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INNOVATIVE RADIOLOGY COMMUNICATION TOOL HELPS TO REDUCE DOOR-TO-NEEDLE TIME IN PATIENTS WITH ACUTE ISCHEMIC STROKE

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Introduction

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- Imaging plays a key role in the current algorithm for administration of thrombolytic therapy.
- The goal of nonenhanced CT is to detect: an intracranial hemorrhage, ischemic stroke or other possible mimic of stroke (e.g., neoplasm, arteriovenous malformation) that could be the cause of the neurologic deficit.

Introduction

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- Earlier administration of intravenous rtPA after the onset of stroke symptoms is associated with greater functional recovery.
- Reducing time-to-interpretation of the head CTs speeds up the process of clinical decision making, reduces time to intravenous rtPA, or door-to-needle times and therefore improves patient outcome.

Goals

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- To eliminate the delay between completion of the head CT and the preliminary report given to the stroke team.
- To decrease the time to rtPA administration.

Target:
Reduce door-to-needle time

- Target: Stroke best practices state that at the minimum, the CT scan should be completed within 25 minutes of arrival and interpretation of the CT scan within 45 minutes of arrival to exclude intracranial hemorrhage or other contraindications prior to administration of intravenous rtPA (4).

We were able to reduce the maximum acceptable 20 minute gap between the CT scan performance and interpretation to essentially **zero**.

We created a communication tool to facilitate a focused assessment of the head CT examinations and to answer the clinical question that would allow the clinician to administer or withhold rtPA, therefore reducing door-to-needle time and improving patient outcomes.

Materials and Methods

- We composed a resident **PRELIMINARY REPORT FORM**

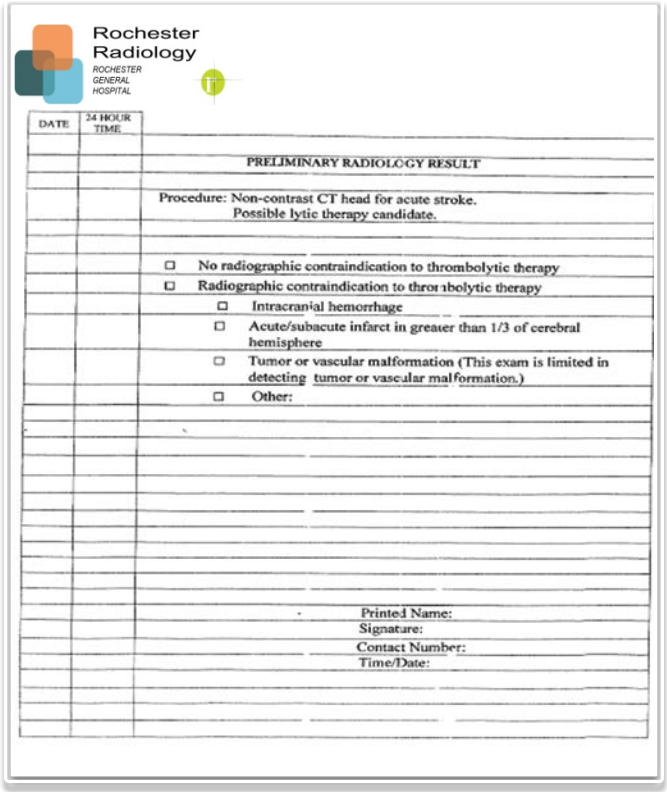
  that contains the most common radiographic contraindications for thrombolytic therapy

Contraindications for rtPA

1. Intracranial hemorrhage
2. Large territorial infarct affecting more than one-third of the MCA territory
3. An intracranial mass
4. Vascular malformations, that can be associated with a high risk of intracranial hemorrhage
5. "Other": recent intracranial surgery, head trauma, or recent stroke

Materials and Methods

- The purpose of the form was to focus the attention of the resident on the identification of contraindications to rtPA administration at the time of completion of the scan and communication of the findings to the stroke team immediately verbally and in a written form.



