Diagnostic Imaging in a Global Perspective

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This seminar is to commemorate an overwhelming tragedy that took place in Japan 60 years ago; however, it is also an opportunity to look forward and concentrate on possibilities for using ionizing radiation for peaceful medical purposes.

"Diagnostic imaging", including examinations based on ionizing radiation, ultrasound, magnetic resonance and others, are regarded to be crucial in any medical setting in order to decide upon, plan and follow-up medical treatment. According to generally accepted, clinical experience within the medical community, some sort of medical imaging is necessary in a minimum of 25% of all patients seeking medical help.

It is not more than some hundred years since the world of medical diagnostic imaging was started. Diagnostic imaging was "born" in Wurzburg, Germany in November 1895 with a publication about the use of ionizing radiation for medical purposes by Professor Roentgen. However, currently it is regarded to be a crucial and mandatory part of all medical work worldwide.

Techniques most commonly used in diagnostic imaging include those using ionizing radiation such as conventional examinations, interventional examinations & procedures, Computed Tomography (CT) ("Cat-scan"), and nuclear medicine examinations (scintigraphy), including Positron Emission Tomography (PET), and those using non-ionizing radiation such as Ultrasound imaging (US), and Magnetic Resonance Imaging (MRI).

Although most people living in highly developed areas of the world takes it for granted that these type of services are available, it is estimated that around two-thirds of the world's population, i.e., more than three billion people has very limited or no access even to the most basic diagnostic imaging services, such as radiography of the chest or limbs.

In other words, few of us living in the highly developed parts of the world are aware of the fact that some 95% of diagnostic imaging services in the world is made available to less than 30% of the world's population (Figure 1), and that large areas of the world has

Figure 1. The unequal distribution of diagnostic medical services in the world.

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a "density" of radiologists of about one radiologist for up to 10 million people!

In countries with few resources (2/3s of the world), small and midsize hospitals provide conventional examination (95-98% of the whole service), with ultrasonography (2-4.999 %), and "high-tech" modalities such as CT (less than 0.001%) constituting a very small portion. On the other hand, in "rich" countries (1/3 of the world) less than 60% of the service is in the form of conventional examinations, and the rest is in the category of "high-technology"-examinations. This is while roughly 85% of any diagnostic problem can be solved by very conventional imaging methods.

Looking deeper into the situation in developing countries, usually two types of health care systems can be found. One is modern, effective, scientifically up-to-date, clean, very expensive, privately organized and accessible by a very small fraction of the population. The other system, which is the rest of it, is disorganized, old-fashioned, not very clean, and lacking many elements from basic equipment to staff.

Outside major cities, a general physician or other clinicians often are responsible for everything including diagnostic imaging. The main reason for this is lack of radiologist and the fact that the few specialists available prefer to work for the private sector located in the capital or other major cities. "PACS" hardly exists, and equipment is mostly old, ill maintained or not at all functioning.

Various factors are contributing to this unfortunate situation, and some of the most important ones are summarized below:

1. Not enough equipment installed, the reason of which is a lack of resources, lack of awareness, etc.
2. When equipment in place, it is often not functioning. The reason is usually a lack of spare parts and preventive basic maintenance.
3. When equipment is installed and functioning, it is often inadequately operated, the reason of which is insufficient training and education of medical staff.

In many industrialized, rich countries high technology examinations such as CT, MRI and PET are suspected to be used unnecessarily for patients where the diagnostic work could have been done with conventional X-ray equipment or ultrasound equipment.

So when is the use of Diagnostic Imaging meaningful? Based on the publication released by the European Commission in 2000, "Radiation Protection 118: Referral guidelines for imaging," a useful investigation is one in which the result-positive or negative-will alter management or add confidence to the clinician's diagnosis.

In other words, medical justification is mandatory! Firstly, this indicates that modern, sophisticated diagnostic imaging may be useful and justified in some settings, but totally "out of place" in others. Secondly, it indicates that diagnostic imaging as a "stand-alone" without being integrated into a national health system in best case may be questionable.

Our common vision (Table 1) in the WHO is to make safe and reliable diagnostic imaging services accessible to as many as possible, through provision of advice, guidelines, support, and assistance to "health-workers", administrators, politicians, and others involved about the necessity for safe and appropriate diagnostic imaging services under their own responsibility.

The WHO cannot supply equipment and "big money", and also is not able to force trained staff to stay in poor countries as long as interesting economic offers are coming from rich countries in need of medical expertise. This sort of "brain drain" is a major problem in many developing countries. The WHO, however, is aiming at supporting and assisting those working in the area of diagnostic imaging to do a better job regardless of their formal education and background. The aim is to assist them to improve both safety and quality of what they are doing.

The WHO activities within the field of diagnostic imaging concentrate on three main issues:

1. Practical education and training, i.e., "capacity transfer" to end-users. This is carried out by local experts supervised and supported by WHO and the members of the Global Steering Group for Education and Training in Diagnostic Imaging which was established in Geneva in 1999, and all major global and regional scientific societies like the International Society of Radiology, and so on, are members of it.
2. Advocacy to governments aiming for increased awareness of the need for diagnostic imaging services. The work and its responsibility should, however, be taken care of by local staff in close collaboration with national authorities, because it is the only way to assure sustainability.
3. Advocacy and research for "new", affordable technology.

Table 1. The vision of WHO on diagnostic imaging services and the means considered to achieve them

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<tr>
<th>Our common vision</th>
<th>Means suggested</th>
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<tr>
<td>Make safe and reliable diagnostic imaging services accessible to as many as possible</td>
<td>Improvement of education and practical training on • technical issues, including preventive maintenance of equipment • medical issues- administrative issues</td>
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<tr>
<td>Advice, guide, support, and assist &quot;health-workers&quot;, administrators, politicians, and others involved about the necessity for safe and appropriate diagnostic imaging services under their own responsibility</td>
<td>Introduction of digital equipment thereby • abolishing the need for film and chemicals • facilitating the introduction of teleradiology</td>
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equipment to improve safety, quality and equity of diagnostic imaging services to a largest possible portion of the world’s population.

The means suggested for reaching this goal are, firstly, improvement of education and practical training on technical issues, including preventive maintenance of equipment, medical issues, and administrative issues, and secondly, to look into possibilities for introducing digital equipment in order to abolish the need for film and chemicals and facilitate the introduction of teleradiology.