A Community-Wide Assessment of the Use of Pulmonary Artery Catheters in Patients with Acute Myocardial Infarction*

Joel M. Gore, M.D.; Robert J. Goldberg, Ph.D.; David H. Spodick, M.D., F.C.C.P.; Joseph S. Alpert, M.D., F.C.C.P.; and James E. Dalen, M.D., F.C.C.P.

As part of an on-going population-based study of patients hospitalized with acute myocardial infarction (MI) in all 16 hospitals in the Worcester, Massachusetts Standard Metropolitan Statistical Area, temporal trends in the use of the pulmonary artery (PA) catheter were examined. Three thousand two hundred and sixty-three patients with validated acute MI during the calendar years 1975, 1978, 1981 and 1984 comprised the study population. There has been a consistent and significant increase in PA catheter use in patients with acute MI over time, from 7.2 percent in 1975, 13.8 percent in 1978, 14.8 percent in 1981 to 19.9 percent in 1984 (p<.001). Ninety-six percent of patients undergoing PA catheter investigation had either congestive heart failure (CHF), hypotension or cardiogenic shock. For the combined time periods, the in-hospital case fatality rate (CFR) for patients in CHF with a PA catheter was 44.8 percent compared to 25.3 percent for patients without a PA catheter (p<.001). For patients with hypotension and a PA catheter, in-hospital CFR was 48.3 percent compared to 32.2 percent for hypotensive patients not receiving a PA catheter (p<.001). In contrast, for patients in cardiogenic shock the in-hospital CFR was 74.4 percent for those receiving a PA catheter as compared to 79.1 percent for patients in shock not receiving a catheter. The use of a PA catheter was associated with an increased length of hospital stay irrespective of the development of acute clinical complications. Long-term prognosis for discharged hospital survivors who had a complicated MI, for up to a five-year follow-up period was similar whether the patient did or did not receive a PA catheter during the acute period of hospitalization. In conclusion, we could not demonstrate a beneficial effect associated with the use of the PA catheter on selected patient outcomes, including in-hospital and long-term prognosis and average hospital stay, in this community-wide study of patients hospitalized with acute MI.

The introduction of the flow-directed pulmonary artery catheter has enabled clinicians to measure right heart pressures, including pulmonary capillary wedge pressure, and determine cardiac output at the bedside. Hemodynamic monitoring is a procedure that is now performed daily in most hospitals throughout the United States. One of the most common indications for hemodynamic monitoring is assistance in management of patients with acute myocardial infarction (MI), especially when complicated by the development of hypotension, cardiogenic shock or congestive heart failure.1-3

Since the introduction of bedside hemodynamic monitoring in 1970,4 several million pulmonary artery (PA) catheters have been placed in patients with acute MI. Hemodynamic monitoring involves a small but definite risk to the patient5-11 and the cost is not insignificant.1,10,12 The therapeutic impact of the PA catheter as based on length of hospital stay, in-hospital survival, and long-term prognosis of patients with acute MI has not been systematically examined from a multi-hospital, population-based perspective.

The Worcester Heart Attack Study is an on-going community-wide study examining time trends in the incidence rates as well as in-hospital and long-term case-fatality rates of patients hospitalized with acute myocardial infarction in all 16 general hospitals in the Worcester, Massachusetts, metropolitan area during the calendar years 1975, 1978, 1981, and 1984.13 As part of this study, the use of various therapies and procedures, including the pulmonary artery (PA) catheter, is being examined. The demographic and clinical profile of patients receiving a PA catheter during hospitalization for acute MI, as well as the association of the PA catheter with in-hospital and long-term prognosis and length of hospital stay, are examined in this study.

