Special Committee on Manpower

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Nuclear Medicine Physician Workforce Requirements, Part 2:

Benchmarking U.S. Nuclear Medicine Physician Workforce Requirements Based on Managed Care Organization Effects

Like many other specialty groups, nuclear medicine has recognized the need to achieve a balance between supply and demand in physician workforce requirements, particularly to plan for the appropriate type and extent of the specialty's training programs. This recognition has been further heightened by the common perception that despite its unique value as an imaging modality nuclear medicine absorbs a large, undetermined share of available financial resources. In response, the Society of Nuclear Medicine (SNM) prepared a 1996 study to estimate future physician workforce requirements. At the same time, it was realized that one important influence on future estimates was unresolved, namely, the unmistakable effect of managed care on the field.

It is well known by both health care professionals and the public that managed care organizations (MCOs) are rapidly penetrating the U.S. health care environment. One recent report noted that enrollment in 563 MCOs nationwide had reached 50.8 million people (91% of whom lived in metropolitan areas) by January 1995, representing 19.5% of the U.S. population, compared to 17.3% a year earlier (*1*). Recent projections indicate that by 2000 as much as one half of the U.S. population will be enrolled in MCOs (*2*).

This article describes nuclear medicine manpower requirements as they might look in a U.S. health care environment largely dominated by MCOs. In presenting this information, we believe that other technologically sophisticated medical specialty groups may benefit from some of our conclusions.

This article reflects the opinions of the authors and not necessarily that of the funding organization, the Society of Nuclear Medicine.

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Objective

The objective of the study was to estimate the number of full-time equivalent (FTE) nuclear medicine physicians required during the next 5 years to provide high-quality, cost-effective nuclear medicine services in the U.S. in a health care environment in which MCOs play an ever-increasing role. It then compared the U.S. nuclear medicine physician-to-MCO enrollee ratio to the national physician rate under fee-for-service systems (*3*). (An FTE was defined as a nuclear medicine physician who works 2304 hours per year, or 48 hours per week 48 weeks per year, providing nuclear medicine services.)

Procedures

Basis for Comparison—The current benchmark model findings were compared to the Manpower Committee's 1996 study, which used a modified needs-based model coupled with a mathematical modifier factor to account for non–patient care activities. In simple terms, this latter model assigns to each CPT-coded nuclear medicine procedure the time needed for its completion as allocated by the RBRVS and multiplies these times by the estimated volume of each procedure performed in 1993 to determine the total time required to perform all nuclear medicine procedures in a year. The time thus calculated is increased by a factor of 30% to account for non–patient care activities. The total time is divided by 2304, the hours representing one FTE (*4*). Using the 1996 model, the committee had calculated that the number of nuclear medicine physicians required was 2595 FTEs (*4*).

The benchmark model determines physician requirements on the basis of actual staffing patterns reported by health maintenance organizations (HMOs) and assuming 100% national participation in MCOs. Data were obtained for this model from Kaiser Permanente and four other large MCOs

TABLE 1

Reported Radiologist/Nuclear Medicine Physician Ratio Per 100,000 MCO Enrollees: Comparison of Selected Specialty-Specific Physician Staffing Patterns with National Supply

Staffing category	Kaiser, most recent data*	Seven Kaiser plans	Kaiser Portland	Four HMOs	U.S. supply
Radiologists	4	4.4	7.9	5.7	8.6
Nuclear medicine physicians‡	.80	.88	1.58	1.14	1.7

*Recent telephone communications with Kaiser staff indicate that 4 radiologists are allocated per 100,000 enrollees.
‡Radiologists and nuclear medicine physicians report that 10%–30% of their time is allocated to nuclear medicine (*7*).
HMOs = health maintenance organizations; MCO = managed care organization.

TABLE 2

Number of Nuclear Medicine Physicians Required in MCOs Using Reported Physician Enrollee Ratios

Radiology-to-nuclear medicine conversions	MCO enrollees	Nuclear medicine physicians required*
10% (0.4)	100,000	1066
15% (0.6)	100,000	1599
20% (0.8)	100,000	2132
25% (1.0)	100,000	2665
30% (1.2)	100,000	3198

*Assuming 100% of U.S. population enrolled in MCOs.
MCO = managed care organization.

