Survey of Nuclear Medicine Physicians, Scientists, and Facilities—1986

"The Committee has learned a great deal from the study... additional surveys are needed to keep nuclear medicine manpower data pertinent and up-to-date."

The Society of Nuclear Medicine's Manpower Survey Committee* has generated a database of nuclear medicine physicians, scientists and institutions throughout the United States. Although the response rate for institutions was low (29%), substantial information was obtained. Comparisons with other surveys, in addition to judgments of the Committee, suggest the responding institutions actually provide a greater proportion of the total nuclear medicine services and personnel than implied by the response rate.

There were few surprises in the pattern of practice; most of the results had been predicted qualitatively, but needed quantitative support. The following findings of the survey are of particular interest.

Nuclear Medicine Physicians

A profile of the average nuclear medicine physician was compiled from the results.

Nuclear Medicine Physician Profile

95%	male
50	years old
11%	minority
14	years in nuclear medicine
74%	work part-time in nuclear medicine
35%	consider nuclear medicine their primary specialty
57%	consider radiology their primary specialty
65%	certified by ABNM
$133,000	average annual income
53%	derived from nuclear medicine
70%	assess balanced manpower supply in their geographic area
24	hours per week spent in nuclear medicine

About two-thirds of all nuclear medicine physicians are between 40 and 60 yrs old, indicating a potential future decline in the total number in the field (Fig. 1). The number of years physicians have been engaged in nuclear medicine are shown in Figure 2.

More than half of nuclear medicine physicians consider radiology their primary specialty (Table 1). Thirty-five percent consider nuclear medicine their primary specialty. Similarly, while 55.6% have residency and/or fellowship training in nuclear medicine, 60.3% have radiology residency and/or fellowship training (Table 2).

Basic information on certifications of responding nuclear medicine physicians is provided in Table 3. There were 1,775 individuals certified by the American Board of Nuclear Medicine (ABNM) who responded to this survey. That constitutes 50% of those certified by ABNM as of 1986.

The annual professional before tax net income of respondents is provided in Table 4. This information should be used with caution for several reasons. First, there is a large variation by type of remuneration. Second, information is available from only 29% of the institution's using nuclear medicine physicians, and only 43% of the physicians in those institutions responded to the question on income. However, the income information could be useful if used as a guide and in general terms.

The average net income of nuclear medicine physicians who responded was $133,000, with 53% of this income coming from nuclear medicine. The reported percentage of income derived from nuclear medicine varied from 2% to 100%. Incomes of salaried nuclear medicine physicians averaged $94,000, compared to $150,000 for those paid by fee for service. Incomes ranged from $35,000 to $250,000 (several higher figures were recorded, but excluded because of questions of validity and usefulness to this survey).

The average nuclear medicine phy-

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sician works 50 hr per week with 24 hr (48%) in nuclear medicine. Fifty percent of this time is spent clinically, including 20% in cardiovascular nuclear medicine. Administration takes up about 22% of the time (Table 5).

Half of the responding nuclear physicians work in private non-profit hospitals, as can be seen in Table 6. The number of institutions for which a nuclear medicine physician works varies from one to four with an average of 1.7. It is not clear why no respondents said they worked in military or other federal institutions; perhaps they answered VA hospitals..

The percentage of nuclear medicine physicians that perform nine selected modalities other than those traditionally performed in nuclear medicine is shown in Table 7. More than half of nuclear medicine physicians do ultrasound and diagnostic radiology procedures. The other modalities are done by a minority of nuclear medicine physicians.

Table 8 reports the ethnic origin of respondents.

Approximately 90% of the respondents expected to continue in nuclear medicine, but about half of those expected to combine nuclear medicine with other medical specialties. Two percent planned to change to another specialty and about 10% planned to retire in a few years.