*From the Department of Medicine, University of Massachusetts Medical School, Worcester.
Reprint requests: Dr. Gore, University of Massachusetts Medical School, 55 Lake Avenue, North, Worcester, MA 01655
Materials and Methods

The population under study consists of patients hospitalized at all 16 general hospitals in the Worcester Standard Metropolitan Statistical Area (SMSA) (population—373,000, 1980 US census) with a primary or secondary discharge diagnosis of acute MI. A complete sampling of the International Classification of Disease (ICD) code 410 for acute MI (9th revision) is carried out. The diagnosis of acute MI is based on pre-defined criteria including clinical history, serial electrocardiographic (ECG) findings, and elevation of cardiac enzymes (CK or CK-MB). At least two of these three criteria need to be satisfied for inclusion in the study. ECG findings are further classified as being either Q-wave or non-Q wave according to previously described criteria. Creatine kinase (CK) levels are considered to be elevated if they are in excess of the upper limit of “normal” as specified by the laboratory at each participating hospital in the four periods examined. Each case of acute MI in the 16 hospitals is individually reviewed and validated according to these pre-established criteria by trained study abstractors. In addition, all autopsy-proven cases of acute MI are included, irrespective of the other criteria.

Of the cases reviewed in the four calendar periods of 1975, 1978, 1981 and 1984, 40 percent were rejected: 30 percent because the discharge diagnosis of MI failed to satisfy our validation criteria, and 10 percent because the patient lived outside the Worcester metropolitan area since this study is concerned with incidence rates of acute MI in a defined population. The present study is based on the 3,363 patients with validated acute MI. Of these, 763 were hospitalized in 1975, 533 in 1978, 978 in 1981 and 689 in 1984. The hospital records of these patients were abstracted for demographic and clinical data including age, sex, type of hospital of admission (teaching vs nonteaching), MI type (Q-wave/non-Q-wave), order (initial vs recurrent), location (anterior vs inferior/posterior), peak CK findings, complications during hospitalization, therapeutic modalities employed and diagnostic procedures used.

For the four time periods, any clinical complication that developed during the acute hospitalization was defined on the basis of information available from the clinical charts. Congestive heart failure was regarded as present when there was evidence of pulmonary edema or bilateral basilar rales with an S3 gallop. Hypotension was defined as persistent systolic blood pressure of less than 90 mm Hg, while cardiogenic shock was defined as systolic blood pressure of less than 80 mm Hg, cyanosis, cold extremities, congestive heart failure and persistent oliguria occurring at any time during the acute hospital phase. The use of the PA catheter and other cardiac procedures was determined on the basis of a review of the medical record including physicians’ and nurses’ progress notes. Survival status after hospital discharge was determined by a review of medical records for additional hospitalizations and by a state-wide search of death certificates for residents of the Worcester SMSA.

Data Analysis

Differences in the distribution of selected demographic and clinical characteristics in patients hospitalized for acute MI according to PA catheter use were examined by the chi-square and t-tests of statistical significance for discrete and continuous variables respectively. The short-term prognosis in each period was examined by calculating in-hospital case-fatality rates. The simultaneous effect of several potentially confounding variables that may affect in-hospital prognosis according to PA catheter usage was adjusted for by means of a logistic multiple regression technique. A life-table approach was utilized to examine long-term survivalship in order to include patients followed for various lengths of time after hospital discharge. The logrank test was used to calculate the overall significance of the difference between long-term survival curves of patients who received a PA catheter as compared to those who did not.

Results

Temporal Trends in PA Catheter Utilization

Hemodynamic monitoring with a PA catheter increased progressively and significantly over time. PA catheters were used in 7.2 percent of MI patients hospitalized in 1975, 13.8 percent in 1978, 14.8 percent in 1981, and 19.9 percent of patients in 1984 (Table 1) (p < .001).

The relationship between teaching (defined as hospitals with full-time house staff) and nonteaching hospitals, peak CK findings, extent of MI and PA location, and the use of the PA catheter was also examined (Table 1). In each time period, a significantly greater proportion of patients received a PA catheter in teaching as compared to nonteaching hospitals (p < .001). Overall, 17.7 percent of patients in teaching hospitals received a PA catheter, as compared to 4.4 percent of patients in nonteaching hospitals. PA catheterization was significantly more likely to be carried out in patients with larger MIs as estimated by peak CK (>5 times normal, 17.6 percent) relative to smaller MIs (2-4.9 times normal, 10.2 percent) and MI extent (Q-wave, 17.7 percent; Non-Q wave, 7.5 percent).

