

FORUM: THE FUTURE OF NUCLEAR MEDICINE

Newsline recently asked five nuclear medicine professionals to comment on the future of the specialty. The participants possess extensive experience in nuclear medicine, but having moved on to roles in hospital administration and business, they were chosen for this forum for their perspective outside the field.

John Burdine, MD is vice-chairman and chief executive officer of St. Luke's Episcopal Hospital in Houston, Texas.

B. Leonard Holman, MD is chairman of radiology at Brigham & Womens Hospital in Boston, Massachusetts.

Michael D. Loberg, PhD is president of operations in Northern Europe for Bristol-Meyers Squibb Company of Princeton, New Jersey.

Leon S. Malmud, MD, president of The Society of Nuclear Medicine, is vice-president of the Health Sciences Center at Temple University Hospital in Philadelphia, Pennsylvania.

F. David Rollo, PhD is the senior vice-president of medical affairs at Humana, Inc., in Louisville, Kentucky.

Defining the Specialty and Its Turf

Dr. Burdine: You can divide nuclear medicine many ways—I've seen it practiced as a support specialty within pathology, practiced as a fundamental part of radiology, seen it practiced in a limited sense as a collection of imaging science, practiced independently with an internal medicine background and also as part of academic departments of internal medicine. The real problem today is not defining nuclear medicine, but deciding how it best fits in the overall scheme in a world of rapidly diminishing resources, in a world where we clearly

are going to have to ration patient care. Where does nuclear medicine best fit? As an independent specialty? In radiology? Or something new? Douglas Maynard [chairman of radiology at Bowman Gray School of Medicine, Winston-Salem, North Carolina] was the first person I know to describe a department of diagnostic science where physicians would refer their patients, and where doctors in consultation would decide upon an array of tests and the sequence of those tests in a sort of decision tree matrix. I think he was right on target. Today what makes sense is to create departments where the unique nuclear medicine expertise comes together with unique cross-sectional anatomy expertise and the two in coordination clearly have the potential of supplying the best value to the patient. Those in other specialties need to come into a common ground through the American Board of Nuclear Medicine or through the cross sectional imaging that is part of the certification in nuclear medicine by the American Board of Radiology.

Dr. Rollo: The specialty of nuclear medicine, however, is in a weak position. Physicians in all areas of medicine are on the prowl for new revenue-producing procedures to claim for themselves. Nuclear medicine depends upon others for referrals, and is in a weak position organizationally. That makes it very hard for nuclear physicians to resist the advances of cardiology and neurology, both of which are well funded and positioned. The radiologists in local hospitals, who often have only spent three months studying nuclear medicine, are not in a position to suggest nuclear medicine procedures, even when they are clearly called for.

Dr. Malmud: Other specialties have sought to enter into areas developed by nuclear medicine as a direct result of the research successes of nuclear medicine.

There would be no lusting for cardiovascular nuclear medicine if it did not offer significantly better information than is available otherwise. There would be no attempt to take over brain imaging or the developing field of therapy with unsealed sources by other specialties if these techniques were not remarkable in their achievements.

Dr. Burdine: In just the heart alone, the information available through nuclear imaging has been so unique that in my mind it has allowed us to apply dangerous and difficult things such as cardiovascular surgery with a great deal of understanding of what the person's true problem is. Watching that as an internist and cardiologist, I think nuclear medicine has made the single biggest contribution to cardiology in the last 50 years. Nuclear medicine has shone a light into silent, hidden areas that we just could not assess decently before these modalities came along.

Dr. Holman: Nuclear medicine has led in the use of computers in medicine and looking quantitatively at images. Yet, nuclear medicine's impact in research, particularly in studies into disease mechanism, far outweighs its relatively small clinical role. The biggest surprise upon becoming chairman of a radiology department was seeing the role that nuclear medicine plays. In most institutions it represents less than 5% of the total volume of imaging procedures.