(see Table 1), supplemented by data very recently reported from Kaiser, to compare national staffing patterns for nuclear medicine physicians per 100,000 MCO enrollees (*3*; Ihde G, *personal communication*, 1996). As in the 1996 report, age and sex of nuclear medicine physicians were coupled with specific death rates, and retirement exit rates were adjusted to the estimated age of the current nuclear medicine workforce (*4*).

Population projections were obtained from the U.S. Bureau of the Census through 2005. The committee assumed the same continued population growth rate of 5% per decade as over the past 30 years (*5*).

Benchmarking in a Volatile Environment—The 1996 modified needs-based model was designed to obtain a general estimate of the FTEs needed based on the best available data (4) as its primary objective, but it put aside projections based on very fluid factors such as the future effects of managed care on the U.S. health care environment.

The benchmark model addresses this new paradigm and the uncertainty and imperfection of the data used in projecting future manpower requirements in a changing health care environment. It is designed to target nuclear medicine manpower needs only within the perspective of MCOs. The benchmark model is based on professional staffing patterns reported by various MCOs, which have fixed proportions of physicians, by specialty per number of enrollees, with variations in reported physician rates often being related to geographic areas and varying enrollee demographics.

At the same time, however, the assumptions of the benchmark model are complex because of constantly changing factors in the health care environment, such as the unpredictable growth of MCOs and attrition of the existing workforce. (For example, because of discrepancies among estimated age, retirement and death rates, estimates of future workforce projections may be affected by 3%–5%). The same complexity affected the committee's earlier model.

The staffing patterns of MCOs also are different from current staffing patterns under fee-for-service medicine. It is believed that the MCO enrollee population is not representative of the population as a whole. The managed care sector seems to be dominated by a more healthy population as a result of selective screening of enrollees by MCOs. As more Medicare and Medicaid patients become enrolled in MCOs, however, the physician-to-MCO enrollee ratio is expected to increase, resulting from the greater needs and demands of a less-healthy population.

Results

The surveyed HMOs did not report a specific category of nuclear medicine physician staffing but included nuclear medicine service under radiology. Thus, Table 1 indicates the number of radiology FTEs employed per 100,000 MCO enrollees. In a previous survey (*6*), radiologists, on average, reported that 20%–30% of their time was devoted to nuclear medicine. Therefore, the number of FTE nuclear medicine physicians indicated in Table 1 is derived by multiplying the number of reported radiologists performing nuclear medicine procedures by a factor of 0.20–0.30.

Assuming that 100% of the U.S. population will be enrolled in MCOs and that 0.8–1.2 FTE nuclear medicine physicians will be required per 100,000 MCO enrollees (see Table 2), *the number of FTE nuclear medicine physicians required in a managed care environment was estimated to be 2132–3198.* (The current reported U. S. population is 266 million and is forecast to be 270 million by 2000). An upward adjustment of 32 FTE nuclear medicine physicians to account for the projected population increase resulted in a total average requirement of 2697 FTE nuclear medicine physicians.

The resulting total FTEs estimated by both the first (modified needs-based) and second (benchmark) models are shown in Table 3 (*4,6*). Although the total numbers differ slightly, we feel that such discrepancies are minor given the many factors

influencing future manpower needs. These factors include the difficulty of determining the percentage of the U.S. population enrolled in MCOs over the next decade, the effect of increasing numbers of sick and unhealthy older MCO enrollees and the fact that as new technology becomes available, new opportunities are opened for the use of nuclear medicine.

Comments

Which model is most appropriate for gauging future manpower needs? In arriving at an answer, the committee noted specific trends that seemed to mitigate the effects of managed care on FTE nuclear medicine physician requirements, perhaps resulting in the surprising conclusion that future requirements may be close to those of the modified needs-based model. For example, despite the widespread fears of managed care's negative effects on health care services, surveys on diagnostic imaging by an independent marketing group appeared to show no consistent correlation nationally between the level of HMO enrollment and nuclear medicine imaging procedure volumes (*7*). Despite wide regional variations, nuclear medicine procedure volumes were reported as generally stable (*7*).