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DATE	24 HOUR TIME	
		PRELIMINARY RADIOLOGY RESULT
		Procedure: Non-contrast CT head for acute stroke. Possible lytic therapy candidate.
		☐ No radiographic contraindication to thrombolytic therapy
		☐ Radiographic contraindication to thrombolytic therapy
		☐ Intracranial hemorrhage
		☐ Acute/subacute infarct in greater than 1/3 of cerebral hemisphere
		☐ Tumor or vascular malformation (This exam is limited in detecting tumor or vascular malformation.)
		☐ Other:
		Printed Name: Signature: Contact Number: Time/Date:

Materials and Methods

- Every time a CT that was ordered as a “crisis stroke” is completed, a radiology resident (covering the ED service or the Neurology service) gets an overhead page.

CRISIS STROKE

FILM CHECK IN

CT ROOM 64

Materials and Methods

- The resident checks the images on the monitor in the CT scan control area before the patient leaves the CT scanner
- The resident communicates the preliminary findings to the team and fills out the form.

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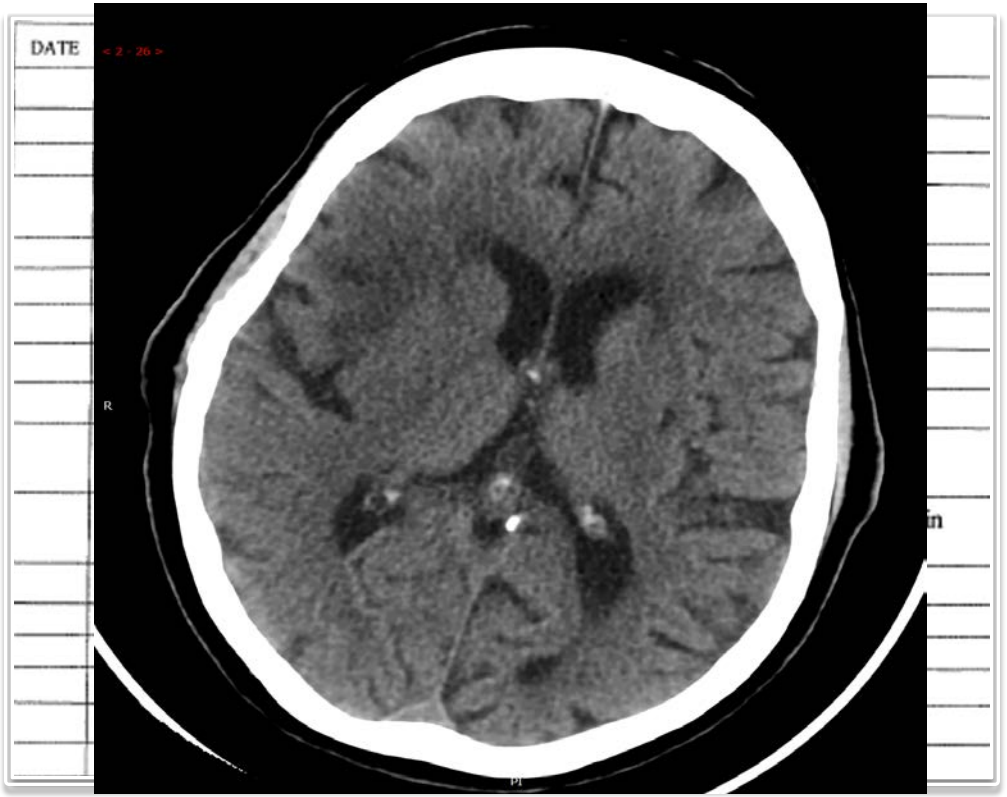
		☐ Radiographic contraindication to thrombolytic therapy
		☐ Intracranial hemorrhage
		☐ Acute/subacute infarct in greater than 1/3 of cerebral hemisphere
		☐ Tumor or vascular malformation (This exam is limited in detecting tumor or vascular malformation.)
		☐ Other:

Materials and Methods

- Presence or absence of contraindications for rt-PA are communicated to the stroke team without delay.
- A copy of the form is also scanned into the Radiology Information System (RIS) system as a part of a permanent medical record.



