Primary Percutaneous Coronary Intervention (PCI) within 90 Minutes of Hospital Arrival for Heart Attack Patients Meeting the Improvement Challenge

Tools and Resources for Hospital Performance Measurement Improvement Activities

Twenty-first in a series of targeted quality improvement articles

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Illinois Hospital Association

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Improvement Challenge

One of two related timing measures (AMI-8 & 8a) for percutaneous coronary intervention (PCI), this measure examines whether heart attack patients with positive electrocardiograph (ECG) changes undergo a percutaneous coronary intervention (PCI) procedure within 90 minutes of hospital arrival.

Previously, this measure (AMI-8a) examined heart attack patients receiving PCI with a time from hospital arrival to PCI of 120 minutes or less. Effective with 3rd quarter 2006 discharges, the measure changed to a time from hospital arrival to primary PCI of 90 minutes or less. This change in the measure is consistent with 2004 guidelines of the American Heart Association and the American College of Cardiology.

Illinois hospitals in the 3rd quarter 2006, the most current available performance data, achieved 54.2% compliance with the PCI within 90 minutes hospital arrival measure. As this is a recently updated measure, there are no national performance data available at this time. The goal for Illinois hospitals is continuous care improvement and greater use of evidence-base for the measures.

Primary Percutaneous Coronary Intervention Measure Description.

Heart disease and heart attacks are a leading cause of death in the United States. Simply stated, a heart attack occurs with a complete blockage (occlusion) of the (coronary) arteries that feed the heart muscle (myocardium). The loss of blood flow leads to diminished oxygenation and subsequent damage/death (infraction) to the effected heart muscle.

A heart attack is a life threatening event that requires rapid evaluation and intervention. The goal is to restore blood flow (reperfusion) and prevent further damage to the heart muscle. Primary (emergency) PCI therapy is a mechanical reperfusion therapy usually performed in the cardiac catheterization lab by an interventional cardiologist and team and is recommended for patients exhibiting signs and symptoms of heart attack that present to the emergency area with an ECG consistent with ST-elevation (STEMI) or left bundle branch block.

For a comprehensive overview of STEMI and PCI including a case vignette, therapeutic recommendations, pathophysiology, clinical evidence and use, adverse effects, guidelines, major clinical studies, review the recent 2007 *New England Journal Medicine* article Primary PCI for Myocardial Infarction with ST-Segment Elevation at: http://www.nejm.org; select Past Issues, select 2007, select January 4, 2007, scroll to article title and select Free Full Text. Note: the free full text article includes a video

animation showing the heart anatomy, PCI with balloon angioplasty and stent placement, and the associated ECG changes.

Calculating the Measure's Performance. **AMI-8a** Primary PCI received within 90 minutes of hospital arrival is reported as a proportion, based on:

- Numerator includes AMI patients whose time from hospital arrival to PCI is 90 minutes or less and all of the following denominator values.
- Denominator includes AMI patients with ST-elevation or LBBB who received PCI with:
    - Principal Diagnosis Code of 410.XX (refer to Appendix A. Table 1.1 from the Technical Specifications Manual), **and**
    - Principal or Other Procedure code for PCI (refer to Appendix A. Tables 1.2 from the Technical Specifications Manual), **and**
    - ST-segment elevation or LBBB on ECG performed closest to hospital arrival, **and**
    - PCI performed within 24 hours after hospital arrival.

A Fuller Understanding of the Measure

With the recent change in this measure from 120 minutes to 90 minutes, a shorter and more rapid intervention time, hospitals may see a decline in their compliance for this measure when compared to previous quarters. As will be demonstrated in the following hospital vignettes, these hospitals achieved continuous improvement by recognizing that the total time for door-to-balloon was comprised of several care processes involving multiple hospital areas and disciplines. These quality review teams reviewed all their cases for timing delays and not just those with time frames greater than 90 minutes. Further, to enhance the interpretive value, these measures are best used in conjunction with each other PCI measure (AMI-8) Median time to Primary PCI.

Successful Quality Improvement and Compliance Experiences Shared by Illinois Hospitals

The experiences and successes for achieving compliance with PCI for AMI are presented below from hospitals representing a variety of characteristics and locations throughout Illinois. The Illinois Hospital Association appreciates the efforts of these hospitals in sharing their experiences with others and also the sharing of contact names at each hospital for follow up questions or discussions.

