Applying the Universal Protocol to Improve Patient Safety in Radiology Services

ABSTRACT

Multiple failed organizational and departmental processes may lead to wrong-patient, wrong-procedure, wrong-side, and wrong-site errors in radiology services. Explanations for such errors are linked to similarities in sites, diagnostic studies, and patient names; breakdowns in communication or teamwork; patient and procedure factors; and failed safety systems. Review of events reported to the Pennsylvania Patient Safety Authority in 2009 identified specific processes that exposed patients to potential harm, including order and scheduling inaccuracies, patient misidentification, and inaccurate procedure verification practices. Implementing and enforcing policies that address patient identification and procedure verification processes to prevent errors, as well as ensuring that staff are continually trained, provides radiology services with opportunities for improvements that not only can be observed by providers but can be expected by patients. (Pa Patient Saf Advis 2011 Jun;8(2):63-9.)

INTRODUCTION

Although much of the attention paid to patient and procedure verification has focused on surgery, occurrences of patient misidentification, procedure mistakes, and side or site confusion errors and near misses continue to surface outside the surgical suite. Despite quality improvement efforts, the prevalence of these errors in other disciplines, namely, radiology services, may be more common than generally expected and reported in the literature.[1] In 2009, the Pennsylvania Patient Safety Authority received reports of 652 events specifically related to wrong-procedure or test (50%), wrong-patient (30%), wrong-side (15%), and wrong-site (5%) radiology errors. Predominant testing modalities reported to the Authority included radiography (45%), computed tomography (CT) scan (18%), mammography (15%), magnetic resonance imaging (MRI) (6%), and ultrasound (5%). The Table outlines the number of wrong-patient, wrong-procedure, wrong-side, and wrong-site events associated with each radiologic study.

Ensuring correct patient identification is a recognized healthcare challenge, and the acute care setting poses the greatest challenge because a wide range of interventions are delivered in various locations by numerous staff who work in shifts.[2] The radiology staff—most notably, radiologic technologists—comes in contact with a significant number of patients on a daily basis. Failure to correctly identify patients and correlate their clinical information to an intended radiologic study continues to result in one of four recognized wrong events: wrong patient, wrong procedure, wrong side, or wrong site. Patient misidentification can lead to unnecessary risks, including overexposure to radiation, delay in diagnosis and treatment, and incorrect treatment.

While such errors are preventable, they continue to occur and to contribute to national health and patient safety concerns. Establishing policies and standard practices similar to those developed for surgery and supported by key leadership may help radiology providers in hospitals and outpatient centers reduce variability among individual care providers and teams in preventing unintended procedures and untoward patient outcomes. Prevention of these events requires safety systems that ensure accurate procedure ordering and scheduling, as well as patient identification and verification processes that work to ultimately prevent wrong-patient and wrong-procedure errors. It is essential that the effectiveness of implemented safety systems is continually observed, evaluated, and monitored to prevent future events.

CAUSES OF THE FOUR WRONG EVENTS

Review of the 652 events identified several failed processes that accounted for the wrong events experienced in radiologic services. These processes were categorized as follows:

- Incorrect order or requisition entry
- Failure to confirm patient identity
- Failure to follow site and procedure verification or procedure qualification processes

Incorrect Order or Requisition Entry

Patients were erroneously subjected to a radiology study as a result of an inaccurate order entry originating from patient care areas (e.g., floor, emergency department [ED]) or radiology registration or clerical personnel or caused by a technologist who selected the wrong option that generated an inaccurate requisition form. Improper orders included order entries that did not specify whether a procedure was to be done with

Table. Wrong Events by Radiologic Study Reported to the Pennsylvania Patient Safety Authority, 2009

