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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1. Stone GW, Sabik JF, Serruys PW, et al. EXCEL Trial Investigators. Everolimus-eluting stents or bypass surgery for left main coronary artery disease [published correction appears in N Engl J Med. 2019;381(18): 1789]. N Engl J Med. 2016;375(23):2223-2235.
2. Valle JA, Tamez H, Abbott JD, et al. Contemporary use and trends in unprotected left main coronary artery percutaneous coronary intervention in the United States: an analysis of the National Cardiovascular Data Registry Research to Practice Initiative. JAMA Cardiol. 2019;4(2):100-109.
3. Gagnor A, Tomassini F, Romagnoli E, et al. Primary angioplasty in ST-elevation myocardial infarction due to unprotected left-main coronary disease in a high-volume catheterization center without on-site surgery facilities: immediate and medium-term outcome; the STEMI-Placet Registry. J Invasive Cardiol. 2012;24(12):645-649.
4. Vallabhajosyula S, Prasad A, Sandhu GS, et al. Mechanical circulatory support-assisted early percutaneous coronary intervention in acute myocardial infarction with cardiogenic shock: 10-year national temporal trends, predictors and outcomes [published online ahead of print November 19, 2019]. EuroIntervention, https://doi.org/10.4244/EIJ-D-19-00226.
5. Davierwala PM, Leontyev S, Verevkin A, et al. Temporal trends in predictors of early and late mortality after emergency coronary artery bypass grafting for cardiogenic shock complicating acute myocardial infarction. Circulation. 2016;134(17):1224-1237.

Pain—Linguistics and Natural Language Processing

To the Editor: Leveraging the natural language of unstructured electronic health records for research purposes

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

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.

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

way the word pain is used in natural language. According to Lakoff and Johnson's conceptual metaphor theory,[3] many words are routinely used metaphorically to convey the meaning of concepts. For example, the conceptual metaphor "argument is war" can be seen in the following statements: (1) "Your claims are indefensible"; and (2) "I demolished his argument." Regarding the word and concept of pain, 2 highly pervasive metaphorical frameworks manifest in discourse including pain as an object and pain as an adversary. The difference between these 2 metaphors is largely dependent on agency; objects are conceptualized as being inanimate, but adversaries are conceptualized as having volition (Table).

These 2 metaphors highlight different aspects of pain. The object metaphor is useful for encoding the quality, intensity, and location of pain (eg, "sharp pain in my leg"), but it does not convey a comprehensive understanding of the experiential aspects of pain. The adversarial metaphor imbues pain with agency; thus, when pain is conceptualized as having volition or is negatively personified (eg, "this pain is killing me" or "my pain rarely gives me a break"), an in-depth understanding of the relationship between the sufferer and the pain experience emerges. Furthermore, sensitivity to the diversity of "pain vs sufferer" expressions can give insight into the reasons behind the variable and highly individualized phenotypes of commonly occurring pain syndromes (eg, fibromyalgia, chronic low back pain), which, in turn, can augment the clinical assessment and documentation of pain by practitioners.

Incorporating rigorous linguistic approachs[4] with ongoing advancements in NLP could drive development of metaphorically informed analyses that reflect the objective and adversarial metaphors of pain. Widespread deployment of these enhanced NLP techniques could open new avenues of epidemiological research and lead to a broader understanding of the effects of pain on health care resource utilization.

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1. Liu K, Hogan WR, Crowley RS. Natural Language Processing methods and systems for biomedical ontology learning. J Biomed Inform. 2011;44(1):163-179.
2. International Association for the Study of Pain. IASP terminology. International Association for the Study of Pain website. https://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1698. Accessed May 29, 2020.
3. Lakoff G, Johnson M. Metaphors We Live By. Chicago, IL: University of Chicago Press; 1980.
4. Pragglejaz Group. MIP: a method for identifying metaphorically used words in discourse. Metaphor Symbol. 2007;22(1):1-39.