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# Revising Code Stroke Algorithms to Improve Use of IV t-PA and Door to Needle Times in Stroke, a Retrospective Review

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## BACKGROUND

Time is brain, each minute a stroke continues without treatment, 1.9 million neurons, 14 billion synapses, and 7.5 miles of myelinated fibers are lost. In 2008, Rhode Island Hospital Department of Neurology began an initiative to improve stroke care. ASA "Target: Stroke" strategies were applied in an effort to increase utilization of IV t-PA and improve door to needle times to less than 60 minutes. Code Stroke was implemented in March of 2010. This retrospective study examines the timing of the evaluation process for 125 stroke patients who received IV t-PA.

## OBJECTIVES

- To evaluate the effectiveness of the "code stroke" system and Target: Stroke strategies in improving the use of IV t-PA and door to needle times.
- To show the effects of code stroke system modification in acute stroke treatment.
- Identify factors which influence time to treatment in acute ischemic stroke.
- Suggest ways to improve door to needle times.

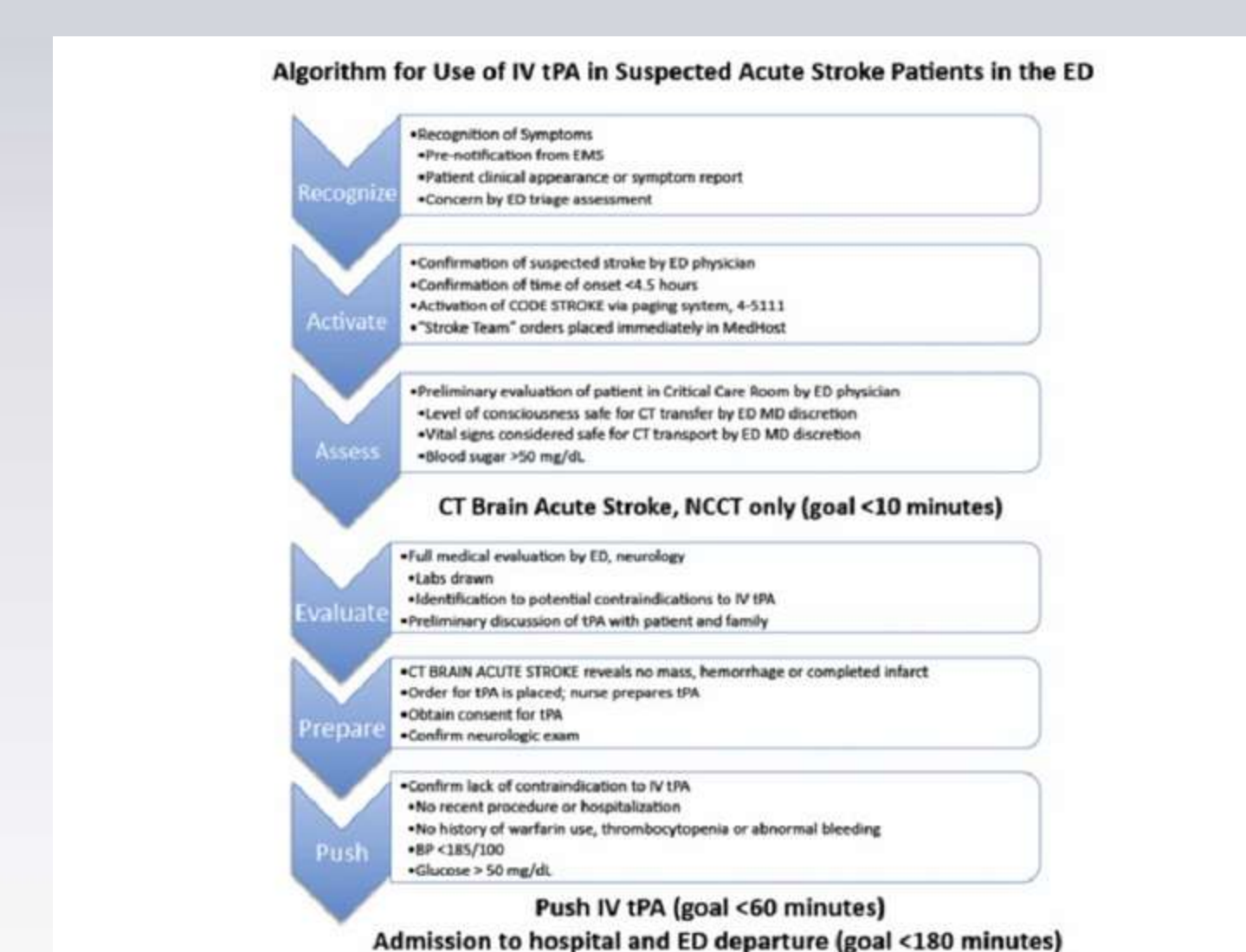
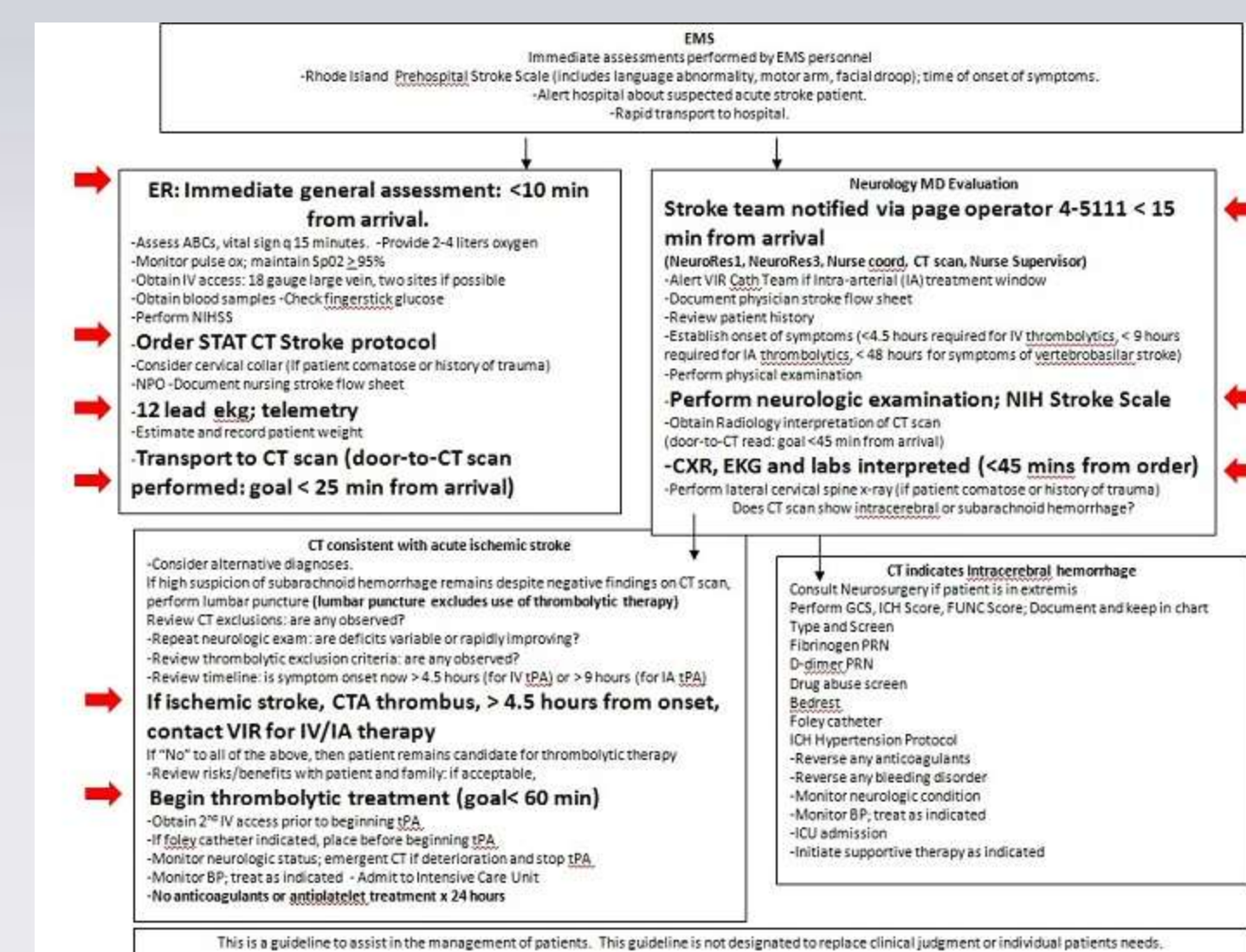
## METHODS

- Retrospective chart review analysis of paper and electronic records of 125 patients treated with t-PA for possible stroke between 7/1/2008 and 4/12/2011, separated into 3 time frames, pre-Code Stroke, Code-Stroke Extended and Code-Stroke Limited Protocols.
- A patient list was gathered from administrative datasets including the Get With the Guidelines registry, and ICD9 discharge diagnosis codes and medication administration records.
- Door to needle (DTN) times, door to physician contact, door to CT complete, and CT complete to IV t-PA administration were analyzed using the wilcoxon test and logrank test.

