



## Measure Information

This document contains the information submitted by measure developers/stewards, but is organized according to NQF's measure evaluation criteria and process. The item numbers refer to those in the submission form but may be in a slightly different order here. In general, the item numbers also reference the related criteria (e.g., item 1b.1 relates to subcriterion 1b).

### Brief Measure Information

**NQF #: 0740**

**Corresponding Measures:**

**De.2. Measure Title:** Participation in a Systematic National Dose Index Registry

**Co.1.1. Measure Steward:** American College of Radiology

**De.3. Brief Description of Measure:** Participation in a multi-center, standardized data collection and feedback program that will establish national dose index benchmarks for designated examinations. The registry will eventually provide a comparison of practice or facility dose indices such as CTDIvol and DLP for specified examinations relative to national and regional benchmarks. Data is captured electronically from the images of CT examinations using Digital Imaging and Communications in Medicine (DICOM) standards and the Integrating the Healthcare Enterprise (IHE) Radiation Exposure Monitoring (REM) profile.

**1b.1. Developer Rationale:** Dose index monitoring is still at an early stage and benchmarks are still under development. While CT scanner manufacturers have stepped up and implemented the capability to notify users about potentially high exposures (1), there is very little guidance about the levels at which these alerts need to be set (2). The primary goal at this point is to facilitate participation by as many facilities as possible to develop detailed benchmarks by procedure, and for this purpose, a participation measure is appropriate. There is evidence in medicine that registry participation improves outcomes, if that evidence is not convincing, we propose the participation measure as a means for infrastructure development with an eventual goal of evaluating dose index values against benchmarks.

The goal of the Dose Index Registry participation measure is to improve patient safety by helping facilities adjust their imaging protocols to obtain diagnostic images using the lowest reasonable dose. There is likely to be quality improvement simply with participation but the larger benefit in the role of an attestation measure is supporting the development of an infrastructure to provide richer means of dose index monitoring.

The need for measures with greater accountability for participants is recognized -- but radiation dose monitoring is still in early stages. There is not adequate guidance regarding appropriate doses for the vast majority of medical imaging procedures. The little guidance that exists is based on phantom images, not from patient images. The ACR believes that while an attestation measure may not be ideal, there remains a need and a particular role for one in the context of dose monitoring. Currently, we have measures in draft that more specifically gauge a site's adherence to accepted benchmarks. For example, comparative standing within the registry participants for the site's average CTDIvol (dose index) for CT Head exams. We intend to submit a set of such measures to the NQF in the next Patient Safety cycle.

#### Background

##### Dose Absorption

The determination of ionizing radiation dose to a living human is very complex and poses many challenges for referring physicians, radiologists, radiologic technologists, medical physicists, equipment vendors, regulators, and patients. To determine the absorbed radiation dose, the initial x-ray beam exposure and the absorption in each organ must be known. It is the latter quantity that complicates this determination. This absorption is dependent on the amount and properties of each tissue encountered by the x-ray beam, and these parameters vary widely among patients. The situation is further complicated because it is not practical to insert radiation detectors into each organ of every patient. It is important to understand that the reported numerical values for individual radiation doses may vary by factors of 5 to 10 depending on individual patients and the manner of image acquisition.

##### Effective Dose

Although there is little doubt that the absorbed radiation dose for an abdominal CT examination is larger than that for a radiograph of the ankle, the precise numeric quantity (particularly for an individual) is quite problematic. (13) The American College of

Radiology has adopted a policy of expressing quantitative values regarding radiation dose as “dose estimates.” Effective dose is an estimate of radiation dose to the “whole body” that allows different sources of ionizing radiation and different regions of the body to be compared.

To date, relatively few data describe how much radiation is received through the most common types of CT examinations when applied in clinical practice, as most published studies focused on phantom studies. (24)

However, with the growing applications of digital imaging, such data can now more easily be acquired. Digital x-ray imaging systems, such as computed radiography (CR), digital radiography (DR), and CT provide an index related to the amount of radiation that was generated to form an image. Currently, these quantities are either displayed at the scanner operator’s console or embedded with the image itself.

A central database established for collecting dose indices as a function of patient qualities (i.e., gender, age, size, etc.) and exam type (i.e., lateral lumbar spine, pelvis CT, etc.), would allow the relative range of radiation doses to be analyzed. Such a database would be valuable in its ability to demonstrate changes in dose indices due to technological advances and practice modifications and would be useful to advisory radiation safety bodies as well as to individual practices wishing to compare their own doses against established benchmarks. The ACR’s dose index registry has been implemented to serve this purpose.

Facilities in the registry receive semiannual reports to help them compare their performance to peers and target protocols for review and optimization. Sample reports with true registry averages are publicly available for all facilities, including non-participants to view and to compare to their own performance. The current state of the registry is summarized in a short publication (5).

