Education

Regional Approach to Training Nuclear Medicine Technologists: The Rochester Experience

Edward B. Stockham, Earl H. Sexton, and Jerome Wagner

Rochester Institute of Technology, Rochester, New York

A university-based baccalaureate nuclear medicine program with a consortium of 11 hospital clinical training sites has been developed in Western New York State to meet the manpower needs in the region. A multifaceted clinical rotation schedule was designed into the program in order to provide students with the broadest possible learning experiences in a variety of hospital and training environments. The success of this educational consortium has depended heavily upon the open channels of communication established among the program's many constituents. The regional demand for technologists is being met as 64% of the graduates take their first job in New York State.

The nuclear medicine technology (NMT) program at the Rochester Institute of Technology (RIT) was developed and initiated in 1974 as a result of a study of a number of career fields related to physics. On the basis of national manpower distribution concerns (*1*), the program was designed as a regional one and encompasses the major population centers of Rochester, Buffalo, Binghamton, and Syracuse in Western New York State. Why RIT developed a regional program and how it is operated will be our subjects of discussion.

Program Design

While the NMT program was being considered, the question of the need for nuclear medicine technologists to have a baccalaureate degree was addressed. The primary source of information on manpower supply and demand at that time was a report prepared by the Technical Education Research Center (TERC) (*2*). In addition to the TERC report and similar reports a survey of physicians in the nuclear medicine departments at the major medical centers in Buffalo, Rochester, and Syracuse was conducted to confirm the need for additional well-trained NMTs in New York State and nationwide. There was universal agreement that nuclear medicine was a rapidly developing field and that there was and would continue to be a demand for substantial numbers of nuclear medicine technologists.

For reprints contact: Edward B. Stockham, Rochester Institute of Technology, One Lomb Memorial Drive, Rochester, NY 14623.

The NMT program at RIT has now been in operation for six years; it is accredited by the Committee on Allied Health Education and Accreditation (CAHEA) through the Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT) with a capacity of 18 students per class. It has graduated 64 students from its first five classes, and all but two of the graduates are presently certified NMTs.

The curriculum consists of three years of study in a core of introductory and advanced courses in basic sciences, radiation biology, computer techniques, radiation physics, and general studies designed to prepare the student for entry into a fourth-year clinical internship. The internship takes place within the consortium of 11 formally affiliated hospital training sites throughout Western New York. Each student intern is placed in 3½ month rotation blocks with each block typically conducted at a different hospital site. Figure 1 illustrates the geographic locations of the hospitals in our regional NMT program.

As has been the case in many university-based NMT programs, the curriculum of study for the first three years of the program was essentially the same as that for the medical technology curriculum. The only difference between medical technology and NMT programs was that the NMT curriculum had a year-long radiation physics sequence instead of advanced biology courses during the third academic year. However, through experience gained during development and with valuable input from the clinical faculty in our hospitals sites, this has changed.

The curriculum has now evolved into a distinct combination of courses designed to allow students the flexibility of choosing from three NMT career-related tracks. The time for these program options was made possible by

