Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Optimizing patient exposure to ionizing radiation: percentage of final reports for CT studies performed for all patients, regardless of age, which document that Digital Imaging and Communications in Medicine (DICOM) format image data are available to non-affiliated external healthcare facilities or entities on a secure, media free, reciprocally searchable basis with patient authorization for at least a 12-month period after the study.

Source(s)

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Process

Secondary Measure Domain

Clinical Quality Measure: Structure

Brief Abstract

Description

This measure is used to assess the percentage of final reports for computed tomography (CT) studies performed for all patients, regardless of age, which document that Digital Imaging and Communications in Medicine (DICOM) format image data are available to non-affiliated external healthcare facilities or entities on a secure, media free, reciprocally searchable basis with patient authorization for at least a 12-month period after the study.

Rationale

The current radiology information systems in hospitals generally do not collect or report radiation

exposures and the medical imaging devices that communicate with radiology information systems do not currently forward data on the radiation dose received by a patient from each such test. As a result, physicians are uncertain of their patients' cumulative exposure and lifetime attributable risk (LAR), which is problematic when assessing, prioritizing and discussing the risks and benefits associated with their patients' clinical needs (Sodickson et al., 2009).

National Quality Forum's (NQF's) Safe Practices for Better Healthcare-2009 Update: A Consensus Report was prepared incorporating the National Priorities Partnership six crosscutting priorities. Safe Practice 12: Patient Care Information addresses the lack of care continuum by not communicating critical patient information such as medical history, diagnostic test results, medications, treatments, and procedures. The Safe Practice Statement addressing this topic reads as follows, "Ensure that care information is transmitted and appropriately documented in a timely manner and in a clearly understandable form to patients and to all of the patient's providers/professionals, within and between care settings, who need that information to provide continued care" (NQF, 2009).

The following evidence statements are quoted verbatim from the referenced clinical guidelines and/or other references:

Core functional requirements for an Internet-based system for sharing medical records (Flanders, 2009)

> Methods to ensure privacy and confidentiality of data;
> Capability to move and store large data files (e.g., images) with the same efficiency and reliability as possible with small data files (e.g., text);
> Construction of registries, which contain "knowledge" of all fragments of medical information (and their physical location) from all sources for a given patient;
> An ability to match records and accurately reconcile patient identities without a common patient identifier;
> A means to regulate access to data and audit the access;
> A method for moving blocks of data from one location to another; and
> A method to aggregate and consume the data at the point of care.

Optimal patient care requires that care providers and patients be able to create, manage and access comprehensive electronic health records (EHRs) efficiently and securely. The sharing of radiologic images has become a fundamental part of radiology services and is essential for delivering high-quality care.

Integrating the Healthcare Enterprise (IHE)
IHE is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. The IHE Radiology Technical Framework, defines specific implementations of established standards to achieve integration goals that promote appropriate sharing of medical information to support optimal patient care. The IHE Radiology Technical Framework includes various Integration Profiles that provide a convenient way for both users and vendors to reference a subset of the functionality detailed in the IHE Technical Framework.

The Cross-enterprise Document Sharing for Imaging (XDS-I) Integration Profile specifies actors and transactions that allow users to share imaging information across enterprises. This profile depends on the IHE IT Infrastructure Cross-Enterprise Document Sharing (XDS) profile. XDS for Imaging (XDS-I) defines the information to be shared such as sets of Digital Imaging and Communications in Medicine (DICOM) instances (including images, evidence documents, and presentation states), diagnostic imaging reports provided in a ready-for-display.

Cross-Document Sharing Work Flow (Mendelson et al., 2008)
The basic workflow is as follows: a document such as an x-ray report is created and stored at the document source, perhaps an imaging center. In addition, a (redundant) copy is sent into the document repository for the affinity domain in which this imaging center is participating.

Upon receiving the x-ray report, the document repository registers it with the document registry for that affinity domain. The document registry ensures that the document is assigned to the correct patient by transacting with the patient identity source, which may be using the Patient Identifier Cross-Reference

and Patient Demographic Query (PIX-PDQ) profiles to reconcile the varying demographic data and medical record numbers that different systems assign to the same patient. Sometime (perhaps even years) later, the patient is seen by another healthcare provider at a remote site. The healthcare provider wishes to read the prior x-ray reports. This remote site participates in the same affinity domain and is now regarded as a document consumer. As such, it may query the document registry as to the existence of the prior reports and query the document repository to obtain the reports. Again, patient identity is reconciled and confirmed using the patient identity source and the relevant IHE actors and profiles. This scenario can be expanded to describe the sharing of many kinds of healthcare documents. There are also slight variations permitted in which some of the actors can be placed either within the affinity domain centrally or at one of the sites at which documents arise.

