The Impact of the Prospective Payment System on the Delivery of Nuclear Medicine Services

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The Society of Nuclear Medicine—Technologist Section conducted this study to evaluate the effect of the Medicare Prospective Payment System (PPS) on nuclear medicine technologists (NMTs) and services. This is the second survey on this topic, the first being conducted in 1985 (*1*). In most cases, the results of the 1987 survey are compared to the 1985 survey to determine whether there have been significant changes. Questions were added to the 1987 survey concerning manpower practices and supply which are also part of this report.

The first survey was designed to assess the effect of PPS on nuclear medicine departments at the early implementation stage. The second survey collected follow-up information to develop trend data. The following questions guided the design of these surveys:

- How has the PPS affected the delivery of nuclear medicine in the hospital setting?
- What changes in nuclear medicine do technologists attribute to PPS, including changes in the following: number of studies, number of staff and staff benefits, effect on budget, effects on patients and patient referrals?

Survey Methods

The questionnaire was mailed to a specialized mailing list constructed by the Technologist Section to generate the highest amount of feedback. Our mailing list, obtained for use in a detailed manpower survey in 1985 and in the 1985 PPS survey and recently updated, included a contact person (either a Chief Technologist/Administrator or Physician Director) in all nuclear medicine departments in the United States, including mobile units that have nuclear medicine personnel. The survey and cover letter were mailed to 5,595 nuclear medicine departments on August 14, 1987. Those that did not respond to the first mailing were sent a second mailing on September 21, 1987.

A total of 1,245 questionnaires were returned, a 22% response rate. Responses were tabulated and entered into the computer. Thirteen (13) responses were not entered for various reasons. The most common reason was that the facility did not have nuclear medicine. The responses to the questions are summarized in Tables 1–18. Furthermore, data on manpower issues are summarized in Tables 16–18.

Tabular Analysis

Tables 1–18 contain data gathered from the survey results. However, it should be noted that, due to ambiguous construction, results from the survey question concerning radiopharmacy services have been deleted. Resultant responses varied with each individual.

Tables 1–3 reflect the demographics of the individuals and institutions surveyed. Eighty percent of the respondents re-

ported that their facility was under the PPS system. A significant increase in administrative personnel (director or administrative technologist) in those people completing the survey form was seen. In 1985, the combined categories represented 51% while in 1987 it represented 83%. It is assumed that the data is therefore more reliable for the 1987 survey because administrative personnel have direct access to pertinent data while staff technologists and others may not. In addition, 99% of the survey respondents indicated that their facilities had provided nuclear medicine services for longer than 12 months.

Of interest, responses to a question not originally asked on the 1985 survey reveal that 46% of the respondents experienced a decrease in occupancy rate while 27% reported an increase in occupancy of between 1 and 10% (Table 4). Table 4 further summarizes this percentage change in occupancy rate in relation to the increase and decrease responses.

New imaging radiopharmaceuticals and techniques introduced since the 1985 survey certainly have impacted upon the total number of nuclear medicine studies performed. Moreover, the continuing effect of PPS on the volume of nuclear medicine services and scheduled hours of service (Tables 5–7) highlights significant trends. Data in Table 5 indicate a continuing effort to provide service on an outpatient basis. However, some increase for inpatient services is evidenced by the fact that 27% of respondents reported an increase of inpatient services. The availability of weekend, evening, or on-call services instituted within the last 12 months or for more than 12 months is assessed in Table 6. This question was not asked in the 1985 survey. Of the respondents who indicated that services were available for more than 12 months, 278 reported the availability of weekend services; 885 reported the availability of on-call services. A small number of respondents (13%) reported implementation of the three types of services within the last 12 months. There was, however, a significant increase (26%, 30%, and 22%, respectively) for all three categories of service when compared to the 1985 data for a similar question. In the 1985 survey, a large percentage of respondents provided a nonapplicable response to this question. It is believed, however, that this was due to the fact that the question was worded differently in 1985 than in 1987. The "not applicable" responses in 1985 indicated that those services were not available.

The effects of PPS on personnel are assessed in Table 8. The following significant trends in personnel-related items were noted:

1. Twenty percent of the respondents indicated that there had been an increase in the number of nuclear medicine technologists employed in their department. This may be related to the fact that there were reported significant increases in cardiovascular and bone imaging procedures (see Table 12) which are more labor intensive. In addition, fewer respondents noted a decrease in the number of technologists employed in 1987 than in 1985.