RADIOLOGIC STUDY	WRONG EVENT				NUMBER OF WRONG EVENTS	PERCENTAGE OF WRONG EVENTS
	Wrong Patient	Wrong Procedure	Wrong Side	Wrong Site		
Radiography	93	104	75	24	296	45.4%
Computed tomography	36	69	4	6	115	17.6
Mammography	7	87	4	0	98	15.0
Magnetic resonance imaging	7	27	5	0	39	6.0
Ultrasound	13	13	6	3	35	5.4
Nuclear medicine	4	8	0	1	13	2.0
Interventional	3	3	0	0	6	0.9
Dexa scan	1	1	0	0	2	0.3
Positron emission tomography	1	0	0	0	1	0.2
Not specified	31	14	2	0	47	7.2
Total Number of Events	**196**	**326**	**96**	**34**	**652**	
Total Percentage of Events	**30.1%**	**50.0**	**14.7**	**5.2**		**100**

or without contrast and order specifications that were the opposite of what was intended. These types of electronic order entry errors occurred because of the lack of verification between the placed order and the reason for the imaging study and because order entry, for the most part, was not performed by the ordering physician. Such errors contributed to the procedure-type errors that accounted for 50% of the reviewed events (see Table).

The following are some of the reported order entry events:

> *A physician ordered bilateral hands and wrist x-rays. The registrar incorrectly entered orders for bilateral hands and feet. The technician did not verify the physician's order and completed bilateral hands/wrists and feet x-rays.*

> *A CT scan of the abdomen and pelvis were ordered with intravenous contrast and no oral contrast. The patient was prepped for oral contrast and the test completed. Requisition did not state, "no oral contrast."*

Event reports submitted to the Authority in 2009 also revealed that physician offices often lacked established protocols for verifying clinical information before scheduling a patient for a radiologic study or procedure. These inadequate protocols led to one of the four wrong events, usually because of one of the following factors:

— The physician did not confirm orders before a staff member scheduled a procedure.
— Two forms of patient identification were not used by the ordering staff member for the receiving radiology staff to verify.
— An incorrect radiologic study or site of study was ordered by the physician and accuracy of the study was not verified, requiring additional scanning of the correct site or performance of the correct study.

Events originating from the physician office include the following:

> *A test order was received for dobutamine nuclear cardiac scan. The scan was started, and when the patient was able to exercise, [staff] called [physician's] office. The physician's office stated that they realized they had ordered the incorrect study.*

> *A script was checked for "bone whole body" but the physician's office wanted an ankle brachial index instead. The script was incorrectly marked.*

> *A patient arrived for a scheduled MRI of the cervical spine. The physician's order was for the thoracic spine. MRI of thoracic spine was completed. The physician's office notified MRI when they received results of incorrect test. Test was scheduled correctly, but physician's order was incorrect.*

One of the most common studies inaccurately ordered or scheduled from the physician's office was mammograms. A total of 98 near-miss events (i.e., a medical event that could have harmed a patient, but harm did not occur as a result of chance, prevention, or mitigation) were reported pertaining to the improper order, 59 (60%), or scheduling, 39 (40%), of mammogram services. Physicians ordered a screening rather than a diagnostic mammogram in 43 (73%) events, a diagnostic mammogram was ordered instead of a screening in 10 (17%) events, and in 6 (10%) events, which study had been improperly ordered was not specified.

In other instances, physician orders were accurate, but scheduling errors occurred: 16 (41%) were scheduled as screening mammograms instead of diagnostic, 1 (3%) was scheduled as a diagnostic instead of a screening study, and in 22 (56%) events, the type of study (screening or diagnostic) that was erroneously scheduled was not specified. All the reports indicated that the proper mammogram study was ultimately performed because staff recognized the need to suggest the more appropriate study.

