Lehigh Valley Health Network

LVHN Scholarly Works

Department of Medicine

Rapid Door to Balloon Time in the Treatment of Acute ST-Elevation Myocardial Infarction is Associated with Reduced Length of Hospital Stay

Amit Nanavati MD
Lehigh Valley Health Network

David A. Cox MD
Lehigh Valley Health Network, David.Cox@lvhn.org

J Patrick Kleaveland MD
Lehigh Valley Health Network, J_Patrick.Kleaveland@lvhn.org

Orlando E. Rivera RN
Lehigh Valley Health Network, Orlando_E.Rivera@lvhn.org

Nainesh Patel MD
Lehigh Valley Health Network, nainesh_c.patel@lvhn.org

Published In/Presented At

Rapid Door to Balloon Time in the Treatment of Acute ST-Elevation Myocardial Infarction is Associated with Reduced Length of Hospital Stay

Amit Nanavati, MD, David Cox, MD, J. Patrick Kleaveland, MD, Orlando Rivera, RN, Nainesh Patel, MD

Lehigh Valley Health Network, Allentown, Pennsylvania

Introduction

- Coronary artery disease and its extreme manifestation - ST-Elevation Myocardial Infarction - remains among the leading causes of death in the United States. Significant research has been devoted to reducing the morbidity and mortality of this condition. Early reperfusion has been established as an important consideration in improving outcomes.

- Accordingly, in 2007 the American College of Cardiology and American Heart Association set a goal of reperfusion of the infarct artery to within 90 minutes of presentation. This benchmark was shown as a cutoff time beyond which significantly worsened outcomes could be expected, and became known as "door to balloon time."

- In addition to mortality, major adverse cardiac events are also reduced with improvements in door to balloon time. However, fewer studies have examined the relationship between door to balloon time and in-hospital complications.

- At Lehigh Valley Health Network, we have established a protocol for rapid transfer to the cardiac catheterization laboratory that can be initiated by ED, Cardiology or EMS. The 'MI Alert' pathway standardizes medications and therapies and has helped reduce door to balloon time. (Figure 1)

