and in the private sector. Because of the very high cost of the super conductor (SC) units which on the average cost over three quarters of a million US dollars a piece, there is a growing number of low field strength permanent units. These units tend to be somewhat limited in their capabilities (compared to the SC units) but offer a more cost effective solution. Twelve of the 19 MRI scanners in Pakistan are SC units. To the best of my knowledge 4 are capable of Diffusion/perfusion imaging.

The cost of MRI scanning also varies greatly. Ranging from Rs. 2000 for "Limited" studies (single sequence studies) to Rs.12000 for complete studies with contrast enhancement.

**Discussion**

Pakistan has an estimated population of 147.6 million. With 80 CT scanners this works out to one CT scanner for every 1.845 million people and one MRI scanner for 7.77 million people. This compares to one CT scanner for 1.74 million people in India and one CT scanner for 47000 people in the USA. The average cost of CT of the head in the USA is approximately USD250. (USD1=PKR59). These figures highlight the marked disproportion in the global distribution of healthcare facilities in general and high technology equipment in particular. These differences remain significant even if the relative wealth and economies of these countries are taken into consideration. The Gross Domestic Product (GDP) is a widely used measure of the economic performance. Pakistan has a GDP of USD2100 compared to the GDP of USA which is estimated at USD36300. This is only a 17 fold difference as compared to the '17 fold difference in the number of scanners. I accept that these comparisons are simplistic but still are of value as they underline the stark differences. Although the numbers and cost of neuro-imaging equipment compares favourably with other developing countries, it still falls far short of the requirements. This deficiency is most marked in the rural areas. The urban centres of Karachi and Lahore have a large proportion of these facilities. Karachi the largest city also has the largest installed base of these scanners with 22 CT and 7 MRI scanners, whereas the entire province of Baluchistan has one CT and no MR scanners.

The private sector has led the way in provision of these expensive machines. This has put a limitation on the cost of scanning. The oily units providing free services are in the public sector institutions but are constantly plagued by problems such as the lack of trained technical staff and frequent prolonged break downs.

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**Neurological Training in Pakistan**

S. S. Hyder
Liaquat National Hospital, Karachi.

Three years ago I had written a guest editorial (Training Neurologists in Pakistan - Meeting needs of the country. Pakistan journal of Neurology. Volume 6, number 2 January -June and July - December 2000:1-2) since then, I am happy to note 12 more neurologists have joined the elite work force in the country, That’s a 50% increase in the total strength of neurologists. Of these twelve, 10 are local FOPS and 2 have returned from abroad. It is hoped this new trend will continue.

As of October 1st 2003, there are 7 Neurology training programs in the country. (3 in Punjab, 3 in Sindh and 1 in NWFP) Currently there are 22 trainees (8 in Punjab, 14 in Sindh). The 1st FCPS in Neurology was obtained in 1995. Since then 30 more candidates have passed the FCPS Examination in Neurology. There are now more than 40 Neurologists in the country (24 in Karachi, 7 in Lahore, 7 in Rawalpindi/ Islamabad, 2 in Peshawar, 1 each in Quetta, Hyderabad. Multan and Faisalabad.

As of October 1st, 2003, there are 7 Neurology training programs in the country: where 22 trainees are under training. The nerve - CPSP requirement of having atleast 4 trainees in each program will further strengthen this number.

It seems if this trend continues we may eventually meet the needs of the country. The training program supervisors and trainers as well as CPSP need to be commended for working towards this goal. The quality of trainers/ supervisors also improving. The new FOPS Neurologists are also being inducted into the training programs which is also increasing the total strength of trainers / supervisors.

An area where more work is needed is Clinical Neurophysiology. It has been observed that barring one or two programs in the country, most of the trainees lack adequate opportunities to learn Electro Diagnostic
Neurophysiology. This may be due to inadequate services or supervisor's lack of interest / training in Neurophysiology. Perhaps one option to consider is to have Neurology Residents in various programs spend time in hospitals where Neurophysiology training opportunities are better available. The residents can rotate for 3 or 6 months at a time. For further training, Neurophysiology fellowships can be organized. Currently only one hospital is offering this. We need more fellows to be trained that will mean more fellowships at various hospitals.

Since Neurology has become a vast subject, subspecialty training should now be emphasized. Fellowships in stroke, epilepsy, movement disorder, neuromuscular disorder, rehabilitation and pediatric Neurology should be organized. Pediatric Neurology in particular should receive its due importance as there are many pediatric Neurology patients in the country and they are either cared for by pediatricians or adult Neurologists. There are many degenerative / metabolic disorders that affects pediatric population and appropriate investigations as well as genetic counseling are lacking.

The jobs of Neurology trainees / supervisor should not end upon completion of the individual's training. The supervisor should also help the individual in proper placement and continue mentorship / relationship.

The Neurologists can help the medical community by bringing about continuing medical education on topics that are poorly understood (epilepsy, stroke, CNS infection etc). Neurologists are one of the most respected specialists in the country. It is crucial that the trainees / supervisors impart this attitude to their trainees. In order to maintain this respect, they must practice Neurology in an ethical manner. The temptations to become commercial are high but they have to do what is right as their patients will have chronic and complicated diseases that will require a lot of empathy besides the cost effective management approach. Cross consultation with other Neurologists needs to be encouraged. Each Neurologist has something to offer. He / She may have a sub-specialty interest or better diagnosis and management techniques. I would even go as far as suggesting formation of a Neurology Board that would ensure that the standard practice parameters are followed by the Neurologists in the country. Practice guideline that meet the needs of the Pakistani Neurologist and his / her patients can also be standardized. Perhaps the Pakistan Neurological Society can play a role in this important step.

Public awareness is as important as physician education. There are many diseases in Neurology that carry taboos amongst local people with appropriate teaching, which can be removed. A patient or family that is aware of the diagnosis and its implication is more compliant with management and also does not get into the doctor shopping loop. Again the Pakistan Neurological Society or other similar organizations (such as Pakistan Stroke Society, Epilepsy Society etc) can take the lead. They are already involved in such work but perhaps at a local level only. A National level involvement is needed. Health Ministries, both Federal and Provincial should be approached there are many International Organizations such WHO that are always looking for private / NGO's that are willing to invest their time and effort.

Overseas Pakistani Neurologists could be a great resource. They are always keen and generous for helping their countrymen. They can assist academically as well as financially Scholarship Programs, endowments, library subscription, attendance at conferences, workshops / courses can all be sponsored with their help.

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