TABLE 1
Primary Specialties of Nuclear Medicine Physicians (N = 2752)

%	Specialty
35.0	Nuclear Medicine
57.1	Radiology
.0	Pathology
3.2	Internal Medicine
1.6	Physicist
1.6	Radiopharmacist
1.6	Other

TABLE 2
Residency/Fellowship Training
(Percentages add to more than 100% because some completed more than one residency/fellowship) (N = 2752)

%	Type of training
55.6	Nuclear Medicine
60.3	Radiology
27.1	Internal Medicine
3.2	Pathology
9.6	Other
8.0	No formal nuclear medicine residency/fellowship

TABLE 3
Certifications
(Percentages add to more than 100% because some have more than one certification) (N = 2752)

%	Certification
64.5	ABNM
27.2	ABR—Diagnostic Radiology
.0	ABR—Therapeutic Radiology
32.2	ABR—General Radiology
15.1	ABR—Special Competence in Nuclear Medicine
3.5	ABP—Pathology
.0	ABP—Radioisotopic Pathology
17.0	ABIM
.0	ABSNM
5.1	Other

TABLE 4
Nuclear Medicine Physicians' Average Annual Income by Type of Remuneration and Sex

Category	Average (N)	Range
Salary	$ 93,719 (479)	($45–$170,000)
Fee for Service	$150,829 (1,004)	($35–$250,000)
Contractual	$112,500 (88)	($75–$150,000)
Other	$160,000 (88)	($150–$170,000)
Males	$130,165 (1,485)	($35–$250,000)
Females	$135,172 (87)	($120–$150,000)

TABLE 5
Distribution of Hours Spent in Nuclear Medicine According to Activity

Hours/ Week	% of Time	Activity
5.3	22.4	Administration (includes quality control, supervision of personnel, indirect patient care, etc.)
2.7	11.4	Teaching
2.6	11.0	Research
5.0	21.1	Cardiovascular Nuclear Medicine
7.1	30.0	Other Radionuclide Studies
0.4	1.7	In Vitro
0.5	2.1	Therapy
0.1	0.0	Other
23.7	99.7	TOTAL

TABLE 6
Type of Institution in Which Nuclear Medicine Physicians Work (Percentages add to more than 100% because some work in several institutions) (N = 2358)

%	Type of institution
51.9	Private Non-Profit Hospital
20.3	Private For-Profit Hospital
20.3	Private Practice
18.6	Veterans Administration
18.6	University Medical Center/Teaching/Research
16.7	Private Out-Patient
9.3	Group Practice—Independent
5.5	Group Practice—HMO
5.5	State/County/Parish/City Institution
3.6	Other
1.9	Free-Standing Imaging Center
0	Military or Other Federal Institution
0	Mobile Unit

TABLE 7
Other Modalities Performed by Nuclear Medicine Physicians (Percentages add to more than 100% because some perform more than one modality) (N = 2577)

%	Type of modality
57.6	Ultrasound
30.6	Bone Mineral Density
1.8	NMR
1.8	Pathology
66.1	Diagnostic Radiology
8.5	Therapeutic Radiology
10.3	Clinical Endocrinology
5.1	Clinical Cardiology
34.1	Radiation Safety
3.5	Other

Chairman's Remarks

Richard A. Holmes, chairman of Manpower Committee and president-elect of the Society, comments: "I am very pleased to see the study completed. It represents a fine effort of many people over many years. The Committee has learned a great deal from the study, but rather than comment on its content now, the Committee is presenting the findings to the breadth of the Society and will await responses from the membership. It is important that future studies be performed in light of the lessons learned here in terms of methodology. Additional surveys are needed to keep nuclear medicine manpower data pertinent and up-to-date." ■

TABLE 8
Ethnic Origin of Responding Nuclear Medicine Physicians (N = 2666)

%	Ethnic origin
88.5	White
1.7	Black
0	Hispanic
1.6	Native American
8.2	Asian/Pacific Islander

