Outcomes of ST-Segment Elevation Myocardial Infarction Involving the Left Main Coronary Artery

To the Editor: Coronary artery disease of the left main coronary artery (LMCA) is associated with poor clinical outcomes.[1,2] There are limited contemporary data from the United States on the outcomes of ST-segment elevation myocardial infarction (STEMI) of the LMCA.[1-3] We conducted a study to address this issue.

PATIENTS AND METHODS

Using the National Inpatient Sample, admissions of patients with a primary STEMI diagnosis (*International Classification of Diseases, Tenth Revision, Clinical Modification* codes I21.x-22.x except I21.4, I22.Ax, I22.2, and I21.9) who underwent coronary angiography between January 1, 2016, and December 31, 2016, were identified. LMCA STEMI was identified by *International Classification of Diseases, Tenth Revision, Clinical Modification* code I21.01. Demographic characteristics, comorbidities, percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), and noncardiac procedures were identified as previously described.[4] Outcomes of interest included in-hospital mortality, resource utilization, and management of LMCA STEMI. Survey procedures using discharge weights provided were used for national estimates. Multivariable regression was performed to identify predictors of in-hospital mortality. Statistical analyses were performed using SPSS Statistics for Windows, version 25.0 (IBM Corp).

RESULTS

During 2016, 159,860 patients with a primary STEMI diagnosis underwent diagnostic coronary angiography. Left main coronary artery involvement was noted in 410 (0.3%). Compared with the other patients, those with LMCA STEMI were older (67.1±11.9 vs 62.5±12.7 years), were more likely to have Medicare insurance (215 of 410 [52.4%] vs 67.607 of 159,450 [42.4%]), were more likely to be nonwhite (122 of 410 [29.9%] vs 37,152 of 159,450 [23.3%]), had higher comorbidity (mean Charlson comorbidity index, 3.9±2.3 vs 3.2±2.2), and were admitted to large hospitals (300 of 410 [73.2%] vs 92, 162 of 159,450 [57.8%]) (all $P<.001$). The LMCA STEMI cohort had higher rates of acute organ failure, cardiogenic shock, cardiac arrest, mechanical circulatory support, and CABG use (Table). The cohort with LMCA STEMI had higher in-hospital mortality (76 of 410 [18.5%] vs 9,248 of 159,450 [5.8%]; unadjusted odds ratio [OR], 3.72; 95% CI, 2.90-4.79; $P<.001$), longer hospital stay (7.9±7.9 vs 4.1±5.3 days), higher hospitalization costs ($177,389±$147,652 vs $110,388±$116,668), and fewer discharges to home (193 of 410 [47.1%] vs 123,574 of 159,450 [77.5%]; all $P<.001$). In the LMCA STEMI cohort, the in-hospital mortality was higher for patients who underwent PCI (61 of 255 [24.0%]) compared with those who underwent CABG (5 of 130 [3.8%]). In patients with LMCA STEMI, female sex (OR, 12.33; 95% CI, 4.20-36.23), cardiogenic shock (OR, 6.84; 95% CI, 2.30-20.33), cardiac arrest (OR, 69.23; 95% CI, 22.91-209.15), and use of mechanical circulatory support (OR, 3.15; 95% CI, 1.18-8.40; all $P<.001$), but not older age (>75 years) (OR, 1.22; 95% CI, 0.51-2.94; $P=.65$), were independent predictors of in-hospital mortality.

DISCUSSION

In this study, LMCA STEMI was associated with higher rates of cardiac arrest, cardiogenic shock, and acute organ failure and worse in-hospital

TABLE. In-Hospital Course and Management of STEMI Admissions[a,b]

In-hospital management	LMCA STEMI (N=410)	Non-LMCA STEMI (N=159,450)	*P* value
Cardiac arrest	70 (17.1)	16,583 (10.4)	<.001
Cardiogenic shock	175 (42.7)	19,772 (12.4)	<.001
Acute organ dysfunction			
Respiratory	135 (32.9)	23,439 (14.7)	<.001
Renal	105 (25.6)	22,801 (14.3)	<.001
Hepatic	25 (6.1)	3,986 (2.5)	<.001
Hematologic	60 (14.6)	7,175 (4.5)	<.001
Neurologic	35 (8.5)	8,610 (5.4)	<.001
Intravascular ultrasonography	20 (4.9)	7,335 (4.6)	.45
Percutaneous coronary intervention	255 (62.2)	136,649 (85.7)	<.001
Coronary artery bypass grafting	130 (31.7)	10,045 (6.3)	<.001
Pulmonary artery catheterization	30 (7.3)	5,740 (3.6)	<.001
Mechanical circulatory support			
IABP	145 (35.4)	14,191 (8.9)	<.001
Impella (Abiomed) heart pump	50 (12.2)	2,551 (1.6)	<.001
ECMO	15 (3.7)	478 (0.3)	<.001
Invasive mechanical ventilation	110 (26.8)	16,264 (10.2)	<.001
Noninvasive ventilation	20 (4.9)	2,073 (1.3)	<.001

[a]ECMO = extracorporeal membrane oxygenation; IABP = intra-aortic balloon pump; LMCA = left main coronary artery; STEMI = ST-segment elevation myocardial infarction.
[b]Data are presented as No. (percentage) of STEMI admissions.

outcomes. The patients with LMCA STEMI underwent PCI less frequently, and nearly one-third underwent CABG. Compared with previous studies, we noted lower rates of cardiac arrest and cardiogenic shock in this study.[3] ST-segment elevation myocardial infarction from LMCA continues to have a high in-hospital and long-term mortality with only slight improvement in temporal trends.[5] The optimal method of LMCA STEMI management remains to be defined and is largely determined by clinical acuity, coronary anatomy, and comorbidity. This study is limited by the use of an administrative database and lack of information on coronary anatomy, successful revascularization, and residual disease after PCI/CABG. In conclusion, LMCA STEMI is associated with high rates of cardiogenic shock, cardiac arrest, and acute organ failure. The outcomes of LMCA STEMI remain poor, and further research in this high-risk cohort is needed.

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Pain—Linguistics and Natural Language Processing

To the Editor: Leveraging the natural language of unstructured electronic health records for research purposes has robust potential for the study of pain. The purpose of this letter is to parse a metaphorical linguistics framework for the word *pain* that could augment natural language processing (NLP) research methods and broaden the understanding of the effects of pain on health outcomes.

TABLE. Metaphorical Framework for the Word Pain

Pain as an object	Pain as an adversary
• Can be described	• Disrupts activities
• Can be located	• Acts with intent
• Can be visualized	• Inherently negative
• Neutral character	• Potential for personification

Natural language processing is a branch of artificial intelligence broadly aimed at "exploiting rich knowledge resources with the goal of understanding, extraction and retrieval [of information] from unstructured text."[1] As the field of NLP advances, it will become increasingly important to understand the definitions and uses of the word pain in natural language.

The word pain has an interesting history in the English language. Originating from the Latin word *poena*, meaning "penalty" or "punishment," pain has been variously used to refer to physical distress, legal punishment, and existential suffering. Although the meaning of the word pain has come to be dominated by the biomedical definition, exemplified by the International Association for the Study of Pain's characterization of pain as "an unpleasant sensory or emotional experience" that has intrinsic associations with "actual or potential tissue damage,"[2] remnants of the word's origins are evident in phrases such as "on pain of death" and apologizing "for being a pain."

Perhaps even more interesting than the origins of the word is the