

Deferral of eGFR testing in low risk patients prior to contrast enhanced CT: Impact on emergency room (ER) imaging throughput

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Introduction

- eGFR testing prior to contrast enhanced CT (CECT) is widely performed in Emergency Departments (ED) but universal testing may be unnecessary
 - Deferral of eGFR testing in outpatients at low risk for kidney disease has been safely demonstrated
 - New United Kingdom consensus guidelines advocate for no routine eGFR testing in ED
 - Risk of contrast-induced acute kidney injury (CI-AKI) shown to be very low or limited to patients with an eGFR < 30 mL/min/1.73m² and/or with acute kidney injury (AKI)
- Risk-based approach may improve timeliness of care and ED operational efficiency
- **Purpose of QI project: To improve timeliness of care in the ED by eliminating need for an eGFR value prior to CECT in patients deemed by ED provider to be at low risk for advanced kidney disease or AKI**
 - *Our prior practice policy was all ED patients need eGFR before CECT (unless life threatening) with many radiologists waiting until eGFR resulted before assigning protocol for exam*

Methods

- HIPAA compliant QI project done in academic radiology department with 4 ED facilities:
 - 2 hospital based adult EDs (one of which is a level I trauma center)
 - 1 free-standing ED
 - 1 hospital based pediatric ED
- A new question was added to all CECT orders placed in the ED in the electronic health record allowing ED provider to defer eGFR testing if patient deemed “low risk” for CI-AKI
- Low risk was defined as:
 - No history of chronic kidney disease (CKD)
 - No risk factors for CKD (diabetes, hypertension, prior kidney surgery, etc)
 - No risk factors for AKI (sepsis, dehydration, drug toxicity, altered mental status, etc)
 - * Patients with CKD that were on chronic dialysis considered “low risk” regardless of risk factors

Methods

- QI project done in 3 phases:
 - Baseline (12/28/2021 - 3/7/2022, weeks 1-10): eGFR testing needed before CECT (except if life-threatening indication like trauma or stroke codes)
 - Pilot phase (3/8/2022 - 6/13/2022, weeks 11-24): order question allowing deferral of eGFR was optional
 - Full implementation (6/14/2022 - 8/15/2022, weeks 25-33): order question required to be answered (“hard stop”)

Pilot Phase (Optional question)

Can this patient get IV contrast without eGFR/Creatinine testing? Note: eGFR/Cr testing should be obtained for patients with ANY risk factors for acute or chronic kidney injury (ex: DM/HTN/prior kidney surgery, sepsis, dehydration, drug toxicity, AMS)

Yes - Low risk for kidney disease

Yes - Life threatening indication

Implementation Phase (“Hard stop” question)

Is eGFR result needed prior to IV contrast? Note: eGFR/Cr testing should be checked for patients with known kidney disease or ANY risk factors for acute or chronic kidney injury (ex: DM, HTN, prior kidney surgery, sepsis, dehydration, drug toxicity, AMS)

