

In this Issue

- A Word from the CEO p. 1
- Advancing Technology p. 1
- Working with NICOE p. 2
- Introducing nordicTumorEx p. 3
- New office in Switzerland p. 4
- 2011 Conference Schedule p. 5

A Word from the CEO



Dear Reader,

With the Holidays just around the corner, we are coming to the end of what has been a very successful and eventful year for NordicNeuroLab.

Frederick Isdal, CEO

Our US headquarters opened in Milwaukee, Wisconsin in 2008 and has expanded to meet the demands of a growing customer base in the US, Mexico and Canada. In Spring of 2010 we expanded our U.S. presence by opening an office in Lottie, Louisiana to have a closer reach to our customers in the southern part of the United States and Latin America. In Fall of 2010 we opened our second European office in Zürich, Switzerland. Our goal is to have more centralized access to our customers in Europe, given the growing market need. As our business continues to grow, we plan to expand into other key locations around the world.

As researchers are tackling new challenges and clinicians are venturing into new applications of functional imaging, we see a clear need for more advanced and specialized hardware and software tools, hence our continued commitment to product development. At this year's RSNA, NordicNeuroLab will introduce nordicTumorEx, a dedicated clinical software application designed specifically for tumor assessment and evaluation. NordicTumorEx features novel diagnostic tools for evaluating a tumor in terms of its perfusion characteristics and its change over time in volume and shape. The software enables processing, analysis, and visualization

Continued on page 2

Advancing Technology – A Collaborative Effort through the Quantitative Imaging Biomarker Alliance (QIBA)

By Dr. Cathy Elsinger, CSO, NordicNeuroLab

As the adoption of fMRI technology for clinical brain mapping increases, and the model of integration across data acquisition systems, MR platforms and data analysis platforms remains fairly commonplace, providers of solutions for fMRI are faced with the task of improving functionality and offering seamless integration capabilities. NNL maintains a firm belief that in order to advance the field of functional MRI it is imperative that we work with industry partners, researchers and clinicians to provide standards and guidelines which will improve the quality of clinical fMRI exams and provide more accurate quantitative results in the interest of better patient care, as well as positively influencing the radiology workflow, analysis and reporting involved with conducting BOLD fMRI exams.

To this end, we proposed a series of discussions regarding the importance and the feasibility of standardizing functional imaging paradigms for BOLD imaging. This effort was initiated during the RSNA meeting last November of 2009 by Dr. Cathy Elsinger, Chief Science Officer of NNL, and involved a number of industry partners and researchers as well as the development leaders (both software and hardware) from NNL.

This initial effort led to the creation of a formal working group under the auspice of the Quantitative Imaging Biomarker Alliance, or QIBA. QIBA is an initiative designed to advance quantitative imaging and the use of imaging biomarkers in clinical trials and clinical practice by engaging researchers, healthcare professionals and industry. This involves

collaborating to identify needs, barriers, and solutions to develop and test consistent, reliable, valid, and achievable quantitative imaging results across imaging platforms, clinical sites, and time. As well as accelerating the development and adoption of hardware and software standards needed to achieve accurate and reproducible quantitative results from imaging methods (<http://qibawiki.rsna.org>).

The QIBA effort is supported by the Radiological Society of North America (RSNA), which is committed to helping transform radiology from a qualitative to a more quantitative science. The QIBA initiative is composed of a Steering Committee with 3 modality committees (CT, PET and MR) and 5 technical working groups (Volumetric CT, oncology; CT density, COPD; FDG-PET, oncology; DCE-MRI, oncology; and BOLD fMRI, oncology and seizure disorders).

The fMRI Subcommittee is co-chaired by Jeffrey Petrella, MD (Duke University) and Cathy Elsinger PhD (NNL) and composed of many scientists, clinicians and engineers from academia and medical centers and industry, devoted to the mission of assessing and improving the reproducibility, accuracy and precision of functional imaging biomarkers that result from BOLD imaging. An ultimate goal of this committee is to provide a profile which consists of a set of guidelines for implementing and optimizing fMRI protocols and associated outcome measures, defining what the quantitative outcome measures are for the specific use case (e.g. presurgical mapping).