There are manuscripts in various stages of development and publication on topics including range of dose index values for high volume exams such as abdomen pelvis and chest, CT protocols for renal colic, and dose indices for pediatric exams. These will be published in peer-reviewed journals for wider dissemination.

1. NEMA. Computed tomography dose check. NEMA Standards Publication XR 25-2010. Rosslyn, Virginia: National Electrical Manufacturers Association; 2010.

2. AAPM. AAPM recommendations regarding notification and alert values for CT scanners: Guidelines for use of the NEMA XR 25 CT dose-check standard: American Association of Physicists in Medicine; 2011 [updated April 27, 2011; cited 2013 January 25, 2013]. AAPM Dose Check Guidelines version 1.0 4/27/2011]. Available from: <http://www.aapm.org/pubs/CTProtocols/documents/NotificationLevelsStatement.pdf>.

13. Amis Es Jr, Butler PF, Applegate KE, et al; American College of Radiology. American College of Radiology white paper on radiation dose in medicine J AM Coll Radiol. 2007;4(5):272-284.

24. Bindman-Smith R, Lipson J, Marcus R, et al. Radiation Dose Associated with Common Computed Tomography Examinations and the Associated Lifetime Attributable Risk of Cancer. Arch Intern Med 2009; 169 (22)2078-2085.

5. Bhargavan-Chatfield M, Morin RL. The ACR Computed Tomography Dose Index Registry: The 5 Million Examination Update. J Am Coll Radiol. 2013 Dec;10(12):980-3. doi: 10.1016/j.jacr.2013.08.030.

**S.4. Numerator Statement:** Participation in a systematic national dose index registry.

**S.7. Denominator Statement:** The measure does not have a numerator/denominator. It is strictly an attestation – Yes or No.

**S.10. Denominator Exclusions:** No exclusions

**De.1. Measure Type:** Structure

**S.23. Data Source:** Registry Data

**S.26. Level of Analysis:** Clinician : Group/Practice, Facility, Other, Population : Regional and State

**IF Endorsement Maintenance – Original Endorsement Date:** Sep 19, 2011 **Most Recent Endorsement Date:** Sep 19, 2011

**IF this measure is included in a composite, NQF Composite#/title:**

**IF this measure is paired/grouped, NQF#/title:**

**De.4. IF PAIRED/GROUPED, what is the reason this measure must be reported with other measures to appropriately interpret**

results?

**1. Evidence, Performance Gap, Priority – Importance to Measure and Report**

Extent to which the specific measure focus is evidence-based, important to making significant gains in healthcare quality, and improving health outcomes for a specific high-priority (high-impact) aspect of healthcare where there is variation in or overall less-than-optimal performance. ***Measures must be judged to meet all subcriteria to pass this criterion and be evaluated against the remaining criteria.***

**1a. Evidence to Support the Measure Focus – See attached Evidence Submission Form**

[0740\\_MeasSubm\\_Evidence\\_\\_01\\_2014.docx](#)

**1b. Performance Gap**

Demonstration of quality problems and opportunity for improvement, i.e., data demonstrating:

- considerable variation, or overall less-than-optimal performance, in the quality of care across providers; and/or
- disparities in care across population groups.

**1b.1. Briefly explain the rationale for this measure (e.g., the benefits or improvements in quality envisioned by use of this measure)**

Dose index monitoring is still at an early stage and benchmarks are still under development. While CT scanner manufacturers have stepped up and implemented the capability to notify users about potentially high exposures (1), there is very little guidance about the levels at which these alerts need to be set (2). The primary goal at this point is to facilitate participation by as many facilities as possible to develop detailed benchmarks by procedure, and for this purpose, a participation measure is appropriate. There is evidence in medicine that registry participation improves outcomes, if that evidence is not convincing, we propose the participation measure as a means for infrastructure development with an eventual goal of evaluating dose index values against benchmarks. The goal of the Dose Index Registry participation measure is to improve patient safety by helping facilities adjust their imaging protocols to obtain diagnostic images using the lowest reasonable dose. There is likely to be quality improvement simply with participation but the larger benefit in the role of an attestation measure is supporting the development of an infrastructure to provide richer means of dose index monitoring.

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**1b.2. Provide performance scores on the measure as specified (current and over time) at the specified level of analysis.** *(This is required for endorsement maintenance. Include mean, std dev, min, max, interquartile range, scores by decile. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included). This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.*

The recent safety investigation by the FDA (1) of "radiation overexposures during perfusion computed tomography (CT) imaging to aid in the diagnosis and treatment of stroke" highlights the importance of carefully evaluating protocols for all CT procedures relative to both radiation dose and image quality.

