Adapting Verification Processes to Prevent Wrong Radiology Events

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Abstract

Reports of Wrong Radiology Events

<table>
<thead>
<tr>
<th>Wrong Event</th>
<th>CY2009 (n = 652)*</th>
<th>AY2017 (n = 987 of 993)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrong patient</td>
<td>196</td>
<td>262</td>
</tr>
<tr>
<td>Wrong procedure</td>
<td>328</td>
<td>215</td>
</tr>
<tr>
<td>Wrong site</td>
<td>34</td>
<td>178</td>
</tr>
<tr>
<td>Wrong side</td>
<td>96</td>
<td>247</td>
</tr>
<tr>
<td>Wrong time</td>
<td>85</td>
<td>Query expanded for AY2017</td>
</tr>
</tbody>
</table>

Notes: In the AY2017 data, (3.0% (n = 30) of reports did not specify the type of wrong report.
AY2017, academic year 2017 (July 1, 2016, through June 30, 2017); CY2009, calendar year 2009 (January 1 through December 31).
* Data reported through the Pennsylvania Patient Reporting System (PA-PSRS), CY2009.
** Data reported through PA-PSRS, AY2017.

Verify patient and procedure details at every point along the medical-imaging care continuum. If the team identifies conflicts or cannot verify information, stop and clarify!

Wrong radiology studies can expose patients to risks of harm, from unnecessary radiation exposure or contrast doses to delays in diagnosis or treatment. The Pennsylvania Department of Health reported that more than 16 million radiology studies were performed by Pennsylvania hospitals in 2016. This high frequency of studies and the complexities of the medical-imaging care continuum put patients at risk for wrong patient, wrong procedure, wrong site, wrong side events. The Pennsylvania Patient Safety Authority analyzed wrong radiology events reported from July 2016 through June 2017. Analysts identified 993 wrong radiology events, including near misses (i.e., events that...
did not reach the patient). The events occurred across the imaging process, from the initial step of ordering through performing the study to the final step of communicating results. Errors involved system failures related to identifying patients and ordering and verifying procedures, including study type, body site, and laterality. Contributing factors cited in event-report details included increased workload, miscommunication, complexities related to healthcare technologies, and studies performed outside of radiology departments. Developing and implementing verification processes specific to the medical-imaging care continuum is essential to reduce the risk of harm from wrong radiology events.

Introduction

The Pennsylvania Patient Safety Authority received a request from a Pennsylvania healthcare facility for an analysis of wrong radiology safety events (e.g., wrong patient, wrong procedure, wrong site, wrong side events) reported through the Pennsylvania Patient Safety Reporting System (PA-PSRS). The request cited a previous Pennsylvania Patient Safety Advisory article (ADVISORIES/Pages/201106_63.aspx) that identified 652 radiology/imaging events reported through PA-PSRS in calendar year 2009 (CY2009).

Analysts queried the PA-PSRS database for recent reports of wrong radiology events using criteria similar to that used to analyze the 2009 data. Analysts' review of the PA-PSRS data identified almost 1,000 wrong radiology imaging events reported during a 12-month period. This article will provide an analysis of wrong radiology events submitted through PA-PSRS in academic year 2017 (AY2017; July 2016 through June 2017).

The current analysis classified the events' stage, based on where along the medical-imaging care continuum the events occurred, and contributing factors associated with the events. This analysis highlights the need for harm-prevention strategies specific to radiology procedures, for which typical procedural time-out processes are challenging to implement because of a team structure that is often distributed across physical locations and time.

Methods

Analysts queried the PA-PSRS database for radiology events reported by Pennsylvania healthcare facilities from July 1, 2016, through June 30, 2017, and identified 1,700 events that mentioned radiology or interventional radiology errors. Of the 1,700 events, structured data-field analysis identified 630 wrong radiology events based on event type and subtype categories (e.g., wrong patient, wrong procedure, wrong site, wrong side). Review of free-text event details in the remaining events identified 363 additional reports of wrong events, for a total of 993 wrong radiology events.

