Acute Myocardial Infarction: Early Strategies to Optimize Results

Speakers: *William O'Neill, MD and Raoul Bonan, MD*
Moderator: *Patrick Whitlow, MD*
Panelists: *Paul Overlie, MD, Roxana Mehran, MD, Ted Bass, MD, Fayaz Shawl, MD, Norberto Schechtmann, MD, Greg Braden, MD*

Greg Braden: Let's discuss the issue of MI patients who live in communities where there is quick access to catheterization laboratories, versus those in remote communities who don't have easy access to cath labs. We live in a modestly rural area where about half of our patients come from other towns. The optimal strategy to manage those remote area patients is one of our biggest challenges in terms of widening the window of opportunity during which myocardial preservation can be achieved. This will increasingly play an important role in our work.

Another issue involves the need for in-hospital education on treating infarcts as emergencies. This is an issue that we still battle at our institution, as most of you probably do as well. Sometimes we are all ready to go, but we can't find a nurse to help bring the patient over from the emergency department to the cath lab because the emergency department doesn't treat the situation as a true emergency anymore. There are various internal challenges we face regarding the reduction of treatment times — all of which I think can be surmounted with better education. We will end up "keeping score" because Medicare will begin requiring it. This will actually be a positive step, since it will force people to evaluate the various components of their time more closely.

Raoul Bonan: We still face the problem of time lost, because most patients live a distance from the nearest cath lab. The myocardial infarction cooling study that Bill discussed proved that myocardial salvage can be achieved if the patient's temperature is reduced (below 35° C) before reopening the artery, particularly in anterior MIs. I believe that cooling for myocardial infarction will have a big impact on patient outcomes. We have launched a feasibility study on mild hypothermia for acute MI with hydrophilic pads holding circulating chilled water that can be placed non-invasively on the patient in the emergency room. After placing the pads, the patient is transferred immediately to the cath lab for direct PCI. We discussed here the example of the 56-year-old female patient whose body temperature we were able to cool down in less than an hour to 34.5° C. Patients were given demerol to prevent shivering and tolerate hypothermia. We have completed this feasibility study in which and we were able to achieve a temperature of 35° C in an average of 61 minutes in one group of patients, and 34.5° C in 79 minutes. We learned how to give the patients demerol at the proper dosage, because once a patient begins to shiver, it is very difficult to control. We obtained authorization to administer a 1 mg/kg bolus dose of demerol, which allowed us to achieve the temperature goal in the last 4 patients in 44.5 minutes. Shivering was controlled in this manner in all but one young patient. The day following the procedure, we had each patient complete a questionnaire and all agreed to accept the procedure again if needed.

For optimal results, therefore, treatment must begin in the emergency room, transfer to the cath lab must be rapid, and shivering must be managed with a fairly aggressively-sized dose of demerol to start. This, of course, requires an initial learning curve. We must design a study to prove that this strategy will be useful for anterior MI patients. Of interest, the CRP levels in all of these patients were low at baseline, and elevated at 24 hours.

Richard Heuser: I want to add to what Greg was saying about the problem with education and the nursing staff, in particular. The nurses just don't seem to get it. In the ambulance and in the emergency room, there is nothing being done for the patients. We need to reperfuse them! What I like about the cooling strategy is that we're not holding anything up; we can cool the patients down as we take them to the cath lab. It makes a lot of sense. Perhaps we won't use demerol, but I don't think it's a big issue. The feasibility study clearly shows that the side effects from demerol are not a problem. I come from the mid-1970s era when MI patients were simply given oxygen and morphine. The cooling strategy allows us to do something for infarct patients before they arrive in the cath lab. Despite the lack of evidence that cooling will work in all of these patients, the primary work that Bill O'Neill has done suggests that it will work in many of them. It certainly merits further study in the form of a larger trial.

Raoul Bonan: Yes. Any time that myocardium can be preserved is beneficial. Here, I am talking about hypothermia, but we could find other techniques that could be used on the patient in the period between their beginning of symptoms and their re-opening of the artery during which there is at least a two-hour delay between the onset of chest pain and treatment.

Patrick Whitlow: For the past 20 years, we have been trying to get EMT technicians to perform ECGs and transmit the data to us, but the system is fraught with inertia, and getting these people to change is extremely difficult. It is a worthwhile project that we need to keep working at, but in 20 years' time, I think there are only a couple of cities in the U.S. where this strategy has been successfully implemented. We need people like Bill and Raoul to help us get these programs launched in our own communities.