The trend charts from the analysis are included in the Appendix as Figure 1. For the four six-month periods between July 2011 and June 2013, 105 facilities had data in all periods for head exams 103 had data for chest exams, and 107 had data for abdomen pelvis exams.

For head exams, the average CTDIvol across participating facilities decreased by 7.8% and the DLP by 6.4% during the two year period. For abdomen pelvis exams, the average CTDIvol across participating facilities decreased by 17.3% and the DLP by 16.5% for the same period. For abdomen pelvis exams, the average CTDIvol across participating facilities decreased by 13% and the DLP by 11% for this period. None of these are statistically significant because there is substantial variability across facilities in their median dose indices, but these do point to movement in the right direction.

The decrease in dose indices over time indicates that participation in the DIR is associated with improvements in performance quality with respect to radiation dose optimization among participating facilities. While we cannot measure the direct quality differences between participants and non-participants, the trend suggests that the registry provides a valuable infrastructure to help facilities improve protocols. This infrastructure supports the implementation of accountable quality measures such as percent of exams with dose indices within desired target ranges. We intend to submit accountability measures for consideration by NQF in the next few months. But even with the accountability measures, there is a need for a simple attestation measure for facilities to be able to build the infrastructure to report on more advanced measures.

**1b.3. If no or limited performance data on the measure as specified is reported in 1b2, then provide a summary of data from the literature that indicates opportunity for improvement or overall less than optimal performance on the specific focus of measurement.**

1. FDA Safety Investigation of CT Brain Perfusion Scans: Update 12/8/2009 Date Issued: December 8, 2009  
<http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm185898.htm>. Accessed January 29, 2010.

2. ACR PRACTICE GUIDELINE FOR DIAGNOSTIC REFERENCE LEVELS IN MEDICAL X-RAY IMAGING

[http://www.acr.org/SecondaryMainMenuCategories/quality\\_safety/RadSafety/RadiationSafety/guideline-diagnostic-reference.aspx](http://www.acr.org/SecondaryMainMenuCategories/quality_safety/RadSafety/RadiationSafety/guideline-diagnostic-reference.aspx)

3. Amis Es Jr, Butler PF, Applegate KE, et al; American College of Radiology. American College of Radiology white paper on radiation dose in medicine J Am Coll Radiol. 2007;4(5):272-284.

4. McCollough C, Branham T, Herlihy V, et al. Radiation doses from the ACR CT Accreditation Program: review of data since program inception and proposals for new reference values and pass/fail limits. Presented at: RSNA 92nd Scientific Assembly and Annual Meeting; 2006.

5. Neumann RD, Bluemke DA. Tracking Radiation Exposure From Diagnostic Imaging Devices at the NIH. J Am Coll Radiol 2010;2:87-89.

**1b.4. Provide disparities data from the measure as specified (current and over time) by population group, e.g., by race/ethnicity, gender, age, insurance status, socioeconomic status, and/or disability. (This is required for endorsement maintenance. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities include.) This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.**

There is no data on disparities by population group available.

**1b.5. If no or limited data on disparities from the measure as specified is reported in 1b4, then provide a summary of data from the literature that addresses disparities in care on the specific focus of measurement. Include citations.**

There is no data on disparities by population group available.

**1c. High Priority** (previously referred to as High Impact)

The measure addresses:

- a specific national health goal/priority identified by DHHS or the National Priorities Partnership convened by NQF; OR
- a demonstrated high-priority (high-impact) aspect of healthcare (e.g., affects large numbers of patients and/or has a substantial impact for a smaller population; leading cause of morbidity/mortality; high resource use (current and/or future); severity of illness; and severity of patient/societal consequences of poor quality).

**1c.1. Demonstrated high priority aspect of healthcare**

Affects large numbers, Frequently performed procedure, High resource use, Patient/societal consequences of poor quality

**1c.2. If Other:**

**1c.3. Provide epidemiologic or resource use data that demonstrates the measure addresses a high priority aspect of healthcare. List citations in 1c.4.**

Ionizing radiation has been used for diagnostic purposes in medicine for more than a century. The benefits are immense and certainly exceed the risks. The more recent development of equipment such as multi-detector row computed tomography and the increased utilization of x-ray and nuclear medicine imaging studies have improved the lives of our patients and, along with other new modalities, revolutionized the practice of medicine. However, this dramatic evolution of imaging has also resulted in a significant increase in the population's cumulative exposure to ionizing radiation.

Over the past quarter century, there has been a rapid growth in both the number of diagnostic x-ray examinations and the introduction of newer, very valuable, but also relatively high-dose technologies. Use of Computed Tomography (CT) has risen considerably over the past several decades; in the past 10 years use of CT has increased nearly 700% (3,4). The total number of CT examinations performed annually in the United States has risen from approximately 3 million in 1980 to nearly 70 million in 2007. (1, 2) Additionally, radiation exposure from CT examinations has also increased, in part due to the increased speed of image acquisition allowing vascular, cardiac and multiphase examination, all associated with higher doses. Thus, greater use of CT has resulted in a concurrent increase in the medical exposure to ionizing radiation. (5)

This dramatic evolution of imaging has also resulted in a significant increase in the population's cumulative exposure to ionizing radiation. (1) Although there is current debate that this will cause an increased incidence of cancer years down the line, the presumption is that it will.