Federal Register, Electronic Health Record Incentive Program (Department of Health and Human Services & Centers for Medicare and Medicaid Services [CMS], 2010)
While the Federal Register, Electronic Health Record Incentive Program is not an evidence-based clinical guideline, the Health Information Technology for Economic and Clinical Health (HITECH) Act requires the use of health information technology in improving the quality of health care, reducing medical errors, reducing health disparities, increasing prevention and improving the continuity of care among health care settings. The Incentive program includes meaningful use objectives and associated measures that pertain to the use of EHRs to facilitate the availability and use of health information.

Evidence for Rationale

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

Department of Health and Human Services, Centers for Medicare and Medicaid Services (CMS). Medicare and Medicaid Programs. Electronic health records (EHR) incentive programs. Final rule. [Federal Register]. 2010;75(144)

Flanders AE. Medical image and data sharing: are we there yet?. Radiographics. 2009 Sep-Oct;29(5):1247-51. PubMed

Mendelson DS, Bak PR, Menschik E, Siegel E. Informatics in radiology: image exchange: IHE and the evolution of image sharing. Radiographics. 2008 Nov-Dec;28(7):1817-33. PubMed

National Quality Forum (NQF). Safe practices for better healthcare â€" 2009 update: a consensus report. Washington (DC): National Quality Forum (NQF); 2009.

Sodickson A, Baeyens PF, Andriole KP, Prevedello LM, Nawfel RD, Hanson R, Khorasani R. Recurrent CT, cumulative radiation exposure, and associated radiation-induced cancer risks from CT of adults. Radiology. 2009 Apr;251(1):175-84. PubMed

Primary Health Components

Ionizing radiation; Digital Imaging and Communications in Medicine (DICOM) format image data; computed tomography (CT) studies; searchable record system

Denominator Description

All final reports for computed tomography (CT) studies performed for all patients, regardless of age

Numerator Description

Final reports for computed tomography (CT) studies, which document that Digital Imaging and Communications in Medicine (DICOM) format image data are available to non-affiliated external healthcare facilities or entities on a secure, media free, reciprocally searchable basis with patient authorization for at least a 12-month period after the study (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Importance of Topic
The use of medical imaging has resulted in revolutionary advances in the practice of medicine. The increased sophistication and clinical efficacy of imaging have resulted in its considerable growth. Consequently, the evolution of imaging has resulted in a significant increase in the population's cumulative exposure to ionizing radiation and a potential increase in adverse effects including cancer (Amis, Butler, & American College of Radiology [ACR], 2010; Amis et al., 2007). Although experts may not agree on the extent of the risks of cancer from medical imaging, there is uniform agreement that care should be taken to weigh the medical necessity of a given level of radiation exposure against the risks, and that steps should be taken to eliminate avoidable exposure to radiation (Amis et al., 2007; Center for Devices and Radiological Health [CDRH], 2010).

High Impact Topic Area
This topic was chosen for measure development because of the high costs associated with imaging studies and because these medical procedures are a significant source of radiation exposure. The following objective data support the degree of increase in the use of imaging studies and emphasize the importance in taking steps to help eliminate avoidable exposure.

Prevalence and Incidence

> The average per capita exposure to ionizing radiation from imaging exams increased by about 600% from 1980 to 2006 in the United States (U.S) (Mettler et al., 2009; National Council on Radiation Protection and Measurements [NCRP], 2009).
> The largest contributor to this dramatic increase in population radiation exposure is computed tomography (CT). In 1980 fewer than 3 million CT scans were performed; in 2006, there were about 380 million radiologic procedures (including 67 million CT scans) and 18 million nuclear medicine procedures performed in the U.S. (Mettler et al., 2009).
> The imaging study with the single highest radiation burden, accounting for 22% of cumulative effective dose, is myocardial perfusion imaging (Fazel et al., 2009).
> In 2006, an estimated 19 million head, 10.6 million chest and 21.2 million abdominal and pelvic CT scans were performed accounting for 28%, 15.9%, and 31.7%, respectively, of the total number of CT scans in the U.S. (Mettler et al., 2009).
> Currently, approximately 11% of CT examinations are performed on children, which could account for more than 7 million pediatric CT examinations per year in the U.S. (Mettler et al., 2000; Frush &

Applegate, 2004; Linton, Mettler, & NCRP, 2003).
The prevalence of CT or magnetic resonance imaging (MRI) use during emergency department (ED) visits for injury-related conditions increased from 6% in 1998 to 15% in 2007 (Korley, Pham, & Kirsch, 2010).
While CT utilization has decreased steadily since 2003 in pediatric facilities across North America (Townsend et al., 2010) the use of CT in children who visit the ED increased from 0.33 to 1.65 from 1995 to 2008 and occurred primarily at non-pediatric focused facilities (Larson et al., 2011).