Some common and unique success factors or strategies include:

- Multidisciplinary quality review teams
- Concurrent quality review
- Review of all cases
- Goal setting, establishing time thresholds
- Communication and feedback
- Education and recognition of each staff's contribution to the team effort

OSF Saint Francis Heart Hospital, Peoria, Illinois

OSF Saint Francis Heart Hospital staff identified early detection, communication, teambuilding, and feedback of performance measure data as key elements driving improvement with primary percutaneous coronary interventions (PCI). Process changes trace back to the mid 1990s relates George Hevesy, M.D., Director of Emergency Medicine, "Where we historically started to do pre-hospital 12-lead ECGs." Recently promoting and increasing early detection of ST elevation from the field by the ambulance crews and notifying the hospital emergency staff prior to the patient's arrival has been a focus of the team.

"In an attempt to educate the paramedics to the importance of the 12-leads," relates Dr. Hevesy, "we established a Cardiology Emergency Medicine Conference every month. Present were the cardiologists, emergency medicine physicians, residents, area emergency staff, and the paramedics. At this conference pre-hospital tapes were played, door to PCI times were presented, how the patient was packaged was discussed and ECGs were reviewed and critiqued," shares Dr. Hevesy.

"What has happened is we developed a dialogue and the dialogue has grown over the years – where we not only talked about the negatives (what we could improve) but more importantly we talked about the positives (what we did well)." Dr. John Rashid, Cardiologist with Heartcare Midwest, agrees "We did this for years …leading to open good discussions, sometimes uncomfortable, but it was all teambuilding."

Teambuilding and team work have allowed for honest and direct communications. Dr Hevesy shares, staff "have the ability to say to one another they did something wrong – without feelings being hurt…that is the key to being successful here is getting that communication to work towards a common goal."

Improving communication impacts many steps in the process of reducing door-to-balloon time; notification is one key element. "We have a process where we activate a code (777) called when a patient is identified as a ST elevation…and that can be pre-hospital or at the hospital," shares Mary Brown, R.N., Cardiac Program Coordinator. The ED physician calls the hospital operator and they page the cardiologist and the cath lab staff with the code. This activates the process and the cath lab comes in at that time. This process has increased the reliability of response as "communications is one of the first things that get lost in the chaos," adds Dr. Hevesy.

"We identified that the patient needed to be packaged in the emergency area quicker and not really unpackaged from the ambulance but left hooked up so they could be quickly transported" to the cath lab, shares Ms. Brown. Another recent improvement involved placing timers on patients as soon as they were diagnosed with an ST elevation MI. The timers provide a strong visual cue reminding staff of the urgency to move the patient along. Dr. Hevesy adds, "the timers help prevent delays …and we are only doing the essential things that need to be done, the bare essentials, and we've looked at everything – does this need to be done or doesn't it!' John Rashid, M.D. agrees and acknowledges,

"When patients come in with a STEMI and the ECG shows such, sometimes they people don't look like they are in distress. Sometimes there is not an urgency to get patients rolling - the timers are also useful reminders to get the patients packaged and delivered!"

Several staff remarked on the importance of sharing the performance data. This has led to additional improvements and fewer delays. "We decided to send out a spread sheet in real time with all the times noted, along with physician's names. Staff can see the good times and the not so good times."

Teresa Dougherty, R.N., Clinical Educator in the Cath Lab, explains further that the EMT training also includes observation in the cath lab. Through this experience, EMTs are able to "see the importance of their participation in the team and why rapid transport and pre-hospital ECGs are important. They are able to see first hand the coronary tree, the blockages, watch the blocked vessels opened and watch the ECG changes; this provides them with a visual that reinforces why their work is important."

Self assessment methods have also been used in their improvement process. Uncertain as to the source of delays in the door-to-balloon time, team members formally met and established "certain parameters and targets we wanted to meet," relates Dr. Rashid. "Establishing time frames and targets to steps in the process allow us to see which parameters need to be improved." Ms. Brown continues, "Every two months we look at all the cases over 90 minutes to determine where we could do a better job." She adds, as processes have been improved over time, future improvement gains are targeted towards identifying "patients that are less obvious – the more atypical patient". Dr. Hevesy echoes similar concerns stating the need of "getting out the media message that people need to come in sooner" …acknowledging that many people sit at home in denial, even driving themselves in to the hospital and that "only thirty percent patients having a heart attack come in by ambulance."

Dr. Hevesy realizes the importance and value of the gains ED and Cardiology have made and envisions sharing their knowledge, and their process model (the communications, consensus and teambuilding) to stroke patients arriving at the hospital. Like MI patients these patients would also benefit from rapid intervention. Contact: Mary Brown, R.N., Cardiac Program Coordinator at Mary.E.Brown@osfhealthcare.org.