It is worth noting that many (CT) scans and nuclear medicine studies have effective dose estimates in the range of 10 to 25 mSv for a single study, and some patients have multiple studies; thus, it would not be uncommon for a patient's estimated exposure to exceed 50 mSv. In further validation of this concern, the International Commission on Radiological Protection has reported that CT doses can indeed approach or exceed levels that have been shown to result in an increase in cancer (1). CT exams account for about 5-15% of imaging exams using ionizing radiation but estimated to contribute 70% of effective radiation dose from all medical imaging [6].

#### 1c.4. Citations for data demonstrating high priority provided in 1a.3

Citations for Evidence of High Impact

1. Amis Es Jr, Butler PF, Applegate KE, et al; American College of Radiology. American College of Radiology white paper on radiation dose in medicine J AM Coll Radiol. 2007;4(5):272-284.
2. IMV Medical Information Division. CT Census Database and Market Summary Report. Greenbelt, MD: IMV;2008.
3. Medicare payment Advisory Commission. A Data Book: Healthcare Spending and the Medicare Program. June 2007. [http://www.medpac.gov/documents/Jun08DataBook\\_Entire\\_report.pdf](http://www.medpac.gov/documents/Jun08DataBook_Entire_report.pdf). Accessed January 29, 2010.
4. Radiation Risks and Pediatric Computed Tomography (CT): A Guide for Health Care Providers - from NCI and SPR. [www.nci.nih.gov/cancertopics/causes/radiation-risks-pediatric-CT](http://www.nci.nih.gov/cancertopics/causes/radiation-risks-pediatric-CT).
5. Bindman-Smith R, Lipson J, Marcus R, et al. Radiation Dose Associated with Common Computed Tomography Examinations and the Associated Lifetime Attributable Risk of Cancer. Arch Intern Med 2009; 169 (22)2078-2085.
6. Brody AS, Frush DP, Huda W, et al. Radiation risk to children from computed tomography. Pediatrics 2007; 120:677-682.

**1c.5. If a PRO-PM (e.g. HRQoL/functional status, symptom/burden, experience with care, health-related behaviors), provide evidence that the target population values the measured PRO and finds it meaningful. (Describe how and from whom their input was obtained.)**

## 2. Reliability and Validity—Scientific Acceptability of Measure Properties

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. **Measures must be judged to meet the subcriteria for both reliability and validity to pass this criterion and be evaluated against the remaining criteria.**

**2a.1. Specifications** The measure is well defined and precisely specified so it can be implemented consistently within and across organizations and allows for comparability. eMeasures should be specified in the Health Quality Measures Format (HQMF) and the Quality Data Model (QDM).

**De.5. Subject/Topic Area** (check all the areas that apply):



Cancer

**De.6. Non-Condition Specific** (check all the areas that apply):

**Safety**

**S.1. Measure-specific Web Page** (Provide a URL link to a web page specific for this measure that contains current detailed specifications including code lists, risk model details, and supplemental materials. Do not enter a URL linking to a home page or to general information.)

<http://www.acr.org/Quality-Safety/National-Radiology-Data-Registry/Dose-Index-Registry>

**S.2a. If this is an eMeasure**, HQMF specifications must be attached. Attach the zipped output from the eMeasure authoring tool (MAT) - if the MAT was not used, contact staff. (Use the specification fields in this online form for the plain-language description of the specifications)

**Attachment:**

**S.2b. Data Dictionary, Code Table, or Value Sets** (and risk model codes and coefficients when applicable) must be attached. (Excel or csv file in the suggested format preferred - if not, contact staff)

**No data dictionary Attachment:**

**S.3. For endorsement maintenance**, please briefly describe any changes to the measure specifications since last endorsement date and explain the reasons.

**There are no changes to the measure specifications since last endorsement.**

**S.4. Numerator Statement** (Brief, narrative description of the measure focus or what is being measured about the target population, i.e., cases from the target population with the target process, condition, event, or outcome)

IF an OUTCOME MEASURE, state the outcome being measured. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.

**Participation in a systematic national dose index registry.**

**S.5. Time Period for Data** (What is the time period in which data will be aggregated for the measure, e.g., 12 mo, 3 years, look back to August for flu vaccination? Note if there are different time periods for the numerator and denominator.)