Table 1—Profile of Acute Myocardial Infarction (MI) Patients Receiving A Pulmonary Artery Catheter

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<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Total</td>
<td>763</td>
<td>7.2</td>
<td>833</td>
<td>13.8</td>
<td>978</td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Teaching</td>
<td>530</td>
<td>10.4</td>
<td>579</td>
<td>19.2</td>
<td>708</td>
</tr>
<tr>
<td>Non-teaching</td>
<td>232</td>
<td>0</td>
<td>254</td>
<td>1.6</td>
<td>270</td>
</tr>
<tr>
<td>Peak CK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 x normal</td>
<td>156</td>
<td>8.3</td>
<td>132</td>
<td>11.4</td>
<td>310</td>
</tr>
<tr>
<td>2-4.9 x normal</td>
<td>109</td>
<td>5.5</td>
<td>147</td>
<td>4.8</td>
<td>282</td>
</tr>
<tr>
<td>&gt;5 x normal</td>
<td>484</td>
<td>7.4</td>
<td>554</td>
<td>16.8</td>
<td>386</td>
</tr>
<tr>
<td>MI extent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q-wave</td>
<td>527</td>
<td>8.2</td>
<td>515</td>
<td>17.7</td>
<td>536</td>
</tr>
<tr>
<td>Non-Q wave</td>
<td>235</td>
<td>5.1</td>
<td>318</td>
<td>7.5</td>
<td>442</td>
</tr>
</tbody>
</table>

*Proportion of patients receiving a pulmonary artery catheter.
Table 2—Pulmonary Artery Catheter Use in Patients with Selected Complications of Acute Myocardial Infarction (MI)

<table>
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<tr>
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<td>n</td>
<td>%</td>
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<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>314</td>
<td>11.5</td>
<td>339</td>
<td>24.5</td>
<td>400</td>
<td>26.3</td>
<td>373</td>
<td>29.8</td>
<td>1,426</td>
</tr>
<tr>
<td>Hypotension</td>
<td>240</td>
<td>16.3</td>
<td>230</td>
<td>29.6</td>
<td>275</td>
<td>36.0</td>
<td>352</td>
<td>32.1</td>
<td>1,097</td>
</tr>
<tr>
<td>Shock</td>
<td>58</td>
<td>29.3</td>
<td>57</td>
<td>45.6</td>
<td>71</td>
<td>62.0</td>
<td>45</td>
<td>75.6</td>
<td>231</td>
</tr>
</tbody>
</table>

*Proportion of patients with the specified complication receiving a pulmonary artery catheter.

those with smaller infarcts (CPK <5 times normal, 8.7 percent) (p<.001). Patients with Q wave infarcts (17 percent) were almost twice as likely to receive a PA catheter than were patients with non-Q wave MI (8.8 percent) (p<.001).

The frequency of PA catheter use in patients with selected complications of acute MI in which PA catheter usage might be clinically indicated is shown in Table 2. In 1975, 11.5 percent of all patients developing congestive heart failure received a PA catheter, increasing to 29.8 percent of all patients with congestive failure in 1984 (p<.001). In 1975, 16.3 percent of hypotensive patients were catheterized, while 32.1 percent of such patients received a PA catheter in 1984 (p<.001). Among patients in cardiogenic shock, 29.3 percent received a PA catheter in 1975, 45.6 percent in 1978, 62.0 percent in 1981, and 75.6 percent in 1984 (p<.001). Of particular note is the fact that only 2.6 percent of all catheters in 1975, 4.8 percent in 1978, 4.2 percent in 1981 and 4.3 percent in 1984 were placed in patients who did not have congestive heart failure, hypotension or cardiogenic shock. Since the majority of patients receiving a PA catheter did so because of clinical indications, the association of in-hospital and long-term prognosis as well as length of hospital stay according to PA catheter use, were examined only in these patients.

