linezolid in MRSA pneumonia could for example include molecular methods established for MRSA screening,20 to at least exclude non-MRSA patients within a few hours. This approach bears the potential to substantially reduce the number of patients receiving overtreatment. The study by Wunderink and coworkers does reveal a small advantage in selected patients if linezolid is included into empiric antibiotic therapy of nosocomial pneumonia, but each intensivist could probably make a much larger difference if he or she would be constantly reminded of his or her Hippocratic oath and be asked: What did you do to prevent it?

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Cardiogenic Shock
What Has Changed?

The oft-repeated adage that we have gained the ability to keep critically ill patients alive longer is valid for the complication of cardiogenic shock. So the next question is, has the disease state changed in the last 40 years? The breathtaking advances in cardiology that have focused on reperfusion of the myocardium after an infarct are supplemented by intensive care to preserve the myocardium. The exhaustive review by Hollenberg and colleagues1 estimated the incidence of cardiogenic shock at 5 to 10% after myocardial infarction, a value that has
remained stable in other studies since 1975.\textsuperscript{2} The reviewers emphasized that myocardial dysfunction due to ischemia worsens the ischemia that creates the “downward spiral.”\textsuperscript{1} The study by Lim and associates in this issue (see page 1885) seems to suggest that the pathophysiology of cardiogenic shock may have changed in some patients. They present a provocative idea that a group of patients who were significantly younger and were kept alive for 4 to 5 days actually may have experienced a distributive form of shock. Their hypothesis is based on data from nine nonsurvivors in whom cardiac index (CI) levels were restored to > 2.2 L/min/m\textsuperscript{2}. These patients had no clinical or bacteriologic evidence of sepsis, including nosocomial infections. Incomparison, patients with low CI values died rapidly from either the classic downward spiral or malignant arrhythmias. They speculate from an analysis of a subgroup of patients in the retrospective study about the role of cytokines, tissue mediators, and nitric oxide in cardiogenic shock. These authors, interestingly, do not consider the important role of myocardial stunning or hibernation that contribute to the pathogenesis of cardiogenic shock.\textsuperscript{1}

Some details in the present study are worth pondering. Consider the fact that the authors of the current study restored normal CI levels of 2.5 to 2.7 L/min/m\textsuperscript{2} with high doses of pressors and inotropes. They also used aortic balloon counterpulsation in almost one third of the patients. A single patient in both groups experienced shock after undergoing cardiopulmonary bypass. The suggestion that a cardiac index of 2.6 L/min/m\textsuperscript{2}, which is barely in the normal range with maximum therapy, represents an inflammatory response may arouse some skepticism. Similarly, values of what the authors call “low systemic vascular resistance” fall within the normal range. Admittedly, these values are lower than those observed in patients who are unable to increase their cardiac output. An astute clinician would consider such a response if the values were associated with a good clearance of lactate. Why would a decrease in systemic vascular resistance to low normal levels be considered pathologic?\textsuperscript{2} To quote Kuhn\textsuperscript{3} from his 1967 article: “It is reasonable to relate the initiation of arterial hypotension to an acute reduction of cardiac output. However, in several instances, the ‘normal’ response to such an acute cardiac output (i.e., a compensatory rise of systemic vascular resistance) has not occurred in acute myocardial infarction.” On the other hand, high doses of pressors and inotropes have been found to be detrimental to myocardial oxygen consumption and lactate production.\textsuperscript{4} The work of Mueller et al\textsuperscript{4} established a long time ago that whole-body oxygen consumption or blood lactate levels might not reflect the true metabolic state of the myocardium. Thus, the change in thinking of the clinicians who, with a great deal of supportive therapy, were able to sustain a subset of cardiogenic shock patients for a few days and then were surprised when the patients died may be real “hubris”!

The authors of the current study have used a relatively new concept that they have developed (i.e., the use of a CI/oxygen extraction [\(O_2\)ER] ratio to document adequacy of oxygen delivery and oxygen consumption). Vincent\textsuperscript{5} in a previous publication has proposed the use of the CI/\(O_2\)ER ratio. In cardiogenic shock, a ratio of < 5 has been identified as being indicative of poor outcome. In all likelihood, the low levels of CI mostly determine the low levels of CI/\(O_2\)ER. In the present study, \(O_2\)ER values are quite similar in patients with low CI and normalized CI values. One surely would consider the separate contributions of CI and \(O_2\)ER in this ratio.