Northwestern Memorial Hospital, Chicago, Illinois

A critical element in Northwestern Memorial Hospital's improvement in time to primary PCI is a result of a thorough and meticulous review of each patient case reports Rahul Khare, M.D., Emergency Physician. "Having physicians and nurses invested – examining each case – that has had a dramatic effect on reducing door-to-balloon time."

"We implemented a strong multidisciplinary approach to handling patients with acute coronary syndrome and particularly ST-elevation MIs," states Charles Davidson, M.D., Director Cardiac Cath Lab. "This involves rapid identification of patients with chest pain

and ST-elevation, timely activation of the cardiac cath lab team and quick triage of the patient to the cath lab."

The multidisciplinary approach is also represented in their quality improvement reviews. The review process includes "all emergency area patients that went to the cath lab," adds Dr. Khare. The Quality Management team is comprised of "cath lab attending physicians, senior interventional fellows, cath lab nurse clinicians, cath lab and CCU managers and representative from Emergency Department (MD and RN)," shares Raffy Syegco, R.N., M.S., C.C.R.N., Clinical Coordinator, Cardiac Cath Lab.

The team scrutinizes each case, looking at the "history and physicals, labs and ECGs," states Dr. Khare, and with a particular focus on care processes and a review of "all the time intervals" for the patients echoes these Northwestern staff. The team has met each month for the past two years.

According to Mr. Syegco, "NMH has established time goals for each segment of the process – "door to ECG time, ECG to cath lab notification, time of cath lab notification to start of the procedure." The team looks for delays in these processes – "Identifying the outliers in the system times such that we go back and make changes to the systems," explains Dr. Davidson. He acknowledges there are certain cases that are "inherently going to be longer – cardiac arrests, where the initial ECGs are not diagnostic, atypical presentations; more clinical delays. We look at all the delays but focus on system delays where staff can change and improve the systems/care processes."

"Even if the patient met the goal of 90 minutes, we are still looking at the time segments to see if we can get a little better," states Mr. Syegco.

"At this time, ECGs are not performed by EMS personnel in the field," relates Dr. Khare. Therefore the hospital's does not benefit from early notification – meeting the time frames and shortening time intervals will occur through continued changes to internal hospital care processes.

Recognizing that it "so vital to get timely ECGs," the emergency area implemented several process changes. The monthly reviews "helped magnify the problems for the emergency and cath lab staff," explains Dr. Khare, "such as delays in ECG. For patients with complaints of chest pain, we include the ECG as part of the vital signs." Further, "ECG technicians are empowered to access the emergency area physicians – to ensure the attending physicians have looked at each ECG," said Dr. Khare. He continues, "We provide education and feedback to the technicians, so they understand the value of their role and the need to timely ECGs."

Recently, the hospital added an additional "triage bay" to the emergency area to facilitate more timely access to ECGs. As the hospital is located in the heart of down-town Chicago, Dr. Khare tells, NMH has "a high volume of pedestrian traffic and with close proximity to the Chicago lakefront – we have a disproportionately high volume of patient walk-ins.

During normal hours of operation, the cath lab is staffed and patients are transported to the next available room. “Off-hours are more of a challenge to meet the new 90 minute time frame,” shares Dr. Davidson. “Activation of cath lab includes the attending, a fellow, and technical and nursing staff – with staff required to live within 30 minutes distance to the hospital and that they are able to respond with that time frame.”

Increasing the on-call cath lab staffing has improved the off-hours response times according to Mr. Syegco. With an increase in the on-call staff from two to three, the hospital is better able to receive the patient when the required personnel are present. The team is considering other measures to improve response times during off-hours. Dr. Davidson ponders, “Can we use staff in other places in the hospital to help mobilize patients and the cath lab – can we have staff positioned close to the hospital?” Both Drs. Khare and Davidson appreciate the value of pre-hospital ECGs acknowledging that pre-hospital ECGs done by the paramedics in the field would be very helpful in meeting the time frames by shortening the time the patient remained in the emergency area. Contact: Raffy Syegco, R.N., M.S., C.C.R.N., Clinical Coordinator, Cardiac Cath Lab at rsyegco@nmh.org.

Edward Hospital, Naperville, Illinois

Acknowledging the difficulties that many centers have with achieving the 120 minute timeframe for door to balloon, Edward hospital staff “realized there wasn’t any one major problem” in their process but saw an opportunity to save a series of minutes along each step that would result in improved and shortened time, relates Mark Goodwin, M.D., Medical Director of the Cardiac Catheterization Lab. Edward Hospital clinical and quality leadership assembled a multidisciplinary team including physicians, nurses and staff, from emergency area, cardiology, cath lab, communications, administration and local area paramedics – “putting everyone together to consider the process also made persons more attentive” to their actions and activities, notes Dr. Goodwin.