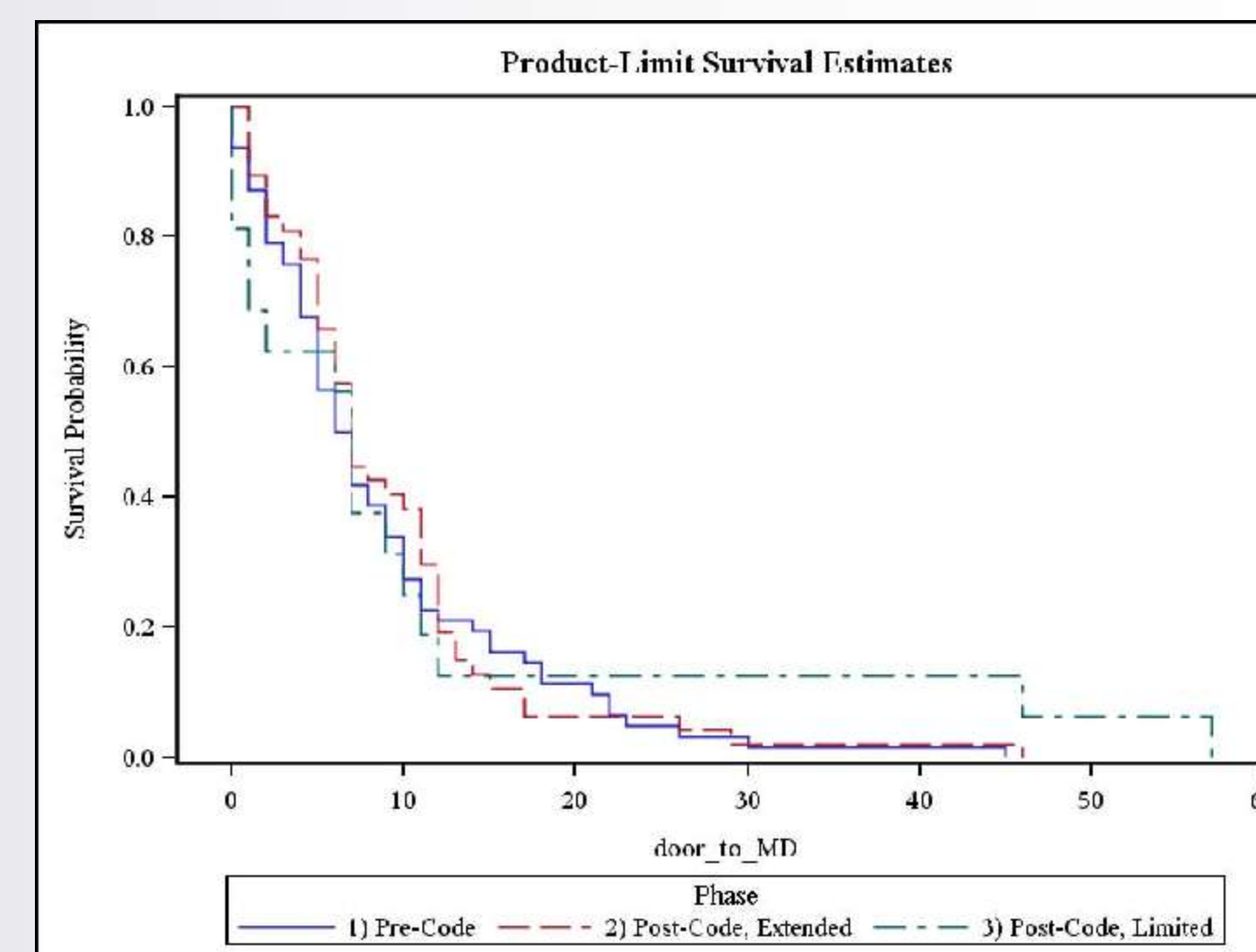
## DEMOGRAPHICS

Demographics	Sample Size (n=125)	Pre-Code Stroke	Post-Code Stroke Extended	Post-Code Stroke Limited
Gender				
Male	30 (48.39)	24 (51.0)	10 (62.50)	
Female	32 (51.61)	23 (48.94)	6 (37.50)	
Race				
White	51 (82.26)	42 (89.36)	15 (93.75)	
Non-White	11 (17.74)	5 (10.64)	1 (6.25)	
English Speaking	54 (87.10)	43 (91.49)	13 (81.25)	
Non-English Speaking	8 (12.90)	4 (8.51)	3 (18.75)	
Prior Stroke				
Yes	7 (11.29)	9 (19.15)	7 (43.75)	
No	55 (88.71)	38 (80.85)	9 (56.25)	
Hypertension				
Yes	48 (77.42)	40 (85.11)	13 (81.25)	
No	14 (22.58)	7 (14.89)	3 (18.75)	
Hyperlipidemia				
No	35 (56.45)	23 (48.94)	8 (50.00)	
Yes	27 (43.55)	24 (51.06)	8 (50.00)	
Diabetes Mellitus				
Yes	14 (22.58)	11 (23.40)	1 (6.25)	
No	48 (77.42)	38 (79.60)	15 (93.75)	
Atrial Fibrillation				
Yes	16 (25.81)	12 (25.53)	4 (25.00)	
No	46 (74.19)	35 (74.47)	12 (75.00)	
History of Smoking				
Yes	27 (43.55)	19 (40.43)	6 (37.50)	