Failure to Confirm Patient Identity

Patient misidentification accounted for about 30% of the radiology events reported to the Authority in 2009, as noted in the Table. Joint Commission's first National Patient Safety Goal (NPSG), "Improve the accuracy of patient identification," was established to eliminate the errors caused when a procedure or treatment is performed on the wrong patient. NPSG 01.01.01, "Use at least two identifiers when providing care, treatment and services," has been in effect since January 2003 and is applicable to all three Joint Commission accreditation programs (hospital, ambulatory health care, and office-based surgery).[3] The events reported to the Authority consistently noted that technologists failed to use two forms of distinct patient identification (e.g., rather than using a patient's name and date of birth, for example, patients were identified using room numbers, or procedure or radiologic studies). Other identification mistakes resulted when radiology staff selected the wrong patient from a hospital room because the patient misunderstood the name called, patients were not actively engaged in the identification process, or the patient for whom a study was intended had been transferred to another unit, and the new patient occupying the bed was taken for the radiologic study instead. Similarly, orders may not have been canceled for a patient before transfer to another location, and the technologist assumed the new patient occupying the same bed was the former patient. Requiring patients to actively respond to questions (i.e., "What is your name?") rather than passively confirming the patient's information (i.e., "Are you Jane Doe?"), and accepting a "yes" or "no" answer or a head nod, invites opportunities for misidentification errors. As specified by the Joint Commission's NPSG, the patient's room number or physical location should never to be used as an identifier because a patient's location may change during his or her stay.[4] Patient misidentification errors commonly delayed the prescribed procedure for the correct patient or allowed an unnecessary procedure to be conducted on a patient.

Additional factors that contributed to patients receiving inappropriate radiographic studies from failed misidentification processes were transporting the wrong patient to radiology with the right patient chart, performing a radiographic study using the wrong patient name, selecting the wrong patient from the work list, misinterpreting the patient's name or confusing patients having similar-sounding names, placing an order on the wrong patient chart, canceling a request on the wrong patient, and mistaking a family member who had previous studies performed at the same location for the patient. In the events in which a patient had a radiologic study performed under another patient's name and information, radiologists subsequently interpreted studies for the wrong patient. Interception of the error was usually made by the radiologist when comparing the new study to previous films, after reviewing records, or after noting the patient's birthdate. The following events are examples of failed identification processes:

> *Patient came into the hospital to have an ultrasound done. A [radiology] staff member went out to the waiting room to get an outpatient for a chest x-ray and called for "Mary." Mary got up and followed her to the x-ray department where the staff member did a two-view chest x-ray. The staff member did not verify the patient's last name or date of birth. It was the wrong Mary.*

> *Transport called to bring patient A to radiology. Transport brought patient B with patient A's medical record. Technologist verified the name on medical record and asked patient if her name was patient A. Patient responded "yes." The exam was performed. Nurse then called and informed technologist that the wrong patient was transported to the [radiology] department.*

> *Patient was inadvertently scanned in error. Radiology requested this patient in the central transport tracking system not realizing there were two patients with the same name. This patient was brought to the scanner by transport and verified that he was this patient (by name only). The second identifier (date of birth) was not checked. A short time later, it was discovered that the wrong patient had been scanned.*

Failure to Follow Site and Procedure Verification or Procedure Qualification Processes

Issues of side or site discrepancy—usually as a result of inadequate verification—made up about 20% of the four wrong radiology events. Performance of radiologic studies were often met with such challenges of laterality, including performing of bilateral studies when only one side was ordered and vice versa, misidentification of the correct body part, and radiographing of additional body parts when not ordered (e.g., cervical and thoracic spine imaged when only cervical ordered). Radiographic errors commonly occurred as a result of misinterpreting the order or prescription (e.g., MRI instead of CT scan), administering contrast when no contrast was ordered or, conversely, not administering contrast when it had been ordered, scanning of a particular body part when another had been ordered, misreading an order or the technologist's failure to verify an order, duplicating procedures because previous test completion was not realized by a technologist, and mislabeling images. Site misidentification instances were noted to occur when (1) technologists were distracted during the procedure, (2) technologists relied on the direction and symptomatology of the patient when an order was not available or when the order or physician's prescription referenced an alternate side or site, and (3) student technologists were indirectly supervised.