Costs

From 2000 through 2006, total Medicare expenditures for physician imaging services increased from $6.7 billion to about $14 billion, an increase of 13% per year on average (U.S. Government Accountability Office [GAO], 2008).
In 2005 imaging services represented an estimated 14% of 2005 spending included in the sustainable growth rate (SGR) calculation, but represented 27% of the total increase in such spending between 2004 and 2005. The majority of the growth occurred for advanced imaging (GAO, 2008).
In 2006, advanced imaging, including CT and MRI, accounted for 54% of total Medicare imaging expenditures, up from 43% in 2000. This translates to an increase in Medicare spending on advanced imaging from about $3 billion in 2000 to about $7.6 billion in 2006 (GAO, 2008).

Disparities
There is variation according to age, sex, and health care market in the proportion and mean dose of patients undergoing medical imaging procedures. One study concluded that the proportion of subjects undergoing at least one imaging procedure was higher in older patients, rising from 49.5% of those who were 18 to 34 years old to 85.9% of those who were 60 to 64 years old. The study also found that women underwent procedures significantly more often than men, with a total of 78.7% of women undergoing at least one procedure during the study period, as compared with 57.9% of men (Fazel et al., 2009).

Opportunity for Improvement
One retrospective cross-sectional study describing radiation dose associated with some of the most common types of diagnostic CT found variable radiation doses. The study found variability in the following exams: 1) routine chest exam without contrast, the CT effective doses ranged from 2 mSv to 24 mSv; 2) routine abdomen-pelvis, no contrast - CT effective dose ranged from 3 mSv to 43 mSv; 3) routine head exam - CT effective dose ranging from 0.3 mSv to 6 mSv (Smith-Bindman et al., 2009).

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 dose indices to be analyzed and compared against established benchmarks.

It has been estimated that between $3 and $10 billion are wasted in the U.S. annually on unnecessary or duplicative imaging studies. Duplicative imaging procedures could be substantially reduced with improved access to existing imaging data. Additionally, universal access to existing imaging studies to retrieve relevant prior images could improve diagnostic specificity for radiologists and potentially further minimize recommendations for follow-up studies (Monegain, 2009).

Evidence for Additional Information Supporting Need for the Measure

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

Amis ES Jr, Butler PF, American College of Radiology. ACR white paper on radiation dose in medicine: three years later. J Am Coll Radiol. 2010 Nov;7(11):865-70. PubMed

Amis ES Jr, Butler PF, Applegate KE, Birnbaum SB, Brateman LF, Hevezi JM, Mettler FA, Morin RL, Pentecost MJ, Smith GG, Strauss KJ, Zeman RK, American College of Radiology. American College of Radiology white paper on radiation dose in medicine. J Am Coll Radiol. 2007 May;4(5):272-84. PubMed

Center for Devices and Radiological Health (CDRH). Initiative to reduce unnecessary radiation exposure from medical imaging. Silver Spring (MD): U.S. Food and Drug Administration, Center for Devices and Radiological Health; 2010 Feb. 12 p.

Fazel R, Krumholz HM, Wang Y, Ross JS, Chen J, Ting HH, Shah ND, Nasir K, Einstein AJ, Nallamothu BK. Exposure to low-dose ionizing radiation from medical imaging procedures. N Engl J Med. 2009 Aug 27;361(9):849-57.

Frush DP, Applegate K. Computed tomography and radiation: understanding the issues. J Am Coll Radiol. 2004 Feb;1(2):113-9. PubMed

Korley FK, Pham JC, Kirsch TD. Use of advanced radiology during visits to US emergency departments for injury-related conditions, 1998-2007. JAMA. 2010 Oct 6;304(13):1465-71. PubMed

Larson DB, Johnson LW, Schnell BM, Goske MJ, Salisbury SR, Forman HP. Rising use of CT in child visits to the emergency department in the United States, 1995-2008. Radiology. 2011 Jun;259(3):793-801. PubMed

Linton OW, Mettler FA, National Council on Radiation Protection and Measurements. National conference on dose reduction in CT, with an emphasis on pediatric patients. AJR Am J Roentgenol. 2003 Aug;181(2):321-9. PubMed

Mettler FA Jr, Wiest PW, Locken JA, Kelsey CA. CT scanning: patterns of use and dose. J Radiol Prot. 2000 Dec;20(4):353-9. PubMed

Mettler FA, Bhargavan M, Faulkner K, Gilley DB, Gray JE, Ibbott GS, Lipoti JA, Mahesh M, McCrohan JL, Stabin MG, Thomadsen BR, Yoshizumi TT. Radiologic and nuclear medicine studies in the United States and worldwide: frequency, radiation dose, and comparison with other radiation sources--1950-2007. Radiology. 2009 Nov;253(2):520-31. PubMed

Monegain B. New coalition targets $3 billionâ€"$10 billion wasted annually on unneeded imaging. [internet]. HealthcareITNews; 2009 Jun 16.