Wrong Radiology Event Type

The query was expanded for this analysis compared to the CY2009 analysis, with criteria for the wrong radiology events defined as follows:

Wrong Patient

- Study ordered and/or performed on the wrong patient
- Wrong patient record selected (e.g., study performed using the wrong patient record, study results documented in the wrong patient record)
- Wrong patient transported to radiology/imaging department

9/20/2018
Wrong patient scheduled for a study

Wrong Procedure

- Wrong study protocol performed—that is, specific protocols or study series based on patient diagnosis and/or physician preference (e.g., dissection protocol, scan protocol for atrial fibrillation ablation, navigation protocol) performed incorrectly
- Wrong study performed (e.g., computerized tomography [CT] versus magnetic resonance imaging [MRI], barium study versus video barium study, weight-bearing versus non-weight-bearing, three-view versus five-view studies)
- Incorrect contrast used
- Study completed with contrast versus without contrast
- Unnecessary study performed (e.g., unintended duplicate studies, old study orders that were completed in error, earlier orders placed and not cancelled until after the study's completion)

Wrong Site

- Study ordered and/or performed on an incorrect body part or location, (e.g., head versus chest, lumbar versus cervical spine, first versus fourth finger)

Wrong Side

- Study ordered and/or performed on the wrong side (e.g., left versus right, left or right versus bilateral)
- Incorrect laterality identified on images using lead x-ray markers
- Laterality incorrectly identified in study reports

Wrong Time

- Study not performed at the time specified in the order or based on the imaging protocol
  - Study ordered to be done after a procedure but done before the procedure occurred (e.g., chest tube removal, central line or endotracheal tube placement, surgery)
  - Study ordered to be performed after specific patient preparation completed and the study was delayed because the patient was not appropriately prepared or the study was done before the appropriate preparation was completed (e.g., patient fasting, MRI screening, fluid hydration)
- Study ordered STAT (emergently) that was delayed
- Delayed reading of the study
- Delayed communication of critical findings
- Delayed performance or completion of the study due to insufficient resources (e.g., time, personnel, supplies, medication)
Analysts excluded reports of injury from devices or equipment (e.g., bumping the patient's head, skin tears). Also excluded were reports of the following patient issues: changes in patient status (e.g., fainting, dizziness, anxiety, chest pain, seizures), allergic reaction or adverse events from contrast, pregnancy screening issues, and intravenous infiltration or extravasation of contrast. Finally, reports of technical issues with images (e.g., lost, overexposed) and contrast issues (e.g., syringe loaded incorrectly) also were excluded.

Events of wrong-result reporting that addressed incorrect patient identification, laterality, or site (e.g., right side was imaged but resulted as left side) were included; however, resulting errors related to diagnostic error were excluded.

Similar to stages of an Imaging Care Cycle described by Jones², the stages for this article have been classified as follows:

- Preprocedure (study ordering, requesting, scheduling)
- Procedure (patient registering, imaging, processing)
- Postprocedure (image resulting and communication of results)

The total number of inpatient, and outpatient radiology procedures was obtained from the Pennsylvania Department of Health, Division of Health Informatics' annual hospital questionnaire.³

Results

Analysis of the data identified 993 wrong radiology events reported in AY2017. Figure 1 shows the number of the reports identified in the CY2009 data analysis (n = 652)¹ and the AY2017 data analysis (n = 993).
In the current analysis, more than half of the wrong radiology errors (51.2%, n = 508 of 993) were reports of wrong-patient and wrong-side events. The most common wrong imaging events involved radiography studies (44.5%, n = 442) and CT scans (24.5%, n = 243). Figure 2 shows PA-PSR events from AY2017 by the type of wrong event and radiologic study involved.

Figure 1. Wrong Radiology Events in Pennsylvania, Reported in Two 12-Month Periods*

<table>
<thead>
<tr>
<th>Event</th>
<th>January 1 through December 31, 2009 (n = 652)</th>
<th>July 1, 2016, through June 30, 2017 (n = 993)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrong patient</td>
<td>261</td>
<td>196</td>
</tr>
<tr>
<td>Wrong side</td>
<td>247</td>
<td>96</td>
</tr>
<tr>
<td>Wrong site</td>
<td>326</td>
<td>178</td>
</tr>
<tr>
<td>Wrong Procedure</td>
<td>85</td>
<td>34</td>
</tr>
<tr>
<td>Wrong Time</td>
<td>0</td>
<td>85</td>
</tr>
<tr>
<td>Not Specified</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

* Data reported through the Pennsylvania Patient Safety Reporting System.
† The database query was expanded for AY2017 to include wrong-time events because this category had a significant number of events with patient outcomes similar to other wrong radiology events.

In the current analysis, more than half of the wrong radiology errors (51.2%, n = 508 of 993) were reports of wrong-patient and wrong-side events. The most common wrong imaging events involved radiography studies (44.5%, n = 442) and CT scans (24.5%, n = 243). Figure 2 shows PA-PSR events from AY2017 by the type of wrong event and radiologic study involved.

