Definitions & Terms

Biomarkers – Substances which are used as indicators of a biologic state which are objectively measured and evaluated as an indicator of normal biologic processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention. In medicine, a biomarker can be a substance that is introduced into an organism as a means to examine organ function or other aspects of health. Imaging biomarkers work within the affected cells in a living organism without the need for taking tissue samples, in contrast to in vitro diagnostic tests.

CT, Computed Tomography – An X-ray procedure which combines multiple X-ray images to generate cross-sectional views and, if needed, three-dimensional images of the internal organs and structures of the body. A CT scan is used to define normal and abnormal structures in the body and/or assist in surgical procedures.

Gamma Camera – A gamma camera is a device used in nuclear medicine or molecular imaging to view and analyze images of the human body of the distribution of medically injected gamma rays emitting biomarkers. A gamma camera consists of one or more flat crystal planes or, detectors, optically coupled to an array of photomultiplier tubes, the assembly known as a "head", mounted on a gantry. The system accumulates events, or counts of gamma photons that are absorbed by the crystal in the camera.

IVD, In Vitro Diagnostics – IVD's are reagents, instruments and systems intended for use in the diagnosis of disease or other conditions, including a determination of the state of health in order to cure, mitigate, treat, or prevent disease or its sequelae (a pathological condition resulting from a disease, injury or other trauma). Basically, in vitro diagnostics are completed outside the body by taking a specimen (blood or urine) and testing it for disease or other conditions.

Molecular Imaging – Molecular Imaging enables the visualization of the cellular function and the follow-up of the molecular process in living organisms without perturbing them, for the diagnosis of diseases such as cancer, neurological and cardiovascular diseases. This technique also contributes in improving the treatment of these disorders by optimizing the pre-clinical and clinical tests of new medication.

MRI, Magnetic Resonance Imaging – A scan which uses magnetism, radio waves and very powerful computers to produce images of body structures. The MRI scanner is a tube surrounded by a giant circular magnet. The patient is placed on a moveable bed that is inserted into the magnet. The images produced by MRI are quite detailed and can detect tiny changes of structures within the body.

Nuclear Medicine – A branch of medicine and medical imaging that uses the nuclear properties of matter in diagnosis and therapy. Nuclear medicine is a part of molecular imaging because it produces images that reflect biological processes that take place at the cellular and subcellular level.

PET, Positron Emission Tomography & SPECT, Single-Photon Emission Computed Tomography – Molecular imaging techniques which produce three-dimensional images or maps of functional processes in the body. These techniques show the "chemical functioning" of an organ or tissue, unlike X-rays, CTs or MRIs which show only body structures. PET and SPECT are also interchangeable with the term "gamma camera".

Tomography – A method of producing a three-dimensional image of the internal structures of a solid object (as the human body) by the observation and recording of the differences in the effects on the passage of waves of energy impinging on those structures.

Ultrasound Technology – UT uses high-frequency sound waves. Ultrasound waves can be bounced off of tissues using special devices. The echoes are then converted into a picture called a sonogram. Ultrasound imaging, referred to as "ultrasonography" allows physicians and patients to get an inside view of soft tissues and body cavities without using invasive techniques.

Semi trucks are used to transport imaging technology to rural areas where hospitals band together to share the cost.

quality of healthcare and reduce the cost. Through innovations in imaging, in vitro diagnostics and healthcare IT systems, Siemens is providing new technologies that can help physicians detect diseases earlier and improve or maintain patients' quality of life.

CWM Siemens announced a new state-of-the-art research facility dedicated to the development of molecular imaging biomarkers last February. What are 'biomarkers'?

ML At our recently opened biomarker research facility in Los Angeles, we are tasked with discovering new imaging biomarkers which can be disease specific, disease stage specific or organ specific. The capability of offering physicians a broad menu of biomarkers allows for more effective and personalized patient management. For example, we are currently developing a biomarker that is able to determine, prior to the start of an oncology treatment, whether a patient is likely to respond to the treatment.