Materials and Methods

HEALTH + CARE

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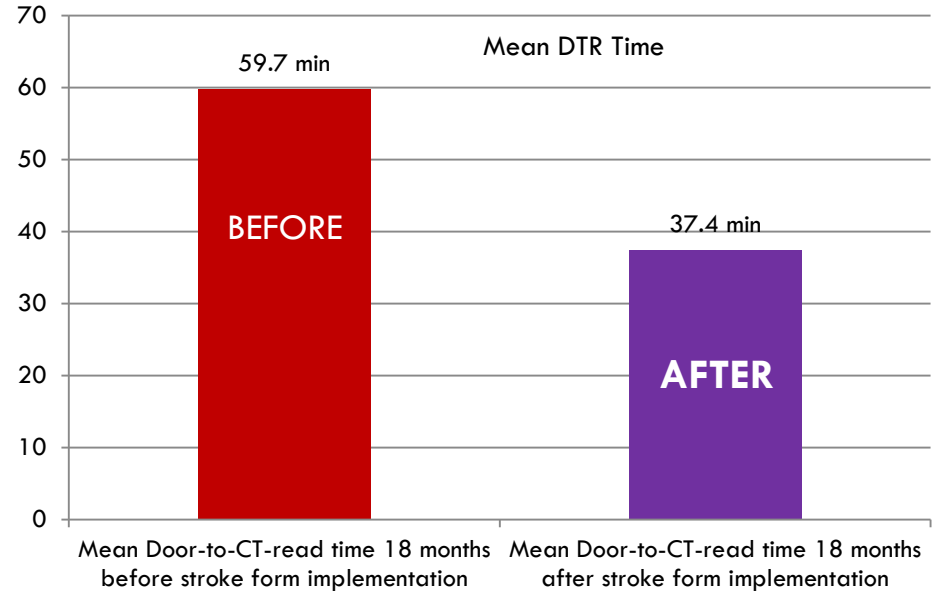
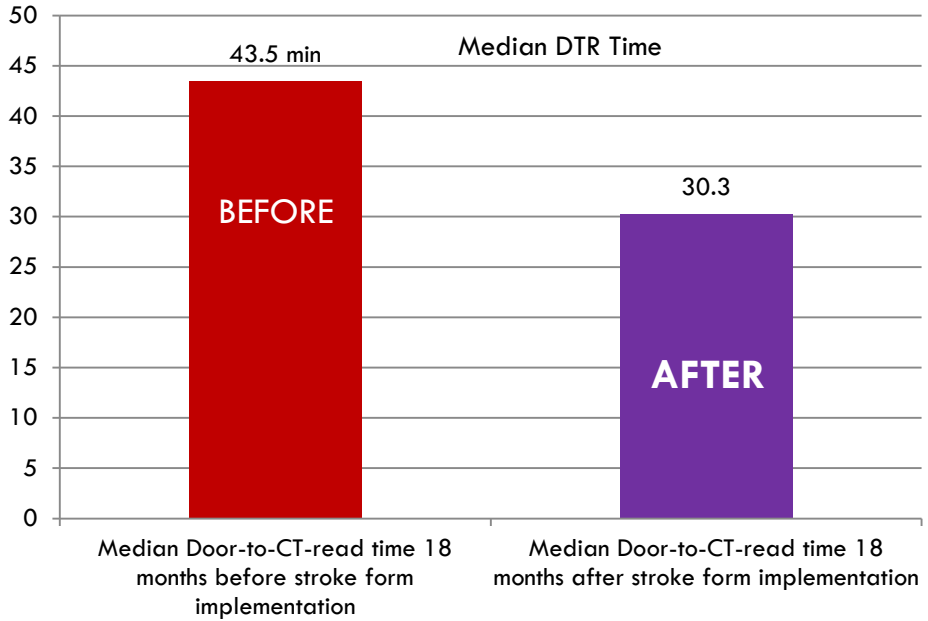
- A total of 609 patients with a suspected stroke were analyzed. A two sample t-test was used to analyze the median and mean door-to-CT-read time and door-to-needle time (DNT) 17 months before and 17 months after the implementation of the form (February 2010-July 2011 and August 2011-January2013).
- The number of CT scans interpreted within 45 minutes of arrival 17 months before and 17 months after the implementation of the form was also analyzed using a two-sample t-test.
- All statistical analysis was performed using SAS v.9.0 (*SAS* Institute, Cary, *North Carolina*) and all significance testing was done at the 5% level.

Results

Door-to-CT-Read (DTR) Times Decreased

Average decrease in mean and median DTR times.





