

Improving heart attack response time

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While all heart attacks have the potential to be deadly, one type is referred to as the "widow maker" because of its high risk of death. A ST segment elevation myocardial infarction (STEMI) is a severe type of heart attack that occurs when a blockage in a coronary artery causes heart muscle to die; without prompt treatment risk of fatality increases dramatically. Coronary angioplasty, or percutaneous coronary intervention (PCI), is the most common emergency treatment for STEMI. During this procedure, an interventional cardiologist feeds a deflated balloon into the artery to the blockage where it is then inflated to open the artery and allow blood to flow to the heart muscle. Current clinical guidelines recommend that PCI be performed for STEMI within 90 minutes of the patient entering the hospital – this is commonly referred to as door-to-balloon time. Recognizing the potential to save even more lives with expedited treatment, Northwestern Medicine® researchers applied performance improvement strategies to lower door-to-balloon times at Northwestern Memorial Hospital, with the goal of creating an approach that could be applied to hospitals across the country. Their findings were published in the *Annals of Emergency Medicine*.

"Despite the current recommended 90 minutes, studies show that survival for STEMI patients decreases when door-to-balloon time exceeds 60 minutes," said principal investigator Rahul Khare, MD, assistant director of operations for Northwestern Memorial's [emergency department](#) and assistant professor of emergency medicine at Northwestern University Feinberg School of Medicine. "While some hospitals across the country achieve times under 60 minutes, there's still

room for improvement. The objective of our study was to put in place process improvements that would optimize door-to-balloon times not only at Northwestern Memorial, but that could be replicated elsewhere. The goal was to reduce door-to-balloon times to 60 minutes for STEMI patients."

Khare and his team utilized a proactive risk assessment method of failure mode, effects and criticality analysis (FMECA) to evaluate door-to-balloon time process at Northwestern Memorial. Pulling together a group that included emergency department and cardiac catheterization laboratory (cath lab) staff, as well as hospital leadership, the researchers mapped out the process from when a STEMI patient arrives in the emergency department to when PCI occurs in the cath lab.

"FMECA is a commonly used risk-assessment technique that has proven successful in high risk industries including nuclear power and aviation," explained Khare. "We modified this technique to fit a clinical setting. Our team included everyone who would respond when a patient with a STEMI arrives at the hospital— emergency physicians and nurses, EKG technicians, and the entire cath lab team from cardiologists to nurses, and even the secretary who answers the phone and takes the patient's information. Together, we were able to identify and evaluate 50 potential issues that could lead to a failure in achieving the goal door-to-balloon time of 60 minutes."

The group identified the causes of the process failures then ranked each based on its frequency and consequence, eventually categorizing 12 as high-risk steps. This information was then used to determine where improvements could be made when caring for STEMI patients. Using process improvement strategies and system redesign, one change put into practice by the team was to get an electrocardiogram (EKG) at arrival for any patient who came to the emergency department and stated they had chest pain.

"We found that there were factors which could cause delays in getting the EKG in our system, so we changed our operations so that the EKG was done when the nurses were getting the patient's vital signs," said Khare.

By identifying risks and implementing changes in process, the team achieved significant improvements in door-to-balloon times. "Our door-to-balloon times decreased by an average of 20 minutes," said Khare. "We saw the most significant and sustained benefits during off hours, which include overnights and weekends. Door-to-balloon times improved by 25 percent. What's truly amazing is that the 15 to 20 minute improvement in door-to-balloon time will decrease the overall death rates of these patients."

A benefit of the FMECA approach is that it brings together all members of the care team, which lead to enhanced communication and understanding of the different roles that each clinician plays in the patient care. Emergency department and cath lab staff were oriented and educated about the roles and responsibilities of the other members of the care team, which they may not have been exposed to previously.

"This research is an excellent example of the team work and quality improvement initiatives that occur at Northwestern Memorial to assure our patients are receiving the best care possible," said Mark J. Ricciardi, MD, director of cardiac catheterization and interventional cardiology at Northwestern Memorial and associate professor of cardiology at the Feinberg School. "With the emergency department and cardiac catheterization teams working together to identify areas for improvement, we now consistently achieve door-to-balloon times that far exceed the national benchmarks for heart attack care."

Khare's goal is for the work done at Northwestern Memorial to serve as a model for hospitals across the country as they seek to implement

change and improve care for [heart attack](#) patients.

"While every institution is unique, this performance improvement model can be applied at other academic and community hospitals, to identify their own vulnerabilities and potential failures in door-to-balloon time systems and processes of care," explained Khare. "We're also hopeful that this approach can be applied when responding to other emergent clinical conditions, such as stroke."

Provided by Northwestern Memorial Hospital

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