A Word from the CEO

Continued from page 1

of dynamic MR imaging data of the brain, and as such, will be a unique and highly efficient application.

As we see advanced imaging techniques for BOLD and DTI move into clinical practice, NNL remains dedicated to assuring that we adhere to quality standards and regulations worldwide, staying abreast of efforts to develop more quantitative measures for these functional imaging techniques. To this end, we have become involved in the Quantitative Imaging Biomarker Alliance (QIBA) - an organization which includes membership from researchers and clinicians from leading academic and medical institutions and from the medical device industry. The QIBA effort is supported by the Radiological Society of North America (RSNA), which is committed to helping transform radiology from a qualitative to a more quantitative science. We are proud to provide a leadership role in this organization.

We have been very fortunate to have the opportunity to work with leading military hospitals and research centers in the study of traumatic brain injury. NNL remains committed to providing state-of-the-art products in support of these institutions efforts to provide the best standard of care to patients with traumatic brain injury. They are excellent representatives of our fastest growing customer group and we are privileged to work with these very progressive institutions.

With growth comes change. As a consequence of diverging perspectives on future business development goals and initiatives, Dr. Tormod Thomsen resigned from his position as CEO of Nordic Labs in June 2010. Mr. Fredrik Isdal, Chairman of the Board since establishing the company in 2002, has been appointed as acting CEO.

We wish you the very best during his holiday season and hope that you have a peaceful start to the New Year!

Fredrik Isdal
CEO, NordicNeuroLab

NordicNeuroLab Installs Equipment to Expand fMRI Capabilities at National Intrepid Center of Excellence

By Dr. Gerard Riedy, Director, National Capital Neuroimaging Consortium and Dr. Cathy Elsinger, CSO, NNL

In July of this year NNL installed our nordic fMRI Solution Hardware at the National Intrepid Center of Excellence in Bethesda Maryland. The National Intrepid Center of Excellence (NICoE), dedicated on June 24, 2010, is an advanced facility dedicated to research, diagnosis and treatment of military personnel and veterans suffering from mild Traumatic Brain Injury (mTBI) and Psychological Health (PH) issues. The NICoE is a 72,000 square foot, two-story facility located on the Navy campus at Bethesda, Maryland, adjacent to the new Walter Reed National Military Medical Center, with close access to the Uniformed Services University, the National Institutes of Health, and the Veterans Health Administration.

“ As a leader in the study of Traumatic Brain Injury, NNL views NICoE and WRAMC as being on the forefront of imaging protocol development ”

tion to providing generous support to soldiers and their families led to the opening of the Center for the Intrepid followed by an initiative to address another critical issue faced by our wounded troops: the treatment of TBI. The IFHF addressed this

need by constructing the NICoE and providing the much needed technology to diagnose and treat military

personnel suffering from TBI.

NNL provided our complete fMRI Solution to the Walter Reed Army Medical Center (WRAMC) in March of 2009. Both installed systems include our full MR-compatible hardware system for stimulus delivery, eye-tracking capabilities and response collection. The fMRI systems will be used for both research studies and clinical exams. We anticipate that the installations will used primarily to support NICoE's extensive TBI program.



National Intrepid Center of Excellence, Bethesda, Maryland

As a leader in the study of Traumatic Brain Injury, NNL views NICoE and WRAMC as being on the forefront of imaging protocol development and the application of these imaging technologies for the study of TBI. NNL remains committed to providing state-of-the-art products in support of NICoE's efforts

The NICoE is designed to provide the most advanced services for advanced diagnostics, initial treatment plan and family education, introduction to therapeutic modalities, referral and reintegration support for military personnel and veterans with mTBI, Post Traumatic Stress Disorder, and/or complex psychological health issues. Further, the NICoE conducts research, tests new protocols and provides comprehensive training and education to patients, providers and families.

to provide the best standard of care to patients with brain injury.