Figure 1. MI Alert Protocol
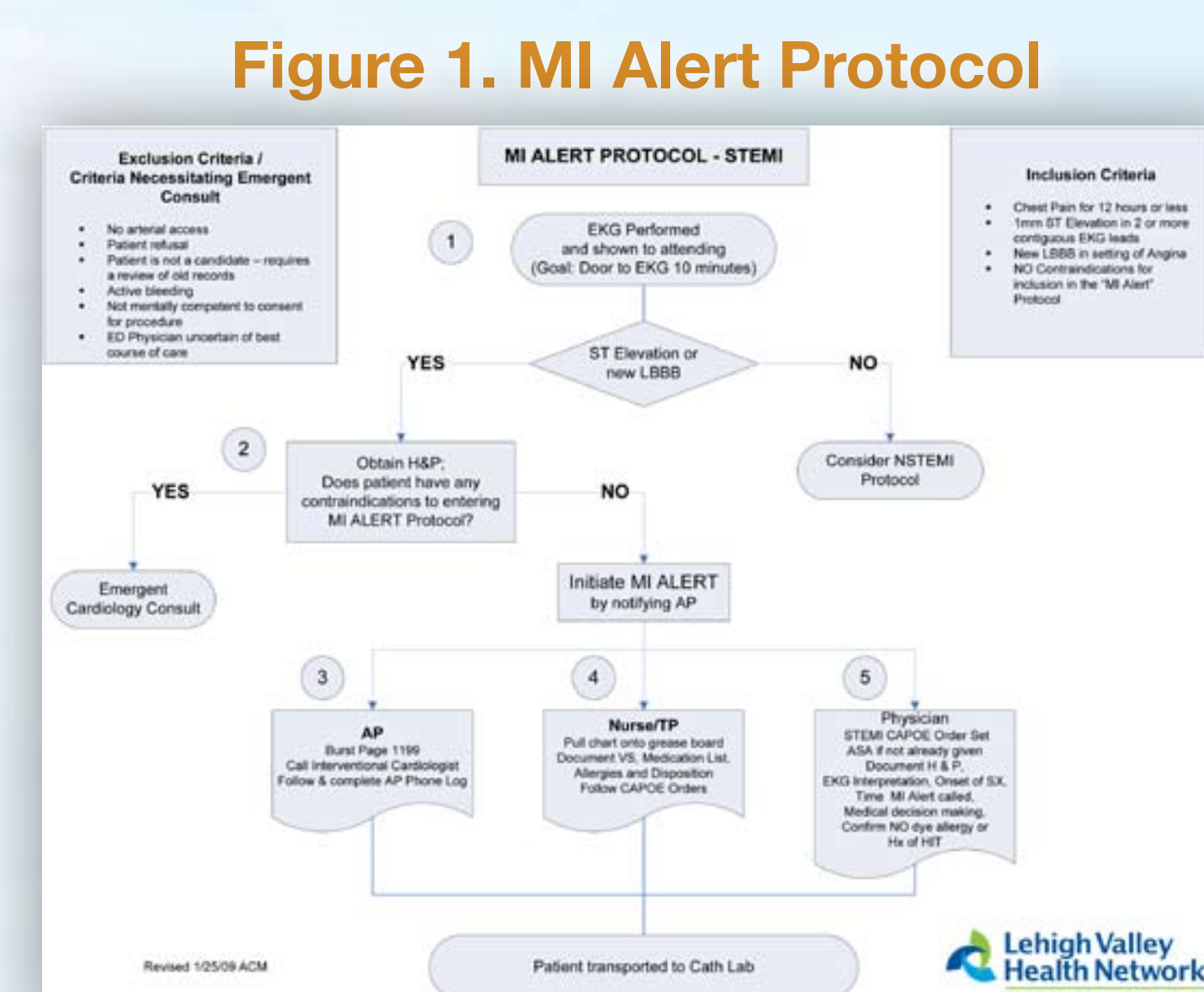
Objective

- Our study examined the relationship between door to balloon time and length of hospital stay. We believe that time to hospital discharge is an effective surrogate for measuring in-hospital complications. The hypothesis is that time to hospital discharge would be reduced as door to balloon time is improved.

Methods

- We examined 356 patients presenting to Lehigh Valley Health Network, an 880 bed academic community hospital in Allentown, Pennsylvania from 2008-2011. The study included patients with Acute ST-Elevation Myocardial Infarction, as determined by activation of the 'MI Alert' pathway, who were deemed to be acceptable candidates for emergency cardiac catheterization and percutaneous intervention.

- Of these 356 patients, 40 (11%) had a door to balloon time of less than 30 minutes (referred to as the "earlier" cohort) and 316 (89%) of which had a door to balloon time of > 30 minutes ("later" cohort).

- Twenty-eight patients (8%) were excluded from the final analysis in the later cohort and one from the earlier cohort. Reasons for exclusion included death, presence of cardiogenic shock, transfers to other hospitals for advanced heart failure therapies, ventricular fibrillation requiring hypothermic cooling and preexisiting multiorgan failure.

- Door to balloon time of the cohorts is presented below. (Table 1)