In-hospital Prognosis

The in-hospital case-fatality for acute MI patients with specific hemodynamic complications according to pulmonary artery catheter use for the combined study periods was examined (Fig 1). Patients whose MI was complicated by hypotension had an in-hospital CFR of 48.3 percent when their management included a PA catheter as compared to 32.2 percent if they were managed without a catheter (p<.001). For MI patients developing congestive heart failure, the presence of a PA catheter was associated with a 44.5 percent in-hospital case fatality rate compared to 25.3 percent for MI patients with CHF who did not undergo PA catheterization (p<.001). Patients in cardiogenic shock receiving a PA catheter had an in-hospital CFR of 74.4 percent as compared to a CFR of 79.1 percent for those patients in shock not receiving a PA catheter. MI patients whose acute clinical course was complicated by the development of either congestive heart failure, hypotension or shock and receiving a PA catheter had an in-hospital CFR of 44.1 percent as compared to an in-hospital CFR of 23.4 percent for MI patients with similar complications who did not receive a PA catheter (p<.001). Similar trends of increased in-hospital case fatality rates associated with PA catheter usage in patients with congestive heart failure or hypotension and a relatively comparable short-term mortality experience for patients in cardiogenic shock were seen when each of the four calendar periods under study were examined separately.

Separate multivariate analyses were then carried out to adjust for the effect of several potentially confounding variables that differed between patients with previously specified clinical complications and PA catheter use. Patients developing congestive heart failure during the acute hospital phase and receiving a PA catheter included a significantly greater proportion of patients with large infarcts as assessed by peak CK findings more than five times normal (69 percent vs 52 percent), men (62 percent vs 53 percent), and Q wave infarcts (74 percent vs 52 percent) (p<.05). However, they were significantly younger (67 vs 72 years) than those not receiving a PA catheter (p<.001). When the in-hospital CFRs were adjusted for differences in these

![Figure 1. In-hospital case fatality rates (CFR) in patients with selected complications of acute myocardial infarction according to pulmonary artery catheter use. CHF = congestive heart failure; any = presence of either CHF, hypotension or shock; + = present; − = absent.](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21568/ on 06/25/2017)
factors, patients in congestive heart failure receiving a PA catheter remained at significantly increased risk of dying during the acute hospitalization than did patients not receiving a PA catheter (adjusted relative risk [RR] = 2.5, p<.001). In a similar manner, when the in-hospital CFRs of hypotensive patients receiving or not receiving a PA catheter were adjusted for significant differences in selected characteristics (peak CK findings greater than five times normal [20 percent vs 59 percent]) (p<.001), significant differences remained in terms of an elevated in-hospital CFR for patients receiving as compared to those not receiving a PA catheter (adjusted RR = 1.5) (p<.001). Patients in cardiogenic shock receiving a PA catheter were significantly younger than those not receiving a PA catheter (68 vs 72 years), and similar to the crude findings, there was no significant difference in short-term prognosis for those receiving vs those not receiving a PA catheter when both stratified and multivariate analyses were carried out. For patients developing either congestive heart failure, hypotension or shock at any time during the early hospitalization, when the in-hospital CFRs for patients receiving vs not receiving a PA catheter were adjusted for significant differences in selected characteristics, including peak CK findings greater than five times normal (69 percent vs 54 percent), age (66 vs 70 years), men (63 percent vs 56 percent) and occurrence of Q wave infarcts (75 percent vs 60 percent), the adjusted in-hospital CFR of patients receiving a PA catheter was 2.6 times greater than for those not receiving a PA catheter (p<.001).