Raoul Bonan: I would like to add that we must meet with our colleagues in Europe and learn more about what they are doing. For example, the Netherlands and France have established specialized tertiary centers to which many hospitals refer patients directly. Something can be done for these patients during their transport to these centers.

Roxana Mehran: In the U.S., unfortunately, cardiologists are not as involved as they could be, because they are too busy in the cath labs to take the time to talk to the E.R. physicians, let alone the EMT technicians. In Europe, it's a completely different story. Physicians with cardiology training even ride in the ambulance, for example; they rotate turns riding in the ambulance. In the U.S. I don't know where we are going with this; we can talk a lot about it, but until we are dedicated and willing to step out of the cath lab and go down to the E.R., or even ride in ambulances, then I don't think we will ever solve the early diagnosis and intervention problem and radically shorten the time-to-treatment.

William O'Neill: I think that there is a looming manpower crisis in interventional cardiology. I have already seen fatigue occurring at centers in Southeastern Michigan. Our state has passed a law that allows angioplasty without surgical back-up. Four hospitals have applied to do this, three of which could not get cardiologists to come perform the procedures. We will be saying "no mas!" We just cannot do any more. How many years are we interventionists going to be able to continue getting up at 2:00 am to treat MI patients?

When I look simplistically at the U.S. healthcare system, I find that the biggest deficiency lies in the ambulance system. These companies

are privatized and barely make a profit. It is very difficult to get them to do anything new. They won't buy ECG machines because they can't afford them. In addition, there are some very stupid laws that require them to take patients to the nearest hospital, even if, for example, the patient is one of mine and specifically asks to be brought to Beaumont. Instead, that patient is taken to some closer, smaller hospital. I will invariably get a call 4 hours later to be informed that the patient is infarcting and is in shock. I am asked at this point to take the patient. Thus, there are a number of logistical hurdles that must be overcome.

In my view, there will be two systems in the U.S.: 1) either more angioplasty procedures will be performed in small hospitals, or 2) an increasing number of heart attack treatment centers will be established. Both the CDC and the ACC are beginning to take the lead and are developing protocols for heart attack centers.

Fayaz Shawl: In Maryland and the Washington, D.C. area, most of the hospitals that do not perform routine interventional procedures do perform direct angioplasty, with very good results. The data from the SEAPORT trial are quite impressive. At my institution, we would have a hard time getting AMI patients during the daytime because we are so busy with elective cases. Our philosophy is that unless the patient is really sick and hypotensive, he or she does not receive direct intervention. Our patients do very well on thrombolytic therapy because it really buys us time when the lab is not available.

Brian Firth: As Roxana was saying, it is really a question of commitment. At Montreal Heart Institute, we have an arrangement with our staff where on-call days for direct angioplasty cases are followed by a day off. That way, staff members cannot use the excuse that they are too tired. The city knows about this arrangement and that patients will not be refused.

The manpower issue is an important one, but there is also the issue of economics for the hospitals. In New Jersey, the Commissioner of Health is a cardiologist who has made an effort to institute better therapy for AMI patients. In the state of Maryland, David Williams recently headed up a panel that provides advice to the state on how to influence this process from a political standpoint. I sit on New Jersey's Health Commission Advisory Committee, and we run right into this problem. Ours is a small state in which you would think the problem could be fairly easily tackled, but the politics involved in implementing a program that would cause ambulances to bypass certain hospitals in favor of others is daunting. There is so much political pressure to avoid doing that, because cardiovascular services, between the cath lab and cardiac surgery, constitute approximately 50% of many hospitals' profits. Thus, diverting patients away from certain centers — giving them the image of non-cardiac centers — has major ramifications. This economic and political problem is another big difference between the U.S. and the United Kingdom.

Howard Cohen: The economic issue also has implications on the the decision-making process, which adversely affects our patients. We have been asked to perform interventions without surgical back-up at small outlying hospitals because these hospitals want to watch their bottom line, and to offer convenience — though not necessarily safety — for the patients. Many institutions put a lot of political pressure on their cardiologists to perform these non-surgical back-up procedures, despite the fact that this is not in the best interest of the patients. Bill, how realistic do you think it is to have these PCI centers when there is such fierce competition among hospitals for patients?