Yes: At risk for kidney injury/disease or eGFR under 30 today

No: Life-threatening indication

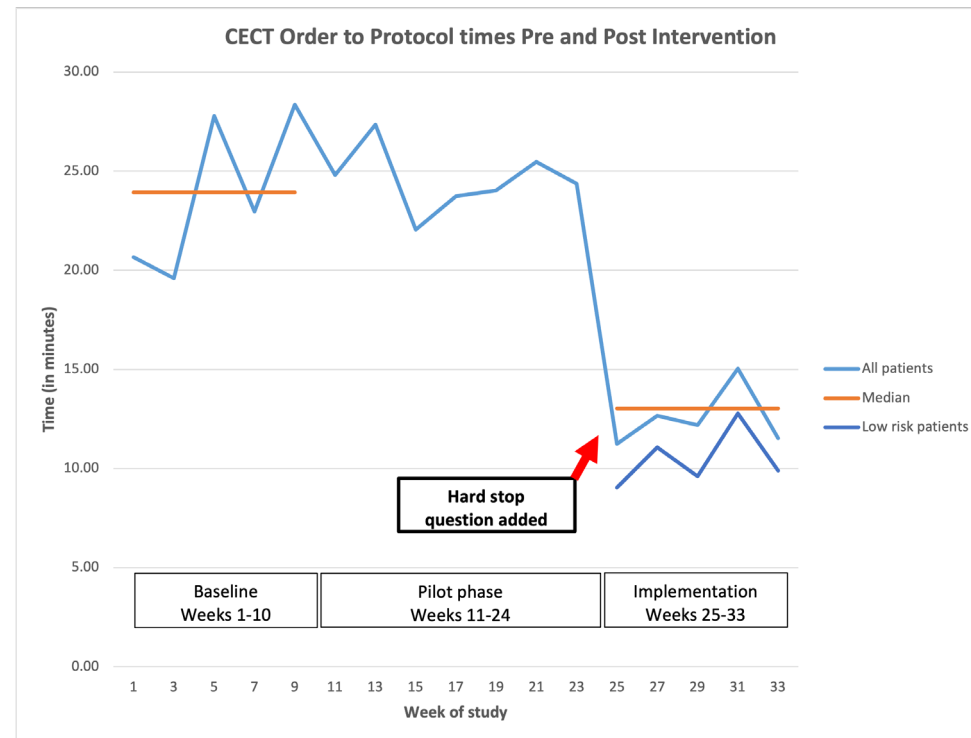
No: Low risk for kidney injury/disease or eGFR over 30 today

Methods

- Outcomes assessed:
 - Median CECT study order to protocol time (O to P)
 - Median CECT study order to begin time (O to B)
- Balancing safety measure: Incidence of patients that were categorized as “low risk” by ED provider (i.e., eGFR testing not needed) but who subsequently were found to have an eGFR test result of less than 30 mL/min/1.73m² during that ED visit
- Mann-Whitney U test used to compare O to B and O to P data for baseline versus implementation phase for each ED, as well as for all EDs combined

Results: Order to Protocol time

- Total of 16,446 CECT studies in 13,731 unique patients
- Low answer rate (5-14%) when question was optional in the Pilot phase, so changed to required (“hard stop”) in Implementation phase
- In implementation phase, 68% studies (3,451/5,057) were categorized as low risk by ordering provider (OK to scan without eGFR)
- **Median O to P time across all ERs improved from 23.93 minutes at baseline to 13.02 minutes in the implementation phase (10.91 min absolute and 46% relative reduction, $p < 0.0001$)**