> *Staff printed report and noted additional [breast] views needed so the additional [studies] were performed. When staff came out to take the images to the radiologist, [it was] discovered that she had read the wrong report from the printer. This patient needed only to have imaging on the left breast. Staff did two images of the right breast as well as the left. The physician was made aware.*

> *A patient arrived for an upper external arterial ultrasound exam. The technologist identified the patient and began asking the patient about her leg symptoms. The patient described symptoms of the lower extremities, which seemed appropriate for the exam. The technologist was interrupted by phone calls and, distracted, performed a lower extremity exam without first verifying the physician's order. The error was discovered after the end of the exam and the patient was rescheduled.*

> *A patient arrived with physician order for an abdominal x-ray to view the kidneys, ureters, and bladder (KUB) with other modifiers on the form, "left ulcer lower extremity rule out osteomyelitis." When the patient was questioned, he insisted on a history of abdominal pain and the need for KUB. A KUB was done. After the incident, the supervisor was notified. The doctor's office was called to clarify order. Left leg [radiograph] was needed, not a KUB. The patient was called to return for the correct films.*

A review of the event reports found that four (1.2%) of the wrong procedures were performed when an order was misinterpreted because handwritten chart notes, orders, or prescriptions were illegible.

> *A patient registered with a bilateral rib order; [staff] misunderstood the script [because] writing was sloppy. [The technologist] did the x-ray and then realized that the script really said "just right side" after a bilateral study was completed.*

> *A patient came over to the radiology department with an order for a cervical spine x-ray. After completion, the ED called over and said that a lumbar spine was supposed to be done instead. The order was not written clearly and was mistaken for a cervical spine x-ray.*

Patients were also subjected to unnecessary or inappropriate radiology studies as a result of inadequate screening before an imaging study. Failed screening for MRI, pregnancy, and renal function often jeopardized patient safety. Patient recollections of shunts, implants, and other forms of metal (e.g., stents, surgical clips, bullet shards) or current use of a medication that may be contraindicated for the procedure (e.g., metformin) were often inaccurate. In addition, patients were given the wrong type of contrast or contrast was given before laboratory results were checked for renal function. Additional information on failed screenings may be accessed and reviewed in the following *Advisory* issues: MRI (March 2009), pregnancy (March 2008), and renal function (March 2007).

> *A patient was ordered an obstruction series. The patient was taken to the radiology department where she was asked if she was pregnant, and she responded with a "no." Staff person was not aware that a serum pregnancy test had been ordered. X-ray series was completed when the positive pregnancy test results were received.*

> *An elderly patient with right lower quadrant pain [was in radiology] for a CT scan of the abdomen and pelvis. Technologist injected iodine contrast into patient who had a creatinine [level] of 2.4. After the patient [was questioned] for consent for intravenous [access], he stated he was not diabetic and had no history of kidney dysfunction or disease. [Previous] labs were normal. Technologist did not check for current lab results until after the test was done.*

THE ROLE OF COMMUNICATION IN PREVENTING WRONG EVENTS

In a study that reviewed a prospective database of physician self-reported occurrences, Colorado researchers found that

wrong-site and wrong-patient surgical and procedure errors continue to occur despite implementation of protocols intended to prevent them (i.e., Joint Commission Universal Protocol) and all wrong-patient cases involved errors in communication.[5] Based on their findings during the January 2002 to June 2008 study period, the authors concluded that "non-surgical disciplines equally contribute to patient injuries related to wrong-site procedures" and suggested that the protocol be expanded to nonsurgical specialties.

Poor communication is responsible for many preventable medical errors.[6] Communication failures that contribute to discontinuity of care stem from a variety of causes, ranging from a lack of interpersonal communication skills to barriers in the work environment to suboptimal use of computer networking tools.[7] The communication errors in the events reported to the Authority resulted from the following types of misinformation: transmission of incomplete or inaccurate information (e.g., the ordering physician requested the wrong procedure, procedures were scheduled without proper patient information), inadequate documentation (e.g., completed studies or canceled orders were not documented), and failure to effectively perform a preprocedure verification or time-out (e.g., proper forms of patient identification were not used and compared to other documents, the ordering or referring physician was not contacted to clarify unclear orders).