William O'Neill: The U.S. is different than South America and Europe. In the U.S., more than 50% of AMI patients either get driven to the hospital, or they drive themselves. I actually advise my patients not to call 911 if they experience chest pains. Rather, I suggest that they have someone bring them to the hospital so they will be brought to the hospital of their choice. Consumers will drive that issue, I believe. In Oakland County, Michigan, EMS regulations have been changed, allowing ambulances to bypass facilities that do not provide emergency angioplasty. I truly think that this is a region-by-region issue, because most politics are local. What Roxana said is very important: We have spent so much time holed up in the cath lab learning how to perform procedures, but we have ignored the more mundane work and have allowed the medical leadership in this field to be taken over by the emergency room physicians. Thus, I think we need to recapture the medical leadership in our respective communities to move the process forward in the right direction.

Fayaz Shawl: In the era of stenting, does it make a difference if there's surgical back-up at a facility? If you are a skilled operator with a good team, there shouldn't be a need for surgical back-up when stents are used.

Michael Mooney: I don't think that's true. This field is continually evolving and becoming increasingly complex. There are distal protection devices, cooling, and other modalities that involve more than just opening the artery. I want to touch on what Bill was saying. I work with a 40-member group of physicians. We've experienced some extraordinary successes recently in terms of getting patients sent to us. The word is out; it's not a secret anymore. Every E.R. that administers thrombolytics knows that they are making a compromise in the quality of the patient's care. If you can realistically offer an alternative that is of a measurably higher standard, people will go for it. We now have patients being transported to our facility from 60 to 80 miles out, with door-to-open artery times of less than one hour. For 136 patients, the mean time is one hour and ten minutes.

In terms of what Roxana said, it was not the doctors who did this. It required an incredible effort primarily on the part of a nurse/administrator to put these protocols together. I would have thought that this could never be done, but it was accomplished at our center. Yes, all politics are regional, and I'm not saying that this approach can be replicated cookie-cutter style elsewhere, but it is up to us to determine how to implement the best level of care for the patients in our communities.

Paul Overlie: I would like to comment on what Mike said. We have had a program in place for many years which involves the cooperation of all physicians in the region and rapid transport services — whether by air or ground. We used to get two-thirds of our patients from outside the city limits, whereas now, the number is about 50%. We had a healthcare system get involved in the middle of it and decided to direct the care of our patients. This hurt our system. The air and ground transport systems became complacent, figuring that as long as they got the patients to our facility quickly, we would open their blocked arteries. We need to recapture our earlier efficacy. We have begun to do this by approaching the administrative end of things. Complacency set in because stents appeared to be working 100% of the time in AMI patients. It's true that stents have provided significant advantage, but there are still a great number of questions left unanswered. One I have, for example, is: What's the denominator in the different regions of the country? What percentage of AMI patients are 1) receiving treatment; 2) receiving thrombolytics; and 3) undergoing angioplasty? I am in the process of trying to gather these data. On a case-by-case basis, it is possible to record which patients have had successful angioplasty procedures and which have been treated quickly, but I am sure that we are missing an awful lot of people.

Raoul Bonan: In Alberta, Canada, a number of registries were launched and were published in 2003. These registries attempted to answer those very questions.

Ted Bass: The small European countries trial, TRANSFER, can teach us a lot in terms of what we should strive toward in the area of delivery and communication systems. Also, many of these results are obtained without very advanced technologies. I believe that streptoki-

nase was the thrombolytic used in several of the TRANSFER trials, and t-PA in the others. Also, there is almost no discussion about adjunctive therapy in these European trials, whereas in the U.S., we have begun to focus on what can be done upstream to better prepare these patients and to overcome some of the inadequacies of our communication and hospital diversion systems. And how are we handling phone calls? Most of us here are probably frequently on the receiving end of calls from outside hospitals who inform us that they are sending us an AMI patient. The patient can be brought to our facility within three hours, let's say, from the onset of chest pain. What are we telling the outlying hospital phsyicians to do to prepare the patient upstream? Do we tell them to give enoxaparin, are we using results that we learned from ASSENT 3, are we using GP IIb/IIIa inhibitor therapy? I would bet that the answers given in this room would be quite diverse —- and I think we can do better.

Jeffrey Werner: Did you get an answer, Raoul, regarding performance of angioplasty procedures at hospitals without surgical back-up? Is this safe now that stents are available? I don't think we really got a concensus from everyone here in the room. It's important for us to share information in this regard. I would thus like the following two questions put to everyone here:

1) Have stents made it such that surgical back-up is not really necessary at your institution — at least for acute angioplasty cases?