Dr. Malmud: An accolade to nuclear medicine—that others wish to assume responsibility for much of what we have developed—carries with it the risk that we may resist assuming the new responsibilities ourselves. There is no reason, for example, why a nuclear medicine physician cannot perform nuclear cardiology studies, nor is there any reason why these studies cannot be collaborative. The problem occurs when the



“If we are unwilling to monitor the care of patients treated with unsealed sources in hospitals as they would be by an attending physician, then nuclear medicine will not be in charge,” says SNM President Leon S. Malmud, MD of Temple University Hospital.

physician is unwilling to become intimately involved in a study. When that occurs on the part of any specialty, another specialty will immediately take the opportunity to take control. So if we are committed to our practice, if we are vigilant, if we are willing to collaborate, then we should be able to maintain a major role in the techniques that we have developed. If on the other hand we are unwilling, for example, to monitor the care of patients treated with unsealed sources in hospitals as they would be monitored by an attending physician, and instead relegate that responsibility to internists and to radiotherapists, then

nuclear medicine will not be in charge. We can't have it both ways—If we want the control, we must diligently assume the responsibility. If we are not willing to make that commitment then we should recognize that those particular studies will no longer be ours.

Nuclear Fear and the Patient's Perspective

Dr. Holman: It's amazing that nuclear medicine is still misunderstood by most of the patients that undergo nuclear medicine procedures. We in nuclear medicine have done a poor job of informing the lay public about what the specialty is and what it can do for them.

Dr. Burdine: I think the patient today remains thoroughly confused about nuclear medicine. People were just beginning to be enlightened and then along came the CAT scanner and along came MRI. I think the patient tends to key more on the word “imaging” rather than on Nuclear Medicine. If you say “nuclear medicine” today and the individual had not had any previous personal experience with it, he may still suspect it has something to do with cancer—that's been my consistent experience. When you say, “no, its a diagnostic modality, we do images of the heart,” they say, “Oh, you mean like CAT scanning.”

Dr. Malmud: That doesn't distress me, as long as physicians are familiar with nuclear medicine so that they can recommend the appropriate studies for their patients. I know that there is a lot of concern with the public's concern with radiation, with the dangers of overexposure to radiation, but I have never met a patient who has refused a nuclear medicine procedure because we used radiation, and I doubt that other practitioners have ever had that experience. We are vulnerable, though not because what we do is more dangerous than what is done in general radiography, or even a fraction as dangerous as what is done in contrast radiography, for example. We

are particularly vulnerable because of the association between nuclear medicine and nuclear energy. The government responds to public pressure to contain the risks of nuclear power by instituting regulations that affect us, even though the isotopes that we deal with generate a tiny fraction of the potential radiation from other sources. If there is a risk, it is the risk of overly cautious and overlapping regulations that make the practice of nuclear medicine increasingly expensive and that render nuclear medicine procedures vulnerable to competing modalities that are less expensive. Nuclear medicine procedures are not in and of themselves expensive. It is the cost of handling, transporting and disposing of radioisotopes that has become rather expensive and the present regulation in response to public hysteria has lumped us together with the nuclear power industry—costs are way out of proportion to the risks.

Dr. Holman: [Nuclear fear] has resulted in increasing restrictions on threshold radiation dose levels and further restrictions from the Nuclear Regulatory Commission, the Food and Drug Administration, really in the over regulation of nuclear medicine. What it means in practice is that for new applications of MRI, testing can begin quite quickly in large numbers of patients, whereas with nuclear medicine, clinical evaluation of new techniques and new radiopharmaceuticals has to wait until the pharmaceuticals have been approved by the FDA, which can take years.

Dr. Loberg: Many of the patients I have seen are grateful for the contribution made by nuclear medicine. Beyond the patients and the hospital workers, though, you may encounter a problem that has been around for a long time: fear of radioactivity. More recent are the problems associated with the disposal of radioactive waste generated in a hospital setting. The environmental issue is a very serious one that's here to stay and we're going to have to find ways to minimize the impact. We continue to make

brochures and pamphlets to educate the patients, and we have been working for many years with ACNP (the American College of Nuclear Physicians), providing funding with others to deal with public perception issues. I believe we've made considerable progress.

