NOTES FROM ABROAD

Nuclear Medicine in Europe.
Considerations of Present Status and Future Trends

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The author reviews past developments and identifies present trends in European nuclear medicine. The influence of economic factors, medical attitudes, acceptance of innovation, and political considerations, as they affect the growth of this medical specialty, is stressed.

Twelve European countries have established separate departments of nuclear medicine within existing university systems. In seven countries nuclear medicine is practiced within the university by radiologists and in three others by internists. In Sweden and Denmark nuclear medicine procedures are performed in the departments of clinical physiology, reflecting the fact that nuclear medicine measures and images organ function. Nine nations have nuclear medicine departments in all university medical schools, and there are a total of 149 departments of nuclear medicine in European universities. Nuclear medicine is recognized as a separate medical specialty in 18 nations, however, educational requirements differ greatly, so that five countries require 4 yr of training, seven countries, 3 yr, and six countries, only 6 mo for certification.

The structural divergence of European nuclear medicine is also mirrored in the available professional societies. In 22 countries organizations exist for those engaged in nuclear medicine—11 nations have their own national society of nuclear medicine, whereas the other 11 have nuclear medicine sections within societies of radiology. Natural scientists are excluded from membership in eight of the 22 nuclear medicine organizations, whereas six countries have societies that accept only natural scientists.

Although western Europe has a total of 1,400 gamma cameras and 750 computer systems, growth depends heavily on national finances. It is estimated that the greatest number of Anger-type scintillation cameras has been installed in the Federal Republic of Germany (West) (498), followed by England/Ireland (206), France (134), and the Netherlands (104). When the number of gamma cameras installed in each nation is compared with the national populations, it is apparent that both West Germany and Sweden have the highest density of gamma cameras, followed by the Netherlands and Switzerland, respectively. Yugoslavia, Hungary, and Bulgaria had the most rapid growth rates in 1977, the last year for which data are reported (Table 1). The acquisition and distribution of computers has shown a development parallel to that of gamma cameras, with about 60% of the cameras being equipped with electronic data processing systems.

Considerable interest exists in Europe in single-photon emission tomography. It is hoped that this technology will increase the confidence of a final diagnosis when used in conjunction with standard projections obtained by conventional gamma cameras. Great interest has also developed in imaging with short-lived positron emitters. Thus, there appears to be a growing market for cyclotrons and for positron cameras. Indeed, there are presently 12 cyclotrons in West Germany alone, four of which regularly produce radionuclides for nuclear medicine use. Four positron cameras have been installed in western Europe, and ten additional installations are foreseen within the next few years in the Federal Republic of Germany alone. It is expected that increased investment in this specific area will have a great impact on studies of pathophysiology and pharmacology.

The importance of nuclear medicine in Europe may be judged from the size of the West German radioisotope market. It is assumed that 5,000 Ci were purchased in 1979 for diagnostic purposes. During 1979 Germany imported 30,000 Ci (included are Au-198 seeds); 16.5% was used for diagnostic applications, 61% for therapy, and 0.5% for scientific applications. The remaining 22%

TABLE 1. ESTIMATED INSTALLATIONS OF GAMMA CAMERAS AND INHABITANT [7] PER GAMMA CAMERA IN EUROPE 1978 WITH ANNUAL GROWTH RATE FROM 1977 TO 1978 (IN PART FROM PERSONNEL COMMUNICATION BY G. van Oortmarssen, G.D. Searle Nederland B.V.)*

Country	Population in millions	Installed γ-cameras 1978	Growth of installations as compared to 1977 (%)	Inhabitants per γ-camera (1000)
Austria	7.51	34	26	220
Belgium	9.84	63	5	160
Bulgaria	8.81	3	50	2940
CSSR	15.14	28	4	540
Denmark	5.1	37	6	140
England/Ireland	59.06	206	26	290
Finland	4.75	28	17	170
France	53.28	134	7	400
FRG	61.32	498	44	120
GDR	16.76	8	14	2100
Greece	9.36	13	44	720
Netherlands	13.94	104	22	130
Hungary	10.69	3	50	3560
Italy	56.7	86	32	660
Norway	4.06	22	10	180
Poland	35.01	11	10	3180
Portugal	9.8	4	0	2450
Rumania	21.85	7	0	3120
Spain	37.11	35	25	1060
Sweden	8.28	69	8	120
Switzerland	6.34	45	10	140
U.S.S.R.	261.57	73	20	3580
Yugoslavia	21.91	23	64	950
Subtotal Scandinavia	22.19	156	9	140
Subtotal Western Europe	324.3	1222	28	270
Subtotal Eastern Europe	391.74	156	20	2510

