We Are What We Think We Are: Professionalization in Nuclear Medicine Technology

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The medical radiation science (MRS) professions, including nuclear medicine, are often portrayed as being unprofessional. Our results show signs of positive internal perception and professionalization of the nuclear medicine science profession.

Methods: The competency-based standards (CBS) project results were analyzed using a descriptive-analytical interpretation method for evidence of professionalization.

Results: Major outcomes of the CBS document include the following signs of professionalization: name change, involvement in research, refinement of ethical content and an expected high level of professional functioning (competence beyond task performance) by entry-level practitioners (ELPs).

Conclusion: Nuclear medicine technologists, especially ELPs, saw their profession as broad and developing in a positive manner. The signs of growth in our unique body of knowledge auger well for the professionalization of nuclear medicine technology in Australia.

Key Words: competency; qualitative research; professionalization

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In an ideal world, perceptions about an occupation and its level of professionalization should be driven by the practitioners themselves. In reality, this does not always hold true. Often negative perceptions by practitioners and those outside the profession can retard development, or even mold the destiny of the profession. Hence the maxim espoused by Hammersley (*1*), "I am what YOU think I am."

Fortunately, this negativism can be offset by the strong exhibition of positive perceptions by both practitioners and concerned others. This paper reports on the results of a research project that developed professional standards for the Australian Nuclear Medicine Science (NMS) profession (*2*). Concrete evidence and a positive perception of a vibrant and growing profession is provided.

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NEGATIVE PERCEPTIONS

A number of media portrayals have painted a negative picture of the profession of nuclear medicine in the United States and abroad. For example, a letter to the *Australian Women's Weekly* (*3*), portrayed a mothers' response after taking her son for a bone scan as being ". . . amazed at the utter incompetence the 'professional' showed . . ." in dealing with her son. In some institutions, one still hears technologists referred to as "my girls" by the physician.

Scientific studies have also often shown negative attitudes towards technologists by patients, physicians, nurses and other health care workers (*4*). In one study, conducted by Conway and Buck (*5*) of radiographers and sonographers, 38% of responding radiographers agreed to the following statement, "I am treated like equipment." The above examples reveal extremely negative perceptions of MRS practitioners by individuals both inside and outside the MRS professions. For instance, Sydney University students often report comments from practitioners on clinical placement such as ". . . why do you want to do this boring job?" or "you don't need a bachelors' degree to become a button pusher." Dowd (*6*) also discusses the problems of satisfaction by MRS professionals and their workplace, whereas Johnson (*7*) reports of the low self-esteem of many technologists. While these disturbing perceptions do not necessarily reflect mainstream MRS practice, these views are nonetheless held by sections of the general community, some radiologists and, unfortunately, by some of our fellow practitioners.

POSITIVE PERCEPTIONS

Perceptions can also be positive as seen in Conrad Nagle's (*8*) letter to the editor about the thinking technologist. Nagle showed that technologists became more sophisticated and thorough as a result of acquiring patient histories. Bob Thorpe's (*9*) landmark article on expected areas of competence for entry-level practitioners provides another positive

statement about the high level of expertise necessary to be successful in the MRS professions.

A proper image for the profession has been validated several times as demonstrated in Neuhaus' (*10*) classic study in which professional appearance was cited by many physicians and nurses as the reason they felt technologists were not professional workers. It is obvious that the practice of wearing a white coat or other image changes does not in itself turn people into members of a profession. However, a positive statement such as wearing a white coat, or in the case of this study, developing a document that clearly defines the areas of competence expected of a graduate, can present a positive self-view of the profession. This is especially important today, in an era when nuclear medicine must justify its existence through positive self-image (*11*).

WHAT DEFINES A PROFESSION?

There is considerable diversity among authors as to the attributes of a profession (*6,12–16*). However, some of the most common attributes include:

- A unique body of knowledge and a systematic process of developing knowledge (research). This body of knowledge should also reflect independent, critical thinking that goes beyond simple task performance;
- Lengthy training, usually in higher education;
- A code of professional ethics;
- Professional standards for accrediting members of the profession;
- A service ideal; and
- Autonomy and prestige.

Professionalization, the process by which an occupation becomes a profession, involves a variety of strategies to achieve the above, such as setting up a professional association and having that association lobby for professional ideals, changing the profession's name, developing or refining a code of ethics, lobbying for increased practice opportunities and obtaining outside recognition (*12,17*).

This article shows how the process of developing the competency based standards (CBS) for nuclear medicine science (NMS) challenged the perceptions of many experienced members of the profession and generated a continuing debate about the name of the profession. More importantly, the positive perceptions generated by the CBS development process presented compelling evidence of the professionalization of nuclear medicine technologists.