In radiology, inadequate communication may result in such patient consequences as anaphylactic shock when allergies to contrast media are overlooked, delay of critical treatments if radiographic studies are not performed at the correct location or the wrong physician is notified of patient results, and unnecessary radiation exposure when the wrong body part is examined or when the wrong patient is selected for a procedure.[8]

> *A patient was admitted complaining of abdominal pain. The physician ordered anterior/posterior CT scan views. Oral contrast was sent to the patient. The patient was preoperative; the surgeon was upset because now surgery is delayed due to contrast. The nurse and [unit] secretary did not inform [radiology] that the CT scan was ordered without contrast.*

Patients were susceptible to unnecessary radiation exposure not only because they or a body part was misidentified, but because failure to communicate changes or other relevant information permitted technologists to perform studies that had already been performed or had been canceled, as in the following event:

> *Order for abdominal ultrasound was in the "to do" box for the ultrasound technologist. The procedure was completed. Afterward, the technologist found a "cancel" order in the system when attempting to complete documentation. The technologist found the "cancel" order in the recycle bin.*

Communication programs can successfully improve the safety culture and performance in radiology. The role of the technologist is not only to gather, document, and transmit patient information; he or she must also verify procedures to be performed or those already completed by communicating with other personnel and the patient to ensure that the correct or intended procedure is received and the correct site is chosen. It may not be enough to simply provide tools (e.g., patient handoff forms), because despite tools designed to assist communication, practices could fail if the proper interactive communication skills are not used in conjunction with them, as in the following event:

> *Patient arrived in the ED and radiology with "hand-off" communication form verified by nurse and transportation for patient. The chart was verified by one technologist and the exam performed by another technologist. The patient was then returned to the floor with chart documentation completed. Radiology received a call indicating that the wrong patient had been transported to the department. Miscommunication between technologists occurred with patient verification.*

USE OF THE UNIVERSAL PROTOCOL IN RADIOLOGY

The principles of the Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery™ outlined by the Joint Commission[8] can be transferred to disciplines other than surgery to prevent unintended procedures and patient complications.[6] The Universal Protocol was created to ensure that patients were accurately identified and procedures correctly scheduled and performed. All healthcare institutions across all specialties—not just surgical disciplines—have been urged to adhere to the Universal Protocol as a standardized quality assurance tool.[5]

Implementation of consistent processes that promote safe and accurate verification in diagnostic radiology is especially important. Although laterality becomes an issue in a limited number of procedures in interventional radiology,[9] the four wrong events involving an invasive procedure may cause major complications resulting in hospital admission, unplanned increase in the level of care, prolonged hospitalization, permanent adverse sequelae, or death.[10] In addition to the Universal Protocol, the National Patient Safety Agency, in conjunction with the World Health Organization, implemented a surgical safety checklist especially for interventional radiology, which can be accessed at http://www.nrls.npsa.nhs.uk/resources/?entryid45=73612.[10]

Guidelines for use or adaptation of the Universal Protocol for invasive radiology

procedures where determination of laterality is required include the following:

- Apply the protocol for proper patient identification.
- Mark the site and side of the proposed procedure.
- Perform a preprocedure time-out to verify the nature of the procedure once the patient is on the procedure or examination table.
- Use the time-out to ensure proper patient identification has been entered into the imaging equipment, to establish proper patient positioning, and to confirm correlation between the guidance system image and the patient's orientation.
- Involve all personnel assigned to the procedure in the time-out process.

STRATEGIES THAT MITIGATE PREVENTABLE WRONG EVENTS

Mitigation of preventable errors in radiology requires the implementation of system safeguards that improve order and scheduling practices, patient identification, and procedure verification protocols. Consider the following strategies, which are based on a review of events submitted to the Authority and on the literature, when implementing fail-safe, risk reduction systems:

