Increasing Utilization and Improving Documentation in a Radiology Critical Alert System

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INTRODUCTION

• **Problem:** Despite an increase in exam volumes, there was not an increase in utilization of our critical result alert system.

• **Hypothesis:** Important critical results are not being communicated.

• **Purpose:** Increase the number of critical finding alerts and improve documentation in our system.
BACKGROUND

- 720-bed, quaternary-referral academic medical center
- Three Critical Result alert levels:
  - Red - Emergency (e.g., tension pneumothorax)
    - Closed-loop communication time goal <1 hour
  - Orange - Requires attention (e.g., malpositioned tube)
    - Closed-loop communication time goal <12 hours
  - Yellow - Non-urgent follow-up needed (e.g., lung nodule)
    - Closed-loop communication time goal <24 hours
- In the 15 months prior to intervention, an average of 662 critical alerts were submitted per month
  - Overall closed-loop communication time compliance rate of 99%
BACKGROUND

• Prior to intervention, 89.8% of alerts went to providers with up-to-date contact information in our critical result alert system
  ▪ 10.2% of alerts were for providers with missing or incorrect info, potentially delaying notification
• Red alert time compliance was also not entirely reliable
  ▪ Prior to intervention, the time from report finalization to Red alert closed-loop communication was tracked
  ▪ Need to know time from identification of the critical finding to closed-loop communication
  ▪ Time stamp statement (Macro critical) added to all users’ Powerscribe macro list to document time of Red level finding identification
INTERVENTIONS

• Critical Results reporting protocol was streamlined and posted in a prominent position on our departmental webpage.

• Protocol was distributed to radiology faculty and residents, with periodic reminders (emails, meetings).

• Event reports (iCare) were generated for instances of inadequate Red alert documentation.

• To address the referring provider contact database, we actively engaged providers and leadership to increase submission of current contact info.

UMMC Imaging Services Critical Results Protocol

The following list is not all-inclusive and represents select examples of UMMC’s Radiology Critical Imaging Findings. Ultimately, it will be the interpreting radiologist’s own professional judgment how to classify a critical imaging finding in light of all circumstances presented.

RED RESULTS (CRITICAL FINDINGS)

Compliance Goal = 24 hours

Venous pneumomediastinum
Unsuspected/Acute pneumomediastinum
Incidental findings requiring follow-up (i.e. liver/kidney/pancreatic mass)

New/Acute/Severe pulmonary embolism
Unsuspected/Acute pulmonary
Unsuspected/Acute pneumothorax

Ruptured/Leaking/Diagnosed aortic aneurysm
Unsuspected/Severe pericardial effusion
Incidental/large AAA

Unsuspected/Acute pneumoperitoneum
Unsuspected/Acute pleural effusion
Lung nodule requiring follow-up (Lung Nodule Alert)

Unsuspected/Acute mesenteric ischemia
Line/Tube inadequate placement
Incidental/intestinal aneurysm

Pediatric small bowel obstruction
New suspected malignancy (Lung Nodule Alert)
Unsuspected/Acute diverticulitis

Gastrointestinal volvulus
Unsuspected/Acute pancreatitis
Unsuspected/Acute bowel obstruction, adult

Intussusception with bowel obstruction
Unsuspected/Acute biliary obstruction
Any findings where specific imaging follow-up is recommended

Pediatric Intussusception
Unsuspected/Acute cholecystitis

Unintended retained foreign object or surgical item
Unsuspected/Acute appendicitis

New intracranial hemorrhage
Unsuspected/Acute pseudotumor

Unsuspected/Acute hemorrhage, any location
Pediatric pyelogenic abscesses

Acute cerebral herniation
New or acute venous thrombosis

Acute arterial thrombosis (non-cardiac)
Unsuspected new fracture

Pediatric non-accidental injury
Impending pathological fracture

New or acute cervical spine fracture with suspected spinal cord injury
New, unsuspected spinal cord edema

Any acute or life threatening finding requiring immediate clinical attention
Unsuspected/Acute hydrocephalus or pseudotumor

Acute occluded hypoglossal
Unsuspected stern graft leak

Ovarian or testicular torsion
Ectopic pregnancy

Any acute or unexpected finding requiring urgent clinical attention
METRICS

• Critical Results Coordinators (WCH, KNM) tracked data over 15 months utilizing our critical results software (PowerConnect):
  ▪ Numbers of critical alerts
  ▪ Alerts to providers without contact information
  ▪ Red alert documentation compliance
  ▪ Compliance with communication times

• All changes were attributed to our interventions
  ▪ No other concurrent interventions involving critical alert utilization
  ▪ No statistically significant change in the rate of increase in monthly exams post-intervention (132/month, 95% CI: -378.4–383.5) vs. pre-intervention (2.5/month, 95% CI: -262.5–525.8) (p=0.705)
ANALYSIS

• Collected data was plotted versus time, and trendlines were generated for each variable, along with 95% confidence intervals
• Trendline slope was interpreted as the average monthly change in each parameter
• Change-point analysis versus pre-intervention data was performed by statistician (STL) to determine statistical significance
RESULTS

- Average increase of 23 total alerts per month, increased from 11 per month prior to intervention (p=0.157)
  
- Yellow alerts (non-urgent follow-up) increased 17 per month on average, up from 3 per month (p=0.033*)
- Orange alerts increased 9 per month, up from 4 per month (p=0.091)
- Red alerts remained essentially unchanged
RESULTS

- Average 0.5% monthly increase in alerts to providers with current contact info, up from 0.1% pre-intervention (p=0.097)

- Compliance with Red alert documentation increased 0.65% per month

Closed-loop communication time compliance remained ≥99% post-intervention
CONCLUSION

• Implementation of a quality improvement project to increase usage of the critical alert system increased the number of alerts generated per month
• In particular, there was a statistically significant increase in Yellow alerts, improving communication of follow-up recommendations for important incidental findings
• Our interventions also resulted in improved documentation for emergency Red alerts and in an improved provider contact information database
• The major limitation of our project was that it did not look at findings that should have generated an alert per our protocol, but did not
• Compliance with closed-loop communication time goals was not sacrificed to achieve these results