METHODOLOGY

Unlike previous competency-based approaches, such as the efficiency movement, espoused by Frederick Taylor (*18*), this project used an integrated approach to define competence. This integrated approach combined the major attributes concerned with being a competent practitioner such as knowledge, capabilities, skills and attitudes, which together enable an individual to fulfill a role at an appropriate level of achievement in a particular situation (*19*).

Research Strategies

The methodology used in the development of this integrated approach to defining professional competence involved a combination of different research strategies (*20*). This mixture of research techniques is common in educational research, especially in the new approaches taken to competency delineation (*21–23*). Four steps were used: the first three to develop and validate a document in a process known as triangulation and the final step was an analysis of the document for evidence of professionalization of the profession.

In step one a qualitative group process known as modified functional analysis (*19*) was used to facilitate the development of a broad-based view of the profession. This involved a purposeful sample of 10 practitioners, chosen to represent a range of geographical and professional practice settings across the country. The group produced a draft CBS document for the NMS profession across Australia.

Step two involved validating that this draft document was at a level appropriate for entry-level practitioners (ELPs). ELPs are defined in Australia as graduates with 12 mo experience. Significant experience interviews were conducted on nine ELPs (10% of Australia's ELP population). The format for these interviews was based on the critical incident technique used by Benner (*24*).

Prior to being interviewed, ELPs were sent a letter that outlined the purpose of the interview and requested that they reflect on their practice and identify two experiences that they considered to be of particular significance. Experiences considered significant were those that had an outcome that was either clearly successful or unsuccessful, were typical and captured the essence of practice or were particularly demanding or satisfying. Additionally, the respondents were asked to describe a typical and an unusual day at work.

Step three involved further validation that the developing document accurately reflected the level and range of competence of ELPs. A census survey was sent to all members of the profession throughout Australia. This survey gave all members an opportunity to comment and provide input into the content of the developing document. Of the 271 surveys, 62 were returned for a response rate of 22.9%.

Step four involved a descriptive-analytical interpretation (*22*) of the CBS documents relative to professionalization and the process involved in the development of the document, as well as an analysis of events in the Australian nuclear medicine community subsequent to the release of the document. The document and subsequent professional action and discussion were analyzed for signs of professionalization based on the criteria described earlier.

Assumptions and Limitations

The methodologies used in gathering data for this study were selected using a process known as triangulation (*25*), as well as purposeful sampling in steps one and two to ensure the validity of results. Although the samples would appear small

for a quantitative study, they are sufficiently large for a qualitative study. In fact, a qualitative study can become too large, making it impossible to draw conclusions from the large amount of data, leading Sandelowski (*26*) to state that, in qualitative research, "small is beautiful."

Qualitative researchers cannot observe every event in a population, but instead use this combined approach to assure validity. Validity is also determined in a qualitative study by the reader, who should be able to "audit the events, influences and actions of the researcher" (*27*).

The results of this study should only be seen as valid for Australia and should not be seen as representative of the profession of nuclear medicine in other countries. However, the methodology could be replicated in the United States, to develop CBS documents and assess the level of professionalization.

This study should not be viewed in the same light as a quantitative study attempting to "prove" or "disprove" the existence of an entity. Instead this type of study is descriptive in nature, and could lead to further quantitative research.

RESULTS

The Structure of CBS

The entire project was jointly funded by the MRS professions of diagnostic radiography, radiation therapy, nuclear medicine science and sonography, and a substantial Australian government grant. The project resulted in the production of a set of standards unique to each of the professions.

These standards have been used in a number of ways, primarily to advance the professions they analyzed. In radiography, for example, the inclusion of image interpretation led to a national study detailing the frequency with which radiographers report clinical findings (*28*). This has led to curricular revisions to address this important skill.

The CBS were developed using a set format similar to the model of competence described by Fennell (*29*). Table 1 provides an example of the structure of the CBS. In this format, the competency based standards are arranged in a five-part structure including:

- Key purpose–mission statement of the profession;
- Units–or major roles/functions of the profession;
- Elements–or sub-roles;
- Performance criteria–which show evidence of competence; and
- Cues–that provide examples of required activities.

Evidence of Professionalization

The CBS document revealed nine items that indicated professionalization (Table 2). Dominant were the following: name change, involvement in research, refinement of ethical content and an expected high level of professional functioning (competence beyond task performance) by ELPs. Whereas previously nuclear medicine may have been viewed as "just a job," the CBS documents show roles that indicate the development of a professional attitude, especially among ELPs, who were more affirming of an increased status than experienced practitioners. The interview process was particularly revealing in this area.

TABLE 1
Format of Competency Based Standards

Unit 6	Professional development and education
6.2 Element–committed to career development	
Performance criteria	
6.2.1	Recognizes professional standards.
6.2.2	Acquires effective interpersonal skills.
6.2.3	Uses educational opportunities and available resources.
CUES	Participates in continuing education programs.
	Reads relevant journals.
	Attends conferences and meetings.
	Updates CPR skills regularly.