Figure 2. Reports of Pennsylvania Wrong Radiology Events by Study and Event Type*

<table>
<thead>
<tr>
<th>Radiologic Study</th>
<th>Wrong Patient</th>
<th>Wrong Side</th>
<th>Wrong Procedure</th>
<th>Wrong Site</th>
<th>Wrong Time</th>
<th>Not Specified</th>
<th>Number of Wrong Events</th>
<th>Percentage of Wrong Events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiography</td>
<td>98</td>
<td>68</td>
<td>79</td>
<td>31</td>
<td>442</td>
<td>1</td>
<td></td>
<td>44.5</td>
</tr>
<tr>
<td>Computerized tomography (CT)</td>
<td>71</td>
<td>85</td>
<td>53</td>
<td>26</td>
<td>243</td>
<td>1</td>
<td></td>
<td>24.5</td>
</tr>
<tr>
<td>Magnetic resonance imaging (MRI)</td>
<td>6</td>
<td>14</td>
<td>6</td>
<td>10</td>
<td>53</td>
<td>1</td>
<td></td>
<td>5.3</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>17</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>43</td>
<td>1</td>
<td></td>
<td>4.3</td>
</tr>
<tr>
<td>Nuclear Medicine</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>23</td>
<td>1</td>
<td></td>
<td>2.3</td>
</tr>
<tr>
<td>Interventional radiology</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>14</td>
<td>1</td>
<td></td>
<td>1.4</td>
</tr>
<tr>
<td>Mammography</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td>Cardiac stress test</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td>DEXA scan</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>Position emission tomography (PET)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>Radiation therapy</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>Not Specified</td>
<td>52</td>
<td>21</td>
<td>27</td>
<td>6</td>
<td>158</td>
<td>4</td>
<td></td>
<td>15.9</td>
</tr>
<tr>
<td>Total number of events</td>
<td>261</td>
<td>247</td>
<td>216</td>
<td>178</td>
<td>86</td>
<td>6</td>
<td></td>
<td>993</td>
</tr>
<tr>
<td>Total percentage of events (%)</td>
<td>26.3</td>
<td>24.9</td>
<td>21.8</td>
<td>17.9</td>
<td>8.6</td>
<td>0.6</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

* Data reported through the Pennsylvania Patient Safety Reporting System, July 1, 2016, through June 30, 2017.
Although AY2017 PA-PASR data indicates a higher incidence of radiography and CT errors than for other types of imaging studies, this does not represent a higher event rate because Pennsylvania Department of Health reporting of CY2016 imaging data identifies diagnostic x-rays and CT scans as the two most common types of radiologic procedures performed at Pennsylvania facilities. three

The total number of inpatient, and outpatient procedures as reported by Pennsylvania hospitals for CY2016 to the Pennsylvania Department of Health Division of Health Informatics’ annual hospital questionnaire are as follows:

- Diagnostic x-ray 9,337,684
- CT scan 3,521,923
- Ultrasound 2,519,280
- MRI exam 1,052,614
- Diagnostic and therapeutic nuclear medicine use 351,255

Of the 993 wrong-site radiology events, 646 (65.1%) reached the patient (i.e., the study was initiated or completed before the error was identified). An additional 328 events (33.0%) were reported as near misses (i.e., a circumstance that might have caused harm but did not reach the patient due to chance alone or active recovery efforts by caregivers). The remaining 19 (1.9%) event reports contained insufficient detail to determine whether the error reached the patient.

The 993 wrong radiology events included 85 reports of studies completed at the wrong time, an event type that was not included in the 2009 data analysis.

**Medical-Imaging Care Continuum: Preprocedure, Procedure, Postprocedure**

Analysis of wrong-site radiology events reported through PA-PSRS identified that errors occurred at single or multiple points along the stages of the medical-imaging care continuum.

Identifying the occurrence points along the continuum helps to determine areas of focus for prevention strategies. Over half of the events occurred during the procedure stage, and the three most common events types occurring during the procedure stage were wrong patient, 30.5% (n = 174 of 571); wrong side, 23.5% (n = 134); and wrong site, 21.9% (n = 125).