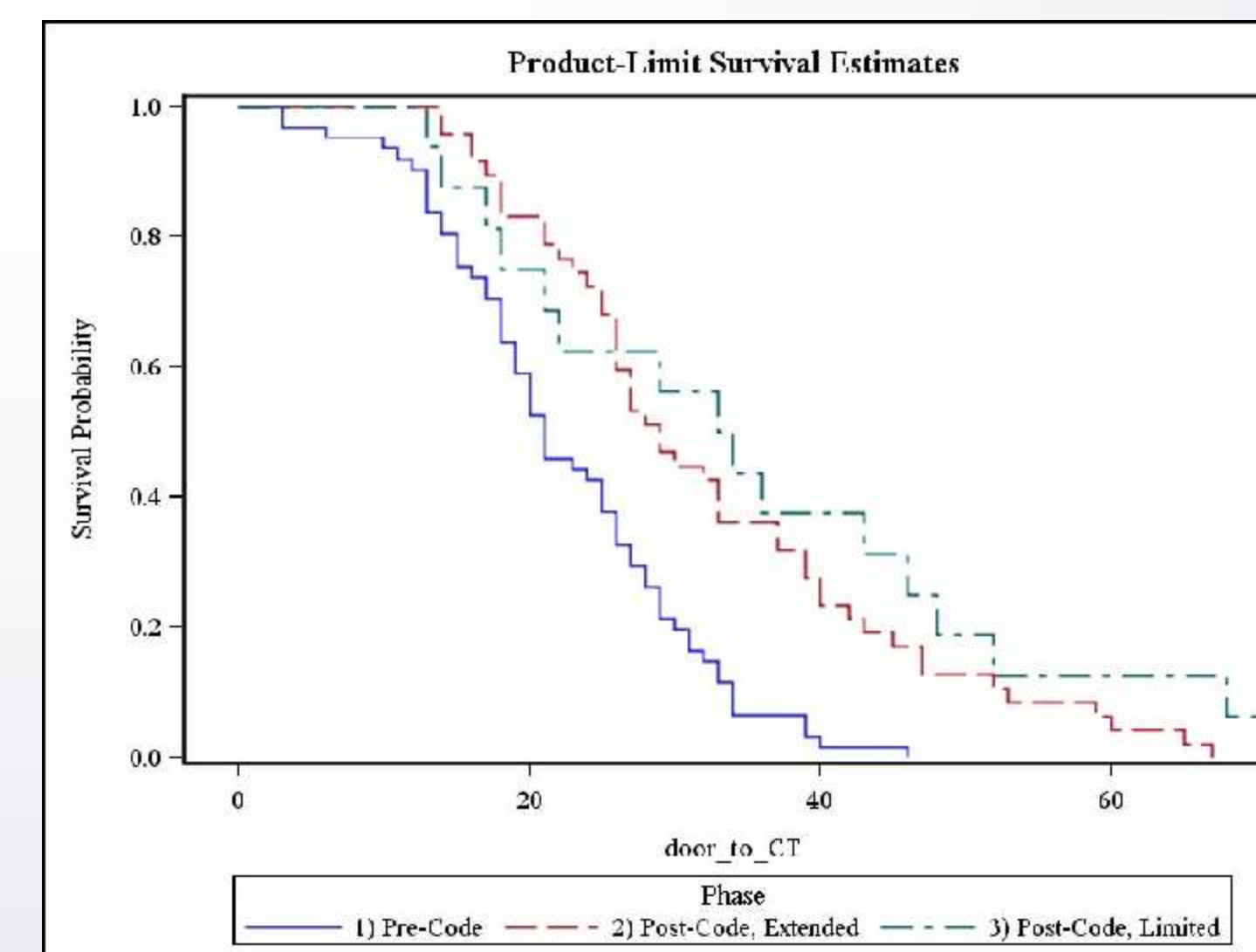
## TREATMENT ALGORITHMS



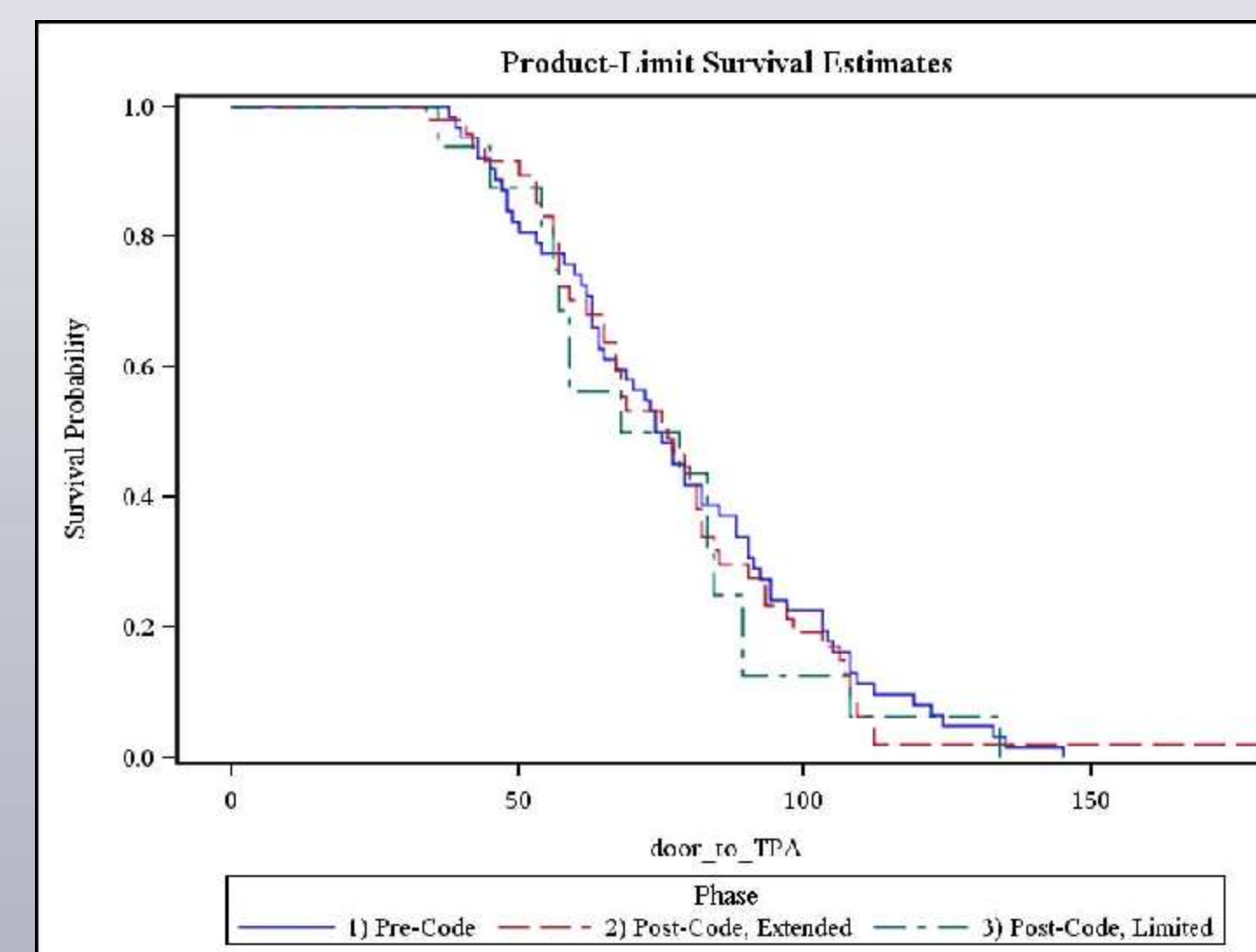
