central nervous system (CNS) studies, renal studies, compartmental volumes, and drug and hormone assays. Some of these areas, such as CNS and renal studies, relate to standard techniques for determining the state of the peripheral circulation, but other procedures have only recently become clinically possible. Many applications, while extremely promising, still occupy an intermediate stage between early clinical testing and routine use. A few, such as acute myocardial infarct scanning, are embryonic; but considering the pace of trial and acceptance in this field, they too may soon be in widespread use. The particular examinations included in these guidelines are, in the judgment of the authors, those most likely to have an impact on patient care.

Resource guidelines for organizing a central hospital nuclear medical program are also reviewed, updated, and expanded. The space, equipment, and manpower requirements described will provide services for all kinds of diagnostic problems, not just those associateed with cardiovascular diseases. Training qualifications for the professional and technical staff, appropriate case loads and utilization levels, methods of quality control, and procedures for protecting the safety of both patients and staff from excessive exposure to ionizing radiations are proposed. In hospitals with heavy cardiac case loads, special satellite cardiovascular nuclear units are recommended when they are medically and economically practical; these can be located in the coronary and intensive care units, noninvasive cardiac laboratory, catheter–angiographic laboratory, emergency room, and cardiac operating room.

These resource guidelines are directed to physicians and hospital administrators who are currently responsible for planning and organizing nuclear medicine programs or who anticipate a future need for such services in their community. It is assumed that the selection and use of these procedures will be the joint responsibility of nuclear medicine specialists and cardiologists who accept their obligation to keep abreast of advances in this rapidly changing field, particularly with regard to instrumentation and methodology.

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BRAIN SCANNING IN METASTATIC DISEASE

In a recent issue of *The Journal of Nuclear Medicine*, Brooks, Mortara, and Preston reported that in six patients with adenocarcinoma of the colon and cerebral metastases, all had negative brain scans with ^{99m}Tc-pertechnetate (*1*). From this unexpected finding they concluded that a negative ^{99m}Tc-pertechnetate scan is the rule rather than the exception with cerebral metastases from adenocarcinoma of the colon. Because of these unexpected results we reviewed our experience with brain scans in patients with adenocarcinoma of the colon to determine if our data would support this conclusion.

Based on data obtained from the tumor registry and records of the nuclear medicine department from January 1967 until the present time, 18 cases were available for review. The results of these scans, positive and negative, were correlated with the patients' available medical records before and after scanning.

Of the 18 patients, 9 had positive brain scans; 5 of these were highly suggestive of metastatic lesions. In one of these five the primary lesion was presumed to be in the lung. The other four cases had histories, signs, and symptoms typical of cerebral metastasis from pathologically proven adenocarcinoma of the colon. Histologic proof was provided in two cases; in one case at surgery and in the other at autopsy. The other two were felt to have inoperative cerebral lesions on the basis of clinical information and scan. Histologic proof was never obtained on these last two.

In the group of patients with negative brain scans, the reasons for performing the scans were varied. Not all of these patients were scanned because of clinical evidence suggestive of a cerebral metastasis. None of this group had subsequent clinical histories strongly suggesting false-negative brain scans.

The results of this small retrospective study demonstrated that of 18 patients with adenocarcinoma of the colon who had brain scans for various reasons, 4 had positive scans along with positive histologic or clinical evidence or both to support the diagnosis of metastasis. None of the group with negative scans had histories strongly suggesting false-negative brain scans. Although there is certainly not enough histologic evidence to refute the contention of Brooks, et al we believe that these data shed significant doubt on the statement that negative brain scans are the rule rather than the exception with cerebral metastasis from colonic adenocarcinoma.

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THE AUTHORS' REPLY

The observation that no positive brain scans were found in histologically proven colonic adenocarcinoma was indeed an unexpected finding that prompted our earlier communication. In spite of the lack of support from the University of Virginia, albeit the lack of histology to confirm negative or positive scans, the lesson in clinical practice remains valid. A negative brain scan in patients with suspected metastatic cancer does not conclusively rule out a secondary brain tumor. In our practice, the lack of a positive scan has been "the rule rather than the exception" in those patients with adenocarcinoma of the colon. Therefore, we would not consider a patient with colon carcinoma and cerebral manifestations suggesting metastatic disease "tumor-free" without additional neurodiagnostic investigations.

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BLOOD VOLUME MEASUREMENTS

I read with interest and some concern an article by Hurley (*1*) in which the author describes the technique he used for measuring blood volume. This technique (as described on page 47) is confusing. The author does not seem to have limited himself to a uniform method. I think he used dual tracers in some cases and in others a single tracer, with the assumption of a constant F_{cell} ratio. Moreover, he states that he ignored zero-time extrapolation and took a single 10–15-min postinjection sample as representative of an adequate equilibrated and mixed dilution sample. It might be valid in normal humans, but I am sure that many readers will assume that such a technique is applicable to the patient who needs a volume measurement. It is disturbing to think that such an assumption might be made. In our experience, blood volume measurements performed in this manner are not valid and should be condemned. Equilibration time varies in the pathologic condition and two tracers (labeled albumin and labeled red cells) may have totally different equilibration or mixing times (*2,3*).

What is normal, and of what significance is a blood volume measurement? Many authors have come up with different formulas and values depending on the population, habitat, and even culture of a people. Fujita (*4*), utilizing a dual-tracer measuring technique, established a different set of values based on a normal Japanese population. Standards and values are all relative and are to be used as a guide for replacement therapy, taking into account the physiologic balance of the particular individual. I certainly agree that body surface is the most reliable parameter and that the Hidalgo, Nadler, and Bloch (*5*) values serve as good guides.

We are presently reviewing 2,000 cases in which blood volume measurements were performed by a dual-tracer technique and our results confirm our earlier observations based on a study comprising 200 patients. The measurements obtained with a single tracer were compared with those obtained when each component was measured separately with its appropriate tracer. The results are valid and comparable provided the multiple sampling technique is rigidly followed and calculations take into account the F_{cell} ratio. Calculations and sources of error are clearly described in the references cited.

One can certainly amuse oneself with all kinds of mathematical exercises to establish a normal value, but how and where does this value apply in actual practice? The reliability of values obtained by the indirect measurement of blood volume depends on