- Demographic data such as age, as well as composite coronary artery disease risk factors such as male gender, hypertension, tobacco use, history of coronary artery disease, diabetes, dyslipidemia, prior CVA and age were similar between the two groups (Table 2). (p-values represent difference between the groups after exclusions).
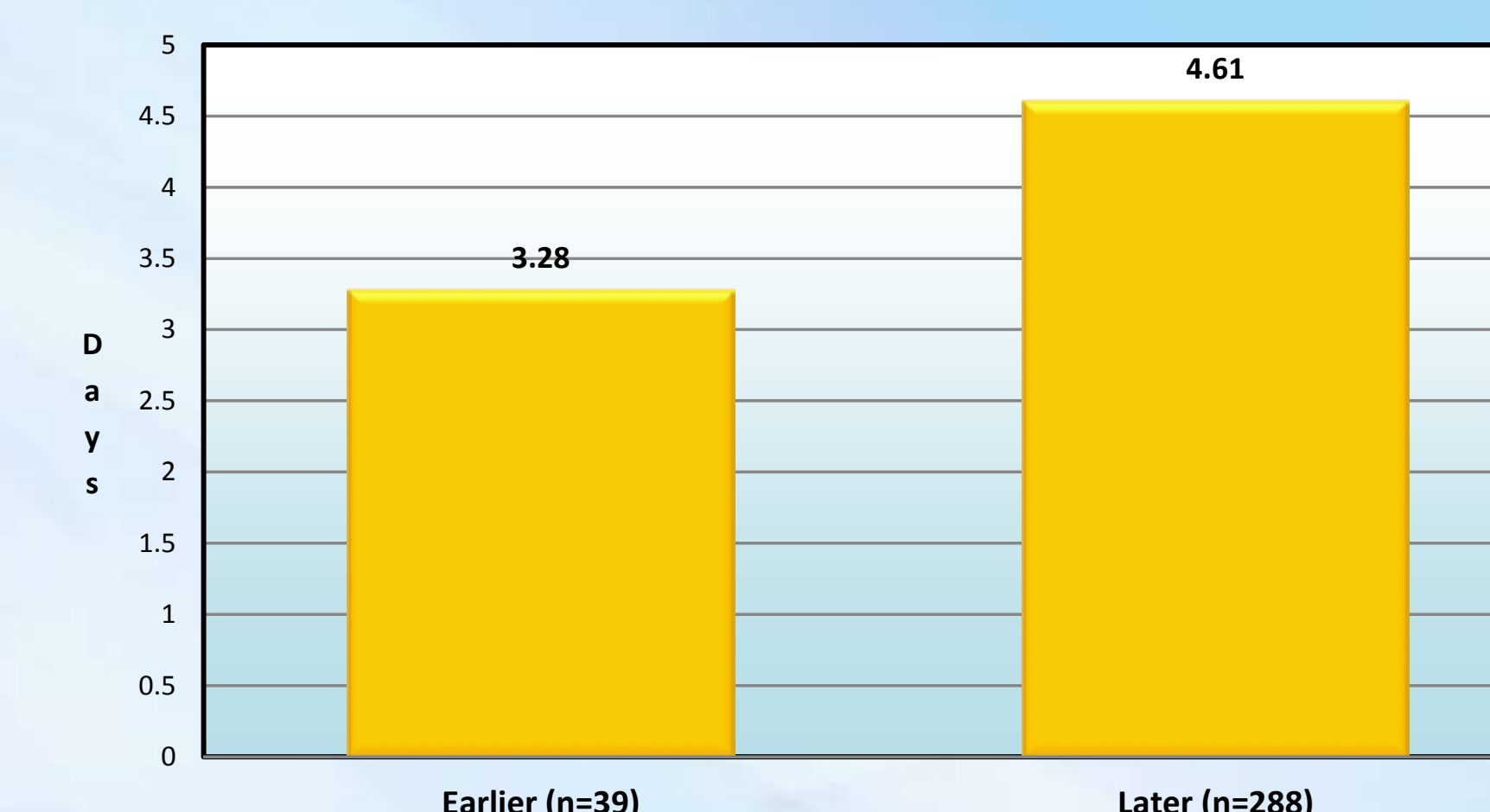
Table 1. Door to Balloon Time

	Earlier (n=39)	Later (n=288)
Door to Balloon (min)	24.9	63

Table 2. Demographic Data and Risk Factors

Risk Factors	Earlier (n=39)	Later (n=288)	p value
Average age (yrs)	61.3 +/- 10.0	61.9 +/- 13.0	0.711
Male Gender	71.7%	74.3%	0.747
Hypertension	71.8%	63.2%	0.077
Tobacco Use	25.6%	34.0%	0.276
Prior CAD	23.1%	25.3%	0.757
Diabetes	25.6%	21.2%	0.553
Dyslipidemia	76.9%	51.7%	0.001
Prior CVA	2.6%	4.2%	0.572
Combined	2.26	2.05	0.120

Table 3. Procedure and EKG Data

	Earlier (n=39)	Later (n=288)	p value
Left Ventricular Ejection Fraction (EF%)	50.7	47.7	0.061
Drug Eluting Stent	53.8%	61.8%	0.358
Anterior Infarction by EKG	20.5%	46.2%	0.001

Results

- Overall mean time to hospital discharge in the earlier group was 3.28 days whereas it lengthened to 4.61 days in the later group (p < 0.001). Without exclusions (with the exception of transfers to other hospitals) the mean time to hospital discharge in the later cohort was 4.96 days. (Graph 1)

- Ten deaths were noted in the later group. No deaths were seen in the earlier group. (p=0.001)

- In the later group, 25 patients had cardiogenic shock compared with none in the earlier group.

- Left ventricular ejection fraction trended towards significance, being lower in the later group (50.7% vs. 45.7%, p = 0.06). The prevalence of anterior myocardial infarction was higher in the later group (p=<0.001). (Table 3)

- Even after excluding patients in cardiogenic shock, a clear difference is still noted in time to hospital discharge as it relates to door to balloon time.

Length of Stay

Conclusions

- Reducing door to balloon time is associated with reduced length of hospital stay.

- Short door to balloon times were associated with fewer mortalities and episodes of cardiogenic shock.

- A hypothesis for this difference could include salvage of more myocardial muscle by faster revascularization, as demonstrated by a trend towards higher left ventricular ejection fraction in those revascularized early.

- Confounding factors include increased prevalence of anterior myocardial infarction in the late cohort.

- Future direction involves quantifying scar burden by follow-up echocardiogram or MRI as well as examining outcomes at 30 days and 1 year.

A PASSION FOR BETTER MEDICINE.™

Lehigh Valley Health Network