Lim and colleagues deserve credit for looking at an old problem and attempting to provide new explanations. They have generated a new hypothesis. We must await further work to delineate the mechanism of death in some patients with cardiogenic shock in whom cardiac output seems to have been restored to normal. Meanwhile, we should heed Kuhn,\textsuperscript{3} who emphasized that specific hemodynamic derangements may vary considerably among different patients who may present similar clinical appearances.\textsuperscript{3} What is more remarkable is that he made these observations when data on only 72 patients with cardiogenic shock were available.

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Hearts in the Air

The Role of Aeromedical Transport

Aeromedical transport (AMT) of seriously ill patients is no longer a rarity, but rather an everyday event. Indeed, as early as 1784, after the balloon flight demonstrations of the Montgolfier brothers, physicians began to consider the benefits their patients could gain from flight. Jean-Francois Picot theorized that not only could patients tolerate balloon flight, they would in fact benefit from purer air encountered at altitude. AMT using heavier-than-air machines was initiated in 1909, when Captain George Gosman built a plane specifically for this purpose. However, it was not easy to convince the government to approve further development of Gosman’s aircraft following its destruction in a crash, and it was never used to transport actual patients. In 1917, the French Dorand AR II was the first air ambulance that actually carried patients. Over the next several decades, the “ambulance airplane” industry grew, mainly in the military. World War II saw great increases in the use of AMT. It has been estimated that more than one million patients were airlifted by the United States from all theaters of this conflict, with an overall death rate of only 4 in 100,000.

The Korean War brought new challenges and opportunities for AMT. In 1950, the use of the helicopter for the front-line medical evacuation of patients during combat was authorized. More than 17,000 patients were transported by Army helicopters alone from January 1951 to 1953. The outstanding medical evacuation system developed during the war in Vietnam owed much to the experience gained during the Korean conflict. The effective use of helicopters for AMT in Vietnam and their appearance almost nightly on domestic television kindled interest in their use for air evacuation in the civilian community. The recent conflict in the Persian Gulf has also emphasized the importance of AMT in military operations.

The marriage of aviation and medicine has expanded the reach of the critical care unit and other specialized units beyond an individual hospital. The incorporation of monitoring, ventilators, oxygen and suction, infusion pumps, etc, allows critical care therapy similar to that available within the hospital. Unfortunately, many advertised “air-ambulance” services are nothing more than business aircraft staffed by a moonlighting paramedic or nurse obtained on a “catch-as-can” basis by a charter aircraft company. There may be no medical direction at all and thus no practice standards, appropriate education of personnel, quality assurance, or medical control. Good clinical studies are definitely needed to aid in the creation of guidelines for the air transport of seriously ill patients.

In this issue of CHEST (see page 1937), Essebag and coworkers review in detail the advantages and disadvantages of AMT for cardiac patients. This comprehensive review clearly points out the advantages of helicopter transport for patients with acute myocardial infarctions and the safety of administration of IV thrombolytics in the air based on studies published over the past 2 decades. The authors are cautious about their recommendations for use of these service for long-distance emergency AMT. Their legitimate concerns about hypoxemia and gas trapping with altitude have remained an issue since the advent of AMT.

In many communities, emergency air medical systems have become an integral part of the practice of cardiology and critical care medicine. These systems provide specialized care by the severely injured and ill, and thus may be needed for patients of health-care practitioners of all types and not only cardiac patients. Understanding the medical aspects of flights and the capabilities of the air medical environment will help the non-air medical practitioner to use these resources in a safe and appropriate manner. Clinicians using AMT for their cardiac patients must be aware of local transport regulations, the types of AMT available in their community, and whether or not they have the necessary personnel and tools to safely transport a specific patient. We firmly believe that AMT is a safe means for transport of cardiac patients and should be considered for patients who require transfer to more specialized centers for additional diagnostic and therapeutic interventions.

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