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Quality Control Procedures: A Waste of Time or a Necessary Task?

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In the early morning hours of most nuclear medicine departments, technologists spend the first hour of their work day performing numerous quality assurance procedures on imaging and counting equipment. In today's health-care environment where employees are required to do more with less, technologists may wonder about the value of spending that first hour performing those procedures when the equipment continues to demonstrate stability and reliability over time.

Aside from the regulatory implications associated with not performing the required or recommended quality assurance procedures, the potential impact associated with eliminating those important, if not somewhat monotonous procedures, the daily test also includes internal software checks including drift testing which are important to assure proper and accurate performance.

Although quality assurance testing may seem like a boring process, a review of the various procedures performed on Capintec's dose calibrators, well counters and probes may help users to understand what's actually being performed as buttons are pushed and reference sources are exchanged and measured which may help to answer the question, 'is this test a waste of time or a necessary task?'

Dose Calibrators

The recommended quality assurance testing for all Capintec dose microprocessor based calibrators includes the daily performance of auto zero, background, system test, data check, constancy and

accuracy. Quarterly tests include: Diagnostics, accuracy and the linearity test. So let's review each procedure individually:

Auto zero: Measures voltage drift from the last measurement and must be within 3% of the previous reading.

Bkg: Measures background in the lab. If the background is < 10 uCi, 'OK' will be displayed. If the background is > 10 uCi but < 530 uCi, 'HIGH' will be displayed indicating the user should investigate and address the excessive background reading. The dose calibrator will not operate in backgrounds that exceed 530 uCi.

System Test: Compares the current chamber voltage to the chamber voltage set at the factory. If the voltage is out of range, 'System Test Failed' will be displayed indicating that the chamber voltage is outside the normal range.

Data Check: Performs an internal review of the nuclide data base.

Constancy: Reports source activity of a known calibrated source to the initial calibrated source corrected for decay. A deviation of 20% requires further investigation of the difference.

Diagnostics: Performs an internal check of software memory, internal programs, and communication links

Accuracy: Measures the chamber's ability to accurately reflect the activity of a NIST traceable source of radioactivity. It is recommended that this procedure be performed using several calibrated sources over a wide range of energies.

Linearity: Measures the dose calibrator's ability to measure a known radioactive source over a wide range of activities used in the laboratory.

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Well Technology (includes Caprac[®] and Caprac[®] R)

Bkg: Performed daily, background measures the background in the environment. For accuracy of the wipe or lab test, the background should be measured and recorded (saved) more than once each day to account for the continuous change in the background environment. The Caprac automatically subtracts saved background value from total counts and reports net counts.

Test of Calibration: Performed daily, Test calculates the ratio of counts in certain channels to determine if the instrument is properly calibrated (e.g. an energy deviation of no more than 3%). Additionally, it compares the difference between the calculated and measured activity of the reference source. Finally, it determines the ratio of channel 1 to channel 4 plus 5 (for Cs-137 or channel 3 plus 3 (for Ba-133) to assure that the noise level for the unit is below the specified limit.

Auto Cal: Performed weekly and when Test fails, auto cal sets the high voltage so that there is a correct relationship between the high voltage, energy and channels in the unit.

CF: Performed at the time of installation or following repair, conversion factors (CF) must be measured for known radionuclide sources to estimate the energy and activity of unknown sources and to convert counts per minute (cpm) to disintegrations per minute (dpm) or activity.

Probe Technology (Captus[®] 600)

Calibration Test: Performed daily, or on the days that the unit is used, the calibration test adjusts the fine gain of the multichannel analyzer. Additionally, it measures and records the full width-half maximum (FWHM) of the system and automatic regions of interest (ROI) are calculated from the FWHM of the Cs-137 photopeak.

Auto Cal: Performed weekly and whenever the daily test fails, Auto Cal checks the system's firmware function by assessing the Diagnostics module; checks the RAM, PROM and EEPROM memory and prints stored nuclide and standard

source data for verification as well as the high voltage reference number and gain adjustments.

Chi-Square: Performed quarterly, assesses the reproducibility of measured activity.

MDA: Performed quarterly, or as needed, the minimum detected activity (MDA) test measures the background in the region of interest defined for a chosen nuclide. The minimum detectable counting rate and activity is calculated using user-defined precision. MDA should be performed whenever the background activity changes (e.g. the unit is moved to a new location or a new source of radiation is located nearby).

CF: Performed at the time of installation or following repair, conversion factors (CF) are constants used to convert measurements in counts per minute (cpm) to disintegrations per minute (dpm) or activity.

Probe Technology (Captus[®] 3000)

Auto Calibration: Performed daily, or on the days of use, the Auto Calibration test uses two reference sources, Cs-137 and Eu-152. The Cs-137 is used to adjust the high voltage, gain and zero offset to provide calibration of approximately 2.0 keV per channel in the MCA. The Eu-152, with its multiple gamma peaks, is used to assess linearity over an energy range of 41 keV to 1408 keV and corrects for any non-linearity responses of the NaI detector. It also provides accurate identification of the energy of the peaks. Note: the ROI's in the thyroid uptake and lab tests are based on the energy ranges defined by the Eu-152 calibration. Additionally, the automatic peak identification program requires the Eu-152 energy calibration to work correctly. Auto Calibration also calculates the detector resolution by determining the FWHM area of the peak and dividing by the peak centroid location. Although detectors do age with time; thus affecting the resolution of the probe, a rapid change in the FWHM may indicate a problem with the detector assembly.