2) If all your hospital does is AMI angioplasty, are you good enough as an interventional center, much less a surgical center, to continue handling acute cases?

William O'Neill: From the PCI guidelines standpoint, I can tell you that there was a run made at dropping that, but it was all strongly vetoed. Thus, from my vantage point as a committee member, hell will freeze over before angioplasty without surgical back-up becomes a Class C indication. I don't think it will happen on a widespread basis in the foreseeable future, though it may on a site-by-site basis.

Paul Overlie: Our institution performs a large number of AMI angioplasty procedures, and I would say that we end up calling the surgeons four to five times a year. Stents and support devices have made a huge difference.

Howard Cohen: But don't you think that acute infarct angioplasty is different than routine, elective angioplasty? I think all would agree that if an outlying hospital has an experienced operator who can perform acute infarct angioplasty, then it's probably a good treatment approach. But even in elective cases, it can be difficult to predict which patients will have problems. I know Kirk will be talking about that, since his group has a lot of experience with angioplasty procedures being performed at outlying hospitals. In the DYNAMIC registry, we found that we could not predict which patients were going to have problems. Looking at the patient's baseline anatomy, it was impossible to predict who would require emergency bypass surgery. We recently treated a young patient who had an acute inferior MI, and it looked like a slam-dunk case. But in the first go-round with the diagnostic catheter, the ostium of the right coronary artery was dissected, and we were unable to find the ostium again. This young man went into shock and died.

Paul Overlie: I think you are right, but our surgeons are available within 10 minutes. I remember borrowing a slide from David Holmes about 10 to 15 years ago showing how long it takes to get a patient who crashed in the catheterization lab to the O.R.

Howard Cohen: Well, 10 minutes is unusually fast. I am being asked to perform angioplasty at a hospital located 2 hours away. Another problem I have encountered involves the following scenario: I've performed an angioplasty procedure on a patient at one of these outlying hospitals and administer a GP IIb/IIIa receptor antagonist. The patient seems to be doing fine, so I leave the hospital, with a local cardiologist to cover for me. As I head back to Pittsburgh an hour away, I receive a call from the hospital informing me that the patient is bleeding, a large hematoma has formed, and he's hypotensive. I tell them to call the cardiologist on call because he can get there quicker than I can. In fact, I would say that at our hospital, there have been more cases of morbidity and mortality associated with the access site than from the local intervention site. We know that elderly patients, very obese patients, and renal failure patients tend to have more access site complications, but it is still very difficult to predict complications in many patients.

Fayaz Shawl: The published data from the SEAPORT acute MI trial show that all of the operators who performed those procedures were from my hospital. They do an excellent job and are a highly experienced team.

Howard Cohen: SEAPORT was an acute MI trial, but I'm talking about elective angioplasty procedures performed at an outlying hospital that is far from any surgical back-up.

Fayaz Shawl: The question was also raised earlier: Should we perform acute MI angioplasty at a hosptial without surgical back-up?

Kirk Garratt: I would like to make a couple of comments on this subject. We developed a program to support both elective and urgent angioplasty at 2 outlying hospitals, both about 80 miles away from the "mother ship" in Rochester. This program was implemented approximately 4 years ago. The main reason we established the program may surprise you: It was not to support the finances of the local hospitals, as they were either partially or wholey owned by the Mayo Clinic Foundation and provided a fairly steady stream of patients to our facility in Rochester. Rather, we did it to benefit our patients. We have a different operating environment than other areas, because these outlying centers are separated from Rochester by 80 to 85 miles of barren, frozen plains for six months of the year. We are servicing a population of Norwegian and German farmers who rely heavily on their local physicians, familes and support networks. In fact, many patients have refused to be transferred from their local hospital in Manketo to the big hospital in Rochester. And sometimes they won't come to Rochester for bypass surgery either. The key, thus, was to extend our operating environment and experience to these outlying community hospitals. We were confident that a program could be established that would render the same high-quality care that's offered in Rochester. In the past four years, over 500 patients have been treated in these outlying hospitals, the vast majority of whom were elective angioplasty patients; approximately 140 to 150 of them were AMI patients. We have been very fortunate thus far, as none of these patients have required urgent bypass surgery. A fail-safe system was implemented to ensure that patients requiring CABG could be transferred to Rochester in a timely manner. We did several "dry-runs" of this program. As Paul mentioned, David Holmes was able to collect information with Peter Berger about the time it takes to get our patients from Manketo or Lacrosse to Rochester for emergency CABG; there is only an additional delay of 10 to 20 minutes over what it would normally take to get a patient to the O.R. from our own cath labs in Rochester.