Figure 3 shows examples of event details from the PA-PSRS database as they occurred along the medical-imaging care continuum.
Adapting Verification Processes for Preventing Wrong Radiology Events | Advisory

Figure 3. Wrong Radiology Events Along the Medical Imaging Care Continuum

Preprocedure 38.3% (n = 367 of 993)
- CRNP ordered CT chest w/contrast - indication was V/Q PE. Order needed to be changed to CTA for PE.
- Patient arrived with a STAT script but study ordered as routine. Script was for left hand but right hand was ordered. Orders corrected.
- MD is not in the system, so an order cannot be entered through EMR health. Instead order goes to a scheduler to be transcribed and scheduled. MD ordered a pelvic ultrasound but the order was transcribed as an ultrasound of the abdomen, which does not include the bladder.

Procedure 57.5% (n = 571 of 993)
- Both father and son have the same month and day for their birthday. Registration accidently ordered a chest x-ray on the father but was actually for the son. This was a near miss as the problem was caught by the technologist when checking the name and date of birth before the x-ray was performed.
- Wrong pt was taken from CT scan to radiology for x-rays. Did not double check the ID band and request. Pt was unable to communicate due to his medical condition. Exam was done before realizing we had the wrong pt.
- When the patient came into radiology, she was coughing. I did not look closer at the order. I started performing a chest x-ray when I realized she was actually ordered for an x-ray of the knee. Her mother was notified of the mistake.

Postprocedure 2.0% (n = 19 of 993)
- X-ray report sent to orthopedics and found that the interpretation appeared to be wrong: ankle vs. shoulder.
- MRI of the right thigh performed but read as left thigh.
- Patient had chest x-ray completed and results faxed with the patient name and correct exam but had results of a Doppler study done on another patient. The image report on the electronic chart is correct.

The PA wrote an order on the wrong infant. The error was found after the x-ray was done so the patient received an x-ray she didn't need.

Pt ordered CT of head with NO contrast as a telephone order. RN entered incorrect order, entered as CTA with contrast. Pt had BUN of 29. MD noticed error and ordered IV fluids to decrease risk of kidney injury.

Patient on ventilator arrived to radiology via EMS. Wrong imaging was scheduled by the nursing home. US unable to do the procedure. Patient transported to the ED per radiologist.

Script had read x-ray of the right foot, registration ordered the x-ray of the left foot. One view of the left foot was x-rayed before the error was caught.

The patient was brought into the room and the father verified the patient's ID and that it was the right foot and ankle to be imaged. The father took off the patient's sock and shoe. The imaging was started and I realized the wrong side had been x-rayed.

A patient came to the emergency department with a brain bleed. He had a history of diabetes and hypertension. A CT of pelvis and abdomen w/contrast was done but not ordered for him. He developed renal failure requiring dialysis treatments X 3 and monitoring in the ICU for 6 days.

RN from PICU notified radiology regarding portable chest x-ray performed on her patient. Stated that the report reflects an ETT, but his patient does not have an ETT in place. Appears that the radiologist dictated the report on the wrong patient.

Script transcribed over the phone from an external provider. Code provided has several options under the ICD-10 code. No descriptive words on the script, scheduler chose the incorrect descriptive under the code and the report went to physician with incorrect diagnosis.

Note: The details of the Pennsylvania Patient Safety Reporting System (PA-PSRS) event narratives in this figure have been modified to preserve confidentiality. Data reported through PA-PSRS, July 1, 2016 through June 30, 2017.

BUN, blood urea nitrogen level; CRNP, certified registered nurse practitioner; CT, computed tomography; CTA, computed tomography angiography; ED, emergency department; EMR, electronic medical record; EMS, emergency medical services; ETT, endotracheal tube; ICU, intensive care unit; ID, identification; IV, intravenous; MRI, magnetic resonance imaging; PA, physician assistant; PICU, pediatric intensive care unit; Pt, patient; RO PE, rule out for pulmonary embolism; US, ultrasound.

* Disclosure of insufficient event narrative details, Pennsylvania Patient Safety Authority analysts were unable to classify 56 of the 993 events by stage. Stage classification was limited by the use of variable and undefined terms to describe radiology processes in the event narratives.
Contributing factors cited in the radiology event report details included the following:

- Increased workload
- Limited resources (e.g., personnel, contrast media)
- Miscommunication between healthcare providers
- Patient or family miscommunication (e.g., patient incorrectly identified the extremity to be imaged, patient was unable to communicate their identity due to altered mental status, patient misunderstood the study to be done because of a language barrier)
- Health information technologies (e.g., platforms that don't interface, selection of wrong patient in the electronic record, selection of incorrect study for indication)
- Studies performed outside of the radiology department (e.g., events related to completing portable x-rays on the wrong patient because a patient moved to a different room)

**Limitations**

The wrong-radiology event data analysis is limited by the information reported through PA-PSRS: The number of reports, type of events, and narrative details analyzed for this article depend on individual facility reporting practices. The increased numbers of wrong radiology events reported in this analysis may also be attributed to the expanded AY2017 database query.

