

@neurIST

Integrated Biomedical Informatics for the Management of Cerebral Aneurysms

Reducing health care cost, optimally targeting the relevant patient population, avoiding unnecessary and potentially risky interventions, @neurIST moves upon integrative decision support systems based on multi-scale computational suites for personalised brain aneurysm rupture risk assessment and treatment.

Objectives of the project

Each year 3 million women and 2.5 million men die from strokes worldwide. Hemorrhagic stroke occurs when a blood vessel, typically an aneurysm, bursts inside the brain. This often leads to severe disabilities or death. Despite considerable advances in treatment, when such ruptures occur, morbidity and mortality is exceptionally high (about 33% each). Currently treatment of cerebral aneurysm is offered to almost all patients because there is insufficient evidence to support a non-intervention decision.

The basic thesis of @neurIST is that the process of cerebral aneurysm diagnosis, treatment planning and treatment development is compromised by the fragmentation of relevant data.

To address this problem, @neurIST will develop an IT infrastructure for the management and processing of heterogeneous data associated with the diagnosis and treatment of cerebral aneurysm and subarachnoid haemorrhage. The data that will be considered ranges from the molecular level, to cellular, tissue, organ, and patient level and finally to the population level.

@neurIST will transform the management of cerebral aneurysm by providing new insight, personalised risk assessment and methods for the design of improved medical devices and treatment protocols.

“@neurIST will transform the management of cerebral aneurism”

Project Description

@neurIST aims to produce a set of integrated software information retrieval, processing and management suites. The @neurIST project will:

- Develop a new procedure and IT-support system for cerebral aneurysm management.
- Identify and collect all publicly-available, relevant and strategically important data from scientific studies.
- Deliver a rich, multiscale information processing chain that will provide new diagnostic indexes and insights into the process of aneurysm development and rupture.
- Develop a set of scalable and reusable integrative suites and demonstrate their value for revolutionising the understanding and management of cerebral aneurysm.
- @neuLink will create an IT environment for the identification of genes associated with the disease and for the integrated analysis of genetic epidemiology and clinical data.
- @neuFuse will provide an open source environment to fuse diagnostic and modelling data into a coherent representation of the patient's condition.
- @neuRisk will produce a personalised risk assess-

Scenario

As a result of a car accident, a 40 year old man is examined for possible lesions. An unrelated and asymptomatic cerebral aneurysm is discovered. Subsequent angiography provides improved image data for characterisation of aneurysm morphology. Blood samples are taken and the patient is screened @neurIST associated genes, by data mining. A rupture risk assessment is also carried out. The clinician verifies its presence in the patient by querying the patients' EHR and retrieving the results of her biochip analysis that discloses a positive test. The patient is informed about the risks/benefits of surgical intervention. On the basis of all available information, a personalised treatment guideline which suggests that endovascular treatment would be beneficial in this case.

ment by integrating all available information.

- **@neuEndo** will deliver an innovative IT system to support the design of implantable devices and intervention planning by simulation of the structural, haemodynamic and biological response to intervention.
- Provide an ICT-system for developing, integrating and sharing biomedical knowledge related to cerebral aneurysm. The **@neurIST** infrastructure will support computationally demanding tasks and it will enable access to health data (@neuInfo).
- Inspire and promote the development of corresponding systems for other disease processes

Expected Results & Impacts

@neurIST will reduce health care cost by optimally targeting the relevant patient population, thus avoiding unnecessary and potentially risky interventions, and improving methods of minimally invasive treatment.

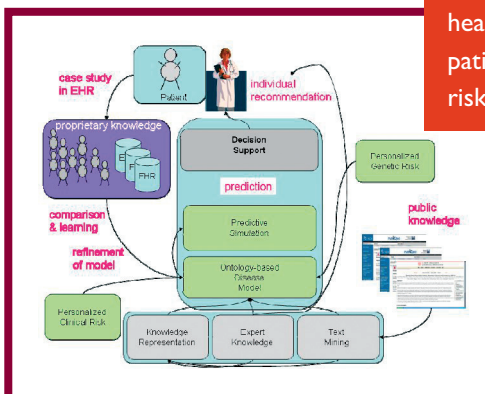
Measurable benefits of **@neurIST** will include the **quantification of risk**, including that of intervention and non-intervention, and the **application of the data** to improve the personalised design of endovascular devices.

By providing an objective measure of risk to the decision making project, based on all available data, **@neurIST** will reduce patient anxiety and unnecessary treatment by identifying aneurysms that do not have a high risk of rupture.

The potential economic benefit of this system in Europe is enormous: taking into account the prevalence of this disease [1-5%], the annual rupture rate [0.2-1%], and the average treatment and 1st-year follow-up care costs of patients [50kEuro], it is estimated that, in Europe alone, unnecessary interventional or surgical procedures costs are in the order of thousands million Euros per annum.

Keywords:

Decision support systems, eHealth networks and architectures, health promotion, patient safety, risk assessment



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Website: <http://www.aneurist.org>

Project co-ordinator:
Universitat Pompeu Fabra

Contact person:

Dr. Alejandro Frangi

Tel: +34 93 542 14 51

Fax: +34 93 542 25 17

Email: alejandro.frangi@upf.edu

Partners:

- Universitat Pompeu Fab - Fundació IMIM Institut Municipal d'Assistència Sanitària - Grid Systems S.A. - Neuroangiografia Terapèutica S.A. - Hospital Clínic iProvincial de Barcelona (ES)
- University of Geneva - Ecole Polytechnique Federale de Lausanne (CH)
- The University of Sheffield - Thrombosis Research Institute - ANSYS Europe Ltd - NEC Europe Ltd. - University of Oxford Cancer Research - InferMed Ltd - University of Luton (UK)
- Fraunhofer Institute - Institute for Algorithms and Scientific Computing - Simulation & Design GmbH - Universitätsklinikum Freiburg (DE)
- Utrecht University Medical Center - Philips Medical Systems B.V. - Erasmus Medical Center (NL)
- Super Computing Solution s.r.l. (IT)
- Royal Institute of Technology (SE)
- ASD Advanced William Cook Europe ApS (DK)
- Institut National de la Sante et la recherche Medicale (FR)
- DAC Ireland Ltd (IE)
- Medical University of Pécs (HU)
- Universitaet Wien (AT)

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Instrument: IP

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