National Council on Radiation Protection and Measurement (NCRP). Ionizing radiation exposure of the population of the United States. Bethesda (MD): National Council on Radiation Protection and Measurement (NCRP); 2009.

Smith-Bindman R, Lipson J, Marcus R, Kim KP, Mahesh M, Gould R, Berrington de Gonzalez A, Miglioretti DL. Radiation dose associated with common computed tomography examinations and the associated lifetime attributable risk of cancer. Arch Intern Med. 2009 Dec 14;169(22):2078-86.

Townsend BA, Callahan MJ, Zurakowski D, Taylor GA. Has pediatric CT at children's hospitals reached its peak?. AJR Am J Roentgenol. 2010 May;194(5):1194-6. PubMed

U.S. Government Accountability Office (GAO). Medicare Part B imaging services: rapid spending growth and shift to physician offices indicate need for CMS to consider additional management practices. Washington (DC): U.S. Government Accountability Office (GAO); 2008 Jun. 49 p.

Extent of Measure Testing

The measures in this set are being made available without any prior formal testing. However, many of the measures in this set (Utilization of a Standardized Nomenclature for CT Imaging Description, Count of Potential High Dose Radiation Imaging Studies: Computed Tomography (CT) and Cardiac Nuclear Medicine Studies, CT Images Available for Patient Follow-Up and Comparison Purposes, Search for Prior CT Studies through a Secure, Authorized, Media-free, Shared Archive, Appropriateness: Follow-up CT Imaging for Incidentally Detected Pulmonary Nodules According to Recommended Guidelines and Reporting to a Radiation Dose Index Registry) have been in use in the Centers for Medicare and Medicaid Services (CMS) Physician Quality Reporting System program since 2013 indicating the feasibility of collecting the data elements required for measure calculation.

The American College of Radiology (ACR) recognizes the importance of thorough testing all of its measures and encourages ongoing robust testing of the Optimizing Patient Exposure to Ionizing Radiation measurement set for feasibility and reliability by organizations or individuals positioned to do so. The ACR will welcome the opportunity to promote such testing of these measures and to ensure that any results available from testing are used to refine the measures on an ongoing basis.

Evidence for Extent of Measure Testing

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Ambulatory Procedure/Imaging Center

Emergency Department

Hospital Inpatient

Hospital Outpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

All ages

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Health and Well-being of Communities
Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Safety

Data Collection for the Measure

Case Finding Period

Unspecified

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Diagnostic Evaluation

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
All final reports for computed tomography (CT) studies performed for all patients, regardless of age

Exclusions
Unspecified

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Final reports for computed tomography (CT) studies, which document that Digital Imaging and Communications in Medicine (DICOM) format image data are available to non-affiliated external healthcare facilities or entities on a secure, media free*, reciprocally searchable basis with patient authorization for at least a 12-month period after the study

**Media-free*: Radiology images that are transmitted electronically *ONLY*, not images recorded on film, CD, or other imaging transmittal form.

Exclusions
Unspecified

Numerator Search Strategy

Fixed time period or point in time

Data Source

Administrative clinical data

Registry data

Type of Health State

Does not apply to this measure

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a higher score

Allowance for Patient or Population Factors

not defined yet

Standard of Comparison

not defined yet

Identifying Information

Original Title

Measure #11: computed tomography (CT) images available for patient follow-up and comparison purposes.

Measure Collection Name

Optimizing Patient Exposure to Ionizing Radiation Performance Measurement Set

Submitter

American College of Radiology - Medical Specialty Society

Developer

American College of Radiology - Medical Specialty Society

Physician Consortium for Performance ImprovementÂ® - Clinical Specialty Collaboration

Funding Source(s)

Unspecified

Composition of the Group that Developed the Measure

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Financial Disclosures/Other Potential Conflicts of Interest

None of the members of the Patient Optimizing Patient Exposure to Ionizing Radiation Work Group had any disqualifying material interests under the Physician Consortium for Performance Improvement (PCPI) Conflict of Interest Policy.

Measure Initiative(s)

Physician Quality Reporting System

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2016 Jan

Measure Maintenance

This measure set is reviewed and updated every 3 years

Date of Next Anticipated Revision

2017

Measure Status

This is the current release of the measure.

Measure Availability

Source available from the American College of Radiology (ACR) Web site .

For more information, contact ACR at 1891 Preston White Drive, Reston, VA 20191; Phone: 703-648-8900; E-mail: info@acr.org; Web site: www.acr.org .

NQMC Status

This NQMC summary was completed by ECRI Institute on November 4, 2015. The information was verified by the measure developer on December 29, 2015.

Copyright Statement

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Production

Source(s)

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

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