Constancy: Performed daily, or on the days of use, compares the Cs-137 standard reference source activity entered in the setup with the measured activity. The activity entered

in the setup is decay corrected and the measured activity is converted to activity by using efficiency values to assess the deviation, if any, of the calculated and measured source. The percent error should be within 5%.

Chi-Square: Performed quarterly, assesses the reproducibility of measured activity.

Efficiency: Performed as needed, efficiency is the ratio of detected counts measured by the system to the actual rate of decay, or disintegrations per minute for a specific nuclide or region of interest. To convert cpm to dpm or activity, the efficiency of the isotope must be measured or entered in the system.

Although the daily quality assurance procedures may seem like an added burden, the tasks being performed are assessing and fine tuning each measuring devices for optimum performance. So the short answer to the question, 'Are Quality Assurance Procedures a waste of time or a necessary task?' depends on how reliable you want your measuring equipment to be. Are those few moments each day worth the reliability you've become accustomed to?



Captus 3000

Introducing the New CRC[®]-25 Line

Designed with your needs in mind, the new Capintec CRC[®]-25 Dose Calibrator line adds updated features to maximize ease of use and functionality.

The CRC[®]25 Dose Calibrator line now includes USB capabilities, SD flash cards for software upgrades, chamber plug-and-play, and enhanced remote functionality. There are three variations: CRC[®]-25 PET Dose Calibrator, the CRC[®]-25R Dose Calibrator, and the CRC[®]25W Dose Calibrator.

The 25 series boosts enhanced software functionality including automated inventory, dose tables, geometry, linearity, and strip QC.

The CRC[®]25 Dose Calibrator line includes such luxuries as automatic zero and background subtraction, quality control tests and self-diagnostics. Optional printers also allow the printing of full size patient records and tickets with peel off labels for vials.

A sophisticated microprocessor chip expands control features and significantly improves speed of activity measurements.

In addition to the great features the CRC[®]25 PET Dose Calibrator and CRC[®]25R Dose Calibrator both provide, the CRC[®]-25W Dose Calibrator allows for the performance of wipe and lab tests.

The user can define specific counting procedures with trigger levels for work, patient, unrestricted areas and sealed source leak testing. The CRC[®]25W can also perform counting functions for wipe tests in as little as 6 seconds, greatly speeding up work processes.



CRC[®]-25R Dose Calibrator

CRC[®]-25 PET Dose Calibrator

CRC[®]-25W Dose Calibrator

Capintec Meeting Schedule

Sept. 6-9 Sept. 8-11	ASNC AMI/SMI Annual Meeting	San Diego, CA Providence, RI
Oct. 13-17	EANM	Copenhagen, Denmark
Oct. 11-14	SNM Western Chapter	Anaheim, CA
Oct. 25-28	SNM Southeastern Chapter	Atlanta, GA
Oct. 26-28	SNM Northeast Chapter	Stamford, CT
Oct. 28-Nov. 1	ASTRO 49th Annual Meeting	

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You can also view us on the web at www.capintec.com under our "News" section

Make Patient Info Input a Snap with the Cap-DICOM™ Module!

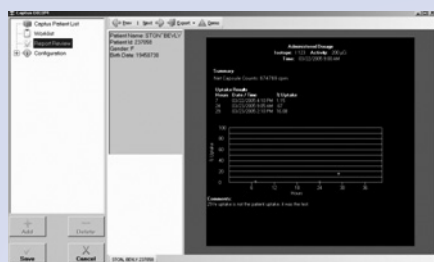
Manual data entry can be a large source of human error when inputting patient information.

With Cap-DICOM™, the Capintec Captus® 3000 gains the advantage of DICOM connectivity. Cap-DICOM™ updates the Captus® 3000 by adding valuable features such as the DICOM modality worklist and DICOM export. This allows patient information and demographics to be pulled from the Radiology Information System

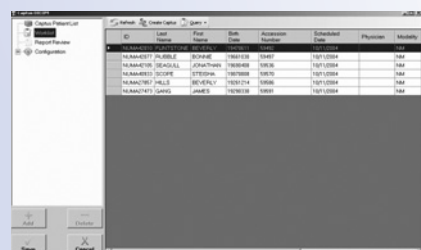
(RIS) or Hospital Information System (HIS), thus, reducing errors and time associated with the manual input of patient information.

Once the user chooses a destination for the information (a nuclear medicine workstation or PACS), Cap-DICOM™ creates a DICOM secondary capture image from information generated during the uptake procedure. The software exports the DICOM image files to a destination DICOM

C-Store provider specified by the user. Cap-DICOM™ supports multiple vendors for nuclear medicine workstations, RIS and PACS systems, stretching compatibility of the software to the limit. Your department's efficiency and workflow will have a large increase in output due to the software's capabilities. In addition, Cap-DICOM™ supports improved physician efficiency in interpretation and clinical review of the combined thyroid uptake report and imaging procedure.



Cap-DICOM™ Report View



Cap-DICOM™ User Interface

Cap-DICOM™ Features:

- Configurable options integrate nuclear medicine into the RIS and PACS environment
- Ability to query the worklist provider by accession number, patient ID, patient name or date
- Intuitive, easy to read user interface to quickly sort and search the worklist
- Ability to correct patient information before exporting
- Ability to review final reports before exporting to a nuclear medicine workstation or PACS