Factors for Uncertainty—The data used in this study are subject to inevitable variability. This is because data respond to the level of integration of managed care in different regions of the country. Adding to the complexity of projections based on workload are the different degrees of approval of access to nuclear medicine procedures required under different managed care arrangements in different regions of the country.

These data were evaluated on the basis of the services provided by a mix of physicians performing nuclear medicine services. As reported earlier, the work profile of the nuclear medicine physician was assumed to be shared in part by radiologists (who were shown in the 1992 committee study to perform the majority of nuclear procedures), oncologists, cardiologists, endocrinologists and other subspecialists. In short, any physician providing and performing nuclear medicine procedures was treated here as a nuclear medicine physician (*4*).

Charting the Future—As the number of managed care arrangements increase, and as more integrated health care systems evolve, future projections of workforce requirements will become even more complex. There will continue to be the need for expert panels well informed regarding managed care systems.

The number of trainees selecting nuclear medicine as a career choice in the future will depend on the direct effects of managed care and changes in the health care environment on future workforce

TABLE 3

Nuclear Medicine Physician Manpower Requirements Based on 1992 Survey, 1996 Modified Needs-Based Model Projections and Benchmark Model Using Physician-to-MCO Enrollee Ratio

Source	FTE nuclear medicine physicians required
1992 Manpower Committee study (*6*)	2495
Modified needs-based model (1996 Manpower Committee study)(*4*)	2595
MCO physician-to-enrollee benchmark model*	2665 (average)/2697‡

*Assuming 100% of U.S. population enrolled in MCOs.
‡Adjusted for projected increase in U.S. population by the year 2000.
FTE = full-time equivalent; MCO = managed care organization.

Nuclear Medicine Physician Requirements and Managed Care: The Basics

Objective

The objective of the Society of Nuclear Medicine's (SNM's) Special Committee on Manpower's study of nuclear medicine physician requirements was to examine the number of full-time equivalent (FTE) nuclear medicine physicians required in a U.S. health care environment largely dominated by managed care organizations (MCOs). The results of this study were compared to different design models that have been used previously to determine nuclear medicine physician requirements. (An FTE was defined as a nuclear medicine physician who works in nuclear medicine 2304 hours per year, or 48 hours per week 48 weeks per year.)

Design

Several MCOs, which assign specific numbers of physicians per 100,000 enrollees, reported their allocations. Depending on their enrollee demographics, various MCOs' models reflected different physician-to-patient/enrollee ratios. Radiology allocations ranged from 4 to 7.9 radiologists per 100,000 MCO enrollees. By using previously reported published data, the committee estimated that 0.8 to 1.2 FTE nuclear medicine physicians would be allocated per 100,000 MCO enrollees. The study then compared the U.S. nuclear medicine physician-to-MCO enrollee ratio to the number of nuclear medicine physicians available under fee-for-service systems.

Main Outcome Measures

The current supply of nuclear medicine physicians compared to future nuclear medicine physician requirements were analyzed using two different models designed to forecast manpower requirements. One model used workload and the other used physician-to-MCO enrollee ratios. These results were compared to the current supply reported in a 1992 SNM survey.

Results

Using the nuclear medicine physician-to-MCO enrollee ratio (assuming 100% of the U.S. population enrolled in MCOs), the required number of FTE nuclear medicine physicians was found to be 2132–3198. An upward adjustment was made to account for the increase in the U.S. population projected by the year 2000. This raised the FTE requirement to an average of 2697.

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to expand considerably in the future. This expansion cannot occur if there are not adequate supplies of isotopes.

Most of the research projects examined by Frost & Sullivan are not expected to have a radiopharmaceutical product on the market for seven to ten years. This time frame allows for formulation of an isotope policy that will secure supplies when demand rises. This policy should emphasize isotopes most needed for therapeutic nuclear medicine rather than isotopes for which there is abundant supply.

INDUSTRY STRUCTURE AND ECONOMICS

Research and Development

Developing a new therapeutic radiopharmaceutical is very costly. Of all the companies Frost & Sullivan contacted for this study, none gave the dollar figure required for the development of these products. Yet, Frost & Sullivan has learned that developing a new therapeutic radiopharmaceutical, can cost close to $50 million, excluding marketing costs. This causes companies developing new drugs serious financial concerns.