Improvement focused on time, continues Dr. Goodwin, as we “took every step we are doing and asked why we were doing it rather than it was the historical way of doing things and trying to prove it.” Key opportunities focused on ECGs, effective communications, paging and cath lab response, and meticulous monitoring and feedback to individual team participants.

“The process starts with getting the paramedics’ rigs to have ECGs available,” recounts Dr. Goodwin. Change occurred over a long time as hospital staff educated paramedics of the value of early detection – “the three minutes on the front end for the paramedics to do the ECG and notify the hospital may save 20 minutes” to do the same when the patient arrives at the hospital. With “changing technology, it is much simpler to transmit from the field,” states Nickie Everett, Clinical Cardiac Data Registrar, and “all of our surrounding villages (except Plainfield) have the capability to transmit 12-lead ECGs. In addition we train the paramedics in 12-lead interpretation so they can recognize an acute MI by looking at the strip.”

Not unlike many other hospital emergency areas, most MI patients are not transported by ambulance but arrive at the hospital on their own or with the assist of family or friends recounts several Edward's staff. To improve time to ECG, Edward Hospital staff adopted the approach that "any patient over the age of 30 with pain above the waist must have an ECG done within five minutes," relates Cindy Rentsch, Emergency Department/CDU Clinical Director. To speed the process, patients do not need to wait for a bed; the emergency staff has a holding area where the ECGs can be done.

"We have also empowered the nurses and staff - through education, ECG training and interpretation, feedback at staff meetings, sharing the data," recounts Ms. Rentsch. Dr. Goodwin explains further, "a nurse in the emergency area can call a "Cardiac Alert" if they think the patient is having a heart attack. They do not wait for the emergency doc to page the cardiologist and cath lab staff." A "Cardiac Alert" is used to notify key staff including the cath lab staff. When off site, staff has a limited time to return to hospital and prepare to receive the patient. "This has been a big time saver – you would rather over call (notify) then under call – you want to allow for it and not penalize for it," states Dr. Goodwin. Ms. Everett echoes a similar message, "Sometimes we have false alerts – it has never been punitive, it has always been well accepted that we will have a few false alerts – we would rather error on that process than not call one that is valid."

Cath Lab involvement in the emergency area trims additional time and facilitates peer-to-peer communication. When all cath lab staff has arrived, instead of emergency area staff transporting the patient to the lab, additional time was cut from the process by having cath lab staff come to the emergency area. "Cath Lab staff preps the patients in the emergency area, gets a face-to-face report and works with the family – this moves the entire process smoothly and more quickly," shares Kerry Boyle, Manager, Cardiac Cath Lab.

Feedback is a critical element in Edward Hospital's improvement efforts. "There is constant feedback on ECG times. On seeing your numbers – you are never quite as good as you think you are, and if you stop measuring you don't stay as good as you think you have been," relates Pete Schubel, M.D., Emergency Physician. Feedback is given to all the staff involved - "if you don't know where your opportunities are you can't fix them," adds Yvette Saba, Administrative Director, Cardiac Services. "It is really open communication – sharing information and identifying where the opportunities for improvement are."

Commenting further about the feedback process, Dr. Goodwin adds, "every case gets reviewed" with cases over the allotted time handled on a peer-to-peer basis. "Just the thought that they (cardiologists) are in charge, makes them a little bit more involved in wanting to get it done – it is not someone else's problem – they are held responsible for it," declares Dr. Goodwin.

Paramedics are also included in the feedback process. “They are asking for feedback – and it is included in regular continuing education programs with EMS personnel, relates Pat Murphy, EMS Program Manager.

Real time data collection and auditing takes place with the use of the Cardiac Alert Audit Form. In order to track crucial process times, a Cardiac Alert Audit Form in generated in the Emergency area accompanies the patient to the Cath Lab – “the form allows us to pinpoint the times and so determine if there are delays anywhere along the process,” shares Joanne Abeling, Manager Clinical Data Services. Ms. Rentsch adds, “In the emergency area staff meetings, we share the data. However, with outliers, doing this one-on-one seems more effective – and allows for discussion about what were the situational variances and areas of miscommunication or misinterpretation – we have better outcomes with one-on-one approach.”