## RESULTS



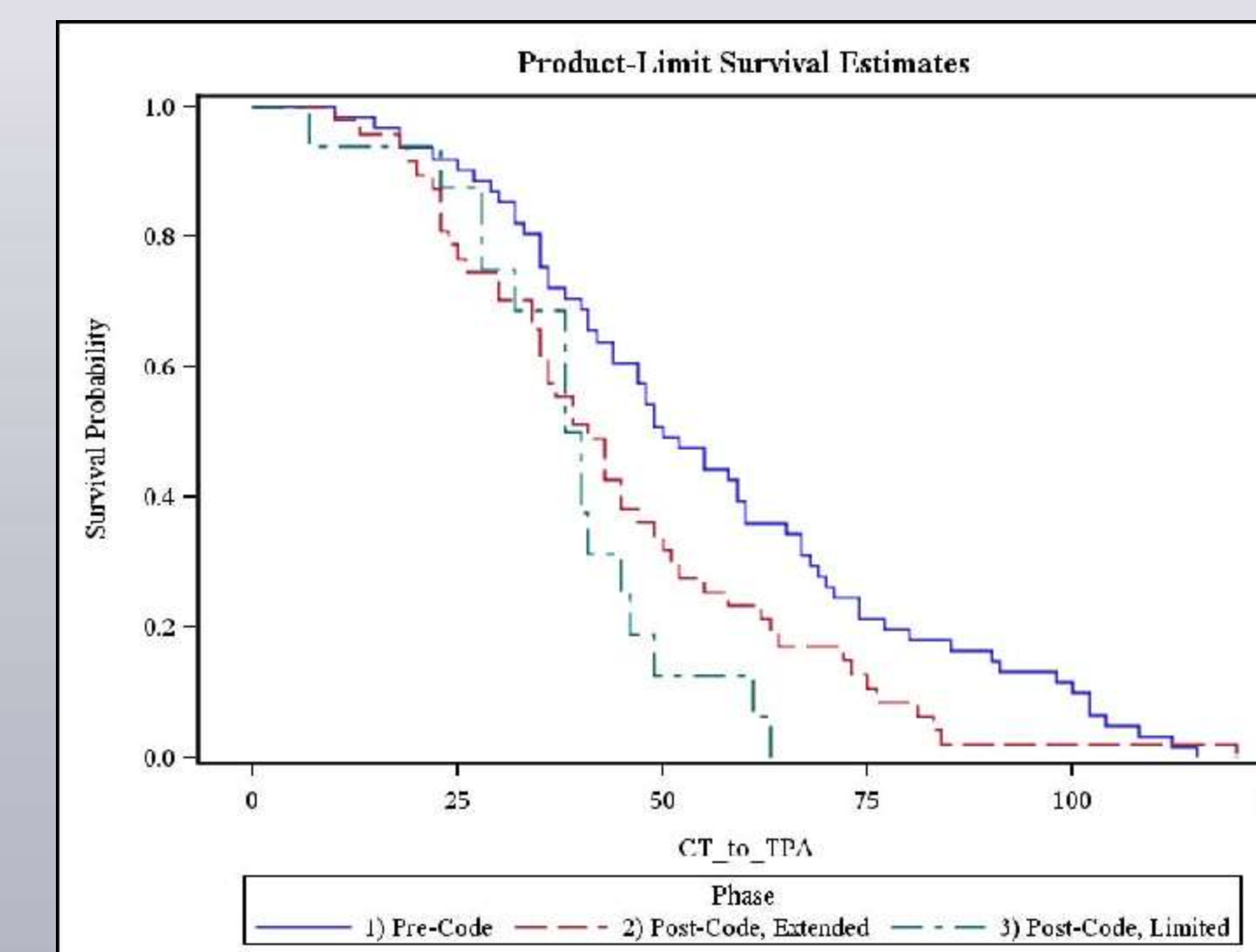
Door to MD (minutes) p value 1.0000 (all groups)