2. There does not seem to be a significant change from 1985 to 1987 in benefits available to employees and related costs except that slightly more individuals stated that costs have increased for employees. In addition, the significant amount in the nonapplicable response (37%) may indicate that more facilities either do not have benefit packages or have benefit packages that are paid for entirely by the institution.

3. Funding for continuing education (CE) has not changed significantly since 1985. Perhaps the most encouraging result is that only 23% of the respondents indicated that funding for CE was decreased as compared to 38% in 1985. This decrease in the trend may be a result of the JCAH pressure to insure that continuing education is available in addition to state licensure requirements for CE.

4. The most significant change has been in technologist's salaries. Fifty-four percent of the respondents stated that there has been a higher percentage increase in salaries since 1985. In 1985, only 24% of the respondents indicated an increase which was difficult to interpret. The question was stated differently in the current survey, and there was a feeling that this represented a normal increase in salaries not related to PPS. The significant change over the last two years is interpreted as a result of the perceived shortage of nuclear medicine technologists, resulting in the institution's efforts to retain and recruit technologists with competitive salaries.

The effect of PPS on patient care is assessed in Table 9. As expected, the majority of respondents (66%) again indicated that the length of hospital stay is continuing to decrease. However, it appears that the trend is slowing when compared to the 81% indicating a decrease in 1985. It may be that stays have been decreased to the maximum achievable. Furthermore, 41% of the respondents indicated that there had been an increase in preadmission testing procedures, a question not asked in 1985. This correlates closely with the indicated increase in outpatient volume. Responses to questions regarding the willingness of referring physicians to utilize nuclear medicine services and the quantity of patient referrals indicate definite trends toward an increase of referrals for nuclear medicine procedures. This may be a direct result of the increased emphasis on marketing techniques in nuclear medicine. Interestingly, there has been no significant change in patient requests for information concerning nuclear medicine services between 1985 and 1987. This could be interpreted to mean that our patients always have been provided with good information such as the ACNP and the SNM patient brochures and other in-house efforts to allay patient fears regarding the use of radioactive materials. Finally, an interesting reversal in the percent-

age of Medicare patients admitted to these institutions has occurred. More individuals responded that there was an increase in Medicare patients admitted in 1987 than in 1985. Does this reversal indicate a comfort level with the PPS system such that justification for admission is a much better understood process and is utilized appropriately?

Trends in departmental budgets are assessed in Table 10. Not surprisingly, 55% of the respondents indicated that there has been an increase in departmental revenue. This is the same number of respondents that indicated an increase in the total number of nuclear medicine studies performed, a significant increase from the 23% reported in 1985. Similarly, 50% responded that the departmental noncapital expense budget had increased which substantiates further data regarding nuclear medicine technologist salaries and also reflects the necessary increase in expense in relation to the number of additional studies being performed. A change also was seen in the capital expense budgets between the two time periods. In 1985, only 15% responded that there had been an increase in this area, whereas in 1987, 36% responded that an increase had been realized.

The hospital demand for nuclear medicine productivity standards continues with 54% as compared to 51% in 1985, indicating that an increase has been realized (Table 11). There is also a definite increase in the number of respondents who stated that documentation procedures were increasing (69% as compared to 43%). This may be due in part to the increased emphasis on quality assurance and JCAH requirements.

The above data reflect the continuing trends on the effect of PPS upon the performance of nuclear medicine procedures. It is apparent that technologists continue to believe that changes in nuclear medicine delivery are related to the implementation of PPS. The 1985 data suggested that other factors such as competing modalitites and the emergence of outpatient facilities also impacted on the delivery of nuclear medicine services. As a result, additional questions were asked on the 1987 survey to elicit data in regard to these other factors. Respondents also were encouraged to provide written comments, the results of which appear at the end of the analysis.

