# Reducing the number of changed orders for radiographs in a radiology department

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# Problem

- · Incorrect orders are a common occurrence in many radiology departments
- · Potential order errors include:
  - · Ordering the wrong test for the indication
  - · Ordering a test on the wrong body part
  - Ordering a test on the wrong side of the body
- · Order errors can lead to unnecessary studies and excess radiation
- · In order to prevent errors, the technologist must verify each potential error with the ordering clinician

# Specific Aim

 The goal of this project was to reduce the percentage of changed radiography and fluoroscopy orders from a baseline of 4.2% to 2.1%

# **Methods**

#### Environment

- · Large academic pediatric radiology practice
- · All inpatient and ambulatory orders are placed in a hospital-wide electronic medical record system (Epic; Verona, WI)
- · Community providers order imaging studies through a variety of paper and electronic methods

#### Baseline measurements

- A weekly report was created in the radiology information system (Epic Radiant, Verona, WI) identifying the procedure type and originating department of each changed order
- The number of changed orders was compared to the total number of radiography and fluoroscopy studies performed each week to calculate the percentage of changed orders
- The percentage of changed orders per week was plotted on a P-chart and tracked as the primary outcome metric
- · Pareto charts were created identifying the most frequently changed orders and the most common originating location for changed orders

#### Percentage of Changed Orders by Ordering Location





Figure 2: Pareto chart shows the top ten most commonly changed radiography orders as well as the percentage of overall changes that these orders represent

#### Interventions

- · After analyzing baseline data, multiple interventions were identified
- · Delete unused orders from the electronic medical record
  - · Outdated orders (i.e. Barium Enema)
  - Unused orders (i.e. Fluoro >1 hour)
  - Orders always changed per departmental protocol (i.e. 3-4 view radiograph of the pelvis)
- Fix faulty order sets
- · Improve departmental and divisional preference lists
- · Remove orders that were either incorrect or rarely used for each division (i.e. 3-view hand radiograph for arthritis was removed from the emergency department preference list)
- Group similar studies together (i.e. all upper extremity radiographs are in the same section)
- · Group different imaging studies of the same body part next to each other (i.e. one-view chest x-ray and two-view chest x-ray)
- · Rename orders to include the common indications for each imaging test (i.e. 1V abdomen - constipation)
- Improve paper order form for community providers
- · Clarify departmental protocols
- 1 versus 2 view abdominal radiograph
- · Imaging study to evaluate lower extremity PICC
- · Pelvis radiograph versus 2-view hip radiograph

### Results

- · At baseline, 4.2% of all radiography and fluoroscopy were changed
- · After multiple interventions, the percentage of changed radiography orders decreased to 3.1% (Figure 3)
- Specific changes
- 4 orders were removed from the electronic medical record
- 4 orders in order sets were removed, 5 added, and 1 corrected
- 20 preference lists were modified (Figure 4)
- The paper order form (Figure 5) was modified and distributed



Figure 3: Run chart showing the percentage of changed orders per week. There has been a significant decrease in the percentage of orders changed from a baseline median value of 4.2% to a current median of 3.1%

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Rad	iology (Radiology)		
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	RAD Abdomen 1V (For constipation or tube	RAD Nasopharynx-Lateral	
pla	cement)		
	RAD Airway - Neck (2V)	RAD Nose (Nasal Bones)	
		RAD Orbits	
	RAD Calcaneus (Heel)	RAD ORBITS FOREIGN BODY	
	RAD Cervical Spine (2-3V)	RAD Pelvis (1-2V) - PORTABLE	
	RAD Chest (1V) - PORTABLE	RAD Pelvis 1-2V	
	RAD Chest (2V)	RAD Radius & Ulna 2V (Forearm)	
	RAD Chest Abdomen (Line Placement)	RAD Scan and Read	
	RAD Chest/Abdomen (Foreign Body)	RAD Scaphoid Series 3v	
	RAD Clavicle	RAD Scoli Limited 1-2V Recumbent	
	RAD E CONSULT	RAD Shoulder (2V+)	
	RAD Elbow (2V)	RAD Shunt Series	
	RAD Facial Bones Partial (2V)	RAD Sinuses 3V+	
	RAD Femur (2V)	RAD Sinuses Up To 2V	
	RAD Finger (2V-3V)	RAD Skeletal Silverman Survey	-
	RAD Foot 2V (Foreign Body)	RAD Skeletal Survey Follow Up	
	RAD Foot 3V+	RAD Skull (1-3V)	
	RAD Hand (3V)	RAD Spine (1V) Cervical Spine - PORTABLE	
	RAD Hand 2V (Foreign Body)	RAD Spine (1V) Lumbar Spine	
	RAD Hand Arthritis 2V	RAD Spine (1V) Thoracic Spine	
	RAD Hips Bilateral (2V)	RAD Thoracic Spine (2V)	
	RAD Hips Complete (3-4V+)	RAD Tibia And Fibular (2V)	
	RAD Humerus	RAD Toe (1-2V)	
	RAD Knee (1-2V)	RAD Wrist (2V)	
	RAD Lumbar Spine (2-3V)		





# Cincinnati Children's

Cincinnati Children's Hospital Medical Center	FAX form (After faxing form	OGY SERVICES ORDER FORM to 513-803-1111 or 1-866-877-8905 a, encourage family to call for appointment.)	Figure 5: Paper order form for
Forms: www.cincinnatichildrens.or *See back of form for list of locatic	rg/consults Appointment STAT request	513-636-4251, option #1 513-636-4251, option #2 - Radiology 513-636-6390, option #0 - Nuclear Medicine	community providers at
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	REASON FOR TESTING	Alt Phone	(b)
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# Conclusions

- · Quality improvement techniques can be used to decrease the number of radiography orders changed in a radiology department
- · We believe that the changes we have made help to make our department safer by decreasing the chance that an incorrect study will be performed