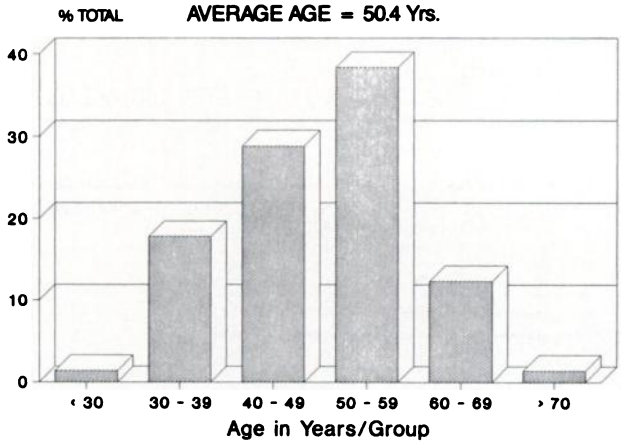

Figure 1. Age of Nuclear Medicine Physicians

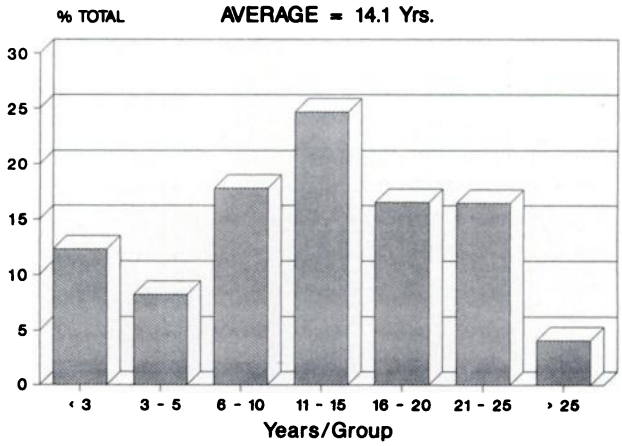

Figure 2. Physicians' Years in Nuclear Medicine

Nuclear Medicine Scientists

A profile of the average nuclear medicine scientist was compiled from the results:

Nuclear Medicine Scientist Profile

63%	male
42	years old
9%	minority
10	years in nuclear medicine
70%	time spent in nuclear medicine
45%	physicists
26%	pharmacists
$53,000	average annual income
68%	derived from nuclear medicine

Approximately three-fourths of responding nuclear medicine scientists are physicists or pharmacists (Table 9). The rest are computer scientists and radiochemists. It is not clear why no pharmacist identified himself as a radiopharmacist; perhaps the question was interpreted to refer to training rather than present duties. Inclusion of the option "nuclear pharmacist" in the questionnaire may have yielded a more accurate response.

The average annual income of responding nuclear scientists is $53,000. Additional information regarding scientists' incomes is not provided due to the small number of respondents.

About 30% of nuclear medicine scientists compared with more than 50% of physicians work in private non-profit institutions (Table 10). Some nuclear medicine scientists work in several institutions; respondents reported up to seven institutions with an average of 1.7.

Nuclear medicine scientists work an average of 43 hr per week, 33 in nuclear medicine. Table 11 provides a distribution of the hours worked in

(continued on page 5)

TABLE 9
Nuclear Medicine Scientists by Specialty (Position) (N = 482)

%	Specialty
45.0	Physicist
9.3	Radiochemist
0	Radiopharmacist
18.1	Computer Specialist
26.0	Pharmacist
1.6	Technologist

TABLE 10
Type of Institution in Which Nuclear Medicine Scientists Work (N = 264)

%	Type of Institution
30.8	Private Non-Profit
23.1	State/County/Parish/City Institution
15.2	University Medical Center/Teaching/Research
7.7	Private Out-Patient
7.7	Private Practice
7.7	Veterans Administration
7.7	Other
	TOTAL

TABLE 11
Distribution of Hours Spent by Nuclear Medicine Scientists in Nuclear Medicine According to Activity (N = 482)

Hours/ week	% of time	Activity
11.7	35.0	Administration (includes quality contrl, supervision of personnel, indirect patient care, etc.)
2.1	6.3	Teaching
3.8	11.4	Research
3.6	10.8	Cardiovascular Nuclear Medicine
5.8	17.4	Other Radionuclide Studies
0	0	In Vitro
0	0	Therapy
6.4	19.2	Other
33.4		TOTAL

TABLE 12
Ethnic Origin of Responding Nuclear Medicine Scientists (N = 482)

%	Ethnic origin
91	White
0	Black
0	Hispanic
0	Native American
9	Asian/Pacific Islander

(continued from page 4)

nuclear medicine by type of activity.

More than 91% of the responding nuclear medicine scientists are white, with the rest being Asian or Pacific Islanders (Table 12). No respondents identified themselves as black, Hispanic, or native American.

