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Radiation Safety Advisory 09-20

California Department of Public Health Computed Tomography Advisory

The California Department of Public Health (CDPH) is advising all facilities to immediately review Computed Tomography (CT) brain perfusion study protocols.

CDPH was notified of patients receiving unnecessary radiation exposures from CT brain perfusion studies. Brain perfusion studies are performed using multi-slice CT scanners to aid in the diagnosis and treatment of stroke.

Over an 18-month period, more than 200 patients at a California facility received doses that were approximately eight times the expected level. Instead of receiving the expected dose of about 0.5 Gray (50 rads) to the head, these patients received doses between 3.0 and 4.0 Gray (300 and 400 rads). The unusually high doses were discovered only after two patients inquired about their hair loss. The facility has notified patients who received the overexposure and provided resources for follow-up.

For brain perfusion studies, the CT scanner is operated with the table stationary and the collimator opened so as to produce a slice width of about 4 cm (1.6 inches). This is accomplished by a software protocol, and results in a patient dose about ten times higher than a routine head CT scan. In the recent series of incidents at the California facility, it appears that unauthorized or unannounced changes may have been made, resulting in the CT scanner continuing to operate at or near maximum tube current. Scanner operation under such conditions would be sufficient to result in hair loss or erythema.

All facilities performing brain perfusion studies should immediately review the CT protocols enabled by software for clinical use. This review should be made in consultation with a medical physicist and should include dose measurements. While the use of certain treatment options may result in increased radiation exposures, the use of protocols that have the potential for injury or adverse effects should be weighed against medical needs.

In addition to the protocol review described above, facilities performing CT should be aware that the newer machines may be configured to display dose estimates for a given examination. Estimates may be displayed on the control panel as volume computed tomography dose index ($CTDI_{vol}$) in units of milligray or mGy, or alternatively as dose-length product (DLP) in units of milligray-centimeter or mGy-cm. While these doses are estimates, they provide a valuable reference for patient exposure. Interpreting physicians should be made aware of these estimates in order to ensure that patients do not receive excessive radiation doses. Staff technologists should be trained to check dose estimates before and after scanning patients, and routinely recording this information should be considered. Staff should also receive clear direction in what to look for with regard to dose estimates, and when to bring to the attention of the radiologist, medical physicist, or radiation safety office any observed increases or drift in dose estimates. Any changes to CT protocols should be made by the Radiation Safety Committee based on dose assessments presented by a medical physicist and/or Radiation Safety Officer. Changes approved by the Radiation Safety Committee should be communicated to staff with written approval from management.

These recent incidents may well be an indicator of deficiencies in CT quality assurance programs in general, rather than being isolated to a particular facility or specific imaging procedure. If patient doses are higher than expected levels, but not high enough to produce obvious signs of radiation injury, problems may go undetected and unreported, putting patients at increased risk for long-term radiation effects.

Please contact the CDPH Radiologic Health Branch at (916) 440-7968 if you have any questions.

Sincerely,

Original document signed by Robert D. Schlag

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