IDAC Ireland Ltd partner in European Project to improve treatment of cerebral aneurysms and implantable device design

@neurIST is a major multidisciplinary European initiative within the Sixth Framework Programme. The project brings together neurosurgeons, neuroradiologists, epidemiologists, engineers, biologists and computer scientists from 30 European institutions. The aim of the project is to develop a usable interface for personalised risk assessment and treatment of patients with cerebral aneurysms.

The volume of data describing human disease processes, including our understanding, diagnosis, and management of them, is growing exponentially. While this increased information allows diseases to be better understood and better treated, it presents a data-management challenge. It is often impossible for an individual—whether a clinician responsible for patient management, or a physicist or engineer developing new imaging or interventional devices—to understand and assimilate this knowledge. It has become increasingly evident that new methods are required to manage, integrate and search data so that it becomes accessible to the end user. The @neurIST project was designed to address this issue. IDAC Ireland was chosen as a partner because of its experience in simulation of implantable medical devices and its pedigree in successful delivery of stent simulation applications to device manufacturers such as Abbott Vascular and Boston Scientific.

The project, which is in its third year of four, will deliver several integrated modules. These are:

@neuLink will create an IT environment for the identification of candidate genes associated with the disease phenotype and for the integrated analysis of genetic epidemiology and clinical data.

@neuFuse will provide an open source environment to fuse diagnostic data and modelling data into a coherent representation of the patient's condition. It will allow the medical professional to interactively visualise all these data, using multiple display modalities and data types. Finally, this application will allow simulation and data steering from/to other suites in order to obtain predictive simulations using all available patient- and domain-specific data. Underlying technologies will be state-of-the-art image segmentation, multimodal registration, and advanced visualisation.

@neuRisk will produce a personalised risk assessment by integrating all available information to produce a quantitative score. This score will be used as a guideline to help determine whether or not a clinical intervention is required.

@neuEndo will build upon the technology of @neuFuse to deliver an innovative IT system for supporting the design of implantable devices and intervention planning by simulation of the structural, haemodynamic and biological response to intervention.

@neuCompute/Info will provide an infrastructure to support the integration of data and computing resources. The @neurIST infrastructure will not only support computationally demanding tasks, such as complex modelling and simulation, but will also enable access to public and protected health databases all over the world. This should promote the development of corresponding systems for other disease processes.

IDAC Ireland is responsible for the development and delivery of @neuEndo. This module will have 2 distinct end-users. The first is the Medical Device Manufacturer. @neuEndo will provide an expert, automated tool directly to stent designers to allow them to simulate the structural and fluid flow performance of proposed stent designs. New stent geometries can be uploaded and simulated for structural performance in a matter of hours, allowing the stent designer to assess many variations quickly and cost effectively. The effect on haemodynamics of new stent designs implanted in diseased vessels can also be assessed allowing the designers to choose stent pattern shapes which produce beneficial effects on blood flow.

The second is the clinical end-user. Typically this would be the neuroradiologists who is treating a patient who has already been diagnosed as having a cerebral aneurysm. The neuroradiologist must decide what treatment is most appropriate for the patient. This will depend on several factors – age, medical history, genetic profile, size and shape of the aneurysm. @neuEndo will allow the clinician to run simulations to better understand the haemodynamics of the diseased vessel. Simulations can also be carried out with a stent implanted to determine its effect on critical measures such as pressure in the aneurysm, flow through the neck of the aneurysm, and shear stress on the wall of the aneurysm. This additional information should help the clinician to choose the best possible treatment plan for the patient.

For further information on @neurIST, please visit www.aneurist.org
For further information on IDAC Ireland, please visit: www.idacireland.com or contact Derek Sweeney at: dsweeney@idacireland.com