Nuclear Medicine Facilities

A profile of the average nuclear medicine department also was compiled from the results:

Nuclear Medicine Facility Profile

- 1952 imaging procedures per year
- 14,118 RIAs per year
- 3.1 physicians per facility
- 0.9 scientists per facility
- 13.3% facilities with perceived shortage of physicians
- 21.8% facilities with perceived shortage of scientists

Tables 13–23 provide detailed data on procedures and staffing of 1,235 nuclear medicine facilities in 1,135 hospitals and 100 non-hospital settings in the United States. An overview by hospital bed size is provided in Tables 13. The responding hospitals averaged nearly 2,000 imaging procedures and 14,000 RIAs during 1986. The services were provided with an average of three nuclear medicine physicians and one nuclear medicine scientist per institution (Table 18). Most of the physicians and scientists are working part-time (Tables 18–19).

Overall, the shortage of physicians is slight except in the largest hospitals (over 1,000 beds). In general, shortages of scientists are much greater, with more than 20% of facilities perceiving a shortage in their geographic area (Tables 20–21). Figure 3 indicates geographic regions.

More than half of all departments

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TABLE 13
Overview of Average Nuclear Medicine Departments by Bed Size of Hospital

Bed size	No. of hosp.	No. imag. proc. per year	No. RIAs per year	Aver. no. phys.	% Facil. short of phys.	Aver. no. sci.	% Facil. short of sci.
0–99	200	670	1,110	2.1	6.1	0.3	11.5
100–199	309	1,404	4,633	2.7	15.3	0.5	25.6
200–299	220	2,246	4,167	3.8	15.0	1.1	19.5
300–399	153	3,097	17,127	3.7	18.9	0.6	22.7
400–499	79	3,411	22,253	5.1	19.0	2.0	27.0
500–749	115	5,244	29,747	3.4	4.5	2.0	27.3
750–999	39	5,514	25,919	2.1	0	1.2	29.4
1,000 & up	20	5,419	21,033	4.0	25.0	2.7	25.0

TABLE 14
Type of Institution Providing Nuclear Medicine Services (N = 1205)

No. of facilities	%	Type of institution
694	55.6	Private Non-Profit Hospital
143	11.5	State/County/Parish/City Institution
107	8.4	Private For-Profit Hospital
80	6.4	University Medical Center/Teaching/Research
65	5.2	Veterans Administration
45	3.6	Private Practice
36	2.8	Private Out-Patient
36	2.8	Group Practice—HMO
21	1.6	Group Practice—Independent
10	0.8	Military or Other Federal Institution
10	0.8	Other
5	0.4	Free-Standing Imaging Center
0	0.0	Mobile Unit

TABLE 15
Percentage Distribution of Nuclear Medicine Services by Type of Department

	% Institutions reporting service in a type of department				
Type of department	Clinical tracer studies	Imaging excluding cardiac	Cardio-vascular NM	RIAs	Radio-nuclide therapy
Autonomous dept. of NM	15.2	19.2	18.2	6.9	18.5
NM as a div. of radiology	27.1	69.0	58.1	5.5	44.5
NM as a div. of pathology	12.6	6.1	5.5	13.7	5.2
NM as a div. of medicine	3.5	3.3	3.8	1.4	3.5
Pathology	26.6	0.4	0.4	56.6	0.4
Cardiology	0	0.4	4.2	0	0
Medicine	0	0.8	0	0	1.3
Radiation therapy	0	0	0	0	7.2
Other	1.7	0	0.4	1.4	1.3
Not performed	13.4	0.8	9.3	14.6	18.1
TOTAL	100.1%	100.0%	99.9%	100.1%	100.0%
Number of respondents	**1,155**	**1,225**	**1,180**	**1,095**	**1,160**

TABLE 16
Percentage of Departments Performing Each Nuclear Medicine Procedure by Type of Department