Length of Hospital Stay

The average length of hospital stay for patients discharged alive during the four study years in relation to PA catheter use was examined (Fig 2). For patients developing congestive heart failure, the mean hospital stay was 22.3 days for patients with a PA catheter, as compared to 17.9 days for patients not receiving a catheter (p<.001). When hypotension complicated the MI, the hospital stay was 21.4 and 16.4 days, respectively, for patients with and without a PA catheter; the average hospital stay was 22.1 days for MI patients with cardiogenic shock receiving a PA catheter as compared to 15.4 days for patients in cardiogenic shock not receiving a PA catheter (p<.01). Similar trends of length of hospital stay were seen when each of the four calendar periods under study were examined separately according to PA catheter usage and development of selected clinical complications.

Long-term Prognosis

Of 2,649 patients discharged alive from the hospital, further follow-up was obtained for 99 percent (2,649/2,649). Long-term survival was assessed for patients whose acute MI was complicated by congestive heart failure, hypotension or shock according to PA catheter use (Table 3). For patients with congestive heart failure during the early hospital period, the long-term prognosis tended to be slightly greater for those receiving a PA catheter than for those who did not. If hypotension or shock complicated the MI, the long-term prognosis for up to a five-year follow-up period was no different for those who were and were not managed with a PA catheter during the early hospital period. Finally, for those patients who developed either hypotension, congestive heart failure or cardiogenic shock during the early period of hospital admission, there was a trend for patients who were managed with a PA catheter to have a slightly greater five-year prognosis as compared to MI patients not managed with a PA catheter.

Discussion

The results of this community-wide study demonstrated that usage of pulmonary artery catheterization in patients hospitalized with validated acute myocardial infarction in all 16 hospitals in the Worcester, Massachusetts SMMA increased almost three-fold between 1975 and 1984. In addition, the increasing use of the PA catheter was observed in each of the various subgroups examined, including those patients developing specific complications of acute MI in whom PA catheter use might be particularly indicated. Parallelizing this increase during the same time period, we also found marked increases in the utilization of other diagnostic procedures including Holter monitoring, echocardiography, exercise treadmill tests and radionuclide ventriculograms in patients with acute MI.18

By including all hospitalized cases of acute MI from a defined community-wide geographic setting, this study decreased the likelihood of selection biases that
Table 3—Long-term Survival Rates for Patients with Selected Complications of Acute Myocardial Infarction According to Pulmonary Artery (PA) Catheter Use

<table>
<thead>
<tr>
<th>Months After Hospital Discharge</th>
<th>Congestive Heart Failure</th>
<th>Hypotension</th>
<th>Cardiogenic Shock</th>
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<tbody>
<tr>
<td></td>
<td>n (185)</td>
<td>n (165)</td>
<td>n (31)</td>
</tr>
<tr>
<td>PA (+)</td>
<td>84 (87)</td>
<td>74 (69)</td>
<td>67 (59)</td>
</tr>
<tr>
<td>PA (-)</td>
<td>83 (76)</td>
<td>77 (69)</td>
<td>66 (59)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>78 (68)</td>
<td>73 (59)</td>
<td>59 (59)</td>
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<tr>
<td>24</td>
<td>70 (64)</td>
<td>74 (68)</td>
<td>59 (59)</td>
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<tr>
<td>36</td>
<td>68 (60)</td>
<td>77 (68)</td>
<td>59 (59)</td>
</tr>
<tr>
<td>48</td>
<td>63 (54)</td>
<td>69 (54)</td>
<td>54 (54)</td>
</tr>
<tr>
<td>60</td>
<td>58 (48)</td>
<td>66 (48)</td>
<td>49 (48)</td>
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</table>

may occur in examining data from individual hospitals. In addition, this study allowed an examination of PA catheter usage in relation to a variety of outcome measures in four distinct time periods.

Of the various diagnostic approaches used in patients with acute MI, we elected to examine PA catheterization in association with several outcome measures for several reasons. This technique is widely recommended to be of diagnostic and therapeutic benefit in acute MI patients and is frequently utilized in this setting. Use of the PA catheter has also recently come under criticism as being commonly performed without an adequate assessment of its potential risks and benefits.