Table 12 summarizes the respondent's impression of the utilization of specific nuclear medicine procedures in terms of increased, decreased, no change, etc. Several significant items can be noted from the results. They are as follows:

1. Seventy-one percent (71%) of the respondents answered nonapplicable for radioassay studies. The impact of non-radioisotopic ligand assay systems is obviously dramatic.
2. There is a significant decrease in brain imaging studies. This study, however, was conducted before the new brain perfusion agents were introduced for routine use. If a survey were conducted today, it is expected that a significant reversal would be seen.
3. Bone mineral absorptiometry studies are not performed by an overwhelming majority of respondents (SPA 86% and DPA 76%). The fact that SPA and DPA are not available in most departments may be attributable to the lack of reimbursement for such procedures.
4. The most dramatic increases in studies performed are seen in bone imaging and cardiovascular procedures.

Tables 13–15 assess the impact of PPS on individuals who perform nuclear medicine technology and other imaging procedures. Seventy-eight percent or 2,999 of the total 3,820 individuals, who were reported as being employed to perform nuclear medicine procedures as a primary responsibility, are certified nuclear medicine technologists (Table 13). Other surveys conducted by the Technologist Section have reported that the majority of nuclear medicine technologists are voluntarily certified, and this correlates well with data in the 1985 Human Resource Survey, which reported that 76.2% of nuclear medicine technologists were certified. When asked if nuclear medicine technologists perform other types of imaging procedures, 62% responded that they do not (Table 14). However, 479 responded that nuclear medicine technologists do in fact perform other procedures such as radiography, ultrasound, and computerized tomography. In an attempt to identify the practice setting where nuclear medicine technologists may be required to perform as multi-skilled individuals, the responses to the above questions were sorted according to reported bed size. Table 15 summarizes those results. The majority of individuals performing more than one modality work in hospitals with 200 beds or less.

In regard to the manpower supply, data in Table 16 reveal that over 34% of the respondents required more than three months to fill a technologist position. The response is reflective of CAHEA data, which reported significant numbers of training program closings and a decrease in enrollments in nuclear medicine technology programs (*2*). When asked their perception of the supply of nuclear medicine technologists in their geographic area, 57% of the respondents perceived a shortage (Table 17) as compared to 19% in 1984 in the Technologist Section's Human Resource Survey (*3*). Forty-three percent (43%) of the respondents indicated that there had been a decrease in the supply of nuclear medicine technologists in their area (Table 18). The combined data in Tables 17 and 18 clearly indicate that the manpower situation is serious and demands immediate attention by the nuclear medicine community.

As previously mentioned, a section for additional comments was included at the end of the survey. Three hundred respondents took the time to provide additional commentary. The majority of the comments were related either to manpower issues or the impact of DRGs, costs, and other imaging modalities on nuclear medicine technology. Most of the comments, however, addressed the shortage of nuclear medicine technologists. The following are typical of the concerns expressed in

regards to the manpower situation:

1. "We have had positions open since December 1986, in spite of an active recruitment effort and availability of a recruitment bonus. Because other hospitals in this area are facing similar situations, I would say that there is an extreme staffing shortage. I feel that it should be the number one priority for the Tech Section to address this problem in order to maintain standards of quality."
2. "We are a private practice of nuclear medicine, radiology, and cardiovascular diseases. We usually perform our own procedures due to a tremendous shortage of qualified NMTs."

Respondent's comments also pinpointed perceived reasons for the lack of qualified personnel. Twenty individuals stated that salaries were not commensurate with training, experience, or level of responsibility. Many other respondents said that increased workloads and expanded hours of service lead to increased stress and early burnout, making nuclear medicine technology a less desirable profession. One respondent related that: "our department continues to grow. Workload is up almost 20% over last year's record number. In the past year, we added a technologist to work four evenings (until 9:00 p.m.) and all day Saturdays. Recruiting the technologist was a difficult task with a limited number of applicants (two)! I am currently having problems filling the vacant position." The lack of career ladders was seen by some respondents as a very unattractive feature of the profession. Many respondents also felt that recruitment for training programs was difficult due to those factors previously stated.

Additional comments also averred that DRGs, increased costs, and the utilization of other imaging modalities have impacted upon the practice of nuclear medicine technology. Whereas 17 respondents cited a decrease in length of patient stay, 22 cited the decrease in the number of nuclear medicine studies as a result of DRGs. The following comments reflect technologist concerns on the effects of competing technologies on the delivery of nuclear medicine services:

1. "I have noticed a decrease in cardiac studies since a recent purchase of a cardiac-ultrasound unit. Even our thallium studies have dropped off to almost nothing."
2. "Liver/spleen scans have dropped off. I believe due to CT scans."