Type of department	N	% of depts. reporting provision of the service				
		Clinical tracer studies	Imaging excl. cardiac	Cardio-vascular NM	RIAs	Radio-nuclide therapy
Autonomous dept. of NM	260	67.3	90.4	82.7	28.8	82.7
NM as a div. of radiology	850	36.8	99.4	80.6	7.1	60.7
NM as a div. of pathology	200	72.5	37.5	32.5	75.0	30.0
NM as a div. of medicine	50	80.0	80.0	90.0	30.0	80.0
Pathology	645	47.6	0.8	0.8	96.1	0.8
Cardiology	55	0	9.1	90.9	0	0
Medicine	25	0	40.0	0	0	60.0
Radiation therapy	84	0	0	0	0	100.0
Other	40	50.0	0	12.5	37.5	37.5

TABLE 17
Average Annual Number of Procedures Performed by Bed Size of Hospital (Number of respondents)

Bed size	Clinical tracer	Clinical imaging	Cardiac studies			RIAs	Radionuclide therapy
			Thallium 201	Equilibrium gated	First pass		
0–99	7 (45)	494 (125)	108 (45)	53 (45)	15 (15)	1110 (25)	5 (50)
100–199	23 (135)	1,128 (215)	154 (175)	82 (160)	40 (40)	4633 (70)	16 (145)
200–299	57 (100)	1,824 (160)	214 (140)	168 (140)	40 (50)	4167 (70)	32 (130)
300–399	65 (109)	2,199 (133)	376 (134)	405 (129)	117 (65)	17127 (55)	30 (99)
400–499	46 (45)	2,582 (50)	376 (50)	369 (50)	84 (20)	22253 (25)	25 (50)
500–749	45 (80)	3,886 (95)	468 (95)	591 (80)	299 (40)	29747 (60)	51 (85)
750–999	104 (24)	3,752 (34)	791 (29)	738 (24)	233 (24)	25919 (25)	56 (29)
1,000 & up	84 (10)	3,656 (10)	981 (10)	782 (10)	0	21033 (5)	48 (10)

TABLE 18
Average Number of Physicians and Scientists Practicing Nuclear Medicine by Bed Size of Hospital (Number of responding institutions)

Bed size	Average no. physicians	% full time (more than 32 hrs/wk)	Average no. scientists	% full time (more than 32 hrs/wk)
0–99	2.1 (190)	12.8 (200)	0.3 (140)	0.0 (80)
100–199	2.7 (304)	26.1 (309)	0.5 (219)	24.5 (120)
200–299	3.8 (195)	30.5 (220)	1.1 (150)	18.7 (100)
300–399	3.7 (148)	22.1 (153)	0.6 (128)	57.1 (98)
400–499	5.1 (79)	18.5 (79)	2.0 (59)	24.3 (49)
500–749	3.4 (115)	49.3 (115)	2.0 (85)	62.5 (80)
750–999	2.1 (39)	76.1 (39)	1.2 (39)	2.4 (34)
1,000 & up	4.0 (20)	68.8 (20)	2.7 (15)	37.5 (5)

TABLE 19
Distribution of Professional Time

Profession	% of total professional time devoted to nuclear medicine				
	% FT	>50%	25–50%	10–24%	<10%
Physicians	21.5	7.3	12.0	27.0	2.1
Scientists					
Physicists	19.4	2.8	19.4	11.1	47.2
Chemists	75.0	25.0	0	0	0
Pharmacists	80.0	0	0	0	20.0
Computer scientists	40.0	20.0	20.0	20.0	0
Other scientists	0	0	100.0	0	0
All scientists comb.	**29.6**	**5.5**	**14.8**	**16.7**	**33.3**

FT = More than 32 hours per week

TABLE 20
Number of Physician and Scientist Vacancies in Responding Facilities by Region

Region	No. of facilities	No. of physician vacancies	No. of scientist vacancies
1	84	1	1
2	111	8	3
3	157	8	8
4	169	12	10
5	209	15	8
6	33	2	1
7	139	11	8
8	76	2	1
9	38	3	5
10	129	9	3
US	**1,145**	**71**	**48**

