
Family Practice Grand Rounds

Myocardial Infarction— Home or Hospital Care

Peter Curtis, MD
Chapel Hill, North Carolina

DR. TOM METTEE (*Assistant Professor, Department of Family Medicine*): Recently we elected to treat at home two patients in our practice who had symptoms and signs suggestive of myocardial infarction. We planned this conference to clarify and discuss the issues involved in home vs hospital care of the patient with myocardial infarction. A cardiologist (Dr. Pack McLaurin) and a clinical epidemiologist (Dr. Edward Wagner) agreed to listen and comment. However, over the last 36 hours one of our colleagues has personally experienced chest pain and Coronary Care Unit (CCU) admission. Fortunately, he recorded this experience for us as it was happening. Thus, at the last minute, we have chosen to substitute his diary for the two cases of home care planned for presentation.

DR. PETER CURTIS (*Assistant Professor, Department of Family Medicine*): As you all know, I have just been discharged from the CCU after a stay of 24 hours, and I thought you might be interested in a firsthand account of my experience at the "other end of the stethoscope."

It was 2:00 AM. A right-sided earache I had had over several days had suddenly become worse. I

often scratch my ears when I'm tense. I decided to be sure to see someone about it tomorrow; I had ignored the whole business for far too long. What was it I used to tell patients? "If only you had come at the proper time (or earlier) you (and I, of course) could have avoided all this trouble."

I tossed and turned. It was no good. I got up and swallowed two double strength Tylenol.

Twenty minutes later a sudden pain flooded into the epigastrium. It felt as if an internal claw had grabbed the two capsules into a vice. The pain ground on and was unrelieved by any change in position. I got up to drink some milk hoping it was indigestion. Every turn and breath made the pain spread like a fan across my lower chest. The cold bland fluid didn't help, and I began to think about the pain. I'm 39. It couldn't be cardiac or could it? No, of course not, it was more like esophageal spasm. Question: Do gastric erosions develop in 20 minutes?

The earache began to fade, but I still tossed and turned, weighing and balancing in my mind the possible cause of the chest pain. My wife turned over and sighed. She knew I was having a bad night. There had been many in recent months, probably as a result of a new demanding and challenging job as well as serious illness and death in my family. Was this pain the result of life crises? I always believed that I was too strong to be affected by these things. My support systems were unassailable!

As the earache faded, the chest pain grew to a

From the Department of Family Medicine, School of Medicine, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina. Requests for reprints should be addressed to Dr. Peter Curtis, Department of Family Medicine, University of North Carolina-CH, Room 711, Clinical Sciences Building 220 H, Chapel Hill, NC 27514.

diffuse permanent lump and stayed there. The process of getting up, washing, shaving, and dressing in the morning was hazed again by the returning earache. I didn't dare take any more analgesics. Breakfast seemed to make no difference either way, but I noticed for the first time a vague ache in both arms.

I talked casually to my wife about the symptoms, mainly to try and reassure her about my restless night, and perhaps as a subconscious warning of what might be coming. She gave me a nice hug as I left for work. I had a stupid thought. How many more hugs would I get if it was an infarct?

"Hi Tom, could you take a look at me after the conference. I would like your advice about something."

"Sure."

Tom examined me and took an ECG. It was slightly abnormal. Our relationship changed. No longer colleagues, I'd abdicated my clinical judgment to him. He would direct my life now. I wonder what he thought about that!

"Peter, I've shown the tracing to a cardiologist. I think you must come into the hospital. That means the CCU." Somehow it sounded like the torture chamber to me, although I knew it wasn't. A few phone calls were made to cancel my busy schedule; messages sent to various people, including my wife.

The controlling authoritarian mechanism began: a name strap around my wrist so that I didn't get lost, a strap around the arm to draw blood, straps around my limbs for another ECG, and the somehow embarrassing and ignominious trip in a wheelchair to the Emergency Room. What followed was the paradox of the caring environment. I lost sight of my clothes, and put on a white depersonalized nightie which effectively removed my individuality; an x-ray machine pointed its ugly face at my chest, and then a nurse surrounded by tubes and IV dextrose said, "I'm going to stick you now."

It's amazing what words can do to one's psyche! Immediate nausea flooded into me, and I began to go dizzy as I saw her approach my arm with the Intracath. She couldn't get into a vein, the nightmare I had always feared since medical school days had arrived. I fainted. The table was tipped down to counter the vasovagal attack. During this time the monitor apparently showed three episodes of cardiac asystole, and the nurse took

the opportunity to get the IV in. I was lucky (in retrospect) that I didn't have a damaged myocardium.

The pain was still there, a hard irregular stone with soft edges.