“We are very excited to have the opportunity to work with the scientists, clinicians and staff at NICoE, and admire their immense dedication to the soldiers and families they treat. It has been a great pleasure to work with Dr. Gerard Riedy, Director National Capital Neuroimaging Consortium, as this large scale study expands to include more study sites. We envision a strong collaborative relationship moving forward as we continue to develop applications for functional neuroimaging in the area of stroke, traumatic brain injury and other neuroscience applications” said Cathy Elsinger, Chief Scientific Officer, NNL – US.

The facility and equipment were funded through the Intrepid Fallen Heroes Fund (IFHF), which was established in 2000 to provide financial support for the dependents of United States military personnel lost in performance of their duty. Their dedica-

nordicTumorEx – the new tool for tumor evaluation and monitoring

By Anja Zysset, CSO/Research Application Specialist, NNL

nordicTumorEx is the newest software application that defines the next step in tumor treatment. With an intuitive and efficient workflow the software will be a tool for the clinician in the process of evaluating the characteristics of tumor, and furthermore, an aid in the process of deciding on a treatment. Together with nordicBrainEx this new software application comprises NNL's new generation of software developed specifically for the clinical environment.

“In nordicTumorEx we have implemented a visualization that allows the user to move through time with a slider and see the tumor change”

nordicTumorEx basically has two main parts, one that is focused on the evaluation of a tumor as it appears on a specific time point, and the other part that intends to visualize how a tumor evolves over time. These two parts together make a package that can help the clinician with a new patient diagnosed with cancer in the brain, as well as monitoring patients that undergo treatment or are subjects to watchful waiting – is there a progression here or is there not?

nordicTumorEx has been developed in collaboration with researchers at the Interventional Centre in Rikshospitalet and at the Oslo University Hospital, both in Norway, who have been using nordicICE Perfusion/DCE software for analysis of tumor perfusion studies. Their research has focused on how to better use perfusion studies to evaluate the aggressiveness of tumors.

Tumor Evaluation

Usually an MR examination of a brain tumor patient offers multiple image series, structural and dynamical. To fully exploit the information available a set of tools has been assembled and structured in a software application that step by step takes the user through coregistration, tumor segmentation, perfusion analysis and report generation.

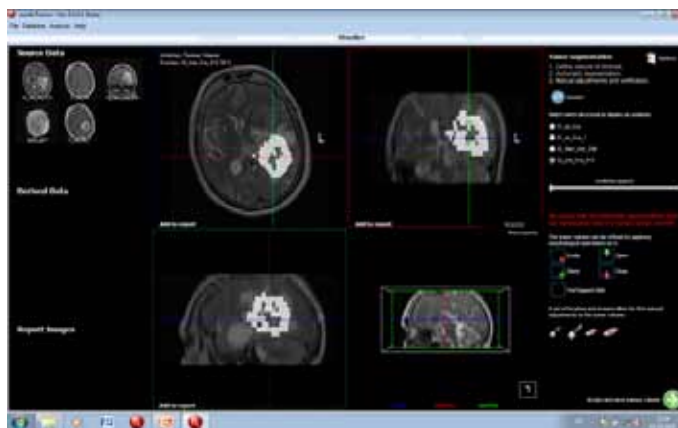
Each of these steps has been automated as much as possible and requires only a minimum of user interaction. In the tumor segmentation step different seg-

mentation algorithms are available. All of them combine the information in the multiple structural image series so that the characteristics of the different acquisition sequences are exploited. In specific the algorithms offered are a multidimensional clustering algorithm, a seed growing algorithm and a simpler thresholding method. After the automatic step the resulting tumor volume may be edited by different morphological operations

and basic drawing tools.

The perfusion analysis is fully automated including motion correction. Familiar parametric maps like the blood volume map, flow, MTT, TTP etc are calculated. In addition we have implemented a patented method for identifying vessels that are either inside a vessel or to a large extent influenced by the contrast agent in a nearby artery.