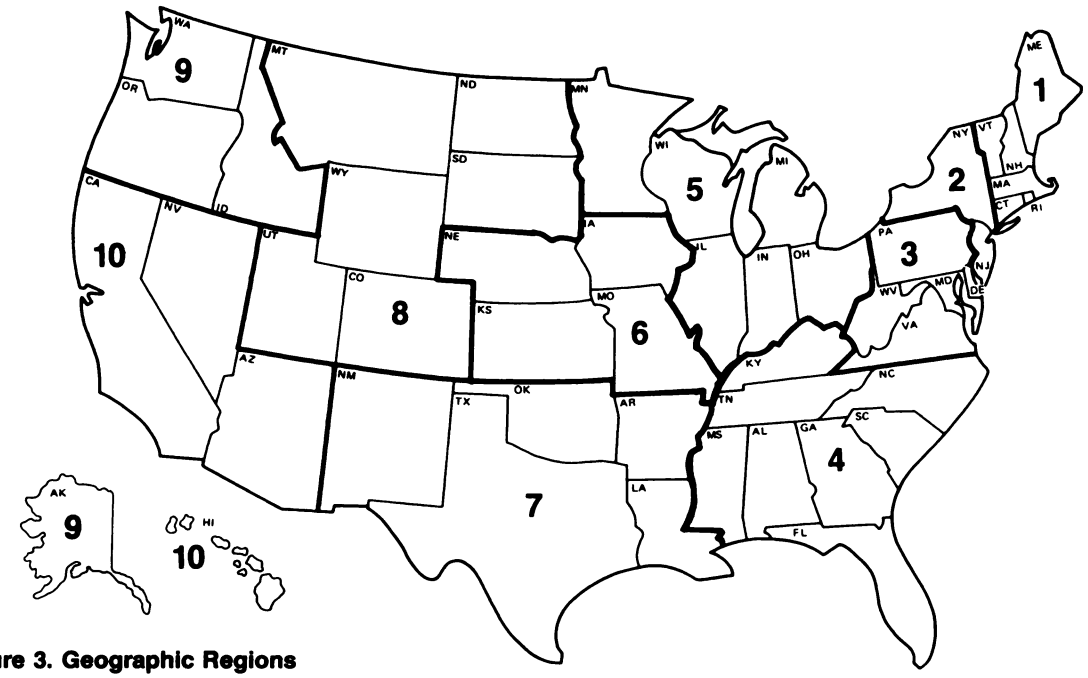

Figure 3. Geographic Regions

TABLE 21
Number of Physician and Scientist Vacancies in Responding Hospitals by Hospital Bed Size

Bed size	No. of hospitals	No. of physician vacancies	No. of scientist vacancies
0–99	185	6	0
100–199	284	6	0
200–299	205	4	0
300–399	143	24	0
400–499	79	10	14
500–749	110	15	30
750–999	39	0	0
1,000 & up	20	5	0
TOTAL	**1,065**	**70**	**44**

TABLE 22
Respondents' Perception of the Supply of Nuclear Medicine Physicians in Their Geographic Area

Region	N	% short supply	% balanced	% surplus
1	83	13.3	73.5	13.3
2	112	12.5	67.9	19.6
3	156	14.7	70.5	14.7
4	172	15.1	69.2	15.7
5	211	13.3	69.7	17.1
6	34	5.9	67.6	26.5
7	140	15.0	72.1	12.9
8	74	12.2	68.9	18.9
9	39	10.3	79.5	10.3
10	129	11.6	69.0	19.4
US	**1,150**	**13.3**	**70.3**	**16.4**

TABLE 23
Respondents' Perception of the Supply of Nuclear Medicine Physicians in Their Geographic Area by Hospital Bed Size

Bed size	No. of hospitals	% short supply	% balanced	% surplus
0–99	165	6.1	87.9	12.1
100–199	294	15.3	71.1	13.6
200–299	200	15.0	75.0	10.0
300–399	148	18.9	47.3	33.8
400–499	79	19.0	62.0	19.0
500–749	110	4.5	77.3	18.1
750–990	34	0	88.2	11.8
1,000 & up	20	25.0	75.0	0

(continued from page 5)

responding were located in private non-profit hospitals. (Table 14).