"Let's try some Trinitrin" (nitroglycerin). A minute after the tablet was under the tongue my head pounded and face flushed. Imperceptibly the pain faded away, but no one inquired about it. The interns were attentive and efficient, but I sensed their embarrassment at having a physician as a patient, for they did not examine me all over. I wondered if a doctor's genitals were above suspicion. Still, I was quite glad about it.

The table on which I lay was obviously designed by someone who had never been a patient. It was hard, round in the wrong places, and covered in a vinyl material which caused me to continuously slip and slide. I reckoned that it wouldn't take more than 30 minutes to develop pain and skin damage to the buttocks.

In the Emergency Room the cardiac monitor beat silently away while we waited for our journey to the CCU. Four of us waited for four hours in the Emergency Room while we got hungrier and our buttocks got more and more sore. One or two colleagues came to communicate with me and reassure me.

Finally, I was on the stretcher getting a waist-level view of life. Then up the elevator, praying I didn't meet anyone I knew, into the CCU.

Quickly I was wired up and trussed like a turkey. The CCU was quiet and efficient. There was the same baseline protocol for everyone: total bedrest, coronary diet, IV lidocaine, and the cardiac monitor. A repeat ECG showed the same pattern as before, possibly a normal variant. The nurses and physicians were excellent and gave me confidence, but they should have explained about the alarm buzzers and bells activated when the monitor or IV fouled up.

My wife came in; she had had her cry and now was angry that I might be copying her father who had died around my age. We talked about my work and ways of slowing down. Visiting was only permitted for ten minutes, probably a reasonable rule. But if I had been dying, I would have liked my family around me, and not just flitting in for ten minutes. Maybe that is what's good about dying at home. In the CCU you can't die with your family around you.

After two hours on the ward I was hooked up to nasal oxygen. The belief is that oxygen may prevent the subischemic zones of the infarct from becoming permanently damaged. All very well and the experimental evidence is good, but why didn't I have the nasal oxygen six hours earlier when I was admitted and presumably my heart was at its most vulnerable? Someone then suggested studying blood gases. I wasn't sure why, since my chest x-ray was normal, and I no longer had chest pain. I was not in cardiac failure and was receiving supplemental oxygen. All part of the management protocol I supposed. I could imagine in my mind the effects the claustrophobic directions and constraints would have on a medically inexperienced person, say, a farmworker! Acute anxiety and environmental deprivation, I would guess.

News! the ECG was unchanged and the enzymes were normal. Boom! I was suddenly and magically normal again. I could put on my pajama bottoms all by myself instead of the nurse doing it, sit up alone, and ten minutes after being reprimanded for not using nasal oxygen, I was discharged, dressed, and attending this lunchtime conference.

The whole process was superbly run and, I am sure, saves lives, provided the person with a severe infarct gets to the CCU in time.

If one has a mild coronary thrombosis or does not have one at all, then it is frightening and may be life-threatening in itself. The acute anxiety, the separation from established support systems, and the possibility of vasovagal attacks (which I had) may well induce arrhythmias in already damaged cardiac muscle.

The highlights of my short hospital stay were, first, the relief of my indigestion by Trinitrin, and then, the Intracath-induced asystole.

A Word of Advice

If you are ever admitted to the CCU be sure to write a diary of what happens. It will keep your mind off things and may save you an arrhythmia or two.

DR. PACK MCLAURIN (*Cardiologist, Assistant Professor of Medicine*): I'm going to have some difficulty topping that introduction. However, I would like to start by reviewing the histori-

cal development of coronary care units without either attacking or defending their value.

In the 1940s and 1950s patients suffering from myocardial infarction were usually admitted to the general wards of hospitals, although a number were kept at home in bed. There was nothing much else one could do for them unless they developed such complications as cardiac failure, pulmonary embolus, or pneumonia. In 1947 Dr. Beck in Cleveland, Ohio, first successfully defibrillated a patient in the operating room, thereby proving that the heart can be revived electrically in humans.¹ Nine years later (1956) he reported the first successful resuscitation by defibrillation outside an operating room.² The patient was a 65-year-old physician with a myocardial infarct whose whole chest was opened, the heart massaged, and then defibrillated. In the same year Zoll reported the first case of transthoracic defibrillation, so the days of heroic surgery were over.³

Beck regarded the nonfunctioning and the injured heart rather like an auto ignition switch;⁴ it was just begging for a chance to be switched on again, and the first CCU was set up as a special room in which all the necessary equipment would be available. It was hoped that significant numbers of patients could be salvaged in the CCU but these hopes were not fulfilled. Studies continued to show that only 50 percent of cases could be resuscitated and of these another 50 percent died a short time afterwards.⁴ It appears that CCUs have had little impact on the overall mortality of coronary artery disease.⁵

