which the exact epidemiology remains unknown due to the absence of national records. (source Addressing the unmet need for a comprehensive lung cancer registry in Romania)

Adoption Plans

We plan on starting the pilot with lung cancer data, and then add all the other cancer data. We would like to be the golden standard for radiology in oncology standardised reports