A significant shift in the volume of outpatient versus inpatient workload also was cited as a factor. Of greatest concern, however, is the fact that the majority of comments emphasized the negative aspect of the changes occurring in the practice of nuclear medicine technology.

In summary, the survey data indicate that technologists believe that there is a continuing impact of PPS upon the delivery of nuclear medicine service to patients. These new data indicate that the manpower supply is the biggest issue facing nuclear medicine technology today. The Technologist Section must respond to this problem in order to prevent serious manpower shortages in the future.

REFERENCES

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TABLE 1. Types of Facilities Surveyed

Hospital	1985	1987
Private	24%	46%
University	3	3
Government	7	5
Community	64	37
Other	2	—
Non-Hospital	**1985***	**1987**
Private Practice	—	3%
Group Practice	—	2
Diagnostic Center	—	2
Mobile Unit	—	1
Other	—	1

*Data are not applicable.

TABLE 2. Hospitals Surveyed by Bed Size

No. of Beds	1985*	1987
0–99	—	18%
100–199	—	26
200–299	—	19
300–399	—	15
400–499	—	9
500–749	—	8
750–999	—	3
1,000 or more	—	2

*Data are not applicable.

TABLE 3. Departmental Contact*

	1985	1987
Director	22%	34%
Administrative Tech	29	49
Other	49	17

*Data are derived from the 1985 DRG survey.

TABLE 4. Occupancy Rate

Increase*	Decrease*	No Change	Unknown	Not Applicable
27%	31%	22%	11%	3%

*The following is the percentage change in occupancy rate for the increase and decrease responses.

Increase		Decrease	
1%–5%	= 78 responses	1%–5%	= 77 responses
6%–10%	= 70 responses	6%–10%	= 89 responses
11%–20%	= 25 responses	11%–20%	= 79 responses
20%–50%	= 43 responses	21%–50%	= 55 responses
over 50%	= 2 responses	over 50%	= 3 responses

TABLE 5. Volume of Nuclear Medicine Studies

	% Increase	% Decrease	% No Change	% Unknown	% Not Applicable
Inpatient nuclear medicine studies					
1985	9	65	25	—	1
1987	27	46	22	1	4
Outpatient nuclear medicine studies					
1985	58	13	28	—	—
1987	74	11	14	1	—
Total number of nuclear medicine studies					
1985	—	—	—	—	—
1987	55	20	24	1	—

TABLE 6. Effects of PPS on the Availability of Scheduled Services

	% Yes	% No
Type of scheduled service offered over the last 12 months		
Weekend	29	71
Evening	9	91
On-call	59	41
Type of scheduled service offered for less than 12 months		
Weekend	3	97
Evening	3	97
On-call	7	93

TABLE 7. Facilities with Scheduled Services for More Than 12 Months

	% Increase	% Decrease	% No Change	% Unknown	% Not Applicable
Weekend services					
1985	13	6	54	1	26
1987	39	6	53	1	0
Evening services					
1985	8	4	54	0	34
1987	43	4	50	2	1
On-call services					
1985	23	6	58	0	13
1987	45	5	50	0	0

TABLE 8. Effects of PPS on Personnel

	% Increase	% Decrease	% No Change	% Unknown	% Not Applicable
Number of nuclear medicine technologists employed by your department					
1985	6	20	71	1	2
1987	20	13	64	1	2
Benefits to individual employees					
1985	—	—	—	—	—
1987	22	10	66	1	2
Cost of benefits to individual employees					
1985	19	9	64	5	3
1987	24	2	36	2	37
Funding for continuing education					
1985	5	38	53	1	3
1987	10	23	59	2	6
Nuclear medicine technologist salaries					
1985	24	4	69	1	2
1987	54	9	34	1	3

TABLE 9. Effects of PPS on Patient Care

	% Increase	% Decrease	% No Change	% Unknown	% Not Applicable
Average length of hospital stay of patients					
1985	2	81	10	6	1
1987	5	66	15	8	6
Quantity of patient referrals for nuclear medicine					
1985	13	29	50	6	1
1987	46	20	31	3	1
Willingness of referring physicians to utilize nuclear medicine services					
1985	11	26	57	5	1
1987	38	10	48	3	1
Patients requests for information concerning nuclear medicine services					
1985	27	3	59	7	4
1987	28	3	61	6	1
Pre-admission testing procedures					
1987	41	5	40	8	7
Percentage of Medicare patients admitted					
1985	15	20	50	13	2
1987	24	10	39	19	8