CWM Should technological development work closely with medical practitioners?

ML Yes. We have advisory board meetings several times a year or more where we meet with clinicians from leading hospitals around the world and scientific advisors from research institutes to identify trends in disease and so forth.

Disease Management

CWM If Molecular Imaging technology is considered noninvasive, is there really any reason to use X-ray technology anymore?

ML Yes, as I explained earlier, X-ray technology, also considered non-invasive, provides the physician with an anatomical map of the structures within the body. This is crucial to define the exact location of suspicious areas as they are identified with molecular imaging techniques such as SPECT and PET.

CWM What types of molecular imaging are used for cancer and cardiovascular testing? And how is the use of molecular imaging techniques making a difference to patients' treatment and the cost of patients' healthcare?

ML The intention and practice of using molecular imaging techniques in oncology, for example, is that based on early detection of disease, we may significantly alter the management and treatment of that disease with respect to cost, efficiency in treatment, and the patient's quality of life. What this means is that using molecular imaging, we have the ability to detect some cancers at their earliest stages, when the costs involved in treating them are much lower and patients have a better chance of survival. Interventional costs to treat cancer in patients where disease has reached the metastatic stage can be up to 80% more than if the disease is found and treated when the cancer first starts to develop. The patient's management and treatment regimen may also be significantly less physically traumatic in this case, resulting in a better quality of life and higher chance of survival.

Currently in oncology, CT and MR techniques are mostly used for initial diagnosis, and PET/CT imaging is often used for disease staging and management, meaning that doctors use the technologies to see if the patient's disease has spread and whether or not the patient is responding to the treatment. Molecular imaging technology is used to visualize not only whether the patient's tumor has decreased in size with treatment, but whether the cellular activity within the tumor has decreased. Every cancer patient should get molecular imaging tests during his or her treatment.

In the case of heart-disease, patients predominantly undergo ultrasound and SPECT procedures combined with invasive techniques such as cardiac catheterizations. Modern procedures include cardiac CT and state-of-the-art PET/CT that give physicians the ability to assess both the anatomy as well as the function of the heart in a non-invasive way. This is important to decide on the best treatment following symptoms or cardiac events such as chest pain or a heart attack.

CWM Are there differences between prevention and detection technology and procedures? Isn't technology such as this only available pursuant to doctors' orders?

ML Yes, there are differences. Some technologies are used primarily for detection. Molecular imaging is frequently used to find secondary sources of disease after initial diagnosis in oncology. Screening tests like mammography have made significant inroads into early breast cancer detection. Innovations in, in vitro diagnosis are paving the way to detecting early disease via blood testing. The newest addition to Siemens Healthcare is Siemens Diagnostics, headquartered in Deerfield, IL. They are working to develop new approaches to profiling patients who may have increased likelihoods of developing certain diseases.

CWM When you talk about "diagnostics", what do you mean exactly?

ML 'Diagnostics' today includes: Molecular Profiling, which can generate a risk profile, patient history, tests, like mammograms, data base knowledge, in vitro diagnostics – bloodwork and DNA workups. Together these things can be the ticket to enter the next level. You can pretty much capture someone digitally – it is the sensible use access to state of the art management. Therapy and technology are increasing the quality of life.

CWM Is prevention practice gaining any real steam in the medical community and health insurance industry?

ML Yes. In fact, more and more, patients are increasingly aware of their own health, family history and risk factors for disease. This, coupled with ongoing research to find diseases at earlier stages has begun to increase survival rates for many diseases thought to have been only terminal. Many conditions, such as Diabetes, for example, have gone from terminal to chronic.

CWM Do you believe technologically mobility is an important factor?

ML Yes, mobility is important, especially in small communities or rural areas that may not have regular access to some imaging technologies, like PET/CT and MRI.

CWM We heard that Siemens has developed "Pocket Ultrasound". What does this device do?

ML The P-10 Ultrasound is a small, portable ultrasound device that essentially fits inside the physician's pocket and can be used in situations