CBE ID

0739

Title

Radiation Dose of Computed Tomography (CT)

Project

Patient Safety

Endorsement Status

Endorsement Removed

Is Under Review

No

Previous Endorsement Cycle

Full Year 2013

Removal Date

Tue, 11/18/2014 - 19:00

Initial Endorsement

Mon, 08/15/2011 - 04:10

Steward

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1.0 New or Maintenance

Maintenance

1.1 Measure Structure

Single Measure

1.3 Electronic Clinical Quality Measure (eCQM)

No

1.6 Measure Description

The measure requires hospitals and output facilities that conduct Computed Tomography (CT) studies to assess the radiation dose associated with the most frequently conducted examination types – CT's of the head, chest, abdomen/pelvis obtained in children and adults. The measure provides a simple framework for how facilities can assess their dose, a framework that currently does not exist. By assessing their doses, facilities can monitor the doses they use over time and compare their doses to benchmarks. The creation of benchmarks is not part of this measure per se. However, if facilities use this measure, I believe professional societies, researchers, and oversight organizations can separately create their benchmarks. Several research groups, including my own, have published benchmarks and published manuscripts that have used the

framework of this measure to assess changes in radiation dose over time (Keagan, JACR, 2014) and to assess the impact of an educational intervention on doses, using the specifications of the measure to assess the results of a randomized trial (Miglioretti, JACR, 2014).

This measure was initially developed for diagnostic CT, but can equally be used for CT used in conjunction with radiation therapy for cancer. Professional organizations within various medical specialties can create appropriate benchmarks depending on the application.

1.7 Measure Type

Outcome

1.8 Level of Analysis

Facility, Health Plan, Integrated Delivery System

1.9 Care Setting

Inpatient/Hospital, Outpatient Services

1.14 Numerator

Radiation Dose, quantified using the distribution in four dose metrics (DLP, CTDIvol, SSDE, ED); within anatomic area, age, and machine-type strata. SSDE only pertains to abdomen scans.These different metrics are highly correlated, but nonetheless reveal important differences regarding radiology practice and performance and are thus complimentary. However, if a practice only generates dose metrics for a single metric, there is a lot of information and performance information to be gleaned.CTDIvol will reveal the settings used per small scan length. This is directly generated by most modern CT scanners.DLP reflects both the dose per small scan length, but also the length of scan that is conducted, and is defined as CTDIvol x scan length. This is directly generated by most modern CT scanners.Effective dose takes into account the total amount of radiation emitted from the machine as well the radio-sensitivity to developing cancer in the area radiated. The measure thus combines both radiation dose and future cancer risk. The metric is the only one that can be combined across types of studies and anatomic areas and is thus useful for dose monitoring dose surveillance and facility performance (see Smith-Bindman, Radiology, 2011).While there are many different ways to calculate Effective Dose, and many current dose monitoring software products can do this automatically, a simple rule of thumb can be used to convert DLP to Effective dose in adults (see Huda, below). In the brain, given typical machine settings that are used, the DLP can be converted to Effective Dose by multiplying DLP measured in mGy-Cm by 0.002 to yield Effective Dose measured in milli-Sieverts. Effective Dose of CT scans though the chest can be estimated by multiplying the DLP measured in mGy-cm by .017 to yield Effective Dose measurements in mSv; and Effective Dose of abdominal and pelvis CT can be estimated by multiplying DLP by 0.18. It is not clear that using greater precision in the quantification of effective dose is necessary for the quality improvement purposes outlined in this measure.Additional relevant citations for effective doseSmith-Bindman R, Miglioretti DL. CTDIvol, DLP, and Effective Dose are excellent measures for use in CT quality improvement. Radiology. Dec 2011;261(3):999; author reply 999-1000.Huda W, Ogden KM, Khorasani MR. Converting dose-length product to effective dose at CT. Radiology. Sep 2008;248(3):995-1003.

1.15 Denominator

Consecutive sample of CTs conducted in the head, chest, abdomen/pelvis

1.20 Types of Data Sources

Electronic Health Data, Electronic Health Records: Electronic Health Records, Other, Registry data

6.1.2 Current or Planned Use(s)

Public Reporting, Quality Improvement (Internal to the specific organization), Quality Improvement with Benchmarking (external benchmarking to multiple organizations)

6.1.3 Current Use(s)

Public Reporting, Quality Improvement (Internal to the specific organization), Quality Improvement with Benchmarking (external benchmarking to multiple organizations)

Exclusions

CT examinations conducted in anatomic areas not included above (such as CTs of the extremities or lumbar spine). In adults approximately 16% of CT scans fall in these excluded areas. In children, approximately 23% of CT examinations fall into excluded areas.

Further, combined areas, such as head and chest, should not be included in the scans collected.

Examinations that are considered "limited abdomen" or "limited pelvis" studies should be included in the abdomen and pelvis category.

Planned Use

Public Reporting, Quality Improvement (Internal to the specific organization), Quality Improvement with Benchmarking (external benchmarking to multiple organizations)

Risk Adjustment

No risk adjustment or risk stratification

Target Population

Children, Elderly

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