**Variable. Can be reported monthly, quarterly, annually. The measure would best be reported on an annual basis.**

**S.6. Numerator Details** (All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)

IF an OUTCOME MEASURE, describe how the observed outcome is identified/counted. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.

Dose Index registry collects dose indices in a standardized format using DICOM Radiation Dose Structured Report for CT as specified in DICOM Content Mapping Resource document PS 3.16-2009 ([ftp://medical.nema.org/medical/dicom/2009/09\\_16pu.pdf](ftp://medical.nema.org/medical/dicom/2009/09_16pu.pdf)) and the IHE (Integrating the Healthcare Enterprise) Radiation Exposure Monitoring profile. Data fields include CTDIvol in milligray (mGy) and Dose Length Product (DLP) by irradiation event for specified examinations, such as Adult Routine Head or Adult Routine Abdomen. Data are collected on all CT exams performed at a participating facility.

**S.7. Denominator Statement** (Brief, narrative description of the target population being measured)

**The measure does not have a numerator/denominator. It is strictly an attestation – Yes or No.**

**S.8. Target Population Category** (Check all the populations for which the measure is specified and tested if any):

**S.9. Denominator Details** (All information required to identify and calculate the target population/denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)

**S.10. Denominator Exclusions** *(Brief narrative description of exclusions from the target population)*

No exclusions

**S.11. Denominator Exclusion Details** *(All information required to identify and calculate exclusions from the denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*

**S.12. Stratification Details/Variables** *(All information required to stratify the measure results including the stratification variables, definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format with at S.2b)*

The measure is not stratified.

**S.13. Risk Adjustment Type** (Select type. Provide specifications for risk stratification in S.12 and for statistical model in S.14-15)

No risk adjustment or risk stratification

If other:

**S.14. Identify the statistical risk model method and variables** *(Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development and testing should be addressed with measure testing under Scientific Acceptability)*

**S.15. Detailed risk model specifications** *(must be in attached data dictionary/code list Excel or csv file. Also indicate if available at measure-specific URL identified in S.1.)*

Note: Risk model details (including coefficients, equations, codes with descriptors, definitions), should be provided on a separate worksheet in the suggested format in the Excel or csv file with data dictionary/code lists at S.2b.

**S.15a. Detailed risk model specifications** *(if not provided in excel or csv file at S.2b)*

**S.16. Type of score:**

Other

If other: Attestation - Yes/no measure

**S.17. Interpretation of Score** *(Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score)*

Passing score defines better quality

**S.18. Calculation Algorithm/Measure Logic** *(Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.)*

The measure is an attestation that the site participates in the registry. Y or N.

**S.19. Calculation Algorithm/Measure Logic Diagram URL or Attachment** *(You also may provide a diagram of the Calculation Algorithm/Measure Logic described above at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)*

No diagram provided

**S.20. Sampling** *(If measure is based on a sample, provide instructions for obtaining the sample and guidance on minimum sample size.)*

IF a PRO-PM, identify whether (and how) proxy responses are allowed.

N/A.

**S.21. Survey/Patient-reported data** *(If measure is based on a survey, provide instructions for conducting the survey and guidance on minimum response rate.)*

IF a PRO-PM, specify calculation of response rates to be reported with performance measure results.



**S.22. Missing data** (specify how missing data are handled, e.g., imputation, delete case.)

Required for Composites and PRO-PMs.

**S.23. Data Source** (Check *ONLY* the sources for which the measure is SPECIFIED AND TESTED).

If other, please describe in S.24.

[Registry Data](#)

**S.24. Data Source or Collection Instrument** (Identify the specific data source/data collection instrument e.g. name of database, clinical registry, collection instrument, etc.)

If a PRO-PM, identify the specific PROM(s); and standard methods, modes, and languages of administration.

[The American College of Radiology Dose Index Registry](#)

**S.25. Data Source or Collection Instrument** (available at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)

[Available at measure-specific web page URL identified in S.1](#)

**S.26. Level of Analysis** (Check *ONLY* the levels of analysis for which the measure is SPECIFIED AND TESTED)

[Clinician : Group/Practice, Facility, Other, Population : Regional and State](#)

**S.27. Care Setting** (Check *ONLY* the settings for which the measure is SPECIFIED AND TESTED)

[Inpatient/Hospital, Other, Outpatient Services](#)

If other: [Imaging facility](#)

**S.28. COMPOSITE Performance Measure** - Additional Specifications (Use this section as needed for aggregation and weighting rules, or calculation of individual performance measures if not individually endorsed.)

**2a. Reliability** – See attached Measure Testing Submission Form

**2b. Validity** – See attached Measure Testing Submission Form

[0740\\_MeasSubm\\_MeasTesting\\_2014.docx](#)

### 3. Feasibility

Extent to which the specifications including measure logic, require data that are readily available or could be captured without undue burden and can be implemented for performance measurement.