Results

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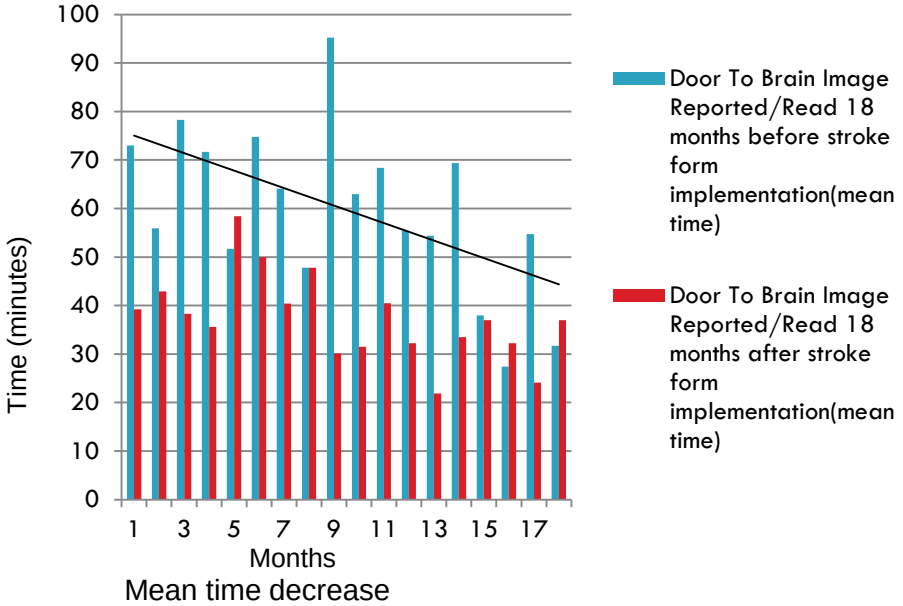
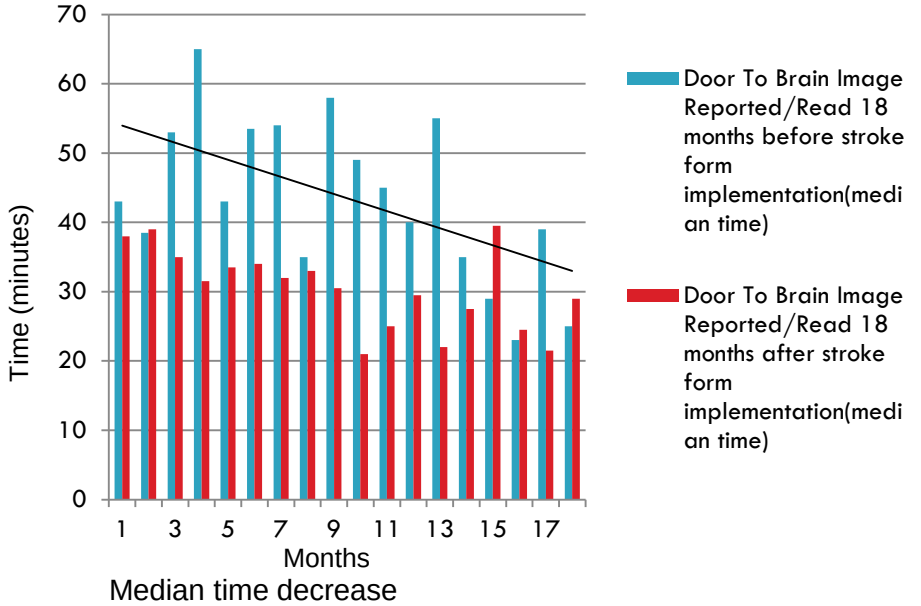
Within the 17 months after the implementation of the form there was significant decrease in:
Mean and median door-to-CT-read times (p=0.0001 and p=0.0005 respectively).