Given the incremental costs of this procedure and current attention focused on the escalating costs of medical care, it is appropriate to attempt to determine if this procedure is cost-effective. To determine if it is cost-effective, we must first determine if it is efficacious. While appropriate reservation must be exercised in the interpretation of data from non-randomized/observational studies such as the present, we have sought to assess the efficacy of this procedure in patients with acute MI by examining the use of PA catheterization in relation to in-hospital and long-term survival, as well as average length of hospital stay.

The data from this community-wide study indicate that pulmonary artery catheterization is most frequently utilized in patients with more extensive myocardial damage, as judged by peak CK levels, and Q-wave myocardial infarction. It is also apparent from our data that the vast majority (96 percent) of patients who received a PA catheter had at least one major hemodynamic complication of MI: congestive heart failure, hypotension or cardiogenic shock. Thus, the patients who received PA catheters were those whose management one would expect to be most likely to benefit from the availability of on-line hemodynamic data.

In-Hospital Prognosis

The first index of benefit that we analyzed in relation to PA catheter use was in-hospital case-fatality. When the in-hospital case-fatality rates in patients with the major hemodynamic complications of MI were examined, we observed that patients with hypotension or congestive failure who received a PA catheter experienced a significantly higher short-term mortality than those who did not. For patients in cardiogenic shock, in-hospital prognosis was essentially the same for patients with or without a PA catheter. In addition, when each of these respective short-term case fatality rates were adjusted for a variety of potential prognostic factors that differed between patients receiving and not receiving pulmonary artery catheters, trends similar to the unadjusted case fatality rates were observed. Reinforcing the consistency of these findings is the fact that these observations were also seen during each of the four years under study.

Average Length of Hospital Stay

A second index of benefit, average length of hospital stay, was analyzed according to PA catheter usage. As previously noted, patients developing congestive heart failure, hypotension or shock and receiving PA catheters had a significantly longer hospital stay than did MI patients with these complications who did not receive a PA catheter. These findings were seen both for the combined study periods, as well as for each study year examined.

Long-term Prognosis

As a third index of therapeutic benefit, the long-term prognosis of patients discharged from the hospital was examined. As shown in Table 3, long-term survival was essentially the same in hypotensive patients receiving or not receiving a PA catheter during the acute
admission. There was a trend for improved long-term survival in patients developing congestive heart failure or shock during the acute admission who did as compared to those who did not receive a PA catheter.

**Overall Assessment**

From the standpoint of in-hospital and long-term survival, as well as average length of hospital stay we could not, therefore, demonstrate a positive benefit for the use of pulmonary artery catheters in patients hospitalized with acute MI.

It is difficult to reconcile these findings with our clinical impression that this technique is of benefit in managing patients with various hemodynamic complications of acute MI. Our clinical impression of the benefit of this technique may be incorrect or alternatively there are other explanations for the negative findings observed in this study.

Although there are known complications of pulmonary artery catheterization, including balloon rupture, pulmonary artery thrombosis, and occurrence of ventricular arrhythmias, it is highly unlikely that they are of sufficient magnitude to overshadow a positive therapeutic benefit. A true positive benefit could have been obscured by the use of this technique in patients in whom it was not indicated, that is, in patients in whom the data provided by this technique would be unlikely to influence their management. The fact that 96 percent of the patients who received a pulmonary artery flow-directed catheter in this study had either congestive heart failure, hypotension or cardiogenic shock make this explanation unlikely.

A potentially confounding factor that could explain the higher short-term case fatality rates and longer hospital stay in MI patients receiving PA catheters could be that PA catheters were more likely to be utilized in the sickest patients. That is, patients with congestive heart failure, hypotension or cardiogenic shock who received a PA catheter may have been sicker than patients with these complications who did not receive a PA catheter. Our definition of congestive failure (rales at least one-third of the way up both lung fields and an S3 gallop) was based on data available in the patient's medical record. We did not attempt to further classify this complication into gradations of severity based on additional findings of duration or symptoms. Hypotension was defined as a recorded systolic blood pressure of less than 90 mm Hg. We did not classify patients with hypotension according to its duration or according to whether a fluid challenge was administered because data available in the hospital charts was not sufficiently detailed to permit this distinction. It is unlikely that the patients with cardiogenic shock who received PA catheters were sicker than those who did not since this definition included hypotension, persistent oliguria and heart failure.