The ability to accurately calculate a rate of event occurrence is limited by differences in report years: AY2017 PA-PSRS event data versus CY2016 Pennsylvania Department of Health annual hospital questionnaire data.

**Discussion**

Most strategies in the literature intended to prevent wrong-site radiology events focus on interventional radiology (IR) procedures, which often involve teams of radiology staff with roles specific to the IR location and procedures. Literature review found fewer articles addressing strategies for preventing wrong-site radiology events outside of the IR suite.¹,²,⁶,⁷

Analysis of the PA-PSRS data highlights the complexity of radiology imaging involving nonstandard "procedural" teams—for example, a radiology team consisting of a bedside nurse assisting a radiology technologist performing an x-ray study with a portable machine. Lack of standardized team roles and time-out processes may contribute to the occurrence of wrong radiology events and may lead healthcare providers to incorrectly perceive a low risk of patient harm associated with radiology imaging.
Although free-text event narratives often stated no or little harm to patient, the consequences of repeated exposure to radiation, the potential side effects due to an incorrect contrast or isotope, or a delay in availability of the correct imaging study can negatively impact the patient. Perception of low patient harm may also be due to the lack of immediacy of harm, because outcomes of harm in these circumstances may not present until months or years after the wrong radiology event.

**Risk of Harm from Exposure to Radiation**

In many of the reported events, patients were exposed to unnecessary and/or additional radiation (i.e., patients did not need the imaging study or patients had incorrect imaging studies performed and needed more imaging to complete the correct study). Although research has shown there is not a specific cancer-causing dose of radiation exposure, scientific evidence supports the theory that repeated exposure to radiation increases the risk of cancer. The American Cancer Society states on its website, "Most scientists and regulatory agencies agree that even small doses of gamma and x-radiation increase cancer risk. In general, the risk of cancer from radiation exposure increases as the dose of radiation increases." Similarly, the BEIR VII Phase 2 (2006) Consensus Study Report found there was "a linear, no-threshold dose-response relationship between exposure to ionizing radiation and the development of cancer in humans."

Based on these findings, the risk of cancer could be higher for patients who undergo imaging studies that are frequently repeated and studies that have higher doses of radiation, such as CT scans, fluoroscopy, and nuclear medicine studies. Linet and co-authors estimate that the average effective dose for a single CT scan of the head would be equivalent to the effective dose of 150 chest x-ray studies. Unnecessary radiation exposure from an added or repeated CT scan would have greater impact than a single additional x-ray study.

**Risk of Harm from Administration of Contrast Agents**

Incorrect or unintentionally administered contrast agents increase risk of renal failure in patients who have been inadequately screened for impaired renal function and/or have not had proper preprocedure preparation, such as discontinuation of contraindicated medications (e.g., metformin), completion of laboratory testing, and administration of premedication regimens or isotonic crystalloid fluids (e.g., normal saline).

Receiving unintended or incorrect contrast also exposes patients to the unnecessary risks of adverse reactions and contrast-media extravasation associated with contrast administration. Reports of events of ordered contrast not given and reports of contrast given unintentionally often resulted in repeating the procedure, which also puts the patient at risk for harm associated with increased radiation exposure.

**Risk of Harm from Delay of Radiology Procedure**

Wrong radiology events may contribute to delayed or missed diagnosis, which can lead to harm from delay of care or from the initiation of incorrect interventions.

**Risk Reduction Strategies**

Physicians, radiology technologists, nurses, inpatient transporters, and other healthcare providers involved in radiology imaging procedures need processes that improve patient safety, minimize impact to workflow, and are user friendly. The authors of the Advisory article, "Applying the Universal Protocol to Improve Patient Safety in Radiology Services," suggested implementing safety processes and checklists for radiology imaging that include elements of verification similar to those in the Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery.
A review of the literature found articles describing use of verification processes and checklists for imaging studies that are similar to those used in surgery. For example, Rubio and Hogan found that implementing a brief two-person verification approach significantly decreased wrong-patient and wrong-study radiology events.\(^\text{16}\)

