CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS, INC.

BOARD OF DIRECTORS POSITION

Relating to: Computed Tomography Protocol Reviews

A recent safety investigation by the U.S. Food and Drug Administration (FDA) of radiation overexposures during brain perfusion CT imaging was conducted at one hospital. Over 200 patients at the particular facility received radiation doses that were approximately eight times the expected level, and in some cases, this excessive dose resulted in hair loss and erythema. The overexposures were determined to be due to a patient protocol being improperly adjusted.

The recent incident of patients receiving unnecessary radiation from CT perfusion brain studies have caused concern and raised awareness in the medical community. In response, the CRCPD's Committee on Computed Tomography has offered recommendations on quality assurance improvement and prevention of such overexposures in the use of CT imaging.

It is the position of the Board of Directors of the Conference of Radiation Control Program Directors, Inc. (CRCPD) that hospitals and CT facilities should review their CT protocols to ensure that their current protocols are appropriate to allow them to provide the best possible CT studies while assuring they are keeping patient exposures as low as reasonably achievable.

The following items should be reviewed and implemented as applicable by hospitals and other CT facilities to improve quality assurance and prevent overexposures in the use of CT imaging:

- Each facility should review all of their CT default protocols to ensure they are correct and are the intended protocol. Comparison should be made to the initial dose assessments that were made at the time of installation and those made during the last annual review by the medical physicist.
- The protocols should be evaluated by the CT interpreting radiologists, CT medical director or section chief in consultation with the medical physicist and chief CT technologist. The evaluation should determine whether the volume computed tomography dose index ($CTDI_{vol}$) dose from the current protocols is appropriate or whether there is an opportunity to reduce the technique and lower the $CTDI_{vol}$. Care must be taken to ensure any dose reductions do not result in an unacceptable sacrifice in image quality.

- The approved techniques must ensure that image quality remains acceptable and results in acceptable dose levels. Once approved, the techniques should be recorded and guidelines of variability established. The limits of the variability range should be approved by the CT medical director. Technologists are permitted to adjust protocols as long as they remain within the approved limits of variability.

- Procedures or engineering protocols such as password protection should be in place that prohibits anyone from changing protocols without approval from the CT medical director.
- Procedures should be set up to have the lead CT technologist review the protocols on a monthly basis, to ensure that they are correct. The protocols should be reviewed by the medical physicist at least once per year. If the $CTDI_{vol}$ dose for each exam is kept as a log at the control panel, the review can be done easily and as needed if any changes in dose trends are noticed.
- All CT technologists should be aware of the normal dose indices that are displayed during exams. Dose indices are normally displayed as volume computed tomography dose index (abbreviated $CTDI_{vol,}$ in units of "milligray" or "mGy") and the dose-length product (*DLP*, in units of "milligray-centimeter" or "mGy-cm"). The technologist should ensure that $CTDI_{vol}$ dose values are forwarded on the images to the PAC workstation. The CT technologists should be able to retrieve the information for the interpreting radiologist's review.
- It is important to review the control parameters of the Automatic Exposure Control (AEC) system, which are unique for each manufacturer. If your CT system has AEC or Dose Reduction capability, one should check that the parameters are correct. The qualified medical physicist in consultation with the medical director and the CT equipment manufacturer should ensure that these control parameters are correct with respect to the imaging requirements of each type of CT study.
- $CTDI_{vol}$ is often misunderstood by CT technologists and interpreting physicians. Each facility should ensure that all interpreting physicians and technologists are properly educated on what the $CTDI_{vol}$ dose numbers mean. The site medical physicists can be consulted to review the $CTDI_{vol}$ methodology and interpretation of the values. These should be reviewed by the interpreting physicians on a case by case basis and the information should be recorded as part of the patient's medical record.
- The CT operator technologists should monitor the dose indices for each patient to ensure that the displayed value falls within an acceptable range. The CT operator technologists should understand the AEC features of the CT scanner. If the technologists are not familiar with the AEC features of the CT scanner, additional training should be provided.

- Consider establishing a threshold to investigate radiation doses above certain dose values. This could be done by selecting common and/or high dose CT studies for $CTDI_{vol}$ radiation dose review.

  Suggested $CTDI_{vol}$ Reference levels are:

  CT Head <75mGy, (7.5 rad)
  CT Abdomen <25mGy, (2.5 rad)
  CT Chest <25mGy (2.5 rad)
  Pediatric Abdomen <20mGy (2.0 rad)
  CT Brain Perfusion study <500mGy (50.0 rad) – Suggested value

  The American College of Radiology and the American Association of Physicists in Medicine are excellent sources for other reference levels.

- Suggestion for state inspectors: Consider using the above items to develop a checklist to ensure that CT departments are aware of the need to establish procedures and protocols that monitor the doses their patients are receiving.

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