Tables 15 and 16 provide a detailed look at the procedures performed according to the type of department providing the service. Because of the complexity of these tables, an example of how to read them is in order. Table 15 shows that of all institutions answering the question, "Where are clinical tracer studies performed?", 15.2% perform them in autonomous departments of nuclear medicine. Table 16 shows that of the 260 autonomous nuclear medicine departments, 67.3% conduct clinical tracer studies. In summary, Table 15 gives data on where within an institution a given service is provided, while Table 16 tabulates complementary data on what type of services a particular type of department provides.

Key findings include:

- Clinical tracer studies are far less likely to be done by the institutions if nuclear medicine is located in the radiology department than if it is an autonomous department or located in either the pathology department or the division of medicine.
- Nearly 70% of all departments doing clinical imaging, and 60% doing cardiovascular nuclear medicine are located in divisions of radiology.
- RIAs are not likely to be performed if nuclear medicine is an autonomous department or a division of radiology.

The average number of selected types of procedures performed per hospital by hospital bedsize is provided in Table 17.

For all nuclear medicine procedures, more institutions increased than decreased the work load in 1986 compared to 1985 (Fig. 4). This was especially true for cardiovascular nuclear medicine. The majority of the departments, however, had no change in workload for radionuclide therapy, and about 45% had no change for clinical tracer studies.

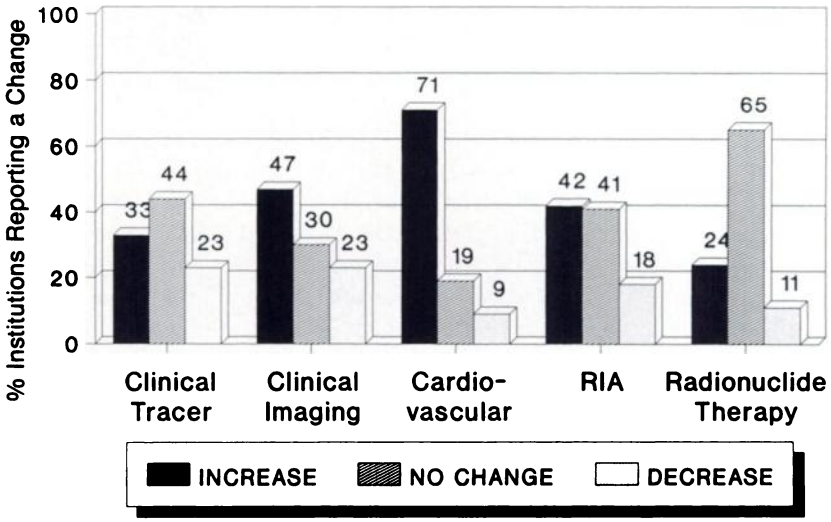

Figure 4. Nuclear Medicine Workload, 1985–1986

Responding institutions reported 3,645 nuclear medicine physicians working in their institutions, or an average per bedsize category ranging from 2.1 to 5.1. The number of physicians per hospital (Table 18) increased to 5.1 for hospitals with 400 to 499 beds, but then decreased for larger hospitals, possibly because larger bed size may represent non-acute beds (such as rehabilitation or chronic care), which require fewer nuclear medicine services. About three-fourths of these physicians were working part-time in nuclear medicine (Table 19).

Responding institutions reported employing 797 nuclear medicine scientists, with an average per bedsize category ranging from 0.3 to 2.7 (Table 18). About two-thirds of these scientists worked part-time in nuclear medicine (Table 19).

The number of nuclear medicine physician and scientist vacancies by region and hospital bed size are given in Tables 20 and 21. A small number of vacancies were reported by the responding institutions. The respondents' perceptions of the supply of nuclear medicine physicians is given in Tables 22 and 23. The supply appears to be in balance with significant shortages noted only in hospitals of 1,000 or more beds and a surplus possible in Region 6.

Future Manpower Surveys

The committee hopes that this first survey of nuclear medicine physicians will provide the incentive for future surveys and that the responses to those surveys will be more complete. Since sampling biases have not yet been explicitly defined, the committee recommends the results of this survey be used as general guidelines, but not for providing precise estimates, nor for projecting estimates for the total population of facilities, nuclear medicine physicians, or scientists. Future reports will present more detailed cross-tabulations and analyses of the survey data. The Manpower Survey Committee hopes to repeat similar surveys at intervals to increase the database and to observe trends in nuclear medicine practice. The Committee encourages interested parties to respond to the findings of this survey, and to suggest topics for future surveys.

