IMAGING QUALITY-CONTROL PROGRAM

The initial production and continuation of high-quality goods has long taxed the ingenuity and resources of industrial establishments. Several of the statistical techniques evolved and recently introduced into clinical laboratories under labels such as "quality control" or "quality assurance" are applicable to the performance of diagnostic tests. A major component of these techniques involves comparisons of in-house performance and methodology with local, regional, or national peer groups. Such comparisons, usually in the form of surveys, are often valuable in estimating and improving precision and accuracy. Implicit in this improvement is the hope of a direct contribution to better patient care.

The College of American Pathologists (CAP) inaugurated its first Proficiency Survey in Clinical Chemistry in 1949. Ensuing years have witnessed a continued expansion of the College's survey activities in other subdivisions of clinical pathology: blood banking, clinical microscopy, microbiology, and hematology.

Several regional external quality-assurance programs already exist in Nuclear Medicine—The Massachusetts Society of Pathology Quality Control Program, the New England Radiological Physics Organization, and the New England Chapter of the Society of Nuclear Medicine Conjoint Program for Quality Control in Nuclear Medicine as well as many more informal local and regional efforts. A cooperative pilot study patterned partly after existing CAP quality-evaluation programs and aimed at providing participants with information useful in radionuclide identification and activity measurement was undertaken by the National Bureau of Standards and the CAP in 1972. These programs have concerned themselves largely with in vitro and, to a lesser degree, with in vivo tests that inherently tend to produce objective and quantifiable data. Nuclear imaging with its additional considerations of image and observer interaction presents quality-control problems whose solutions remain incomplete and imperfectly formulated. The Nuclear Medicine Resource Committee of the CAP Council on Quality Control with the cooperation of the Society of Nuclear Medicine and the American College of Radiology initiated the first National Phantom Survey Series in 1973. The series proposed to evaluate the question of whether problems with imaging procedures could be identified through an interlaboratory comparison of a group of phantoms.

Four phantoms were compared during 1973 and 1974. The first (1973 X-A) was a square container of uniform-sized "hot" and "cold" areas with varying lesion-to-background ratios. The second through the fourth series (1973 X-B, 1974 X-A and X-B) attempted to mimic clinical material more closely in the form of liver and brain models. All prototypes were initially designed by Nilo E. Herrera in consultation with James Cristie, Gerald J. Hine, and William J. MacIntyre and fabricated according to specifications by E. R. Squibb & Sons. The models used ^{57}Co as a reasonably long-lived substitute for ^{99m}Tc. Participants were given scanning instructions and a questionnaire relating to equipment and imaging parameters and were asked to analyze the phantom with regard to the number of "abnormal" areas —their dimensions, their shapes, and their target-to-nontarget ratios. Results were tabulated and each participant received an overall summary enabling him to compare his performance with that of his peers. Phantoms remained in each participant's laboratory for future use as a daily quality-control aid.

Survey programs in their infancy often suffer from a lack of participants and, therefore, of clear-cut statistical conclusions. Although the CAP program has been vulnerable to this criticism, it has provided several important insights. It has emphasized, for example, the great importance of the pulse-height analyzer's window width to good performance of both rectilinear devices and cameras. Participants who used a narrow window and a baseline of approximately 90% of the energy peak of ^{57}Co obtained results markedly superior to those who failed to do so.

The 1975 Phantom Series will begin with a thyroid model, with a lung phantom projected as a second unknown later in the year. Information pertaining to the survey series is available through the CAP office, 7400 North Skokie Blvd., Skokie, Ill. 60076 [Telephone (312)677-3500]. We urge our fellow members of the Society to give this program their thoughtful attention and critical support.

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