Later Dr. Bernard Lown at the Peter Bent Brigham Hospital came to understand that 80 percent of all patients had arrhythmias in the first 24 to 72 hours after the acute infarct, and he therefore began to treat bradycardia, multifocal premature ventricular contractions, and short runs of ventricular tachycardia in an attempt to reduce these arrhythmias.⁶ His lead was followed throughout the world, and the mortality of myocardial infarction has dropped from between 30 to 40 percent on medical wards to about 17 percent in CCUs at the present time.^{7,8}

In spite of these figures CCUs have had little economic, social, or life-sparing impact on coronary artery disease in the United States. It seems that solving the problems of access to medical care would be more valuable in saving lives than setting up CCUs in every hospital.⁶ In your particular

case, Dr. Curtis, the period of greatest risk was already over by the time you reached the CCU: pain onset 2:00 AM; diagnosis of abnormal ECG 9:30 AM; and admission to CCU 2:00 PM, 12 hours after the onset of pain. Admission at this stage is usually more a rehabilitation exercise than anything else, although this in itself may have some value.

The new ideas concerning mobile acute coronary care have come from Pantridge in Belfast, Ireland.⁹ Coronary care ambulances with trained paramedics can get to patients at an earlier stage of the disease, increasing the chances of resuscitation. For instance, in Seattle the Heart Watch Program vehicles can get to an infarct patient successfully within five minutes.¹⁰ What we are really talking about is the extension of expert care beyond the hospital, and the treatment of sudden death from any remediable cause rather than just coronary artery disease. This means increasingly complex and expensive health care which seems to be the typical American way of doing things. Also typical in its own way may be the conservative British approach to infarction, home care. We act in America as if we had unlimited resources, which we do not. But like it or not the build up of mobile coronary care units is occurring. For instance, 1978 will usher in an attempt to bring mobile coronary care to one of the rural communities in this area.

Which patients should be in CCUs? Those with low blood pressure, those who are ill, and those who are electrically unstable. Over a period of time a standard of care has been established which states that all patients with myocardial infarction should be in a CCU. The physician may no longer fully believe in the benefits of this. I suspect that the public and the legal profession do, and that means that the pattern of care will continue much as it is now.

DR. METTEE: Prior to the conference we distributed two papers by Mather et al from England comparing hospital and home care of patients with myocardial infarction, one published in 1971 and one in 1976.^{11,12} These suggest that the outcome of the disease is much the same in both settings, raising questions about the benefits of hospital care. Lord Platt commenting on these studies said, "If indeed intensive hospital care offered an important advantage there would be a need for: (1) the revision of the role of the family physician in relation

to this condition in Great Britain, (2) the development of special CCUs, and (3) the development throughout the land of special ambulances to shorten the interval between pain and skilled care."¹¹ I would like to ask our clinical epidemiologist to comment on the validity of these British studies, and perhaps tell us if we can draw any lessons from them for the United States.

DR. EDWARD WAGNER (*Assistant Professor, Departments of Medicine and Epidemiology*): I would like to review the background of these articles.^{11,12} The British perspective at the time of the first study was that it was standard practice for the family physician to diagnose a myocardial infarct in the home. If the patient was fairly stable, he stayed home; and if he was ill, he was sent to the hospital. The American perspective in the same period was to send all patients to the hospital and preferably to a CCU. Mather's work on home care of myocardial infarction was greeted placidly in Britain since it confirmed, to a large degree, accepted practice, whereas in the United States it met with almost total disbelief. With that perspective I would like to ask two questions of those studies: (1) Does the research design justify the conclusions that there was no difference between home and hospital treatment? (2) If it does, what can we infer from this study?

Mather's study involved four towns and 450 family physicians. When the physician was called to the home of a patient with an infarct he would randomly select home or hospital care unless the patient was so ill as to need hospitalization. Those patients that became unstable at home were transferred to the hospital. Each patient was also seen by a cardiology fellow, and the diagnosis was confirmed by ECG and enzyme studies. There was close follow-up at home. About one third of all the patients were randomly selected and those who stayed at home fared slightly better than those in the hospital.

The problem of a randomized controlled trial like this one is this: To what extent can one be sure that patients with infarcts were present in each group? The overwhelming predictor of mortality in myocardial infarction is the initial systolic blood pressure. Using this measure there was no difference in mortality between home care or hospital groups with infarcts of equal severity.

DR. CHARLES MARGOLIS (*third year family practice resident*): Did the physicians have ECG

machines when they visited the patients at home? As far as I know British general practitioners do not carry ECGs with them.