Mean time decrease

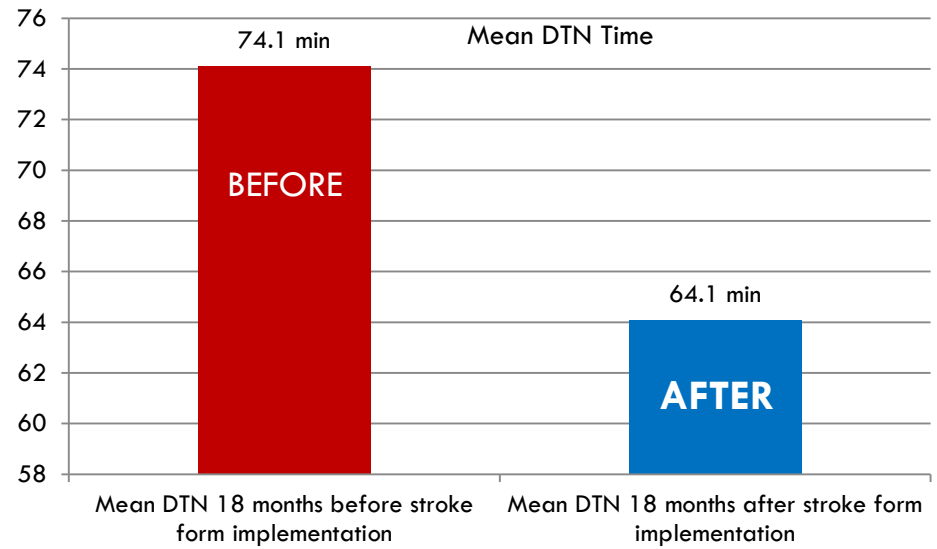


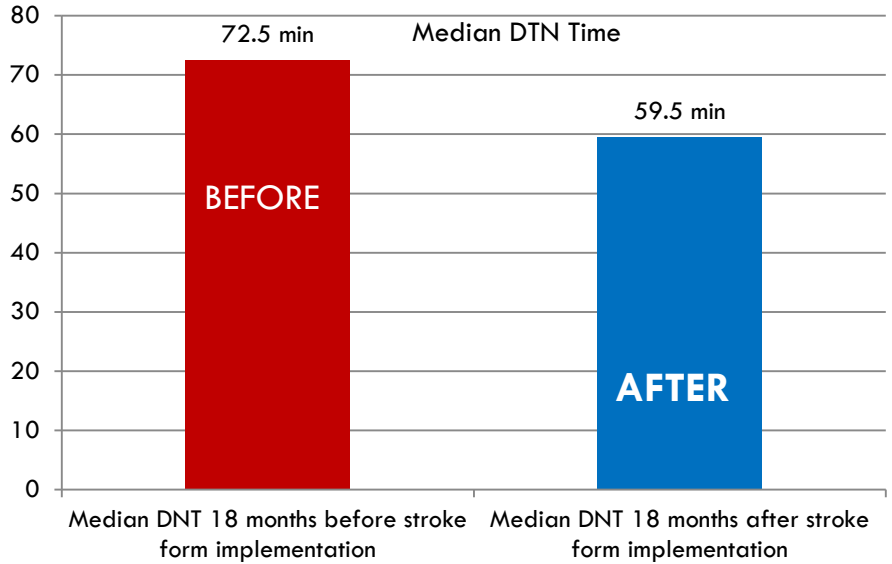
Median time decrease

Results

Door-to-Needle Times (DTN) Decreased.

