Implementing personalized
treatment for oral cancer

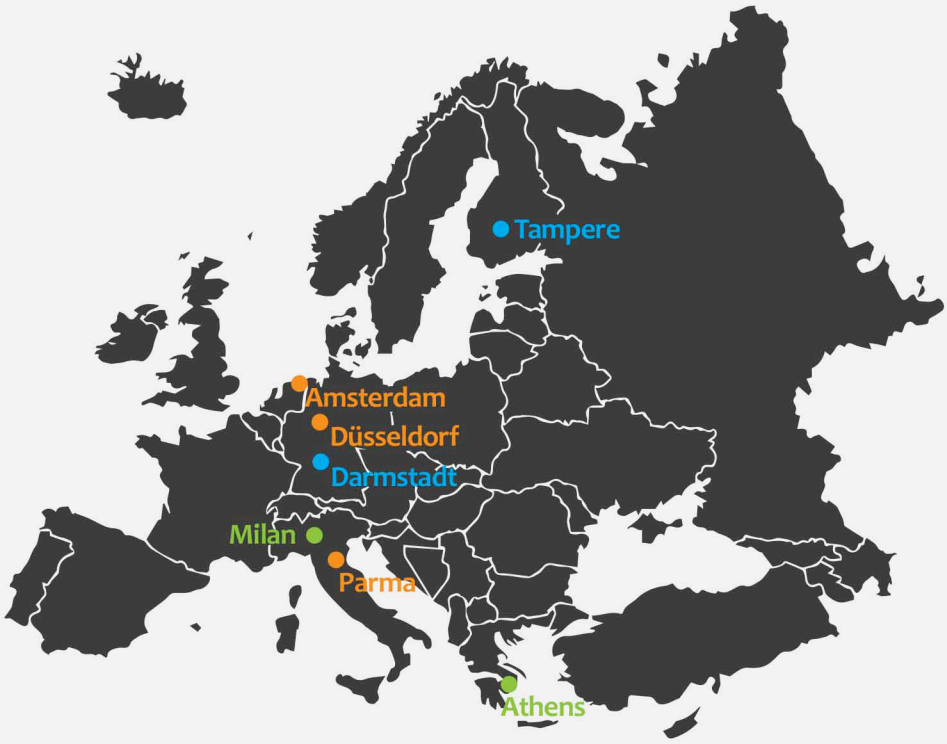
OraMod: implementing personalized treatment for oral cancer

The idea behind OraMod stems from the need of clinicians to identify the patient-specific factors involved in the progression of oral cancer, in order to foresee the growth and the dissemination of the tumour and to adopt the most effective and less impairing treatment.
OraMod has implemented a set of patients' stratification models for risk stratification of patients and a decision support environment integrated into the clinical workflow that translates the concept of personalized medicine and Virtual Physiological Human representation into the everyday's clinical practice.
Thus OraMod provides a comprehensive vision of the patient considering all multiscale factors involved in the disease and presents them to all involved clinical actors (head and neck surgeons, radiation oncologists and medical oncologists, radiologists, pathologists, geneticists), assembling data of various origin each one characterized by a different staircase of evaluation.
Data visualization and visual representation is the basis for shared decision making, supported in OraMod by a Virtual Tumor Board system, that allows remote discussions of patients' cases and treatment decisions, thus overcoming the current concept of physical meetings and opens new scenarios where also small, local hospitals could take advantage of the expertise of cancer reference centres.
From a technological side, innovative tools such as Diagnostic Images Automatic analysis and Point of Care genomic tests performed by means of portable Real Time PCR, pave the way for more accurate, low cost and operator-independent data collection.

Consortium

The project engages 8 partners from 5 European countries:

- three university hospitals (VU University Medical Center in Amsterdam, Heinrich-Heine University Clinic in Düsseldorf and the University of Parma with the University Hospital);
- two primary European research institutions (Fraunhofer Institute for Computer Graphics IGD in Darmstadt and the VTT Technical Research Centre of Finland in Tampere);
- three technology providers (Motivian in Athens, OneToNet and STMicroelectronics in Milan).



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Oral cancer

Oral cancer is an extremely impairing and deadly disease: nearly 300.000 new cases are diagnosed each year in the world and 145.000 patients die*. It is very often diagnosed late and has therefore a disappointingly low survival rate: around 50% of diagnosed patients die within five years from diagnosis and disease relapses are frequent (10-25% of cases). Treatment decisions are particularly challenging, due to oral cancer variability and unpredictability and due to the impacts of treatment and post-treatment morbidity. It is necessary an easy-to-adopt decision aid that allows an in-depth understanding and visual representation of the disease in each and any specific patient, shared by all involved medical specialists, and proposes personalized prognostic scenarios.