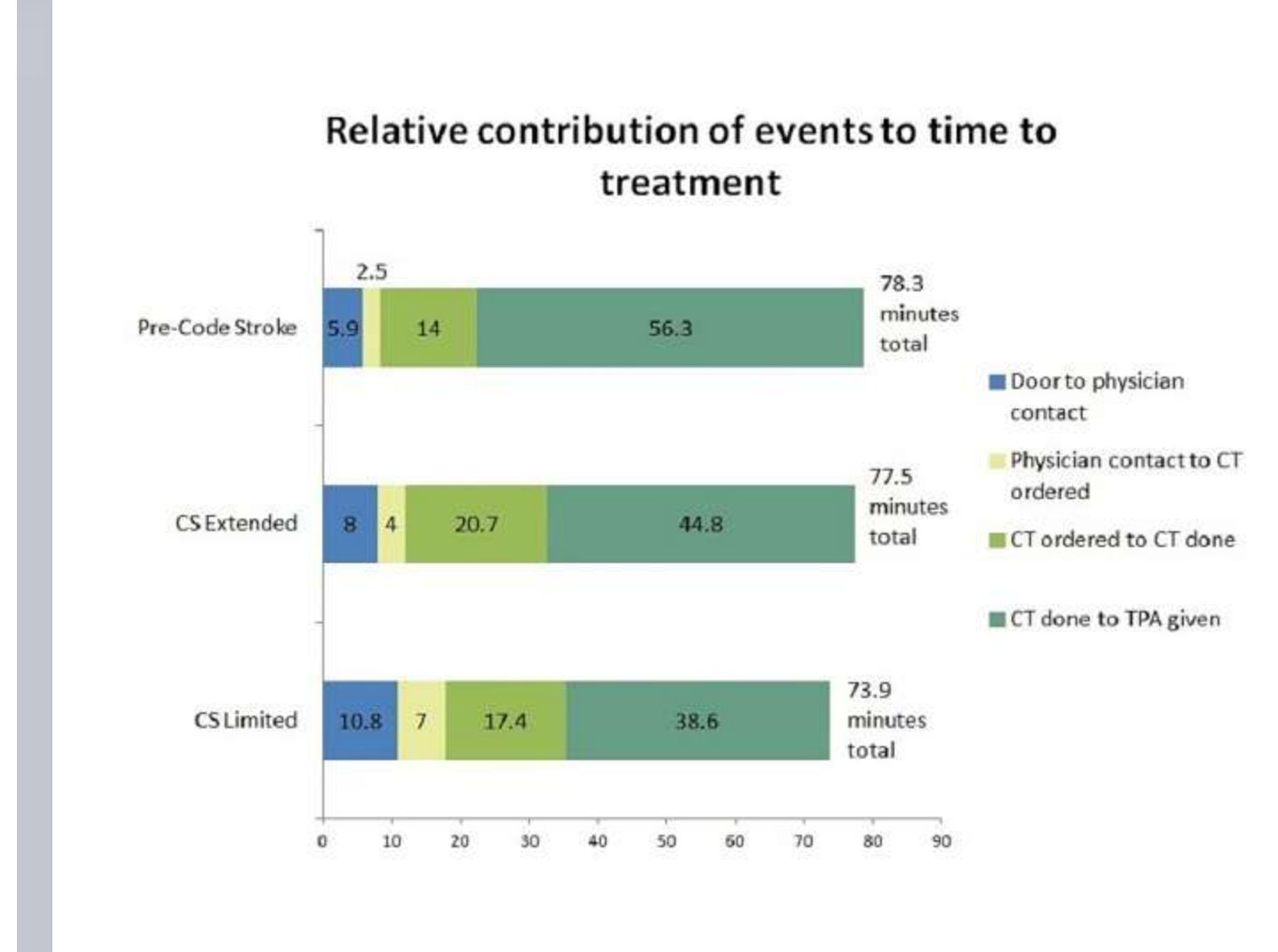
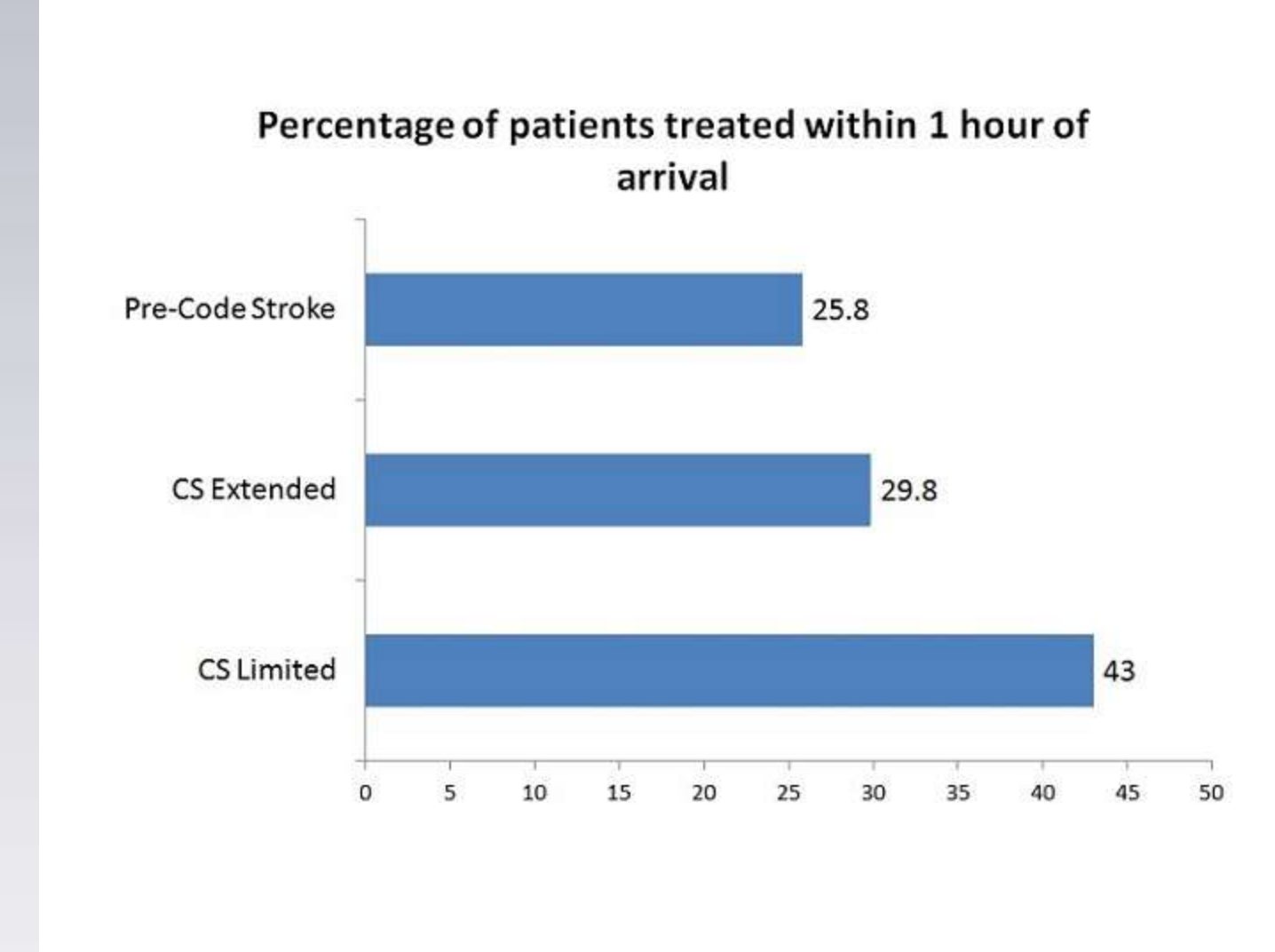
Door to CT Completed p value 0.0003 (pre-code to both post-code groups)