#### 3a. Byproduct of Care Processes

For clinical measures, the required data elements are routinely generated and used during care delivery (e.g., blood pressure, lab test, diagnosis, medication order).

##### 3a.1. Data Elements Generated as Byproduct of Care Processes.

[generated by and used by healthcare personnel during the provision of care, e.g., blood pressure, lab value, medical condition](#)

If other:

#### 3b. Electronic Sources

The required data elements are available in electronic health records or other electronic sources. If the required data are not in electronic health records or existing electronic sources, a credible, near-term path to electronic collection is specified.

**3b.1. To what extent are the specified data elements available electronically in defined fields?** (i.e., data elements that are needed to compute the performance measure score are in defined, computer-readable fields)

[ALL data elements are in defined fields in electronic clinical data \(e.g., clinical registry, nursing home MDS, home health OASIS\)](#)

**3b.2. If ALL the data elements needed to compute the performance measure score are not from electronic sources, specify a**

credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources.

**3b.3. If this is an eMeasure, provide a summary of the feasibility assessment in an attached file or make available at a measure-specific URL.**

**Attachment:**

### **3c. Data Collection Strategy**

Demonstration that the data collection strategy (e.g., source, timing, frequency, sampling, patient confidentiality, costs associated with fees/licensing of proprietary measures) can be implemented (e.g., already in operational use, or testing demonstrates that it is ready to put into operational use). For eMeasures, a feasibility assessment addresses the data elements and measure logic and demonstrates the eMeasure can be implemented or feasibility concerns can be adequately addressed.

**3c.1. Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues.**

**IF a PRO-PM, consider implications for both individuals providing PROM data (patients, service recipients, respondents) and those whose performance is being measured.**

Operational use has taught us a great deal about the variability across facilities. Some examples are as follows:

- We were aware early on about the wide range of procedure names across and even within facilities to describe the same exam. As we worked through the process of standardized names, we learned what kinds of assistance and tools facilities needed to be able to implement the standardization.
- The experiences of our facilities helped the lexicon developers (RadLex) implement user-friendly interfaces and continues to inform the development of a complete and useful lexicon.
- We were aware of differences in scanner output with regards to dose information, but the extent of variation between scanners was larger than we had anticipated. We learned that we needed to use our relationships with manufacturers to seek their assistance in testing the software that we use for data collection. We also sought advice from manufacturers when trouble-shooting the data acquisition process and used their support in helping their customers get started with data submission.
- We have learned that our facilities are our best resource in solving operational issues and we recruit their assistance in helping other participating facilities get started with data submission. Facilities often understand hands-on operational issues much better than registry staff or manufacturer representatives.
- We continue to learn more about facility operations that we do not fully accommodate and our oversight committee will help us find consensus solutions. For example, some perfusion exams may have multiple monitoring scans to monitor contrast before performing a scan of the body part of interest and this may lead to misrepresentation of the dose index for an exam. Some facilities may split and rename an exam such as CT of the chest, abdomen, and pelvis and may have different body parts interpreted by different physicians; the dose index screen in this case may reflect the whole exam but the exam name may only describe one of the body parts. Our committee is working on solutions to minimize misinterpretation.

**3c.2. Describe any fees, licensing, or other requirements to use any aspect of the measure as specified (e.g., value/code set, risk model, programming code, algorithm).**

There is no fee to use the measure. There is a small annual fee to sites to participate in the ACR Dose Index Registry. The annual registry participation fee is based on number of radiologists at a site, and would typically be \$500 - \$1,000 per year.

<http://www.acr.org/Quality-Safety/National-Radiology-Data-Registry/Registration-Process-and-Fee-Structure>

## **4. Usability and Use**

Extent to which potential audiences (e.g., consumers, purchasers, providers, policy makers) are using or could use performance results for both accountability and performance improvement to achieve the goal of high-quality, efficient healthcare for individuals or populations.

### **4a. Accountability and Transparency**

Performance results are used in at least one accountability application within three years after initial endorsement and are publicly reported within six years after initial endorsement (or the data on performance results are available). If not in use at the time of initial endorsement, then a credible plan for implementation within the specified timeframes is provided.

#### 4.1. Current and Planned Use

*NQF-endorsed measures are expected to be used in at least one accountability application within 3 years and publicly reported within 6 years of initial endorsement in addition to performance improvement.*

Planned	Current Use (for current use provide URL)
Public Reporting	Professional Certification or Recognition Program
Payment Program	American Board of Radiology – Approved Maintenance of Certification Part IV Practice Quality Improvement Project.
Quality Improvement (Internal to the specific organization)	<a href="http://www.theabr.org/moc-dr-pqi-projects">http://www.theabr.org/moc-dr-pqi-projects</a> and Dose Index Registry Example

##### 4a.1. For each CURRENT use, checked above, provide:

- Name of program and sponsor
- Purpose
- Geographic area and number and percentage of accountable entities and patients included

The ACR Dose Index Registry has been approved by the American Board of Radiology as an MOC Part IV practice quality improvement project.