TABLE 10. Effects of PPS on Departmental Budgets

	% Increase	% Decrease	% No Change	% Unknown	% Not Applicable
Department revenue					
1985	23	36	35	4	2
1987	55	16	21	4	3
Department expense (noncapital)					
1987	50	14	30	4	2
Department expense (capital)					
1985	15	30	48	4	3
1987	36	16	41	5	2

TABLE 11. Effects of PPS on Productivity and Documentation of Standards and Procedures

	% Increase	% Decrease	% No Change	% Unknown	% Not Applicable
Hospital demand for nuclear medicine productivity standards					
1985	51	2	42	3	3
1987	54	2	36	2	7
Nuclear medicine documentation procedures					
1985	43	1	50	4	1
1987	69	1	26	1	3

TABLE 12. Effects of PPS on Nuclear Medicine Studies Performed in 1987

	% Increase	% Decrease	% No Change	% Unknown	% Not Applicable
Skeletal Studies					
Bone scans	67	7	25	0	2
Bone mineral asbosptiometry					
SPA	3	3	5	2	86
DPA	11	4	8	2	76
Cardiovascular Studies					
GBP/MUGA	42	14	24	0	20
Thallium	60	7	15	1	17
Respiratory Studies					
Perfusion lung imaging	40	10	47	0	3
Ventilation lung imaging	41	10	41	0	8
Gastrointestinal Studies					
Liver/Spleen imaging	15	44	40	0	2
Biliary imaging	42	10	46	0	2
GI Bleeding	28	12	53	0	7
Brain Studies					
Brain scans	5	56	29	1	9
Renal Studies					
Kidney studies	34	15	47	0	4
In Vitro Studies	8	7	24	3	58
Endocrine Studies					
Thyroid	25	14	56	0	5
Parathyroid	16	6	31	2	45
Adrenal	3	4	22	2	69
Miscellaneous Studies	34	5	44	1	16
Radioassay	9	4	13	3	71
Radionuclide Therapy	18	6	41	1	33

TABLE 13. Individuals Whose Primary Responsibility is to Perform Nuclear Medicine Procedures

Total number	3,189.6	
Classification by Type		
Certified	2,998.6	78%
Noncertified	351.8	9
Radiographer	253.9	7
Medical technologist	60.6	2
Nurse	29.0	1
Other	113.0	3

TABLE 14. Technologists Performing Other Imaging Modalities*

X-ray	64%†
Ultrasound	50
CT	31
NMR	2
Laboratory procedures	6
Other	11

*Of facilities surveyed, 479 reported that technologists do perform other imaging procedures; 765 reported that technologists do not.
†This table totals more than 100% because individuals may perform multiple modality studies.

TABLE 15. Other Imaging Modalities Performed by Technologists in Hospitals by Bed Size

	X-ray		US		CT		NMR		MT		Other	
Beds	No. of Studies	%	No. of Studies	%	No. of Studies	%	No. of Studies	%	No. of Studies	%	No. of Studies	%
0–99	125	45	78	35	42	30	1	11	7	39	13	28
100–199	101	36	79	36	63	45	2	22	2	11	15	33
200–299	36	13	29	13	22	16	3	33	5	28	7	15
300–399	12	4	23	10	9	6	1	11	3	17	4	9
400–499	4	1	2	1	3	2	1	11	0	0	3	7
500–749	1	0	7	3	1	1	0	0	1	6	4	9
750–1000	1	0	2	1	1	1	1	11	0	0	0	0
+1000	0	0	1	0	0	0	0	0	0	0	0	0

TABLE 16. Average Length of Time to Fill a Technologist Position

	1984*	1987
Less than 1 month	40%	22%
1–2 months	29.3	24
2–3 months	12.2	20
3–5 months	13.2	17
5 or more months	5.9	17

*Data are derived from the 1985 Human Resource Survey.

TABLE 17. Geographic Assessment of Manpower Supply

	1984	1987
Shortage	19.2%	57%
Balanced	50.6	34
Surplus	30.6	9

TABLE 18. Supply of Nuclear Medicine Technologists

Increase	Decrease	No Change	Unknown	Not Applicable
11%	43%	37%	7%	2%