DR. WAGNER: No, the general practitioner made a clinical diagnosis and then called in the cardiology expert to confirm the diagnosis. On balance, as an epidemiologist, I can find little evidence to seriously question the validity of these studies. But it is important to remember who was randomized: a relatively minor subset of all those who suffered an infarct. Furthermore, what was the home treatment? It involved almost daily visiting by the physician. In spite of this, 25 to 30 percent of patients who were selected for home treatment ultimately ended up in the hospital.

Remember also that in the United States people come to the Emergency Room with their infarcts, and would have to be sent home again if we want to parallel British practice.

DR. DAN VINSON (*third year family practice resident*): Perhaps, if one had an infarct at 2:00 AM, and received attention in the home from a mobile CCU the patient could satisfactorily bypass the hassle of the Emergency Room and this way have the best of both worlds.

DR. WAGNER: There is no data available that going to the hospital and the Emergency Room is particularly dangerous, but I share your bias about the effect of institutions and professionalism on patients.

DR. MCLAURIN: The United States' data show that the mortality of myocardial infarction in CCUs is between 13 and 15 percent, yet in British hospitals it seems to be in the range of 30 percent.¹³ This may be a reflection of the type and setting of British CCUs within larger intensive care units in which death may result from causes other than infarcts.

DR. CURTIS: The mortality from myocardial disease in Britain may relate in part to the stoicism of the patients, or to the lack of an awareness of what chest pain can mean. A recent study involving physicians in England demonstrated an average time lapse of 1 hour and 44 minutes between the onset of chest pain and receiving medical help outside the hospital. An average of three hours elapsed between onset and admission to the hospital.¹⁴

Home care in Britain may well be acceptable because of the highly developed and widespread primary care teams, consisting of family physi-

cians, home nurses, health visitors, and social workers. Any specialist will also visit the patient in the home at the request of the family physician. In the case of my own patients suffering from infarcts in England, I used to visit twice daily the first week, and daily the second week. The home nurse did the same. One other feature is important; home care is facilitated by compact communities, few traffic problems, and easy access to nearby hospitals. So, in Britain, home care flourishes in small towns and rural areas. The American pattern is followed in the bigger English cities. Geography is important. After all, England is only about the same size as North Carolina and, even as a rural family physician, the furthest I had to drive in my practice to see a patient was 12 miles, whereas here it might be 50 miles.

So, you see, there are cultural and geographical aspects of medicine which cannot be transplanted from one country to another. On the other hand, I would make a plea for flexibility so that we know that home care is at least possible without feeling guilty of practicing low quality medicine.

One of the original reasons for holding this conference rests with a 68-year-old patient of ours who developed chest pain. He had suffered previous strokes and was physically unable to communicate with anyone except his wife. He lived 30 miles away and was initially treated at home for two reasons.

1. The ECG changes on a home visit were equivocal.
2. His wife was not allowed to stay with him in the CCU, and we felt that his isolation there might be more life-threatening than the possibility of an infarct.

He eventually came into the hospital because of further ECG changes, but ended up in a general ward as the CCU was full! In the final analysis he did not have an infarct.

DR. MCLAURIN: I feel basically the same as you about this problem. I have strong feelings about some of the admitting mechanisms to hospitals. Many a patient has died while waiting in the Emergency Room to go to the CCU. When I was in the Air Force, we used a screening room close to the CCU in which all patients with chest pain were seen immediately. Sixty percent of them were able to go home in 45 minutes. We did not wait for the hospital chart to arrive or for an IV to be put up. The whole sequence of coronary care

from the onset of chest pain to the monitored, wired-up patient in the CCU could bear some reevaluation, and I believe that this now is happening more frequently.

DR. METTEE: Thank you for this provocative and balanced discussion of home versus hospital care of patients with myocardial infarction. As an American family physician, I am proud to be associated with a medical system whose use of technology appears to significantly reduce mortality for those lucky patients that get "plugged into" CCU care. However, I also feel frustrated by the organization and structure of American society which often (1) denies or reduces access to care (in home or hospital), (2) places high demands on limited and costly resources (CCU's), (3) limits "acceptable" choices for physicians in caring for myocardial infarction, and (4) separates family from patient during critical periods in life, all of which translates into an anxiety-provoking process between the onset of chest pain and the arrival at the care setting. This is the antithesis of ideal management of the injured myocardium. We have a great deal to learn about the therapeutic benefit or iatrogenic complications of the present system of care for myocardial infarction in the United States. I feel this conference has stimulated all of us to reexamine our own methods and assumptions surrounding the care of these patients.

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