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was lost because of decay. Of the radionuclides used 99% are administered in hospitals and 1% by physicians in private practice. The total market value of the radiotracers used in 1979 was 75.2 million dollars. Radioisotope sales in Germany have experienced a steady rate of increase in recent years. In 1975 they were valued at 31.2 million, in 1976 they amounted to 42 million, and in 1977 49 million. Sales in 1980 are expected to approach 75.3 million dollars. Growth estimates for nuclear medicine procedures in Great Britain, France, Germany, Italy, and Sweden are expected to average 20% during 1980. Excluded are cardiac studies where the growth rate may be 400%.

The European market has attracted continental and numerous non-European suppliers of nuclear medicine equipment (Tables 2 and 3). Acceptable maintenance service, such as speedy repairs and immediately available replacement parts, depends on the existence of cooperative endeavors with national manufacturers and on local

TABLE 2. VENDORS OF NUCLEAR IMAGING EQUIPMENT I

Gamma cameras	Gamma cameras with own dedicated computer systems	Mobile gamma cameras with data acquisition and processing
Searle	Searle	Searle
Picker	Ohio Nuclear	Ohio Nuclear
Ohio Nuclear	Elscint	Picker
Elscint	CGR	General Electric
General Electric	Cordis-Baird-Atomic	Elscint
Toshiba	Berthold	
CGR	Union Carbide	
Philips	General Electric	
Nuclear Enterprises (EMI)	Raytheon	
Union Carbide		
Raytheon		
Cordis-Baird-Atomic		
Berthold		
Selo		

TABLE 3. VENDORS OF NUCLEAR IMAGING EQUIPMENT II

General purpose data processing and display systems	Positron cameras	Cyclotrons	Single photon emission tomographs
Digital Equipment Corp.	Scanditronix	Scanditronix	Searle
ADAC Laboratories	Cyclotron Corporation	Nucletronix	General Electric
Informatek	FG & G Ortec	Cyclotron Corp.	Union Carbide
Medical Data Systems (Medtronic)	Atomic Energy of Canada Ltd	Atomic Energy of Canada Ltd. (Japan Steel Works Ltd)	J & P
Artronix			CMS 7-pinhole technique
Philips			Selo
Varian			
Krupp Atlas-Elektronik			
Elscint			

distributors. Service contracts, particularly those for computers, appear to be too expensive for the European market. There may be a development towards leasing, or 5-yr service contracts, with continuous updating included in the price of the equipment. Although after-sales service and maintenance of nuclear medicine equipment are considered to be important, in-house quality control appears to receive less attention. Routine testing on a weekly or monthly basis is seldom performed.

Computers in nuclear medicine are used primarily with gamma cameras for data acquisition, processing, and image and kinetic display. The more automated systems are preferred by smaller hospitals and private practitioners of nuclear medicine. General purpose systems appear to gain increasing acceptance, especially for cardiovascular procedures.

Five journals of nuclear medicine are published in Europe; the *European Journal of Nuclear Medicine*, *Nuclear Medicine*, *The Journal of Nuclear Medicine and Allied Sciences*, *NUC-Compact*, and *Der Nuklearmediziner*. Numerous medical specialty and scientific journals publish papers related to nuclear medicine, particularly journals of radiology, medical physics, and computer science.

The most important scientific meetings of the European nuclear medicine community are the International Annual Meeting of the Society of Nuclear Medicine, the Congress of the European Nuclear Medicine Society, and the Radioaktive Isotope in Klinik und Forschung, in Bad Gastein, Austria.

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