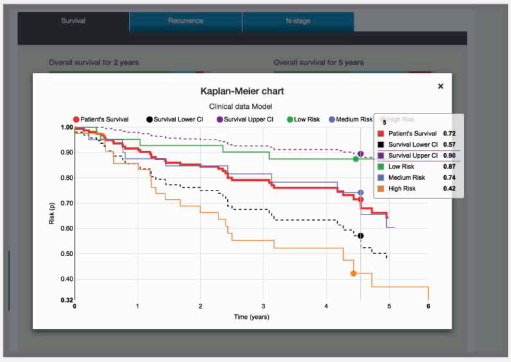
* *GLOBOCAN 2012: Estimated Cancer Incidence, Mortality and Prevalence Worldwide in 2012* - International Agency for Research on Cancer

OraMod project

OraMod has developed an integrated decision support platform that combines multiscale patient's data collection from all the data sources available in hospitals (radiology, pathology, biomolecular lab, outpatient visits facilities, etc.), with virtual representation of patient's health records, clinical co-decision tools (Virtual Tumor Board) and prediction models. The prognostic models developed in OraMod, contrary to the majority of "black-box" models, allow clinicians to verify the prognostic weight of each predictive marker, to perform simulations (e.g. add or remove marker sets), in a "what-if" approach. In so doing OraMod offers a "transparent" prognostic tool to clinicians, perfectly integrated inside the hospital information system and clinical workflow.

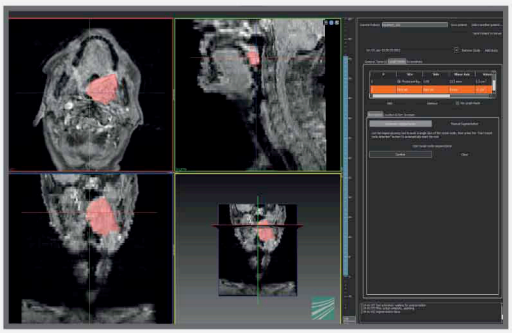
OraMod prognostic models

The core of the platform are the prognostic models that allow to predict three specific endpoints: survival, tumor-positive lymph-nodes and reoccurrence.
These models, developed by VUmc Biostatisticians, have identified at first one genomic signature specific for each outcome, based on ~250 retrospective cases.
These gene signatures have been validated in 125 independent retrospective cases and are thus extremely reliable from a scientific and clinical perspective.
An analysis of retrospective independent cases, showed that OraMod prediction models are able to determine with an extremely high confidence level the prognosis and also to quantify the percentage of potentially over-treated and under-treated cases that are currently undetected by TNM staging system.



OraMod diagnostic images analysis and processing

The model relies to a wide set of multi-scale data collected from OraMod specific tools.
The diagnostic images analysis and processing developed by Fraunhofer IGD allows semiautomatic lymph-node and tumour segmentations on both MRI and CT scans, automatically quantifies volumes and other radiological parameters, thus significantly reducing the time needed by radiologists (at least by 50%, estimated by UNIPR and UDUS radiology team) and at the same time reducing operator-dependent results.



OraMod point-of-care qRT-PCR

The "Q3-Plus" point-of-care quantitative Real-Time PCR device and OraMod-specific lab-on-chips embedding gene detection chemistry, developed by STMicroelectronics, allow fast (50 minutes), as accurate as standard laboratory equipment, personalized genomic signature assessment.
The system, besides offering an OraMod-dedicated software for biologists, is completely integrated into the OraMod platform to which it securely transfers patients' genomic data, in one click, and it is very easy to use.

OraMod platform

The binding software that allows clinicians to navigate, investigate, analyse, share, discuss patient's data in a co-decision framework for personalized best treatment is the OraMod platform, developed by Onetonet - ClinicalHub®, integrated with the hospital information system (HIS), throughout the oral cancer diagnosis and treatment workflow. The platform integrates both existing legacy Hospital Information System software and new software components developed by OraMod. Integration is guaranteed by state-of-art standards (e.g. HL7 for patients' health records) and integration communication APIs.

Virtual Tumor Board

The advanced virtual data presentation, opinion and shared co-decision aid, developed by Motivian and fully integrated within the OraMod platform, allow data navigation, visualization, interpretation and prediction simulation in very few mouse clicks, thus making OraMod platform a tool used and appreciated by clinicians for daily practice, covering all activities from diagnosis to patient's discharge and follow-up visits. Data securely collected and stored in hospitals, are anonymized for oral cancer research purpose.

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SEVENTH FRAMEWORK PROGRAMME