Reference

1. J Nucl Med Technol 1985;13:187–195.

History and Methodology of the Manpower Survey

Questions relating to manpower resources in medicine are pivotal in an era of increasing public, medical, and governmental concerns about the quality of, access to, and cost of medical care. In 1980, the Graduate Medical Education National Advisory Committee (GMENAC), studying physician requirements and supply, estimated a general physician surplus by 1990. That report and a more detailed review of nuclear medicine by the Office of Graduate Medical Education in 1982, concluded relative to need, the supply of nuclear physicians would be balanced or show a slight excess by 1990. Those conclusions, however, were based on various assumptions about the supply. It was generally recognized that those assumptions were very uncertain.

A limited survey of the eastern states in 1982-1983 by the Manpower Committee of the Society of Nuclear Medicine demonstrated the difficulty of obtaining accurate manpower information due to great heterogeneity in the practice patterns of nuclear physicians. From 5% to 100% of a practitioner's time might be devoted to nuclear medicine and, of that time, a variable fraction would actually be spent in clinical services. Thus, even if all "nuclear physicians" could be identified, a head count would not provide an accurate estimate of available manpower supply.

Realizing accurate manpower data and practice profiles would not only satisfy the curiosity of the nuclear medicine community but, also would be a necessary tool for planning things such as training programs, the Federated Council of Nuclear Medicine Organizations (FCNMO) began to develop a manpower survey of physicians and scientists. After FCNMO disbanded, the Society of Nuclear Medicine formed a Manpower Survey Committee, consisting of representatives from FCNMO, and charged it with the task of developing a manpower database. Accordingly, in 1987 the Committee undertook a survey of nuclear physicians and scientists and nuclear medicine facilities in an effort to measure manpower supply, to develop a picture of practice patterns, and to examine the practice environment.

The project was organized into three phases. Phase 1 entailed updating and revising the list of facilities that perform nuclear medicine procedures. The list used in the 1984 technologist survey was used as the starting point. (*1*) This list was augmented by contacting the Nuclear Regulatory Commission and the agreement states and obtaining a list of all facilities that hold radioactive licenses. Each facility was sent a card asking if they performed nuclear medicine studies and, if so, for a contact person in nuclear medicine, preferably the director. The list was then purged of all medical laboratories, private physician offices, and other non-nuclear medicine facilities. The final list of 4,258 facilities consisted mainly of hospitals, but also included imaging centers.

Phase 2 involved the actual design and implementation of the survey. The committee designed the comprehensive questionnaires for both institutions and individuals.

A pretest questionnaire was sent to 40 institutions and revised based on the results. The final, revised questionnaires were sent to 4,258 nuclear medicine facilities in 1987. In addition, the Committee sent two follow-up mailings later that year to improve the response rate. Because of the timing of the survey, it is assumed that most statistics refer to 1986.

Each facility answered questions about the institution and then gave a separate questionnaire to each physician and scientist who performed nuclear medicine procedures.

The presentation of results of the report is Phase 3, and it is based on completed survey forms from 1,235 institutions, 2,752 nuclear medicine physicians and 482 nuclear medicine scientists. As stated earlier, while the response rate for institutions was low, much information was obtained. Compared to the American Hospital Association statistics of hospitals offering nuclear medicine, our survey showed less hospitals with under 99 beds and more hospitals with over 500 beds, suggesting that our data represents a greater proportion of nuclear medicine procedures than that implied by a random sample.

The responding institutions reported 3,645 associated physicians and 2,752 (76%) of these filled out individual questionnaires. The American Medical Association master file contains 4,185 physicians who list nuclear medicine as one of their specialties and the American Board of Nuclear Medicine has 3,583 certified diplomates. If one assumes that physicians who answered the survey are predominantly those who consider themselves nuclear medicine specialists and who come from the same population as those listed in the AMA files, one can come to the unverified, but reasonable conclusion, that our survey is representative of the majority of nuclear medicine manpower. ■