DISCUSSION

Name Change for Nuclear Medicine

Technologists. Early drafts for the key purpose used the term nuclear medicine technologist/scientist reflecting the range of

TABLE 2
Segments of the CBS Document That Reflect Professionalization of Nuclear Medicine

Segment	Professionalization Indicator(s)
Key purpose	Name change to nuclear medicine scientist
Element 1.2–Recognizes the need for participation in development of resources including development of database and case studies.	Participation in research
Element 4.5–Analyzes data. Performance criteria 4.5.3–Professional opinion of medically significant findings reported to medical personnel responsible for patient treatment when considered necessary or requested.	Critical thinking that goes beyond task performance
Element 6.1–Actively involved in short- and long-term advances in nuclear medicine practice.	Body of knowledge: professional standards
Element 6.2–Committed to career development.	Service ideal
Element 6.3–Practices in a professional manner.	Service ideal
Element 6.4–Participates in and/or initiates research.	Participation in research
Element 6.5–Participates in the education of students.	Service ideal
Unit 7–Advocacy (promotion of nuclear medicine in the workplace: professional issues).	Code of ethics; service ideal; autonomy and prestige

TABLE 3
Suggested Alternative Names for the Profession

Names
Nuclear medicine practitioner
Medical radiation scientist
Nuclear medicine technologist
Nuclear medicine scientific officer
Nucleographer
Scientologist
Nuclear imaging scientist
Radioisotope scientist
Nuclear medicine applied scientist
Nuclear medicine applications scientist
Gamma radiographer
Nuclear medicine scientist

opinion between members of the expert panel. The national survey received a broad range of data regarding the name of the profession. Table 3 lists 12 alternative names for the profession. While many practitioners felt no change was required, the largest group of respondents opted for nuclear medicine scientist (NMS). A common thread in the comments from these respondents was that NMS, although not the ideal name, was the best name in the absence of a more suitable alternative.

Analysis of the level of experience of respondents revealed that the desire for a new name decreased with an increase in the number of years of experience. Table 4 shows 11 of 13 (84.6%) ELPs believed the name should change compared with 8 of 24 (33.3%) practitioners with more than 10 yr experience. A comparison of the level of qualifications between ELPs and the rest of the profession (Table 5) showed that ELPs had a higher level of education.

The most frequently stated reason for changing the name to scientist was because the current qualification is a baccalaureate applied science degree. This difference in perception linked to qualification was also seen by Cox (*30*) when the profession of radiation therapy in Australia upgraded to the baccalaureate degree.

The name issue generated a great deal of debate that has continued over the past three meetings of the Australian

TABLE 4
Should the Name of the Profession be Changed to Nuclear Medicine Scientist?

	Years of experience of respondents				
Response	**0–2 yr**	**3–5 yr**	**6–10 yr**	**>10 yr**	**Total**
Yes	11 (84.6%)	5 (62.5%)	11 (64.7%)	8 (33.3%)	35 (56.4%)
No	2 (15.4%)	2 (25%)	6 (35.3%)	12 (50%)	22 (35.5%)
Unsure	–	1 (12.5%)	–	4 (16.7)	5 (8.1%)
Total	13	8	17	24	62

TABLE 5
Years of Experience Compared with Level of Qualification

	Years of experience of respondents				
Qualification	**0–2 yr**	**3–5 yr**	**6–10 yr**	**>10 yr**	**Total**
Bachelors degree	4 (30.8%)	0	–	–	4 (6.4%)
Diploma	7 (53.8%)	3	4	9	23 (37.1%)
Associate diploma	–	1	7	2	10 (16.1%)
Certificate	–	–	–	6	6 (9.7%)
Other	2 (15.4%)	3	5	7	17 (27.4%)
Unknown	–	1	1	–	2 (3.2%)
Total	13	8	17	24	62

and New Zealand Society of Nuclear Medicine Technologists (ANZSNMT) and produced a six-page article by Bell (*31*) and others in the ANZSNMT newsletter discussing the pros and cons of a name change. Rather than settling the issue, suggested name changes in addition to the 12 names listed on Table 3 have now emerged. The current debate has focused more on whether the name should change rather than coming up with one specific alternative name.

Wagner (*32*) has indicated the merits of removing the word nuclear from our name and instead using the term molecular medicine. In this case, we could become known as molecular medicine scientists. One compromise suggestion from the survey was to call the profession NMS but maintain the NMT for individual practitioners.

This level of debate is pleasing as it indicates that the professionalization process is occurring. There is intellectual discussion about our identity as a profession.

Ethical Issues. The CBS documents served to help define a number of ethical issues in the profession. They have been especially useful in the development of clinical assessment forms to assess professional values and ethics, as well as develop courses in medical ethics within and outside of the MRS profession (*28*).