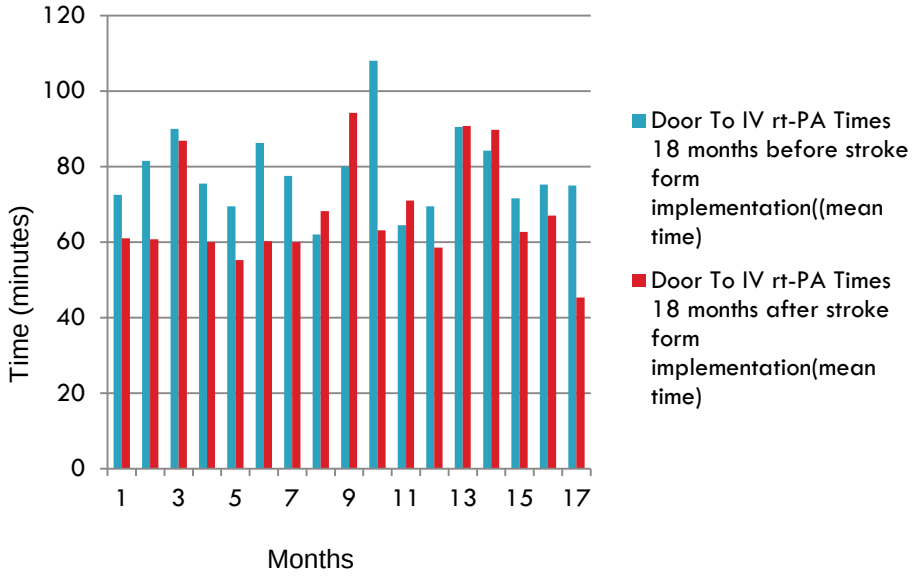
Average decrease in mean and median DTN



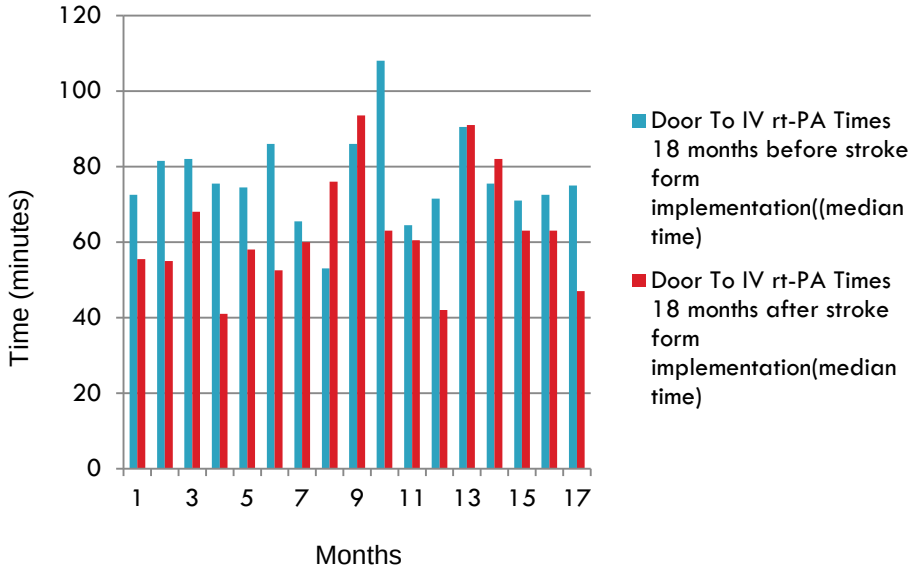


Results

Within the 17 months after the implementation of the form there was significant decrease in: Mean and Median door-to-needle times (DNT) ($p=0.01$ and $p=0.0057$ respectively).



Mean time decrease

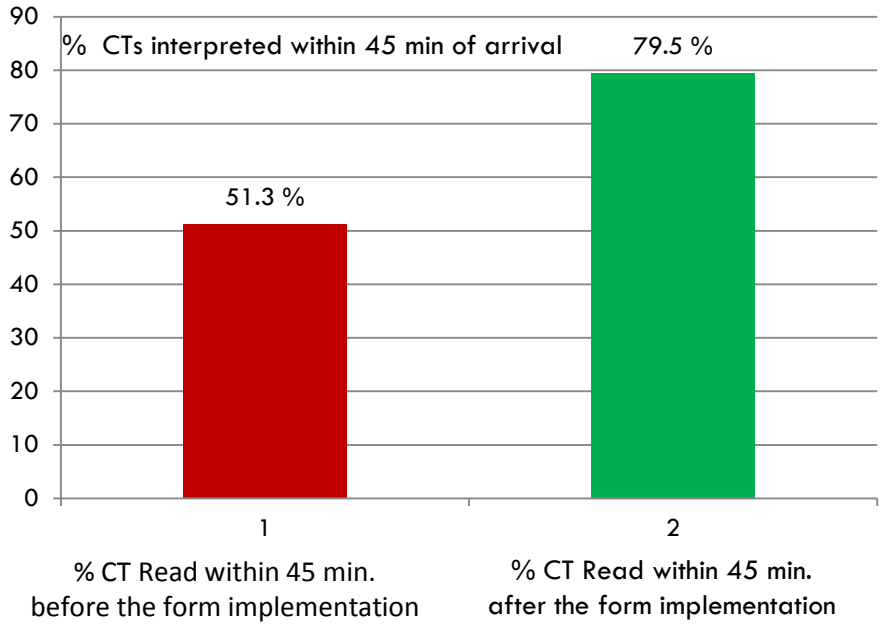


Median time decrease

Results

Average increase in the number of CT scans interpreted within 45 minutes of arrival before and after the implementation of the implementation of form.