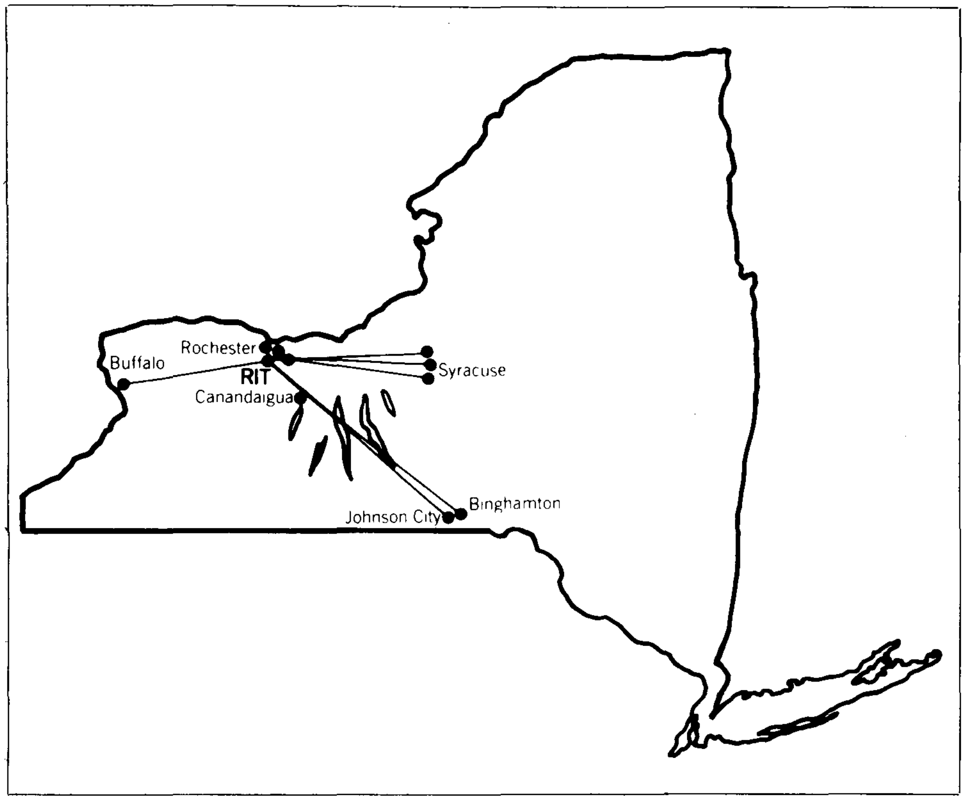

Fig. 1. Western New York State regional NMT program centered at Rochester Institute of Technology.

reducing the number of required science courses by three and expanding the number of electives from two to five. By concentrating elective courses in one area, a student can build a foundation in management, science, or instructional technology as preparation for administration (i.e., chief technologist), research, or teaching, respectively.

These curricular changes maintain the relatively easy transfer of credits among other allied health programs offered at RIT. The changes have also allowed for easier transfer of credits from the radiologic technology, radiation therapy, and nursing programs at other institutions into our baccalaureate NMT program.

The curriculum for the clinical internship is outlined in Table 1. The components of the 12-month internship conducted in the consortium of 11 hospitals are:

1. *An intensive two-week training session in June that introduces students to nuclear medicine technology*: morning classes are held on the RIT campus and are taught primarily by physicians and technologists from the affiliated hospitals. Afternoon clinical and laboratory sessions take place at affiliated hospitals and are directed by clinical faculty.
2. *Three and 1/2 month training periods (rotations) at each of three different hospitals*: the day-to-day training in nuclear medicine scanning procedures takes place during these rotations. The medical director of the nuclear medicine department and the chief technologist are responsible for teaching our student interns under specific guidelines set by RIT. The RIT nuclear medicine technology coordinator makes periodic visits to each of the hospitals for the purposes of evaluating student progress and consulting with hospital staff. The students are required to complete reading and problem assignments, and must do a special project related to NMT during each rotation. Every student's written work is graded by the coordinator.
3. *Periodic on-campus training sessions*: every three weeks all of the students return to RIT for a two-day training session, which is planned and directed by the NMT coordinator. A typical session includes an examination on the material previously assigned, discussion of internship matters of common concern, and lectures by physicians, scientists, and technologists from affiliated hospitals.
4. *Didactic training in radioimmunoassay*: in June the students also receive a week of instruction in RIA. Morning classes are taught by a biochemist and afternoon laboratory sessions are under the direction of an RIA specialist.
5. *Clinical training in RIA*: each student intern is assigned four weeks of RIA clinical training at one of our affiliated hospitals.
6. *Review week*: at the conclusion of the internship year, the entire class returns to RIT for a one-week review. This review includes lectures, question-and-answer sessions, independent study using our library materials, and a practice registry examination.

Results and Discussion

Why did RIT initiate a regional NMT program? Two

TABLE 1. Nuclear Medicine Technology Clinical Curriculum

Courses	Quarter Credits		
	Fall	Winter	Spring
Intro to clinical nuclear medicine	6		
Clinical nuclear medicine lecture series		1	1
Review in nuclear medicine	1	1	2
Radionuclide imaging and external monitoring	4	7	4
Patient positioning and nursing procedures	1	2	1
Nuclear medicine pharmacy, in vitro procedures and therapy	2	2	2
Nuclear medicine administrative procedures and radiation protection	2	1	1
Instrumentation in nuclear medicine	1	1	1
Introduction to RIA		2	
RIA practicum	—	—	4
Total credits	17	17	16

major factors strongly influenced the decision to expand the program's geographic borders to include clinical training sites outside the Rochester metropolitan area: economics and placement of graduates. Addressing economics first, it became quite evident at the beginning that RIT, a private university, would not support a new program with an enrollment of less than 12 students per year. Coupled with this fact was the dim prospect for absorbing all of the graduates in Rochester after a few years. It became clear that the four Rochester hospitals participating in the planning could neither place that number of newly trained technologists per year nor train that number while maintaining quality clinical instruction. Thus, it was necessary to expand the program's training sites into the region. This was viewed favorably—there was an identified regional demand for more NMTs and many students would probably stay in the areas where they received their training.