A measure “Participation in a Dose Index Registry” has been implemented in the CMS Physician Quality Reporting System in 2014.

The Joint Commission includes a standard for diagnostic imaging services:

The Joint Commission Standards: Revised Requirements for Diagnostic Imaging Services; prepublication December 30, 2013  
[http://www.jointcommission.org/assets/1/6/PREPUB-12-20-2013-DiagImaging\\_AHC.pdf](http://www.jointcommission.org/assets/1/6/PREPUB-12-20-2013-DiagImaging_AHC.pdf)

Standard PI.02.01.01

The organization compiles and analyzes data.

Elements of Performance for PI.02.01.01

A 6. For organizations that provide diagnostic computed tomography (CT) services: The organization compiles and analyzes data on patient CT radiation doses and compares it with external benchmarks, when such benchmarks are available.

**4a.2. If not currently publicly reported OR used in at least one other accountability application (e.g., payment program, certification, licensing) what are the reasons?** (e.g., Do policies or actions of the developer/steward or accountable entities restrict access to performance results or impede implementation?)

**4a.3. If not currently publicly reported OR used in at least one other accountability application, provide a credible plan for implementation within the expected timeframes -- any accountability application within 3 years and publicly reported within 6 years of initial endorsement.** (Credible plan includes the specific program, purpose, intended audience, and timeline for implementing the measure within the specified timeframes. A plan for accountability applications addresses mechanisms for data aggregation and reporting.)

#### 4b. Improvement

Progress toward achieving the goal of high-quality, efficient healthcare for individuals or populations is demonstrated. If not in use for performance improvement at the time of initial endorsement, then a credible rationale describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.

##### 4b.1. Progress on Improvement. (Not required for initial endorsement unless available.)

Performance results on this measure (current and over time) should be provided in 1b.2 and 1b.4. Discuss:

- Progress (trends in performance results, number and percentage of people receiving high-quality healthcare)
- Geographic area and number and percentage of accountable entities and patients included

The trend charts from the analysis are included in the Appendix as Figure 1. For the four six-month periods between July 2011 and June 2013, 105 facilities had data in all periods for head exams 103 had data for chest exams, and 107 had data for abdomen pelvis exams.

For head exams, the average CT DIvol across participating facilities decreased by 7.8% and the DLP by 6.4% during the two year period. For abdomen pelvis exams, the average CT DIvol across participating facilities decreased by 17.3% and the DLP by 16.5% for the same period. For abdomen pelvis exams, the average CT DIvol across participating facilities decreased by 13% and the DLP by 11% for this period. None of these are statistically significant because there is substantial variability across facilities in their median dose indices, but these do point to movement in the right direction.

The decrease in dose indices over time indicates that participation in the DIR is associated with improvements in performance quality with respect to radiation dose optimization among participating facilities. While we cannot measure the direct quality differences between participants and non-participants, the trend suggests that the registry provides a valuable infrastructure to help facilities improve protocols. This infrastructure supports the implementation of accountable quality measures such as percent of exams with dose indices within desired target ranges. We intend to submit accountability measures for consideration by NQF in the next few months. But even with the accountability measures, there is a need for a simple attestation measure for facilities to be able to build the infrastructure to report on more advanced measures.

The number of participants and number of exams in the registry have grown since the launch of the registry in May 2011. See Figure 2 for illustration of this growth.

Sample semi-annual reports provided to facilities are posted here:

Adult patients: <http://www.acr.org/~media/ACR/Documents/PDF/QualitySafety/NRDR/DIR/DIRSampleReport.pdf>

Pediatric patients: <http://www.acr.org/~media/ACR/Documents/PDF/QualitySafety/NRDR/DIR/DIRPedSampleReport.pdf>

Facilities also receive detailed color-coded spreadsheet reports that help them identify high-priority for review and optimization, and a spreadsheet report with trends to help them determine which protocols have changes in dose indices over time. An extract from these spreadsheet reports is included in the appendix as Figure 3.

Figure 4 includes examples of live reports available to facilities to examine their own data at any time between semiannual reports.

**4b.2. If no improvement was demonstrated, what are the reasons? If not in use for performance improvement at the time of initial endorsement, provide a credible rationale that describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.**

#### **4c. Unintended Consequences**

The benefits of the performance measure in facilitating progress toward achieving high-quality, efficient healthcare for individuals or populations outweigh evidence of unintended negative consequences to individuals or populations (if such evidence exists).