ELPs and Experienced Practitioners Differ on the Role of the Practitioner. The contrast in perceptions between ELPs and more experienced practitioners was also seen in the response to the question "Does the key purpose clearly reflect the role and functions of the profession?" A total of 76.9% of ELPs agreed, compared to only 45.8% of experienced practitioners.

When asked whether the CBS were pitched at a level appropriate to ELPs, the ELP group again had a higher level of positive response than the more experienced group. This division prompted some of the more experienced members of the expert panel to recommend reducing the level of competence expected of ELPs. This argument was laid to rest when analysis of the interview data clearly supported the findings of the ELP group that ELPs are in fact practicing at a high level of

TABLE 6
Types of Significant Experiences Reported During Interviews with Entry-Level Practitioners (ELPs)

1. Cardiac arrest in which the physician was able to take control.
2. Cardiac arrest in which the nursing staff played a major role.
3. Cardiac arrest in which the practitioner took an active role.
4. Attendance at a continuing education workshop.
5. Teaching students while dealing with a difficult patient and solving a computer software problem.
6. Performing a study in the intensive care unit (ICU).
7. Conducting research, preparing the results for conference presentation, learning new equipment.
8. Problem with double-booking patients and dealing with a difficult radiologist.
9. Dealing with an ethnic male patient who refused to cooperate with a young female ELP.
10. Confronting a situation in which the floor became contaminated with radioactive blood.

competence. This augers well for the future of the profession as it indicates the level of perception and competence will rise as new graduates enter the profession.

Interviews Validate High Level of Competence of ELPs. In addition to providing validation for the CBS documents, valuable information was gained in relation to the contexts in which MRS practitioners work in Australia. Table 6 lists the types of significant experiences chosen by ELPs.

The experiences chosen as significant by three interviewees related to life-threatening experiences in which their patients had cardiac arrests. The level of involvement in dealing with a medical emergency showed considerable variation from a role that was secondary to other health professionals to a situation in which the practitioner had to assume a major role in cardiac resuscitation. Two other interviewees chose to relate difficult work-related relationships to illustrate demanding roles of an ELP. While relationship problems were complex, they were not considered to be demanding for experienced practitioners.

One interviewee described a complex event involving his role as teacher, emergency worker and computer problem-solver. This demonstrated to the panel the complex nature of the routine work load of a practitioner and that ELPs were capable at performing at a high level of competence. For another interviewee, the development of research and subsequent conference presentation of her results was seen as a routine part of her role as a practitioner. These experiences resulted in the panel agreeing that although not all ELPs operate at the highest levels of competence, the standards should reflect the highest possible level of routine practice.

Research: An Integral Role of the Nuclear Medicine Scientist. The CBS are arranged into major functions or roles of the profession known as units of competency. Table 7 shows the units of competency for the NMS profession. These units include professional development and education, and advocacy/promotion of the profession as major roles for practitioners.

It is pleasing that the involvement in research was seen as an integral role of even beginning practitioners. Research is a high-level activity essential to the development of the knowledge base of a profession and a major indicator of professionalization.

Research has become an integral part of the university curriculum in MRS and nuclear medicine (*33*). All students in the honors program (a 4-yr, rather than 3-yr, program that provides additional recognition to students as well as the opportunity to directly enter PhD programs) engage in research. Students in this option take Research in Medical Radiations I and II, Research Methods and Statistics, as well as elect one research course (eg., Epidemiological Research, Qualitative Research Methods), and complete a research project. ELPs graduating from this program are expected to assume a number of roles in clinical research.

CONCLUSION

Significant progress is being made in the professionalization of nuclear medicine. The CBS allowed us to articulate, in an integrated manner, the complexity and variety of expertise of being nuclear medicine science practitioners who can lay claim to a body of knowledge unique to our profession.

Competency-based standards have the potential to create a professional milieu in which practitioners have the power to control their own destinies, and to end debates regarding education and training in producing a flexible, multiskilled work force (*34*).

In this method, practitioners indicate and, through proactive change, influence their roles in the health care system. This brings about a positive self-fulfilling prophecy. Rather than being defined by others we can now say "We are what we think we are." These results are leading to further research by the first author, in a doctoral dissertation, to further professionalize the discipline of nuclear medicine. This will logically include increasing the amount of research in the profession as well as looking at post-graduate education opportunities for technologists.

TABLE 7
Units of Competency (Major Functions/Roles) for Nuclear Medicine Science

Unit 1	Management of resources
Unit 2	Quality control and quality assurance
Unit 3	Patient welfare
Unit 4	Nuclear medicine services
Unit 5	Radiation and occupational health and safety
Unit 6	Professional development and education
Unit 7	Advocacy/promotion

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