Tumor grade is considered to be an important parameter in tumor treatment, and it is therefore of great importance to determine this. Research has shown that the histogram of blood volume values inside the tumor can be analyzed to determine if it is a high or low



Tumor segmentation step

grade with a high specificity and sensitivity [Refs], and is thus a non-invasive alternative for tumor grading. Therefore the histogram is formed using the segmented tumor volume

Continued on page 4.

nordicTumorEx – the new tool for tumor evaluation and monitoring

Continued from page 3.

and the blood volume map with the identified vessel pixels excluded. It is presented together with histograms representative of tumors of high and low grades for the comparison. We are awaiting validation of this patented method at research institutions before the implementation of the statistical determination of the actual grading is included in the software.

sometimes the tumor has been operated and the clinician wants to see if there may be tumor tissue left that starts to grow again. Either way, visual inspection is an important means to determine if there is change or not, and in nordicTumorEx we offer visualizations that increases the clinicians' chances of successfully assessing the possible changes.



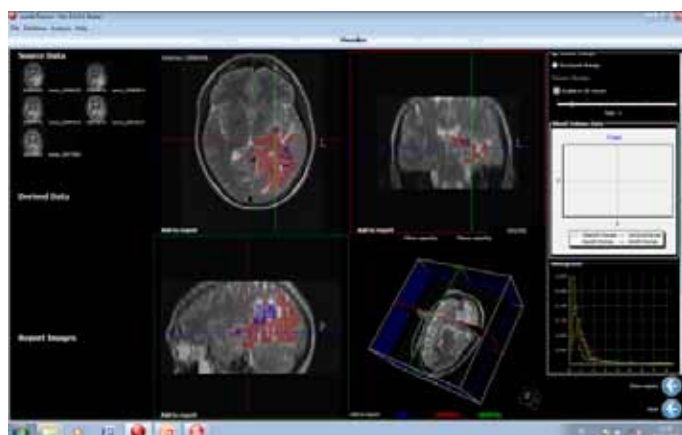
Result screen

Many patients undergo MR exams multiple times, and a tool for exploring the possible changes from one date to another is therefore of importance. In nordicTumorEx we have implemented a visualization that allows the user to move through time with a slider and see the tumor change. The user may also inspect the changes in the structural images. In addition to these geometrical studies, nordicTumorEx presents parameters as functions of time, for example the tumor volume in cm³, and the blood volume histograms of the different study dates may be compared.

A report module allows for the creation of a structured report including images, curves, text and markers. Key parameters like name, age, physician etc. are entered automatically. Meeting the needs in a clinic the report can be exported as pdf or as a DICOM-file that again may be sent to a PACS server or some other DICOM database.

Longitudinal study

How the tumor develops is important knowledge for the clinician. Some tumors are inoperable, in some cases it considered to be an option to wait and see how the tumor evolves and



Monitoring of tumor change

NNL opens office in Switzerland

By Anja Zysset, CSO/Research Application Specialist, NNL

NordicNeuroLab continues to manifest its role as a leading competent partner for functional MRI technology, be it in research or clinical settings. As of December 1st, 2010, NordicNeuroLab will be opening an office in Zurich, Switzerland. Leading operations of NordicNeuroLab GmbH will be Dr. Anja Zysset, who has worked for many years with NordicNeuroLab headquarters in Norway.

Given the growing customer base in Europe, NordicNeuroLab's presence in central Europe

will allow us to be even closer to our European customers and to offer service and support with increased efficiency and reduced latency.

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2011 Conference Schedule

Conference

ASFNR
ECR
AANS
SSO
ISMRM
ASNR
IBMISPS
HBM
ESNR
Stockholm Cancer Congress
RSNA

Location

Phoenix, AZ, USA
Vienna, Austria
Denver, CO, USA
San Antonio, TX, USA
Montreal, Canada
Seattle, WA, USA
San Francisco, CA, USA
Quebec, Canada
Antwerpen, Belgium
Stockholm, Sweden
Chicago, IL, USA

Dates

March 2 - 4
March 3 - 7
April 11 - 13
May 3 - 5
May 7 - 11
June 7 - 9
June 8 - 9
June 26 - 30
September 22 -25
September 23 -27
Nov. 27 - Dec. 2