**4c.1. Were any unintended negative consequences to individuals or populations identified during testing; OR has evidence of unintended negative consequences to individuals or populations been reported since implementation? If so, identify the negative unintended consequences and describe how benefits outweigh them or actions taken to mitigate them.**

Sites must register to participate in the registry. A list of registered sites is maintained including address and facility contact, and participation is verified by checking on data submission. Because the participation measure is fairly straightforward attestation, it is not particularly susceptible to errors or inaccuracies.

### **5. Comparison to Related or Competing Measures**

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure.

#### **5. Relation to Other NQF-endorsed Measures**

Are there related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population)? If yes, list the NQF # and title of all related and/or competing measures.

Yes

**5.1a. List of related or competing measures (selected from NQF-endorsed measures)**

0510 : Exposure time reported for procedures using fluoroscopy

0739 : Radiation Dose of Computed Tomography (CT)

**5.1b. If related or competing measures are not NQF endorsed please indicate measure title and steward.**

ABMS/ABR/ACR/AMA PCPI Participation in a Dose Index Registry. This measure has not yet been submitted to NQF for endorsement review as it lacks testing. The measure was included in PQRS 2014. It is similar to measure #0740. The differences include:

- PCPI measure allows for a registry to be local, single-center and does not require automated data collection. The PCPI measure is to be paired with another measure "Standardized Nomenclature for CT exams" that serves the purpose for exam mapping to standardized names to allow comparison.
- PCPI measure is specified with a numerator/denominator: Percentage of CT exams submitted to a dose index registry.
- PCPI measure is specified at the clinician level.

**5a. Harmonization**

The measure specifications are harmonized with related measures;

**OR**

The differences in specifications are justified

**5a.1. If this measure conceptually addresses EITHER the same measure focus OR the same target population as NQF-endorsed measure(s):**

**Are the measure specifications completely harmonized?**

Yes

**5a.2. If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden.**

**5b. Competing Measures**

The measure is superior to competing measures (e.g., is a more valid or efficient way to measure);

**OR**

Multiple measures are justified.

**5b.1. If this measure conceptually addresses both the same measure focus and the same target population as NQF-endorsed measure(s):**

**Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible.)**

egarding measure #0739 UCSF

Yes, the measures are completely harmonized.

The two measures have the same overarching goal of improving the safety of medical imaging with CT by improving the appropriateness of CT radiation exposures. The two measures are unique, although complimentary, and facilities can efficiently participate and comply with both measures if they so choose, without undue burden.

Because the two measures focus on similar radiation dose metrics, participation in one measure will facilitate participation in the other with minimal incremental effort and without undue burden to facilities. Data that will be collected through participation for the ACR dose registry measure can be used to generate the statistics that are called for in the UCSF measure through automatic data collection methods. (The ACR Dose Index registry has tested data collection from new and legacy scanners manufactured by four major vendors of CT scanners.) Site feedback reports can generate data that conforms to the specifications of the UCSF measure, including effective dose.

## Appendix

**A.1 Supplemental materials may be provided in an appendix.** All supplemental materials (such as data collection instrument or

methodology reports) should be organized in one file with a table of contents or bookmarks. If material pertains to a specific submission form number, that should be indicated. Requested information should be provided in the submission form and required attachments. There is no guarantee that supplemental materials will be reviewed.

[Attachment](#) **Attachment:** [Appendix\\_-\\_Tables\\_and\\_Figures.pdf](#)

### Contact Information

**Co.1 Measure Steward (Intellectual Property Owner):** [American College of Radiology](#)

**Co.2 Point of Contact:** [Judy, Burleson, jburleson@acr.org, 703-648-3787-](#)

**Co.3 Measure Developer if different from Measure Steward:** [American College of Radiology](#)

**Co.4 Point of Contact:** [Judy, Burleson, jburleson@acr.org, 703-648-3787-](#)

### Additional Information

**Ad.1 Workgroup/Expert Panel involved in measure development**

**Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.**

[American College of Radiology Dose Index Registry Measure Workgroup](#)

[Rick Morin, PHD, FAAPM Chair of DIR Committee and Measure Workgroup](#)

[Kalpana Kanal, PHD, FAAPM Incoming Chair of DIR Committee](#)

[Priscilla Butler M.S., FACR, FAAPM ACR Staff Physics Commission, DIR Committee member](#)

[Mythreyi Chatfield, PhD ACR Senior Director of Registries](#)

**Measure Developer/Steward Updates and Ongoing Maintenance**

**Ad.2 Year the measure was first released:** [2010](#)

**Ad.3 Month and Year of most recent revision:** [04, 2013](#)

**Ad.4 What is your frequency for review/update of this measure?** [Annually](#)

**Ad.5 When is the next scheduled review/update for this measure?** [01, 2014](#)

**Ad.6 Copyright statement:**

**Ad.7 Disclaimers:**

**Ad.8 Additional Information/Comments:**