Therefore, the regional approach was undertaken not only because it was the obvious option available but also because of the positive aspects it would lend to the program. The advantages of this regional linkage of training sites were: 1) meeting RIT's requirement for a minimum number of students, 2) reducing the educational costs and time commitment to each participating hospital, 3) providing a broad spectrum of resources to the program, 4) insuring that a wide variety of clinical experience and faculty was available to the program, and 5) establishing an inter-institutional communications network wth high potential for sharing professional expertise, case studies, and other resources.

Additional benefits to the hospitals have been derived from this synergistic relationship. For example, the hospitals have first access to a manpower pool that, if trained in their facility, do not have to be oriented or inservice trained before starting work. Hospital personnel teaching in the program have benefited from improved communication and supervisory skills. The clinical faculty also receive faculty appointments and are entitled to tuition waivers for continuing education courses as well as use of libraries and other facilities at RIT.

How does one involve so many different independent institutions while ensuring an equivalent educational experience and overcoming the operational problems introduced by this approach? In a word the answer to this question, and, indeed, the key to success in an undertaking of this magnitude, is *communication*. Effective and meaningful communication is achieved through the RIT-based clinical coordinator who makes triweekly visits to each affiliate to coordinate and evaluate each student's progress and to assist the clinical faculty in designing the day-to-day educational experiences. Major policy changes and curricular modifications are made and implemented through a physician advisory committee after it receives input from the chief technologist advisory committee, students, and clinical faculty.

In order to make the entire system work it was essential that clear educational performance objectives be provided for each hospital site. These objectives were developed by the clinical coordinator with the help of the clinical faculty, and each site agreed to fulfill those objectives that it and the RIT faculty decided it could do best. To ensure that all student interns are exposed to all necessary components of the clinical curriculum, they are rotated through three different hospitals, spending $3\frac{1}{2}$ months in each. The rotation schedules are carefully adjusted by the clinical coordinator to capitalize on the strengths and logistical differences of each training site so that all students will complete their program with the same basic entry-level technologist skills. However, students are encouraged to take maximum advantage of these training site differences—with the end result being a fairly individualized program that satisfies their own interests.

As a consequence of this regional approach, students proceed at divergent rates depending upon the rotation schedule prescribed for them. Of paramont importance in coordinating this complex training approach is an accurate record-keeping system and a comprehensive mechanism to evaluate an individual student's progress in the mastery of clinical performance objectives. The clinical faculty must quickly know how the student is progressing in any particular performance area. A performance check sheet was adopted; the students are responsible for keeping this current with their progress. The sheet is continually updated and provides both the clinical faculty and student interns with the necessary information for scheduling such activities as evaluating satisfactory completion of stated performance objectives in the curriculum.

The evaluation instruments used by the clinical faculty and the clinical coordinator, during the triweekly visits, were designed in conjunction with the educational performance objectives. Each technologist skill/procedure is evaluated against the original objectives. Successful completion of a skill or procedure is recorded on the intern's check sheet as either a first or a follow-up evaluation. When the intern is rotated to a new training site, this record is reviewed by the clinical faculty, and, together with the clinical coordinator, a new training program is scheduled for the incoming intern. Periodic re-evaluations are performed on skills already mastered in order to reinforce the learning and to ensure proper performance of the procedures. (Details of this record keeping and evaluation system will be the topic of a forthcoming article.)

The major didactic portion of the curriculum is conducted at RIT; it is provided to the entire class rather than individually at the 11 training sites. This has proved to be the most efficient and economical use of faculty time. Students from all of the training sites return to the RIT campus on a triweekly schedule to attend formal classroom instruction by the program faculty and guest lecturers. During the sessions, students are also given written examinations and quizzes, and assigned written work is usually turned in for grading. The sessions reinforce the fact that the interns are still students. Furthermore, it renews the class camaraderie, which would be difficult to maintain without the return to the RIT campus. Perhaps most beneficial to the students is the opportunity for them to share and profit from each other's experience.

Since physician input to any training program is so important, most of the guest lecturers are physicians from our affiliates. The physicians also provide individual instruction at their training sites, but this requires far less preparation time than the formal presentations, the responsibility for which is divided among the 11 medical directors of the program. Other medical specialists and nuclear medicine physicians and residents from our affiliates are also available for these didactic sessions on a regular basis.

A nuclear medicine program of this geographic size is not without special problems intrinsic to its design. Equivalent instruction, which was discussed earlier, was the most serious concern of the program faculty and has been constantly monitored and modified as the necessity arose. Although there has been a large turnover rate of chief technologists at our affiliated training sites, this has not had any adverse effect on the program's quality or integrity. Often clinical faculty at these sites are promoted to the chief technologist position, thereby maintaining a high level of continuity for the program as well as the hospital. New faculty preparation has been conducted by RIT to maintain quality instruction and a clear understanding of the program objectives, evaluation methods and operational procedures.