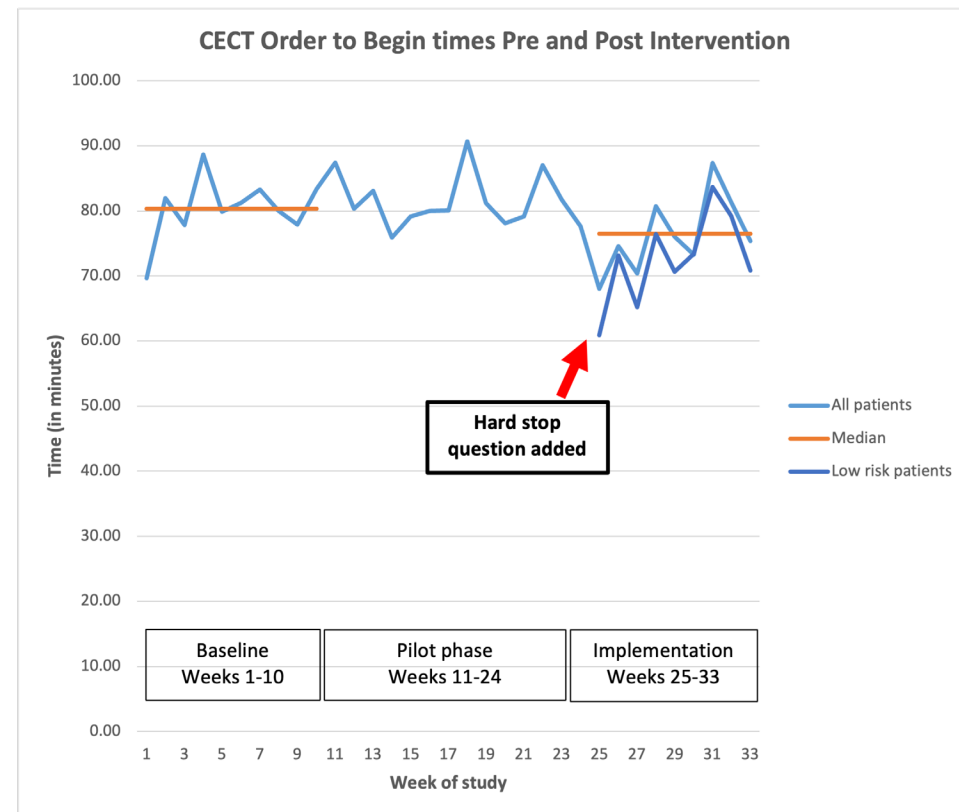
Results: Order to Begin time

- Median O to B across all EDs improved from 80.34 min at baseline to 76.48 min in implementation phase (3.86 min absolute and 5% relative reduction, $p < 0.0001$)
- Substantial improvement in median O to B in Freestanding ED: 36.33 min at baseline to 22.98 min in implementation phase (13.35 min absolute and 37% relative reduction, $p < 0.0001$)
- No statistically significant change to Hospital based ED 1 (trauma center) and pediatric ED

	All EDs	*Hospital-based ED 1	Hospital-based ED 2	Freestanding ED	Pediatric ED
<u>Baseline data</u>					
Number of studies	4,456	2,400	1,335	672	49
Median O to B (minutes)	80.34	86.87	93.83	36.33	147.65
<u>Implementation phase</u>					
Number of studies	5,057	2,718	1,494	801	44
Median O to B (minutes)	76.48	88.80	87.22	22.98	132.80
p-value	< 0.0001	0.88	0.001	< 0.0001	0.28

Results: Order to Begin time

- For **low-risk** patients across all EDs, median O to B was further improved from baseline median of 80.34 minutes to 72.08 minutes in implementation phase
- In implementation phase, 0.3% (2/646) studies deemed low risk (and did not have an eGFR result at time of starting CT study) subsequently had an eGFR result < 30 mL/min/1.73m² in that ED visit
 - Both patients had uneventful recovery of renal function, and did not need dialysis



Discussion

- EHR-embedded eGFR deferral process based on risk factor assessment was successfully implemented
 - Slightly over 2/3 of patients deemed low risk
 - Only 0.3% of patients had severe renal impairment (eGFR < 30) discovered after CECT that were deemed low risk at order entry
- Greater improvement in O to B times noted in our freestanding and non-trauma center hospital-based ED compared to the tertiary care center hospital-based ED
 - Freestanding ED relied on conventional lab processing (low use of point-of-care (POC) testing)
 - Greater benefit expected in centers that do not use POC testing
 - Tertiary care/trauma center is busiest ED, often working well above capacity
 - In pediatric ED, ultrasound and CT studies are often ordered at the same time, but CT is only performed if the ultrasound is indeterminate

Discussion/Conclusion

- eGFR testing prior to contrast enhanced CT (CECT) may be safely deferred in low-risk ED patients, leading to improved CT order to protocol and order to begin times
- **Limitations:**
 - Many patients (44% of those deemed low-risk) had eGFR results already available at time of CECT order
 - ED operational metrics (e.g., patient arrival to discharge times) not assessed
 - Did not directly compare “low-risk” patients at baseline versus post-implementation
- **Further PDSA improvements after implementation of new order question:**
 - Developed “Smart” EHR alert for CT Techs when patient has recent eGFR < 30 when beginning CECT exam
 - Helps us catch low values even if patient was deemed low risk at time of order
 - Refined the order question in EHR to “hide” it when there is a recent eGFR < 45
 - Takes away ability to defer eGFR testing for this patient cohort and treats them as at risk and needing labs