- Appoint strong leadership within the clinical radiology team to advocate the development and implementation of policies and procedures that ensure that the right patient and the right site undergo the right procedure before any intervention begins, and communicate the appointed leader to the radiology staff. Observing and enforcing compliance of procedures and patient identification policies is essential for these practices to be effective. Solicit feedback from those directly affected by the policy to determine if the policy is working as intended and if it provides staff with the necessary information to maintain compliance. (See a sample policy in the toolkit available from the Authority at http://patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx.)
- Verify that both the requisition and the medical record order are consistent in the acute care setting. For outpatients, consider placing the physician's order on top of the requisition form so technologists can review both documents and compare them for consistency before performing any procedure. Review all available documentation, including the patient's history, reason for radiologic study, and previous medical imaging studies. Include a checklist with the radiology requisition to reduce risks of overradiation, delay in diagnosis and treatment, or incorrect treatment. (See the aforementioned Authority toolkit for a sample assessment tool.) Consider software programs that can "red flag" examinations that have been performed on the same patient within a given time frame.
- Empower staff to verify orders that are unclear, illegible, or inconsistent with patient expectations with the ordering physician before performing any study. If issues go unresolved, consult a radiologist to determine whether a patient should undergo a given procedure. Avoid assumptions by implementing verbal "read back" to reconfirm verbal orders and improve the effectiveness of communication when scheduling radiologic studies or procedures as defined by the Joint Commission: "Before taking action on a verbal order or verbal report of a test result, staff uses a record and 'read back' process to verify the information."[11] All members of the radiology team (i.e., radiologists, nursing staff, technologists, clerks, and referring physicians) are accountable for ensuring accuracy of documentation, verification, and transmission of patient and procedural information.
- Ensure that two unique patient identifiers are consistently obtained and verified by two independent technologists to accurately identify patients, as well as conform to the Joint Commission's NPSG 01.01.01. Acceptable identifiers may be the patient's name, birthdate, medical record number, or other patient-specific identifier (e.g., home telephone number).[4] Assess staff competency in sustaining error-free patient identification and compliance with policy.
- Provide technologists with the necessary training to perform radiologic studies correctly. Quality of radiation procedures is directly linked to the skill and competence of those that are entrusted to performing them.[12] The American Registry of Radiologic Technologists (ARRT) recognizes qualified individuals in medical imaging, interventional procedures, and radiation therapy.[13] Verify that technologists have been appropriately credentialed through ARRT and can provide evidence of completing the required continuing education program.
- Advise referring physicians and physician practices to actively acknowledge misidentified patient reports or unordered results received and notify radiologists so that they can accurately report the miscommunicated information to the proper referring physician.[14]
- Develop a campaign to promote patient awareness of identification protocols. The Authority's "Did You ID Me" materials (see aforementioned toolkit), for instance, not only encourages compliance with verification practices but also serves as a fail-safe mechanism for patients to ask staff about proper identification before the radiologic procedure.

— Survey patients to determine whether staff followed implemented protocols and whether patients felt involved in the process. Questions addressing understanding of the procedure performed, patient identification practices, involvement in procedure verification, and ability to ask questions may serve to monitor communication efforts as well as provide staff with constructive feedback.

— Share adverse events and near misses with staff at departmental meetings to learn from and improve existing risk reduction mechanisms. (See a collection of event examples in the Authority toolkit.) Event examples can be used in staff training sessions to (1) identify potential failures in systems, (2) discuss the successes and barriers of implemented processes, and (3) ensure that the premise of safety is at the forefront for all staff.

CONCLUSION

Implementation of quality and safety strategies poses a significant challenge for radiology services, yet provides opportunities for improvement. The four wrong events of wrong patient, wrong procedure, wrong side, and wrong site occur more frequently than healthcare providers and patients may realize, and it is unclear whether their consequences, including unnecessary exposure to radiation, delay in treatment, and other possible missed opportunities, affect or may later affect patient well-being.

Although the causes of errors in radiologic services may differ from those errors in surgical settings, they are all rooted in communication inadequacies and lack of effective safety systems. Prevention of radiology-related iatrogenic injuries requires the development of safety strategies and initiatives aimed at improving order or scheduling practices, patient identification, and procedure verification protocols before any radiologic study or invasive procedure. Such initiatives, however, are effective only if they are followed by all who come in contact with patients.

NOTES

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