Faculty and student travel has continued to present

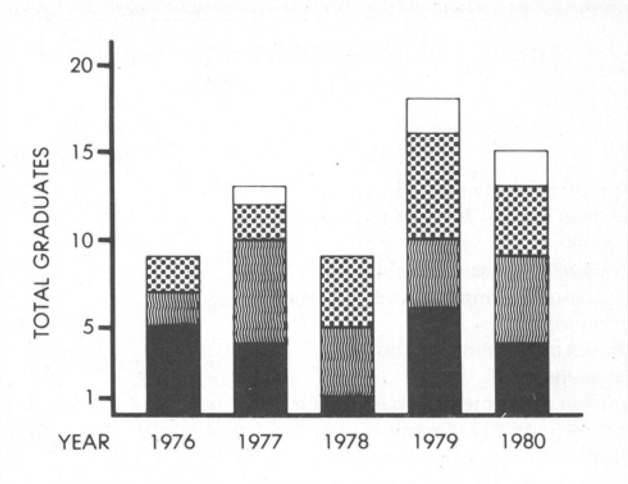

Fig. 2. First job placements of regional NMT program graduates: black areas equal placement in program-affiliated hospitals; wavy black-and white lines equal placement in hospitals in New York State; checkerboard black-and-white pattern equals placement in out-of-state hospitals; and white areas equal graduates who are not in the nuclear medicine field.

the most inconvenient set of problems confronting the program. Bad weather during the winter months has forced us to schedule major activities at times other than winter. The visits to the hospitals made by the clinical coordinator have been combined into one day for each of the more distant hospitals in major cities such as Syracuse and Binghamton. In an attempt to minimize clinical faculty and physicians' travel time, committee meetings are typically conducted at two locations throughout the year, namely Rochester and Syracuse. This has not resulted in the development of two program factions.

Aside from the triweekly traveling to RIT for the one-day didactic sessions, housing presents a continuing problem to the program and student interns. Attempts to secure housing at the local colleges and universities in Syracuse, Buffalo, and Binghamton proved unsuccessful in light of the fact that on-campus housing is in high demand today. Consistent with our regional goal, interns are often assigned rotations in hospitals that are close to their hometown and they commute to the training site. When interns must lease housing they are usually assigned to two successive rotations in the same area, and at least two interns are assigned in the area so they can room together. In the event that housing cannot be obtained, a few hospitals have been able to rent rooms to the interns, but only on a space-available basis. The interns can also take all their meals in the hospital cafeterias, thereby eliminating the necessity to set up housekeeping while they are still students.

The only curricular problem involved the scheduling of the RIA practical experience. Initially, two of the seven original affiliated hospitals agreed to provide all of the training experience in their RIA laboratories. However, this overburdened their facilities and complicated the rotation schedules. To overcome this shortage of RIA facilities as well as increase the quality and resources available to the program, four new affiliated hospitals were brought into the program bringing the total to 11. (The addition of four new affiliates to our accredited program required that an application for accreditation amendment be submitted to the JRCNMT.) It was also at this time that the program was expanded from 15 to 18 students.

Conclusions

The advantages of the regional training program have more than compensated for the problems encountered in this approach. The program goal—supplying NMTs to the region—has been successfully met. The hospital training sites have absorbed a considerable number of the program graduates and they also have a constant source of well-trained technologists available to fill vacancies. Figure 2 summarizes the first job placement of graduates from the program for five years. Forty-one graduates (64%) from the first five classes have remained in New York State. Eighteen graduates (28%) have obtained employment in the states of California, Florida, Illinois, Massachusetts, Michigan, Missouri, Pennsylvania, Rhode Island, and Texas. Only five graduates (8%) did not remain in nuclear medicine. From this latter group, one enrolled in optometry school and two went into graduate programs at RIT.

The graduates have an added advantage of having been exposed to a number of different work environments during their training. Graduates have indicated that the experience of adjusting to new work environments while they were still in training greatly reduced the anxiety of starting their first job at a hospital different from any in which they had been trained.

From the hospitals' point of view the graduates from our program brought a certain maturity to the job and adapted to the department much more rapidly than usual.

The variety of physicians and technical personnel, nuclear medicine equipment and procedures, and departments and hospital structures has provided our graduates with a healthy perspective of the field of nuclear medicine and how it fits into the health care system. This broad experience provides them with a solid underpinning from which to launch their careers.

Acknowledgment

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