Computer-Assisted Radiology

Heinz Lemke

Editorial note: Professor Heinz Lemke of the Technical University of Berlin has been the organizer of the Computer Assisted Radiology meetings in Berlin (CAR '85, CAR '87). In anticipation of CAR '89, Professor Lemke has provided the following overview on Computer Assisted Radiology (also

known as Picture Archiving and Communication Systems [PACS]). CAR '89 will be held in Berlin from June 25 to June 28, 1989. For further information write to Professor Lemke.

NEW DIGITAL imaging modalities and more sophisticated image processing systems will have a profound effect on those areas of medicine that are concerned with imaging for representation, communication, archiving, diagnosis, and therapy planning.

It is widely expected that there will be an information science derived evolution in imaging for radiology and related departments. Computer assistance may be applied to image generation (ie, computer tomography, magnetic resonance imaging, digital radiography, and digital subtraction angiography), storing and transferring of images, and viewing, analysing, and interpreting images. The application of computers to these activities may be defined as computer assisted radiology (CAR). Principally, CAR will promote the transition from analog imaging systems to digital systems, integration of digital imaging modalities through picture archiving and communication systems (PACS), and the graduated employment of medical work stations for computer-assisted representation, communication, diagnosis, and therapy planning.

The advantages that are expected from this development are: (1) increased accessibility of image information; (2) improved reliability; (3) retention of dynamic diagnostic information; (4) transmission and display of images to multiple geographical areas; (5) ease of interaction between medical subspecialists, ie, radiologists with referring physicians; (6) expertise in subspecialties of diagnostic imaging can be widely disseminated; (7) studies are available to authorised viewers immediately after image acquisition; (8) recent studies and reports on a patient are readily available; and (9) examination sequencing, examination tailoring and integration of diagnostic data is made easier. All these aspects will have a considerable impact on patient management, on radiologists and on the health care system.

For patients, it should mean faster and more accurate diagnoses, less invasive procedures, fewer retakes and the possibility of improving the methods for restoring health through computer assisted therapy planning. For radiologists and related medical disciplines, CAR will produce a change in the working profile through activities relating to viewing, analysing, manipulating, and retrieving images on digital display work stations. For the health care system, more computers and associated equipment should mean more critical health technology assessment, an activity increasingly asked for and carried out in many countries by those who pay for the health service. It is expected to lead to more intensive examinations on when and where to purchase imaging equipment, on the length of imaging equipment replacement cycles, and on how to improve the infrastructure of medical imaging activities.

The advantages of CAR are many and of considerable significance. Their acceptance, however, is not only a matter of cost but also an awareness of their potential, and the willingness of the medical community to adapt to changes on their working profile.

Many questions have to be attended to, such as, is present technology cost effective? Which radiologic and clinical departments should be considered first and how can it be funded? What priority should be given to PACS and its interdependency to radiologic and hospital information systems? What are the tangible and intangible

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benefits? How can complexity and obsolescence of present technologies be dealt with? What will be the role of referring physicians and imaging when shifting from in-patient to out-patient medical care, and also how will staff qualification, training, unemployment, re-employment and additional employment be effected?

A further focus of attention is the design and application of medical work stations. They may be employed to assist diagnosis, reporting, and therapy planning. What capabilities should be provided for image, spatial, contrast, and temporal resolutions? Which image processing functions are really useful? Where does three-dimensional imaging and reconstruction show promise and how can acceptance of diagnosis and therapy work stations be improved? These are only a few of the questions CAR will catalyze.

The biannual symposia on CAR that commenced in Berlin, West Germany in 1985, have

highlighted the medical, technical, and social aspects of this new discipline. In preparing CAR symposia, papers are solicited and panel discussions organized that address themselves to the above questions and related problems. The result, hopefully, will be to develop the individual attitudes of medical, technical, and administrative staff towards the general theme and towards specific issues of introducing computer and communication systems into health care.

There has been a substantial increase in interest of physicians, computer scientists, and the general public in computer assisted radiology and computer and communication techniques in medicine. Responsible decision making on the application of the technologies and systems in medical health care should be encouraged. The CAR symposia provide the information basis on which a meaningful synergy of medicine and technology can be achieved.