Asked about where future opportunities exist, Dr. Goodwin and staff shared these goals:

- Every EMS rig has the capability of performing and transmitting ECGs
- A decrease in the door to balloon time to less than 60 minutes
- A decrease in mortality
- A decrease in time to ECG, and
- A recognition of patients presenting with vague symptoms to enhance recognition and intervention.

Dr Goodwin elaborates, “I know that door to balloon time of less than 60 minutes may seem as a stretch” but it is achievable during the day time hours and “if we make it easy on ourselves, we are not going to get any better.”

Primary PCI Web Based Resources

See Appendix I for PCI web-based resources.

For additional information about AMI-Primary Percutaneous Coronary Intervention measures, Hospital Compare measures, or to comment on this series, please contact Tim Philipp, Director, Quality Improvement at tphilipp@ihastaff.org.

APPENDIX I. AMI - PCI Web Based Resources

This document offers web resources about AMI – Percutaneous Coronary Intervention (PCI) useful in your improvement efforts. To access the materials below, click on or enter the web address and follow the additional steps.

PCI Guidelines/ Recommendations.

- ACC/AHA/SCAI 2005 guideline update for percutaneous coronary intervention. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/SCAI Writing Committee to update the 2001 guidelines for percutaneous coronary intervention) at the Agency Healthcare Research and Quality (AHRQ) National Guideline Clearinghouse. Go to: http://www.guideline.gov/, enter "PCI" into search box (upper left), scroll to title of interest.
- Cardiovascular Annotated Bibliography (last updated January 2007) at www.medqic.org, select Hospitals (top menu bar), select AMI (left menu bar), select Literature (right menu box), scroll to title of interest.

Educational.

- D2B – Door to Balloon an Alliance for Quality is a guidelines applied in practice program launched by American College of Cardiology provides hospitals key evidence-based strategies and supporting tools for reducing D2B. Go go: http://d2b.acc.org/, select Presentation & Slide Shows (left menu bar) for education and intervention stories.
- Reperfusion Performance Measures for AMI: Fact Sheet (January 2007) describes measures changes and addresses abstraction issues for discharges July 2006 forward. Go to: www.medqic.org, select Hospitals (top menu bar), select AMI (left menu bar), enter "PCI" into search box (upper right), scroll to title of interest.
- Current discussion addressing door to balloon with additional resources can be viewed at the American Heart Association, at www.americanheart.org, select Science and Professional (left menu bar), select Library, enter "door to balloon" in search box (upper right).

Intervention Tools.

- Review change, intervention strategies, and results for reducing door-to-balloon time at the Institute for Healthcare Improvement, go to: http://www.ihi.org, select Topics (left menu bar), select Reliability, select Reliability General, select Improvement Stories, see two topics: Reducing Door-to-Balloon Times in a Community Hospital, Reliability Design: Improving Core measure Performance for AMI.
- Review key themes characterizing experiences in hospitals successful with decreasing door-to-balloon times in Achieving Rapid Door-to-Balloon Times: How Top Hospitals Improve Complex Clinical Systems. Downloaded free from Circulation Journal at www.circ.ahajournals.org/, select An Issue from the Achieve, select 2006, volume 113, pages 1079+.

- Review key strategies associated with faster door-to-balloon times in Strategies for Reducing the Door-to-Balloon Time in Acute Myocardial Infarction. Downloaded free from New England Journal Medicine at www.nejm.org/, select Past Issue (top menu bar) select 2006, November 30, pages 2308+.

Institute Healthcare Improvement (IHI) Tools and Materials.

- As part of the 5 Million Lives Campaign, the IHI provides educational and interventional tools and materials for delivering reliable, evidence-based care for AMI. To review, go to: http://www.ihi.org, click on the 5 Million Lives logo, scroll down to Interventional Materials, select Improve Care for Acute Myocardial Infarction. Registration is required to access IHI materials. Registration is free and open to all.

Frequently Asked Questions – (FAQs)

FAQs often reflect the insights and concerns of hospital staff involved in clinical care and data collection. Use FAQs as your first source to answer clinical and data related questions. FAQs are also an important educational tool for novice and expert.

- For Topic, select Hospital-AMI Measures or Hospital-AMI Interventions. Enter key words noting that different key words: PCI, primary PCI, ECG, STEMI; will increase your returns (with some duplication). If Topic defaults to All Topics, then entering PCI will show more 500 FAQs. Responses address data abstraction, clinical practices, and documentation issues.

To review FAQs or to ask a new question, go to: www.medqic.org, from top menu bar select Home, from left menu bar select FAQ.