IAEA Quality Control Atlas for Scintillation Camera Systems

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IAEA Quality Control Atlas for Scintillation Camera Systems is a collection of approximately 250 images, mostly of the quality-control, acceptance, or performance-testing variety, but including a fair representation of example clinical images illustrating both normal γ-camera behavior and a variety of abnormalities and artifacts symptomatic of underlying problems with the imaging system. The target audience is nuclear medicine professionals who deal with γ-camera images daily, although I believe this atlas will be of most interest to nuclear medicine physicists. The stated purpose of the atlas is to provide "a guide on how to take proper quality control measures, on performing situation and problem analysis, and on problem prevention." I have never before personally come across such a comprehensive atlas on γ-camera quality control, and it appears to me that this one completely fulfills its stated purpose.

The atlas was developed under the auspices of the International Atomic Energy Agency (IAEA), with contributions by numerous experts from around the world. The 4 primary contributors are well-known physicists in the field of nuclear medicine, namely L.S. Graham (United States), A. Todd-Pokropek (United Kingdom), E. Busemann Sokole (Netherlands), and A. Wegst (United States). The contents are neatly divided into an introduction followed by 6 major sections, each corresponding to a particular aspect of modern-day γ-camera imaging (planar, SPECT, whole body, scintillation camera–computer interface, environment/radioactivity, and display/hard copy). Each section is further subdivided into system performance categories specific to each aspect of the imaging. The section on planar imaging is, not surprisingly, by far the largest, composing over half the atlas, as most performance measures and problems can be traced back to the basic operation of the camera. Each illustration consists of one or more images accompanied by a brief description of image acquisition parameters, specific test equipment used (if any), what measure or problem is being demonstrated, and results and comments sections, with concise but clear explanations of cause, effect, and remedy. Tips on how to perform various tests in the clinic are provided with several of the illustrations. These tips are especially useful for tests that are less commonly performed, such as collimator hole alignment and angulation. The reader is occasionally directed to other subsections or illustrations to obtain more information on a particular subject. Presumably, this is to allow detailed information on each subject to be found in one location, as opposed to being scattered throughout the book. Literature references are also cited along with an illustration when deemed appropriate.

There are 2 features of the atlas that impressed me most. The first is the wide variety of manufacturers, generations, and models of γ-camera from which the illustrations are drawn, although the authors appropriately keep the γ-cameras anonymous throughout. I personally recognized just about every camera I have encountered over the last quarter century. I believe this adds to the global relevance of the atlas, as even many of the older camera models are still in use today around the world. The second feature is the vast subsection on planar uniformity. I was amazed at just how many problems can be diagnosed through proper interpretation of a simple flood image, which is the easiest quality-control test and is performed daily in just about every clinic. The atlas provides examples of at least 2 dozen types of detector or collimator problems and examples of diagnoses made either during acceptance testing or routine quality control with various types of flood images. For completeness, illustrations of artifacts resulting from improper measurement techniques (e.g., source–detector geometry) and faulty sources and phantoms are provided, along with guidelines for proper performance of the tests.

I suppose the only limitation one might find in this atlas is that not every possible problem or artifact is included. This is not so much a criticism of the atlas as an indication of the reality that it is next to impossible to include examples of every possible faulty condition in every particular model of γ-camera. Furthermore, as γ-camera technology continues to evolve, the list of possible defects, malfunctions, and maladjustments will continue to grow. The IAEA acknowledges this fact and encourages contributions from readers to broaden the scope of the atlas and keep the CD-ROM version up to date.

Overall, I found the atlas to be organized well, easy to read, thorough, and very informative. Essentially every aspect and type of problem associated with γ-camera imaging is illustrated at least once. I highly recommend this atlas not only as an excellent reference guide for clinicians, and especially those responsible for performing and analyzing the results of γ-camera tests, but also as a tool in educational programs for nuclear medicine technologists and physicists. I plan to use it for both purposes.

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