Positron Emission Tomography

Dr. Burdine: One of the things that did PET no good was a few snake oil salesmen that were trying to push PET beyond its real, objective, clinical effectiveness. For a number of years measuring a few of the compounds in the brain or in the blood stream or elsewhere had to be of benefit, but we didn't know what to do with the information. In the last decade PET has changed enough so that it has become tantalizing, something that needs further study. It already clearly has applications in the brain. I think there is still more research applications than clinical, although there is an ever burgeoning number of patients that have benefitted clinically from PET studies. When you look at the heart, there is a fairly small category of surgical patients, a very important category that truly benefit from PET studies, but when you apply the cost effectiveness measure to them, it leaves us in an amazing quandary. Our cardiologists here have struggled with that issue, and in their minds it's almost a washout to determine whether it's really worth spending the money for a PET scan or trying to deal with the patient without this information. I am not at all sure that the cost of that technique is going to go down as fast as the reduction in money available in our system for payment of that type of study.

Dr. Malmud: I have never seen a technology that failed because of its expense, and I don't think that PET will be the first. If a technology is useful—and PET is more than useful—then the technology will prevail. Nuclear Medicine physicians in large academic centers should be fighting earnestly to have PET and cyclotrons funded so that they can par-

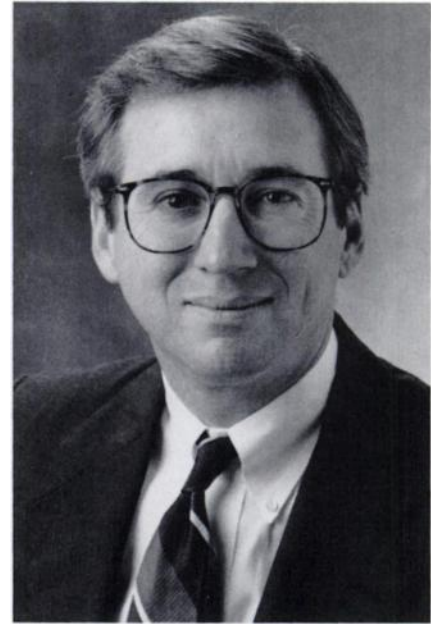
ticipate in the exciting research that is already ongoing. PET really is the future of the field. I do not, however, envision a PET camera in every major hospital. It's not the equipment that will be the limiting factor, it is the brain power to support PET that will be the limiting factor. PET cannot flourish absent a large cadre of physician scientists to support it. PET growth will be constant, but not the kind of phenomena that we have seen with either CT or MI.

Dr. Loberg: For a long time hospitals were reluctant to install PET machines because no radiopharmaceuticals were available, and conversely, the pharmaceutical companies were reluctant to invest in radiopharmaceutical development for PET because so few machines were in operation. We contributed to the break of that longtime stalemate with the development of the rubidium-82 generator, the only radiopharmaceutical marketed for PET, spurring development of what we hope will be a large market.

Dr. Burdine: I think PET has a real potential. I don't mean that I see a specific endpoint. I think that a lot of very good people believe that the progress we're making in understanding the biodistribution, metabolism, and physiology of a number of chemicals and natural compounds has great research potential and should over the next decade result in more and more clinical applications. If we expect PET to suddenly double the interest in nuclear medicine, I think that's unlikely.

The Future of Nuclear Medicine

Dr. Loberg: I look very favorably on the future of nuclear medicine. For many years, the maturation of nuclear medicine technology has been the subject of understandable concern, since very few technologies that have their roots in the 40s and 50s can lay any claim to immaturity. Yet one can make a convincing argument that nuclear medicine remains an immature technology as it enters the



“The maturation of nuclear medicine technology has been the subject of understandable concern, since very few technologies that have their roots in the 40s and 50s can lay any claim to immaturity. Yet one can make a convincing argument that nuclear medicine remains an immature technology,” says Michael D. Loberg, PhD.