Regulatory Approval

The cost of producing a new therapeutic radiopharmaceutical is increased by FDA and NRC regulations. Companies developing new radiopharmaceuticals hope that the FDA in particular will apply a more expeditious approval mechanism.

Companies must show a compelling amount of research data and must demonstrate low toxicity. Once this is done, the FDA should take a more responsive stand towards the approval of therapeutic radiopharmaceuticals. The FDA should also consider the financial issues involved in unnecessary delays.

Acceleration of the approval process would encourage development of more therapeutic radiopharmaceuticals by encouraging radiopharmaceutical companies to increase research and development programs. On the other side, if approval continues to be slow and resource consuming, fewer companies will venture into this new branch of nuclear medicine.

Market Maturity

Nuclear medicine is over half a century old. For most of this period, the overwhelming majority of radiopharmaceutical products offered were for diagnostic applications. Not until the 1960s was iodine looked at as an isotope with therapeutic applications. The first isotope with therapeutic applications was P-32, but it damaged the bone marrow of most patients.

Until the late 1980s, iodine was the only therapeutic radiopharmaceutical available. The arrival of Amersham's Metastron changed the dynamics of the market, bringing therapeutics to the forefront of nuclear medicine. In 1997, P-32, I-131, Sr-89, and Sm-153 are the only therapeutic isotopes offered in the United States. Frost & Sullivan judges nuclear medicine to be both a mature and an infant market.

Diagnostics is very mature, but is still developing new radiopharmaceuticals for oncology, neurology, and infection imaging. Therapeutics is fairly new, with a large number of radiopharmaceuticals in research. Both branches of this science have tremendous revenue potential.

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requirements. In this context, the results of the benchmark model may help nuclear medicine leaders plan future nuclear medicine training programs, just as similar models may assist other specialties in forecasting their own training needs.

Yet in an environment of MCOs and cost containment, the inclination may be to further reduce the number of all specialists—including nuclear medicine physicians—over the course of the next few years. Moreover, the tendency of MCOs to restrict access to imaging procedures may result in delayed diagnosis of specific diseases with obviously negative results for patient outcomes. As the complexity of procedures increases, higher levels of training will be required, and those physicians meeting the more complex training criteria are expected to dominate that particular domain of nuclear medicine. MCOs may react by requiring increased qualifications for performing specialized procedures, and organizational subspecialties of nuclear medicine—such as the American Society of Nuclear Cardiology—may well grow. In fact, nuclear cardiology procedures have increased by approximately 19% since 1993 (*8*).

Planning and research are necessary to meet these challenges. This study on the effects of managed care is part of the planning process in that it may suggest strategies to meet the altered manpower requirements imposed by the changing health care environment. As for nuclear medicine research, rapid changes in technology and the availability of new imaging agents and new procedures inevitably mean that nuclear medicine physicians can create procedures and appropriate sequences of testing that will provide optimum diagnostic accuracy, and this too is expected to better meet the needs of the patient as well as improve cost-effectiveness.

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has been approved or cleared by the FDA. When submitting the claim, the provider is certifying this and must be able to produce a copy of this approval upon request. An official approval letter need not be submitted with the claim.

You may consider conducting a review on a post-payment basis to verify, based on a sample of PET scan claims, that the PET scan was performed at a center with a PET scanner which was approved or cleared for marketing.

B. *EOMB and Remittance Messages*—Providers must indicate the results of the PET scan and the previous test using a two-digit modifier as specified in §4173.4.

Assigned claims received on or after January 1, 1998 without the proper documentation for claims for staging metastatic NSCLC or for characterizing SPNs must be denied using the following EOMB message:

"Your service was denied because information required to make payment was missing. We have asked your provider to resubmit a claim with the missing information so that it may be reprocessed." (Message 9.33)

Use the following remittance message for assigned claims:

"The procedure code is inconsistent with the modifier used, or a required modifier is missing." (Reason Code 4)

C. *Type of Service*—The type of service for the PET scan codes in the "G" range is 4, Diagnostic Radiology.

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