

TENPET©: Trans-European network for positron emission tomography

TENPET© evaluates the provision of integrated teleconsultation and intelligent computer supported cooperative work services for clinical positron emission tomography (PET) in Europe. It addresses technological challenges by linking PET Centres and developing supporting services that permit remote consultation between professionals in the field. The technological platform runs on Win2000/NT/XP systems and incorporates advanced techniques for image visualization, analysis and fusion, as well as for interactive communication and message handling for off-line communications. Four PET Centres from Spain, France and Germany have participated to the pilot system trials. TENPET© promotes the co-operation and improved communication between PET practitioners that are miles away from their peers or on mobile units, offering options for second opinion and training and permitting physicians to remotely consult patient data if they are away from their Centre. TENPET© is expected to have a significant impact in the development of new skills by PET professionals and will support the establishment of peripheral PET units.

Objectives of the Project

PET is a molecular imaging technique, with the potential to yield the physiologic information necessary for oncological diagnosis based on increased regional metabolism of radio-labelled compounds and also to serve as a valuable tool for monitoring chemotherapeutic effects and the early diagnosis of tumour appearance and recurrence for diagnosis as well as treatment planning and management of patients with cancer, apart from its contributions to medical and pharmacological research.

Traditional diagnostic techniques, such as radiography, computerized tomography (CT) scans or magnetic resonance imaging (MRI), produce anatomical images of how the internal organs look like. The premise with these techniques is that there is a visible structural change in anatomy caused by disease. However, biochemical processes are also altered with disease and may occur before there is a change in gross anatomy. Furthermore, PET can provide medical doctors with important early information about very subtle changes of function in tissues, due to disease-related modifications in tissue perfusion, cell metabolic rates, etc. This allows physicians to diagnose and treat these diseases earlier and consequently more efficiently and accurately, according to the axiom "the earlier the diagnosis, the better chance for treatment". PET can also help physicians monitor a patient's response to treatment, as well as identify distant metastases that can affect treatment, helping curtail ineffective treatments and reduce unnecessary invasive procedures. The field of PET has been emerging today into clinical diagnostic medicine and is approved by many insurance carriers for coverage.

Although complementary to other medical imaging modalities (MRI, CT, etc), PET is often installed in independent health care centres (known as PET Centres) or in separate units within the nuclear medicine departments of major hospitals. The somehow autonomous nature of a PET Centre is due to its extremely specialised and expensive instrumental equipment and maintenance, the requirements for a particular construction for its housing, its high demand for financial input and needs for highly qualified and trained multidisciplinary personnel. Today relatively few PET Centres operate in each European country, separated by language and cultural barriers. Furthermore, some Centres are specialised on particular cases whereas others count only little time of operation and consequently need support, training and advice from PET Centres with long-year experience. In addition, modern PET/CT installations usually lack radiological expertise in order to read and report on the patient CT data.

TENPET© comes to cover these needs, develop specific services for the technology implemented and set the first step towards the formation of a solid network covering most of the European PET sites. Moreover, the wider TENPET© network includes some of the major referring centres (general hospitals, large health care centres, etc.) to the PET Centres, with the aim to facilitate the process of patient referral and allow the ordering physician to link and discuss directly with the examining physician the patient's images and results. Furthermore, the project goes beyond the restricted principle of remote reporting, by allowing physicians to conduct a real-time integrated on-line session on a specific case. At the same time provides an advanced platform for image visualization, analysis and processing, as well as a complete database system for data storage and autonomous operation within a clinic. In addition, is the only system specifically available for PET that can link together the PET imaging centre and the referring physicians in a simple to use platform, which runs on conventional PC platforms and operates in the plug-and-play principle without long installation or training phases.

Project Description

Four PET Centres from Spain, France and Germany currently participate to the pilot system trials. It is based on the results of the successful EU funded research TeleInViVo (2001 IST Grand Prize Winner),

which has already demonstrated the technical viability of the envisaged services. The communication between two connected workstations is based on a TCP/IP connection secured by strong encryption, patient data anonymization and secure socket layers (SSL). The platform is CE-cleared and incorporates advanced techniques for image visualization, analysis and fusion. A tele-consultation between two TENPET© workstations can be on-line or off-line. Images and data are only transmitted if they do not already exist in the database of the remote communication partner.

For on-line synchronisation, interface sharing is employed and thus only short commands like mouse operations are transmitted. This enables online consultations even over low bandwidth connections. Alternatively, two TENPET© users can exchange off-line information concerning a clinical case (images, patient information, text, audio messages) via the transmission of messages.

In order to overcome the problems imposed by the existence of firewalls during data transmission, a virtual private network (VPN) has been established for all users. The use of VPN however implies several restrictions, like the necessity that even for off-line transmissions both workstations must be on and connected to the network. As an alternative, the open-source jabber instant messaging protocol has been implemented. Jabber is XML-based and the system consists of a hub server and many remote nodes, which are able to be connected to the server. The hub is responsible for keeping tracks of users' presence status and to forward the messages to the right user. Transmission security can be obtained via HTTPS and SOCKS5 proxies.

Expected Results and Impacts

TENPET© establishes a telecommunication link between physicians in specialized centres, peripheral hospitals and other points of care in order to improve the continuum of patient care. Currently, when a particular case is difficult to diagnose with confidence, the PET specialist in charge addresses his/her peers via mailing lists or web sites, soliciting assistance. The TeleConsult platform that implements the TENPET© services, eliminates this hassle and offers to PET specialists a tool and specific methodology to contact other colleagues and request their cooperation in an efficient, easy-to-use and standardized procedure. Furthermore, TENPET© can help PET medical personnel to approach their colleagues and maintain close links with them over the large distance that typically separates PET Centres.

TENPET© therefore promotes the cooperation and improved communication between PET physicians, offering options for second opinion and training. Furthermore, it permits physicians to remotely consult patient data if they are away from their Centre or work on mobile units. Through the provision of a bundle of services via an easy-to-use user interface, TENPET© allows the speedy, accurate and film-less communication between referring oncologists and specialized medical personnel at a PET Centre. Furthermore, it brings all PET Centres in Europe (and beyond) closer, breaking barriers of frontiers, language or culture, by integrating advanced medical imaging technology and health telematics networks applications into a single, easy to operate telemedicine platform. It is expected that when fully deployed, TENPET© will have a significant impact in the development of new skills by PET professionals and will support the establishment of peripheral PET units.

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