Optimizing MRI Utilization at a Level 1 Trauma Center: A Tiered Protocol to Improve Turnaround Times and Patient Outcomes

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Introduction

Research has shown improved diagnostic accuracy with the utilization of magnetic resonance imaging (MRI) in the evaluation of patients at trauma centers. In light of the increasing demand and the expanding role of MRI in informing patient care, we identified a critical need to optimize imaging triage and improve efficiency at our Level 1 Trauma Center, which manages over 3,500 trauma cases annually. **To address this, a tiered MRI utilization protocol was developed and implemented in August of 2024 to enhance operational efficiency and prioritize imaging based on clinical urgency.** This structured approach ensures that patients with time-sensitive or emergent conditions receive expedited imaging, while non-urgent cases are handled in a systematic manner. By aligning imaging prioritization with clinical need, the protocol effectively balances resource allocation without compromising the quality of care. Furthermore, by reducing workflow bottlenecks and clearly delineating case urgency, this system contributes to improved imaging turnaround times and supports the well-being of radiology technologists.

Methods

Collaborative Development: Protocol designed by neurosurgery, ortho trauma, neurology, and radiology teams.
Tiered Prioritization: Established clinical criteria and communication guidelines for MRI urgency tiers.
Standardization: Implemented consistent procedures for patient triage and resource coordination.
Data Collection: MRI turnaround time (TAT) tracked pre- and post-implementation.
Key Metric: % of MRIs completed within 12 hours used as primary performance indicator.
Analysis: Compared efficiency and patient outcome metrics before and after protocol launch.

Conclusions

Tiered MRI protocol improved efficiency: Implementation led to modest gains in the percentage of exams completed within 12 hours, with peak improvements noted post-launch. Continued evaluation is essential, as the protocol has only been in place for five months.
Workflow standardization enhanced exam completion times: All post-protocol months exceeded the 80% goal for exams finalized within 24 hours of tech completion.
Radiologist shortages impacted certain metrics: Limited improvement in exams completed within 24 hours from order to read highlights systemic staffing challenges.

Results

Approved 01/2025 — **MRI Leveling Criteria**

Tier	Tier 1 (Critical)	Tier 2 (Emergent)	Tier 3 (Urgent)
Description	➢ Critical patient in need of immediate response/ surgery	➢ Emergent patient in need of rapid response	➢ Urgent patients in need of emergency level medical care.
	➢ Patient's life/limb is at risk, or the patient may need thrombolytics	➢ Results will drive major changes in medical management	
	➢ Scan results will drive major changes in medical management		
Target Order Time to Start Time (OTST)	2 Hours	3 Hours	Procedure initiated same day during working hours or 1st case next day
Requirements *Consulting team will enter appropriate orders/meds to ensure accuracy and to assess the patient to see if they are a candidate to lie still*	➢ Direct communication between requesting service and radiologist to plan and mobilize resources. Call either: 1) Dr [redacted] 2) General Neuro Reading Room at [redacted] or general reading room at [redacted] 3) After hours, call senior resident radiologist at [redacted] 4) If unable to reach resident, call [redacted] opt 4 for the MRI department.	➢ Requesting service to call MRI department [redacted] to notify them of Tier 2 order in order to plan and mobilize resources.	
	➢ Place "Tier 1" in the order comment and call either:	➢ Place "Tier 2" in the order comment box	➢ Place "Tier 3" in the order comment box.
Qualifying Examples	➢ Stroke – pt. qualifies for thrombolytics/ with CT that requries further workup	➢ Trauma patient with an abnormal CT of the spine that requires further workup	➢ Focal neurologic deficits that are **NOT THROMBOLYTIC** candidates
	➢ Traumatic paraplegia, quadriplegia, parapareisis, or suspected spinal cord injury	➢ Trauma patient with abnormal neurological examination.	➢ Patients on C-spine precautions and require MRI for C-spine clearance
	➢ Atraumatic paraplegia, quadriplegia, or paraparesis that is rapidly progressive		➢ Back pain with mild neurologic symptoms.
	➢ Concern for epidural abscess/hematoma		➢ Concern for osteomyelitis/discitis **WITHOUT** focal neurologic findings
	➢ Concern for cauda equina		➢ Space occupying brain lesion WITH or WITHOUT hemorrhage (may level up if there are acute neurological changes)

Above shows the tiered MRI utilization protocol developed and implemented in August 2024. It shows the protocols respective of each tier as well as detailed qualifying examples for easier use.

A

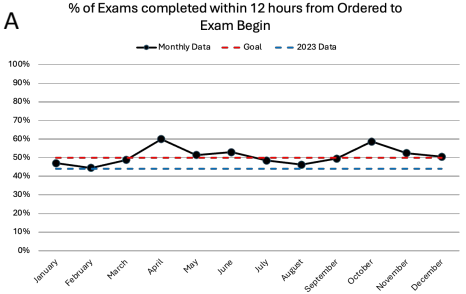


Figure A. shows the percentage of exams completed within 12 hours from ordered to beginning of the exam. Following protocol implementation in August, there were slight improvement, peaking at 58.63% in October.

B

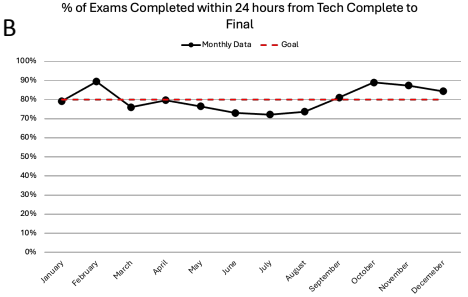


Figure B. shows the percentage of exams completed within 24 hours from tech complete to final. Rates improved rapidly upon protocol implementation, with all post-protocol months surpassing the 2024 goal at 80%.

C

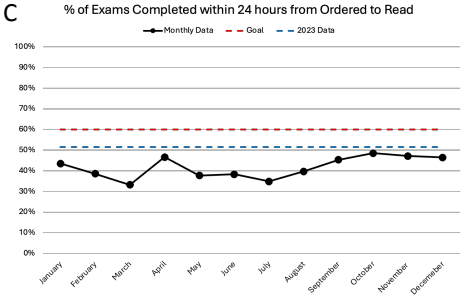


Figure C. shows the percentage of exams completed within 24 hours from ordered to final report. There were no significant improvements upon the protocol implementation with the entire year's data below the initial goal and 2023 average. This could be attributed to the shortage of radiologists during this period.

References

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