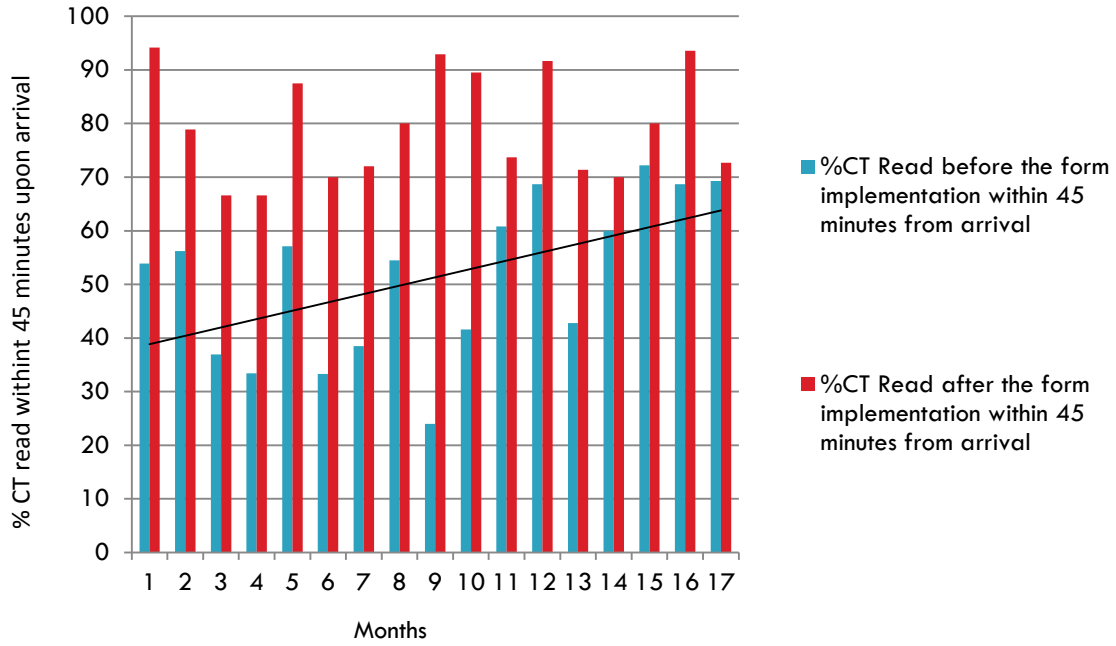
There has also been a significant increase in the number of head CT studies interpreted within 45 minutes of arrival with the 17 months after the implementation of the form (p=0.0001) (Fig.6).



Results

The number of Head CTs interpreted within 45 minutes upon arrival increased significantly after the implementation of the form.

There has also been a significant increase in the number of head CT studies interpreted within 45 minutes of arrival with the 17 months after the implementation of the form (p=0.0001) (Fig.6).



Stroke Gold Plus Achievement Award

- As a result of the implementation of the form, we were awarded the Stroke Gold Plus Achievement Award/Target Stroke Honor Roll (American Heart Association and American Stroke Association, 2011-2013).
- This award recognized Rochester General's commitment and success in implementing excellent stroke care for patients in accordance with evidence-based guidelines.

Conclusions

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- Imaging plays a key role in the management of acute stroke.
- Rapid analysis of a non-enhanced head CT in a patient with suspected stroke and immediate communication of the results to the stroke team is key.
- The implementation of the preliminary read form reduced the door-to-CT-read mean and median times by 63% and 70%, door-to-needle times by 87% and 82% respectively.
- It increased the number of CTs interpreted within 45 minutes of arrival to the emergency department by 65%.
- This new practice improved compliance with the AHA/ASA guidelines and therefore improved and will continue to improve patient outcomes.

On the basis of the success that we have achieved via the implementation of this innovative communication tool, we recommend that other institutions adopt this practice.
For more information and with any questions please feel free to contact the author at kaplanlist@gmail.com

References:

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4. Target: Stroke. Campaign manual. AHA/ASA. http://www.strokeassociation.org/idc/groups/heart-public/@wcm/@hcm/@gwtg/documents/downloadable/ucm_308277.pdf