The second point is that when we think about the risks to the individual patient, what we'd really like are the data. We have developed some data from our experience that show very good results. The only other data I am aware of in which the quality and volume are germaine to this discussion are from Pat's institution — but he's just too humble to tell us about it. Approximately one year ago, Pat and his group published their experience from the Cleveland Clinic. These data covered a 10-year experience on urgent surgery to support a complication related to angioplasty. They found that in the current stent environment, the need for urgent bypass surgery is estimated at 0.14% of cases. That means that there is a 99.86% probability that a patient will not require emergency CABG support. Although we can say that we want to do what's best for our patients, I would posit that it is reasonable to take an

event with that degree of rarity and essentially not devote much time to protect against it – at least beyond what we have been able to do.

Finally, in terms of risk prediction and what Howard discussed, I think that we are actually pretty good at predicting risk — at least on a population basis. Sure, each of us has an anecdote about an RCA that unraveled when it wasn't expected, but in fact, we have been able to determine and define risk to a very high level of precision. Mandeep Singh, my colleague in Lacrosse who is a Mayo Clinic physician, has done a huge volume of work on this subject. He has 13 papers in publication, and in fact, at the 2004 ACC meeting, he will receive the Parmly Award for his work in this area. With a spectrum of 13 or 14 risk variables, most of which can be collected prior to the angiogram, risk can be defined with reasonable accuracy in both elective and urgent angioplasty cases. We ought to be thinking more in terms of establishing quick access to hospital centers that can offer angioplasty, even when CABG services are not available. And we ought to be thinking very carefully about vascular access and whether the radial artery should be used more routinely, since complication rates — at least in experienced hands — seem to be quite low and much more easily managed. In terms of the lytic issue, if we can create a network of hospitals that can receive patients and take them to the cath lab quickly, even without on-site surgical services, and render quick risk assessment for complications, it would render lytic therapy rather unattractive.

Paul Overlie: You used the word "experienced" about 8 times in the past few minutes — and that is a common criticism among less experienced operators across the U.S, for those of us who have been involved in the PAMI trials that Bill launched. Those ideas are fine for those of us who perform these interventional procedures on a daily basis, but what about the physician who only performs 13 interventions a year? Experience is extremely important in this field. Howard could travel 2 hours to a small hospital and perform a procedure on an AMI patient and leave unscathed, but a much less experienced operator would perhaps hurry to get the diagnostic catheterization done, splitting the right coronary artery, and then put a guidewire right down into the dissection.

Kirk Garratt: I'm glad you brought that up, Paul, because in our group, in fact, we currently have 5 routine "angioplasters" at the two hospitals — three of them are Mayo-trained; the other two came from private practices in Iowa where they had acquired only moderate angioplasty experience. They had been performing about 60 to 75 angioplasty procedures a year, so they were considered skilled, but not high-volume experienced. Yet, with the support system we developed, they are enjoying remarkably low complication rates today.

Greg Braden: I think you will end up with very low complication rates in certain settings. The issue of emergency surgery back-up is somewhat of a surrogate for the level of care at the hospital. As Howard mentioned, complications such as renal failure or pulmonary edema can be better handled at larger centers that have support systems to care for these patients, not just the need for CABG due to complications from the intervention, such as perforation, which don't often occur. More often, the patient gets sick and needs to see a pulmonologist, a nephrologist, or a vascular surgeon. I see these as looming issues in terms of small-center angioplasty sites.

Howard Cohen: If we give carte blanche to centers, we will be opening up a can of worms across the country. I always like to say, "Does it meet the mother test?" That is, would you want your mother to undergo an intervention at a low-volume hospital or at a facility that lacks all of the support services? Because I'm not particularly worried about the patient who requires bypass surgery; I'm worried about the other problems that could arise. I am sure that in the hands of Mayo Clinic-trained physicians, a patient can receive good care, but I'm not so sure that this would be the case at smaller, less experienced centers.

Michael Cowley: You could alternatively ask, "Does it pass the mother-in-law test?"