When multivariate analytic techniques were used to adjust for differences in additional prognostic factors in patients receiving and not receiving a PA catheter, a significantly increased in-hospital case fatality continued to persist for patients in congestive heart failure, hypotension, and in those with or without a complicated MI who received a PA catheter during their acute hospitalization.

Thus, given the retrospective observational nature of the present study, and its reliance on the use of the medical record as its primary source of data, we could not determine if patients with specified hemodynamic complications of acute MI who received a PA catheter were indeed sicker than patients with these complications who did not have a PA catheter inserted. The decisions to place these catheters were made by scores of physicians, with varying levels of skills in the use of the PA catheter, at 16 different hospitals over a ten-year period. It is very unlikely that there was a uniform or even a consistent pattern of practice with regard to the use of PA catheterization throughout the periods studied.

The data obtained from this community-wide study of patients hospitalized with acute MI in a large metropolitan area during the calendar years 1975, 1978, 1981, and 1984 fail to provide evidence of positive therapeutic benefit of using pulmonary artery catheters in the management of patients with acute MI complicated by congestive heart failure, hypotension, or cardiogenic shock. It is certainly possible that the use of PA catheterization may be helpful in selected patients with acute myocardial infarction. Indeed, several studies have reported that the PA catheter is clinically beneficial in patients with acute MI28-30 and in those undergoing coronary artery bypass surgery. On the other hand, there may be untoward physiologic effects or other undesirable effects of the PA catheter in patients with acute myocardial infarction that may unfavorably influence the acute and recovery phase of such patients or of selected patient subsets.27

Given the results of the present study and lack of documentation of the risk/benefit of this procedure, we agree with others that a randomized controlled clinical trial to assess the efficacy of the PA catheter in patients with acute myocardial infarction is indicated.34-38 To our knowledge, such trials have not been reported. The results of such a trial might identify those patient groups likely or not to benefit from the use of pulmonary artery catheterization during the acute phase of myocardial infarction. Indeed, given the current era of cost-containment, the need for such a trial becomes even more evident. Similarly, the therapeutic benefit of other invasive and noninvasive diagnostic techniques used in patients with acute MI needs to be assessed.
ACKNOWLEDGMENT: The authors wish to express their appreciation to the administration, medical record departments, and cardiology departments of the hospitals in the Worcester SMSA who provided access to their medical records; to Sandra Knowlton and Gerrie Nespoli for data abstraction; to Donald Love and Marc Zive for statistical analysis; and to Mary Larson for secretarial assistance.

REFERENCES


Death by Pulmonary Artery Flow-Directed Catheter (editorial)

Time for a Moratorium?

Eugene D. Robin, M.D.*

A study by Gore et al in this issue of Chest (see page 721) raises some critically important issues involving the safety of large numbers of patients.

The impact of the use of the pulmonary artery flow-directed catheter on patient outcome following acute (usually complicated) myocardial infarction was analyzed retrospectively in 3,263 patients. No benefit in terms of mortality, length of hospital stay (longer in those with the catheter), or long-term prognosis could be demonstrated. These findings, although not anticipated by the overwhelming majority of catheter users, are scarcely surprising. The probable lack of benefit was anticipated in 1950 and has been emphasized since 1982. A lack of benefit in the use of pulmonary flow catheters in the ICU is also implicit in the data of Knaus et al.

The present study by Gore et al, however, surprisingly shows a very large excess mortality in patients in

*Professor of Medicine and Physiology, Stanford University Medical Center, Stanford.

Reprint requests: Dr. Robin, Physiology, Anatomy Building, Stanford University School of Medicine, Stanford 94305

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