1990s. This is because growth in nuclear medicine has never been bounded by the discovery of new physical principles. Rather, nuclear medicine always had its basis in the application of tracer methodology to diagnostic medicine. As such, nuclear medicine has grown and should continue to grow as we learn more about human pathophysiology and its biochemical underpinnings.

Dr. Rollo: The future of the practice of nuclear medicine is really a matter of numbers. We don't have enough qualified individuals now, and we aren't training enough for the future. [Nuclear medicine] needs to keep the lock on the shop or they'll find nothing left in the morning. The future lies in efforts to establish firm new requirements for the presence on staff, of a minimum of nuclear medicine board certified personnel in hospital settings. If physicians certified in nuclear medicine were required to be present in all radiology departments, nuclear medicine would have advocates where it mattered most.

Dr. Holman: I think it would be difficult to make these requirements—what agency would you use to foster these restrictions? The NRC? We keep hiding behind the skirt of the NRC and then get angry with their over-regulation. We better be fully aware of the consequences before we consider this. In rural areas, only one radiologist may be available to perform neuro-radiology, cardiovascular radiology, and all other aspects and that's what the work load demands. In community practice, it would not be in the patients' interest to over-regulate radiology. I see the nuclear medicine division of the future continuing as part of radiology. I don't think that nuclear medicine can stand separately, particularly as the need for correlative imaging and comparison of multiple images becomes an important part of the way that we make our diagnoses. As we increase the use of electronic networks to bring images together, it will be important to have the nuclear medicine images on the same network as the MR and CT images; that's accomplished most easily if nuclear medicine operates in a single department of radiology, the way it works in most hospitals today.

Dr. Burdine: The future is going to depend a lot on technical advances in nuclear medicine and in other fields. I would urge a person who is interested in nuclear medicine to get a basic background in something else so that nuclear

medicine as well as other activities could be pursued. For a radiologist who is interested in nuclear medicine, now is a golden opportunity to place yourself in good stead in MRI imaging or CAT scanning, or some other modality and really become an imaging science specialist. I guess what I am saying is this - as we go into the future, the fact that the growth in nuclear medicine, in terms of the American Board of Nuclear Medicine, has been fairly static does not signal the dwindling demise of the field. I don't believe that at all. I simply believe that things are going to be packaged differently and if you look at the notion of a diagnostic imaging science group, maybe what we should be doing is training people in several types of imaging science so that wherever they go they are qualified. I sense that nuclear medicine has been fairly static for a number of years in terms of its growth and I think that anything that the field can do to promote organization of resources in a consolidated fashion will promote what is truly best for patients. I would love to see a department of imaging science, bringing several specialties together, occur here at this institution. I truly believe that the imager has to become broader and we need to tailor training programs a little differently than we do today. I see a very good future for nuclear medicine as it broadens. I don't see anybody losing a job, but I see exciting new hybrids emerging.

Dr. Malmud: The applications of PET, SPECT, and now radiotherapy with unsealed sources are limitless and are just beginning to be tapped. I think that nuclear medicine laboratories will continue to grow if not in the volume of what they do, certainly in the importance and complexity of what they do. Absent investigation, we will stagnate and wither away. Given the opportunities there is no reason for us to stagnate. We are presently training an excess number of physicians in the U.S. and experts predict a surfeit of physicians by the 21st century. I don't see that as a catastrophe. If there is a surfeit of physicians, what we



“I truly believe that the imager has to become broader,” says John Burdine, MD of St. Luke's Episcopal Hospital in Houston, Texas. “I would urge a person who is interested in nuclear medicine to also get background in something else so that nuclear medicine as well as other activities could be pursued.”

will see is a redirecting of physicians into areas that are not so attractive at the moment, and that will include research and administration. So I view the changes as ones that will be difficult, but nevertheless represent more in the way of opportunities than in the way of restrictions. I would recommend to any physician interested in having some patient contact, and who is also interested in the application of basic sciences, that this is an exciting discipline, the potential of which has yet to be achieved.

Reported by Francis F. Mand