Abstract 16

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Title: Reducing Recognition-to-Balloon Time for Inpatient ST-Elevation Myocardial Infarction (STEMI)

Background:
It is projected that out of 11,000 inpatient STEMIs, 4,300 will result in death2(p6) The recent study published by Dai, X et.al on Acute ST-Elevation Myocardial Infarction for Noncardiac Conditions3 shows that it takes more than 2 hours (129 minutes) from the time EKG is done until the first device is activated and the occluded coronary artery is open. If 1-year mortality is increased by 7.5% for every 30 minutes of delay4, more than 2 hours of delay will mean an increase of 30% in mortality rate. This is further supported by Dai, X et.al findings with an in-hospital mortality of 39.6% for inpatient STEMI compared to 4% for outpatient STEMI3, leading to the conclusion that a patient who will have a STEMI outside the hospital will more likely survive the heart attack than a patient who is already admitted in the hospital which is extremely troubling. One of the reasons identified for the longer response time was the delay in the performance of the EKG. The recent initiative supports this by pushing on facilitating early diagnosis using prehospital ECG and rapid transportation to a PCI-capable hospital to reduce door-to-balloon time.5 For patients who are already admitted in the hospital, shorter response time can be achieved also by early diagnosis, that is, by streamlining EKG acquisition and interpretation and early activation of Code STEMI. So, this is the purpose of this performance improvement project: to determine if the use of an existing hospital resource like Rapid Response Team (RRT) can reduce the recognition-to-balloon time by providing means of streamlining EKG acquisition, interpretation and activation of CODE STEMI.

Methods:
The process improvement method that was use in this project is the Deming Cycle or the Plan-Do-Check-Act (PDCA). The first step is the “Planning” stage. This is where the process that needs improvement is identified. Plans on how the change can be implemented, as well as to measure the effect of the change will be part of planning. Once the plan is finalized, it is time to move to the next stage. The “Doing” stage is the implementation of the change. In this stage, all the people that will be affected by the change will be informed of the reason or need for the change as well as the actual change that will be implemented. After the change is implemented, the “Checking stage” begins and analysis of the data collected is done. Analysis includes the determination as to whether the process improves or not with the change, how to measure the improvement and whether new method is more difficult to use or not. The result from the Checking stage will determine what needs to be done in the “Acting stage”. If the new process works, then the “act” stage will involve continuous follow-up and measurement to sustain the process. But if the process did not work, then the act stage is to eliminate the change that was implemented and to start the cycle of PDCA again for new options and
alternatives.6 As part of the planning stage for this project, a retrospective review of existing data regarding all of the inpatient STEMI cases for two years was conducted. A total of 26 inpatients STEMI cases were reviewed, 14 cases the year prior to the implementation of revised Code STEMI and another 12 cases on the year after the implementation of the revised Code STEMI. The existing STEMI feedback form and patient's record were used in the review. The patient's record documented the time the EKG was performed, the time the physician was notified, the time he/she called back, any orders or interventions performed on the patient (e.g. nitroglycerin, morphine, etc), who and what time the CODE STEMI was activated, who responded to the code call, the present status of the patient, and the decision of the responding physician. The STEMI feedback form, on the other hand, contained the time the team was activated and called, time the patient was brought to the cath lab, the time the team and interventionalist arrived and the time of first device activation (FDA). After the retrospective chart review, a meeting with the Acute Coronary Syndrome (ACS) Committee to discuss the identified cause of delay was set-up. Among the issues and causes of delay that were identified were as follows: 1. Only telemetry and critical care units have the protocol to perform an EKG for patients complaining of chest pain, the rest of the units need to obtain or call for a doctor’s order. 2. Telemetry units have the protocol of administering nitroglycerin for chest pain relief. Protocol is to administer it for chest pain sublingually every 5 minutes times three doses. Because of this protocol, most nurses will wait until after the protocol is carried out hoping for relief before they will decide to call the physician for more orders. 3. The absence of a physician at the bedside to immediately read/interpret the EKG results in the need to call the physician to notify them of the patient’s change in condition or complaint. The call would usually results to a longer waiting time, which reflects how long it takes for the physician or the physician’s service to call back. There were also cases where the EKG needed to be faxed to wherever the physician is so he/she can interpret for any change or presence of ST elevation. During the discussion, it was determined that one-way of reducing response time is to have a physician readily available to interpret the EKG and to activate the CODE STEMI if needed. Further discussion came to the realization that the existing hospital RRT was a potential resource. The RRT is composed of a hospitalist (MD), the nursing supervisor, a critical care nurse, respiratory therapist and a security officer. The purpose of activating the RRT is to assist the staff, patients and family members with assessment, stabilization and if necessary, transferring a patient to a higher level of care. The goal is to intervene before a clinical situation gets worse. By activating the RRT, additional resource can be brought at the bedside, more specifically a physician that can help assess the patient, interpret EKG, give order and activate the CODE STEMI if needed. Since the hospitalist will be the one that will respond, the proposed changes were first presented and discussed with this physician group. Once an agreement was reached, the modification to the policy was created. Part of the DO stage was the modification in the Code STEMI Policy, specifically calling or activating a RRT for all admitted patients with complaint of chest pain. An immediate EKG will also be performed so that it can be interpreted when the hospitalist arrives. This modification to the CODE STEMI policy was also presented to the Critical Care Committee and Code Blue/RRT Committee for approval and a diagram to simplify the steps and processes was also created (figure 1). Information was disseminated and education was started utilizing the E-learning (HealthStream), unit huddles, unit meetings and emails via E-shifts. The revision
was also presented to the Nursing Professional Practice Council and to the hospital Medical Executive (medexec) Committee. The Clinical Nursing Education Department consisting of Clinical Nurse Specialist and Nurse Educators were recruited to assist in education and information dissemination. Finally, the electronic version of the STEMI Policy was also revised reflecting the new process. Once all staff and responsible parties were informed and educated, implementation follows. Data was continuously collected after the implementation.