A presentation at the Radiological Society of North America 2015 annual meeting reported that a hospital in the Generations and Northern Manhattan Network of Bronx, New York, implemented a "Radiology Exam Verification and Time Out" process. This time-out by the radiology technologist and another healthcare provider occurs at the location of the study (e.g., radiology area, neonatal unit, emergency department) and includes a two-person verification of patient identifiers, procedure to be performed, site, laterality, site marking, contrast (orders and expiration date if applicable) and pregnancy screening. Both the technologist and witness initial each item of verification then sign an acknowledgement that all the steps of verification were completed.\(^\text{17}\)

Einstein Healthcare Network of Philadelphia, Pennsylvania, has developed a clinical decision support process for ordering CT scans. The tiered approach uses two different platforms, an evidenced-based algorithm embedded in the electronic medical record (EMR) to help clinicians decide whether a CT scan is indicated and a clinical decision support imaging tool which advises whether or not an ordered scan is appropriate. The utilization of these platforms standardizes advanced radiologic procedure clinician ordering, with the intent to decrease exposure to unnecessary radiation and improve workflow, which could significantly decrease wrong-procedure errors.\(^\text{18}\)

As in the analysis of 2009 data, this current analysis found that the errors were caused by process failures (e.g., incorrect order or requisition entry, failure to confirm patient identity) which occurred at any point of patient interaction or care during the continuum stages. Strategies to decrease the risk for wrong radiology events should include developing verification processes specific to the radiology services environment, resources, and medical-imaging care continuum. Creating a culture of safety, which encourages reporting and sharing of radiology safety events by staff (including near miss events), provides opportunities to learn about and reduce risk of harm to patients. Analysis by radiology staff of wrong radiology events and where they occur along the facility's medical-imaging care continuum can identify areas of vulnerability and points along the continuum where implementing a verification process might decrease the risk of wrong radiology events.\(^\text{2}\)

Verification processes should include confirmation that all sources of information relevant to the planned imaging agree, including the written order or prescription, the electronic order, the documentation or electronic record, and the patient or parent report. Every detail (patient identifiers; procedure to be completed, including laterality and site; reason for the procedure) from each source should agree. Any discrepancies should be resolved before the procedure is initiated.\(^\text{19}\)

A link to Authority resources for radiology imaging verification, an example of the Generations and Northern Manhattan Network's "Radiology Exam Verification and Time Out" form, and other guidance materials are provided in Supplemental Material.

**Conclusion**

Wrong radiology events can occur during any process and stage of the medical-imaging care continuum. Addressing system issues and implementing verification processes along the continuum can prevent harm from wrong radiology events. Verification of patient identification, correct imaging, and preprocedure preparation should occur at multiple points along the continuum, and processes need to address the specific challenges of completing time-outs in the radiology imaging setting.
Using verification processes and checklists in the diagnostic radiology setting has been reported as an effective strategy for reducing wrong-site events. A key concept for any radiology verification process is verifying patient and procedure details at every point along the medical-imaging care continuum. If the patient's identity cannot be verified or if information conflicts in the source documents, radiology teams are encouraged to stop the process and seek clarification before proceeding with any imaging study.

Notes


3. PA Department of Health, Division of Health Informatics. Data from the Annual Hospital Questionnaire. Reporting period: January 1, 2016 through December 31, 2016. Report 10: CT scanner and MRI data by facility and county. Harrisburg (PA): Pennsylvania Department of Health; Also available: http://www.statistics.health.pa.gov/HealthStatistics/HealthFacilities/HospitalReports/Pages/HospitalReports.aspx#.WsFyHeLD-Ul

4. PA Department of Health, Division of Health Informatics. Data from the Annual Hospital Questionnaire. Reporting period: January 1, 2016 through December 31, 2016. Report 12-B: Diagnostic radiology. Harrisburg (PA): Pennsylvania Department of Health; Also available: http://www.statistics.health.pa.gov/HealthStatistics/HealthFacilities/HospitalReports/Pages/HospitalReports.aspx#.WsFy1OLD-Uk


Supplemental Material

- Applying the Universal Protocol to Improve Patient Safety in Radiology Services (http://patientsafety.pa.gov/ADVISORIES/Pages/201106_63.aspx)
- Example: Radiology Exam Verification and Time Out (http://patientsafety.pa.gov/pst/Pages/Radiology_Universal_Protocol/checklist.aspx) from Generations + Northern Manhattan Network Lincoln Medical and Mental Health Center

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