Door to t-PA p value 1.0000 (all groups)



CT to t-PA administered p values:  
Pre-code to post-code extended 0.0462  
Pre-code to post-code limited 0.0111  
Post-code extended to post code limited 1.0000



## DISCUSSION

- The pre-code stroke average DTN time was 78.3 minutes. During the code stroke extended protocol era the average DTN time was 77.5 minutes, and the code stroke limited protocol era average is 73.9 minutes.
- The DTN times were broken down to these time frames: door to physician contact, door to CT completion, and CT completion to t-PA given.
- In the pre-code stroke era there was an average of 5.9 minutes from door to physician contact, this increased to 8 minutes in the code stroke extended protocol era, and further increased to 10.8 minutes in the code stroke limited protocol era.
- Door to CT time increased from 22.4 minutes in pre-code stroke to 32.7 minutes in code stroke-extended and 35.3 minutes in code stroke-limited era. This was statistically significant with a p value of 0.0003.
- The time from CT completion to t-PA administration was 56.3 minutes pre-code stroke, with the code stroke extended protocol, this decreased to 44.8 minutes, this time further decreased to the current 38.6 minutes during the code stroke limited protocol timeframe.
- The drop from 56.3 minutes from CT complete to t-PA given in the pre-code stroke era to 38.6 minutes in the code stroke limited protocol era is statistically significant with a p value of 0.0111 by the wilcoxon method and 0.0034 by the logrank test.

## LIMITATIONS

Limitations of this study include its small sample size and retrospective design. In addition all 125 patients evaluated received IV t-PA thus a selection bias inherently exists as not all patients who presented with acute ischemic stroke symptoms within the 0 - 4.5 hour window were studied.

## CONCLUSIONS

Revisions in code stroke algorithms demonstrated a modest improvement in door to needle times, though not statistically significant. Door to CT time increased with the implementation of code stroke extended and limited algorithms and this was statistically significant. Further study is needed to investigate the reasons for this time increase, looking at patients treated with low NIHSS or ambiguous stroke symptoms. There was a decrease in time from CT to IV t-PA administration which was statistically significant. This suggests that once the decision to treat is made (post CT scan), time to drug administration is decreased. The study suggests that there is not enough data to support that revision of code stroke algorithms alone, improve the use of IV t-PA and door to needle times. Future directions of study include evaluating methods to improve door to CT time including the effects of: pre-notification by EMS, pre-registration of stroke patients prior to arrival, EKG and labs after CT scan completion, and educational interventions for ED staff.

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The study was approved by the Rhode Island Hospital Institutional Review Board

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