**Results:**
Guidelines for patients having STEMI recommend a door-to-balloon time that is equal to 90 minutes. A significant disparity exists on the care and outcome between patients who suffer from STEMI while admitted in the hospital as compared to those who had STEMI as an outpatient. Review of the hospital’s data for two years revealed that the average door-to-balloon time for patients presenting in the ED is 66 minutes as compared to our inpatient STEMI of 156 minutes. Specifically, the hospitalized in-patients mean for onset/complain-to-EKG takes 15 minutes, EKG-to-interpretation takes 36 minutes and interpretation-to-activation of Code STEMI takes 68.5 minutes, totaling to 156 minutes from recognition to balloon. Analysis of one-year post-implementation data revealed a significant improvement. The onset/complain-to-EKG was reduced from 15 minutes to 3 minutes, EKG-to-interpretation from 36 minutes to 0, the interpretation-to-activation of code STEMI from 68.5 minutes to 3 minutes with a total of 39 minutes from 156 minutes recognition-to-balloon time (figure 2).

**Conclusion:**
If the goal is to improve morbidity and mortality for all STEMI patients is a D2B time of less than or equal to 90 minutes, the inpatient STEMIs should not be excluded in this goal. To achieve this goal, it is necessary to streamline the EKG acquisition and interpretation and to systematize the activation of inpatient Code STEMI. One way of achieving this is by using and activating existing hospital resources like the Rapid Response Team (RRT) to bring the necessary resources at the bedside, specifically the physician that can help assess patients, give order, interpret/read an EKG and activate a code STEMI if needed. By doing this, it can speed up the process and reduce recognition-to-balloon time for inpatient STEMIs. Early reperfusion saves more myocardial muscle. This will in turn improve patient outcomes, reduce morbidity and complications, shortens length of stay and reduce mortality. And since existing hospital resources were utilized, it did not entail additional expense and finances to enact the change.